ANNEX 6

AN ASSESSMENT OF THE PESTICIDE USE, PRACTICE AND HAZARDS IN THE ETHIOPIAN RIFT VALLEY

BY:

TADESSE AMERA (MPH)

AND

ASFERACHEW ABATE (PhD)

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LIST OF ACRONYMS

DNA: Designated National Authority

EPA: Environmental Protection Authority

EPI Info: Epidemiological Information

EU: European Union

FAO: Food and Agriculture Organization

ISD: Institute for Sustainable Development

MoARD: Ministry of Agriculture and Rural Development

MoH: Ministry of Health

NRgroup: Natural Resource Group, Development Professionals, UK

PAN-UK: Pesticide Action Network-UK

ABSTRACT

Background: Over 85 percent of Ethiopia's population; currently estimated at 81 million, live in rural areas and depend on agriculture for food and other basic necessities. Although chemical pesticide use in Ethiopia was historically low, recent developments in increased food production and expansion in floriculture industry have resulted in higher consumption of chemical pesticides. The impacts of pesticides in Ethiopia are much more aggravated by the limited knowledge among users on safe practice, toxicological and chemical properties of these substances. Even worse, less is known about the long term and indirect effects of pesticides on rural and urban communities as well as on local and national food production systems.

Objective: The study was designed to assess the pesticide use, practice and hazards in the Ethiopian Rift Valley.
Method: Four hundred and twenty two farmers were selected randomly from 23 villages in Ziway and Arsi Negele woredas and a structured and pre-tested questionnaire was used for data collection

Results: The result showed that 84.4% of the farmers depend only on farming as a sole livelihood, 94.3% of the farmers used pesticides as part of their agriculture input and 28.7 % of the farmers use DDT for Agriculture. The protective equipment utilization in the area was almost none; alongside which 31% of the respondents claimed illness after spraying pesticide and 14.2% indicated the occurrence with in the family of a health related pesticide incident. The training given to farmers on pesticide issues was also very minimal which lead to low level of awareness. About 50% of the respondents used empty pesticide containers for water/food storage and about 7% of them indicated that they sell empty containers for others to use. About 31% of the respondents stored pesticides any where in the house and about 6% of them stored pesticides even in the kitchen.

Conclusion & Recommendation: The low level of awareness in the study area and the public health and environmental consequence resulting from the misuse of pesticides is alarming. There should, therefore, be an integrated effort from governmental and non-governmental organizations that focus on the awareness raising of farmers on proper pesticide management related issues.

1. INTRODUCTION

1.1 General Background

Over 85 percent of Ethiopia's population; currently estimated at 81 million, live in rural areas and depend on agriculture for food and other basic necessities. The country's population is estimated to reach 130 million by 2030. This has a serious implication on the sustainability of the natural resource base and the efforts to attain national food security given that nearly half of the current population is classified as undernourished.

Population growth and land degradation contribute most to the increasing risk of food insecurity and famine in Ethiopia. On top of these obvious factors, the average crop loss due to pests was estimated to reach between 30 and 40% annually.

Although chemical pesticide use in Ethiopia was historically low, recent developments in increased food production and expansion in floriculture industry have resulted in higher consumption of chemical pesticides.

Recently, Ethiopia has been considered as having the largest accumulations of obsolete pesticides in the whole of Africa. It was estimated that there were 402 stores at 250 sites containing 1, 500 tones of obsolete pesticides (MOARD (2007) Report). This estimate does not include the massive but unquantifiable amounts of pesticides soaked in soils. Nor does it include contaminated building materials, pallets, shipping containers and other miscellaneous items.

The Ethiopian Obsolete Pesticides Disposal Project, a project that mainly aimed at removing obsolete pesticides has been operational in Ethiopia for the last five years. It has been reported (MOARD (2007) Report) that a significant portion of the obsolete pesticides have been removed since then. However, it should be noted that as the obsolete pesticides are removed, new pesticides are imported and are possibly contributing to further accumulation.

While pesticides have increased agricultural production and improved public health, evidences in the last few decades have shown that they could also be detrimental to human health and the ecosystem. The real impacts of pesticides are not easily mapped in most circumstances. Acute effects are easier to observe, but they could also be confused with common illnesses. Pesticides may also cause chronic diseases such as cancer, reproductive disorders, birth defects and immune system disorders.

Considering the absence of effective controlling mechanisms in pesticides imports and their increased and inappropriate use in Ethiopia, an assessment of the impact on human health and the ecosystem is warranted.

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 can not be understood or missing. Little is known about the long term and indirect effects of pesticides on rural and urban communities as well as on local and national food production systems.

1.2. Crop pests: Challenges for food security

Land degradation and recurrent drought have been attributed as main factors for the low crop production in the Ethiopian agricultural system. It is, however, essential to note that losses due to pests, diseases, and weeds also play important roles in reducing crop yields and thereby contributing to food insecurity, though updated information on the extent of their damage is generally lacking. The following paragraphs highlight crop losses due to pests on the basis of available information.

1.2.1 Losses by pests

A. Losses by insects and Rodents

Crop yield loss by major insect pests is dependent on the type of crop pest and the crop variety. According to the estimate by the Holetta Research Station (1986), the average pre-harvest loss for field crops (e.g. Cereals, Pulses and Oil Seeds) ranged between 15 to 40%, for horticultural crops (e.g. Root and Tubers, Vegetables and Fruits) between 13-29%, for coffee between 9 to 48% and for cotton between 21-60%. The average pre harvest crop losses due to insect pests ranged between 17 and 41%.

Losses to migratory pests can be catastrophic. For example, in 1958 the desert locust (*Schistocerca gregaria*) caused an estimated loss of 267, 000 tones of grain in Ethiopia. This was estimated to be enough to feed 1 million people for one year (Anon, 1993).

Losses due to vertebrate pests such as rodents and birds are estimated to reach between 10 and 25%. According to EARO (2000), during the period 1995 to 1999 an annual average of 74.5 million Quelea birds infested an average of 1, 500 ha of sorghum.

B. Losses by diseases

Crop diseases caused by fungi, bacteria, viruses, and plant parasitic nematodes inflict a significant amount of losses on crops. For instance, according to the field study by Holeta Agricultural Research Station (1986), losses on field crops ranged between 32-52%. Similarly the average loss on industrial crops ranged between 22 and 44%, and on horticultural crops ranged between 35 and 62%.

C. Losses by weeds

Losses caused by weeds in selected crops have been reported to be as high as 100%. According to the findings by the Holeta Research Center, the average loss for field crops ranged between 49 to 65% and for industrial crops it ranges between 45

and 83%. The overall average loss on crop yield estimated to reach between 52-76%.

Since most loss assessment studies were conducted in research stations, they do not necessarily reflect on-farm losses; hence, their interpretations should be made with care. However, it should be noted that the above crop loss data provide general indications on the importance of pests in the reduction of food production.

1.3. Approaches in pest control

Worldwide, three approaches are used to eradicate or greatly lessen the number of pest organisms:
i) The first approach is chemical treatment. Although this approach has had much success, it gives only short-term protection. Furthermore, the chemical often has side effects that are highly damaging to other organisms.

ii) The second approach is called ecological approach. This approach seeks to give long lasting protection by developing control agents on the basis of knowledge of the pest life cycle and ecological relationships. Such agents, which maybe other organisms or chemicals, work in one of two ways: Either they are highly specific for the pest species being fought, or they manipulate one more aspects of the ecosystem. Ecological control emphasizes the protection of people and domestic plants and animals from damage of pests, rather than eradication of pest organism. Thus, the benefits of pest control can be obtained while maintaining the integrity of the ecosystem.

iii) The third approach is integrated pest management which is a pest management system that, in the context of a given environment and the nature of the pest species in question, utilizes all suitable techniques and methods of pest control in compatible, a manner as possible to maintain the pest population at levels below those causing economic loss. Thus pests are treated as part of the whole ecosystem rather than as isolated occurrences. In the IPM system, chemicals are applied only as a last resort as the time when pests are most vulnerable, rather than routinely by calendar schedule.

2. STATEMENT OF THE PROBLEM

Ethiopia's chronically food insecure population, which is estimated to be between four and five million, has continued to increase as the annual population growth of 2.9% outstrips the average annual 2.4% increase in agricultural production (CRDA, 2002). Even during good years with normal rainfall, an average of about 5 million people is food insecure.
The challenge of providing enough food is and will remain one of the most pressing and urgent problems in Ethiopia. This is an alarming situation calling for an integrated approach towards increasing food production, productivity, and protection both in the field and after harvest. On the other hand, the efforts to increase food production and protection should be in a way that does not affect public health the environment adversely.

This study, therefore, aimed at assessing the pesticide use, practice and hazards by rural communities in the Ethiopian Rift Valley, focusing on Ziway and Arsi Negele Woredas. The findings of the study are expected to provide some insights on the trend of pesticide use and its impacts on public health and the environment.

3. OBJECTIVES

3.1 General Objective

To assess the pesticide use, practice and hazards to the small holder farmers in the Ethiopian Rift Valley.

3.2 Specific Objectives

1. To assess the pesticide utilization practices of the farmers in Ziway and Arsi Negele
2. To assess the pesticide related knowledge and perception of farmers in Ziway and Arsi Negele
3. To Assess the pesticide use and related public health and environmental effects

4. METHODOLOGY

4.1 Training of high school Environment club students

The high schools of Meki, Ziway, Arsi Negele and Shashemenie (all in the Ethiopian Rift Valley) were contacted to assess interest in the intended training; Ziway and Arsi Negele high schools were selected because of the quick response we got from the two schools' administration.

The environment club members of the two schools were chosen because of their awareness of environmental issues and their commitment to raise the awareness of their school students, their families, neighbors and families.

A total of 70 students (40 from Ziway and 30 from Arsi Negele) were registered to participate in the training and carry out the local surveys. Their club leader teachers (two from each high school) were also included to make the training more effective.

A training module was also prepared in collaboration with the Federal Ministry of Agriculture and Rural Development, Crop Protection Department and the training was given for six days in December 2007.

4.2 Survey

4.2.1 Study Setting

A cross-sectional study was conducted in 23 villages of the two Weredas of the Great Rift Valley of Ethiopia namely, Ziway and Arsi Negle from September to December 2007.

Ziway and Arsi Negle are located 160 km and 225 km South East of Addis Ababa at the main road between Addis Ababa and Awassa respectively. The most important features of the two Weredas relevant to risk assessment are described below.

MAP OF ZEWAY

a) Climate

The two Weredas are characterized by a semi-arid to sub-humid climate with mean annual precipitation and mean annual temperature of 620 mm and 250C respectively (Ethiopian Meteorological Services Agency). The area is characterized by three main seasons. The long rainy season in the summer (June–September; locally known as kiremt) is primarily controlled by the seasonal migration of the inter tropical convergence zone (ITCZ). The kiremt rain represents 50–70% of the mean annual total. Highlands flanking the Rift Valley intercept most of the monsoonal rainfall in the region, resulting in a strong moisture deficit at the rift floor in general. The dry period extends between October and February (known as baga). Occasional rains during the dry period may bring 10–20% of the annual mean (Degefu, 1987). The 'small rain' season (belg, 20–30% of the annual amount) during March to May coincides with a diminution of the Arabian high as it moves towards the Indian Ocean, causing warm, moist air with a southerly component to flow over most of the country (Griffiths, 1972).

b) Vegetation

The vegetation in the rift valley is mainly characterized by Acacia open woodland (personnal observation). The most common trees being the woodland Acacias, Acacia etbaica, A tortilis, A. Senegal and A. seyal. Euphorbia abyssinica and Euphorbia candelabrum are also common. There is also rich herb and grass flora if it not grazed to bare ground. Grass and herb species dominant in the area are Cenchrus ciliaris, Hyparrhenia hirta, Chloris gayana, Cryptostegia grandiflora, Harpachne schimperi, Tagetes minuta, Solanum incanum, Bidens pilosa, Satureja abyssinica and Sida ovata (Asferachew et al 1998). Crops produced in the area include Tef, maize, barely, wheat and sorghum. According to the survey result over 95% of the crops produced is maize.

c)Lakes

The two Weredas are characterized by four lakes namely Lake Ziway, Lake Langano, Lake Abjata and Lake Shalla. The upstream lakes Ziway and Langano are mainly fed by rivers emanating from the highlands on either side of the rift. The major influents of Lake Ziway are the Ketar and the Meki Rivers, which drain the eastern and western plateaus respectively. The catchment of these two rivers represents about 5610 km2 (40% of the Ziway–Shala basin). Lakes Ziway and Langano are open lakes, and overflow towards Lake Abiyata to the south through the Bulbula and Horakelo Rivers respectively. Lakes Abiyata and Shala are closed lakes. Owing to its terminal position in the drainage area and its shallow depth, Lake Abiyata is especially susceptible to changes in rainfall in the surrounding plateaus and escarpments, as well as to human water use in its cachment. The fish production for human use is high from Lake Ziway followed by Lake Langano. Lake Abiayta and Shalla are used for fishing for human consumption. However, they used to be sanctuaries for a large number of Pelicans and Greater and Lesser Flamingos. Lake Ziway provides habitat for indigenous Tilapia species such as Orechromis niloticus and Tilapia zilli (Tigabu, 2003).

d) Birds and other wildlife

Given the availability of the lake and a diversified vegetation, the two Weredas shelter a number of bird species and other wildlife. Abjata Shalla National Park is also located in Arsi Negele Wereda. Over four hundred species of birds have been registered in the area (Important Bird Areas of Ethiopia, 1996). The bird species

include Ostrich, Imperial Eagle, Lesser Kestrel and wattled Crane. Other wildlife includes Greater Kudu, Grant's gazelle, Warthog, Klipspringer and Jackal.

4.2.2 Study Population

A. Sample Size

The Source population included farmers in Ziway and Arsi Negele.
The number of farmers to be included in the study (participants) was determined using single population proportion formula.

$$n = \frac{(Z\alpha/_2)^2 p(1-p)}{d^2}$$

Where, (Zα/2) = Reliability coefficient = 1.96

n = Sample size

p = 50% this is because similar studies were difficult to find and taking the assumption that 50% of the farmers had low level of knowledge, attitude and practice regarding chemical pesticides.

d = assumed marginal error (5%)

$$n = \frac{(1.96)^2 (0.50)(0.50)}{(0.05)^2} = 384$$

10 % non-response rate was added to the final sample size. Accordingly,
n = 384 + 10/100(384) = 384 + 38= 422

Therefore the final sample size was **422** farmers of which 211 were from Ziway and the rest 211 were from Arsi Negele.

B. Sampling Procedures

After selecting the two woredas (Ziway and Arsi Negele), it was decided conveniently to take 50% of the samples from each. Random sampling technique was, therefore, used to select 10 farmer villages from Ziway and 13 farmer villages from Arsi Negele. Households were also selected randomly and the intended data from 422 households was collected from the 23 farmer villages of Ziway and Arsi Negele.

4.2.3 Data collection

A. Data Collection tools

A semi-structured questionnaire was developed by referring different literatures and modifying according to the objectives of this study. The questionnaire had four parts which enabled to collect information on general background to the household and farms, pesticide practice, pesticide knowledge and perception and pesticide use and environmental effects. The questionnaire was first developed in English. For the data collection, it was translated in to Oromifa (a local Language) and back to English for data entry.

Two days before the data collection, the questionnaire was pre-tested in 20 farmers (4.7% of the sample size) who were farmers in the study area which was not included in the main data collection. It was, therefore, checked for its clarity and some corrections were made.

Names of Villages and Number of Households Surveyed in Arsi Negele and Ziway

No.	Arsi Negele		Ziway	
	Names of Villages	No. of Households Surveyed	Names of Villages	No. of Households Surveyed
1	Meko Oda	22	Annaanoo	22
2	Sayo Maja	22	Abine Garmama	22
3	Woyo	15	Dodecha	22
4	Hada Baso	14	Gerbii Widanna Boramoo	22
5	Arba Gasha	15	Ganda Halaku	22
6	Watera Damota	14	Bochesa	22
7	Qadhoo Tulluu	14	Iddoo Gojolaa	22
8	Ashallee	16	Ganda Warjaa	22
9	Edo Jigesa	16	Goobajoochoo Asaboo	22
10	Adaba Tita	8	Willicoo Boraamo	22
11	Ashoka	14		
13	Gorbii Arbaa	21		
13	Kersa Maja	21		

B. Data Collectors

Seventy youth (grades 9 and 10, environment club members of Ziway (40 students) and Arsi Negele (30 students) high schools) who were grades 9 and 10 and four teachers who were leading the environment clubs were trained for six days on pesticide and environment, pesticide and agriculture, pesticides and public health and chemical conventions. Fifty youth were selected from the trained group and the four teachers were taken as supervisors of the data collection.

The selected data collectors and supervisors were trained for two days on the concepts and contents of the questionnaire, ethical considerations, instruction of the questionnaire, data collection procedure and coding.

C. Ethical consideration and Data collection procedure

The selected villages were contacted with a formal letter written from the Institute for Sustainable Development and asked for permission to continue the data collection. The study participants (households) were selected randomly. The study participants were also asked for verbal consent (ethical consideration). Data was collected after their full consent and their confidentiality was kept by not mentioning their names in any communications.

4.2.4 Data Processing

Data were entered in to EPI info software version 6 and data analysis was conducted with SPSS software version 11 for windows. Frequency distribution and percentages were used to describe the findings according to each specific objective.

4.2.5 Dissemination of findings

The result will be submitted to PAN-UK, PAN-Africa (Senegal) and AGENDA For Environments and Responsible Development (Tanzania).

The findings of this study will be disseminated to the nature and environment clubs of Ziway and Arsi Negele high schools, the offices of Agriculture, Health and Environmental Protection of Ziway and Arsi Negele, the Federal Ministry of Agriculture and Rural Development, the Federal Ministry of Health and the Federal Environmental Protection Authority which is the Designated National Authority for Chemical Conventions in Ethiopia. The results will be published as a booklet and will also be published in a scientific journal.

5. RESULTS

5.1 Background to the household and farm

5.1.1 Socio-Demographic Characteristics

All the 422 (100%) of the intended study participants participated in the survey. The mean age of study participants was 42.5 with minimum of 15 years and maximum of 90 years. The average family size was 7.97. Of all the participants 347 (82.2%) were male, 75 (17.8) were female and 392 (92.9%) of the study participants were the head of their families.

Results regarding education are presented in Table 1.

Table 1. Socio-demographic characteristics of farmers in Ziway and Arsi Negele, 2007

No.	Variables	Frequency	Percent
1	**Sex**		
	Male	347	82.2
	Female	75	17.8
2	**Head of the family**	392	92.9
3	**Can read and write**	234	55.5
4	**Highest level of Education**		
	Elementary	116	27.4
	Grade 7-9	98	23.3
	Higher education	14	3.3

5.1.2 Other occupation of farmers

Most of the farmers (84.4%) depended only on agriculture for living whereas 32 (7.6%) of them work as civil servants besides their farming, 15 (3.6%) were traders besides their farming and 19 (4.5%) had another occupation besides farming.

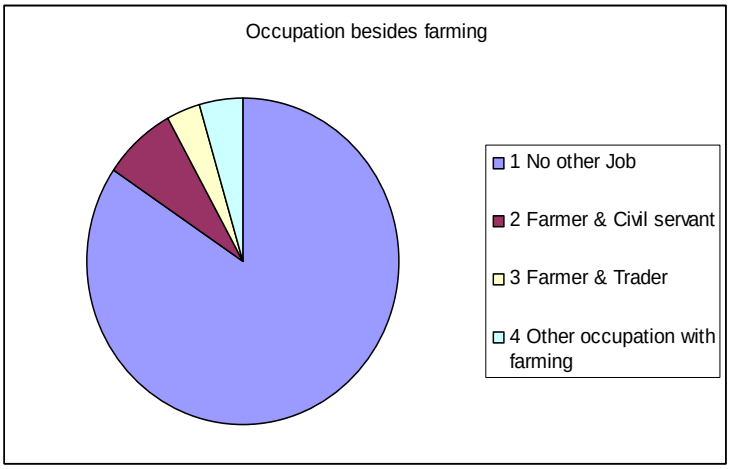

Figure 1. A chart showing occupation besides farming in Ziway and Arsi Negele Farmers, 2007

5.1.3 Location of farm land

The majority of the study participants (60%) had the location of their land at lowland/plain land, 170 (40.3%) had land location near different water bodies, 33 (7.8%) had land located near the edge of a town and 31 (7.3%) had land with other locations.

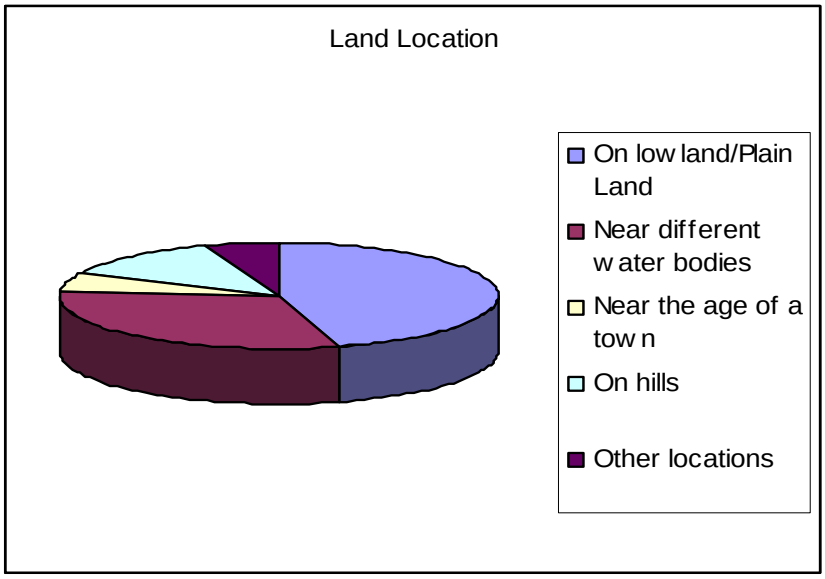

Figure 2. A chart showing the location of farm land in Ziway and Arsi Negele, 2007

5.1.4 Crops produced

Of the crops produced in the study area, maize is produced by the majority (94.3%) of the study participants followed by Tef (82%), vegetable (24.2%), fruits (21.6%) and wheat (11.6%). The majority of the producers were also dependent on subsistence farming.

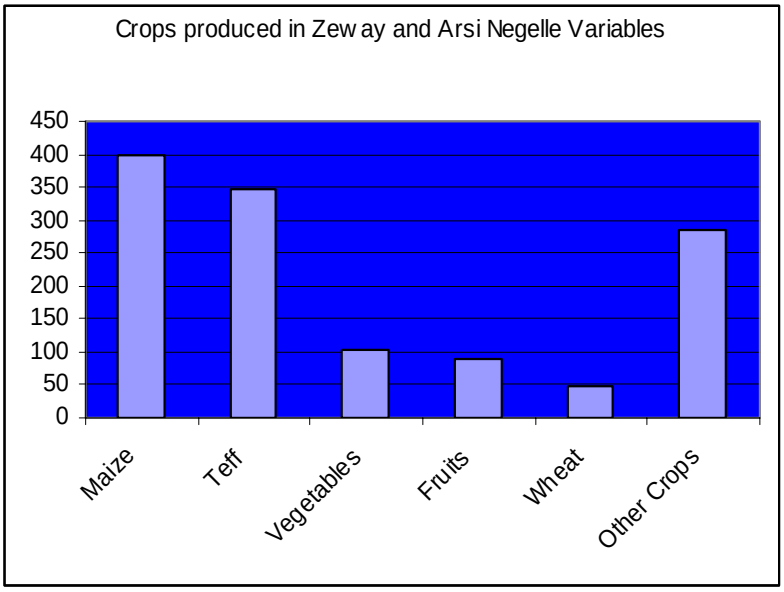

Figure 3. A graph showing crops produced in Ziway and Arsi Negehle, 2007

5.1.5 Pesticide utilization

Regarding chemical pesticide utilization, the majority, 398 (94.3%) of the study participants said that they use chemical pesticides at different levels (regularly or occasionally) and 24 (5.7%) said that they don't use chemical pesticides for crop production. The utilization of artificial fertilizers was indicated by 310 (73.5%) of the study participants, 328 (77.7%) of the participants indicated that they use manure for crop production and 119 (28.2%) indicated that they use bio-pesticides/natural enemies and IPM for crop production.

Table 2. Table showing Pesticides used by farmers in Ziway and Arsi Negele, 2007

No.	Pesticide used by farmers	Frequency	Percent
1.	2-4D	193	45.7
2.	U-46	193	45.7
3.	DDT	121	28.7
4.	Malathion	41	9.7
5.	Selecron	8	1.8
6.	Thionex	7	1.7
7.	Mancozeb	5	1.2
8.	Ridomil	3	0.7

The chemicals mostly used by the farmers were identified as 2,4D and U-46 accounting 193 (45.7%) each, DDT accounting 121 (28.7%) and Malathion accounting 41 (9.7%).

5.1.6 Livestock

As indicated on Figure4, 406 (96.2%) of the study participants had livestock at home; of which 385 (91.2%) own cattle, 312 (73.9%) own donkeys, 275 (65.2%) own chicken, 255 (60.4%) own goats, 213 (50.5%) own sheep and 61 (14.5%) own other livestock. From the 406 households who had different livestock 224 indicated that they use chemical pesticides for the treatment of livestock pests.

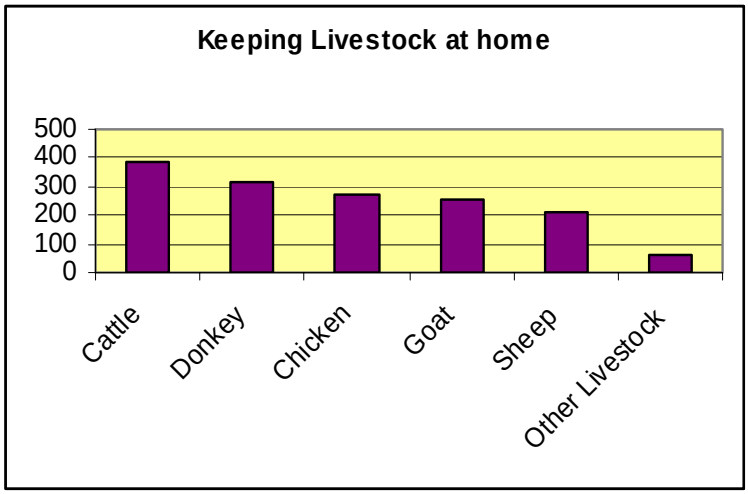

Figure 4. A graph showing households keeping livestock at home in Ziway & Arsi Negele, 2007

5.2. Pesticide practices of farmers

5.2.1 Purposes of pesticide application

Of those farmers who use chemical pesticides 378 (89.6%) indicated that they use it for weed control, 195 (46.2%) indicated that they use it for insect pest control, 148 (35.1%) indicated that they use it for fungi/molds/rust control, 100 (23.7%) indicated that they use it for rodent control, 94 (22.3%) indicated that they use it for veterinary uses and 5 (1.2) indicated that they use it for other purposes.

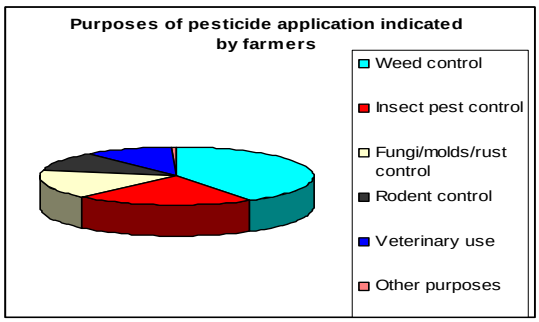

Figure 5. A chart showing purposes of pesticide application in Ziway and Arsi Ngele, 2007

5.2.2 Perceived benefits of pesticides

Regarding the benefits of the pesticide they were using, 356 (84.4%) indicated that pesticide solved their pest problems and 340 (80.6%) indicated that pesticide use increased crop production.

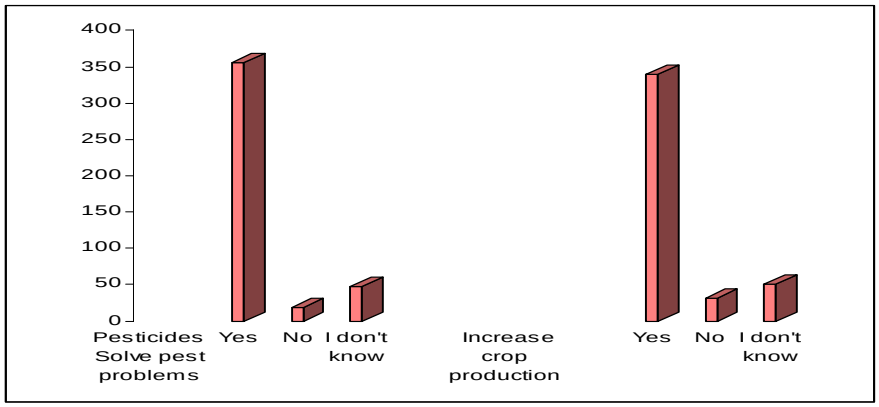

Figure 6. A graph showing the perceived benefits of pesticides by farmers in Ziway & Arsi Negele, 2007

5.2.3 Pesticide spraying, protective equipment utilization and trainings provided for farmers

From the total (422) study participants 235 (55.7%) respondents were those who spray pesticides themselves. Fathers were 189 (44.8%) of pesticide sprayers followed by hired labor 160 (37.9%), sons 57 (13.5%) and mothers 8 (1.9%).

Regarding protective equipment while they were spraying pesticides, 219 (51.9%) used normal clothes, 116 (27.5%) used cotton overalls, 34 (8.1%) used gloves, 36 (8.5%) used hat, 143 (33.9%) used boots while 59 (14.0%) sprayed bare feet. Twenty three (5.5%) of those who spray pesticides used glasses while 16 (3.8%) used goggles for eye protection. As a protection of inhalation, 60 (14.2%) used handkerchief around their mouth and only 7 (1.7%) used mask.

Different training components regarding pesticides were also provided. Less than half of the study subjects 143 (33.9%) indicated that they were trained on pesticide issues. Of those trained, 111 (26.3%) indicated that they were trained on how to use pesticides, 51 (12.1%) were trained on health and safety issues, 30 (7.1%) were trained on IPM, 30 (7.1%) were trained on disposal, 52 (12.3) were trained on application technology and 45 (10.7%) were trained on environmental effects of pesticides.

Table 3. Table indicating the frequency of pesticide sprayers, use of protective devices and trainings related to pesticide issues in Ziway and Arsi Negele, 2007

No	Variables	Frequency	Percent
1	**Pesticide sprayer**		
	Father	189	44.8
	Mother	8	1.9
	Son	57	13.5
	Daughter	3	0.7
	Hired Labor	160	37.9
	Other	5	1.2
2	**Using protective devices during spraying**		
	Using normal clothes	219	51.9
	Using cotton overalls	116	27.5
	Using gloves	34	8.1
	Using hat	36	8.5
	Using boots	143	33.9
	Spraying bare feet	59	14.0
	Using glasses	23	5.5
	Using goggles	16	3.8
	Using handkerchief	60	14.2
	Using mask	7	1.7
	Using other devices	10	2.4
3	**Training received on pesticide issues**		
	Trained on how to use	111	26.3
	Trained on health and safety	51	12.1
	Trained on IPM	30	7.1
	Trained on Disposal	30	7.1
	Trained on application technology	52	12.5
	Trained on environmental effects	45	10.7
	Trained on other issues	6	1.4

5.2.4 Reading labels on pesticide containers, understanding and following instructions

Even if 188 (44.5%) of the respondents indicated that they could read labels on pesticide containers, only 29% could understand and follow instructions. Some 62 (14.7%) of them also indicated that they had bought pesticides without labels.

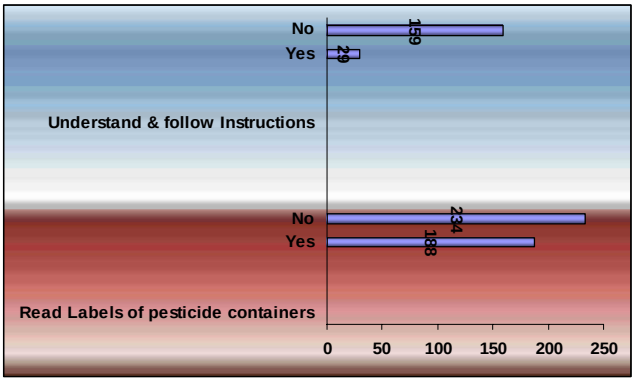

Figure 7. A graph showing the farmers who read labels on pesticide containers; understand and follow instructions in Ziway and Arsi Negele, 2007

5.2.5 Public health effects of pesticides

Regarding illness after pesticide application 131 (31.0%) indicated that they felt discomfort after application and 38 (9.0%) indicated that they sometimes feel discomfort after pesticide application. Head ache was felt by 109 (25.8%) whereas 90 (21.3%) indicated a feeling of nausea, 84 (19.9%) indicated vomiting, 43 (10.2%) indicated skin irritation, 41 (9.7%) indicated eye irritation and 9 (2.1%) indicated other discomforts after pesticide application. However, only 102 (24.2%) knew about the channel of reporting of pesticide incidents and 77 (18.2%) indicated the channel of pesticide reporting is agriculture office.

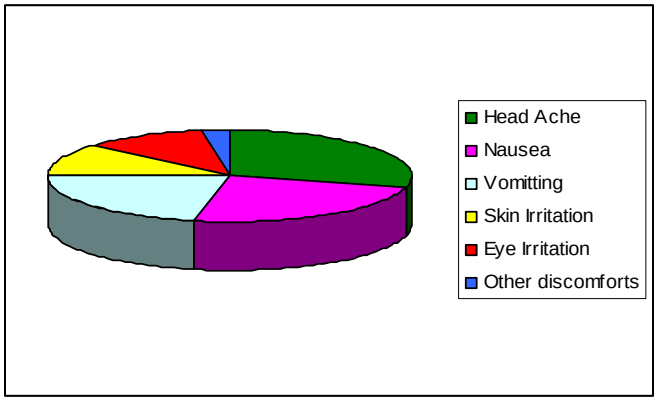

Figure 8. Distribution of illnesses felt by farmers after pesticide application in Ziway and Arsi Negele, 2007

5.2.6 Quantity of yearly pesticide use and how pesticides are stored

The amount of pesticide use every year was indicated increased by 193 (45.7%) of the respondents whereas 108 (25.6%) indicated that the amount of pesticide use every year decreased. Only 125 (29.6%) bought pesticides from licensed vendors while the others bought from vendors they knew but not sure about the license and from open market.

The majority, 233 (55.2%) store their pesticides in a separate place specified for pesticide storage but 132 (31.3%) store their pesticides anywhere in the house and 24 (5.7%) stored their pesticides in the kitchen.

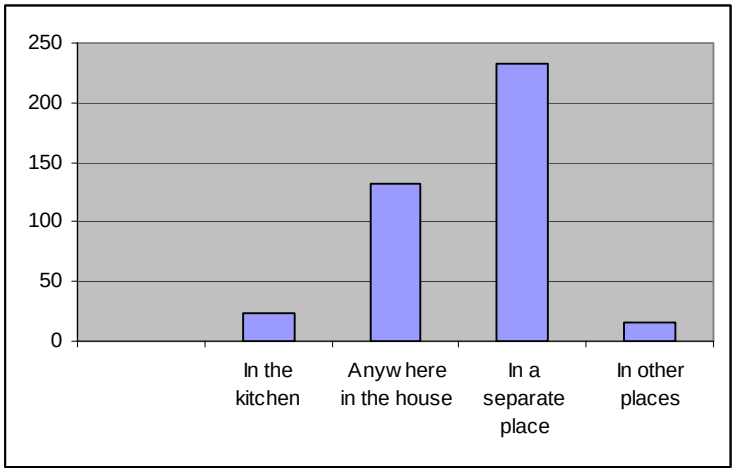

Figure 9. A graph showing places where pesticides stored by farmers in Ziway and Arsi Negele, 2007

5.2.7 Empty pesticide container and obsolete pesticide management

Regarding empty pesticide containers, 208 (49.3%) indicated that they use it for water and/or food storage, 140 (33.2%) indicated that they bury it in the soil and 30 (7.1%) indicated that they sell it. Regarding obsolete pesticides at the farmers' hand, 162 (38.4%) indicated that they continue using it, 103 (24.4%) indicated that they dispose it in the soil and only 72 (17.1%) indicated that they ask advice from a development agent. Inline with expiry date of pesticides, only 105 (24.9%) consider the availability of it on the original container.

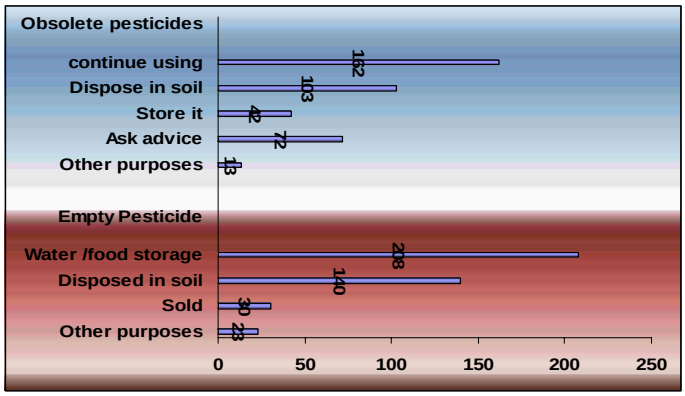

Figure 10. A graph showing the management of empty containers and obsolete pesticides by farmers in Ziway and Arsi negele, 2007

5.3. Pesticide knowledge and Perception of farmers

5.3.1 Farmers knowledge and perception on pesticide effects

The perception of 148 (35.1%) of the farmers was considering pesticides as always good whereas 146 (34.6%) of the farmers perceived pesticides as sometimes harmful and 102 (24.2%) of the farmers perceived pesticide as sometimes good.

As the harmful effects of pesticides, 138 (32.7%) indicated that pesticides cause damage to human health 108 (25.6%) indicated that pesticides cause damage to animal health, 27 (6.4%) indicated that pesticides cause damage to wild life, 48 (11.4) indicated that pesticides cause damage to water bodies, 113 (26.8%) indicated that pesticides cause damage to all human, animal and wildlife health and water bodies and 11 (2.6%) indicated that pesticides cause other damages than those indicated. Inline with the damages pesticides could cause, the farmers were asked if it would be possible to protect the damage and only 197 (46.7%) indicated that it is possible.

Table 4. A table showing the perception of farmers on pesticides and their knowledge on the harmful effects of pesticides in Ziway and Arsi Negele, 2007

No	Variables	Frequency	Percent
1.	**Farmers perception about pesticides**		
	Always good	148	35.1
	Some times good	102	24.2
	Always harmful	2	0.5
	Sometimes harmful	146	34.6
	Useless/not effective	3	0.7
	Don't know	20	4.7
	Other	1	0.2
2	**Farmers' knowledge on harmful effects of pesticides**		
	Pesticides can cause damage to human health	138	32.7
	Pesticides can cause damage to animal health	108	25.6
	Pesticides can cause damage to wild life	27	6.4
	Pesticides can cause damage to water bodies	48	11.4
	Pesticides can cause damage to all indicated	113	26.8
	Pesticides can also cause other damages than indicated	11	2.6
3	**Perception of farmers on possibility of protecting pesticide hazards**		
	Yes, pesticide hazards can be protected	197	46.7
	No, we can not protect pesticide hazards	47	11.1
	Don't Know if it is possible to protect pesticide hazards	178	42.2

5.3.2 Family pesticide poisoning incident

Regarding pesticide poisoning incidence in the family, 60 (14.2%) indicated its occurrence; of which 43 (10.2% of the families of study participants) were poisoned and recovered, 11 (2.6% of the families of study participants) had long term injuries and 6 (1.4% of the families of study participants) died because of the poisoning incidence.

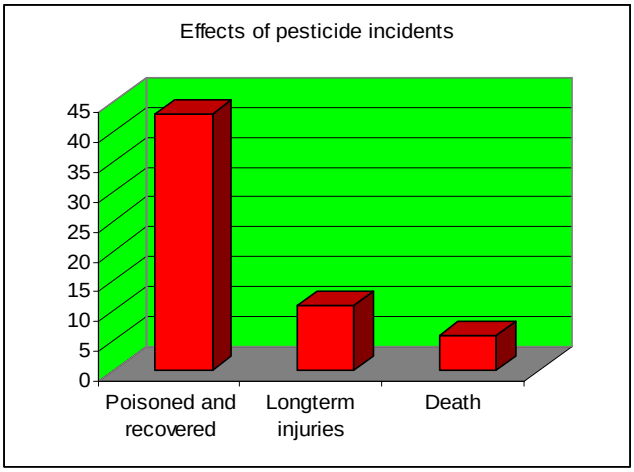

Figure 11. Graph showing the effects of pesticide incidents in Ziway and Arsi Negele, 2007

5.3.3 Causes of pesticide incidents and affected family members

Twenty three (5.5% of the families of study participants) of the incidents occurred during preparation for application, 21 (5.0% of the families of study participants) of the incidents occurred during spraying, 8 (1.9% of the families of study participants) of the incidents occurred as a result of poor storage, 4 (0.9% of the families of study participants) of the incidents occurred during transportation, 2 (0.5% of the families of study participants) of the incidents occurred during disposal and 2 (0.5% of the families of study participants) of the incidents occurred as a result of intentional suicide attempt. The affected Family members were 41 (9.7%) fathers, 15 (3.6%) sons, 3 (0.7%) daughters and 1 (0.2%) other family member. In addition to the family incidents; 90 (21.3%) of the respondents heard of pesticide poisoning incidents in their communities.

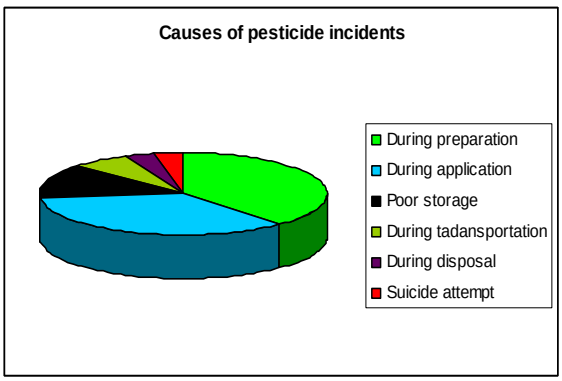

Figure 13. A chart showing causes of pesticide Incidents in Ziway and Arsi Negele, 2007

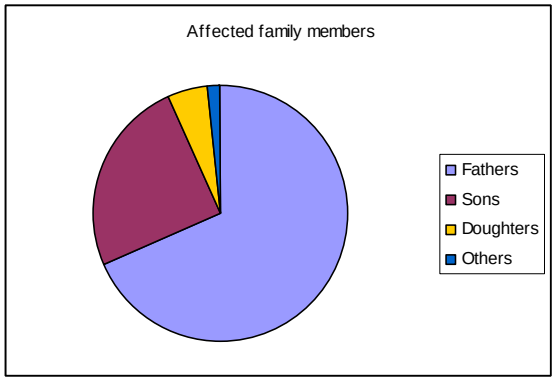

Figure 12. ***A chart showing the family Incidents in Ziway and Arsi Negele, 2007***

5.4. Pesticide Use and Environmental Effects

5.4.1 Pesticide formulations and their application

The main formulations for pesticides being used in Ziway and Arsi Negelle were dust, granule and liquid forms. The respondents who used hand for dust application were 72 (17.1%), those who used powder sack were 75 (17.8%) whereas 63 (14.9%) used can or plastic container, 83 (19.7%) used mechanical devices and 12 (2.8%) used mixed methods for dust formulation of chemical pesticide application.

As the application method for granule formulation, 52 (12.3%) used hands, 96 (22.7%) used containers (can or tub), 112 (26.5%) used mechanical devices and 2 (0.5%) used mixed methods.

As a method for liquid formulation, 46 (10.9%) used bottles, 8 (1.9%) used spinning disk applicators, 312 (73.9%) used backpack sprayers, 20 (4.7%) used vehicle mounted sprayers, 16 (3.8%) used bucket and cup or tub and 2 (0.5%) used mixed methods of application.

When the farmers mix pesticides, 30 (7.1%) of them did it near community water sources, 42 (10.0%) of them did it near a lake, 34 (8.1%) of them did it at home, 278 (65.9%) of them did it in the field and 2 (0.5%) of them did in other places. Moreover, only 195 (46.2%) of the respondents consider wind direction during application of pesticides.

Table 5. A table showing the application of different pesticides and places of mixing pesticides in Ziway and Arsi Negele, 2007

No.	Variables	Frequency	Percent
1.	**Dust application**		
	With hands	72	17.1
	Using powder sack	75	17.8
	From a can or plastic tub	63	14.9
	Using mechanical device	83	19.7
	Mixed	12	2.8
2.	**Granule application**		
	With hands	52	12.3
	From a container (can/tub)	96	22.7
	Using mechanical device	112	26.5
	Mixed	2	0.7
3.	**Liquid application**		
	From a bottle	46	10.9
	From a spinning disk applicator	8	1.9
	From a backpack sprayer	312	73.9
	From a vehicle mounted sprayer	20	4.7
	From a bucket	16	3.8
	Mther	2	0.5

4.	Place of mixing pesticides		
	Near community water sources	30	7.1
	Near a lake	42	10.0
	Near a river	26	6.2
	At home	34	8.1
	In the field	278	65.9
	Other	2	0.5

5.4.2 Quantity of pests and other biota in the last two years

Regarding the amount of weed in the study area in the last two years, 285 (67.5%) of the respondents indicated that it decreased, 87 (20.6%) indicated that it increased, 25 (5.9%) indicated that they didn't see any change and 25 (5.9%) indicated that they don't know the changes.

The study area's experience with regard to insect pests in the last two years indicated that it decreased 257 (60.9%), increased 40 (9.5%), No change 35 (8.3%) and 90 (21.3%) of the respondents don't know.

The mosquito population in the last two years was also indicated decreasing by 218 (51.7%) of the respondents whereas 55 (13.0%) indicated that it increased, 41 (9.7%) indicated that they didn't notice any change and 108 (25.6%) indicated that they don't know.

The spider population in the last two years was indicated decreased by 170 (40.3%) of the respondents, increased by 27 (6.4%) of the respondents whereas 37 (8.8%) indicated that they didn't see any change and 188 (44.5%) indicated that they don't know.

With regard to bees in the last two years, 242 (57.3%) indicated that it decreased, 40 (9.5%) indicated that it increased, 19 (4.5%) indicated that they didn't notice the change and 121 (18.7%) indicated that they don't know.

Other pollinators in the last two years were also indicated decreased by 159 (37.7%), increased b 32 (7.6%), no change by 24 (5.7%) whereas 207 (49.1%) don't know about the change.

Table 6. A table showing the changes in pest population in Ziway and Arsi Negele, 2007

No.	Variables	Frequency	Percent
1.	**Weeds in the last two years**		
	Increase	87	20.6
	Decrease	285	67.5
	No Change	25	5.9
	Don't know	25	5.9
2.	**Insect pests in the last two years**		
	Increase	40	9.5
	Decrease	257	60.9
	No Change	35	8.3
	Don't know	90	21.3
3.	**Mosquitoes in the last two years**		
	Increase	55	13.0
	Decrease	218	51.7
	No Change	41	9.7
	Don't know	108	25.6
4.	**Spiders in the last two years**		
	Increase	27	6.4
	Decrease	170	40.3
	No Change	37	8.8
	Don't know	188	44.5
5.	**Bees in the last two years**		
	Increase	40	9.5
	Decrease	242	57.3
	No Change	19	4.5
	Don't know	121	28.7
6.	**Other pollinators in the last two years**		
	Increase	32	7.6
	Decrease	159	37.7
	No Change	24	5.7
	Don't know	207	49.1
7.	**Other insects in the last two years**		
	Increase	30	7.1
	Decrease	101	23.9
	No Change	21	5.0
	Don't know	270	64.0

5.4.3 Differences in number/diversity of aquatic life and water quality following pesticide application

Following pesticide application, differences in number and diversity of aquatic life was noticed by 102 (24.2%) of the respondents and 124 (29.4%) of the respondents noticed difference in water quality (color and odor).

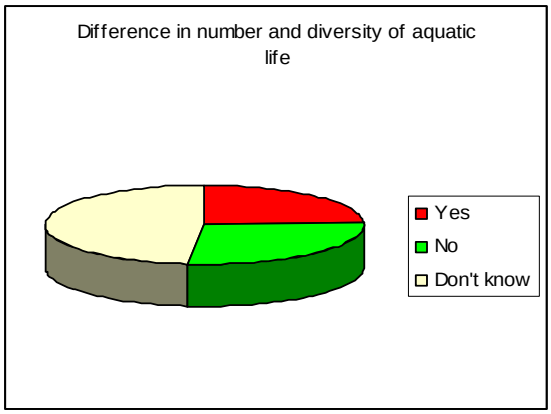

Figure 14. A chart showing difference in number and diversity of aquatic life following pesticide application in Ziway and Arsi Negele, 2007

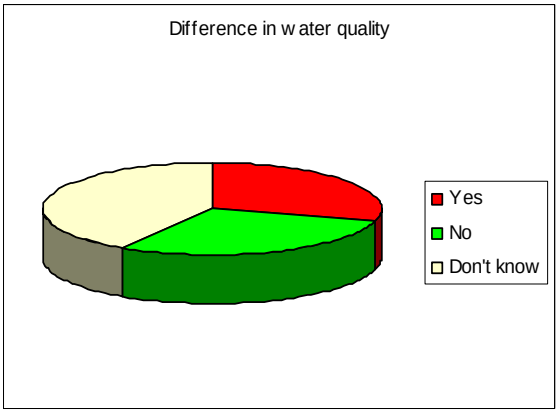

Figure 15. A chart showing difference in water Quality following pesticide application in Ziway and Arsi Negele, 2007

5.4.4 Environmental incidents and reporting

In the last 12 months, 94 (22.3%) of the respondents heard of environmental incidents caused by pesticides but only 46 (10.9%) reported it to agriculture office.

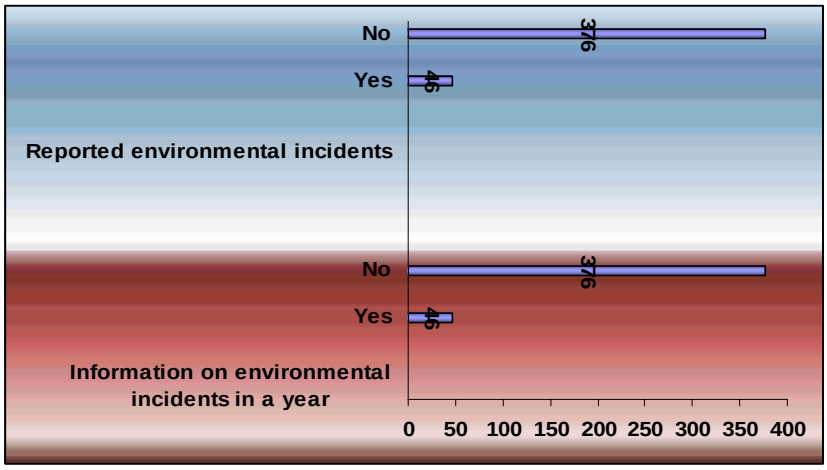

Figure 16. A graph showing information of farmers about environmental incidents and how many knew if it is reported in Ziway and Arsi Negele, 2007

6. DISCUSSION

6.1 General

In the 23 farming villages of Ziway and Arsi Negele where about 85% were fully dependent on farming, about 94% of the total 422 respondents indicated that they were using pesticides at different levels. However about 35% of them indicated that they consider pesticides as always good and only about 46% of them indicated that it is possible to protect the public health and environmental hazards that can be caused by pesticides.

The pesticide use trend in the study area was also indicated increasing by about 46% of the respondents. However, only about 30% were buying the pesticides from licensed venders and only 29% could understand and follow instruction on pesticide containers. Moreover, the habit of pesticide storage any where in the house (31.1%) and in the kitchen (5.7%); the habit of using empty pesticide containers for food/water storage by about 50% of the respondents and selling, disposing in the soil or using them for other purposes by the rest of the respondents; the continuation of using obsolete pesticides (38.4%) and disposing them in soil (24.4%) or storing them(10%) could be related to the local terminology given for pesticides as "Medicines" which influenced the farmers perception on how to handle them.

The use of proper protective equipment by the farmers who spray pesticides in the study area was also almost nil where 40% of those who spray pesticides indicated that they felt different illnesses after they sprayed pesticides. This might be related to the low level of awareness which might also be linked to the low level of trainings on how to use (26.3%), on health and safety (12.1%) and on environmental effects (10.7%) given to farmers.

This low level of awareness could also be the reason for applying the dust formulations (17.1%) and granules (12.3%) using their bare hands and for the application of liquid formulations of pesticides pouring in bottles (10.9%) by their hands. The mixing habit on the other hand might also be accounted for some of the causes of pesticide incidents, including those resulting in death.

Most of the pesticide sprayers in the study area were males particularly fathers (44.8%) and only 2.6% were women sprayers. Considering the low level of awareness in the area, the low level of women's involvement in spraying protects them (from overt and reported health effects) from being highly affected because of their physiological vulnerability.

The effect of improper utilization of pesticides in the Rift Valley might also be aggravated by the habit of the farmers mixing pesticides near different water bodies (23.3%) including community water sources and lakes. However, only 24.2% of the farmers indicated that they noticed differences in the number and diversity of aquatic lives and only 29.4% indicated that they noticed differences in water quality (color and odor) after pesticide application.

Even if most of the respondents indicated that the number of weeds and other insect pests decrease in the last two years, they also couldn't hide that the decrement of the number of bee population and other pollinating insect population. This could be related to the improper utilization of pesticides and also the law level (7.1%) of training given to farmers on IPM which would have been away to identify and protect the useful insects.

6.2 Pesticides selected for RRA

Because of high number of households that used 2, 4-D and DDT (according to the recent survey conducted in Ziway and Arsi Negle Weredas) and their potential environmental and health risks, they were selected for carrying out Rapid Risk Assessement (RRA).. (Colin and Ian please add on the selection criteria)

6.2.1 Chemical characteristic of 2, 4-D

2, 4-D is typical phenoxy herbicide (Fig. 1). 2,4-D comes in three basic chemical forms and is marketed in numerous trade names (commercial products), primarily as a sole active ingredient but also in conjunction with other active ingredients. The chemical forms of 2,4-D are grouped into Acid, Esters, and Salts. 2, 4-D imported in Ethiopia with ten different trade names 1 (Table 7). All the ten trade names are approved for use for the control of broadleaf weeds in wheat, barely, teff, maize, sorghum and sugarcane.

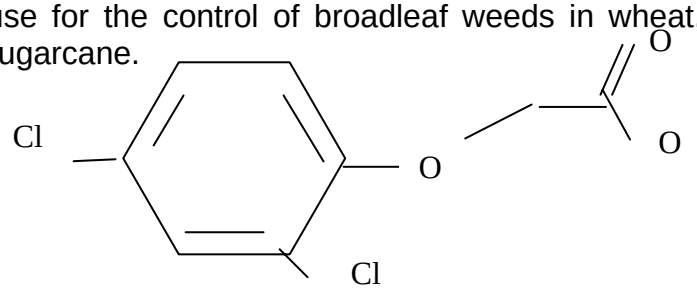

Figure17. Chemical formula of 2,4-D

Table 7. Trade names of 2, 4-D imported in Ethiopia

No.	Trade name	Common name
1.	Agro- 2,4-D amine 720g/l A.E	2,4-D 720 g/l A.E
2.	Calliherbe Super	2,4-D 720 g/l A.E
3.	Desormone liquid	2,4-D 720 g/l A.E
4.	Dicopur 720 SL	2,4-D 720 g/l A.E
5.	Litamine 72 SL	2,4-D
6.	QISH- Fordat	2,4-D
7.	Sanaphen D 720 SL	2,4-D 720g A.E/L,SL
8.	U-46 D fluid 72% EC	2,4-D 720g/l A.E
9.	Weedkiller	2,4-D 72 A.E
10.	Zura Herbicide	2,4-D 720 g/l A.E

1 According to the list of registered pesticides obtained from the Ministry of Agriculture and Rural Development, Crop Protection Department, October 2007

A. Effects on plants

2,4-D is a synthetic auxin herbicide, causes disruption of plant hormone responses. These growth-regulating chemicals cause disruption of multiple growth processes in susceptible plants by affecting proteins in the plasma membrane, interfering with RNA production, and changing the properties and integrity of the plasma membrane. The plant's vascular system becomes blocked due to excessive cell division and the resulting growth crushes the vascular transport system. The most susceptible tissues are those that are undergoing active cell division and growth. Plant injuries include growth and reproduction abnormalities, especially on new growth. Stem and petiole twisting (epinasty), leaf malformations (parallel venation, leaf strapping, and cupping), undifferentiated cell masses and adventitious root formation on stems, and stunted root growth is experienced by broadleaf plants. Rolled leaves (onion leafing), fused brace roots, leaning stems, and stalk brittleness are observed on grass plants. Disruption of reproductive processes may occur resulting in sterile or multiple florets and nonviable seed production. Symptoms may appear on young growth almost immediately after application, but death may not occur for several weeks.

B. *Toxicological effects*

As describe above 2,4-D can be in Acid, Salt or Ester forms. It was not possible to get information on the most commonly used form in Ethiopia. Since the Acid form is not produced in Ethiopia, it is highly likely that the 2, 4-D in Ethiopia could be Ester or amine salt (personal communication with Ian and Colin).

Table 8 provides a summary of the environmental toxicity of 2,4-D acid, salts and esters.

Table 8. Summary of Environmental Toxicity of all forms of 2,4-D

Toxicity	Acid	Salts	Esters
AVIAN - acute	practically non-toxic	practically non-toxic	practically non-toxic
- short term	practically non-toxic	practically non-toxic	practically non-toxic
- reproduction	no effect at 100ppm for bobwhite quail	no data	no data
AQUATIC- - fish	practically non-toxic	practically non-toxic	highly toxic
- invertebrates	slightly toxic	slightly toxic	moderately toxic
- amphibians	practically non-toxic (frog tadpoles)	low toxicity	Undetermined (data gaps)
algae/aquatic plants	highly toxic (duckweed)	highly toxic (duckweed)	highly toxic (duckweed)
TERRESTRIAL – invertebrates/arthropods	slightly toxic	slightly toxic	moderately toxic
- non-target vegetation	highly toxic	highly toxic	highly toxic

Source: The reconsideration of approvals of the active constituent 2,4-D, registrations of products containing 2,4-D and their associated labels. Preliminary Review Findings (Environment)

The environmental fate of all forms of 2,4-D has been reported as generally not persistent. The acute and chronic toxicity common to all forms are also described below.

C. Acute Toxicity

The oral LD50 of 2,4-D ranges from 375 to 666mg/kg in the rat. The dermal LD50 values are 1500 mg/kg in rats. 2,4-D is a WHO Class II 'moderately hazardous' pesticide. It has an LD50 of 375 mg/kg in the rat with evidence suggesting a similar level of toxicity in humans.

In humans, it has been reported that prolonged breathing of 2,4-D causes coughing, burning dizziness and temporary loss of muscle coordination. Other symptoms of poisoning can be fatigue and weakness, with possible nausea. On rare occasions following high levels of exposure, there can be inflammation of the nerve endings with muscular effects.

It has been reported that rats given high amounts, 50 mg/kg/day of 2,4-D in the diet for 2 years showed no adverse effects. Study in the USA showed that long term exposure to 2,4-D causes damage to the nervous system, kidneys and liver.

The evidence suggests that if 2,4-D causes reproductive effects in animals, this only occurs at very high doses. Thus reproductive problems associated with 2,4-D are unlikely in humans under normal circumstance. Study conducted in rats indicated that 2,4-D has neither serious teratogenic nor mutagenic effects on humans at expected exposure levels.

E. Carcinogenic effects

The carcinogenic status of 2,4-D is not well established as studies give conflicting results. For example, Hodgkin's lymphoma was found among a Kansa and Nebraska farm population associated with the spraying of 2, 4-D. Other studies done in New Zealand, Washington, New York, Australia showed negative results.

F. Environmental fate and transport:

There is a significant weight of evidence from literature and registrant-sponsored data supporting the conclusion that 2,4-D amine salts and 2,4-D esters are not persistent under most environmental conditions, including those associated with most sustainable agricultural conditions. 2,4-D amine salt dissociation is expected to be instantaneous (< 3 minutes) under most environmental conditions. Preliminary Review Findings indicate that 2,4-D esters in normal agriculture soil and natural water conditions are likely to be short-lived compounds (<1 week). Under these conditions, the environmental exposure to 2,4-D esters and 2,4-D amines is expected to be minimal for both terrestrial and aquatic environments.

When we consider its stability in water, although a number of factors affect solubility of 2,4-D in water (for example hydrolysis rate can be affected by soil clay mineralogy, organic carbon content, temperature, and moisture content), 2,4-D dissociation is rapid (< 3 minutes).

G. Determination of which organisms, functions or resources might be at risk from 2,4-D

i) Impact on humans

Given that the majority of the respondents do not use 2, 4-D properly, acute impacts on human health is highly likely. For example, over 55% of the respondents do not read pesticides labels,and ----do not use protective cloth. According the information obtained from the Ministry of Agriculture and Rural Development, farmers in the study area do not follow instruction on dosage and use old knapsack sprayers. The use of old knapsack sprayer in most cases resulted not only improper application of pesticides (at times inefficient) but also leakage of pesticides on the sprayers body. Sincealmost all the sprayers do not use protective cloths direct body contact with 2, 4-D is imminent.

Acute impacts of 2,4-D such as coughing, burning dizziness and temporary loss of muscle coordination, fatigue and weakness, with possible nausea could be common. Additionally, those hired for spraying pesticides could be exposed to a high level of 2, 4-D that could result in inflammation of the nerve endings with muscular effects.

Although it was not only for 2, 4-D, the respondents reported that they felt discomfort after application (31%), headache (26%), nausea (20%), vomiting (10%) and skin irritation (10%). Given that 2, 4-D is one of the most common pesticide used in the area, all the acute symptoms reported by the respondents could be resulted mainly from this chemical.

Since the carcinogenic impacts of 2, 4-D on humans is not well established; it may not be possible to precisely predict its impact in causing cancer on the study population. However, given that weed is the main problem and 2, 4-D is the preferred pesticides used for eradicating it, it is hard to out rule the possibility of 2, 4-D in inflicting cancer in the study population after use for a long time. The possibility to be affected by cancer particularly holds true when we consider the inappropriate use of pesticides in the study area.

ii) Impact on water resources

As per the survey result, 40% of the farmers had agricultural land close to water body (in this case the four lakes described above). Though 2, 4-D is not persistent and dissociate fairly fast in water, the highly to moderately toxic nature of the Ester form of 2,4-D to fish, invertebrates and algae should be given a high consideration.

Lake Ziway provides fish for a large portion of the people living in Ziway Wereda. It is also surrounded with agricultural fields where 2, 4-D application is prominent. Thus, it is highly likely that 2, 4-D is introduced into the Lake through wind drift and surface runoff. Once in the lake, the chemical could disrupt the food chain (by poising algae and killing) and could result in indirect effects of reducing fish population. Direct poising of fishes could also result in their death resulting in the direct reduction of fish population. Reduction in fish population could affect the livelihood of the population that depend on fish resources for living.

Those fish survived 2,4-D could accumulate it in their body through the process of bioaccumulation and biomagnifications that would later affect humans.

Impacts on the fish of Lake Abiyata and Shalla directly linked to the bird population that feed on the phytoplankton and fish of the two lakes. In this case the primary targets are the Pelicans and lesser and Greater Flamingos. Fortunately, all forms of 2, 4-D are less toxic to Avian (Table 2). However, its impact due to high exposure of the birds to the chemical could not be negligible.

iii) Impact on non-target vegetation

As described in section 3.2, 2,4-D disrupts the growth process of most plants particularly the broad leaves. It is also indicated in Table 2 that 2, 4-D is highly toxic to non target plants. Thus, it is highly likely that the chemical affects plants that have useful function in the ecosystem, for example forage plants for bee, plants that can be grazed by livestock, plants that provide food for birds and other animals in the ecosystem.

H. Risk Management Notes

i) Awareness creation

Farmers should be aware on the negative impacts of pesticides, particularly 2,4-D. They should be thought that risks on their health and the environment can be minimized if they use the pesticides carefully. Other means of weed control should also be encouraged, for example mechanical weed control.

ii) Use protective cloth

Direct contact with 2,4-D should be avoided. Farmers should wear protective cloth when they spray 2,4-D. This helps a lot to avoid acute toxicity.

iii) Avoid its use near to water body

Because of the high negative effect of 2,4-D on fish, invertebrates and phytoplanktons, farmers that cultivate close to the water should exert maximum effort to avoid entrance of the chemical to the water body through wind drift and runoff.

6.2.2 Rapid Risk Assessment for DDT

Dichlorodiphenyltrichloroethane (DDT) was first synthesized in 1874, but its insecticidal properties were not discovered until 1939, and large scale industrial production started in 1943.DDT was considered as a magic bullet in mid twenties for having helped boost in agricultural production and protecting billions of people from malaria. However, because of massive information on the impacts of DDT particularly on human health, its use has been banned in many countries since long. For example, Sweden was the first country to ban the use of DDT in January 1970.In the former USSR its use for agriculture was banned in 1981. In Sweden and former U.S.S.R the reason for banning DDT was because of their persistence, bioaccumulation and carcinogenicity.

Mounting evidences on the negative impacts of DDT and other persistent organic pollutants resulted in the emergence of the Stockholm Convention in 2001 which aimed among others at getting rid of DDT from the world. Under this convention DDT is banned worldwide except in countries where malaria is a serious problem. Ethiopia is one of the countries that use DDT for controlling Malaria epidemic.

A. DDT source in Ethiopia

At present DDT is produced in Ethiopia in Adami Tulu Pesticide Processing Plant located in Adami Tulu wereda, in the National Regional State of Oromia. The Plant is producing DDT 75% WP. According to the information obtained from the Factory (personal communication with Ato Tesfaye Haile Michael), the factory produces DDT from imported technical grade DDT. The supplier for the technical grade DDT is Tianjan Bahai Import and Export Corporation of China.

According to information obtained from Adami Tulu Pesticide Processing Plant DDT is produced solely for controlling malaria. The Plant produced on the basis of demands from the Ministry of Health (MoH) and submits all the products to the Ministry. It was also found out that the total production of DDT in 2007 was 650 tonnes. In 2008 there is a plan to produce 140 tonnes.

According to the information obtained from MoH DDT is sprayed every year in malaria prone areas after the rainy season. Information obtained from regional bureau of Agriculture confirmed that DDT is sprayed near water bodies where mosquito flies believed to be breeding.

B. Use of DDT in Agriculture

Although DDT is banned for use for agricultural purpose, recent survey conducted in the Rift Valley (see main report for the details) revealed that DDT is used as insecticides by farmers. One of the experts in the regional Agricultural Bureau also informed us that he has seen farmers spraying DDT on their fields. It was also observed that DDT is openly displayed in shops for sale.

It rather seems that farmers are also using DDT openly and much more comfortably for controlling insects. Some of the interviewees were surprised with our comment on the negative impact of pesticides. In fact they were angry with us because we were

blaming their magic bullet. Here we agree with the comment given by Ian on peoples' perception on DDT.

"I imagine that many older farmers still revere DDT because they associate it with their first significant agricultural gains – or those of their fathers before them. The same agricultural benefits can be thought by using most of the broad-spectrum insecticides which leads me to think that those complaining are doing so because:
The price of the DDT in the market stalls is much lower than the registered, bone fide alternatives – illegal /black market and fake products always are. All farmers consider the purchase price; so younger ones may also be complaining (about the legality) in areas where DDT is available.
They are using it for more than crop applications – probably around the home and backyards – against ticks, lice, mosquitoes, grain borers etc, not to mention your example of a malaria treatment…"

C. Where is the leak for DDT?

Obviously DDT reaches to the farmers through the workers of the MoH, particularly through those involved in spraying it. We have not yet done a market assessment, but it is highly likely that the price of DDT is much lower compared to other insecticides for the obvious reason that the sprayers get it free of charge.

D. Impact of DDT on human health

It is a well studied fact that DDT causes endocrine disruption, impair immune response, affect reproduction (still birth), causes cancer with repeated exposure. The farmers in the study Weredas were exposed to all health impacts of DDT. The impact is even aggravated with haphazard use of pesticides (without a specified dosage and protective cloth).

Because of the persistence nature of DDT, the negative impact on heath is not only contained the studied Wereda. The DDT can easily be transported to big towns like Addis on the leaves of vegetables.

Of particular interest with human health is the impact of DDT on human immune system. DDT affects the immune system, reducing the ability of natural killer T-Cells to destroy tumour cells. By affecting the T-cells, DDT happens to be similar to HIV/AIDS. Given a large number of people affected with HIV/AIDS, particularly in the rural area, the impact of DDT on HIV/AIDS patients could be detrimental.

E. Impacts on fish resources and wildlife

DDT's impacts on fishes, birds and other wildlife have been studied by many people. For example DDT accumulates in fish and can be easily transported from one food chain to another. Given that, the four lakes with great potential for fish resources and also habitat for wildlife, the possible negative impacts of DDT on fishes and other forms in the Rift Valley can be imagined.

A case study material

The high school students and teachers said that this is their first time to have a detail information regarding pesticides and they expressed their gratitude to the organizers of the training.

One of the teachers said that he was mixing maize with pesticides for protecting weevils. He was doing the mixing without protective equipment. He said he was unconscious for some time (he doesn't know how long) and he recovered because of the help of his family. He didn't realize that it could be pesticide poisoning until he got this training.

One of the trainee students also said that he knew a farmer who used Malathion to treat ecto-parasites of his cattle and lost 9 of them at once.

The student data collectors were also confronted by farmers when they were explaining about the hazards of using DDT for agriculture. The farmers were trying to convince the students about the benefits they got from DDT and some students even indicated that they knew farmers who mix DDT powder with water and made their cattle drink it for parasitic treatment. It is also to be recalled that some elderly people in remote areas of Alaba (southern Ethiopia) used to drink cups of DDT for malaria prevention.

7. Strength and Limitation of the study

7.1 Strength

The involvement of school environment club members in the process of awareness raising of farmers and their peers in the schools; and the opportunity they got to know the awareness gap in the villages during the process of data collection which motivated them to disseminate the information they have, were found to be of great importance to reach a high number of peer groups to disseminate the appropriate information to the wide number of farmers.

7.2 Limitations

As far as the knowledge of the principal investigators is concerned, it was difficult to get similar studies in the area to be used for comparison.

The study based merely on the collected questionnaire. It would have been better if it were also supported by a laboratory based analysis taking samples from people; the water bodies and plants so that the public health and environmental effects indicated could be confirmed.

8. CONCLUSION

Ethiopia signed the Stockholm Convention for which the Federal Environmental Protection Authority is the Designated National Authority. Regarding the DDT issue, Ethiopia is one of the countries which are exempted to use it only for malaria control. The result of the study in Ziway and Arsi Negele, however, showed that 121 (about 29%) of the 422 farmers use DDT for agriculture pest control. This indicated that not only the grass roots farmers but also the DDT sprayers employed by the Ministry of Health, which are illegally selling the DDT without the consent of the Ministry, are not well aware of the Stockholm Convention and the hazards of using DDT haphazardly.

Environmental Protection Authority is the Designated National Authority (DNA) for the Prior Informed Consent (PIC) regarding industrial chemicals and the Ministry Of Agriculture and Rural Development is the DNA for pesticides. The incidents at the village level were indicated being reported to the agriculture offices in the area. However, the link between and integration of the Environmental Protection Authority (which doesn't have offices at the woreda level) and Agriculture Offices at the grassroots level was not well known.

There should, therefore, be an intensive advocacy on the Stockholm convention especially involving the Ministry of health from which DDT is leaking to farmers illegally; to work for the enforcement of the convention in collaboration with the ministry of Agriculture and Rural Development and the Environmental protection Authority, DNA of the Stockholm Convention.

As per the feedback from the trainees and the survey, the awareness level in the community is very minimal; the use of protection 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.

The underlying cause for this is believed to be the dispersed efforts being done by governmental and non-governmental organization; especially the minimal or no integration of the Federal Ministry of Agriculture and Rural Development, the Federal Ministry of Health and the Federal Environmental Protection Authority; in the process of raising the awareness of the grass roots and designing ways of solving existing problems resulted from improper utilization of pesticides.

9. Recommendation

Based on the study findings the following are recommended.

- There should be an integrated effort from governmental and non-governmental organizations that focus on the awareness raising of farmers on proper pesticide management and related issues.
- There should be a clear mechanism of working and chain of communication between the Ministry of Health, Ministry of Agriculture and Rural Development and Environmental Protection Authority from the grass roots to the Federal level.
- An intensive advocacy is recommended on the enforcement of Stockholm Convention especially in relation to the use of DDT for Agriculture.
- A laboratory based study (residual analysis of blood, soil and water) is recommended so that the extent of pesticide damage on public health and the environment could be confirmed.

10. Reference

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11. ANNEX 1

QUESTIONNAIRE ON
"PESTICIDE USE, PRACTICE AND HAZARDS IN THE ETHIOPIAN RIFT VALLEY"

***Questionnaire Number*_____**

***Name of Village*_____**

INTRODUCTION AND CONSENT

Hello. My name is _____ and I am part of a team of people who are carrying out a study on "**ASSESSMENT OF THE LEVEL OF KNOWLEDGE, ATTITUDE AND PRACTICE ON HAZARDS OF PESTICIDES**": A Cross-sectional Study in the Ethiopian Rift Valley. We would very much appreciate your participation in this survey. I would like to ask you some questions related to pesticides which will take you about 15 minutes. Your answers will remain confidential, and we will not be taking down your name or address, so your answers will be anonymous.

Participation in this survey is voluntary and you can choose not to answer any individual question or all of the questions. However, we hope that you will participate in this study since your views are important.
At this time, do you want to ask me anything about the survey?
May I start asking you the survey questions?

Start time: _____ End time: _____ Date_____/____/_____

Respondent Agrees To Be Interviewed_____1 **Respondent Does Not Agree To Be Interviewed** _____ 2

Name of Data Collector_____ **Signature** _____

Name of Supervisor_____ **Signature**_____

Part 1: Background to the Household & Farm

Village _____

101	Sex of the respondent? M / F		**102**	What is your age?	___ ___	
103	Are you the head of the family?	1.Yes ☐ 2.No ☐	**104**	Can you read and write?	1.Yes ☐ 2.No ☐	
105	How many people are living in your house?		**106**	How much land do you farm?	_____	Acres or Hectares

107	Marital status?	1.Single ☐ 2.Married ☐ 3.Divorced ☐ 5.Widowed ☐
108	What is the highest level of education you have reached?	1. None ☐ 2. Elementary ☐ 3.Grade 7-8 ☐, 4.> Grade 9 ☐ 5.Higher education ☐
109	Do you have an occupation other than farming?	1. I don't have any ☐ 2. Civil Servant ☐ 3. Trader ☐ 4.Other (Specify)
110	Where is the farm located? *(The enumerator can fill this in without needing to ask the question)*	1.in hills or mountains ☐ 2.in a lowland area ☐ 3.a wetland area ☐ 4.near the river bank ☐ 5.near another water body (please specify) _____ 6. near the edge of a town ☐ 7.other (please specify)

What crops do you grow? (Tick all that apply)		1.Subsistence	2.Commercial Cash crops	3.Irrigated	4.Rainfed
111	Tef				
112	Maize				
113	Wheat				
114	Fruit (please specify)				
115	Vegetables (please specify)				
116	Others (specify)				

117. Do you keep livestock? Yes / No If so, what types of livestock do you keep, and how many?

How many: *(Approx.)*	**118**	**119**	**120**	**121**	**122**	**123**	**124**
	1.Cattle	2.Goats	3.Sheep	4.Chickens	5.Pigs	6.Donkeys	7.Others

125.	Do you use chemical pesticides on your crops?	1.Yes Regularly ☐	2.Yes Occasionally ☐	3.No, I do not use pesticides ☐

On your crops, do you also use:

126	Artificial fertilizers? ☐	**127**	Manure ☐
128	Bio-pesticides / natural enemies / IPM ☐	**129**	Hired labour ☐

130. Do you use chemical pesticides on any of your livestock? 1. Yes ☐ 2. No ☐

131 If yes: Which livestock _____

132 For what problems are the chemicals used _____

Part 2: Pesticide Practice

201	If you use chemical pesticides, for what purpose do you use them? *(tick any that apply)*	1.Control of weeds ☐ 2.insect pest control ☐ 3.Control of fungi/molds/rusts ☐ 4. Rodent control ☐ 5. Veterinary uses ☐ 6.Others (please specify)	
202	Which Chemicals are you using? *Note: If the respondent does not know the name, or if it is a brand-name product, you may need to ask if you can see the container.*	Brand name / Local name	Chemical
203	What initiates your use of those chemicals?	1. own decision ☐ 2. advice from DA ☐ 3.advice from vendor ☐ 4. advice from neighbour or friends ☐ others (please specify)	
204	Who sprays/applies pesticides?	1.Father ☐ 2.Mother ☐ 3.Son ☐ 4.Daughter ☐ 5.Hired labour ☐ 6.Others (specify)	
205	When (season/month) do you apply pesticides?		
206	How often do you apply the same pesticide during a given year?		
207	What size (area) are the fields you apply pesticides to?		
208	Does your pesticide use solve your pest problem	1.Yes ☐ 2.No ☐ 3. don't know ☐	
209	Does your use of pesticides increase levels of crop production?	1.Yes ☐ 2. No ☐ 3. don't know ☐	
210	Do you spray/apply pesticides yourself?	1.Yes ☐ 2. No ☐	If No then go to 210
211	What do you (or whoever applies pesticides for you) wear when spraying?	1. Normal clothes ☐ 2. Cotton overalls ☐ 3. Gloves (specify material) ☐ 4. Hat (specify type) ☐ 5. Boots (specify material) ☐ 6. Bare feet ☐ 7. Glasses/spectacles ☐ 8. Goggles ☐ 9. Handkerchief around mouth ☐ 10. Mask (specify type) ☐ 11. Other (specify)	
212	Have you had training about use of pesticides?	1.Yes ☐ 2. No ☐	
213	If yes, from whom?		
214	And what were you trained on?	1.How to use them ☐ 2.Health & safety ☐ 3.IPM ☐ 4.Disposal of pesticides ☐ 5.Application technology ☐ 6.Environmental effects ☐ 7.Other (please specify)	
215	Do you usually read the labels on pesticide containers?	1.Yes ☐ 2.No ☐	

216	Have you ever bought chemical pesticides without a label or without instructions? (if so, please specify from whom/where)		1.Yes ☐ 2.No ☐
217	Have you ever used chemicals with instructions in a language you don't understand?		1.Yes ☐ 2.No ☐
218	Do you understand the instructions for use?		1.Yes ☐ 2.No ☐ 3.sometimes ☐ 4.don't know ☐
219	Can you always accurately follow the instructions?		1.Yes ☐ 2.No ☐ 3.sometimes ☐ 4.don't know ☐
220	Have you ever felt any discomfort/illness after pesticide application?		1.Yes ☐ 2.No ☐ 3.sometimes ☐ 4.don't know ☐
221	If yes, what was your feeling? *NB. Let respondent give an answer and then mark down against alternative answers: do not prompt with possibilities*	1. Nausea 2. Vomiting 3. Head ache 4. Skin irritation 5. Eye irritation 6. Other (please specify)	
222	Is there a channel for reporting any pesticide incidents that occur?		1.Yes ☐ 2. No ☐ 3.don't know ☐
223	If yes, to whom do you report?	1. Agriculture office 2. Environmental protection authority 3. Health office 4. Others (please specify)	
224	Have you been told about the risks and hazards from pesticides?		1.Yes ☐ 2.No ☐
225	If yes, by whom?	1. DA 2. Health office 3. Environmental Protection Authority. 4. Other (please specify)	
226	Does the amount of pesticide used on your farm increase or decrease each year?	1.Increase ☐ 2.Decrease ☐ 3.Increase or decrease ☐ 4.I don't know ☐	
227	Where do you buy the pesticides? *(If possible record the name of the vendor/ place)*	1. From a licensed vendor 2. From a vendor I know but I am not sure about license 3. From open market 4. From both 5. Others (please specify)	
228	Where do you store pesticides?	1. In the kitchen 2. Anywhere in the house 3. In a separate place 4. Others(please specify)	
229	What do you do with empty pesticide containers?	1. Use it for water and/or food storage 2. Sell it 3. Dispose of it by burying it in the soil 4. Other (please specify)	
230	Is there an expiry date on the container of pesticides that you use?		1. Yes ☐ 2. No ☐ 3.don't know ☐
231	What do you do with obsolete (expired) pesticides in your hand?	1.I continue use it ☐ 2.I ask advise of DA ☐ 3.I dispose of it in the soil ☐ 4. I just store it ☐ 5.Other (please specify)	

Part 3: Pesticide Knowledge & Perceptions

301	Is the use of pesticides:	1.Always good ☐	2.Sometimes harmful ☐	3.Useless / not effective ☐
		4.Sometimes good ☐	5.Always harmful ☐	6.Don't know ☐
		7.Other (please specify)		
302	What are the benefits to you from pesticide use?			
303	If harmful, what is the damage?	1. To human health 2. To animal health 3. To wildlife	4. To water bodies 5. To All of the above 6. Others (please specify)	
304	If harmful, can we protect against the harmful effects of pesticides?	1.Yes ☐ 2.No ☐ 3.don't know ☐		
305	Did you have pesticide poisoning incident in the family during the last 12 months?	1.Yes ☐ 2.No ☐	**If no, go to 309.**	
306	If Yes, what was the effect?	1.Poisoned and recovered ☐ 2.Long term Injuries/illness ☐ 3.Death ☐		
307	How did the incident happen?	1.During preparation for application ☐	2.During transport ☐	3.During disposal ☐
		4.During application or spraying ☐	5.As result of poor storage ☐	6.Intentional, e.g. suicide attempt ☐
		7.Other (please specify)		
308	Who in the family was affected?	1.Father ☐ 2.Mother ☐ 3.Son ☐ 4.Daughter ☐		
		5.Others (please specify)		
309	Have you heard of any pesticide poisoning incident happening in the community in the last 12 months?	1. Yes ☐ 2. No ☐		
310	Do you know the doses of every pesticide you use?	1.Yes ☐ 2.No ☐		

Part 4: Pesticide Use & Environmental Effects

401	What type of pesticide formulation do you use? *(Tick all that apply)*	1.dust or powder ☐	2.bait ☐		
		3.liquid spray ☐	4.ULV ☐		
		5.granules ☐	6.other (specify)		
402	How do you apply pesticide dusts or powders?	1.with hands ☐	2.using powder sack ☐		
		3.from a can or plastic tub ☐	4.using a mechanical device ☐		
		5.other (please specify)			
403	How do you apply pesticide granules?	1.by hand ☐	2.from a container (can/tub) ☐	3.use mechanical device ☐	
		4.other (please specify)			
404	How do you apply liquid insecticides? *(Answer any that apply and for each one specify the type used)*	1.from a bottle	☐	2.spinning disk applicator	☐
		3.from a backpack sprayer	☐	4.from a vehicle mounted sprayer	☐
		5.from a bucket, cup or tub	☐	6.Other (specify)	
405	Where do you mix (prepare) your	1.near community water source ☐	2.near a lake ☐		

	pesticides before application?	3.near river ☐ 4.at home ☐ 5.in your field ☐ 6.other places (please specify)
406	Do you follow instructions to mix (prepare) pesticides for application?	1.Yes ☐ 2.No ☐
407	If 'No', how do you decide on the dosage of to be used?	1.Advice from supplier ☐ 2.Advice from Ag extension office ☐ 3.Common sense ☐ 4.Past experience ☐ 5.Other (specify)
408	Do you consider of wind direction when you spray pesticides?	1.Yes ☐ 2.No ☐ 3.don't know ☐
409	Do you spray pesticides near any water bodies?	1.Yes ☐ 2.No ☐
410	If yes please specify the water body?	1.Lakes ☐ 2.Rivers ☐ 3.Others (specify)

In your area, during the last two years, have you noticed a change in:

411	weeds	1. Increased ☐ 2.decreased ☐ 3. no change ☐ 4.don't know ☐
412	insect pests	1. Increased ☐ 2.decreased ☐ 3.no change ☐ 4. don't know ☐
413	Mosquitoes	1.Increased ☐ 2.decreased ☐ 3.no change ☐ 4.don't know ☐
414	spiders	1.Increased ☐ 2.decreased ☐ 3.no change ☐ 4.don't know ☐
415	bees	1.Increased ☐ 2.decreased ☐ 3.no change ☐ 4.don't know ☐
416	other pollinating insects	1.Increased ☐ 2.decreased ☐ 3.no change ☐ 4.don't know ☐
417	other insects (specify)	1.Increased ☐ 2.decreased ☐ 3.no change ☐ 4.don't know ☐
418	Have you noticed any difference in the number/diversity of aquatic life in your local rivers or lakes following pesticide application?	1.Yes ☐ 2.No ☐ 3.don't know ☐
419	Have you noticed any difference in water quality following pesticide application?	1. Yes ☐ 2. No ☐ 3.don't know ☐
420	Have you heard of any environmental incident caused by pesticide happening in the community in the last 12 months? (please specify)	1.Yes ☐ 2.No ☐
421	Was the incident reported? And to whom?	1.Yes ☐ 2. No ☐

Please record any additional comments relating to:

Part 1: Background to the Household & Farm

Part 2: Pesticide Use

Part 3: Pesticide Knowledge & Perceptions

Part 4: Health and Environmental Impacts of the Pesticides

12. ANNEX 2

MINSITRY OF AGRICULTURE AND RURAL DEVELOPMENT
Crop Protection Department

List of Registered Pesticides as of October, 2007

OCTOBER, 2007

List of Registered Pesticides (Insecticides)

No	Trade Name	Common Name	Approved uses	Registrant
1	Actellic 2% dust*	Pirimiphos-methyl	For the control of storage pests on cereals and pulses	6
2	Actellic 50 EC*	Pirimiphos - methyl	For the control of aphids in cotton	6
3	Actellic 50 EC	Primiphos methyl 50% EC	For the control of mosquitoes (Anopheles arabiensis)	6
4	Adonis 12.5 UL*	fipronil 12.5% ULV	For the control of locusts	3
			1.	
5	Agro-Thoate 40% EC*	dimethoate 40% EC	2. For the control of beanfly (*Ophiomiya phaseoli*); Bean aphid (*Aphis fabae);* Thrips (*Taenothrips spp*.) ABW (*Helicoverpa armigera*) on french beans. 3. For the control of aphids (*Myzus persicae*) and ABW (*Helicoverpa armigera*) on tomato 4. For the control of cabbage Aphid and various aphids on cabbage and potato, respectively	9
6	Akito 2.5% EC	beta cypermethrin	For the control of stalk borer on Maize	5
7	Apron Star 42 WS	thiamethoxam 20% + metalaxyl - 20% + difenoconazole 2%	For the control of Russian wheat aphid on barley (To be used as seed treatment pesticide)	6
8	Basudin 600 EW*	diazinon	for the control of armyworm and other pests on cereals.	6
9	Baythroid 050 EC*	cyfluthrin	For the control of shootfly, aphids, fleas and stockborer on sorghum	11
10	Bestox 7.5 ULV*	alphacypermethrin	For the control of African bollworm on cotton	3
11	Celphos	Aluminium phosphide 56% table	for the control of maize weevil (sitophillus spp) and flour beetle (Tribolium spp) on stored maize	24
12	Cruiser 70 WS	thiamethoxam 70% WS	For the control of Russian wheat aphid on barley (To be used as seed treatment pesticide)	6
13	Cruiser 350 FS	thiamethoxam 35% FS	For the control of Russian wheat aphid on barley (To be used as seed treatment pesticide)	6
14	Cybolt 2.5 ULV*	flucythrinate 2.5% ULV	For the control of whitefly in cotton	3

Name	Position	Signature
Tsehay Azage	Chairman of Pesticide Advisory Committee	_____

* Re-registered pesticide

** Canceled from registration upon receipt of a notification, in writing, from the registrant of the pesticide that this specific formulation has been phased out from their production line.

*** Canceled from registration upon receipt of a notification, in writing, from the registrant of the pesticide that it has been with drawn from sale.

**** Registration expired

List of Registered Pesticides (Insecticides)

No.	Trade Name	Common Name	Approved uses	Registrant
15	Curacron 250 EC/ULV**	profenofos	For the control of white fly on cotton.	6
16	Cymbush 1% Granule****	cypermethrin	For the control of stalk borer in maize and sorghum	6
17	Cymbush 25% EC***	cypermethrin	For the control of cotton pests on large scale farms	6
18	Danitol 10% EC	fenopropathrin	For the control of African bollworm on cotton	1
19	Deltacal 0.2DP*	deltamethrin 0.2%DP	For the control of maize weevil on stored maize	12
20	Decis 0.5 EC/ULV*	deltamethrin	For the control of African bollworm and leafhoppers on cotton	4
21	Decis 0.6 ULV*	deltamethrin	For the control of African bollworm and leafhoppers on cotton	4
22	Decis 2.5 EC*	deltamethrin	For the control of African bollworm and leafhoppers on cotton.	4
23	Delicia *	aluminium phosphide 56.7%	For the control of storage pests on cereals and pulses.	15
24	Deltanet 200 EC*	furathiocarb	For the control of aphids on cotton	6
25	Detia Gas-Ex-T*	aluminium phosphide 56.7%	For the control of storage weevils and beetles on cereals and pulses.	16
26	Devicyprin 25	cypermetrin	For the control of stalk borer on maize	26
27	Diazinon 10%G	diazinon	For the control of stalk borers on maize and sorghum	7
28	Diazinon 60% EC	diazinon	For the control of armyworm on cereals	7
29	Diazol 10G*	diazinon	For the control of stalk borer on maize and sorghum	5
3®	Diazol 60 EC*	diazinon	For the control of pests of cereals, vegetables and oil seeds	5
31	Diptrex SP 95*	trichlorofon 95%	For the control of shootfly on cereals	11
32	Dursban 240 ULV*	chloropyrifos-ethyl	For the control of armyworm, locusts, and grasshoppers on cereals and pastures	2

Name	Position	Signature
Tsehay Azage	Chairman of Pesticide Advisory Committee	_____

* Re-registered pesticide

** Canceled from registration upon receipt of a notification, in writing, from the registrant of the pesticide that this specific formulation has been phased out from their production line.

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**** registration expired

List of Registered Pesticides (Insecticides)

33	Dursban 48% EC*	chloropyrifos-ethyl	For the control of armyworm, locusts and grasshoppers on cereals and termites.	2
34	Ethiolathion 5% Dust	malathion	For the control of maize Weevil (*Sitophilus zeamays*) on stored maize	18
35	Ethiozinon 60% EC	diazinon	For the control of maize stalk borer (*Busseola fusca*) and sweet potato butterfly (*Acraea acerate*) on maize and sweet potato respecitviely.	18
36	Ethiozinon 60% EC	diazinon	-For the control of termite damage in hot pepper	18
37	Ethiolation 50% EC	malathion	For the cotrol of sweet potato butterfly (*Acraea acerata*) on sweet potato	18
38	Ethiotrothion 50% EC	fenithrothion	For the control of sweet potato butterfly (*Acraea acerata*) on sweet potato	18
39	Ethiosulfan 25% ULV	endosulfan	For the control of African bollworm (*Helicoverpa armigera*) on cotton	18
40	Ethiothoate 40% E.C	dimethoate	1. For the control of Aphids on field pea 2. For the control of Russian Wheat Aphid (Diuraphis Noxia) on barley	18
41	Fastac 7.5 g/l ULV*	alphacypermethrin	For the control of African bollworm in cotton	3
42	Fullongphos	Aluminium phosphide	For the control of maize weevil and other storage pests on stored maize	26
43	Fyfanon 50% EC*	malathion	For the control of armyworm, locusts and grasshoppers on cereals	5
44	Gastoxin	aluminium phosphide 57% tablet	For the control of maize weevil and other storage pests on stored maize	23

Name	Position	Signature
Tsehay Azage	Chairman of Pesticide Advisory Committee	_____

* Re-registered pesticide

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**** Registration expired

List of Registered Pesticides (Insecticides)

No.	Trade Name	Common Name	Approved uses	Registrant
45	Gaucho 70 WS	imidacloprid	For the control of Russian wheat aphid (*diuraphis noxia*) on barley	11
46	Helerat 5% EC	lamda cyhlothrin	For the control of boll worm on cotton.	15
47	Helmathion 50 Ec	malathion 50% EC	1. For the control of Aphids and leaf hoppers on maize 2. For the control of storage insect pests in storage structures	15
48	ICONET (Icon 2.5 EC)	Lambda-cyhalothrin 2.5 CS	For the control of mosquitoes (Anopheles arabiensis) as a bed net impregnation	6
49	ICON 10 WP	Lambda - cyhalothrin	For the control of mosquitoes (Anopheles arabiensis)	6
50	K-O Tab.*	deltamethrin 25% m/m	for the control of mosquitoes as a bed net impregnation	8
51	K-Othrine Moustiquare* SC 1%	deltamethrin 1%	For the control of mosquitoes as a bed nets impregnation	8
52	Karate 0.8 ULV*	lambda-cyhalothrin	For the control of cotton pests on large scale farms	6
53	Karate 5 EC*	lambda-cyhalotrin	for the control of cotton pests on large scale farms	6
54	Lamdex 5% EC	Lambda-cyhalothrin 5% EC	For the control of maize stalk borer (Busseola fusca Fuller)	5
55	Malathion 50% EC*	malathion	For the control of armyworm, locusts and grasshoppers on cereals and pastures.	1
56	Marshal 20 UL	carbosulfan	for the control of locust and grasshoppers	3
57	Marshal 25% EC*	carbosulfan	for the control of aphids on cotton	3
58	Marshal 25% ULV*	carbosulfan	for the control of aphids on cotton	3
59	Marshal/Suscon	carbosulfan	For the control of termites of Eucalyptus trees (*Eucalyptus camaldulensis; E. citriodora and E. saligna*) and Leucena trees (*Laucena leucocephala*)	3
60	Medopaz*	white oil	for the control of red scale (*Aonidiella aurantii*); Oranage scale (*Chrysomphalus dictyospermi*); Purple scale (*chrysomphalus aonidum*) and Black scale (*Parlatoria zizyphus*) on citrus alone or in combaination with some organophosphate insecticides	5
61	Metasystox R 250 EC*	oxydemethon-methyl	for the control of shootfly, aphids, fleas, and stalk borer on sorghum	11

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List of Registered Pesticides (Insecticides)

No.	Trade Name	Common Name	Approved uses	Registrant
62	Neoron 500 EC*	bromopropylate	For the control of spider mite on cotton	6
63	Nimbicidine	neem	For the control of thrips on onion	22
64	Nuvacron 40 SCW*	monocrotofos	For the control of spider mite on cotton.	6
65	Phostoxin 56% Tab.*	aluminium phosphide	For the control of storage pests in warehouses.	2
66	Polo 500 SC	Diafenthiuron 500 SC	For the control of Aphids (Aphis gossypii) on cotton	6
67	Polytrin C 220 ULV	profenofos + cypermethrin	For the control of locust and grasshoppers	6
68	Pyrinex 24 ULV*	chlorophyrifos-ethyl	For the control of armyworm on cereal and pasture	5
69	Pyrinex 48 EC	chloropyrifos-ethyl	For the control of armyworm on cereals and pasture	5
70	Pyrinex	Chlorpyrifos 48% EC	For the control of Termites on hot pepper	5
71	Quickphos*	aluminium phosphide 56% W/W Tablets	For the control of storage pests	5
72	Rimon	novaluron	IGR to control stalk borer on maize	5
73	Ripcord 5% ULV*	cypermethrin	For the control of African bollworm, leaf worm and thrips in cotton	3
74	Rovral Aqauflo 500 SC	Iprodione	For the control of botrytis and alternaria on Flowers	4
75	Selecron 720 EC*	Profenofos "Q" 720g/l	For the control of maize stalk borer on maize	6
76	Sevin 85% WP*	carbaryl	For the control of armyworm, grasshoppers Wellobush cricket on cereals & pasture	4
77	Success Bait	Spinosad	For the control of Fruit fly on guava.	2
78	Sumithion 50% EC****	fenitrothion	For the control of armyworm & locusts on cereals & pastures, Grasshoppers under the supervision of extension agents	1
79	Sumithion 96% ULV*	fenitrothion	For the control of armyworm and locusts on cereals and pastures	1
80	Sumithion 95% ULV*	fenitrothion	For the control of armyworm and locusts on cereals and pastures	1

Name Tsehay Azage Position Chairman of Pesticide Advisory Committee Signature _____

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**** Registration expired

List of Registered Pesticides (Insecticides)

No.	Trade Name	Common Name	Approved uses	Registrant
81	Suprathion 40 EC*	methidathion 400 g/l	For the control of scale insects on citrus	5
82	Talstar 20 ULV*	bifenthrin	For the control of whitefly and red spider mite on cotton	3
83	Thiodan 25% ULV*	endosulfan	For the control of bollworm on cotton, maize and sorghum	4
84	Thiodan 35% EC*	endosulfan	For the control of African bollworm on cotton, maize and sorghum	4
85	Thionex 25% EC/ULV*	endosulfan	For the control of African bollworm on cotton maize, sorghum & tobacco	5
86	Thionex 25% ULV*	endosulfan	For the control of African bollworm on cotton, maize and sorghum	5
87	Thionex 35% EC*	endosulfan	For the control of African bollworm on cotton, maize, sorghum and tobacco	5
88	Ultracide 40 EC*	methidathion	For the control of scale insects on citrus	6
89	Winner 0.8 ULV	Lambda cyhalothrin	For the control of African boll worm on cotton	

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List of Registered pesticides (Herbicides)

No.	Trade Name	Common name	Approved Uses	Registrant
1	Agro-sate 48 SC*	glyphosate 360 g/l A.E	For the control of broad spectrum of weeds in coffee and citrus.	9
2	Agro- 2,4-D amine 720g/l A.E*	2,4-D 720 g/l A.E	For the control of broadleaf weeds in wheat, barley, teff, maize and sorghum	9
3	Alanex 48% EC*	alachlor 480 g/l	For the control of annual grass and some broadleaf weeds in maize and soyabeans.	5
4	Alazine 350/200 SE*	alachlor 350 + alazine 200	For the control of grass and some broadleaf weeds in maize	5
5	Atramet combi 50 SC*	atrazine 25% + ametryne 25%	For the control of grass weeds in sugarecane	5
6	Banvel P	dicamba + mecoprop	For the control of broadleaf weeds in wheat and barley	10
7	Brittox 52.5 EC ****	bromoxynil + ioxynil + mecoprop	For the control of broadleaf weeds in wheat and barley	8
8	Calliherbe Super*	2,4-D 720 g/l A.E	For the control of broadleaf weeds in cereal crops and sugarcane	12
9	Codal 600 EC**	prometryn + metolachlor	For the control of broadleaf weeds and grass weeds in cotton	6
10	Desormone liquid*	2,4-D 720 g/l A.E	For the control of broadleaf weeds in cereals (wheat, barley, teff, maize & sorghum)	5

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List of Registered pesticides (Herbicides)

No.	Trade Name	Common name	Approved Uses	Registrant
11	Derby 175 SC	flurasulam 75 G/L + flumetsulam 100 G/L SC	For the control of broadleaf weeds in cereals	2
12	Dicopur 720 SL*	2,4-D 720 g/l A.E	For the control of broadleaf weeds in cereal crops	5
13	Dicopur pp 600 SL	Mecoprop 600 G/L Aqueous concetrate	For the control of broad leaf weeds in cereals (wheat, barely and teff)	5
14	Dual Gold 960 EC	s-metolachlor	For the control of broad leaf weeds on haricot bean	6
15	Folar 525 FW**	terbuthylazine + glyphostate	For the control of broad leaf weeds in coffee	6
16	Fuca 75 EW	Phenoxaprop-p-ethyl	For the control of Avena Spp. And Phalaris paradoxa on wheat	15
17	"Fusilade" Super 12.5% EC	fluzifop-p-butyl	For the control of grass weeds in cotton and fababean	2
18	Gesapax combi 500 FW*	ametryne + atrazine	For the control of various weed spp. in sugarcane	6
19	Gesaprim 500 FW*	atrazine 500g/l	For the control of complex weeds in maize and sorghum	6
20	Glyfos 360 SL	glyphosate 36 SL	For the control of sedges and perennial grass weeds in coffee	5
21	Gramaxone 20% EC*	paraquate	For the control of complex weeds in coffee plantation	6
22	Granstar 75 DF *	tribenuron methyl	For the control of broadleaf weeds in wheat	2
23	Glyphogan T	glyphosate + terbuthylazine	For the control of broad-leaved weeds on coffee	5
24	Glyphogan 480 SL	Glyphosate 480 G/L SL	For the control of coffee weeds such as Cyprus spp, cynodon spp, Digitaria spp, Hydrocotyle American, Echnocloa spp, Bidens pilosa, Ageratum conyzoides, Galinsoga parviflora and conyza albida	5
25	Hellosate 48 SL	Glyphosate 48 SL	For the control of annual and perennial weeds in citrus plantations	15

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List of Registered pesticides (Herbicides)

No.	Trade Name	Common name	Approved Uses	Registrant
26	Illoxan 28% EC*	diclofop-methyl	For the control of wild oat and grass weeds in wheat and barley	4
27	Kalach 360 SL*	glyphosate 36% SL	For the control of pernnial grasses, sedges and broadleaf weeds in coffee	12
28	Lasso 480 EC	alachlor 480 G/L EC	For the control of broadleaf weeds in haricot bean	8
29	Lasso/Atrazine 55% SC*	alachlor 35% + atrazine 20%	For the control of annual weeds in maize, soybean and sugarecane	8
30	Litamine 72 SL	2,4-D	For the control of broad leaf weeds on wheat	15
31	Mamba 360 SL	glyphosate	For the control citrus and coffee weeds	2
32	Mustang	(XDF 6.25 G/L + 2,4-D 300 G/L) Suspo-Emulsion (S.E)	For the control of broadleaf weeds in cereals	2
33	Primagram 500 FW*	metolachlor + Atrazine	For the control of broadspectrum broadleaf and grass weeds in maize	6
34	Puma super 75 EW*	fenoxaprop-p-ethyl 6.9%	For the control of grass weeds in wheat	4
35	Primagram Gold 660 SC	(s-metolachlor 290 g/l + Atrazine 370 g/l) SC	For the control of broadleaf and grass weeds in maize	6
36	QISH- Fordat	2,4-D	For the control of broadleaf weeds on wheat	4
37	Roundup 36 SL*	glyphosate 360 g/l	For the control of complex weeds in coffee	8
38	Sanaphen D 720 SL	2,4-D 720g A.E/L,SL	For the control of Broad leaf weeds in wheat	2
39	Starane M 64% EC*	fluroxypyr + MCPA	For the control of broadleaf weeds in wheat	2
40	Stomp 500 E*	pendimethalin	For the control of rooboelia weed in maize	3
41	Topik 080 EC*	cladinafop-propargyl	For the control of grass weeds in wheat	6

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List of Registered pesticides (Herbicides)

No.	Trade Name	Common name	Approved Uses	Registrant
42	U-46 KV fluid 600***	mecoprop	For the control of broadleaf weeds in wheat and barley	3
43	U-46 D fluid 72% EC*	2,4-D 720g/l A.E	For the control of broadleaf weeds in cereal crops and sugarcane	3
44	Velpar 75 DF*	hexazinone 75% DF	For the control of broadleaf and grass weeds in sugar cane	2
45	2,4-D PA****	2,4-D 720 g/l A.E.	For the control of broad leaf weeds in wheat and teff	17
46	Weedkiller	2,4-D 72 Acid Equivalent	For the control of broadleaved weeds in teff and wheat	24
47	Zura Herbicide	2,4-D 720 g/l A.E	For the control of broad leaf weeds on maize.	26

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List of Registered pesticides (Fungicides)

No.	Trade Name	Common name	Approved Uses	Regist rant
1	Agro-Laxyl	mancozeb + metalaxyl	For the control of Early blight on tomato and Late blight on potato	
2	Ardent 50 SC	kresoxim	For the control of powdery mildew on pepper	5
3	Bayleton 25 WP*	triadimefon 250 g/l	For the control of rust diseases on wheat and barley	11
4	Benlate 50 WP****	benomyl 50% WP	For the control of bean anthracnose on haricot beans	2
5	Bumper 25 EC*	propiconazole 25%	For the control of leaf and stem rust on wheat	5
6	CRUZATE R WP	cymoxinil + copper oxychloride	For the control of late blight on potato and downy mildew on grape	2
7	Daconil 2787 W 75*	chlorothalonil 75% WP	For the control of coffee berry disease	6
8	Helcozeb 80 WP*	mancozeb 80% W/W	For the control of cercospora leaf spot on statice flowers	15
9	Indofil M-45	mancozeb 80% WP	For the control of late blight on potato	22
10	Kocide 101*	copper-hydroxide	For the control of late blight on potato	5
11	Kumulus DF	sulfur	For the control of Powdery mildew on Flowers	3
12	Mancolaxayl 72 %	Mancozeb + metalaxyl	For the control of late blight on tomato	5
13	Mancozeb 80 WP	mancozeb	For the control of Downey mildew, Botrytes, Black spot and rust on Flowers	27
14	Matco	Metalaxyl 8% + Mancozeb 64%WP	For the control of late blight disease (*phytophtora infestans*) on potato and tomato and downy mildew (*pernospora destructor*) on onion	22
15	Nimrod 25 EC	buprimate	For the control of powdery mildew on peper	5
16	Noble 25 WP*	Triadimefon	For the control of leaf and stem rust on wheat	15
17	Odeon 82.5 WDG	chlorothalonil	For the control of Late blight on Potato	5
18	Orius 25 EW	tebuconazole	For the control of rust on flowers	5
19	Penncozeb 80 WP*	mancozeb 80% WP	For the control of lateblight on tomato	5
20	Privicur Energy SL 840	Propamocarb hydrochloride	For the control of downey mildew on flowers	4
21	Ridomil 5G*	metelaxyl	For the control of fungus spp. on pepper, tomato, oranage & apples	6
22	Ridomil MZ 63.5 WP*	metalaxyl/mancozeb	For the control of fungus spp. on potato, tomato, pepper & onion	6
23	Ridomil Gold MZ 68 WG	Metalaxyl-M 68% WG	For the control of downy mildew on grape	6
24	Rova 500 FW*	chlorothalonil 50% FW	For the control of coffee berry disease on coffee	5
25	Rova 75 WP*	chlorothalonil 50% FW	For the control of coffee berry disease on coffee	5
26	Ridomil Gold MZ 68 WP	metalaxyl - M 4% + mancozeb 64%	For the control of downy mildew on grape	6

List of Registered pesticides (Fungicides)

27	Sancozeb 80% WP*	mancozeb 800 g/kg WP	For the control of chocolate sport and rust on faba bean	2
28	Thiram Granuflo 80 WP*	thiram 80% WP	For the control of seed decay and damping off disease; on maize and sorghum	10
No.	**Trade Name**	**Common name**	**Approved Uses**	**Regist rant**
29	Tilt*	propiconazole	For the control of fungus spp. on teff wheat and barley.	6
30	Unizeb 80 % WP	Mancozeb	For the control of late blight on potato	5
31	Agro-Laxyl	Mancozeb + metalaxyl	For the controlof Early blight on tomato and late blight on potato	9

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List of Registered pesticides (Rodenticides, miticides, avicides, adjuvants, PGL, sticker, Nematodes and house hold pesticides)

No.	Trade Name	Common name	Approved Uses	Re.
		Rodenticides		
1	Klerat pellets*	**brodifacoum**	For the control of rats in large stores and in the field for out breaks control under the supervision of an expert.	6
2	Lanirat Bait 0.005%****	bromadiolone	For the control of field and storage rodents	6
3	Storm*	flocoumafen 0.005% pellet	For the control of storage and field rodents	3
4	Zinc phosphide	Zinc phosphide 80% Technical	For the control of field rats as a finished bait 4% zinc phosphide. Zinc phospdide 80% technical can not be sold to the user unless it is formulated to 4% zinc phosphide by the registrant	19
5	Ratol*	Zinc phosphide 80% Techical	For the control of field rats as a finished bait 4% zinc phosphide. Zinc phospdide 80% technical can not be sold to the user unless it is formulated to 4% zinc phosphide by the registrant	5
		Miticides		
1	Mercur 500 SC	diafenthuron	For the control of spider mite on Flowers	27
2	Mitigan 18.5EC*	dicofol	For the control of red spider mite in cotton	5
3	Calypso SC 480	Thiacloprid	For the control of spider mite, aphids and thrips on Flowers	4
4	Mitac*	amitraz	For the control of red spider mite and whitefly on cotton	4
5	Oberon SC 240	spiromesifen	For the control of spider mite on flowers	4
		Avicides		
1	Queletox UL 600*	fenthion	For the control of weaver birds (Quelea quelea)	11
		Nematicides		
1	Mocap GR 10	ethoprophos	For the control of Nematodes on Flowers	4
		Adjuvants, stickers and plant growth regulators		
1	Pix 50 EC*	mepiquat chloride 50 g/l or 5%	For plant growth regulation of cotton	3
2	Citowett°	alkylarylpolyglycol 100%	For reducing surface tention and increasing the adherence of pesticides.	3

Name	Position	Signature
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- Canceled from registration upon receipt of a notification, in writing, from the registrant of the pesticide that, the manufacturer has decide to phase out the product by the year 2002.

**** Registration expired

List of Registered pesticides (Fungicides)

No.	Trade Name	Common name	Approved Uses	Re.
House hold pesticides				
1	Baygon	Propoxur 1% + Cyfluthrin 0.04% + Dichlorvos 0.5%) Aerosol	For the control of cockroaches and Mosquitoes	24
2	Hardy	Cypermethrin 0.03% + Dichlorvos 0.99%	for the control of common housefly (Musca domestica aerosol)	25
3	Kilit*	dichlorvos 0.7% + tetramethrin 0.14%	for the control of cockroaches, mosquitoes and house flies	20
4	Knoxout 2 FM	Diazinon 23% W/W	For the control of cockroaches	5
5	Mobil insecticide*	tetramethrin = neopnamin 0.20%+ pynamin forte = d -allethrin 0.250% + Sumithrin = d-phenothrin 0.120%	for the control of flying household insects	14
6	Roach killer*	fenithrothion + cypermethrin+bioallethrin 2.3%	For the control of cockroaches, mosquitoes and ants	21
7	Super shelltox F.I.K[+]	d-phenothrin 0.05% + teramethrin 0.25%	For the control of flies, mosquitoes and other flying insects	13
8	Super shelltox C.I.K[+]	cypermethrin 0.25% + teramethrin 0.15%	For the control of cockroaches, ants and other insects in kitchens, rooms offices, etc.	13

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Total = 190

List of Registrants in Ethiopia

No.	Company Name	Address	Telephone Number	Fax Number
1	Filbert & Company	P.O.Box 90490 Addis Ababa	(251)(01)(613629	
2	Chemtex private ltd C.	P.O.Box 2403Addis Ababa	(251)(01)519557	
3	FS Private Limited Company	P.O.Box Addis Ababa	(251)(01)201342	
4	HEARTS P.L.C.	P.O.Box 41033 Addis Ababa	(251)(01)521080	251(01)520806
5	General Chemical & Trading Pvt. Co	P.O.Box 5620, Addis Ababa	(251)(01)150080	
6	Syngenta Agroservices Ag. Ethiopia	P.O.Box 5939 Addis Ababa	(251)(01)552231	251 155 2844
7	Marubeni Corporation	P.O.Box 2326 Addis Ababa	(251)(01)513366	
8	Makobu Enterprises	P.O.Box40391 Addis Ababa	(251)(01)654792	
9	Chemtrade International	P.O.Box 101035 Addis Ababa	(251)(01)261589	
10	T.M. Global Agency	P.O.Box 5259 Addis Ababa	(251(01)610799	
11	BYSWM P.L.C	P.O.Box 863 Addis Ababa	(251)(01)514551	
12	Tensae International Business Ent.	P.O.Box 8743 Addis Ababa	(251(01)121617	
13	Shell Ethiopia Limited	P.O.Box 3174 Addis Ababa	(251)(01) 653040	
14	Mobil Oil East Africa Limited	P.O.Box 1365 Addis Ababa	(251)(01) 651125	
15	Lions International Trading (Pvt) Co.	P.O.Box 101302 Addis Ababa	(251)(01)518601	
16	Afro German Chemicals Est. PLC.	P.O.Box 1109 Addis Ababa	(251)(01)550200	
17	MITSUI & Co., Ltd., Liason Office	P.O.Box 1300 Addis Ababa	(251)01)511583	(251)(01)51006
18	Adami-Tulu Pesticides Processing Factory	P.O.Box 5747 Addis Ababa	(251)(01)611311	(251)(01) 611764
19	Tadi Zerhin General Trading PLC	P.O.Box 100755 Addis Ababa	(251)01) 621571	(251)(02)61429
20	Hagos legesse	P.O.Box 15177 Addis Ababa	(251)(01) 760347	(251) (01) 760479
21	Magbanz Pvt Ltd Co.	P.O.Box 21320	251(01) 752430	(251)(01) 752566
22	Markos Private Limited Company	P.O.Box 50964	251 (01) 273319	

No.	Company Name	Address	Telephone Number	Fax Number
23	Alem Business Center PLC.	P.O. Box 4663	251 (01) 341603	251 (01) 341752
24	Rangvet Pvt. Ltd. Co.	P.O. Box 62699 Addis Ababa	251 (01) 615028	++ 251(01) 1615028
25	Omer Haji Woday Import and Export PLC	P.O. Box 1563 Dire Dawa	251 (01) 11 5367	215 (01) 13 4633
26	K.M.S.EGGA Trade and industrial P.L.C.	P.O. Box 4414 Addis Ababa	251-1-130224	251-1-779635
27	Axum Green Line Trading PLC	P.O. Box 618/1250 Addis Ababa	824840-6	824856/7