PROBICOU/SAICM PROJECT

Promoting Chemical Safety for Children at Work in Rural Agricultural Communities

INVENTORY OF DANGEROUS CHEMICALS, PROCESSES AND END POINT DISCHARGES
ABBREVIATIONS AND ACRONYMS

ACB.................Agrochemicals Control Board
ACGIH..............American Conference of Governmental Industrial Hygienists
ACTC................Agricultural Chemicals Technical Committee
FAO..................Food and Agricultural Organisation
FFS..................Farmer Field School
GDP..................Gross Domestic Product
GEF..................Global Environment Facility
IARC...............International Agency for Research on Cancer
ILO.................International Labour Organisation
ICCM................International Conference on Chemicals Management
IPCS...............International Program on Chemical Safety
KEBS................Kenya Bureau of Standards
KEPHIS..............Kenya Plant Inspectorate Services
MAAIF..............Ministry of Agriculture, Animal Industry and Fisheries
MGLSD.............Ministry of Gender, Labour and Social Development
MSDS..............Material Safety Data Sheet
NEAP.................National Environment Action Plan
NEMA..............National Environment Management Authority
NUPAW..............National Union of Plantation and Agricultural Workers
OSHA...............Occupational Safety and Health Agency
PPE..................Personal Protective Equipment
PROBICOU.........Pro-Biodiversity Conservationists in Uganda
SAICM..............Strategic Approach to International Chemicals Management
SMC...............Sustainable Management of Chemicals
UBOS..............Uganda Bureau of Statistics
UNBS..............Uganda National Bureau of Standards
UNDP..............United Nations Development Programme
UNEP..............United Nations Environment Program
UNHS..............Uganda National Household Survey
US EPA..............United States Environmental Protection Agency
WHO.................World Health Organization
ACKNOWLEDGEMENTS

Pro-Biodiversity Conservationists in Uganda (PROBICOU), working together with the Strategic Approach to International Chemicals Management (SAICM) Secretariat, the United Nations Development Programme, the Ministry of Gender Labour and social development, the Global Environment Facility (GEF) Small Grants Programme-Uganda, and partners, has developed the “Inventory of Dangerous Chemicals, Processes and End Point Discharges” in plantation agriculture in Uganda. This has been done using a variety of human resource, as required by the principle of multi-sectoral, multidisciplinary, consultative and participatory approach. On behalf of PROBICOU, I extend gratitude to all the persons who contributed their commitment, experience, knowledge, and time to this report. The following individuals and institutions are especially noted for their contributions in various capacities:

As members of the field work team: -
1. Dr. Ogaram David – Team Leader
2. Mr. Guma Bens- Team Member
3. Mr. Katula Yusuf – Team Member
4. Mr. Twebaze Paul – Team Member
5. Mr. Muyambi Ellady – Team Member
6. Prof. Katima Jamidu – International consultant

As Members of Institutions: -
1. Hon Pajobo Joram – The National Union of Plantation and Agricultural Workers of Uganda;
2. Ms Kassede Christine – The National Environment Management Authority (Ministry of Water and Environment);
3. Mr Katula Yusuf – The Department of Occupational Safety and Health (Ministry of Gender Labour and Social Development).

We are also grateful to the plantation estate staff who accepted to be interviewed; the guides at the community level who played a key role in supporting the research team to locate relevant study participants and the owners of those establishments who cooperated, did not object to this grilling time consuming exercise, and did not hide any information or place from us.

Finally, PROBICOU thanks its partners SAICM, UNEP, GEF, UNDP and the facilitating Government agencies (Ministry of Gender, Labour and Social Development; Ministry of Agriculture Animal Industry and Fisheries, and the Ministry of Water and Environment) for their support. We all look forward to a safer working environment, better infrastructure for sustainable management of chemicals and improved environment and human health.

..................................................

Mr. Robert Tumwesigye Baganda
EXECUTIVE DIRECTOR – PROBICOU.
TERMS AND DEFINITIONS

The term: -

**Active ingredient** means the biologically active component of the pesticide.

A **neurotoxin** means an organic or synthetic substance that destroys neurons—the cells of the brain and nervous system.

**Application technology** means the actual physical delivery and distribution process of a pesticide to the target organism or to the place where the target organism comes into contact with the pesticide. The knap-sack spray pump is on such technology.

**Banned pesticide** means a pesticide for which all uses have been prohibited by final regulatory action, in order to protect human health or the environment. The term includes a pesticide that has been refused approval for first-time use, or has been withdrawn by industry either from the domestic market or from further consideration in the domestic approval process, and where there is clear evidence that such action has been taken in order to protect human health or the environment.

**Bioaccumulation** means the gradual build up of certain pesticides within the tissues of living organisms after they feed on lower organisms containing smaller amounts of these pesticides. Animals higher in the food chain accumulate greater amounts of these pesticides in their tissues.

**CAS Reg. No. (Chemical Abstract Service Registry Number)** is a unique identifier number assigned to each chemical and to some mixtures of chemicals by the Chemical Abstracts Service, a division of the American Chemical Society. This number is used worldwide to identify the chemical.

**Chemicals** mean chemical elements and compounds, and mixtures thereof, whether natural or synthetic;

(a) the term **hazardous chemical** includes any chemical which has been classified as hazardous in accordance with Article 6, ILO C170 or for which relevant information exists to indicate that the chemical is hazardous;

(b) the term **use of chemicals at work** means any work activity which may expose a worker to a chemical, including (Article 1, ILO C170).

i. the production of chemicals;

ii. the handling of chemicals;

iii. the storage of chemicals;

iv. the transport of chemicals;

v. the disposal and treatment of waste chemicals;

vi. the release of chemicals resulting from work activities;

vii. the maintenance, repair and cleaning of equipment and containers for chemicals;

**Carcinogen** means a chemical that is capable of causing cancer. A suspected carcinogen is a substance that may cause cancer in humans or animals but for which the evidence is not conclusive.

**Carcinogenic** means causes cancer.

**Carcinogenicity** means the cancer-causing potential of a substance.

**Chronic** means pertaining to long duration or frequent occurrence.

**Chronic effect** means an adverse effect on any living organism in which symptoms develop slowly over a long period of time or recur frequently.
**Cholinesterase** means an enzyme, in the insect and also in the human body, critical for the proper functioning of the nervous system. It is inhibited or damaged by organophosphates or carbamate insecticides.

**Corrosive** means having the power to corrode or wear away by chemical action.

**Dangerous occurrence** means a readily identifiable event that has occurred, that has the potential to cause an injury, or disease to persons at work or the public, or caused damage to the environment; **Dermal** means pertaining to the skin. The skin is one of the major ways in which pesticides can enter the body.

**Genotoxic** is Descriptive of a substance that is capable of interacting directly with genetic material, causing DNA damage that can be assayed. The term may refer to carcinogenic, mutagenic, or teratogenic substances.

**An endocrine disruptor** means an organic or synthetic chemical substance that disrupts or harms the endocrine glands—heart, adrenals, thyroid, pituitary, parathyroid, sex glands, pancreas—that produce the hormones your body requires for instructions on how to function, both mentally and physically.

**EPA Toxicity Category** means the four categories used to indicate the potential hazard of EPA-registered pesticides, thus Class I (Danger-Poison), Class II (Warning), Class III-IV (Caution).

**Formulation** means a mixture of active ingredients combined during manufacture with inert materials. Inert materials are added to improve the mixing and handling qualities of an insecticide.

**Knapsack Sprayer** means a small portable sprayer carried on the back of a person making a pesticide application. Some knapsack sprayers are hand-operated, others are powered by small gasoline engines.

**Mutagenic** describes a chemical's capability of causing mutations in the cells of living organisms. Mutagenicity means the degree to which a chemical can cause a biological mutation.

**Mutagenesis** means the induction of heritable changes in germinal and somatic cells. It is a process that causes changes (mutations) in the genetic material in individuals or cells spontaneously where by their successors differ consistently from their predecessors. Mutagens are those agents that cause mutagenesis.

**Oncogenicity** is a measure of the tendency of a chemical to cause tumours.

**Oral** means taken into the body through the mouth. It is one of the routes of entry of pesticides into the body.

**Personal protective equipment (PPE)** means any clothes, materials or devices that provide protection from pesticide exposure during handling and application. It includes both specifically designed protective equipment and clothing reserved for pesticide application and handling. These are protective items for the eyes (goggles, glasses), ears (ear plugs, ear muffs), respiratory system (respirators, face masks, cartridge filters), feet (safety boots), head (hard hats) and body (aprons, safety harnesses).

**Pesticide** means any substance or mixture of substances intended for preventing, destroying or controlling any pest, including vectors of human or animal disease, unwanted species of plants or animals causing harm during or otherwise interfering with the production, processing, storage, transport or marketing of food, agricultural commodities, wood and wood products or animal feed-stuffs, or substances which may be administered to animals for the control of insects, arachnids or other pests in or on their bodies. The term includes substances intended for use as a plant growth regulator, defoliants, desiccant or agent for thinning fruit or preventing the premature fall of fruit, and substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport (FAO).

**Reproductive Effects** describes effects of a pesticide on reproduction in animals.
Risk means the likelihood that a harmful effect might result from exposure to a particular hazard for example, for toxicity to occur; there must be exposure to a hazardous chemical.

Teratogenicity describes a chemical’s tendency to cause physical birth defects in the offspring of exposed parents.

Teratogen is a substance capable of causing birth defects.

Toxic means poisonous.

Toxic chemical means a substance that can cause severe illness, poisoning, birth defects, disease, or death when ingested, inhaled, or absorbed by living organisms.

Toxicity means a physiological or biological property which determines the capacity of a chemical to do harm or produce injury to a living organism by other than mechanical means. It is the capacity of a chemical to do harm to an organism by other than mechanical means.
EXECUTIVE SUMMARY

Chemicals are useful to human life. Indeed the world could not have sustained the nutrition of its increasing population without the use of modern chemicals such as pesticides. Chemicals have also contributed significantly to improvements in human health through medicine and the control of vector-borne diseases. However, in addition to their useful properties, chemicals possess dangerous properties. They are toxic, can cause fires or explosions, can corrode or react with other chemicals in the environment, and can move on their own to places originally not intended for them. Pesticides as a special group of chemicals are easily accessible to the rural communities. Chemicals therefore have to be used judiciously and safely.

Earlier situational analysis efforts originating from the National Environment Management Authority informed on the nature and size of the chemical safety problem, and the structure, size, and capacity of Uganda’s effort on sound management of chemicals. It noted that a variety of chemicals are imported into Uganda every year for use in agriculture, forestry, health, industry, and veterinary services. Close to 300 pesticide formulations are known in the country. The storage, transportation, mixing, spraying and disposal of pesticides are carried out by various categories of people without correct information, skills and equipment. As a result, the population is exposed to pesticides at work, at home, and in the general environment. Of particular vulnerability are the children at work in the agricultural communities and establishments, who are involved in the use of dangerous pesticides or exposed to them as by-siders during application.

This work is an effort to evaluate the hazards and exposure regarding chemicals that exist in the plantation agriculture in Uganda and targets workers and children. With the knowledge of hazards and exposure to them, the level of risk can be assessed and guidance can be given. It sought to identify dangerous chemicals and processes with a view to quantify risks and then warn key players to safeguard human health and the environment in Uganda from harmful effects of the chemicals and so fulfil Uganda’s commitment to international standards she is a party to.

This work covered only and is limited to plantation estates and their out growers. It does not cover peasant agriculture. It does not therefore capture all chemicals used in various types of agriculture and chemicals used for public health.

Objective

The objective is to develop a national inventory of dangerous chemicals, dangerous processes and endpoint discharges likely to affect working children in agriculture.

Specific objectives of the study

The specific objectives of the study are: -

a. To establish: -
   i. the types of chemicals used by farmers in their farming practices;
   ii. how these chemicals are applied with respect to safety procedures;
   iii. the extent of child involvement in the whole chemical cycle;
   iv. whether there is competent supervision in the use of these chemicals;
   v. the kind of equipment used;
   vi. how the leftover chemicals are disposed off;
   vii. whether these chemicals used are properly labelled and identified; and

b. To record the dangerous aspects of chemical usage on both humans and the environment.
**Activity**

The activity was to carry out a survey of enterprises/plantation at national and district levels and inspect their chemicals handling facilities. This was to determine the situation at the onset of the project so that problem areas are identified. Data on ill health occurrences and information leading to establishment of an inventory of chemicals and dangerous processes was collected. Data collected was stored on computer and shared among key stakeholders.

This work in particular targeted plantation estates for: Sugar cane, tea, tobacco, rice, and export flower and horticulture establishments. The main ones were visited, interviewed, inspected and the chemicals and their handling recorded. The chemicals are accordingly grouped within the crop of use.

**Inventory of Dangerous Chemicals**

The dangerous chemicals used in each type of establishment have been tabulated. The tables show the trade name, the active ingredient in the formulation, and the health effects that it might pose. The term “dangerous” refers to the inherent properties of the chemical to cause biological or physical harm to humans or any of human interests.

Current knowledge of the health effects from pesticides is largely based on international experimental studies in animals and cell cultures as well as from clinical and epidemiological data from people who are exposed to higher than average doses either by accident or through their work. This is condensed and provided for each chemical.

**Inventory of Dangerous Processes**

A number of dangerous practices, processes and occurrences were observed during the inventorying exercise. The criteria for regarding a process as dangerous relates to the level of risk, what hazards are present, and the nature of exposure. These themselves arise from natural and dangerous properties of chemicals as mentioned in chapter three above.

**Conclusion and Recommendations**

Overall, this inventorying exercise and health effects data, although unable to make precise statements about risks from some pesticides, supports that, from a public health standpoint, there are serious risks and serious adverse experiences in commercial agricultural establishments, which need to be purposely addressed. Consequently, as a safety measure, avoiding unnecessary uses of pesticides is prudent.

Children are always close to the pesticide activities in the establishments and surrounding communities.

Minimizing pesticide use is important where there is likely to be exposure of infants, young children, pregnant women, the elderly and those with pre-existing illnesses. These are the members of communities who are most immediately identifiable as being potentially more vulnerable to chemical exposures. It is therefore prudent, as a measure for their safety, to encourage people to avoid pesticide use in areas where young children are likely to be exposed.

While much of the necessary law is in place, the blatant violations that obtain in the field show that the enforcement of the law is inadequate and is the main problem leading to exposure and the undesired effects observed. This in turn arises from lack of capacity in the legally mandated institutions. Lack of sufficient human resources and lack of budget and therefore facilities to inspect and enforce the regulations are the main causes of non-compliance by many pesticide dealers. This is the parent cause of the dire situation observed.
# TABLE OF CONTENTS

## ABBREVIATIONS AND ACRONYMS

- Page 2

## FOREWORD

- Page 4

## TERMS AND DEFINITIONS

- Page 6

## EXECUTIVE SUMMARY

- Page 9

## CHAPTER ONE: BACKGROUND

1.0 Introduction ................................................................. 15
1.1 Background ................................................................. 15
1.2 SAICM Quick Start Programme ........................................ 16
1.3 Purpose of the Inventory .................................................. 17
1.4 Context ........................................................................ 17
1.4.1 Agriculture in the economy ........................................ 17
1.4.2 Import and trade in crop protection products .......... 19
1.4.3 Trends in agricultural chemicals import ..................... 20
1.4.4 Why children are especially vulnerable .................. 20
1.4.5 How pesticide poisoning affects a child’s health .... 21

## CHAPTER TWO: OBJECTIVES AND METHODOLOGY

2.0 Introduction ................................................................. 23
2.1 Strategy .................................................................... 23
2.3 Objective .................................................................... 23
2.3.1 Specific objectives of the study ................................. 23
2.5 Output ...................................................................... 24
2.6 Activity ..................................................................... 24
2.7 Methodology ............................................................... 24

## CHAPTER THREE: INVENTORY OF DANGEROUS CHEMICALS

3.0 Introduction ................................................................. 26
3.1 Inventory of Dangerous Chemicals used in Horticulture ... 27
3.2 Inventory of chemicals used in sugar cane plantations .... 34
3.2 Inventory of chemicals used in sugar plantations ............ 37
3.4 Inventory of chemicals used in rice plantations .......... 41
3.5 Inventory of chemicals used in tea plantations ............. 47
3.6 Inventory of chemicals used in Tobacco Plantations .... 50

## CHAPTER FOUR: INVENTORY OF DANGEROUS PROCESSES

4.0 Introduction ................................................................. 56
4.1 Dangerous processes ....................................................... 56
4.1.1 Involvement of children ......................................... 56
4.1.2 Occupational risks for mixer/loaders/applicators

4.1.3 Repacked Products

4.1.4 Unregistered products

4.1.5 Smuggled products

4.1.6 Counterfeit and fake products

4.1.7 Expired products or unusable products

4.1.8 Inadequate Training

4.1.9 Inadequate Investigations and Prosecutions

4.1.10 Lack of the MSDS

4.1.11 Poor Handling and packaging

4.1.12 Poor Storage

4.1.13 Inadequate End point Discharges

4.1.14 Poor handling of Empty containers

4.1.15 Poor Packaging and Labelling

4.1.16 Poor Transportation

4.1.17 Stockpiles of expired chemicals

4.1.18 Misuses of chemicals

4.2 Non-Compliance of The legal situation

4.2.1 The Agricultural Chemicals (Control) Act No 1, 2006

4.2.2 The Occupational Safety and health Act No 9, 2006

4.3 Conclusion and Recommendations

CHAPTER FIVE: GUIDLINES FOR SAFE PESTICIDE USE

5.0 Introduction

5.1 Actions at domestic level

5.1.1 Pesticide Safety Tips

5.1.2 Tips to follow if you have children or if children visit your house or farm

5.1.3 General First -Aid Guidelines

5.1.4 Methods of Mosquito Control

5.1.5 What you can do to control mosquitoes around the home

5.1.6 Methods used by state and local agencies in mosquito control

5.2 Action at plantation level

5.2.1 Labels

5.2.2 Transport by truck or boat

5.2.3 Storing and using pesticides

5.2.4 Exclusion from a sprayed area

5.2.5 Disposal of wash water

5.2.6 Disposal of wash water as a diluent

5.2.7 Disposal of containers by burning
CHAPTER ONE: BACKGROUND

1.0 Introduction

Chemicals are useful to human life. They are legitimate and useful tools that can provide significant benefits to our society. Indeed the world could not have sustained the nutrition of its increasing population without the use of modern chemicals such as pesticides. Chemicals have also contributed significantly to improvements in human health through medicine and the control of vector-borne diseases. However, in addition to their useful properties, chemicals possess dangerous properties. They are toxic, can cause fires or explosions, can corrode or react with other chemicals in the environment, and can move on their own to places originally not intended for them. Chemicals therefore have to be used judiciously and safely. Unfortunately, as it has been identified before, this is not the case in Uganda’s agricultural communities.

Towards the judicious and safe use of chemicals, Pro-Biodiversity Conservationists in Uganda (PROBICOU), working together with the Strategic Approach to International Chemicals Management (SAICM) Secretariat, and the United Nations Development Programme (GEF) Small Grants Programme-Uganda, developed the project “Promoting Chemical Safety for Children at work in Rural Agricultural Communities”. Under this project, the development of a national inventory of dangerous chemicals, dangerous processes and endpoint discharges likely to affect working children in agriculture is the second objective.

1.1 Background

Uganda is a signatory to a number of international chemical safety related agreements and initiatives, which SAICM seeks to harmonise and synergise. SAICM, adopted by the International Conference on Chemicals Management (ICCM) on 6 February 2006 in Dubai, United Arab Emirates, is a policy framework for international action on chemical hazards (ICCM 2006).

Notable about SAICM are its comprehensive scope; ambitious “2020” goal for sound chemicals management; multi-stakeholder and multi-sectoral character; endorsement at the highest political levels; emphasis on chemical safety as a sustainable issue;

The Basel Convention on the Control of Trans-boundary Movement of Hazardous Wastes and their Disposal, 1989;
provision for resource mobilization; and formal endorsement or recognition by the governing bodies of key intergovernmental organizations.

This Inventory is laying emphasis on chemical safety as a sustainable issue. It is in the context of the international policy framework to promote chemical safety around the world - The Strategic Approach to International Chemicals Management (SAICM). This has as its overall objective the achievement of the sound management of chemicals throughout their life cycle so that, by 2020, chemicals are produced and used in ways that minimize significant adverse impacts on human health and the environment.

1.2 SAICM Quick Start Programme

Activities to develop this Inventory report are funded under the SAICM Quick Start Programme (QSP). The Overarching Policy Strategy, in paragraph 19 on Financial Considerations, provides that initial capacity building activities for the implementation of Strategic Approach objectives will be supported by the establishment of the Quick Start Programme (QSP). The QSP contains a voluntary, time-limited trust fund, administered by the United Nations Environment Programme (UNEP), and may include multilateral, bilateral and other forms of cooperation. PROBICOU was granted these funds for the implementation of the project activities.

Consequently, as required by SAICM, this inventory has been developed through an integrated approach in which the main stakeholders have been involved. These include the Ministry of Gender, Labour and Social Development (MGLSD); the National Environment Management Authority (NEMA); the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF); the National Union of Plantation and Agricultural Workers (NUPAW); and the United Nations system (UNDP, UNEP). It builds upon earlier situational analysis efforts originating from NEMA, which informed on the nature and size of the chemical safety problem, and the structure, size, and capacity of Uganda’s effort on sound management of chemicals.


1.3 Purpose of the Inventory

The inventory addresses the issue of lack of awareness and inadequate information on pesticides, which is one of the issues that was identified and prioritized by NEMA (NEMA 2009) during the multi-sectoral, multi-disciplinary and consultative task teams inventorying process on Sustainable Management of Chemicals (SMC). It seeks to identify dangerous chemicals and processes with a view to identify and quantify risks and then warn key players to safeguard human health and the environment in Uganda from harmful effects of the chemicals and so fulfil Uganda’s commitment to international standards she is a party to. It recognizes the benefits of chemicals for improved standards of living, public health and protection of the environment, and strives to avail this information to many lead agencies and so promote the safe production and use of chemicals. The Inventory seeks to mobilise and bring together the stakeholders and development partners to the assistance of Uganda's national efforts on sustainable management of chemicals.

This Inventory is intended for the use of all those sectors that have a responsibility for sustainable management of chemicals. Its objective is to provide action guidance to those key players which are engaged in planning activities relating to the use of chemicals such as competent authorities, the management of companies where chemicals are supplied or used, and emergency services. It also offers guidance to suppliers’, employers’ and workers’ organisations especially those in plantation estates.
1.4 Context

The activity in this inventory arises from the development context of the country. This has a dominant reliance on agriculture.

1.4.1 Agriculture in the economy

Agriculture remains the mainstay of the Ugandan economy (MAAIF 2011), providing a significant share of Gross Domestic Product (GDP) and the bulk of raw materials used by the mainly Agriculture based industrial sector. 86.3 per cent of the Uganda’s population, currently estimated at 34 million, live in the rural areas and depend directly on agriculture for their livelihoods. Major agricultural products include: organic and non organic crops, oils seeds, cereals, pulses, essential oils, animals and animal products, honey and bees wax, fish and fish products, silk cocoons, and cattle products.

The cash crop subsector includes growing of coffee, cotton, tea, cocoa, sugar cane, and export cut flowers and horticulture. Many of these are produced in large plantation estates. As a result of this situation, Uganda needs to use chemicals as a major input to increase productivity during all the stages of crop and livestock production.


According to the Agricultural Statistical Abstract (MAAIF 2011), Uganda incurred a cost of United States Dollars 49,260,000 on importation of organic chemicals and 26,649,000 on inorganic chemicals for use in agriculture that year. With agricultural exports amounting over 60% of the total annual value, the role of chemicals as a factor in the national economy needs to be recognised and the corresponding need for safety from their dangerous aspects addressed.

A variety of chemicals are imported into Uganda every year for use in agriculture, forestry, health, industry, and veterinary services. Close to 300 pesticide formulations are known in the country. The storage, transportation, manipulation, use and disposal of these chemicals are carried out by various categories of people without correct skills and equipment. As a result, the population is exposed to chemicals at work, at home, and in the general environment. Of particular vulnerability are the children at work in the agricultural communities and establishments, who are involved in the use of dangerous chemicals or exposed to them as bystanders during application.

While agriculture is the mainstay of the economy, child labour exists in Uganda. In the recent past, 25% of all the children between the ages 5 - 17 years were child labours with males (28%) more prominent than females (24%). Child labour was highest among the child group 5 - 11 years (34%). The total number of children in child labour was 2,750,388 (UBOS UNHS 2009/2010).

One countrywide form of child labour is the involvement of children in agriculture especially as cheap domestic labour. According to UBOS (UBOS, 2008), 96% of commercially active children (7 to 17 years) are in agriculture. In this sector, children are involved in application of pesticides and other agricultural chemicals. Children at work and those just standing by in agricultural communities and establishments are therefore directly and indirectly exposed to toxic chemicals.


This study defines child labour as comprising of: (i) All children involved in work aged 5-11 years; (ii) All working children aged 12-14 years involved in work beyond their capacity or work which is not ‘light work’ as provided for in national legislation and, or, they work for a total of 14 hours or more per week and; (iii) All working children aged 15-17 involved in hazardous work and, or, they work an equivalent of 43 or more hours per week. This definition of child labour fits squarely within the ILO Conventions 138 and 182 on child labour and national labour legislation – the Employment Act No 6 2006.


The earliest authoritative study of child labour was done by UBOS (2001) based on the Uganda Demographic and Household Survey of 2000-2001. The study estimated that, out of the total 7.9 million children in the country aged 5-17 years, 2.7 million were at work.


Exposure of children to toxic chemicals is an aspect of the worst forms of child labour as identified in the National Child Labour Policy MGLSD, (MGLSD, 2006) and the Guidelines for Labour Inspection on the Identification of Hazardous Child Labour MGLSD (MGLSD, 2010). Drawing attention to this vulnerability is the mission of this project.

Under this project therefore is an effort to put in place a minimal programme of information to prevent ill health arising from pesticides with particular focus on children at work in agricultural setting. The project focuses on: - developing an up-to-date information on chemicals in agriculture, their use, the dangerous processes and end point discharges; developing manpower among the workers, employers and the general public for the dissemination of safety measures in use of toxic chemicals; and building a comprehensive public awareness and education on the alternatives to toxic chemicals and careful use when it is necessary to use them.

1.4.2 Import and trade in crop protection products

Uganda’s agricultural chemical market is liberalised and is led by the private sector. Importation of agricultural chemical products is handled by the registered private importers that include among others: Balton (U) Ltd., Nsanja Agrochemicals Limited, Bukoola Chemical Industries, Green House Chemicals Ltd, Twiga Chemicals, Sekalala Enterprises, Lipsun, Alga, Keith Associates, Evergreen International, General and Allied, MVC Farmers Centre, East Africa Seed, FICA and Lyala-Bissi. Most of the importers are closely affiliated to at least one multinational agricultural chemical company it represents from countries such as Israel, Singapore, Europe, India, China, South Africa and the USA on the basis of product registration. The leading imported chemicals for 2007 grouped by type can be seen in Table 1 below.

Pesticides are the chemicals of greatest concern in regard to health and safety in agriculture. The total pesticide imports amounted to about 4,414,705 L/Kg and fertilizers amounted to 107,658,686kg/l. The market share of fungicides was 38.7%, followed by herbicides at 36.5% and insecticides at 23.8%. Pesticides are imported into the country as ready-to-use products in handy packages, or bulk formulations.

1.4.3 Trends in agricultural chemicals import

As most of the agricultural chemicals are imported, the pattern of agricultural chemical imports is closely related to trends of agricultural chemicals used. Table 2 below shows that the import of agricultural chemicals strongly increased over the stated six years. From 2002-2007, the quantity of insecticides imported increased from 923,638L to 1,050,552, resulting in an average annual growth rate of 1.14%. However, imports varied from year to year.

Table 2: Quantity of agricultural chemicals imports 2002 – 2007

<table>
<thead>
<tr>
<th>Year</th>
<th>Insecticides</th>
<th>Fungicides</th>
<th>Herbicides</th>
<th>Fertilizers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quantity (L/KG)</td>
<td>Quantity (L/KG)</td>
<td>Quantity (L/KG)</td>
<td>Quantity (L/KG)</td>
<td>Quantity (L/KG)</td>
</tr>
<tr>
<td>2002</td>
<td>923,638</td>
<td>238,030</td>
<td>3,166,626</td>
<td>12,755,000</td>
<td>17,083,294</td>
</tr>
<tr>
<td>2003</td>
<td>2,510,190</td>
<td>1,733,259</td>
<td>922,164</td>
<td>28,587,000</td>
<td>33,752,613</td>
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<tr>
<td>2004</td>
<td>1,066,500</td>
<td>1,699,581</td>
<td>900,012</td>
<td>47,421,329</td>
<td>51,087,422</td>
</tr>
<tr>
<td>2005</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2006</td>
<td>402,420</td>
<td>673,968</td>
<td>501,945</td>
<td>48,138,500</td>
<td>49,716,833</td>
</tr>
<tr>
<td>2007</td>
<td>10,505,520</td>
<td>12,052,585</td>
<td>1,618,182</td>
<td>107,658,666</td>
<td>131,834,970</td>
</tr>
</tbody>
</table>

Source: Department of Crop Protection (MAAIF) Pesticide Statistics for the Year 2007.

1.4.4 Why children are especially vulnerable

Children can be exposed to work-related pesticides in several ways: -

i. On-the-job exposure, such as when children work in agricultural settings spraying crops with pesticides;

ii. Parents may bring their children with them to work, where pesticides have been or are being applied – this is prominent in tea and sugar estates where workers live in work camps;

iii. There may also be second-hand exposure to children of agricultural workers through spray drift or residue on the parents’ clothing, or spraying of the parents’ homes to control vectors (mosquitoes, bed bugs, lice). While adults as well are of concern in this project, children are more of concern because of key differences in physiology and behaviour.

Children are more susceptible to chemical hazards than adults because of the following factors: -

Differences in Physiology: -

i. Children’s nervous, immune, digestive and other systems are still developing. Developing systems are less able to detoxify and excrete these pollutants compared to adults;
ii. Children’s systems provide less natural protection than adults;
iii. Children breathe in more air than adults, inhaling almost twice as many pollutants.

Differences in behaviour:

i. Children spend more time outdoors on grass, playing fields, and in their ignorance, play with equipment where pesticides may be present;
ii. Children crawl on the floor and therefore have full body contact with deposits on the floor and carpets;
iii. Children’s hand-to-mouth contact is more frequent, exposing them to toxins through ingestion;
iv. The diets of infants and children may differ substantially from those of adults and that they consume more food for their size than adults. As a result, they may be exposed to proportionately more pesticide residues;
v. Children also have a longer “shelf-life”. In other words, they have much more of their life ahead of them and a longer period of time during which exposures can occur and for health problems to manifest.

Children may also be accidentally poisoned from exposure to pesticides that are improperly stored or where appropriate precautions are not taken after use. Children rely on the protection of adults to avoid undue and unnecessary exposure to substances such as pesticides. Adults therefore need to be informed first. This work therefore aims to inform the adults so that they can give the necessary protection to the children.

1.4.5 How pesticide poisoning affects a child’s health

Pesticide poisoning is especially harmful to children since their brain and nervous systems are at early critical stages of development. Because their bodies are still developing, children have fewer natural defences and can develop serious health effects if overexposed to pesticides.

There are two categories of health effects of pesticide exposure. Acute exposure refers to an intense exposure over a short period of time; for instance, a child sitting in the room during a spraying. Chronic exposure - low-dose and long-term exposure is exposure that occurs over a period of time.

Acute exposure to pesticides may cause short-term effects such as:

i. Headaches;
ii. Dizziness;
iii. Muscle twitching;
iv. Weakness;
v. Tingling sensations; and
vi. Nausea.

Long-term exposure to pesticides may cause serious health effects such as:

i. Birth defects;
ii. Learning disabilities;
iii. Behavioural changes;
iv. Organ damage;
v. Forms of cancer, including leukaemia, breast cancer, and brain tumours; or
vi. Asthma symptoms.

In evaluating the use of chemicals, these health effects are in focus.
CHAPTER TWO: OBJECTIVES AND METHODOLOGY

2.0 Introduction
This is an effort to evaluate the hazards and exposure regarding chemicals that exist in the plantation agriculture in Uganda and targets workers and children as the primary beneficiaries. With the knowledge of hazards and exposure to them, the level of risk can be inferred and necessary guidance to minimise it can be given. This is in line with the NEMA action plan on sound management of chemicals (SMC) (NEMA, 2010). It adds to NEMA’s earlier work (NEMA, 2007) which covered and visited other farms focusing on persistent organic pollutants pesticides.

2.1 Strategy
The strategy is to mount a survey of importers, stockists, distribution, transporters, applicators and the whole chain of handling chemicals with a view to identify hazards and areas of particular exposure to workers and associated children and so enable contingency safety measures to be put in place to manage them.

2.3 Objective
The objective is to develop a national inventory of dangerous chemicals, dangerous processes and endpoint discharges likely to affect workers and in particular, working children in agriculture and to disseminate it.

2.3.1 Specific objectives of the study
The specific objectives of the study are:

a. To establish:
   i. The types of chemicals used by farmers in their farming practices;
   ii. How these chemicals are applied with respect to safety procedures;
   iii. The extent of child involvement in the whole chemical cycle;
   iv. Whether there is competent supervision in the use of these chemicals;
   v. The kind of equipment used;
   vi. How the leftover chemicals are disposed off;
   vii. Whether these chemicals used are properly labelled and identified; and

b. To record the dangerous aspects of chemical usage on both humans and the environment.


2.5 Output
As a contribution to the outputs of the whole project, the output of this activity is a developed inventory of dangerous chemicals dangerous processes and endpoint discharges likely to affect working children and their environment.

2.6 Activity
The activity was to carry out a survey of enterprises/plantation at national and district levels and inspect their chemicals handling facilities. This was to determine the situation at the onset of the project so that problem areas are identified. Data on ill health occurrences and information leading to establishment of an inventory of chemicals and dangerous processes was collected. Data collected was stored on computer and shared among key stakeholders.

2.7 Methodology
In carrying out assessment for this report, qualitative methods of data collection and analysis were adopted. The methods of data collection included interviews and document review and inspection.

Document reviews: - Documents and literature review were undertaken. The purpose of this was to identify gaps, areas of weaknesses and strengths to build upon. Relevant policy documents, action plans, and other materials were reviewed. These include Government policies, laws and institutional set ups in subjects of use, manufacture, handling, storage, and waste disposal of chemicals.

The range of the documents reviewed included international documents and conventions. The purpose of this was to obtain reference point with which to judge Uganda’s effort in this area.

Furthermore, a literature survey was undertaken. This included in particular, UNEP materials on chemical safety, WHO health statements on named chemicals, and EPA (USA) toxicology profiles materials and Material Safety Data Sheets (MSDS). The purpose of this review was to obtain international experience on the subject with which to assess the impacts and threats facing Uganda workers.

Field Survey: - In order to get a deeper understanding of the people’s experiences and thoughts, in-depth interviews were carried out in all the accessible selected test population. The following aspects were considered among others:

- Experience with chemicals and consumer products;
- General health and other social services accessed;
- Common beliefs;
- Health demoting behaviours and habits;
- Awareness of laws and dangers of chemicals consumed or used; and
- Level of inspection and contact with competent authorities.

The method of data collection was unstructured discussions, not longer than one and a half hours, with a probing question at the beginning. The venue was in the interviewee’s respective place of work or home where necessary. The in-depth interviews were undertaken with individuals. Annex 1 presents the guiding questionnaire.

Premises visits: Inspection type field visits to the premises of stakeholders, manufactures, dealers of chemicals and products supported with administration of an in-depth questionnaire described above.

Site Examinations: The general areas of the survey were examined by a walk-through tour with a view to assess the values that are being affected and to estimate the extent of damage in the event of further commercial development activities. Consultations and interviews with the community members, entrepreneurs and officials were then carried out in order to expand the observations and make inferences.
**Sampling methodology:** The survey was based on a probability sample, stratified by district and size of establishment. The sampling frame for selection of establishments took into account the UBOS, 2007 Business Register. A Business Register is a record of all active business establishments in a given area (or in the whole country) in a given period. Essentially, it contains structural information about each business that includes among others, name, economic activity, location and employment by gender, among other variables. Structural information on businesses is central to the collection of business statistics. This is because the information enables one to identify and describe more precisely each business participant in the economy. Owing to inadequate time and funding, the study did not cover all large farms and did not cover peasant agriculture and stockists of various chemicals.

**Approach.** A multi-sectoral, multidisciplinary multi agency team of persons with detailed terms of reference for their tasks carried out the survey. The objectives were to assess the sound management of chemicals regimes relative to the strategic objectives of the SAICM Overarching Policy Strategy, and put in place measures to begin addressing gaps in the national regime; and to improve the incorporation of national sound management of chemicals priorities into the national development planning agenda.
CHAPTER THREE: INVENTORY OF DANGEROUS CHEMICALS

3.0 Introduction

The objective of this inventory is to ensure a high level of protection of human health and the environment. The target is commercial agriculture. This includes plantation estates for sugar cane, tea, tobacco, rice, and export cut flower and horticulture establishments. The main ones were visited, interviewed, inspected and the chemicals and their handling recorded. The chemicals are accordingly grouped within the crop of use. The Tables 3 to 8, are the inventory of dangerous chemicals and show the chemicals used in each type of establishment to achieve protection against various pests on the crop. The tables show the trade name, the active ingredient in the formulation, and the health effects that it may pose. In order to identify the active ingredient scientifically, the CAS Registration Number is given followed by the chemical name. The IUPAC naming system is used for all the scientific names of chemicals in this report.

The term “dangerous” refers to the inherent properties of the chemical that can cause biological or physical harm to humans or any of human interests. The dangerous properties of chemicals that are of concern in this survey include: -

i. Toxicity properties: Acute and chronic health effects affecting all parts of the human body such as:
   - Allergenic and sensitising effects;
   - Carcinogenic effects;
   - Teratogenic and mutagenic effects;
   - Effects on the reproductive system (Endocrine interrupters).

ii. Chemical and physical properties: Such properties as whether the chemical is:
   - Flammable, explosive, oxidising, highly reactive;
   - Stable or reactive in ambient environment;
   - Corrosive and irritant;
   - Persistent, can bioaccumulate, or is mobile or transportable on its own.

iii. Ecological effects: These include:
   - Mobility/transportation of the chemical which creates potential routes for release to the environment;
   - Persistence and degradability, bioaccumulative potential; and
   - Aquatic toxicity and other data relating to ecotoxicity, e.g. effects on water treatment works.

CAS Reg. No. (Chemical Abstract Service (CAS) Registry Number) is a unique identifier number assigned to each chemical and to some mixtures of chemicals by the Chemical Abstracts Service, a division of the American Chemical Society. This number is used worldwide to identify the chemical.

The IUPAC is the International Union of Pure and Applied Chemistry. It is an international scientific organization, not affiliated to any government. The IUPAC was formed in 1919 by scientists and academicians who recognized a need for standardization in chemistry. The IUPAC strives to advance chemistry, in part by setting global standards for names, symbols, and units. It has a set of rules to generate systematic names for chemical compounds. The IUPAC is the recognized authority for chemical standards of nomenclature, measurements, and atomic mass values. It is the nomenclature used most frequently worldwide.
The health effects of pesticides depend on the type of chemistry of the pesticide. Some, such as the organophosphates and carbamates, affect the nervous system. Others may irritate the skin or eyes. Some pesticides may be carcinogens. Others may affect the hormone or endocrine system in the body. Human health risk assessments for many pesticides are available on the web. These have been consulted in this work.

Current knowledge of the health effects arising from pesticides is largely based on experimental studies in animals and cell cultures as well as from clinical and epidemiological data from people who are exposed to higher than average doses either by accident or through their work. A brief summary of known facts is provided for each chemical. Some chemicals are common to a number of crops and are repeated in the relevant table.

It must be stated clearly and emphatically that the scientific literature examining the health effects associated with pesticides is not conclusive for some pesticides, nor is it uniformly positive. The principle of the best available evidence is observed in this work. The information presented herein is therefore based on available data from reliable sources, and is correct to the best of PRO-BICOU’s knowledge.

This work covered only and is limited to plantation estates and their out growers. It does not cover peasant agriculture. It does not therefore capture all chemicals and dangerous practices used in various types of agriculture. It also leaves out chemicals used for public health. These areas are covered under NEMA’s work (NEMA 2007) mentioned above.

3.1 Inventory of Dangerous Chemicals used in Horticulture

Rose flowers in Uganda are grown commercially in greenhouses. Many species of insects and mites attack and injure roses. These include Aphids: Many species of aphids or plant lice, including the rose aphid, attack roses. Aphids are small, soft-bodied winged or wingless insects. Leafhoppers: Leafhopper species are about four times longer than wide. Both adults and nymphs can injure roses. Some species feed on tender stems and leaf petioles; others, such as rose leafhoppers, feed on the underside of leaves, causing whitish stippling. Spider mites: the most common is the two-spotted...
Spider mite. Mites are tiny, scarcely visible without magnification. Spider mites rupture plant cells with their mouthparts and suck the juices. Grasshoppers: Several species of grasshoppers feed on rose leaves, buds, flowers and stems. There are several other insects and weeds on rose flowers. All the pests need to be controlled.

Pesticides are the most readily used weapons against these pests. The variety of pesticides used in cut-flowers and horticulture production are presented in table 3 below.

**Table 3: Chemicals used in the Horticulture - flower growing**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Active ingredient</th>
<th>Hazard phrase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verita</td>
<td>Fenamidone +</td>
<td>Slightly toxic. Unlikely to be hazardous to humans (WHO). Toxic to fish, shrimp and oysters. Toxic to aquatic invertebrates.</td>
</tr>
<tr>
<td></td>
<td>(An imidazole)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CAS Reg. No: 161326-34-7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(S)-1-anilino-4-methyl-2-methylthio-4-phenylimidazolin-5-one;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fosetyl-Aluminium</td>
<td>Some laboratory animal feeding studies indicate that fosetyl-Al has a slight degenerative effect on the testes of dogs and shows evidence of cancer effects (urinary bladder tumors) in male rats, when these test animals are fed high doses of the pesticide. Considering these and other available oncogenicity studies, EPA has classified fosetyl-Al as a category C oncogen-that is, a possible human carcinogen with limited evidence of carcinogenicity in animals. Fosetyl-Al is not a mutagen and it does not pose developmental or reproductive effects of concern.</td>
</tr>
<tr>
<td></td>
<td>(An Organophosphate)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CAS Reg. No: 39148-24-8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aluminium tris(ethyl phosphonate)</td>
<td></td>
</tr>
<tr>
<td>Equation Pro</td>
<td>n-butanol 30% +</td>
<td>Slightly hazardous. WHO classification III.</td>
</tr>
<tr>
<td></td>
<td>(An Alkane)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CAS Reg. N.: 71-36-3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bupirimate 25% +</td>
<td>Famoxadone has low acute toxicity when administered by oral, dermal, and inhalation routes; No genotoxic potential; and is unlikely to pose a carcinogenic risk to humans. It is relatively non-toxic to terrestrial wildlife, but highly toxic to freshwater fish and aquatic invertebrates.</td>
</tr>
<tr>
<td></td>
<td>(A pyrimidine)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CAS Reg. No: 41483-43-6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Famoxadone</td>
<td>May cause sensitisation by skin. Contact and inhalation; irritating to respiratory system.</td>
</tr>
<tr>
<td></td>
<td>CAS Reg. No: 131807-57-3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-anilino-5-methyl-5-(4-phenoxyphenyl)-1,3-oxazolidine-2,4-dione.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cymoxanil</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CAS Reg. No: 57966-95-7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1-(2-cyano-2- methoxyiminoacetyl)-3-ethylurea</td>
<td></td>
</tr>
</tbody>
</table>

EPA Toxicity Category. Four categories used to indicate the potential hazard of EPA-registered pesticides, thus Class I (Danger-Poison), Class II (Warning), Class III-IV (Caution).

The following cancer classification scheme was first introduced in 1986.

Group A - Human carcinogen. This group is used only when there is sufficient evidence from epidemiologic studies to support a causal association between exposure to the agents and cancer.

Group B - Probable human carcinogen. This group includes agents for which the weight of evidence of human carcinogenicity based on epidemiologic studies is "limited" and also includes agents for which the weight of evidence of carcinogenicity based on animal studies is "sufficient." The group is divided into two subgroups. Group B1 is reserved for agents for which there is limited evidence of carcinogenicity from epidemiologic studies. Group B2 is used for Agents for which there is "sufficient" evidence from animal studies and for which there is "inadequate evidence" or "no data" from epidemiologic studies.

Group C - Possible human carcinogen. This group is used for agents with limited evidence of carcinogenicity in animals in the absence of human data.

Group D - Not classifiables as to human carcinogenicity. This group is generally used for agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.

Group E - Evidence of non-carcinogenicity for humans. This group is used for agents that show no evidence for carcinogenicity in at least two adequate animal tests in different species or in both adequate epidemiologic and animal studies.

The classification which is used in many countries is the WHO recommended classification of pesticides by hazard. Active ingredient (technical grade) of pesticides are classified as follows: 1. Extremely hazardous (Class 1a); 2. Highly hazardous (Class 1b); 3. Moderately hazardous; 4. Slightly hazardous; 5. Active ingredients unlikely to present acute hazard in normal use.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Active ingredient</th>
<th>Hazard phrase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aliette Flash WG 80</td>
<td>Ethyl hydrogen phosphonate&lt;br&gt;Fosetyl-al&lt;br&gt;(Also called Aluminum tris phosphonate).&lt;br&gt;(An Organophosphate)&lt;br&gt;CAS Reg. No.: 15845-66-6</td>
<td>Slightly toxic. Unlikely to be hazardous (WHO).&lt;br&gt;Does not pose a risk to birds or fish, and does not adversely affect aquatic plants.</td>
</tr>
<tr>
<td>Scala</td>
<td>Pyrimethanil&lt;br&gt;(An anilinopyrimidine)&lt;br&gt;4,6-dimethyl-N-phenyl-2-pyrimidinamine.&lt;br&gt;CAS Reg. No.: 53112-28-0</td>
<td>If swallowed, do not induce vomiting unless told to do so by a physician. Classified&lt;sup&gt;35&lt;/sup&gt; (US-EPA) as a Group C&lt;sup&gt;36&lt;/sup&gt; chemical - possible human carcinogen.</td>
</tr>
<tr>
<td>Amonium Phosphate</td>
<td>Sec-butyl ammonium phosphate.&lt;br&gt;CAS Reg. No.: 13952-84-6</td>
<td>Toxic to humans, including carcinogenicity, reproductive and developmental toxicity, neurotoxicity, and acute toxicity.</td>
</tr>
<tr>
<td>Apollo</td>
<td>Clofentezine.&lt;br&gt;(A tetrazine)&lt;br&gt;3,6-bis(2-chlorophenyl)-1,2,4,5-tetrazine.&lt;br&gt;CAS Reg. No.: 74115-24-5</td>
<td>Clofentezine has low acute oral toxicity in all species tested.&lt;br&gt;Possible carcinogen (US-EPA).&lt;br&gt;Suspected endocrine disruptor (US-EPA). Skin irritant and eye irritant.&lt;br&gt;WHO&lt;sup&gt;37&lt;/sup&gt; Classification III</td>
</tr>
<tr>
<td>Common Name</td>
<td>Active ingredient</td>
<td>Hazard phrase</td>
</tr>
<tr>
<td>-------------</td>
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<td>---------------</td>
</tr>
<tr>
<td>Dynane</td>
<td>m-Xylylenediamine (M-XDA) (A diamino xylene) 1,3-Bis(aminomethyl)benzene. CAS Reg. No. 1477-55-0</td>
<td>Exposure Routes: inhalation, skin absorption, ingestion, skin and/or eye contact. Corrosive. Causes eye and skin burns. Harmful if inhaled. May be harmful if swallowed or absorbed through the skin. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns.</td>
</tr>
<tr>
<td>Flint</td>
<td>Trifloxystrobin  (A Beta-methoxyacryl ester) CAS Reg. No.: 141517-21-7 Benzeneacetic acid, (E,E)-alpha-(methoxyimino)-2-[[1-[3-(trifluoromethyl)phenyl] methyldiene] amino]oxy[methyl]-methylene ester.</td>
<td>Classified (US-EPA) as a &quot;not likely human carcinogen&quot;. Sub-chronic and chronic toxicity studies demonstrated that the primary effects of trifloxystrobin occur in the liver and kidneys, at high doses.</td>
</tr>
<tr>
<td>Push</td>
<td>Not reflected in literature</td>
<td></td>
</tr>
<tr>
<td>Nissorum</td>
<td>Hexythiazox. (A thiazolidine) CAS Reg. No.: 78587-05-0 (4RS,5RS)-5-(4-chlorophenyl)-N-cyclohexyl-4-methyl-2-oxo-1,3-thiazolidine-3-carboxamide.</td>
<td>No harmful effects are expected if the precautions on the label and MSDS are followed. Inhalation: High vapour concentrations of the solvent while handling the concentrate are irritating to the eyes and the respiratory tract, may cause headaches and dizziness, and may have other central nervous system effects. Ingestion: Possible symptoms of exposure include: symptoms of central nervous system depression as described under inhalation. Skin: Will irritate the skin. Prolonged contact with the concentrate can cause defatting of the skin and may result in dermatitis; Eye: Will irritate the eyes. Reproductive Toxicity: Data indicates no teratogenic effects; Mutagenicity: Data indicates no mutagenic effects.</td>
</tr>
<tr>
<td>Folio Gold</td>
<td>Metalaxyl-M Concentration (% w/w): 3.0</td>
<td>Harmful by inhalation. Irritating to</td>
</tr>
<tr>
<td>Common Name</td>
<td>Active ingredient</td>
<td>Hazard phrase</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Collis</td>
<td>Indoxacarb.</td>
<td>Harmful if swallowed. Causes moderate eye irritation. Harmful if absorbed through skin. Avoid contact with skin, eyes or clothing. Wash thoroughly with soap and water after handling. Harmful if inhaled. Avoid breathing (dust, vapour or spray mist). Remove contaminated clothing and wash clothing before reuse.</td>
</tr>
<tr>
<td>Impulse</td>
<td>Chlorpyrifos or Dursban. (An organophosphate)</td>
<td>Potential for both acute toxicity at larger amounts and neurological effects in foetuses and children even at very small amounts. For acute effects, the US-EPA classifies chlorpyrifos as Class II: moderately toxic. Highly toxic to amphibians. Very toxic for aquaculture.</td>
</tr>
<tr>
<td>Biodewcon</td>
<td>The fungus (<em>Ampelomyces quisqualis</em>)</td>
<td>A bio-pesticide, derived from micro-organism (bacteria, fungus, viruses) and natural enemies of pests (parasitoids, predators, and pathogens).</td>
</tr>
<tr>
<td>Biophos</td>
<td>Dipotassium phosphate; dipotassium phosphonate. (A biologically activated phosphate fertiliser system, which works with nature to efficiently deliver minerals to plants through the soil and its biomass.)</td>
<td>Hazardous to humans &amp; domestic animals. Harmful if inhaled or absorbed through skin. Causes moderate eye irritation. Avoid contact with eyes, skin or clothing. Avoid breathing spray mist. Wash thoroughly with soap and water after handling.</td>
</tr>
<tr>
<td>Biopotash</td>
<td>An eco-friendly liquid biological formulation containing bacteria, <em>Frateuria aurantia</em> which remains around the seed or seedlings. Parasporal crystal containing Delta-endotoxin. Spores.</td>
<td>Safe to mammals, man, non-target parasites and predators, insects, hydrobiots, fish, and birds. Classified (US EPA) as Class-IV, low hazardous (green label) pesticide.</td>
</tr>
</tbody>
</table>
| Nimrod          | Bupirimate. (A pyrimidine)  
|                | CAS Reg. No.: 41483-43-6  
|                | 5-butyl-2-ethylamino-6-methylpyrimidin-4-yl dimethylsulfamate.  
|                | Low toxicity to mammals. Eye and skin irritant.  
|                | Skin - Bupirimate mild irritant, moderate skin sensitizer.  
|                | Not mutagenic or teratogenic (i.e. does not cause cancer or reproductive problems).  
|                | If swallowed - Nausea, dizziness, diarrhoea, central nervous system depression, nose and throat irritation. If uncoordinated vomit may enter lungs causing complications.  
|                | On skin - repeated and prolonged exposure may cause allergic contact dermatitis. N-butanol can be absorbed through the skin giving symptoms similar to ingestion above. Inhalation may lead to headache, dizziness, fatigue and possible nausea. High concentrations can produce central nervous system depression, loss of coordination, impaired judgement and eventually unconsciousness.  
| Melton          | Esfenvalerate – 3.5%  
|                | (A pyrethroid).  
|                | CAS Reg. No.: 66230-04-4  
|                | (S)-Hydroprene: (Ethyl(2E,4E,7S)-3,7,11-trimethyl-2,4-dodecadienoate  
|                | Or  
|                | 4-chlorophenyl)-3-methylbutyrate.  
|                | Acute toxicity: moderate;  
|                | Carcinogenicity: not likely;  
|                | Endocrine disruptor: suspected.  
|                | Symptoms of poisoning:  
|                | • Irritation of skin and eyes  
|                | • Irritability to sound or touch, abnormal facial sensation, sensation of pricking, tingling or creeping on skin, numbness.  
|                | • Headache, dizziness, nausea, vomiting, diarrhea, excessive salivation, fatigue.  
|                | • In severe cases: fluid in the lungs and muscle twitching may develop. Seizures may occur and are more common with more toxic cyano-pyrethroids.  
| Megalal         | Not reflected in literature  
| Miiros          | Not reflected in literature  
| Melorku Bud     | Not reflected in literature  

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Active ingredient</th>
<th>Hazard phrase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorpyriphos 48%</td>
<td>Chlorpyrifos also called Dursban. (An organophosphate) CAS Reg. No.: 2921-88-2 O,O-diethyl O-3,5,6-trichloropyridin-2-yl phosphorothioate.</td>
<td>Potential for both acute toxicity at larger amounts and neurological effects in fetuses and children even at very small amounts. For acute effects, the US-EPA classifies chlorpyrifos as Class II: moderately toxic. Highly toxic to amphibians</td>
</tr>
<tr>
<td>Ridomil</td>
<td>Mefenoxam. (A Xylylalanine) CAS Reg. No.: 70630-17-0 Methyl N-(methoxyacetyl)-N-(2,6-xylyl)-D-alaninate.</td>
<td>Causes moderate eye irritation. Harmful if inhaled or absorbed through the skin. Avoid contact with skin, eyes, or clothing. Avoid breathing dust. Wash thoroughly with soap and water after handling. <strong>Personal Protective Equipment (PPE):</strong> Applicators and other handlers must wear: - Long-sleeved shirt and long pants; - Chemical resistant gloves made of any waterproof material; - Shoes plus socks.</td>
</tr>
<tr>
<td>Match</td>
<td>Not reflected in literature</td>
<td></td>
</tr>
<tr>
<td>Meltatox</td>
<td>Dodemorph (A morpholine) CAS Reg. No.: 1593-77-7 4-cyclooctyl-2,6-dimethyl-morpholine</td>
<td>Dodemorph-acetate is of low oral toxicity to rats and low dermal toxicity to rabbits. It is of low toxicity to mammalian species. Dodemorph-acetate is extremely irritating to the skin, severely irritating to the eye and is a potential skin sensitizer. The target organ of dodemorph-acetate is the liver, with effects including increases in liver weights and various histopathological.</td>
</tr>
</tbody>
</table>
3.2 Inventory of chemicals used in sugar cane plantations

There is a wide spectrum of pests and diseases which attack sugar cane. These include: Early Shoot Borer (Chilo infescatellus): This attacks the crop during the early part of cane growth, before internode formation. It also attacks the cane stalks in the years of scanty rainfall. Internode Borer (Chilo Saccharifagus Indicus) - Damages the crop soon after internode formation and its activity continues till harvest. Termites (Coptotermes Heimi Wasmann; Odontotermes Assmuthi Holmgr; O. Obesus Rambur; O. Wallonensis Wasmann; Microtermes Obesi Holmgr; Trinervitermes Biformis Wasmann): The termites attack setts, shoots, canes and also stubbles. Whitefly (Aleurolobus Barodensis Mask): The nymphs of white flies suck the sap from the under surface of leaves which turn yellow and pinkish in severe cases and gradually dry up. Pyrilla (Pyrilla purpusilla Walker): Pyrilla is the most destructive foliage-sucking pest of sugarcane. Adults and the nymphs suck leaf sap from the under surface of the lower leaves. When the infestation is heavy, leaves turn yellowish white and wither away.

These pests and many others are controlled using pesticides. The chemicals used in sugar cane plantations in Uganda are presented in table 4 below.
Table 4: Chemicals used in the Sugar cane plantations

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Active ingredient</th>
<th>Hazard phrase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyphosate</td>
<td>Glycine, (An organophosphate) CAS Reg. No.: 1071-83-6 N(phosphonomethyl).</td>
<td>Has a United States Environmental Protection Agency (US-EPA) Toxicity Class of III (on a I to IV scale, where IV is least dangerous) for oral and inhalation exposure. It does not bioaccumulate, and breaks down rapidly in the environment.</td>
</tr>
<tr>
<td>2-4-D</td>
<td>CAS Reg. No.: 94-75-7 (A phenoxy acetic acid) (2,4-dichlorophenoxy) acetic acid.</td>
<td>Demonstrated toxic effects on the thyroid and gonads following exposure, There is concern over potential endocrine-disrupting effects. 2,4-D is included in the U.S. EPA June 2007 Draft List of Chemicals for Tier 1 Screening. 24</td>
</tr>
<tr>
<td>Ametrin</td>
<td>Ametryn (A methylthiotriazine) N-ethyl-N’-(1-methylethyl)-6-(methylthio)-1,3,5-triazine-2,4-diamine. CAS Reg. No.: 834-12-8</td>
<td>Toxicity class WHO (a.i.) III; US-EPA (formulation) III Highly toxic to birds and fish. Slightly toxic endocrine disruptor.</td>
</tr>
<tr>
<td>Varian</td>
<td>Not reflected in literature</td>
<td></td>
</tr>
<tr>
<td>Carbofuran</td>
<td>Furadan (A carbamate) 2,2-dimethyl-2,3-dihydro-1-benzofuran-7-yl methylcarbamate.</td>
<td>Has one of the highest acute toxicities to humans of any insecticide widely used on field crops. Since its toxic effects are due to its activity as a cholinesterase inhibitor it is considered a neurotoxic pesticide. Carbofuran is also a powerful endocrine disruptor that can cause transient alterations in the concentration of many hormones in animals and humans even at extremely low doses.</td>
</tr>
<tr>
<td>Grammoxone</td>
<td>Paraquat (A Bipyridyl) CAS Reg. No.: 4685-14-7 1,1’-dimethyl-4,4’-bipyridinium.</td>
<td>Acute effects. Severe paraquat poisoning is fatal; death may be very rapid or delayed up to several weeks. The main target organ of paraquat poisoning is the lung, but paraquat is also distributed to the heart, liver, and kidney. The brain is now recognised as another target organ. Systemic paraquat poisoning is characterised by burns to the mouth, throat, oesophagus,</td>
</tr>
<tr>
<td>(Same as Paraquat)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.2 Inventory of further chemicals used in sugar plantations

More chemicals used in sugar cane plantations are presented in table 5 below.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Active ingredient</th>
<th>Hazard phrase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lannate 90</td>
<td>Methomyl (A carbamate)</td>
<td>Acute exposure, is the main area of concern for methomyl. Restricted (EU) - Owing to toxicity to humans, including carcinogenicity, reproductive and developmental toxicity, neurotoxicity, and acute toxicity.</td>
</tr>
<tr>
<td></td>
<td>(E,Z)-methyl N-[(methylamino)carbonyl]oxy)ethanimidothioate.</td>
<td>High toxicity to aquatic organisms.</td>
</tr>
<tr>
<td>Royaltac EC</td>
<td>n-decanol 5.7 to 5.72 lb/gal</td>
<td>High acute toxicity, as designated by the World Health Organization (WHO), the U.S. EPA, or the U.S. National Toxicology Program.</td>
</tr>
<tr>
<td></td>
<td>CAS No.: 112-30-1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CAS Reg. No.: 58-89-9</td>
<td>In 2009 the production and agricultural use of lindane was banned under the Stockholm Convention on persistent organic pollutants. A specific exemption to that ban allows it to continue to be used as a second-line pharmaceutical treatment for lice and scabies.</td>
</tr>
<tr>
<td></td>
<td>1α,2α,3β,4α,5α,6β-hexachlorocyclohexane.</td>
<td></td>
</tr>
<tr>
<td>Product</td>
<td>Active Ingredient</td>
<td>CAS Number</td>
</tr>
<tr>
<td>---------</td>
<td>------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Ace 750 WSP</td>
<td>Acephate (An organophosphate), CAS Reg. No.: 30560-19-1 (RS)-(O,S-dimethyl acetylphosphoramidothioate) or (RS)-N-[methoxy(methylthio)phosphinoyl]acetamide.</td>
<td></td>
</tr>
<tr>
<td>Buildoc</td>
<td>Beta Cyfluthrin (A pyrethroid), CAS Reg. No.: 68359-37-5 cyano(4-fluoro-3-phenoxyphenyl)methyl 3-(2,2-dichlorocethenyl)-2,2-dimethylcyclopropanecarboxylate.</td>
<td></td>
</tr>
<tr>
<td>Ridomil</td>
<td>Mefenoxam (An acylamino acid) CAS Reg. No.: 70630-17-0 Methyl N-(methoxycetyl)-N-(2,6-xylyl)-D-alaninate.</td>
<td></td>
</tr>
</tbody>
</table>
with soap and water after handling.

Personal Protective Equipment (PPE):
Applicators and other handlers must wear:
- Long-sleeved shirt and long pants;
- Chemical resistant gloves made of any waterproof material;
- Shoes plus socks

<table>
<thead>
<tr>
<th>Actellic</th>
<th>Primiphosmethyl</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A pyrimidine organothiophosphate)</td>
<td>Primiphos-methyl can cause cholinesterase inhibition in humans; it can overstimulate the nervous system causing nausea, dizziness, confusion, and at very high exposures (e.g., accidents or major spills), respiratory paralysis and death. Symptoms of poisoning (of organophosphates) include:</td>
</tr>
<tr>
<td>CAS Reg. No.: 1698-60-8</td>
<td>- Excessive salivation, sweating, rhinorrhea and tearing;</td>
</tr>
<tr>
<td>O-2-diethylamino-6-methylpyrimidin-4-yl O,O-dimethyl phosphorothioate.</td>
<td>- Muscle twitching, weakness, tremor, incoordination;</td>
</tr>
<tr>
<td></td>
<td>- Headache, dizziness, nausea, vomiting, abdominal cramps, diarrhea;</td>
</tr>
<tr>
<td></td>
<td>- Respiratory depression, tightness in chest, wheezing, productive cough, fluid in lungs;</td>
</tr>
<tr>
<td></td>
<td>- Pin-point pupils, sometimes with blurred or dark vision;</td>
</tr>
<tr>
<td></td>
<td>- Severe cases: seizures, incontinence, respiratory depression, loss of consciousness.</td>
</tr>
<tr>
<td></td>
<td>Affected organs: Respiratory system, CNS, cardiovascular system, skeletal muscle (motor endplate).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Azocord</th>
<th>Imidacloprid</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A neonicotinoid)</td>
<td>Based on laboratory rat studies, imidacloprid is rated as &quot;moderately toxic&quot; on an acute oral basis to mammals and low toxicity on a dermal basis by the World Health Organization and the United States Environmental Protection Agency (class II or III, requiring a &quot;Warning&quot; or &quot;Caution&quot; label). It is rated as an &quot;unlikely&quot; carcinogen and as weakly mutagenic by the U.S. EPA (group E). It is not listed for reproductive, or</td>
</tr>
<tr>
<td>CAS Reg. No.: 138261-41-3</td>
<td>- N-[1-[(6-Chloro-3-pyridyl)methyl]-4,5-dihydroimidazol-2-yl]nitramide.</td>
</tr>
</tbody>
</table>
developed toxicity, but is listed on EPA's Tier 1 Screening Order for chemicals to be tested under the Endocrine Disruptor Screening Program.

Imidacloprid is one of the most toxic insecticides to bees.

**Cofidor**

Imidacloprid 0.25 g/kg
(A neonicotinoid)
CAS Reg. No.: 138261-41-3
N-[1-[(6-Chloro-3-pyridyl)methyl]-4,5-
dihydroimidazol-2-yl]nitramide.

Rated as "moderately toxic" on an acute oral basis to mammals and low toxicity on a dermal basis by the World Health Organization and the United States Environmental Protection Agency (class II or III, requiring a "Warning" or "Caution" label). It is rated as an "unlikely" carcinogen and as weakly mutagenic by the U.S.EPA (group E). It is not listed for reproductive or developmental toxicity, but is listed on EPA's Tier 1 Screening Order for chemicals to be tested under the Endocrine Disruptor Screening Program (EDSP).

Imidacloprid is one of the most toxic insecticides to bees.

May adversely affect human health, especially the developing brain.

**Orthene**

Acephate
(An organophosphate)
CAS Reg. No.: 30560-19-1
O,S-dimethyl acetylphosphoramidothioate.

*Toxicity to Humans:* Inhalation or ingestion of orthene can result in poisoning symptoms, including dizziness, sweating, difficulty breathing, abdominal cramps, nausea, vomiting, diarrhea and in severe cases, convulsions. Consult a medical professional in the event of suspected acephate poisoning.

*Toxicity to Wildlife:* Exposure to orthene can result in behavioral and developmental changes in organisms such as fish, amphibians and crustaceans.

*Long-Term Health Risks:* Acephate has been identified as a cholinesterase inhibitor, meaning that long-term exposure can result in neurological damage. It has also been identified as a suspected endocrine disruptor and a possible carcinogen.
3.4 Inventory of chemicals used in rice plantations

Insect pests attack all portions of the rice plant at all stages of plant growth. Feeding guilds consist of the (1) root feeders, (2) stem borers, (3) leafhoppers and plant-hoppers, (4) defoliators, and (5) grain sucking insects. Insects also attack rice grains in storage. The variety of pests are indicated below.

Root Feeders: Examples of root feeders are termites (order Isoptera) and the rice water weevil, Lissorhoptrus oryzophilus (order Coleoptera). Stem Borers:

Stem borers consist primarily of insects in the lepidopterous families, Noctuidae and Pyralidae. The adult moths lay eggs on rice leaves and the larvae bore into the stem. Feeding in the stem during the vegetative growth stage of the plant (seedling to stem elongation) causes death of the central shoot (“deadheart”).

Leafhoppers and Planthoppers: In general, the leafhoppers (family Cicadellidae) attack all aerial parts of the plant whereas the planthoppers (family Delphacidae) attack the basal portions (stems). Defoliators: A large group of insects belonging to several insect orders feed on rice leaves. Most common are the larvae and adults of beetles (order Coleoptera), larvae of the order Lepidoptera and grasshoppers (order Orthoptera). Defoliation reduces the photosynthetic capacity of the rice plant and thereby decreases yields.

Grain Sucking Insects: The stink bugs (order Hemiptera), known for the foul odour produced by the scent glands on their abdomen, penetrate the developing grain with their sucking mouthparts and remove the white fluid referred to as “milk”. Damage early in the development of the grain prevents the filling of the grain. The yellow stem borer (Scirpophaga incertulas) may be considered as one of mankind’s worst pest. Scirpophaga incertulas could attack most of the growing stages of rice plant, beginning with seedling through tillering and up to ear setting. Scirpophaga incertulas caterpillars bore into the rice stem and hollow out the stem completely.

When modern rice varieties were introduced in the 1960’s, pesticides became the major strategy for their protection. Chlorinated hydrocarbons were first used, next came the phosphates, and recently the carbamates have been used. The chemicals currently used in rice plantations in Uganda are presented in table 6 below.
<table>
<thead>
<tr>
<th>Common Name</th>
<th>Active ingredient</th>
<th>Hazard phrase</th>
</tr>
</thead>
</table>
| Glyphosate/Roundup   | Glyphosate or glycine (An organophosphate) N-phosphonomethyl glycine. Glycine,   | Has a United States Environmental Protection Agency (EPA) Toxicity Class of III (on a 1 to IV scale, where IV is least dangerous) for oral and inhalation exposure.  
It does not bioaccumulate, and breaks down rapidly in the environment. |
| Oxyfluorfen 24% EC   | Oxyfluorfen (A nitrophenyl ether) 2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl)benzene. CAS Reg. No.: 42874-03-3 | Oxyfluorfen is of low acute oral, dermal, and inhalation toxicity. The primary toxic effects are alterations in blood parameters (anemia) and in the liver.  
Oxyfluorfen is classified as a possible human carcinogen based on combined hepatocellular adenomas/carcinomas in the mouse carcinogenicity study.  
Based on current use patterns, handlers (mixers, loaders, and applicators) may be exposed to oxyfluorfen during and after normal use of liquid and granular formulations in agricultural and other settings. |
| Butachlor 60% EC     | Butachlor (A chloroacetamide) CAS Reg. No.: 23184-66-9 N-butoxyethyl-2-chloro-2'-6'-diethylacet anilide. | Low toxicity to human beings and cattle. Toxic to fish. US-EPA lists it as a likely carcinogen. Not known to exhibit reproductive or birth defects.  
Non-teratogenic and non-oncogenic. Prolonged or Frequent contact may defat and dry the skin, leading to discomfort and dermatitis. |
| Thiobencarb 50% EC   | Thiobencarb (A thio-Carbamate) CAS Reg. No.: 28249-77-6 S-4-chloroberzyl diethyl(thiocarbamate). | Thiobencarb has been one of the herbicides previously associated with fish kills in agricultural drains near the Sacramento/San Joaquin rivers and their Delta.  
Suspected to be embrototoxic. |
| Pendimethalin 33% EC | Pendimethalin (A dintroraniline) N-(1-ethylpropyl)-2,6-dinitro-3,4-xylidine. CAS Reg. No.: 40487-42-1 | \textit{Inhalation}: Can cause respiratory tract irritation, headache, dizziness and narcotic effects.  
\textit{Ingestion}: Considered of low toxicity if swallowed. Aspiration of the vomit into the lungs during vomiting may cause mild to severe pulmonary |

---

Table 6: Chemicals used in Rice Plantations
<table>
<thead>
<tr>
<th>Chemical</th>
<th>Description</th>
<th>Toxicity/Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propanil 33% EC</td>
<td>Propanil (An anilide) 3',4'-dichloropropionanilide (DCPA). CAS Reg. No.: 709-98-8</td>
<td>Is immunotoxic – attacks the immune system. No carcinogenic, mutagenic and teratogenic effects at experimental dosage. Highly toxic to fish and aquatic organisms. Low toxicity to bees and birds.</td>
</tr>
<tr>
<td>Bispyribac sodium 40% SC</td>
<td>Bispyribac (A pyrimidinylxyloxybenzoic acid) sodium 2,6-bis(4,6-dimethoxypyrimidin-2-yloxy)benzoate. CAS Reg. No.: 125401-75-4</td>
<td>At higher doses than normal for application, health effects include effects on the liver, bile duct, gall bladder and urinary bladder. Effects on the developing fetus were observed at doses that were toxic to the mother, indicating that the fetus is no more sensitive to bispyribac-sodium than the adult. Bispyribac-sodium is not genotoxic and does not cause cancer, damage the nervous system or have reproductive effects. Bispyribac-sodium presents a low risk to wild mammals, birds, earthworms, bees, aquatic invertebrates and fish.</td>
</tr>
<tr>
<td>2,4-D Amine salt 72% SL</td>
<td>2,4-dichlorophenoxyacetic acid dimethyl-amino salt (DMA) and 2-ethylhexyl ester (EHE) forms account for approximately 90-95% of the total global use. CAS Reg. No.: 5742-19-8</td>
<td>Demonstrated toxic effects on the thyroid and gonads following exposure. There is concern over potential endocrine-disrupting effects. 2,4-D is included in the U.S. EPA June 2007 Draft List of Chemicals for Tier 1 Screening. Symptoms of acute oral exposure to 2,4-D include vomiting, diarrhoea, headache, confusion, aggressive or bizarre behaviour. A peculiar odour is sometimes noted on the breath.</td>
</tr>
<tr>
<td>Metsulfuron methyl 60% WP</td>
<td>2-[[4-methoxy-6-methyl-1,3,5-triazin-2-yl]amino]-</td>
<td>Acute Toxicity: Very low toxicity in mammals.</td>
</tr>
<tr>
<td>Product</td>
<td>Chemical Composition</td>
<td>Chronic Toxicity</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Dimethoate 40% EC</td>
<td>Dimethoate (An organophosphate) O,O-dimethyl S-methylcarbamoylmethyl phosphorodithioate</td>
<td>A 2-year feeding study in rats resulted in a No Observable Effects; Reproductive Effects: Multigeneration studies in rats did not result in any reproductive effects at the highest doses tested; Organ Toxicity: Metsulfuron-methyl is a moderate eye irritant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>As with all organophosphates, dimethoate is readily absorbed through the skin. Skin which has come in contact with this material should be washed immediately with soap and water and all contaminated clothing should be removed. Organophosphates are highly toxic by all routes of exposure. They are easily absorbed through the lungs. Persons with respiratory ailments, recent exposure to cholinesterase inhibitors, impaired cholinesterase production, or with liver malfunction may be at increased risk from exposure to dimethoate. High environmental temperatures or exposure of dimethoate to visible or UV light may enhance its toxicity. Teratogenic Effects: Dimethoate is possibly a human teratogen.</td>
</tr>
</tbody>
</table>
| Kitazin 50% EC              | Iprobenfos (An organophosphate) S-benzyle O, O-di-isopropyl phosphorothioate           | Very Toxic in contact with skin and if swallowed. Danger of very serious irreversible effects through inhalation Symptoms of poisoning:  
  - Excessive salivation, sweating, rhinorrhea and tearing.  
  - Muscle twitching, weakness, tremor, incoordination.  
  - Headache, dizziness, nausea, vomiting, abdominal cramps, diarrhoea.  
  - Respiratory depression, tightness in chest, wheezing, productive cough, fluid in lungs.  
  - Pin-point pupils, sometimes with blurred or dark vision.  
  - Severe cases: seizures, incontinence, respiratory depression, loss of consciousness.  
  A cholinesterase inhibitor. |
<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>Health Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fenthion 50% EC</td>
<td>Fenthion (An organophosphate). O,O-dimethyl O-4-methylthio-m-tolyl phosphorothioate CAS Reg. No.: 55-38-9</td>
<td>Fenthion and its metabolites are typical organophosphorus anticholinesterase agents. These chemicals act by interfering with the activities of cholinesterase, an enzyme that is essential for the proper working of the nervous systems of both humans and insects. Moderately toxic to mammals, and highly toxic to birds. Symptoms of poisoning are similar to other organophosphates given above.</td>
</tr>
<tr>
<td>Propiconazole 25% EC (TLT)</td>
<td>Hexaconazole (A conazole) CAS Reg. No.: 60207-90-1 [2RS,4RS;2RS,4SR]-1-[(2,4-dichlorophenyl)-4-propyl-1,3-dioxolan-2-ylmethyl]-1H-1,2,4-triazole. Or 1-[(2,4-dichlorophenyl)-4-propyl-1,3-dioxolan-2-ylmethyl]-1,2,4-triazole</td>
<td>Possesses low acute toxicity by all routes of exposure [categories 3/4] with some evidence of sensitization. It is slight to moderately irritating to the eye and non-irritating to the skin. Sub-chronic and chronic studies in mice, rats and dogs indicate that the liver is the primary target organ as generally seen by increased liver enzyme levels, liver cell hypertrophy, and fatty infiltration of the liver across species. Likely to be a human carcinogen.</td>
</tr>
<tr>
<td>Trycycloazole 78% WP (BEAM)</td>
<td>5-methyl-1,2,4-triazolo[3,4-b][1,3]benzothiazole. CAS Reg. No.: 41814-78-2</td>
<td>Effects have been reported on the following organ: liver. Cancer information: Tricycloazole did not cause cancer in laboratory animals. Unlikely to cause cancer to humans. Teratology (birth defects): Birth defects are unlikely. Reproductive effects: Tricycloazole did not interfere with reproduction in animal studies. Unlikely to do so for humans. Mutagenicity: For tricycloazole, in-vitro and animal mutagenicity studies are so far negative.</td>
</tr>
</tbody>
</table>
| Carbendazim 80% WP | Carbendazim (A benzimidazole) 5-methyl-1,2,4-triazolo[3,4-b][1,3]benzothiazole. CAS Reg. No.: 10605-21-7 | Carbendazim represent a very low risk for acute poisoning in humans. Is not a heritable gene mutagen. It does not interact with cellular DNA, induce point mutations or result in germ cell mutations. Carbendazim is a suspected endocrine disruptor. Neurotoxic signs, consisting of leg weakness, ataxia and/or "goose-
### Carbofuran 10 GR (also called Furadan)

**Furadan**  
(A carbamate)  
2,2-dimethyl-2,3-dihydro-1-benzofuran-7-yl methylcarbamate.  
CAS Reg. No.: 1563-66-2

- Has one of the highest acute toxicities to humans of any insecticide widely used on field crops.
- Since its toxic effects are due to its activity as a cholinesterase inhibitor it is considered a neurotoxic pesticide.
- Carbofuran is also a powerful endocrine disruptor that can cause transient alterations in the concentration of many hormones in animals and humans even at extremely low doses.

### Agral 90

- Nonylphenoxycpolyethoxy ethanol.  
CAS Reg. No.: 35860-86-7
- Nonyl phenol ethoxylate.  
CAS Reg. No.: 9016-45-9

- May cause severe eye irritation. May cause irritation to the skin and the respiratory system.
- Inhalation: Mists may cause irritation of the nose, throat and respiratory tract; may also cause coughing, sneezing and shortness of breath.
- Skin contact: Prolonged and repeated exposure may cause irritation, redness, swelling and dermatitis.
- Eye contact: May cause severe eye irritation. Can cause redness and tissue damage.
- Ingestion: Low acute oral toxicity. May cause nausea, diarrhoea and abdominal cramps.
- Chronic effects: Skin contact may aggravate pre-existing skin conditions. Inhalation of mists may aggravate pre-existing respiratory conditions.
- Carcinogenicity: The ingredients in this product are not classified as carcinogenic by the ACGIH, IARC, OSHA and the NTP.
- Mutagenicity: There is no evidence that this product has mutagenic potential.
- Teratogenicity: There is no evidence that this product has teratogenic potential.
- Ecotoxicological information: Harmful to aquatic life at low concentrations.

### Mancozeb

- Dithane (A dithiocarbamate)

- Acute toxicity: Mancozeb is practically nontoxic via the oral route; Workers stepping" gait have been observed.

The acute toxicity of carbendazim to a variety of aquatic organisms is demonstrated (EHC).
### 3.5 Inventory of chemicals used in tea plantations

The tea plant is subject to attack from at least 150 insect species and 380 fungus diseases. Globally, 1,031 species of arthropods are associated with the intensively managed tea Camellia sinensis. All parts of the plant, leaf, stem, root, flower, and seed, are fed upon by at least one pest species, resulting in an 11%–55% loss in yield if left unchecked.

The following can be named among others: **Tea mosquito bug**, Helopeltis theivora; Adults and nymphs suck the sap from buds, young leaves and tender stems; **Looper caterpillar**, Biston supressaria. Young caterpillars feed on the tender leaves - making punctures; **Lobster Caterpillar**, Neostauropus alternus, two or three caterpillars can completely devour all the leaves from a small plant in two or three days. **Flush worm**, Cydia leuocostoma. Caterpillar ties up the margin of tender leaves and forms a case enclosing the bud. **Tea tortix**, Homona coffearia. Caterpillars make leaf nests by webbing the leaves using silken threads. Other pests include **Tea Mites a) Red spider mite**, Oligonychus coffeae; b) **Scarlet mite**, Brevipalpus californicus; c) **Purple mite**, Calacarus carinatus’ d) **Pink mite** (or) **Orange mite**, Acaphylla theae; e) **Yellow mite**, Polyphagotarsenemus latus.

This situation calls for the use of pesticides to control the pests. The chemicals used in tea plantations are presented in table 7 below.

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Description</th>
<th>Toxicity Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manganese ethylenebis(dithiocarbamate) (polymeric) complex with zinc salt.</td>
<td>with occupational exposure to mancozeb have developed sensitization rashes.</td>
<td>Chronic toxicity: A major toxicological concern in situations of chronic exposure is the generation of ethylenethiourea (ETU) in the course of mancozeb metabolism, and as a contaminant in mancozeb production. This has the potential to cause goiter, a condition in which the thyroid gland is enlarged, this metabolite has produced birth defects and cancer in experimental animals.</td>
</tr>
<tr>
<td>Mancozeb (manganese ethylenebis(dithiocarbamate) (polymeric) complex with zinc salt.</td>
<td></td>
<td>Mutagenic effects: Data regarding the mutagenicity are inconclusive but suggest that mancozeb is either not mutagenic or weakly mutagenic;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Organ toxicity: The main target organ of mancozeb is the thyroid gland; the effects may be due to the metabolite ETU.</td>
</tr>
</tbody>
</table>
Table 7: Chemicals used in Tea Plantations

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Active ingredient</th>
<th>Hazard phrase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Glyphosate/Roundup</strong></td>
<td>Glyphosate or glycine (An organophosphate) CAS Reg. No.: 1071-83-6 N-phosphonomethyl glycine. Glycine</td>
<td>Has a United States Environmental Protection Agency (EPA) Toxicity Class of III (on a I to IV scale, where IV is least dangerous) for oral and inhalation exposure. It does not bioaccumulate, and breaks down rapidly in the environment.</td>
</tr>
<tr>
<td></td>
<td><strong>1,1′-dimethyl-4,4′-bipyridinium</strong> <strong>(A bipyridyl)</strong> CAS Reg. No.: 4685-14-7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>chlorpyrifos. <strong>(An organophosphate)</strong> CAS Reg. No.: 2921-88-2</td>
<td>Can cause cholinesterase inhibition in humans; that is, it can over-stimulate the nervous system causing nausea, dizziness, confusion, and at very high exposures (e.g., accidents or major spills), respiratory paralysis and death.</td>
</tr>
<tr>
<td></td>
<td><strong>Dursban</strong></td>
<td>No indication of oncogenicity; Diquat dibromide is not mutagenic; It does not directly affect the reproductive system; Not neurotoxic - did not cause delayed neuropathies in rats.</td>
</tr>
<tr>
<td></td>
<td>Chlorpyrifos. <strong>(An organophosphate)</strong> CAS Reg. No.: 2764-72-9 9,10-dihydro-8a,10a-diazoniaphenanthrene or 6,7-dihydropyridine[1,2-a;2′,1′-c]pyrazine-5,8-diium or 1,1′-ethylene-2,2′-bipyridyldiylium</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Paraquat</strong> (also called Grammoxone) <strong>1,1′-dimethyl-4,4′-bipyridinium</strong> <strong>(A bipyridyl)</strong> CAS Reg. No.: 4685-14-7</td>
<td>Acute effects. Severe paraquat poisoning is fatal; death may be very rapid or delayed up to several weeks. The main target organ of paraquat poisoning is the lung, but paraquat is also distributed to the heart, liver, and kidney. The brain is now recognised as another target organ. Systemic paraquat poisoning is characterised by burns to the mouth, throat, oesophagus, and stomach (when ingested); acute respiratory distress; and multi-organ failure. Less frequently there may be affects on the central nervous system; adrenal glands; kidney; heart; and muscles including necrosis, excitability, convulsions, lack of coordination; and coma. Paraquat exposure in pregnant women usually also affects the infant. It crosses the placenta and has been measured at levels 2-6 times higher in the foetal and cord blood than in the maternal blood.</td>
</tr>
</tbody>
</table>
### Inventory of chemicals used in Tobacco Plantations

3.6 

It is very difficult to produce a healthy crop of tobacco because the plants are susceptible to many diseases. The common diseases and pests are black root rot, fusarium wilt, tobacco mosaic, bacterial leaf spot, downy mildew or blue mold, black shank, broomrape, and witchweed. These may be controlled by sanitation, crop rotation, the use of sprays and fumigants, and breeding of disease-resistant strains. Resistance to bacterial leaf spot, fusarium wilt, mosaic, black shank, and black root rot have been accomplished by breeding. Some resistant varieties of tobacco in general use have been produced by blending desired characteristics from N. longiflora, N. debneyi, N. glutinosa, and others with some strain of N. tabacum. Weeds are also a problem. Weeds are controlled using several methods which may include crop rotations, early root destruction, cultivation and herbicides.

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Description</th>
<th>Health Effects</th>
</tr>
</thead>
</table>
| **Ambush** | Permethrin (A pyrethroid) | **Inhalation:** coughing, wheezing, shortness of breath, runny or stuffy nose, chest pain, or difficulty breathing.  
**Skin contact:** rash, itching, or blisters.  
**Long term effects:** disrupts the endocrine system by mimicking the female hormone, estrogen, thus causing excessive estrogen levels in females. In human males, its estrogenizing (feminizing) effects include lowered sperm counts. In both, it can lead to the abnormal growth of breast tissue, leading to development of breasts in males and cancerous breast tissue in both male and females.  
**Neurotoxic effects include:** tremors, incoordination, elevated body temperature, increased aggressive behavior, and disruption of learning. Laboratory tests suggest that permethrin is more acutely toxic to children than to adults.  
**Other:** A known carcinogen. There is evidence that pyrethroids harm the thyroid gland. Causes chromosomal damage in hamsters and mice; deformities in amphibians; blood abnormalities in birds.  
**This pesticide is extremely toxic to fish and aquatic organisms. Do not contaminate water when disposing of equipment wash water.** |
| **Copper oxide** | Copper oxide  
3-(phenoxyphenyl) methyl (+,-)-cis, trans-3-(2,2-dichloroethenyl)-2,2-dimethyl cyclopropanecarboxylate (approximately 60% trans, 40% cis isomers).  
CAS Reg. No.: 52645-53-1 | **Irritant:** respiratory tract; skin; eye. Very low, sub-lethal copper levels can adversely affect the sense of smell and behaviour of fish. |
The chemicals used in tobacco plantations are presented in table 8 below.

### Table 8: Chemicals used in Tobacco Plantations

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Active ingredient</th>
<th>Hazard phrase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lannate 90 SP</td>
<td>Methomyl (A carbamate) (E,Z)-methyl N-[(methylamino)carbonyl]oxyethylthioate.</td>
<td>Restricted (EU). Acute exposure is the main area of concern for methomyl.</td>
</tr>
<tr>
<td></td>
<td>CAS Reg. NO.: 16752-77-5</td>
<td>High toxicity to aquatic organisms.</td>
</tr>
<tr>
<td>Royaltac EC</td>
<td>n-decanol</td>
<td>High acute toxicity, as designated by the World Health Organization (WHO), the U.S. EPA, or the U.S. National Toxicology Program.</td>
</tr>
<tr>
<td></td>
<td>CAS Reg. NO.: 112-30-1</td>
<td>Decanol causes a high irritability to skin and eyes; when splashed into the eyes it can cause permanent damage. Inhalation and ingestion can be harmful; it can also function as a narcotic. It is harmful in the environment—toxic to fish.</td>
</tr>
<tr>
<td>Lindane 20%</td>
<td>Lindane or (An organochlorine)gamma-hexachlorocyclohexane.</td>
<td>Persistent Organic Pollutant. The World Health Organization classifies lindane as “Moderately Hazardous,”</td>
</tr>
<tr>
<td></td>
<td>CAS Reg. No.: 58-89-9</td>
<td></td>
</tr>
</tbody>
</table>
Malathion 95% min  
(An organophosphate)  
O,O-dimethyl dithiophosphate of diethyl mercapto succinate.  
CAS Reg. No.: 121-75-5

Malathion is very low in toxicity when ingested.

Observed effects include weakening of the immune system (thereby resulting in increased colds, flu and infections), birth defects, genetic damage, accelerated aging of certain body organs, increased neurological damage to the elderly and toxicity to wildlife.

**Malathion**

| Ace 750 WSP | Acephate  
(An organophosphate)  
O,S-dimethyl acetyl phosphoramidothioate.  
CAS Reg. No.: 30560-19-1 | Toxicity to Humans:  
Inhalation or ingestion of orthene can result in poisoning symptoms, including dizziness, sweating, difficulty breathing, abdominal cramps, nausea, vomiting, diarrhea and in severe cases, convulsions. Consult a medical professional in the event of suspected acephate poisoning.  
Toxicity to Wildlife:  
Exposure to orthene can result in behavioral and developmental changes in organisms such as fish, amphibians and crustaceans.  
Long-Term Health Risks:-  
Acephate has been identified as a cholinesterase inhibitor, meaning that long-term exposure can result in neurological damage. It has also been identified as a suspected endocrine disruptor and a possible carcinogen.  

In 2009 the production and agricultural use of lindane was banned under the Stockholm Convention on persistent organic pollutants. A specific exemption to that ban allows it to continue to be used as a second-line pharmaceutical treatment for lice and scabies.
Based on laboratory rat studies, imidacloprid is rated as “moderately toxic” on an acute oral basis to mammals and low toxicity on a dermal basis by the World Health Organization and the United States Environmental Protection Agency (class II or III, requiring a “Warning” or “Caution” label). It is rated as an “unlikely” carcinogen and as weakly mutagenic by the U.S.EPA (group E). It is not listed for reproductive, or developmental toxicity, but is listed on EPA’s Tier 1 Screening Order for chemicals to be tested under the Endocrine Disruptor Screening Program.

Imidacloprid is one of the most toxic insecticides to bees.

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Bulldock

Beta Cyfluthrin

(A pyrethroid)

cyano(4-fluoro-3-phenoxophenyl)methyl 3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropanecarboxylate.

CAS Reg. No.: 68359-37-5

Poisonous if swallowed. Avoid inhaling vapour or spray mist. Avoid contact with eyes and skin. Will damage eyes and skin.

When opening container and preparing spray and using the prepared spray wear cotton overalls buttoned to the neck and wrist and washable hat, elbow length PVC gloves and face shield or goggles.

If clothing becomes contaminated with product remove clothing immediately.

Azocord

Imidacloprid

(A neonicotinoid)

N-[1-[(6-Chloro-3-pyridyl)methyl]-4,5-dihydroimidazo-2-yl]nitramide.

CAS Reg. No.: 138261-41-3

Based on laboratory rat studies, imidacloprid is rated as “moderately toxic” on an acute oral basis to mammals and low toxicity on a dermal basis by the World Health Organization and the United States Environmental Protection Agency (class II or III, requiring a “Warning” or “Caution” label). It is rated as an “unlikely” carcinogen and as weakly mutagenic by the U.S.EPA (group E). It is not listed for reproductive, or developmental toxicity, but is listed on EPA’s Tier 1 Screening Order for chemicals to be tested under the Endocrine Disruptor Screening Program.

Imidacloprid is one of the most toxic insecticides to bees.

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Serious harm to wildlife.

Children may show somewhat different signs than adults following exposure to malathion and other organophosphate insecticides. Children are less likely to show decreased heart rate, sweating, muscle tremors, and lacrimation than adults, and more likely to show lethargy, seizures, constricted pupils, excessive salivation, muscle weakness, and coma.
**Pirimiphos-methyl** can cause cholinesterase inhibition in humans; it can overstimulate the nervous system, causing nausea, dizziness, confusion, and at very high exposures (e.g., accidents or major spills), respiratory paralysis and death. Symptoms of poisoning include:

- Excessive salivation, sweating, rhinorrhea and tearing;
- Muscle twitching, weakness, tremor, incoordination;
- Headache, dizziness, nausea, vomiting, abdominal cramps, diarrhea;
- Respiratory depression, tightness in chest,

Mancozeb is a cholinesterase inhibitor and can therefore have affects to the nervous system. Symptoms of exposure include fatigue, headache, blurred vision, and nausea. At high doses exposed persons can have convulsions, slurred speech, confusion, and slowed heartbeat. In lower doses, mancozeb can also cause a skin rash if the chemical has contact with the skin.

A major toxicological concern with respect to mancozeb and other dithiocarbamates is its primary metabolite, ethylenethiourea (ETU), shown to cause thyroid and carcinogenic effects in test animals.

Many studies show that mancozeb can cross the placental barrier and induce or increase tumor incidence. Mancozeb and its metabolites can produce DNA damage and initiate tumors in fetal cells.

<table>
<thead>
<tr>
<th><strong>Ridomil</strong></th>
<th>Mancozeb</th>
<th>Mancozeb is a cholinesterase inhibitor and can therefore have affects to the nervous system. Symptoms of exposure include fatigue, headache, blurred vision, and nausea. At high doses exposed persons can have convulsions, slurred speech, confusion, and slowed heartbeat. In lower doses, mancozeb can also cause a skin rash if the chemical has contact with the skin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A carbamate)</td>
<td>+ Metalaxyl</td>
<td>A major toxicological concern with respect to mancozeb and other dithiocarbamates is its primary metabolite, ethylenethiourea (ETU), shown to cause thyroid and carcinogenic effects in test animals.</td>
</tr>
<tr>
<td>manganese ethylenebis(dithiocarbamate) (polymeric) complex with zinc salt.</td>
<td></td>
<td>Many studies show that mancozeb can cross the placental barrier and induce or increase tumor incidence. Mancozeb and its metabolites can produce DNA damage and initiate tumors in fetal cells.</td>
</tr>
<tr>
<td>CAS Reg. No.: 8018-01-7</td>
<td>CAS Reg. No.: 57837-19-1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Actellic</strong></td>
<td>Pirimiphosmethyl</td>
<td>Pirimiphos-methyl can cause cholinesterase inhibition in humans; it can overstimulate the nervous system causing nausea, dizziness, confusion, and at very high exposures (e.g., accidents or major spills), respiratory paralysis and death. Symptoms of poisoning include:</td>
</tr>
<tr>
<td>(A phosphorothioate)</td>
<td>O-2-diethylamino-6-methylpyrimidin-4-yl O,O-dimethyl phosphorothioate.</td>
<td>- Excessive salivation, sweating, rhinorrhea and tearing;</td>
</tr>
<tr>
<td></td>
<td>CAS Reg. No.: 29232-93-7</td>
<td>- Muscle twitching, weakness, tremor, incoordination;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Headache, dizziness, nausea, vomiting, abdominal cramps, diarrhea;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Respiratory depression, tightness in chest,</td>
</tr>
</tbody>
</table>
amphibians and crustaceans.

**Long-Term Health Risks:**

Acephate has been identified as a cholinesterase inhibitor, meaning that long-term exposure can result in neurological damage. It has also been identified as a suspected endocrine disruptor and a possible carcinogen.

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**Orthene.**

**Confidor**

Imidacloprid 0.25 g/kg

(A neonicotinoid)

N-[1-[(6-Chloro-3-pyridyl)methyl]-4,5-dihydroimidazol-2-yl] nitramide. CAS Reg. No.: 138261-41-3

Rated as “moderately toxic” on an acute oral basis to mammals and low toxicity on a dermal basis by the World Health Organization and the United States Environmental Protection Agency (class II or III, requiring a “Warning” or “Caution” label). It is rated as an “unlikely” carcinogen and as weakly mutagenic by the U.S.EPA (group E). It is not listed for reproductive or developmental toxicity, but is listed on EPA's Tier 1 Screening Order for chemicals to be tested under the Endocrine Disruptor Screening Program (EDSP).

Imidacloprid is one of the most toxic insecticides to bees.

May adversely affect human health, especially the developing brain.

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Toxicity to Humans: Inhalation or ingestion of orthene can result in poisoning symptoms, including dizziness, sweating, difficulty breathing, abdominal cramps, nausea, vomiting, diarrhea and in severe cases, convulsions. Consult a medical professional in the event of suspected acephate poisoning.

Toxicity to Wildlife: Exposure to orthene can result in behavioral and developmental changes in organisms such as fish, amphibians and crustaceans.

Long-Term Health Risks:

Acephate has been identified as a cholinesterase inhibitor, meaning that long-term exposure can result in neurological damage. It has also been identified as a suspected endocrine disruptor and a possible carcinogen.

---

Toxicity to Humans: Inhalation or ingestion of Confidor can result in poisoning symptoms, including wheezing, productive cough, fluid in lungs;

• Pin-point pupils, sometimes with blurred or dark vision;

• Severe cases: seizures, incontinence, respiratory depression, loss of consciousness.

Affected organs: Respiratory system, CNS, cardiovascular system, skeletal muscle (motor endplate).

Orthene.

Acephate

(An organophosphate)

O,S-dimethyl acetylphosphoramidothioate. CAS Reg. No.: 30560-19-1

Toxicity to Humans: Inhalation or ingestion of acephate can result in poisoning symptoms, including dizziness, sweating, difficulty breathing, abdominal cramps, nausea, vomiting, diarrhea and in severe cases, convulsions. Consult a medical professional in the event of suspected acephate poisoning.

Toxicity to Wildlife: Exposure to acephate can result in behavioral and developmental changes in organisms such as fish, amphibians and crustaceans.

Long-Term Health Risks:

Acephate has been identified as a cholinesterase inhibitor, meaning that long-term exposure can result in neurological damage. It has also been identified as a suspected endocrine disruptor and a possible carcinogen.
CHAPTER FOUR: INVENTORY OF DANGEROUS PROCESSES

4.0 Introduction
A number of dangerous practices, processes and occurrences were observed during the inventorying exercise. The criteria for regarding a process as dangerous relates to the level of risk, what hazards are present, and the nature of exposure. These aspects themselves arise from natural and dangerous properties of chemicals as mentioned in chapter three above. When the handling of the chemicals does not depict respect for these dangerous properties it is deemed a dangerous practice.

4.1 Dangerous processes
4.1.1 Involvement of children
Children are directly involved in rice planting, chasing and scaring birds in rice plantations, and mixing and spraying chemicals. Children are involved in spraying pesticides onto coffee plants, harvesting coffee beans and washing the Arabica coffee beans. Children are also involved in all stages of tobacco production at the rural environment including spraying the crop. Children of workers living in work camps in plantation estates are exposed to pesticide when a drift wind blows sprayed pesticide into their living environment. Children are directly exposed when housing where they live in the work camps are sprayed to eliminate household pests and vectors (lice, bed bugs, mosquitoes). Children walking from school through sugar cane plantations chew sugar canes which sometimes have been sprayed with pesticides thereby obtaining an oral dose of the pesticide.

Figure 1: Children resting under a tree near a freshly sprayed tobacco plantation.
4.1.2 Occupational risks for mixer/loaders/applicators

Workers in plantation establishments can be exposed to pesticides by:

- Preparing pesticides for use, such as by mixing a concentrate with water or loading the pesticide into application equipment;
- Spraying or applying pesticides, such as in an agricultural or commercial setting;
- Entering an area where pesticides have been applied to perform allowed tasks, such as picking crops.

Mixing and spraying were found wanting in many establishments. Sugar and flower enterprises generally had a better approach. They have mixing teams separate from sprayers and both equipped and supervised. In the rest of the enterprises, this was not the case. The mixing equipment, the supervision, the training, and personal protective equipments, when compared to international guidance and standards, were inadequate. Major accidents resulting in poisoning were observed and followed up.

One such accident involved a person mixing herbicide for application. He was blending glyphosate and grammoxone into one mixture to be applied. He had to deliver this by carrying a pail full of the mixed pesticide on his head to a tank on a tractor some 20 metres away. He had no protective equipment other than his clothes. The container of the mixture leaked. Figure 7 and Figure 8 show the skin effects. These effects appeared slowly and took more than a week for the symptoms to appear. He has developed stomach cramps and lost his libido. He is currently under treatment.


ILO Recommendation 192 - Safety and Health in Agriculture Recommendation, 2001: Recommendation concerning Safety and Health in Agriculture; Recommendation:R192; Place:Geneva.

Sometimes, when provided, the protective clothing is torn and gives false protection. In all the cases, the plastic manual hand operated knapsack sprayer was used for spraying. Many of these were observed to be leaking thereby providing skin absorption of the pesticide. In addition, the workers were wearing old torn clothes with little else for protection. This indicates negligence and poor maintenance of equipment. It leads to high exposure. In two instances, women were observed mixing and spraying pesticides. In one case, the woman was pregnant. This situation can expose the foetus to harm from teratogenic pesticides.
Figure 3: A Woman Sprayer. Some of the Chemicals she is exposed to are teratogenic – will affect the offspring.
Figure 4: The most commonly used spraying equipment – The Knapsack.

Mixing and application comprise the most hazardous phase of the use of pesticides, because the worker is exposed to the pesticide concentrate. In any particular situation, only selected persons should be responsible for mixing; they should be thoroughly conversant with the hazards and provided with the proper facilities for dealing with accidental contamination. Even when the mixed formulation is of such toxicity that it can be used with a minimum of personal protective equipment (PPE), more elaborate equipment may need to be provided for and used by the mixer.
Figure 5: Women Sprayers getting ready to spray. Improvised and Inadequate personal protective equipment.
Figure 6: Mixing dangerous Chemicals without personal protective equipment – Ignorance or negligence?

The challenge here is inadequate capacity of the inspectorates to inspect and follow up cases of negligence in this process.
Figure 7: Suffered Damage on the head by a herbicide owing to lack of personal protective equipment.
4.1.3 Repacked Products

These are the products packed in packaging materials other than the approved and registered packages. The pesticides dealers open the original bigger packages and repack the contents in smaller packs which are affordable and convenient to the peasants. These new packs are not labelled. This practice is common with dust formulations. Repacked products constituted 4.8% of the total quantity inspected. The persons who repackage pesticides target the rural (out growers) who are unknowing, unorganized and unsupervised. It is therefore necessary to target the affected stockists and farmers. They should be educated on the risks associated with repacking of products and warned against the practice.

4.1.4 Unregistered products

The largest quantity of the observed products in the rural environment shops and open markets - were unregistered, comprising 84.6% of the total products inspected. They come with a guarantee to kill roaches, mice and other household pests like nothing else on the market. But most such products are illegal. Illegal pesticides can hurt much more than roaches. They can harm the family much more. Many illegal pesticides are very toxic. Others contain unknown ingredients, or the ingredients may vary from time to time. Where traceable, the manufacturers were warned against the practice while investigations are ongoing to trace out the manufacturers of those products whose source was unknown. Some of the large enterprises also had chemical that are not reflected in literature. These are directly imported by the establishment often without the knowledge of the Agricultural Chemicals Control Board. The said products should be seized by inspectors and disposed off by incineration.
4.1.5 Smuggled products

These are the products brought into the country without undergoing the registration process. Most of these products come through the porous borders from the neighbouring countries – Kenya and Tanzania. Some flower farms also bring in products being used in their sister companies in Europe assuming that these have no problems here in Uganda. Often they do so without getting clearance from the Uganda Agricultural Chemicals Control Board (ACB). Controls at the entry points should be strengthened through close cooperation with Kenya Plant Inspectorate Services (KEPHIS), The Uganda Bureau of Standards (UNBS), Kenya Bureau of Standards (KEBS) and the customs authorities of both sides to arrest the situation. The affected products should be seized and disposed off through incineration.

4.1.6 Counterfeit and fake products

These refer to the products that are imitations of already registered products. The counterfeit products are emerging in the market and are very difficult to detect. This is because the approved labels are scanned and reproduced making them very similar to the approved labels. Fortunately the glue that the counterfeiters used was inadequate and their labels fell off in the rough handling situations revealing the vice. 13% of the labels of products inspected were missing having fallen off or having been removed on purpose.

Another concern was alteration of dates of expiry of pesticide labels of expired products to appear as if they were still useful and put them back into market or supply them to unsuspecting out growers.

A further concern in this subject is that unscrupulous manufacturers pack and label products already regulated for use in the country purporting them to have been made by the registrant when in fact the actual content (active ingredient) is different from the registered specifications and normally not efficacious. The products that were noted included the following: -

i. Milraz 76 WP
ii. Karate 12.5EC
iii. Gladiator 4 TC
iv. Dithane M45
v. Cuprocaffaro
vi. Furadan 5g
vii. Pyrinex 48EC

No reports of governmental investigations to this phenomenon were cited. Hence there appears to be no capacity to conduct these investigations. There is a need to set up and provide capacity to investigate and prosecute the perpetrators of this dangerous behaviour.

4.1.7 Expired products or unusable products marketed

There are significant quantities of expired or unusable products (stockpiles) in the stores in some enterprises. These find routes of escape and are peddled by illiterate street vendors and in rural open markets. The stockists should be made to stock only the amounts of chemicals they need for the crop in order to avoid building up expired or un-needed stocks. Quantities of expired products are increasing and this increase corresponds to the rise of illegal hawking and peddling of pesticides on the street and in open markets. These products should be resized and disposed off by incineration. The challenge here is that there appears to be no capacity to do this.
4.1.8 Inadequate Training

The persons observed mixing and spraying pesticides in most establishments did not reveal competence. Some were out right illiterate – unable to comprehend the pesticide label on the container. While all workers using pesticide formulations of moderate or higher hazard should be thoroughly trained in their use, such training is particularly important if the pesticide is extremely toxic. Many of the pesticides listed in this inventory are extremely toxic.

Training is therefore necessary to provide the know-how necessary for safe use of chemicals. Training programmes should be developed to cover: toxicity of compounds used and routes of absorption; handling of concentrates and formulations; methods of use; cleaning of equipment; precautions to be taken; and PPE to be worn; maintenance of PPE; avoidance of contamination of other crops, foods and water supplies; early symptoms of poisoning; and first-aid measures to be taken.

All training should be strictly relevant to the pesticides actually being used, and, in the case of extremely hazardous compounds, it is wise to license operators following an examination to show that they have, in fact, a good understanding of the hazards and the procedures to be followed.

Many persons doing the storage, mixing and spraying pesticides were found untrained. Yet the current pest control industry is highly competitive. As a result, employers must hire and retain highly skilled individuals to perform the multitude of tasks associated with manufacturing, distributing, handling, and storing pesticides. Most managers realize that employees do not become “skilled” overnight; experience is essential to proficiency. Educational training programs serve to develop skills, improve worker competency, and promote job awareness and productivity. The capacity to get the knowledge, skills, techniques and attitudes down to the communities is inadequate. This is the challenge to be addressed.

In order to impart knowledge on pesticides, the inspectors should participate in various trainings in collaboration with the Agrochemicals Associations. These trainings should cover safe and effective use of pest control products.

4.1.9 Inadequate Investigations and Prosecutions

The work in this project did not observe any investigations regarding the illegal trade and use of pesticides. Inspection regarding chemicals was found absent in many establishments – those not visited by relevant inspectors in the last two years. During the first year of this project, only two of the enterprises investigated had been inspected by Government Inspectors. The contraventions they found include:

- Illegal importations of pest control products;
- Counterfeit pest control products;
- Hawking of pesticides;
- Decanting/reweighing and repackaging of pest control products;
- Misuse of pest control products;
- Illegal formulation of pest control products.

There is a need to improve the capacity of the relevant inspectorates.

4.1.10 Lack of the Material Safety Data Sheets

The Occupational Safety and Health Act No 9, 2006 requires that chemical manufacturers and importers thoroughly evaluate chemicals that they produce, import, and supply, respectively, to determine their hazard potential.
If a chemical presents a hazard, a Material Safety Data Sheet (MSDS) must be developed to communicate its hazard potential to users. The first step in preparing an MSDS for a hazardous chemical is to identify its composition. The product may be pure (consisting of just one component, namely, the pesticide active ingredient) or it may be a formulation of two or more chemical ingredients. Once the composition has been established, information on hazards can be collected.

The MSDS contains product and company identification, information on active ingredients, hazard identification, toxicological information, ecotoxicity information, first aid measures, fire-fighting measures, accidental release measures, handling and storage, exposure controls/personal protection, physical and chemical properties, stability and reactivity, disposal considerations, transport information, regulatory information.

In this survey, the MSDS were largely absent and so storekeepers were not informed on the chemical properties and associated hazards of the chemicals in stores, hence putting their lives at risk. This situation is also permitted by inadequate inspection.

4.1.11 Poor Handling and packaging

Moderate packaging of chemicals was observed throughout all respondents. However there was glaring lack of personal protective equipments (PPE). Where PPE was provided, the pieces were old and torn, not properly maintained and not appropriate for the tasks. Workers were therefore exposed. The enterprises do not have health and safety guidelines to guide them in addressing risks associated with exposure pathways thus leading to poor handling of toxic and corrosive chemicals. Even where these guidelines are available, they remain on paper, because there is no financial commitment (adequate budgets) to implement them. There is a need therefore to develop codes of practice to give guidance to the enterprises.

Figure 9: Poor handling of chemicals leading to Damaged containers.
4.1.12 Poor Storage

Some large establishments have dedicated stores for chemicals they use. However there were chemical spills in these stores inspected. This indicates carelessness in measuring out chemicals and further indicates inadequate supervision and training of the persons in charge. Where there is inadequate appreciation, some establishments simply store chemicals in cargo containers. The problem in this is that the containers are metallic without the necessary ventilation. In the tropical temperatures (20 to 30°C) the thermal environment in the container is not conducive to the wellbeing of the chemicals. The chemicals rapidly deteriorate in composition. Chemicals should be stored in a cool, dry, well ventilated store out of reach of direct sunlight.

Figure 10: Storage of dangerous chemicals in mud and wattle house.

In some establishments, chemicals were stored in a general store where other farm equipment and inputs including food (beans and posho bags) for workers was stored. This is dangerous. There can be spills that can contaminate food leading to massive poisoning incidents. In addition, many workers will have access to dangerous chemicals when they do not appreciate the dangers involved.

In all the establishments that operate out grower’s schemes, the out growers are supplied and take chemicals to their homes and store them there. The extension services are inadequate to supervise this activity. Consequently there is no guarantee of the safety of these chemicals in the hands of uninformed untrained persons. 75% of the visited establishments did not have storage guidelines that could help separate and classify the different chemicals for proper storage. As noted above, there are no materials safety data sheets. This situation increases the risk to the health of workers. It is a challenge that needs to be addressed.
Figure 12: Safe storage of Dangerous Chemicals in this rural setting can be a challenge.

4.1.13 Inadequate End point Discharges

The disposal process by many industries visited was wanting. A majority (68%) had no arrangement for disposal of chemical and argued that they have no problem with them. This situation allows the pesticides the entry into the environment. 25% had systems in place and collect all the containers from the field and from out growers. 7% of the establishments were seen to have incinerators for chemicals that they no longer need and crush and incinerate empty containers.

In order to protect the environment, it is necessary to institute competent disposal of empties and pesticides that are not needed.

4.1.14 Poor handling of Empty containers

While some establishments collect for disposal empty containers of chemicals from out grower farmers, the remaining ones don’t. This avails an opportunity to farmers to re-use these containers, quite often for drink or food. The inadequacy of portable water in the rural environment does not allow the farmers to wash and rinse these empties to a safe level. They and their families are therefore exposed to the dangers of the chemicals.

4.1.15 Poor Packaging and Labelling

It was observed that most chemicals come packaged in big containers e.g. metal drums, bags, plastic drum containers. For institutions which were repackaging chemicals, inadequate labelling obtained. Most often just one word was written – the purported name of the pesticide. However, this process does not comply with the desired standards of labelling. Labels are supposed to summarise information from the technical dossier and data obtained from local efficacy trials (FAO 1995). The label on the pesticide container should be approved by the Agricultural Chemicals Control Board. Further still, while there is law requiring competent labelling, there is lack of a national detailed standard to guide labelling. All labels sited were in English and yet most of the handlers could not speak or read English if they could read at all.
4.1.16 Poor Transportation

Within the large enterprises, the mode of transport of pesticides is by tractor pulling a tank (loaded or empty) of pesticide. Outside the enterprise, chemicals are brought in by hired trucks that are not designed, designated, and appropriately labelled to carry corrosive or toxic chemicals. These trucks did not have well defined, labelled, and safe transportation carriers and were ordinary transportation vehicles whose drivers were not trained in managing hazardous chemicals during transport. This puts the lives of the transporters and the public at large in danger as there can be mix-up in packaging or in case of accidents or fire outbreaks.

[Text at: http://www.fao.org/AG/AGP/AGPP/Pesticid/]

4.1.17 Stockpiles of expired chemicals

There are stockpiles of dangerous chemicals that are no longer needed in some establishments. Some stocks have been kept in store for over 20 years. Some of the stocks are quite large and so require assistance to be extended to the establishment to dispose them properly. This is an outstanding problem.

![Figure 14: Stockpile of dangerous expired chemicals.](image)

4.1.18 Misuses of chemicals

Participants to this survey contributed experiences of dangerous processes that obtain in the rural communities:

i. Pesticides are used for trapping white ants (enswa) and birds (guinea fowls) for food and the delicacy, grasshoppers (nsenene). The main chemicals include: Ambush; Condora; Damacron. The chemical is dissolved in waragi before use.

ii. The peasants also use pesticides (self formulated) to preserve cereals in their houses for post harvest longevity and don’t wash the pesticide off before preparing the cereals for consumption. This leads them to ingest dangerous chemicals;

iii. Persons brewing alcohol (waragi) use formaldehyde to make it more potent - improve the percentage of alcohol in the brew. Unfortunately, the chemistry of the reaction leads to formation of ethanol mixed up with methanol which is the toxic chemical that has caused deaths and blindness among consumers of this brew.

4.2 Non-Compliance of The legal situation

There is a reasonable effort to legislate for safety from chemicals. The parent legislative framework is The Constitution of The Republic of Uganda (as at 15th February 2006) (GOU 1995). This has several objectives and articles referring to environment.
Article 34 (4): Children are entitled to be protected from social or economic exploitation and shall not be employed in or required to perform work that is likely to be hazardous or to interfere with their education or to be harmful to their health or physical, mental, spiritual, moral or social development.

Article 39: Every person has a right to a clean and healthy environment.

In order to operationalise these rights, there are many provision concerning chemicals and products in the law. The following laws are core:

4.2.1 The Agricultural Chemicals (Control) Act No 1, 2006

This is a significant law directly governing the use of chemicals especially pesticides in agriculture in Uganda. Consequently it is relevant for the above named observations and concerns about pesticide use in the enterprises. Under this Act:

• No person shall manufacture, package, store, display, distribute, knowingly transport, be in possession of, and advertise any agricultural chemical except in accordance with the Act.
• No person shall pack, label, or advertise any agricultural chemical in a manner that is false, misleading or deceptive or is likely to create an erroneous impression regarding its character, value, quality, composition merit or safety.
• No person shall import into or sell within Uganda and use such chemicals without registration.

The Act sets up a multi-sectoral, semi-autonomous body, the Agricultural Chemicals Board (ACB) and requires registration of agricultural chemicals by this Board. It also sets up inspectors with powers to seize chemicals that are not used in accordance with the Act. The Act is implemented by the Department of Crop Protection in the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF).

The functions of the Board are to ensure that agricultural chemicals are duly registered in the country and are used in a manner consistent with the rules made by the state. It is also responsible for regulation of agricultural chemicals imports and advises the government on matters related to enforcement of provisions of the statute. The Act further empowers the agricultural chemical Board to appoint an Agricultural Chemicals Technical Committee (ACTC) to advise the board on the technicalities of agricultural chemicals. This committee is responsible for receiving applications for registration of pesticides, technical analysis, and verification of the efficacy of agricultural chemicals.

The Act is expounded by regulations. These spell out the following guidance: -

i. No pesticide—whether imported or manufactured in Uganda— shall be used, stored, distributed, or dealt in unless it is duly registered in accordance with rules and regulations of the Agricultural Chemicals (Control) Act.

ii. No person by way of business shall deal in pesticides unless the same is registered as a fumigator or commercial applicator with a certificate from the Agricultural Chemicals Board (ACB).

iii. Any premise used in dealing in pesticides must be appropriate and registered by the Agricultural Chemicals Board as indicated in the statutory instrument of 1993.

iv. Any person employed in the manufacturing, formulating, packaging and applying of pesticides shall have his/her health monitored, and be well protected with the appropriate equipment and safe practices.

For a pesticide to be registered: -

i. It must undergo official screening and testing to prove that it is effective, safe, and not a danger to public health.

ii. It must be assessed by the Agricultural Chemical Control Technical Committee for active ingredient purity, and for toxicological, public health and environment acceptability.

iii. The ACB is responsible for appointing a researcher to test the candidate pesticide following specific standards and guidelines. The guidelines are currently under review to conform to international standards.

iv. A fee of Uganda Shillings two million (2,000,000/=) shall be paid by the registrant (pesticide manufacturer, re-formulator, re-packager, re-seller, etc.) to cover the cost of testing and temporary registration.

v. The new pesticide shall be tested for a minimum of three crop-growing seasons in different locations in Uganda, to cover the appropriate agro-ecological zones.

vi. Approval shall be granted or denied to a pesticide within six months from the end of the period required for testing. Pesticides are registered on the basis of their efficacy.

vii. The company submitting the pesticide shall provide all technical information necessary to guide the testing process—that is, toxicity to humans and the environment, the toxicity index (LD50), Maximum Residue Limits [MRLs] and tolerance levels, and any other relevant information.

viii. A pesticide is (duly) registered on payment of (an additional) fee of Uganda Shillings 500,000/=.

To register as a fumigator and/or commercial applicator, a person must: -

i. Submit certified copies of relevant documents regarding the technical knowledge of the applicant.

ii. Pay a fee of Uganda Shillings 500,000/= only for a certificate of registration that remains valid until suspended or cancelled.

iii. A tested pesticide shall be recommended for the control of specific pests on all host crops rather than for specific crops.

To register a premise as a pesticide seller or related business: -

i. An application on Form F is submitted to the ACB by the applicant.

ii. The pesticide business, in relation to the premise, must be under immediate supervision of a registered fumigator or commercial applicator.

iii. A fee of Uganda Shillings 500,000/= is paid to the ACB for a certificate of registration.
iv. Registration is for a period of five years, after which a new application must be made.

v. Registration may be cancelled by the ACB if any of the provisions of the Agricultural Chemicals (Control) Act are contravened. Storage, Labelling, Packaging, and Transportation

The agricultural chemicals regulation statutory instruments give clear details of how storage, labelling, packaging, and transportation of pesticides ought to be carried out safely. It stipulates, among other things, that:

i. No pesticide shall be imported, distributed, sold, or used without a label; and that such a label should conform to FAO standards.

ii. There shall be no removal or alteration of the pesticide labels.

iii. Packaging and re-packaging shall be carried out on premises registered by the ACB.

iv. Every manufacturer or distributor of a pesticide shall provide a range of packaging sizes that can be used safely and appropriately by small-scale farmers and other users in Uganda.

v. Premises on which pesticides are stored shall be a separate building strictly for purpose of storage of agricultural chemical and shall comply with specified requirement of the Act.

vi. Pesticide stores and shops shall not be used for sitting or sleeping.

vii. Food, feeds, and drinking water shall not be kept in pesticide premises, and premises shall not be used as sleeping places for human beings and livestock animals.

viii. There shall be sufficient space for storing empty containers, damaged containers, spills of pesticide, and out-of-date stocks awaiting disposal.

Use and Disposal of Pesticides

The Agricultural Chemicals (Control) Act gives adequate guidelines and rules on how pesticides should be used, the precautions that should be taken (before, during, and) after application, and how pesticides should be disposed of. For example it indicates that:

i. Protective clothing shall be worn whenever applying pesticides.

ii. Recommended applicators shall be used to apply pesticides.

iii. Pesticides shall be used in such way as to safeguard the environment.

iv. Pesticides shall not be disposed into open waters or any waterway.

v. Any pesticide that expires before use shall be disposed of by professional handlers, and expired material must be reported to the Board.

vi. Monitoring of pesticides shall be mandatory by agents of manufacturers and distributors concerned to assess the impact on the environment.

vii. Pesticides shall be used only when they cannot be avoided.

viii. Indiscriminate use of pesticides is prohibited.

ix. Pesticides least damaging to the environment shall be encouraged.

4.2.2 The Occupational Safety and Health Act No 9, 2006

This Act makes provisions for the health, safety and welfare of persons employed in all work establishments including factories, plantations and other related places. Among others, it deals with the steps to be taken before operating a factory, the guarding of dangerous machines, the training of persons to work at any machine, which may cause injury and the obligations of both employers and the employees to ensure safety at work places.

The Act places the following action points and burden on the employer (section 13):-

“13 Duty of employers to protect workers.”
(1) It is the responsibility of an employer-
(a) to take as far as is reasonably practicable, all measures for the protection of his or her workers and the general public from the dangerous aspects of his or her undertaking at his or her own cost;
(b) to ensure, as far as is reasonably practicable, that the working environment is kept free from any hazard due to pollution by-
(i) employing technical measures, applied to new plant or processes in design or installation, or added to existing plant, processes or where this is not possible; or
(ii) supplementary organizational measures.

The measures required in this section are spelled out in the subsequent sections. The employer is required, at his or her cost, to:
- Establish safety committees (section 16);
- Control the release of dangerous substances (section 18);
- Provide personal protective equipment and cause them to be used (Section 19);
- Supervise the health of the workers (Section 21);
- Keep medical records of workers (section 22);
- Provide safe premises of work (Section 26);
- Provide for health and welfare of the workers including adequate sanitary conditions, wholesome drinking water, washing facilities, washrooms among others (Part VIII of the law (Sections 45 to 55);
- Take general safety measures (Section 56);
- Provide fire precautions (Section 57); and
- Manage toxic materials (Section 85).

The Act also provides the employee with a right to move away from a dangerous situation and suffer no punishment (section 37): -

“A worker’s right to move away from a dangerous situation.

37. A worker who has removed himself or herself from a work situation which he or she has reasonable justification to believe presents an imminent and serious danger to his or her life or health shall not be punished or subjected to undue consequences provided the danger is confirmed by the Commissioner.”

4.3 Conclusion and Recommendations

Overall, this inventorying exercise and health effects data, although unable to make precise statements about risks from some pesticides, supports that, from a public health standpoint, there are serious risks and serious adverse experiences in commercial agricultural establishments, which need to be purposely addressed. Consequently, as a safety strategy, preventing these effects and avoiding unnecessary use of pesticides minimises exposure and so are prudent.

Children are always close to the pesticide activities in the establishments and surrounding communities. Minimizing pesticide use is important where there is likely to be exposure of infants, young children, pregnant women, the elderly and those with pre-existing illnesses. These are the members of communities who are most immediately identifiable as being potentially more vulnerable to chemical exposures. It is therefore prudent, as a measure for their safety, to encourage people to avoid pesticide use in areas where young children are likely to be exposed.

While much of the necessary law is in place, the blatant violations that obtain in the field and lack of any court conviction show that the enforcement of the law is inadequate and is the main problem leading to exposure and the undesired effects observed. This in turn arises from lack of capacity in the legally mandated institutions. Lack of sufficient human resources and lack of budget and therefore facilities to inspect and enforce the regulations are the main causes of non-compliance by many pesticide dealers. This is the parent cause of the dire situation observed.

It can therefore be concluded that Uganda does not lack the law but lacks the rule of law. This clearly, is a situation that must be addressed by the Government of Uganda (GOU). GOU should note that while it has made significant regulatory
progress, the mitigative benefits of enforcement have not been realized. The following recommendations are therefore made with a view to assist GOU ensure safer handling of pesticides: -

i. Provide adequate funding and staffing for the ACB Secretariat.

The major limiting factor in the pesticides regulation and registration processes is lack of adequate funding. Although substantial income is generated from registration, much of it goes to the treasury and none of this is returned to the ACB account. There is need to ensure that money from registration of pesticides is ploughed back into pesticide regulation activities, which is not the case now.

ii. Provide additional staff in pesticide inspection and ACS enforcement.

The staffing situation in the ACB Secretariat is inadequate and does not allow effective enforcement and policing of pesticide regulations. There is, therefore, a need for the Government of Uganda to urgently consider increasing the number of pesticide inspectors and supporting them adequately to enable them to do the work effectively. This includes increasing their budget, training them, and strengthening their powers in the law.

iii. Accelerate training.

The only way of raising the population’s awareness of problems associated with pesticides, and how those problems can be avoided, is through continuous training. Training for “safer pesticide use” is a common approach to mitigating the potential negative health and environmental impacts of pesticides. This conventional approach promotes reducing health risks of pesticides by safer use of the products through training on the, use of protective equipment and technology improvements, as well seeking to reduce pesticide hazards via regulations and enforcement. For training to be effective and appropriate, it has to be at different levels: -

- Training of trainers in IPM and safer pesticide management. There is need for training of all Field Officers in integrated pest management and safer pesticide use who would, in turn, become trainers. These trainers will then train their own system of extension agents.
- Pesticide management training of pesticide wholesalers, dealers, and stockists. It is, therefore, highly desirable that the geographic coverage, quality, and frequency of trader, dealer, and stockist training be enhanced to include special emphasis on crop protection chemicals, to be implemented by all applicable programs in the country. Pesticide handling and management training should be specifically tailored to the different target groups, depending on their level of involvement with pesticides.
- Training of public sector extension agents. Adequate dose of knowledge and skills and techniques will make them better at providing objective and research-based knowledge of crop production and protection practices and strategies, including non-chemical alternatives.
- Training farmers. This should be in the subject integrated pest management. The pre-requisite for this is the establishment of farmer field school (FFS) types of participatory learning and research programs, done jointly with farmers, extension service providers, and researchers. The FFS approach involves a growing season-long informal learning experience in the farmers’ own fields. Farmers apply integrated pest management concepts in practice, to give them an understanding of basic diagnostics, biology of crop and agro-ecosystems, and are introduced to alternatives to synthetic chemicals.

iv. Plug the gaps in the law

While the laws give inspectors some powers, these powers are inadequate for sustainable management of chemicals. None of the laws gives the inspectorate full powers to: -

a. Accept; reject; detain; destroy; order to destroy; order reconditioning, processing, or re-export; return to country of export; designate as non-food use;

b. Recall consignments following importation;

c. Retain control over consignments in transit during intra-national transport or during storage prior to import clearance;

and,

d. Implement administrative and/or judicial measures when the specific requirements are not satisfied.

It is therefore necessary to bring to the fore the role of inspection, strengthen it to ensuring compliance and provide adequate and effective powers in the revised legislation.
The inspectors should: be gazetted; carry identification; and have powers to enter alone or in the company of a police officer, public and private properties (excluding residences), examine the premises, facility, processes, examine records, take samples, impound, seize or confiscate any item or consignment violating the law, obtain information, examine activities, conduct field tests, examine any files and records in any facility dealing with chemicals, interrogate persons at the site, stop any process which he/she considers poses imminent danger, give advice, warning, improvement notice, collect evidence and carry out criminal investigation, have powers to prosecute (powers similar to those of labour inspectors). The inspector should write a report for every inspection, investigation, prosecution, advice given, e.t.c; and compile a monthly and an annual report of his/her activities.

v. Intensify the provision of information

Despite the sentiments about the law, all said and done, it is not the rigorous enforcement based on utilisation of sanctions of the law to the full that counts. This often leads to conflict with the law and is counter-productive. Rather, it is the provision of relevant information, skills and knowledge that lead to sense that really counts.

The level of awareness is low and this is why there is poor handling, the misuse and high incidence of accidental poisoning among the public. The current public attitude towards chemicals, especially pesticides, indicates no fear or respect for the dangers posed by them. The obtaining attitude is that these materials are harmless. As the result this attitude, chemical handling is correspondingly careless.

Therefore, there is a need to intensify the provision of information and deliver it right down to the workers and communities including the out growers. This information must be packaged such that it is accessible and understandable by the communities.
5.0 Introduction

All crop protection products are dangerous and so must be handled with respect. To achieve this, certain basic precautions must be followed. Employees must be constantly alert to safety concerns and understand that the greatest threat to their well-being occurs when they do not follow prescribed safety practices in the workplace. Not only should workers recognize potential problems and how to prevent them, they also must be prepared to respond to chemical emergencies such as pesticide warehouse fires, accidental poisonings, and tank ruptures on service vehicles. Preventive strategies and a thorough knowledge of proper reactionary steps are essential components of pesticide safety policies.

Failure to recognize the potentially serious consequences of a pesticide emergency can, in itself, prove catastrophic. Employees who ignore safety practices increase the likelihood of injury to themselves and others. Loss of income, the cost of medical treatment, and job loss resulting in financial strain are potential consequences of even a minor safety problem. Also, negative publicity from a safety-related incident can damage the company’s reputation.

These guidelines are provided with a view to effectively improve pesticide handling. They take into account international guidelines from the ILO, FAO, and WHO cited above.

5.1 Actions at domestic level

One of the most effective ways to prevent pesticide poisonings is by adopting Integrated Pest Management (IPM) practices to reduce children’s exposure to pesticides. IPM is a safer method of pest management that makes use of a variety of control techniques and focuses on eliminating the causes of pest infestations instead of merely treating the symptoms. Since children spend so much of their day at home, at school, or at work, IPM provides an opportunity to create a safer living, learning or working environment—to reduce children’s exposure to pesticides as well as eliminate pests. IPM involves the following six steps:

i. Keep Pests Out — If pests can’t get inside, then one won’t need to use any pesticides to kill them;

ii. Starve and Dry Pests Out — Every creature needs food and water to survive. Eliminate pests’ access to these things and they won’t hang around for long;

Integrated Pest Management (IPM) means the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other actions to levels that are economically justified and reduce or minimize risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms.
iii. Eliminate Safe Havens for Pests — Cockroaches can live in any nook and cranny. Anywhere one can see a small crack leading to a spot that people can’t access, one should make sure to seal it up. All nooks and crevices should be sealed;

iv. Monitor for Pests — Monitoring is key to successful IPM. It lets us know when there is a problem so we can address it early;

v. Create an IPM Plan and Keep Proper Records — An IPM plan is a document that indicates how a person can plan to monitor for pests and what can be done if pests suddenly arrive. Having this tool will help avoid the urge to use dangerous pesticides;

vi. Treat Existing Pest Problems — To get rid of existing pests, use traps, vacuums, gels and baits. If pesticides are necessary, use spot treatments rather than area-wide applications.

vii. For more information on pesticides or pesticide poisoning prevention, refer to NEMA Web site, or call the doctor (Director of District Medical Services).

5.1.1 Pesticide Safety Tips

Although pesticides can be useful, they also can be dangerous if used carelessly or are NOT stored properly. Below are some tips for safer pest control:

i. The most effective way to reduce risks posed by pesticides is to use non-chemical control methods to reduce or eliminate pest problems. Around the home, such measures include removing sources of food and water (such as leaky pipes) and destroying pest shelters and breeding sites (such as litter and plant debris);

ii. If you decide you must use pesticides, always read the label first and follow the directions to the letter, including all precautions and restrictions;

iii. Do not use products for pests that are not indicated on the label and don’t use more pesticide than directed by the label. Do not think that twice the amount will do twice the job;

iv. Use protective measures when handling pesticides as directed by the label, such as wearing impermeable gloves, long pants, and long-sleeve shirts. Change clothes and wash your hands immediately after applying pesticide;

v. Before applying a pesticide (indoors or outdoors), remove children, their toys, and pets from the area and keep them away until the pesticide has dried or as recommended by the label;

vi. Do not spray outdoors on windy or rainy days. Take precautions to keep the pesticide from drifting or running off into the vegetable garden, pool, or neighbour’s yard;

vii. Remove or cover food during indoor applications;

viii. If using a commercial applicator or lawn care service, ask for information about potential risks and safety precautions to take;

ix. Do not buy more pesticides than you will need. If you have leftover pesticides, check with your local government to determine whether your community has a household hazardous waste collection program or other program for disposing of pesticides. If no community program exists, follow label directions and any state or local regulations regarding disposal;

x. Keep the telephone number of your area doctor.

5.1.2 Tips to follow if you have children or if children visit your house or farm

i. Always store pesticides away from children’s reach, in a locked cabinet or garden shed. Child-proof safety latches also may be installed on cabinets and can be purchased at local hardware stores and other retail outlets;

ii. Never transfer pesticides to other containers that children may associate with food or drink;

iii. Never place rodent or insect baits where small children can get to them;

iv. Teach children that “pesticides are poisons” - something they should not touch;

v. Alert others to the potential hazard of pesticides especially care givers and grandparents.
IN CASE OF AN EMERGENCY, try to determine what the person was exposed to and what part of the body was affected before you take action, since taking the right action is as important as taking immediate action. If the person is unconscious having trouble breathing, or having convulsions, give needed first aid immediately. Call 911 or your local emergency service. If the person does not have these symptoms, contact your doctor. Have the product container with you when you call for assistance - remember to act fast!

### 5.1.3 General First-Aid Guidelines

i. **Swallowed poison:** Induce vomiting. ONLY if the emergency personnel on the phone tell you to do so. This will depend on what the child has swallowed; some petroleum products or caustic poisons will cause more damage if the victim is made to vomit.

ii. **Poison in eye:** Eye damage can occur, within minutes with some types of pesticide. If poison splashes into an eye, hold the eyelid open and wash quickly and gently with clean, running water from the tap or a gentle stream from a hose for at least 15 minutes. Do not use eye drops or place chemicals or drugs in the wash water.

iii. **Poison on skin:** If pesticide splashes on the skin, drench area with water and remove contaminated clothing. Wash skin and hair thoroughly with soap and water. Later, discard contaminated clothing or thoroughly wash it separately from other laundry.

iv. **Inhaled poison:** Carry or drag victim to fresh air immediately. If you are able to get to the victim because of fumes, immediately contact the Fire Department. Loosen victim’s tight clothing. If the victim is blue or has stopped breathing, give artificial respiration (if you know how) and call rescue service for help. Open doors and windows so no one else will be poisoned by fumes.

### 5.1.4 Methods of Mosquito Control

While this study is not about mosquito control, it suffices to state that children are living in environment that is full of mosquitoes and as noted above, pesticides are used at the enterprise an household level to control them. It is therefore useful to give some guidance in this activity.

### 5.1.5 What you can do to control mosquitoes around the home

i. **Remove their habitat (where they live and breed)**
   - Eliminate standing water in rain gutters, old tires, buckets, plastic covers, toys, or any other container where mosquitoes can breed.
   - Empty and change the water in bird baths, fountains, wading pools, rain barrels, and potted plant trays at least once a week to destroy potential mosquito habitats.
   - Drain or fill temporary pools of water with dirt.
   - Keep swimming pool water treated and circulating.

ii. **Prevent your exposure to mosquitoes**
   - Use government registered mosquito repellents when necessary and follow label directions and precautions closely.
   - Use head nets, long sleeves and long pants if you venture into areas with high mosquito populations, such as salt marshes.
   - If there is a mosquito-borne disease warning in effect, stay inside during the evening when mosquitoes are active.
   - Make sure window and door screens are “bug tight.”
   - Replace your outdoor lights with yellow “bug” lights which tend to attract fewer mosquitoes than ordinary lights. The yellow lights are NOT repellents, however.

Neighbourhoods are occasionally sprayed to prevent disease and nuisance caused by large mosquito numbers. If you have any questions about mosquitoes and their control, contact your local mosquito control district or health department.

### 5.1.6 Methods used by state and local agencies in mosquito control

**Surveillance as First Step in Mosquito Control**

The first step in mosquito control is surveillance. State or local mosquito specialists conduct surveillance for diseases harboured by domestic and non-native birds, including sentinel chickens (used as virus transmission indicators), and mosquitoes. State and local mosquito control authorities also conduct surveillance for larval habitats.
by using maps and aerial photographs, and by evaluating larval populations. Other techniques include various light traps, biting counts, and analysis of reports from the public.

Mosquito control programs also put high priority on trying to prevent a large population of adult mosquitoes from developing so that additional controls may not be necessary. Since mosquitoes must have water to breed, methods of prevention may include:

i. Controlling water levels in lakes, marshes, ditches, or other mosquito breeding sites;

ii. Eliminating small breeding sites if possible;

iii. Stocking bodies of water with fish species that feed on larvae.

Both chemical and biological measures may be employed to kill immature mosquitoes during larval stages.

Chemical or Biological Measures to Control Mosquitoes

Controlling mosquitoes at the larval stage

Larvicides target larvae in the breeding habitat before they can mature into adult mosquitoes and disperse. Larvicides include:

Bacterial Insecticides

i. Bacillus thuringiensis israelensis

ii. Bacillus sphaericus

Insect Growth Inhibitor

i. Methoprene

Organophosphate Insecticide

ii. Temephos

Other Materials

i. Mineral oils

ii. Monomolecular films

Oils and films disperse as a thin layer on the surface of the water which cause larvae and pupae to drown. Liquid larvicide products are applied directly to water using backpack sprayers and truck or aircraft-mounted sprayers. Tablet, pellet, granular, and briquet formulations of larvicides are also applied by mosquito controllers to breeding areas.

Controlling Adult Mosquitoes

Adult mosquito control may be undertaken to combat an outbreak of mosquito-borne disease or a very heavy nuisance infestation of mosquitoes in a community. Pesticides registered for this use are known as adulticides and are applied either by aircraft or on the ground employing truck-mounted sprayers. State and local agencies commonly use the organophosphate insecticides malathion and the synthetic pyrethroid insecticides permethrin, resmethrin, and sumithrin for adult mosquito control.

Mosquito adulticides are applied as ultra-low volume (ULV) sprays. ULV sprayers dispense very fine aerosol droplets that stay aloft and kill flying mosquitoes on contact. ULV applications involve small quantities of pesticide active ingredient in relation to the size of the area treated, typically less than 3 ounces per acre, which minimizes exposure and risks to people and the environment.

Adulticides can be used for public health mosquito control programs without posing unreasonable risks to the general population or to the environment when applied according to the pesticide label. For more information on pesticides commonly-used in public health mosquito control programs, see the specific fact sheets mentioned below.
5.2 Action at plantation level

Guiding Principles

Everyone who handles pesticides has a duty to ensure that the pesticides affect no other person, and that adverse environmental effects are avoided as far as possible.

It is the provision of information, skills and knowledge to all concerned that leads to sense and improvement of attitudes practices.

Consequently the strategy is to develop alertness and involvement of all people concerned with the subject through creation of attitude and practice changing awareness. In line with the purpose of these guidelines, the information that may be of help to the stakeholders is provided.

5.2.1 Labels

The first step in the use of pesticides is the reading of the label. Consequently no one who cannot read and understand a label should handle a pesticide.

i. The label gives the trade name and the approved name of the pesticide. ii. The active ingredients, and the hazard it presents.

5.2.2 Transport by truck or boat

i. Containers of pesticides should never be carried in the same truck or boat as food or animal feeds because if the containers leak, foodstuffs may absorb pesticides especially in the liquid form. Never carry pesticides in the same truck or boat as food or animal feed for the same reason that they may be absorbed if the container for some reason leaks.

ii. Note that the food may not show that it has been contaminated.

iii. Whenever the pesticides are carried, the deck of the truck or boat should always be examined after unloading for any evidence of leakage. If containers might have leaked, the deck must be decontaminated immediately.

iv. Decontamination is carried out by scrubbing the deck with water. Use saw dust, news papers or old cloth to absorb the water, and dispose of these in the same way as empty containers namely by burning or burying. Feet and hands must be protected during decontamination.

5.2.3 Storing and using pesticides

i. Unused pesticides should be kept in a locked cupboard, but not in the same cupboard as drugs, or medicines.

ii. Do not use pesticides in any other way other than as described on the label.

iii. Pesticide containers in use should be kept out of the reach of children.

iv. Pesticides should be kept in their original containers. Do not repack or put them in bottles or other containers except in the original properly labelled containers. If a child or adult mistakenly drinks or eats a pesticide, the medical person attending to him needs to have access to the original label to save him or her. These labels are important.

5.2.4 Exclusion from a sprayed area

i. After application of pesticides in the agricultural area, no unprotected person should enter the sprayed area.

ii. The exclusion areas must be marked with flags or other marking that is understood by the local population at work or near the sprayed area. This marking should be removed as soon as the exclusion period has ended.

iii. For areas dusted or sprayed with liquid formulation of a slight hazard pesticide, this exclusion should last until the pesticide has dried up on the crop.

iv. For pesticides with higher hazard ranking, the label on the original container gives the exclusion period and this label should be consulted to.

5.2.5 Disposal of wash water

i. In areas where the ground water is not high, wash water can be allowed to soak away slowly in a pit and the pit should be refilled with soil in a slow way so that the water does not overflow from the pit. Recall that most flower growing farms are located in low lying areas next to lakes or rivers. This implies that the ground water is near the surface and this method of disposal is null and void.
Most pesticides will either be inactivated as they soak away through the soil or be absorbed on to soil particles so that they will not travel far from the point of spraying. However, the persistent organic pollutants do move beyond and this method will not work for them. These pesticides should not be used at all in Uganda.

The pit should be at least one meter deep and more than 100 meters away from streams, lakes or any water body, or house. The base of the pit should be dry before use.

No more than the recommended amount of pesticide should be used. Disposal of unwanted pesticides can be avoided by care in calculating the amount of pesticide needed.

### 5.2.6 Disposal of wash water as a diluent

1. When the ground water level is high, a dry pit cannot be dug. In this case, an alternative has to be found.
2. Wash water can be used to make up the dilution of the same pesticide on the next day that the pesticide will be used.
3. The wash water should be collected in a clearly marked drum with a tight lid.
4. If the drum is transported, it should be treated in all respects as a container of pesticides. However when the water is used for dilution, it should be measured as if it was water.

### 5.2.7 Disposal of containers by burning

1. Large containers of pesticides retain pesticide residues in them after use. If the containers cannot be returned to the supplier for destruction, they should be buried if they are made of hard paper.
2. A hole suitable for burying containers must be dry and when the container is buried its highest point is at least one meter below the top surface as well as being 100 meters away from a water body or an occupied house.
3. All containers should be pierced or crushed before burying. This should not apply to pressurised containers.
4. Addition of manure or other rotting organic matter to the hole before filling will assist microbiological breakdown of the pesticide.
5. If an approved disposal site for chemical waste is available (such as Kitesi in Kampala) all empty containers should be taken there.

### 5.2.8 Disposal of containers by burning

1. This method of disposal can be used for boxes, card drums, plastic liners, and other combustible materials. This method should only be used if a pit cannot be dug and there is no other way of disposing the containers in an approved site for chemical waste.
2. The smoke may affect the residents of the area so this has to be avoided by choosing a burning site that is remote.
3. The fire must be down the wind in direction.

### 5.2.9 Specific steps in disposal of containers by burning

1. First empty the containers of any pesticide and rinse out plastic liners.
2. Dispose the resulting wash water as wash water described above.
3. Make a fire in the pit at least 100 meters away from any well, river, or house.
4. One worker at least must stand by the fire (windward side of the fire, to avoid the smoke) until the containers have been reduced to ash.
5. When all the containers are burnt, cover the ash with soil and refill the pit.

### 5.2.10 Disposal of large quantities of unwanted pesticides

This has to be done with the direct guidelines of the National Environment Management Authority (NEMA) guidelines. The following should be noted:

**Never**

1. Dispose into any river, lake or water body
2. Put into any landfill site unless it has been specifically approved by NEMA.
3. Use for any other purpose other than that stated on the original label.
v. Donate to any person or organisation unless it is not legal.

*Options*

i. Return it to the supplier.

ii. Incinerate at high temperature in an approved incinerator (There is one in Nakasongola Industries Limited).

### 5.2.11 Principles of personal care and pesticide hygiene

i. As said above, pesticides should never be stored or kept in the same place where food is kept or in the same containers used for food.

ii. Workers should be supplied with plenty of soap and water to wash themselves with after work with pesticides.

iii. The employer should give maximum supervision by a knowledgeable person during mixing of chemicals.

iv. Handling of pesticides and smoking cigarettes at work simply do not mix together. Therefore workers should not smoke at work.

v. Workers handling pesticides should not chew anything while at work because the pesticide on the hands will be ingested.

vi. Applicators should wear protective clothing during spraying and these should be regularly cleaned. The thrust of protection is the face including the nose. Mouth and neck; the hands; the body and legs.

vii. Spraying equipment should be regularly serviced and replaced when leaks develop.

viii. The equipment for pesticide application should be accessible only to persons who fully understand and appreciate the dangers of pesticides. On no account should equipment be close to children.

### 5.2.12 Simple tips to avoid pesticide contamination

i. Cover as much skin as possible with cotton cloth material.

ii. Clothing soaked with pesticide should be changed immediately.

iii. When moderately and highly toxic pesticides are used, ensure that the head and the neck are protected.

iv. When spraying above waist level, a wide brimmed cotton hat should be worn.

v. The lower legs and feet can be contaminated during spraying or walking through recently sprayed areas. Therefore: wear boots during spraying; do not wear open sandals; If possible, do not walk through recently sprayed fields.

vi. Use gloves when handling concentrated pesticides; when applying highly toxic formulations; when washing or maintaining pesticide application equipment.

vii. Protect the lungs by wearing appropriate respirator: A respirator must be fitted with the proper type of canister, and this must be regularly replaced in accordance with the instructions on the canister; it must closely fit around the mouth and nose curvature; must be washed daily after removal of the canister and dried; must be kept in a clean, dry plastic bag when not in use; must be regularly inspected; must be worn only by persons trained to use them.

### 5.2.13 Mixing Pesticides

This is a process when the concentrated pesticide is diluted with water or appropriate liquid to the approved concentration before spraying. This process requires extra caution.

i. Wear a plastic apron when pouring the mixture into the application equipment.

ii. Use a paddle or stirrer to stir the mixture – not bear hands.

iii. Make sure that water for washing hands is close at hand.
5.2.14 Washing
i. Always wash hands, arms and face with soap and water: before eating, before dinking, before travelling back to base, before urinating. This way you minimise contamination of the body and intake through the skin.
ii. Washing (bathing) is always needed; at the end of the day, one should take a bath or shower before going home.
iii. Each time the pesticide pump is refilled, persons engaged in hand spraying should wash their hands and arms.
iv. Whenever the skin is contaminated, wash immediately with soap and plenty of water. It is the responsibility of the employer to provide these items.
v. Wash your working clothes separately from your domestic clothes – pesticides can cling to your clothes and you should not take pesticides home to your children in your clothes.

5.2.15 Recognising pesticide poisoning
Pesticide poisoning is usually of “acute” nature ie it occurs in a short while and the effects are recognisable within a few days. It usually results from ingestion of the pesticide or the pesticide enters the body through the skin.
The many signs and symptoms include:
i. General: Extreme weakness and fatigue.
ii. Skin: Irritation, burning, excessive sweating, staining.
iii. Eyes: Itching, burning, watering, difficulty in seeing or blurred vision, narrowing or widening of the pupils.
iv. Digestive system: Burning in the mouth, burning in the throat, extreme salivation, nausea, vomiting, abdominal pain, diarrhoea.
v. Nervous system: Headache, dizziness, confusion, restlessness, muscle twitching, staggering gait or loss of balance, slurred speech, fits, unconsciousness.
vi. Respiratory system: Cough, chest pain, and tightness, difficulty in breathing, wheezing.
Whenever these are noted in the working environment ask:
i. The person concerned and workmates if any contamination has occurred or if any work with pesticides has taken place;
ii. What product has been handled and in what quantity;
iii. When and for how long handling took place;
iv. What protective clothing has been used;
v. If alcohol or medicines had been taken.
Look for:
i. Evidence of pesticide containers, labels, or spray equipment, and retain them carefully;
ii. Evidence of exposure, spillage on to ground or clothing;
iii. For defective or faulty equipment;
iv. The patient’s condition.
Smell: Many pesticide formulations have a characteristic smell, which will normally be noticeable if contamination to any great extent has occurred.
If over exposure is suspected, give first aid as described and call refer to a doctor as soon as possible. It will be important for the doctor to know what pesticide the person has been exposed to so that he can do the necessary speedy diagnosis.
6.2.16 **First aid measures**

i. Check first for respiration and pulse. If either is absent, start resuscitation;

ii. Ensure that the first aider will not be contaminated in the process of resuscitation;

iii. If the person is unconscious, make sure that the airway is clear by pulling the chin upwards and backwards;

iv. Put the person at rest on the side or front downwards, with the head turned one side;

v. If the person is to be transported, use this posture in order to prevent vomitus from entering the lungs;

vi. Never give anything by mouth to unconscious patient;

vii. Immediately remove any contaminated clothing from the person and wash the skin with soap.

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