



**PESTICIDES IN ZIMBABWE**

Toxicity and Health Implications

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*and*  
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# Pesticides and Occupational Safety and Health in Zimbabwe

*Rodwell C. Chitemerere*

## Summary

In Zimbabwe, the Department of Occupational Safety, Health and Workers' Compensation in the Ministry of Labour collates, analyses and develops information systems out of reported accidents or cases of poisoning occurring throughout industry. The accidents/poisoning cases also include those due to pesticides. Reporting systems of accidents/poisonings are poor and deteriorating due to poor control strategies. This is because there is lack of safety guidelines, enforcement machinery, low level of functional literacy among workers and users and lack of social security or health insurance schemes. It is therefore important to improve the accident/poisoning reporting system so as to get reliable representative statistics about occupational safety and health especially in association with pesticide poisonings.

## Introduction

The agricultural sector contributed about 13 per cent of the gross national product (G.N.P) in 1990, while the export of agricultural products (crops and livestock) contributed about 50,4 per cent of the country's total annual exports making it an important foreign currency earner (CSO, 1990). The use of pesticides continues to play an important role in maintaining high levels of agricultural production especially on the large-scale commercial farms. Pesticides are an important tool in controlling crop pests and diseases of man and animals. Pest-induced losses due to weed infestations, plant diseases, arthropods and vertebrate pests have been estimated at 30-35 per cent (FAO, 1988). It is asserted that, without the use of pesticides, these losses would be higher. In public health, pesticides used to control insect vectors have been instrumental in reducing deaths due to infectious diseases such as malaria, trypanosomiasis and typhoid. Animal diseases caused by insect and other vectors have also been controlled by the use of pesticides.

Some of the commonly used pesticides in Zimbabwe include organophosphates, organochlorines, carbamates and pyrethrins; fungicides such as dithiocarbamates, inorganic compounds, benzimidazoles and cyanic nitrogenous compounds; herbicides such as paraquat, diquat, triazines and urea-based herbicides; as well as other categories of pesticides such as rodenticides, wood preservatives, textile and leather protectants.

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There are structural and social factors which confound the health and safety problems associated with use of pesticides in most developing countries, that is:

- lack of enforcement machinery that leads to the indiscriminate use of even very toxic substances whose use is banned or restricted in developed countries (ILO, 1991).
- lack of proper monitoring on effective implementation of existing legislation due to lack of human and financial resources.
- low level of functional literacy among workers and other users.
- propaganda by some importers and suppliers to sell more toxic pesticides as "more effective" products because of a highly competitive market (WHO, 1989a).
- high comparative cost of personal protective equipment compared with income, its scarcity, lack of training in its use, repair and maintenance, and scarcity of replacements for disposable components such as filters.
- tropical climatic conditions that greatly hinder working with protective clothing and equipment, even if supplied.
- lack of social security or health insurance schemes.
- poor state of health and nutrition that may be further aggravated by endemic diseases, large family size, low income and unemployment.
- lack of diagnostic capacity or expertise for detection of chemically induced health effects.
- lack of proper labelling and Chemical Safety Data Sheets (CSDS) specifying how the pesticides should be handled, used, stored, disposed of and any other pertinent information.

All these factors tend to expose the workers and users in developing countries to greater health hazards from the use of pesticides.

### **Health effects of some pesticides**

Despite their obvious advantages, pesticides pose significant hazards to human health. Hazards due to occupational exposure to pesticides have been reported. Pesticides are also widely recognized as environmental pollutants.

In factory workers exposed to an average of 0,7 mg per cubic metre for eight months, significant inhibition of plasma and red blood cells cholinesterase (ChE) activity has been recorded. Cases of dermatitis and skin sensitisation due to dichlorvos have been described in workers handling and spraying the pesticide. In addition, cross-sensitisation with certain pesticides has been seen (WHO, 1989a).

Data concerning the effects of thiocarbamates on man are scarce. However, cases of irritation and sensitisation have been observed in agricultural workers (WHO, 1988).

No cases of accidental poisoning have been reported as a result of occupational exposure to cypermethrin, and skin sensations reported by some authors during field studies lasted only a few hours and did not persist for more than one day after exposure. Neurological signs are not observed. There is no confirmed negative effects on the health of exposed workers to this compound (WHO, 1989b). This is probably true of the other synthetic pyrethrins.

### **Accidents involving pesticides**

About 25 million agricultural workers in developing countries are poisoned by pesticides annually and some 20 000 people die of pesticides poisoning annually (Jeyaratham, 1985). Most cases of pesticide poisoning go unreported. Most people suffer from one or more of the immediate symptoms which range from eye and lung irritation to muscle twitches and skin problems and there may be long-term effects which range from behavioural changes to cancer (Zenc, 1984). Accidental poisoning may be occupational among adults or due to environmental exposure in both adults and children. Poisoning can be intentional such as in suicide, parasuicide or homicidal cases. Self-poisoning is acute and usually fatal as opposed to occupational poisoning which usually follows chronic exposure.

Occupationally, the most vulnerable group of workers are the factory workers during pesticide formulation, handling, transportation, transfer, packaging and storage. The farm workers are exposed mainly during mixing and spraying.

An analysis of the statistical records of accidents in the use of pesticides in the agricultural sector of Zimbabwe does not portray an alarming number of casualties and fatalities. A closer look at them reveal that the majority of the accidents in this sector are similar to those in other industries – falls, people struck by materials and objects, caught in or between objects and others. Occupational accidents pertaining to pesticide exposure for the period 1986–1990 are a small percentage of the total agricultural injuries reported. This is probably because of under-reporting of accidents by both factories, large- and small-scale commercial, and communal farmers. Table 1 shows accidents reported by the agricultural sector in general and on pesticides poisoning in particular.

Most of the pesticide poisoning accidents occur during spraying. Crops which normally require extensive spraying are tobacco, cotton, tea, fruits, sugarcane and horticultural produce. As a result, it is evident that the acute types of accidents are the ones mainly reported whereas chronic cases go unreported until the worker is either retired or dismissed on health grounds. Sickness caused by pesticides is still largely misdiagnosed because of the lack of knowledge among health professionals.

**Table 1:** Occupational injuries reported by the agricultural sector.

Year	Fatals	Non Fatals	Total
1986	41 (0)	2 381 (43)	2 422 (43)
1987	52 (1)	2 132 (13)	2 184 (14)
1988	42 (0)	1 968 (27)	2 010 (27)
1989	62 (4)	2 011 (14)	2 073 (18)
1990	52 (2)	2 097 (16)	2 149 (18)
TOTAL	249 (7)	10 589 (113)	10 838 (120)
Percentage	2,8	1,0	1,1

- The numbers in brackets indicate injuries due to pesticides poisoning.
- The percentages (%) indicate injuries due to pesticide poisoning as a percentage of the total occupational injuries.

Therefore, the accident reporting system needs revamping so that it can, at least, portray a clearer picture of both acute and chronic occupational pesticides poisoning in Zimbabwe. It would be useful, for the benefit of those analysing the data, if those reporting the accidents on Accident Report Forms (F.G. 2) fill in the actual name of the pesticide involved. From the experience of those concerned with occupational accidents in the Department of Occupational Health, Safety and Workers' Compensation, it is only the acute accidents which come to their attention for compensation. There is evidence that a reasonable number of both chronic and acute pesticide poisoning go unreported. Therefore, everything should be done to educate the employers and workers on the importance of reporting cases of poisoning.

Table 2 shows the total number of poisoning cases which were submitted to the Government Analyst Laboratory between 1986 and 1990. The number of positively confirmed cases of pesticide poisonings is also shown. In all these cases, the reasons were parasuicide or homicide. It is with these figures that one understands how pesticides are accessible hence abused by the general public.

### **Preventive programmes**

In Zimbabwe, the legislation which deals with the control of pesticides is fragmented between different ministries. The law sets minimum standards to be met in the registration, use, storage and production of these compounds and it affords the law enforcement agencies the opportunity to check on compliance in the safe use, production, storage and registration of the pesticides.

**Table 2:** Non-occupational sudden deaths cases reported to Government Analyst Laboratory for analysis of the samples to identify those with pesticide poisoning.

Year	No. of cases	Positive	Percentage
1986	353	119	33,7
1987	413	140	33,9
1988	428	77	18
1989	463	105	22,7
1990	415	72	17,3
<b>TOTAL</b>	<b>2 072</b>	<b>513</b>	<b>24,8 %</b>

The pesticide formulating plants handle a variety of hazardous chemicals in different physical states. As such, the types of hazards encountered are similar in many ways to those encountered in chemical factories in general.

Before pesticides are sold or distributed in Zimbabwe, they must be registered with the Ministry of Lands, Agriculture and Rural Resettlement in terms of the Pesticide Regulations of 1977, under the provisions of the Fertiliser, Farm Feeds and Remedies Act (Chapter III) and placed in Group I, II or III of the Hazardous Substances Control Board and the supporting statutory instruments under the Ministry of Health.

### **Statutory instrument 313 of 1981**

These regulations control the premises and supply of group II pesticides. These are pesticides which are considered to be highly toxic and bear a purple or red label. They are only kept in licensed premises which should comply with the basic requirements, that is, proper ventilation, kept under lock and key and the supplier's register to record who bought what, where and when. These licenses are renewed on a yearly basis and the premises are inspected regularly to check on compliance.

### **Statutory instrument 315 of 1981**

The regulations control the supply and packaging of group III pesticides. These are pesticides which are moderately toxic and bear an orange or green label. This group also includes most of the household products.

### **Statutory instrument 262 of 1984**

These regulations are commonly known as the transportation by, and the labelling of road tankers and specify codes to be stuck on road tankers to



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**Table 3:** Number of deaths for the period 1986–1990 and the type of pesticide responsible.

Pesticide	1986	1987	1988	1989	1990
Endosulphan	47	85	26	26	19
Dimethoate	23	26	25	30	12
Aldrin/Dieldrin	11	4	1	—	—
Dioxathion	9	5	10	1	1
Diazinon	7	1	2	2	7
Dioxathion/Chlofeniphos	4	1	—	—	—
Aldrin	4	1	2	1	1
Malathion	3	—	—	3	5
Fenitrothion	2	1	—	3	2
Phosdrin	2	—	—	—	—
Monocrotophos	1	—	—	3	2
Dieldrin	1	1	—	—	—
Parathion	1	9	4	3	7
Methyl Parathion	1	—	—	—	3
Carbaryl	1	—	2	—	1
Bromophos Ethyl	1	—	—	4	4
Warfarin	1	—	2	1	—
Metasystox	—	1	—	1	1
Chlofenvinphos	—	2	3	3	—
Telodrin	—	1	—	1	—
Aldicarb	—	1	—	—	—
Triazophos	—	1	—	—	—
Gama Benzene	—	—	—	1	1
Atrazine	—	—	—	2	1
Chlopyriphos	—	—	—	1	—
Chlordane	—	—	—	5	2
Chlopyriphos/Diazinon	—	—	—	1	—
Carbofuran	—	—	—	2	—
Dichlorophos	—	—	—	1	2
Parathion/Dioxathion	—	—	—	—	1
Carbaryl/Malathion	—	—	—	—	1
* UOP	—	—	—	10	—
	119	140	77	105	73

\* UOP — Unknown organophosphorus pesticides

Source: Government Analyst Laboratory, 1990.

indicate what they are carrying and emergency procedures to be taken in the event of an accident.

On all those groups of pesticides governed by the above statutes, first aid information, antidotes and detailed procedures in cases of accidental poisoning are provided.

### **Statutory instrument 205 of 1985**

These regulations spell out the protective clothing which must be worn when using the various pesticides. It is incumbent upon the supplier as well as the user to acquaint themselves with these regulations.

### **Law enforcement**

The Factories Inspectorate in the Department of Occupational Safety, Health and Workers' Compensation enforces the requirements of the legislation of, *inter alia*, safe use, storage and production of pesticides. The Inspectorate also assists in the education of both employers and workers in the safe handling of pesticides. Chemical hazards are monitored in pesticides formulating factories and analysed in the occupational hygiene laboratory using gas chromatographic methods. Reports are sent to the workplace advising management on ways of improving the work environment and methods of controlling the level of contamination in the workplace using international standards as reference for threshold limit values (TLVs).

### **Health and safety promotional programmes**

Education and training programmes have been intensified by the Department of Occupational Health, Safety and Workers' Compensation in all chemical industrial and agricultural sectors since 1980. Initially, the offices carry out safety surveys or inspection to familiarise themselves with the nature of operations and hazards at each workplace. Then they conduct relevant in-house teach-ins for both the management and the workforce at their workplace. The response to these ongoing education and training programmes has been very encouraging and more and more workplaces including farms are requesting for the programmes. In addition to these teach-ins, seminars or workshops are also organized.

Other promotional activities include dissemination of information such as posters, booklets, articles and advertisements on pesticides safety in the press and in the in-house journal, *On Guard*, to educate workers, management and the public.

The courses on safety and health organized and run by the Department also include subjects on chemical safety in general and the fundamentals of toxicology of chemicals to participants who often include those from the chemical industry and agriculture sector. All lecture sessions are backed by relevant safety films, slides and use of overhead transparencies followed by discussions between the lecturer and the participants.

## Conclusion

Agrochemicals are clearly of value in agricultural production. However, the indiscriminate use of these products in developing countries has had disastrous health consequences at times. More and more new pesticides whose health hazards are not fully known are introduced into the market. The problem of pesticides hazards will continue to grow. The situation will deteriorate in developing countries where there are poor control strategies.

In Zimbabwe, the pesticides accidents/poisonings reporting system is not as elaborate as in developed countries. Therefore, efforts should be made to improve the accident reporting system so that there are representative statistics.

Although education and training on the safe use, handling and production of pesticides to protect the workers, the public and the environment is an ongoing exercise, it should be intensified to arrest the deteriorating situation.

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