



Guidelines for the management of small quantities of unwanted and obsolete pesticides

FAO PESTICIDE DISPOSAL SERIES 7

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Foreword

Obsolete, unwanted and banned pesticide stocks continue to pose serious environmental and human health problems in developing countries. In rural areas, pesticide waste tends to build up wherever farming and pest control activities are practised, either intensively or extensively. Urban dwellers, particularly in the tropics, are also affected by the pesticide waste and contaminated containers that often pervade their homes. Many people are unaware of the dangers and health risks of pesticides. Accidents, particularly those involving children, are common and often fatal. There is a lack of guidance for people involved in the management or disposal of small quantities of pesticide-related waste, so hazardous chemicals are often left lying around in both rural and urban areas, municipal dumps and even children's playgrounds. The reuse of contaminated containers for domestic purposes, which is a common practice in many developing areas, is another major health risk.

In 1994, a panel of experts from FAO, the United Nations Environment Programme (UNEP) and the World Health Organization (WHO) developed a set of guidelines for the disposal of bulk quantities of obsolete pesticides. At the same time, the panel recommended that a second set of guidelines be developed for the disposal of small quantities of unusable pesticide stocks, pesticide-related waste and contaminated containers. Since then, the FAO project on prevention and disposal of obsolete stocks, financed by the Government of the Netherlands, has made this one of its main priorities.

These guidelines are the result of the Netherlands' continued support and commitment, which have made possible the initiation and maintenance of a regional project related to the issues and problems of obsolete pesticide stocks.

The guidelines do not set out to provide all the information necessary for management and disposal operations, but strict adherence to the principles that they outline will definitely minimize the further accumulation of unwanted pesticides and the subsequent need for disposal. A revised version may be produced in the future, based on technical developments, newly available information and feedback from readers.

The guidelines will be translated into several languages and made widely available to governments, pesticide users, extension agents and small farmers.

Introduction

These guidelines form part of the FAO Pesticide Disposal Series. They give guidance and advice on what to do with the small quantities of unwanted, unusable and obsolete pesticides that are often found on farms, in homes and in many other situations.

At present, end users are often expected to deal with potentially hazardous pesticide-related waste and empty containers by themselves. The guidelines aim at putting this responsibility into the more capable and better-resourced hands of national and local authorities. Guidance is therefore addressed principally to governments, local authorities, extension services and pesticide suppliers and distributors, although pesticide users are also advised about what to do and warned against which actions to avoid.

One of the guidelines' main objectives is to stop the current practice of advising pesticide users to burn or bury empty pesticide containers and bury, or send to landfill, other pesticide-related wastes.

None of the actions recommended in this publication present any risk to users. The main focuses are on preventing the accumulation of unusable pesticides at user level and removing waste where it exists. No technical information is given on exactly how to dispose of pesticides and containers because this is a risky operation involving dangerous chemicals and many readers will not be sufficiently trained or appropriately equipped to carry it out.

Material is presented in simple images which can be adapted to suit the various needs of local communities and reproduced for widespread distribution.

What are pesticides?

The *International code of conduct on the distribution and use of pesticides*¹ defines pesticides as: "Any substance or mixture of substances intended for preventing, destroying or controlling any pest, including vectors of human and 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 foodstuffs, or 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, defoliant, 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."

The problem

All pesticides are toxic to some or all living organisms. They are designed to prevent, destroy or control specific plants or animals that threaten crops or other useful resources. However, if beneficial insects or crops are exposed to pesticides they too may be destroyed, and farm animals, wildlife or people may become ill or die after exposure to even very small quantities of pesticide.

Over the past 40 years, the worldwide production and use of pesticides have increased. In 1996, the global pesticide market was valued at US\$30 560 million.² Growth in pesticide sales has slowed in industrialized countries, but it continues to grow rapidly in developing countries and dependence on pesticides is also increasing in these regions.

As reliance on pesticides increases, so do the problems of hazardous pesticide wastes. How can used containers, contaminated materials, deteriorated or unusable chemicals and excess pesticide supplies be disposed of safely?

The World Health Organization (WHO) estimates that, worldwide, exposure to pesticides causes an annual 20 000 deaths and at least 3 million cases of acute poisoning.³ Other estimates suggest that the annual figure for pesticide poisonings is as high as 25 million in developing countries alone.⁴ Many deaths and cases of poisoning are caused by mishandling of pesticide wastes and containers; the common practice of reusing pesticide containers to store food and water is an example of this. Pesticides that are carelessly disposed of can contaminate the air, water and land, and poison people, livestock, fish and wildlife.

Size of the problem

Commercial synthetic chemical pesticides are traded in every country and reach even the remotest regions. Wherever pesticides are used, unusable or unwanted pesticides and empty pesticide containers have to be managed and disposed of safely.

A wide variety of media (pictograms, posters, radio programmes and training of extension services and farmers) have been used to promote the safe storage, transportation and use of pesticides. The success of such efforts varies, but their focus is on the safe use of pesticides, while relatively little has been done to promote the safe management of pesticide-related waste materials.

Very few local or national authorities, pesticide suppliers or other organizations provide adequate support to pesticide end users. Advice is sometimes given on product labels or through regulations or guidelines, but this advice rarely reaches pesticide end users and, even when it does, it tends to be inappropriate and difficult to follow.

People often reuse empty plastic or metal pesticide containers as storage for fuel or even food and water, even though it is usually impossible to remove all traces of chemicals from these containers. Old products, unlabelled containers and leaking packages are often kept in misguided efforts to avoid waste or because people do not understand the hazards they pose.

Other dangers arise when unwanted pesticides and containers are disposed of inappropriately. For example, many pesticide suppliers and national authorities recommend the burying or burning of waste pesticides and empty containers. However, buried chemical waste can contaminate soil and leach into surface or groundwater, while burning pesticides and containers release highly toxic fumes (see Inappropriate disposal practices, p. 13).

The solutions

Pesticide regulators, advisers, distributors and end users urgently need clear advice on how to minimize the accumulation of pesticide-related waste and how best to deal with any waste that is generated. At present, guidance is often unclear, wrong or, in too many cases, completely lacking. Advice should focus, in particular, on ways in which pesticide end users can safely dispose of

empty pesticide containers and unwanted or obsolete pesticides. The main aim of these guidelines is to indicate best practices and responsibilities.

The safe management and disposal of pesticide-related waste should be provided and coordinated by regulatory authorities, pesticide distributors and suppliers. Other organizations that support and advise pesticide users, such as extension and health promotion services, non-governmental organizations (NGOs), agricultural colleges and schools, also have important roles to play.

Governments and their agencies, including ministries of agriculture, health, environment and education, are responsible for regulating the manufacture, import, distribution and use of pesticides. These responsibilities should be extended to include the management of pesticide-related waste products, including empty containers, which are often overlooked.

Pesticide suppliers should ensure that effective product stewardship systems are in place. Stewardship should cover all stages of pesticide production, distribution and use, including the management of waste. Local distributors of pesticides should be actively involved in product stewardship and should help to provide safe solutions to the problems of pesticide-related waste and empty containers.

NGOs and farmers' organizations are invaluable channels for information and advice in communities that are poorly serviced by official bodies. They can help to implement the recommendations made in these guidelines, although they still need institutional support for their activities and cannot be expected to act entirely voluntarily.

Pesticide end users also have important roles to play in minimizing the generation of pesticide-related waste and managing what waste there is in a responsible manner, in keeping with the best practices that are available.

The roles of the various bodies and individuals involved in the management of pesticide-related waste are described in greater detail in Solution options on p. 5.

1 FAO. 1990.

2 Agrow. 1997. *Agrow's Top Twenty Five*. DS 141. UK, PJB Publications.

3 WHO. 1990a.

4 Jeyaratnam, J. 1990. Acute pesticide poisoning: a major problem. *World Health Statistics Quarterly*, 5(43): 139-144.

Identifying the problem

Because of the different management methods required, small quantities of obsolete and unwanted pesticides should be clearly differentiated from large or bulk quantities, which are addressed in FAO's *Disposal of bulk quantities of obsolete pesticides in developing countries*.⁵ When deciding whether a quantity of pesticides is large or small, not only should the quantity of the chemical it contains be taken into account, but also the risk it poses to health and the environment (see Table 2). The World Health Organization (WHO) has classified pesticides according to their "acute risk to health (that is, the risk of single or multiple exposures over a relatively short period of time) that might be encountered accidentally by any person handling the product in accordance with the directions for handling by the manufacturer or in accordance with the rules laid down for storage and transportation by competent international bodies".⁶

All pesticide products should be labelled in accordance with the FAO *Guidelines on good labelling practice for pesticides*.⁷ The label should indicate the pesticide's hazard rating (see Table 1) in words, symbols and an appropriately coloured band. Old and obsolete pesticides that have not been properly labelled should always be assumed to be extremely hazardous (Class Ia) according to the WHO classification system.

Table 2 provides a broad indication of the quantities that may be regarded as small, based on the WHO hazard classification of pesticides.

Any single or cumulative quantity of pesticides or contaminated materials that exceeds the amounts in Table 2 should be treated as a large or bulk quantity.

Soil, clothing or other materials that have been contaminated by pesticide, as well as empty containers, should be given the same classifications as the pesticide itself, i.e. depending on the hazard classification of the pesticide and the quantity of contaminated material or containers.

The management and disposal operations carried out should be appropriate to the total quantity of pesticides and contaminated materials present on any one site – several small quantities of individual products, containers or contaminated materials are, therefore, likely to constitute one large quantity (unless the individual amounts are very small indeed).

Unidentified products should always be assumed to be of the highest WHO hazard class and should be dealt with accordingly. These include unlabelled containers, products that have been transferred into containers other than those in which they were supplied, and materials that have been contaminated by unidentified products. If such products exceed 2.5 kg or litres they should not be dealt with as a small quantity but as a bulk quantity.

Large or bulk quantities of obsolete or unwanted pesticides should be dealt with in accordance with the FAO guidelines on the disposal of bulk quantities of obsolete pesticides in developing countries.

What causes the problem?

The following are some of the causes of accumulation of obsolete and unwanted pesticides and related waste products:

- products that have already been bought are subsequently banned and cannot be used;
- products have exceeded their use-by date and should no longer be used;
- products have deteriorated physically or chemically to a degree that makes them unusable;
- products cannot be identified because they have no label, the label is in the wrong language or it cannot be read;
- damaged containers have leaked, exposing products;
- products are no longer needed for their intended use;
- too much of a product has been supplied and it cannot all be used;
- materials have been contaminated by spilled pesticides;
- empty containers need to be disposed of.

In most developing countries pesticides are expensive and difficult to obtain. Empty containers are also highly valued and are often recycled for other uses. As a result, the owners of obsolete pesticides and containers are often reluctant to declare or dispose of them – and so, when products are declared to be obsolete or unusable, their condition is likely to be extremely poor and highly hazardous. Authorities and pesticide suppliers should encourage owners to dispose of dangerous waste products.

Pesticide-related waste and empty containers will, however, continue to accumulate wherever pesticides are in use. The hazards associated with waste cannot, therefore, be eliminated by a single disposal operation and efforts should aim at reducing the generation of waste and providing long-term solutions.

The risks

Unusable pesticides pose even greater risks to people, animals and the environment than do products in good condition. Obsolete products include the many pesticides that have been banned or severely restricted because of their high toxicity or environmental persistence. Unlabelled products and pesticides that have been transferred into unmarked containers can be mistaken for other substances such as fuel, cleaning products or even drinks. Leaking containers and spilled pesticides can release noxious vapours and come into contact with other materials such as food, clothing and furniture, causing serious health problems to people or animals, even when contact has been very brief.

TABLE 1
Pesticide product label information to indicate the WHO hazard classification

WHO hazard class	Information to appear on label	Hazard statement	Band colour	Hazard symbol	Symbols and words
Ia	Extremely hazardous	Very toxic	Red	N	N Very toxic
Ib	Highly hazardous	Toxic	Red	N	N Toxic
II	Moderately hazardous	Harmful	Yellow	r	rHarmful
III	Slightly hazardous	Caution	Blue Green		Caution
Products unlikely to present a hazard in normal use					

TABLE 2
Definition of small quantities of pesticides, based on the WHO hazard classification of pesticides

WHO hazard class	Small quantity	Large quantity
Extremely hazardous (Ia)		
Highly hazardous (Ib)	< 2.5 kg/litre	> 2.5 kg/litre
Moderately hazardous (II)	< 10 kg/litre	> 10 kg/litre
Slightly hazardous (III)		
Less hazardous than Class III	< 25 kg/litre	> 25 kg/litre

5 FAO. 1996a.

6 WHO. 1998.

7 FAO. 1995c.

Solution options

Roles of national and local authorities

Pesticide management

Authorities should do all they can to develop the capacity for pesticide management and to ensure that products in the supply chain are approved and appropriate. Controls on pesticide distributors should be imposed and mechanisms developed for the management of empty pesticide containers, as well as of unused, unwanted and obsolete pesticides.

Reducing pesticide dependence

Pests, diseases and weeds in agriculture, public health and other situations can often be controlled without the use of synthetic chemical pesticides. Low external input methods, such as organic farming and integrated pest management (IPM) systems, have been very successful in eliminating or significantly reducing the use of pesticides in many countries and situations. Public education on the causes of pest problems and the simple hygiene that prevents them can also reduce reliance on pesticides.

Widespread implementation of low external input systems needs institutional support from government ministries, extension services, researchers and development agencies. Policies and activities that support low external input systems, including organic farming and IPM, can help to prevent the problems of pesticide-related waste as well as other health and environmental problems associated with pesticide use. National and local authorities should consider implementing policies and establishing mechanisms that support the widespread adoption of low external input production systems in agriculture and low external input pest management systems in non-agricultural situations.

Regulating pesticide suppliers and distributors

Pesticide suppliers and distributors are obliged to operate within the laws of the countries in which they trade. They are also required to adhere to international regulatory controls relating to pesticides. Many international organizations such as FAO, the Organisation for Economic Co-operation and Development (OECD), the World Bank and the European Commission have guidelines or codes of practice which pesticide manufacturers and distributors should follow. Pesticide companies that belong to trade organizations also have to follow the codes of practice of those organizations.

National and local authorities can enforce their own regulations, which may include appropriate elements of codes of practice and guidelines from other organizations. Regulations should ensure that pesticide suppliers and distributors follow practices that minimize the risk of their products causing harm. Licensing systems, for example, can help enforce regulations and maintain standards throughout the pesticide supply chain.

One of the main concerns of these guidelines is that pesticide suppliers and distributors be regulated to ensure that their products are sold, stored, used and disposed of in ways that minimize the generation of waste. Suppliers and distributors should also be required, or at least encouraged, to provide ways of dealing with any waste that is generated by, for example, providing reverse supply chains to collect empty containers and unused or unwanted pesticides.

Training pesticide users

National and local authorities should raise awareness among pesticide users of the hazards of pesticides; the importance of avoiding them as far as possible; and the correct handling, storage and use of pesticides when their use is unavoidable.

Extensive efforts have already been made in these areas. National authorities, international agencies and pesticide suppliers have implemented education and training programmes in many countries and regions. Nevertheless, in many parts of the world there is still a profound lack of understanding about the hazards that pesticides present and the ways in which these hazards can be mitigated.

People are more likely to stop generating pesticide wastes and misusing empty containers when they understand the hazards involved and how to avoid them. A wide range of media, including radio, newspapers, posters, direct verbal communication (from extension officers, for example) and formal training can be used to communicate the relevant information to pesticide end users. Publicity and education campaigns need to be repeated, so that information is not forgotten.

These campaigns should be directed towards anybody who buys pesticides, uses them and/or deals with pesticide waste and empty containers. Several different campaigns may be needed to reach all of the various groups and individuals involved. For example, in many communities women show greater concern for potential health problems than men. It may, therefore, be more effective to direct information and training to women because, even if they do not use pesticides themselves, they often pass the message on more effectively to those who do.

Information routes will also vary considerably. In some places, for instance, women rarely come into contact with agricultural extension officers, but meet health workers frequently. Or children, who may be more willing to accept warnings about their elders' uses of pesticides and may also have higher levels of literacy, can be taught in schools through reading material. Non-governmental organizations (NGOs) and farmers' organizations often work with communities that are not in regular contact with government authorities. Teachers, health workers, other community services and NGOs may, therefore, all be involved in programmes aimed at improving the health and safety profile of pesticides.

Collection schemes

National and local authorities can help with the disposal of farmers' and householders' pesticide-related waste by establishing infrastructures for the collection and appropriate management of small quantities of pesticides and contaminated materials.

In some countries widely publicized "amnesties", aimed at removing all existing waste materials, have encouraged the holders of pesticide waste to bring it to local collection points. Amnesties should be accompanied by training, education and publicity on how to prevent further accumulation of pesticide wastes. At the same time, systems that support this aim should be established. For example, arrangements can be made with pesticide distributors to take back empty containers and

unused pesticides.

When collection schemes are established, the authorities should ensure that collection points and interim storage facilities for waste are secure and present no hazard to the health of people or animals or to the environment. Everybody involved in operating a collection scheme should be trained in the handling of toxic materials and have access to adequate and appropriate safety and handling equipment. Waste materials should be transported only after they have been securely packed and only on vehicles that meet the specifications of the UN *Recommendations on the transport of dangerous goods*.⁸ Management or disposal of all the collected pesticide waste should be in keeping with the FAO guidelines on the disposal of bulk quantities of obsolete pesticides in developing countries.

Roles of suppliers

Pesticide suppliers include the manufacturers, importers, wholesalers and retailers of pesticides. They can do a great deal to prevent the problems associated with the disposal of waste pesticides and empty containers.

Everybody involved in the supply chain that delivers pesticides to end users has a responsibility to ensure that customers are well informed about, and protected from, the potential hazards of pesticides. Suppliers must, therefore, establish pesticide storage and sale practices and after-sales service that protect pesticide users, the general public and the environment, as detailed in the FAO *International code of conduct on the distribution and use of pesticides*.⁹

Most countries already have legislative and regulatory systems that control the manufacture, import, distribution and use of pesticides. Individuals or bodies who are involved in these functions as part of their commercial activities are required to adhere to national law. In many developing countries the regulatory systems controlling pesticides are less developed than they are in industrialized countries. The responsibility therefore, falls on pesticide suppliers and distributors to ensure that their products and activities comply with local and international law and best practice.

Some major pesticide manufacturers implement product stewardship programmes aimed at enforcing good practice throughout the life cycle of their products. Stewardship should extend to the use and final disposal of unused products, waste and containers. Suppliers should establish mechanisms that allow pesticide end users to dispose of pesticide-related waste safely.

Storing pesticides

When distributors store pesticides properly, containers are less likely to become damaged and the risk of chemicals leaking and contaminating other materials is greatly reduced. Good stock management helps to minimize the accumulation of obsolete pesticide stocks.

Pesticides held by distributors should always be stored in secure and appropriately constructed stores managed by trained personnel. Details on the safe storage and management of pesticide stocks are given in the FAO publications *Pesticide storage and stock control manual*¹⁰ and *Provisional guidelines on prevention of accumulation of obsolete pesticide stocks*.¹¹

Pesticide stores should be solidly constructed and secure, with good ventilation and impermeable floors that will contain chemical spills and the water used in fire-fighting. Inside the store, small containers of pesticide should be stored on shelves while larger drums and sacks are on pallets.

Stores should be appropriately equipped to deal with such emergencies as fire, leakage and poisoning.

Damaged containers and contaminated materials should be safely repackaged by persons trained in the handling of toxic materials and then removed immediately from the store. Pesticides in damaged containers should never be sold for use. Similarly, pesticides that have leaked from their original containers and been repackaged should not be sold for use but should be disposed of appropriately.

Container design

The design of pesticide containers must take into account all the specific requirements related to the safe handling of pesticides. Containers should be designed to allow safe storage, transport, preparation and use of the product, as well as rinsing and disposal of the empty container. The design of features such as the pouring orifice should allow for smooth flow of the contents and for complete emptying of the container; handles should not be integral with the container as this might create reservoirs of pesticide that are difficult to empty or rinse out.

In recent years, containers have been designed to limit operator exposure and allow efficient emptying and cleaning. However, many of them require the use of expensive and sophisticated pesticide application equipment which is not always available. In developing countries, technology, personal protective equipment and running water are often lacking and pesticide suppliers should supply products in containers that are appropriate for these conditions.

The use of soluble packaging completely eliminates the need for container disposal, but the soluble packs themselves must be contained in waterproof packaging to prevent accidental leakage of pesticides. Soluble packs must also be of an appropriately small size for farmers in the developing world to avoid the waste and other hazards that arise from the partial use of large packs.

Reusable packaging that is designed for return to the original suppliers must be robust enough to withstand local conditions of transport, storage and use. Containers should be designed to allow efficient emptying and rinsing so that they are as clean as possible when returned for reuse. They should be indelibly marked so that their use and contents are easily identifiable. Lids should be permanently attached to containers to limit contamination from the small amounts of pesticide that remain inside.

Selling pesticides in small quantities

Pesticide users often need only small amounts of chemicals to resolve their pest problems. Distributors should stock pesticides in original containers of a size appropriate to local needs. For example, if local farmers are likely to use only 1 litre of a product during a season, it would be inappropriate for distributors to stock and sell that product in 10- or 25-litre units.

Under no circumstances should pesticides be transferred from bulk containers to smaller ones for sale to the public. Pesticide vendors sometimes transfer products into plastic bags or bottles for sale in small quantities. The containers used may originally have been for drinks or medicines, and are generally not properly labelled. This practice is extremely dangerous because pesticide end users do not have such essential information as what hazards are associated with the product or the dose required for effective use. People may not realize that an unlabelled bottle or other container contains pesticide, and may unwittingly expose themselves to extreme hazards. The practice of decanting pesticides from their original containers into other containers is contrary to the FAO

international code of conduct on the distribution and use of pesticides.

Do not encourage overbuying and stocking of pesticides. Pesticide distributors should not encourage users to buy larger quantities of pesticides than they are likely to use in a season. Sales staff often encourage bulk buying by offering lower unit prices per litre or kilogram so that the turnover of products is faster for the distributor. Pesticide end users are thereby often left with products for which they have no valid use and this may result in inappropriate use of pesticides on crops or in situations for which they are not intended; overuse of pesticides; deterioration of products that have been stored for long periods; and damage to inappropriately stored containers.

Distributors should make a commitment to take back unused products from users who have been oversupplied (see below).

Do not sell pesticides that are inappropriate, out of date or close to their sell-by date. Farmers, householders and other pesticide end users often rely on retailers for advice about the best products for a particular purpose, and for guidance on how to use those products. It is therefore crucial that vendors are well informed about pesticides and that products are accompanied by labels and other informative material that users can understand.

Pesticide manufacturers should train retailers about which products are appropriate for particular pest problems and situations. Pesticides should only be sold for the purposes for which they are intended as indicated on the product label. For example, insecticides should not be sold for use as rodenticides, and insecticides for public health should not be used in agriculture.

Pesticides should be supplied in formulations that end users can apply effectively. For example, formulations designed for bulk application by aircraft or tractor-mounted sprayers are unlikely to be appropriate for small-scale farmers using knapsack sprayers, and wettable powders should not be sold for dry application.

Pesticide distributors and sales people should also take note of the date by which products should be used (the expiry date). When its expiry date has passed, a product should never be sold or supplied for use, even at a discounted price; its use could be dangerous. Products should not be supplied to retailers or end users within one season or six months (whichever is the shorter period) of their expiry date. The expiry date should always be clearly marked on the product package.

Take back empty containers and unused pesticides. End users of pesticides generally have neither the expertise nor the resources to dispose of empty pesticide containers and unused or unwanted pesticides safely. The burial or burning of waste are unacceptable practices because they can cause irreversible damage to human health and the environment (see Inappropriate disposal practices, p. 13).

Pesticide distributors should help users of their products to dispose safely of empty containers and pesticides that cannot be used. Collection and disposal systems can be developed in conjunction with national or regional authorities).

The following are some of the measures that provide pesticide users with safe and reliable systems for disposing of their pesticide-related wastes:

- Charging customers a deposit on pesticide containers (which would be reimbursed when empty, triple-rinsed containers were returned to the distributor) would help to discourage the market in empty containers that exists in many countries.
- Pesticide retailers should be provided with UN-approved containers (as specified in the

Recommendations on the transport of dangerous goods)¹² into which small quantities of obsolete and unwanted pesticides and related waste materials can be placed. Each individual waste item should be packed separately and sealed in a sturdy plastic bag to prevent the mixing of chemicals in the waste bin.

- Pesticide manufacturers and distributors should establish reverse supply chains to collect empty containers and bins of waste pesticides from retailers and transport them to sites where they can be appropriately managed.
- Information about facilities for the collection and disposal of pesticide-related waste should be well publicized to end users and should be included in training programmes, on promotional material and on product labels.
- All the waste materials and empty containers that are collected by distributors and their agents should be stored safely and securely to prevent access by unauthorized persons or by animals.
- Storage facilities should be designed to prevent materials from leaking or presenting any other risk to health or the environment.

Do not sell products that are unlabelled or labelled in a foreign language. The product label is generally the only means by which a pesticide can be clearly identified. Labels also provide crucial information on efficacy, dosage, modes and timing of use, hazards associated with the product and precautions that users should take. Pesticides without product labels should be disposed of because they may be inappropriately or dangerously used.

All pesticides supplied to end users should be clearly labelled in accordance with the FAO *International code of conduct on the distribution and use of pesticides*.¹³ Labels should be in a widely understood local language and should include pictograms that clearly identify product hazards, appropriate modes of storage and handling and other precautions that users should be aware of.

Products that have no label, have a damaged label or are labelled in a language other than the most commonly used local language should never be sold or supplied. This rule also applies to pesticides that have been decanted into containers other than those in which they were supplied.

Roles of users

Avoiding pesticide dependence

Pesticides are often used inappropriately in situations where simple hygiene or the forces of nature would be equally or more effective. Reliance on chemical pesticides derives from a lack of understanding of the causes of pest problems, misunderstanding of what pesticides can do, and lack of knowledge about alternative pest control methods.

Training and information programmes aimed at farmers and other pesticide users should promote the principles of IPM and make as much use as possible of non-chemical measures to keep pest populations below damaging levels. Alternative measures include cultural or environmental controls, physical barriers and the encouragement or introduction of natural enemies of pests.

Control measures are not always necessary, even when pests are present. A small pest population, for example, may cause only insignificant damage. When control is required, the emphasis should be on managing the pest population rather than eradicating it completely (which may, in any case,

be impossible). Chemical pesticides, when used, should be carefully selected and introduced in a way that minimizes adverse effects on people and the environment.

Programmes that raise awareness of the hazards of pesticides encourage users to treat pesticides with care, minimize their use, and manage them and their waste products cautiously.

If pesticide users are to change the ways in which they currently buy, use and dispose of pesticides, they need to have reliable information and advice and appropriate resources available to them. Information and resources should be provided by the government and industry.

Buying pesticides

Users should ensure that they buy only those pesticides that are appropriate for the purpose. The massive range of pesticides and commercial formulated products available makes it difficult for users to know which is the most suitable product for a particular pest problem.

Before buying or using pesticides, anybody affected by an outbreak of pests should seek independent advice about alternative ways of controlling it. Advice should also be sought about the most suitable pesticide products, should they be necessary. Independent advisers include agricultural extension officers, other growers and agricultural development organizations in the area. Additional sources of useful information include newspapers and magazines, radio programmes, reference books and the Internet, when they are available. When it has been decided that a chemical pesticide must be used, distributors should advise on the most suitable product for a given task.

The product selected should not only be effective against the pest but should also be of a formulation that is appropriate to the type of application equipment used by the buyer. For example, a small-scale farmer with a knapsack sprayer should not buy a formulation intended for bulk application from crop-dusting aircraft or tractor-mounted sprayers.

Products should be bought only when they are in their original, sealed containers. Containers that are damaged or appear to have been opened previously should not be bought. Nor should pesticides that have been transferred from the containers in which they were supplied by the manufacturer or importer into any other container. Pesticides are often repacked for situations and in regions where end users require only small quantities and original containers are too large. The transfer of pesticides into empty drink bottles, small plastic bags, empty cans or containers from other pesticide products is particularly dangerous since the pesticides cannot be properly identified and may be mistaken for other items such as beverages. This has caused many cases of poisoning, particularly of children. In addition, decanted products lack the hazard information and instructions for use that appear on product labels and are, therefore, likely to be misused.

Users should only buy pesticides in containers that have an original and complete product label attached. The label should be in a local language and be clearly legible. Pesticide users should always read the product label because it includes a great deal of useful and important information. Pesticide buyers or users who cannot understand the label should seek help from someone they know and trust. The label should include information about:

- the content and formulation of the product;
- its potential hazards and associated safety information;
- complete instructions for use of the product.

Labels should be designed and printed in accordance with FAO's *Guidelines on good labelling practice for pesticides*.¹⁴ End users of pesticides are unlikely to know about the FAO labelling guidelines, so if the label does not contain the information listed above, or is incomprehensible to the user, the product should not be purchased.

Pesticides should be bought in quantities that can be used within a few weeks at most. In general, only as much product as is needed for a given pest control task should be purchased so that users do not have to store significant quantities of unused pesticides. Buyers should resist pressure from pesticide vendors to buy larger quantities than are needed, even if cost reductions are offered. They should also negotiate the return of empty containers and unused pesticides to the distributor.

The provision of free pesticides is a dangerous activity and should be prevented by regulation and good trading practices. Offers of free pesticides should be treated with caution and accepted only if the products provide an appropriate solution to an existing pest problem. Pesticides that are intended for use on major crops such as cotton or coffee are often offered for use on other crops such as vegetables, or for the control of domestic pests. Such offers should not be accepted since the use of pesticides in situations for which they are not intended can be dangerous and has been known to lead to poisoning through toxic food residues. Free pesticides should only be accepted if unused quantities can be returned.

Storing pesticides

Owners and end users of pesticides have a responsibility to store them safely so that they do not cause harm. Badly stored pesticides are likely to deteriorate and become unusable or obsolete. The following conditions should be adhered to when pesticides are stored in homes or on farms:

- Pesticides should be kept in a secure place to which children, animals or unauthorized people do not have access.
- They should not be stored in living or sleeping quarters.
- They should be kept separately from all food, including animal feed, and away from water and water supplies.
- They should be kept dry and out of direct sunlight.
- They should be kept away from naked flames, e.g. fires or lamps.
- Storage places should be well ventilated.
- Pesticides should never be transferred into containers other than those in which they were supplied.
- Older products held in store should always be used before newly purchased products. Use-by dates on products should be strictly observed.

Empty containers

When a container of pesticide is finished, it should be cleaned out as completely as possible. For liquid (e.g. emulsifiable concentrate) or solid (e.g. wettable powder) formulations that are diluted before application, containers should be triple-rinsed and the washings used as part of the product dilutant. Containers for dry application products should be emptied as completely as possible.

Washed and emptied containers that the pesticide supplier does not intend to reuse should be punctured or otherwise rendered unusable for any other purpose. Even apparently empty containers contain pesticide residues that cannot be completely removed and they must, therefore, never be

used for any purpose other than storage of the pesticides that they originally contained.

In many countries, empty pesticide containers are highly valued and often sold or exchanged as storage containers for other materials such as fuel, chemicals and even food or water. Such practices are dangerous and should be prevented, for example, by puncturing any empty pesticide containers that cannot be returned to the supplier.

Empty pesticide containers should not be burned or buried. Suppliers and distributors, product labels and even national authorities often recommend these practices, but they are potentially extremely hazardous to human and animal health and the environment. Safe, hazard-free burning techniques require a good understanding of pesticide chemistry while safe pesticide burial requires knowledge of local hydrology as well as of the environmental behaviour of pesticides. Many end users of pesticides do not have such knowledge or cannot apply it to their particular circumstances. It is, therefore, strongly recommended that the burying or burning of pesticide-related waste and empty containers be discouraged rather than, as happens at present, encouraged.

Whenever possible, empty pesticide containers should be returned to the distributor or taken to an approved collection scheme. If no facilities exist for the return or safe disposal of empty pesticide containers and unwanted or unusable pesticides, end users should lobby pesticide distributors, local authorities and agricultural advisers to establish schemes. The aim should be to remove potentially hazardous waste pesticides and empty containers from users and pass them on to competent authorities who have the resources to deal with them safely.

Unwanted pesticides

Unidentified or unusable pesticides should not be kept or used for any purpose. Neither should pesticides that are out of date or stored in damaged containers. Materials such as shelving, soil, clothing or cleaning materials that have been contaminated with pesticides should be disposed of safely through an approved scheme.

Pesticide-related waste should not be buried, burned or dumped. Advice should be sought from pesticide suppliers or local and government authorities. Only approved collection schemes should be used to dispose of waste pesticides, empty containers and contaminated materials. If no such scheme exists, pesticide distributors and local authorities should be encouraged to establish one.

8 UN. 1995.

9 FAO. 1990.

10 FAO. 1996b.

11 FAO. 1995a.

12 UN. 1995.1

13 FAO. 1990

14. 1995c

Solving existing problems

Reuse

Products that can be positively identified, are still in usable condition, are within their expiry date and have an appropriate use should be used as instructed on the label. Owners of pesticides that meet these criteria but who, for any reason, cannot use them themselves could transfer them to people who can use them. Such transfers should, ideally, be carried out through a reputable pesticide supplier who is able to identify the product and its most appropriate uses. When reuse prevents pesticides from becoming obsolete or being disposed of inappropriately it is of benefit.

Inappropriate disposal practices

The burial of pesticide-related waste is not an appropriate option. Buried pesticides can leak from their containers into the surrounding soil and spread to contaminate large areas. Leaking pesticides can leach into water to contaminate underground aquifers, rivers, lakes and even the sea. Pesticides in water can damage or destroy aquatic life and affect people and livestock if the water is used for drinking, irrigation or washing. When pesticides and their containers are continually buried on the same site, the area can become severely contaminated and unusable. Conversely, if pesticide-related wastes are buried in several different sites, a far larger land area could eventually become contaminated.

The burning of waste pesticides, empty containers and contaminated materials is another inappropriate practice. When burned, many pesticides release highly toxic fumes that can harm the people and animals who inhale or come into contact with them. Many of the materials from which pesticide containers are made also release toxic fumes when burned. Pesticides burned in open fires often leave toxic residues as a result of incomplete combustion. Burning on open fires or in stoves is therefore not a recommended option for the destruction of pesticide-related waste and empty containers.

Another unacceptable disposal method is the dumping of waste pesticides, empty containers and contaminated materials in landfills or other general waste collection sites. Most waste disposal sites are not designed to prevent toxic materials from leaking into the ground under them or being washed out by rain into water bodies. Pesticides, their containers and contaminated materials need to be treated as toxic waste. They should only be disposed of in approved and appropriately constructed and maintained toxic waste disposal sites. Access to such sites should normally be available only to specialist toxic waste disposal contractors or the relevant national authorities.

Pesticides should never be poured down drains or emptied into rivers, streams, lakes, drainage channels or any other water body. Even a few millilitres of pesticide can kill fish and other aquatic organisms and contaminate very large volumes of drinking- or irrigation water. Removing pesticides from water is an extremely expensive and complex task and in some cases is not possible.

Appropriate disposal practices

Most pesticide users are not equipped to dispose of pesticides and related waste materials safely and should not, therefore, be expected to do so. The stewardship of pesticide products that manufacturers and distributors of pesticides are expected to provide under the FAO international code of conduct on the distribution and use of pesticides should include the provision of facilities that allow pesticide users to dispose of empty containers and pesticide-related waste materials safely.

Such facilities could include the suggestions made in the section on taking back empty containers and unwanted pesticides on pages 10-11 and could be developed in conjunction with national or local authorities, which also have an important role to play in the management of toxic waste and the minimization of hazards from pesticide waste.

In many developing countries, national and local authorities have only limited resources to develop toxic waste collection schemes and facilities for the management of bulk quantities of toxic waste. It is, therefore, imperative that pesticide suppliers and their distribution networks be involved in the development and implementation of solutions.

A fundamental principle of these guidelines is that no attempts should be made to treat or dispose of obsolete pesticides and pesticide wastes at the end-user level. These products should always be removed and dealt with as bulk quantities of obsolete pesticides in keeping with the FAO provisional technical guidelines on the disposal of bulk quantities of obsolete pesticides in developing countries.

Reproducible advice to farmers and other pesticide users

The following section contains material based on simple graphic images and easily translatable text advising pesticide users on how to avoid waste problems and on what actions they should take to deal with the problem when it arises. It also includes clear advice on actions that should not be taken by pesticide users when dealing with pesticide waste. This material can be photocopied or duplicated in any way that is convenient for distribution to farmers and other pesticide users. It can also be adapted to suit the needs of local communities.

[1. Only buy and use pesticides if you must.](#)

[Ask advice about pest management](#)

[2a. No damaged/repackaged containers or missing labels.](#)

[Buy original whole undamaged product](#)

[2b. No decanting pesticides into other containers](#)

[2c. No decanting pesticides into other containers](#)

[3. Only buy as much pesticide as you need](#)

[4a. Store pesticides securely](#)

[4b. Do not store pesticides next to/near food](#)

[4c. No eating food near pesticides](#)

[4d. Children should not be allowed to play with or have any contact with pesticides](#)

[5. Read label and follow directions](#)

[6. Return unused/unknown products to supplier](#)

[7a. No water in empty containers](#)

[7b. No fuel in empty containers](#)

[7c. No food in empty containers](#)

[8a. No burying](#)

[8b. No burning](#)

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