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ACKNOWLEDGEMENTS

Baseline study on the problem of obsolete pesticide stocks was written by Mark Davis on behalf of the Organisation for Economic Co-operation and Development (OECD) Pesticides Working Group, FAO Obsolete Pesticides Project, United Nations Environment Programme (UNEP) Chemicals and the Secretariat of the Basel Convention (SIB), in August 2000.

Abbreviations

CIDA	Canadian International Development Agency
CIS	Commonwealth of Independent States
DAC	Development Assistance Committee (OECD)
DANIDA	Danish International Development Agency
DDT	Dichlorodiphenyltrichloroethane
DFID	Department for International Development (United Kingdom)
DGIS	Directorate General for International Cooperation (Netherlands)
DNOC	Dinitro-o-cresol
EC	European Community
ECA	Economic Community of Africa
EMPRES	Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases
EU	European UnioN
FAO	Food and Agriculture Organization of the United Nations
FINIDA	Finnish Development Agency
GCPF	Global Crop Protection Federation
GEF	Global Environment Facility
GTZ	German Agency for Technical Cooperation
HCB	Hexachlorobenzene
IFCS	Intergovernmental Forum on Chemical Safety
IGO	Intergovernmental organization
ILO	International Labour Organization
IOMC	Inter-Organization Programme for the Sound Management of Chemicals

IPEN	International POPs Elimination Network
IPM	Integrated pest management
MSDS	Material safety data sheets
NGO	Non-governmental organization
NORAD	Norwegian Agency for Development Cooperation
OAU	Organization of African Unity
OECD	Organisation for Economic Co-operation and Development
PAN	Pesticide Action Network
PCB	Polychlorinated biphenyl
POP	Persistent organic pollutant
RENPAP	Regional Network on Safe Pesticide Production and Information for Asia and the Pacific
SBC	Secretariat of the Basel Convention
SIDA	Swedish International Development Agency
SPREP	South Pacific Regional Environment Programme
ULV	Ultra-low volume
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
UNITAR	United Nations Institute for Training and Research
USAID	United States Agency for International Development
USEPA	United States Environmental Protection Agency
WHO	World Health Organization

Introduction

Large stockpiles of obsolete pesticides have been accumulated in virtually all developing countries over periods sometimes extending back for more than four decades. The accumulation of these stocks results from a variety of causes that will be described in more detail later in this report. Current estimates suggest that up to 500 000 tonnes of obsolete pesticides are held in countries not belonging to the Organisation for Economic Co-operation and Development (OECD). The condition of these pesticides varies from extremely good, potentially usable products, to unidentifiable mounds of mixed products and heavily contaminated soils into which pesticides have leaked from their containers.

The common feature binding these stocks of obsolete pesticides, regardless of their condition or location, is the serious threat that they pose to health and the environment while they remain inadequately managed. Although the most acute hazards are close to the stockpiles, many of the products can be transported through the global environment to contaminate ecological zones and organisms far away.

The scale and nature of the obsolete pesticides problem demand that urgent action be taken to remove the stockpiles and prevent their recurrence. Such action is technically complex and costly and requires the support of the international community.

This baseline study provides an overview of the current global situation in relation to obsolete pesticides and reviews the perspective of the various organizations with an interest in the issue. It has been prepared as the basis for a collaborative plan of action to be carried out by the interagency working group on obsolete pesticide stocks. The interagency group includes the United Nations Environment Programme (UNEP) Chemicals Programme, the UNEP Secretariat for the Basel Convention, the Food and Agriculture Organization of the United Nations (FAO) Programme for Prevention and Disposal of Obsolete Pesticide Stocks, the World Health Organization (WHO) Programme for Chemical Safety, and the OECD Pesticide Programme. The study was also provided as background for the OECD-FAO-UNEP Workshop on Obsolete Pesticide Stocks (September 2000, United States) and the Inter-Organization Programme for the Sound Management of Chemicals (IOMC) meeting in Brazil in October 2000.

SCOPE OF THE STUDY

There are a number of similarities between the ways in which obsolete pesticides are or should be managed, and the management of other hazardous materials such as industrial chemicals, chemical weapons and clinical waste. However, the problem of obsolete pesticides is unique in many respects, for example, in the reasons for accumulation, the location of stockpiles and the way in which pesticides are provided and used. The scope of this study is

therefore limited to cover only obsolete pesticides and not stocks of industrial chemicals, weapons or other materials.

Reference to obsolete pesticides for the purposes of this study includes all pesticide products not in current use because they have been banned, have deteriorated or are damaged, have passed their expiry date, cannot be used for any other reason or are not wanted by the current owner. Some obsolete pesticides may be in use despite their legal or physical/chemical status, and these are included as obsolete where appropriate. Similarly, some pesticides classed as obsolete by their owners may be deemed usable in terms of their physical, chemical and biological properties.

These products are also classed as obsolete and in need of action which may include transfer of ownership for use elsewhere.

Chapter 1

Overview of the situation

ESTIMATED SIZE AND GEOGRAPHICAL DISTRIBUTION OF OBSOLETE PESTICIDE STOCKS

Quantification of obsolete pesticide stocks is difficult because of the wide distribution of pesticides and the remote location of many of the storage points. Nevertheless, it is widely accepted that inventories that include details of obsolete pesticide identities, quantities, condition, location and source are an essential prerequisite to any remedial action.

FAO has been foremost in the completion of inventories with a comprehensive programme of data-gathering covering Africa and the Near East. Inventories have now been completed for 53 countries in these regions and identify a total of more than 47 000 tonnes of obsolete pesticides. The FAO programme was expanded to Latin America in 1998 where 33 countries were invited to carry out inventories; five have been submitted to date. In these five countries 1 895 tonnes of obsolete pesticides have been identified. FAO is also currently expanding its programme to Asia where 21 countries will be invited to participate commencing in early 2001 (A. Wodageneh, pers. comm., 2000).

Experience gained from the FAO programme demonstrates clearly that data gathered through this process are indicative of the situation but not conclusive. In countries where disposal operations have taken place, more detailed inventories completed for shipment and destruction purposes generally identify much larger quantities of obsolete pesticides than the initial inventory, sometimes increasing totals by up to 50 percent.

In the Commonwealth of Independent States (CIS), where most countries are not FAO members, work to complete inventories of obsolete pesticides and persistent organic pollutants (POPs) has been supported by UNEP Chemicals, following the format developed by FAO. Elsewhere in Eastern Europe there is little coordination of work on obsolete pesticides matters. No inventory data have been published yet for these regions, but early indications suggest that very large stockpiles exist. Apochryphal reports suggest that about 70 000-100 000 tonnes of obsolete pesticides are held in these countries (UNEP, 1999e).

A number of additional bilateral programmes are supporting completion of obsolete pesticide inventories in some countries either as a stand-alone activity or as part of a wider programme. Examples include a Netherlands-funded programme in Pakistan being carried out by the German Agency for Technical Cooperation (GTZ) that has so far identified 917 tonnes of obsolete pesticides in 133 stores in Punjab. An additional 30-40 stores remain to be surveyed. According to W. Schimpf of GTZ (pers. comm., 2000) 317 tonnes from 13 stores will be disposed of shortly. Other programmes are a Danish-funded programme in five Eastern European countries for which no results are available (L. Lauritzen, pers. comm., 2000); a self-financed programme in Poland that has identified 60 000 tonnes (see paper by Stobiecki et al., for the 5th International HCH and Pesticides Forum, 1998); a World Bank/Finland-supported programme in Nicaragua; and a South Pacific Regional Environment Programme (SPREP) programme in a number of Pacific countries that has identified 63 tonnes of obsolete pesticides, of which 10 tonnes are dichlorodiphenyl-trichloroethane (DDT) (B. Graham, SPREP, pers. comm., 2000).

Accounting for the paucity of data from many regions and individual countries, estimates based on existing inventories and previous experience would indicate that virtually all developing countries and economies in transition hold obsolete pesticides stockpiles. Countries that previously operated centralized supply mechanisms tend to have larger stockpiles, often reaching tens of thousands of tonnes. In total it could be estimated that global obsolete pesticides stockpiles in developing countries and economies in transition amount to something in the order of 400 000-500 000 tonnes.

DESCRIPTION OF PESTICIDE STOCKS

Nature of pesticide stocks

No pesticide type or chemical group is excluded from obsolete pesticide stockpiles. Although some stockpiles have been accumulating over periods as long as 40 years, new products are being added to the stockpiles continuously. Among the major contributors to obsolescence are product age and poor storage. Since these are continuous processes, products that remain unused beyond their expiry date and products that are poorly stored will become obsolete.

Ironically, some of the oldest pesticides are still usable for significantly longer periods than most newer pesticides. Products such as the organochlorine insecticides

(aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene [HCB], mirex and toxaphene) remain active for many years. However, it is precisely this

property that has led to the widespread banning of these chemicals and their inclusion in the list of POPs whose discontinued production and use are currently being negotiated under the proposed POPs Convention.

The table in Annex I lists POPs pesticides that have been identified in existing

inventories separately. Where the entry for POPs is lacking or zero this may signify that POPs have not been identified rather than their absence. Nevertheless, existing data indicate that more than 20 percent of obsolete pesticide stockpiles consist of POPs pesticides. This is without doubt a factor of age since the majority of these products have been banned or restricted in the majority of countries for several years.

The next most important group of chemicals represented among obsolete stocks is probably the organophosphate insecticides. These were developed as less persistent alternatives to the organochlorines. Over the years the high toxicity of these products to humans has led to their replacement by synthetic pyrethroids in many industrialized countries. These are less toxic to mammals, and consequently safer for humans to use. However, synthetic pyrethroids are more expensive than organophosphates and in developing countries organophosphates remain in widespread use.

Organophosphates have a more limited shelf-life than organochlorines and can become physically and chemically altered with time. Therefore many organophosphates supplied in the 1980s and early to mid-1990s are now obsolete. Products more than two years old also need to be analytically tested to determine whether they remain viable for use. Until such testing is carried out, these products are classified as obsolete.

Other pesticide types included in obsolete stockpiles include carbamate and synthetic pyrethroid insecticides, the various fungicide and herbicide groups, and even some botanical and microbial products. Organometallic compounds, such as arsenic, mercury and tin-based chemicals are included in some inventories. Many of these have been banned for several years and are likely to be more than 30 years old.

Some inventories also include veterinary products, many of which are pesticides. However, many are also pharmaceuticals, which are categorized differently.

The FAO inventory for Africa and the Near East (FAO, 1999c) also includes many entries listed as unknown. These represent approximately 7 percent of entries numerically, which include unlabelled products or unpackaged mixed products.

In addition to chemicals, obsolete stockpiles include contaminated equipment such as knapsack sprayers, empty pesticide containers and significant quantities of heavily contaminated soil where the contents of damaged containers have leaked out.

Condition of pesticide stocks

The condition of obsolete pesticide stockpiles varies from securely contained, well stored products that can still be used in the field (subject to analysis), to products that have entirely leaked from corroded or otherwise damaged containers into the surrounding environment.

Storage conditions can contribute significantly to product deterioration. In many instances products are stored in the open where they are exposed to great temperature fluctuations and other damaging conditions, which accelerate the deterioration of the pesticides as well as their containers. However, even where physical storage conditions are good, the length of storage and the nature of the products have resulted in container corrosion and product leakage. This is particularly prominent where organophosphate insecticides, which are acidic, have been stored for prolonged periods in steel drums that have corroded.

It is often difficult to ascertain the ownership of old stockpiles as a result of changes in ownership and in the status of organizations or the disappearance of owners. For example, state enterprises that have since been privatized, or organizations that no longer exist, do not retain responsibility for previously accumulated stockpiles of obsolete pesticides. In such cases stocks have become neglected and even basic storage conditions are not maintained. This results in more rapid deterioration and severe environmental contamination. The absence of secure storage in such situations also frequently leads to vandalism, theft of products and access by children and livestock who are exposed to the pesticides and contribute to wider environmental dispersal.

There are also many examples of inappropriate action being taken in the past to resolve obsolete pesticide problems. The most common and lasting example is burial of pesticides. In some cases buried pesticides are known to have leaked into surrounding soil, and sometimes into adjacent groundwater sources. In other cases entombment of the pesticides in concrete prevents easy access and monitoring of the condition of the stockpiles. However, burial or entombment is never considered to be a long-term solution because leakage is inevitable. Examples where burial or entombment has taken place and will require remedial action include Chad, Colombia, Poland, Senegal and Yemen.

Location of pesticide stocks

There is virtually no developing country or economy in transition that does not have a

stockpile of obsolete pesticides. Even countries that claimed to have no obsolete pesticides when the FAO inventory gathering process began are now admitting to holding significant stocks.

Obsolete pesticide stocks are distributed widely in countries where they exist. The largest stocks may be localized in a few stores from which pesticides are distributed around the country, but these stores are usually properly managed. In remote regions the quantities of

pesticides in each place may be smaller, but they are also more likely to be poorly stored and handled because of a lack of training and resources.

In most developing countries subsistence agriculture occupies the majority of people and land. Disease vectors, such as malaria-transmitting mosquitos, know no geographical boundaries and affect even the most remote communities. In many countries, provision of pesticides, along with other agricultural inputs and medical supplies, is seen as an integral component of development programmes. There are therefore no limits to the geographical dispersal of pesticides. This is evident in Ethiopia, for example, where 420 stores containing obsolete pesticides have been identified throughout the country, and more are being found while a detailed inventory is being compiled. This situation is common in other countries.

The location of new pesticide stores is now subject to detailed guidelines such as those produced by FAO (FAO, 1996a). These guidelines are based on previous experience and past errors. Many obsolete pesticide stockpiles have been held in the same stores for decades, and these stores were constructed and sited without the benefit of guidelines or experience. As a result many are poorly constructed or positioned.

Agriculture tends to take place near water sources, be they natural or artificial irrigation schemes. Many stores are therefore now sited close to water. In an effort to protect and secure pesticides, rural dwellers may have built stores using traditional methods. The materials used, such as mud and straw with earth floors, are unable to contain spilled pesticides and generally absorb the chemicals. Many such stores now need to be demolished and the materials from which they were constructed should

be disposed of as hazardous material because of the chemicals they have absorbed In the past, pesticide stores were constructed away from residential areas which, in most cases, have expanded with population growth and urbanization surrounding the sites of pesticide stores. It is therefore common to find pesticide stores containing obsolete stocks in densely populated areas. Frequently people and their livestock are found to be living near a pesticide store, edible crops growing on contaminated land, and contaminated water used for drinking and irrigation.

ORIGIN OF PESTICIDE STOCKS

Producers

The major pesticide manufacturers are based in Europe, the United States and Japan. Most of these companies are represented by the Global Crop Protection Federation (GCPF) and henceforth in this report will be referred to as GCPF companies. A significant proportion of obsolete products originated from GCPF companies and their obsolescence has come about as a result of age, poor storage and poor handling. The proportion of obsolete stocks derived from GCPF companies varies among regions. In the CIS for example, very little is from GCPF producers, but in Latin America and some parts of Africa and Asia the proportion is high. The

causes of obsolescence and accumulation are discussed in more detail under Causes of accumulation, on p. 6.

Pesticides that were produced in the CIS, Eastern Europe and other countries previously aligned to the former Soviet Union are still commonly found among obsolete stockpiles.

In recent years formulators and producers of "generic" (off patent) pesticides have multiplied and expanded, particularly in China and India, but also in other Asian and some Latin American countries. Generic pesticides are still produced and sold by GCPF companies in much larger quantities than those sold by developing-country- based non-GCPF manufacturers. The products distributed from these generic manufacturers tend to be based on older technology (e.g. organochlorine and organophosphate insecticides) and the products are often reported to be of low quality. Nevertheless they are frequently purchased in developing countries because they are cheaper than products sold by GCPF companies. These generic products are increasingly appearing in obsolete stockpiles.

A number of developing countries now have pesticide formulation plants where technical active ingredients are formulated and packaged for local marketing. These plants tend to be able to gear their production and marketing strategies, including details such as appropriate package sizes, to local market demands quite precisely. It is therefore unusual to find locally formulated products among obsolete stocks.

Buyers

The bodies responsible for the procurement of pesticides that have accumulated as obsolete stocks are diverse and numerous, but can be grouped into four categories:

National agencies. These include government departments (primarily agriculture and health); crop production boards (e.g. cotton, coffee, etc.); nationalized agricultural input supply agencies; and local authorities, state farms, etc.

Multilateral agencies and intergovernmental organizations. The World Bank, the European Commission, regional development banks, United Nations organizations (in particular FAO and WHO) and specific projects such as the FAO Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES).

Bilateral agencies. These primarily include development assistance agencies from industrialized countries supporting southern countries. Examples include the United States Agency for International Development (USAID), the United Kingdom Department for International Development (DFID), the Netherlands Directorate General for International Cooperation (DGIS), the Danish International Development Agency (DANIDA), the Swedish International Develop-ment Cooperation Agency (SIDA) and the Canadian International Development Agency (CIDA).

Private sector. The distribution of pesticides in developing countries is increasingly conducted by private companies that import, distribute and sell pesticides locally. In many developing countries certain key sectors, such as major export crops and

health, remain under state control so that the private sector supplies pesticides only to smallholder farmers and domestic users.

CAUSES OF ACCUMULATION

The FAO Obsolete Pesticides Programme has defined six key factors that lead to the accumulation of obsolete pesticides in developing countries (FAO, 1995b). These are:

- product bans;
- inadequate storage and poor stock management;
- unsuitable products or packaging;
- donation or purchase in excess of requirements;
- lack of coordination between donor agencies;
- commercial interests of private sector and hidden factors.

Much of the following explanation of these factors is derived specifically from Chapter 2 of the FAO document cited above (FAO, 1995b), which describes the causes of accumulation comprehensively. That information is updated and supplemented with new material in this report.

Banning of products

In many countries, where a range of products has been banned or withdrawn for health or environmental reasons, the fate of existing stocks is given scarce consideration. Stocks remain where they are stored and eventually deteriorate. This applies particularly to organochlorine compounds that are part of strategic stocks for locust control. A common example is the occurrence of dieldrin stocks in many African countries where migratory locusts cause problems. Dieldrin was banned from use in donor-supported locust control programmes in the late 1970s, but no provision was made for the depletion or removal of existing stocks. These have been stored since then, awaiting an appropriate solution. In some cases the pesticides have leaked from damaged containers and elsewhere they have been used illegally.

Inadequate storage and poor stock management

Insufficient storage capacity for pesticides. The authorities responsible for pesticide stocks often do not have sufficient storage capacity to store all their pesticides safely. Many stores are poorly constructed, have insufficient ventilation, are too hot and/or do not have concrete floors. Because of space constraints, pesticides are often not properly stacked, thereby reducing access to products and making it difficult to monitor the condition of containers. In many places, pesticides are stored in the open for prolonged periods. Poor storage conditions accelerate the degradation of pesticides and their containers. New products are sometimes stored inappropriately because obsolete products are occupying the limited storage space.

Inappropriate storage conditions. Some pesticides require specific storage conditions because of their physical-chemical properties. For example, solid formulations should be

separated from liquids; corrosive agents should be kept away from metal containers; and oxidizing agents should be stored separately from flammable and combustible products. Advice and information on these matters are available from product labels, material safety data sheets (MSDS) and published guidelines. However, rural storekeepers in developing countries rarely, if ever, have access to such material and are unlikely to be trained in its interpretation. It is unlikely that existing storage facilities will allow such requirements to be accommodated. It is therefore common to find products inappropriately stored. This adds to the risk of damage to products and containers and acceleration of product deterioration.

Staff not trained in stock management. Storekeepers of major stores and those responsible for national stocks are often unfamiliar with the rules of good stock management (proper stacking, product segregation, principle of "first in - first out", etc.). Leakage and spills may not be cleaned up immediately because staff have not been trained in how to handle them, or because the necessary materials and protective equipment are unavailable. Contamination and improper stacking may affect the condition of other products and may impede the application of good stock management. Stock records may not be regularly updated and communicated to the central authority responsible for establishing the country's pesticide requirements, which in turn leads to over- or underordering of pesticides in subsequent seasons.

Poor distribution systems. Delays in processing imported pesticides and poor stock management at the first point of storage and distribution in a country can result in long delays before products reach their point of use. In many cases, products only reach their final destination shortly before or even after their date of expiry. Storekeepers and plant protection officers in remote areas may not be aware of this issue because of a lack of training or absence of information on product labels. Even where officials are aware of product expiry they are reluctant to turn away scarce and expensive supplies since no alternatives are available.

Inappropriate handling during transport. Drums and other packaging materials are often damaged through rough handling or in transport. When drums are battered, their inner and outer coatings may be damaged, which will accelerate corrosion and shorten their life. Unnecessarily long periods of exposure to direct sun during transit are another important factor that affects both the container and its contents.

Unavailability of analytical facilities. Because laboratory facilities for pesticide quality control are not available in most developing countries, it may be difficult to determine whether a pesticide can still be used after its indicated shelf-life has expired. Inadequate labelling and the absence of a date of manufacture/release on labels or on the container may complicate the matter. For this reason, there is often an understandable tendency to deviate from the principle of "first in - first out" and to use a newer product to be certain of its effectiveness; however, this practice leads to prolonged storage of older products.

Unsuitable products and packaging

Products that have been donated or procured are sometimes unsuitable for their intended use and will therefore remain in store and deteriorate. It should be noted that all the causes of

obsolescence covered under this heading are addressed in the International Code of Conduct on the Distribution and Use of Pesticides (amended version) of 1990. Governments, procuring agencies and industry should be following this Code of Conduct, yet the evidence indicates that this is not so in many countries.

Inappropriate active ingredient or formulation. Examples of cases where products have been considered unsuitable include the following:

> The active ingredient of a product was not evaluated in the recipient country and field trials were required before it could be approved for use. This took time and the product started to deteriorate.
> The product was not effective against the target pest or against the weed it was supposed to destroy, or it had unacceptable side-effects (e.g. it appeared to have phytotoxic effects on the crop itself).
> The formulation was not stable under tropical conditions and the product rapidly degraded.
> The formulation could not be used with locally available application equipment (e.g. ultra-low volume [ULV] formulation for use by small-scale farmers who only have knapsack-sprayers).

Impractical package size or poor container quality. Bulk quantities of pesticides are commonly supplied in 200-litre metal drums of liquid formulations or 25-kg, or larger, sacks of powder. For countries without good repackaging facilities this may create problems if the pesticides are intended for use by plant protection staff, extension staff or small-scale farmers. In order to transfer the contents of large drums into smaller packages, large quantities of small empty containers, a pump, labels, etc. are needed. These are often not available, or are insufficient, at the repackaging location. Consequently, pesticides may remain unused, or improvised measures may be taken that are dangerous to handlers or users.

Pesticides are sometimes delivered in containers of poor durability that soon start to leak. Once drums have corroded or leak, they can no longer be transported, which makes it considerably more difficult to use their contents. The same applies to torn bags and other damaged packaging.

If the container quality is not specified in tender documents, bidders may be tempted to reduce their price by compromising on the quality of containers.

Missing or incomplete labels. In some cases, pesticides are not used because the end user does not know the specifications of the product, or how to apply it, since labels are missing or incomplete, are illegible (as a result of rain, sunlight, leakage) or are in a language alien to the user.

Insufficient communication between aid agency and recipient country. In some cases, the quantity, active ingredient, formulation or packaging of donated pesticides is inappropriate for the intended use. Such mistakes generally occur because of a lack of detailed specifications in requests for pesticide donations and/or a lack of background information and justification. Developing countries are not the only ones responsible for this communication

gap. Aid agencies can also be guilty of failing to obtain such information before processing requests for pesticide donations. This failure can be due to: insufficient communication with officials who are well informed about the country's pesticide needs, failure to request detailed information on the quantity of pesticides needed, or failure to evaluate pesticide orders placed by recipient countries.

The Japanese "KR2"agricultural aid programme, in particular, has been criticized for providing excessive quantities of pesticides and pesticides that the recipients already have in store. In this case, problems of communication are partly to blame.

Lack of product stewardship by donors and suppliers. Release of pesticides from customs and their transportation to point of use can be extremely slow in developing countries. Donors and suppliers of pesticides do not always take responsibility for ensuring that donated pesticides, or pesticides bought with agricultural development funds, are dealt with properly and efficiently in the recipient country. This continues to be a problem in Ethiopia, where pesticides provided by the Japanese KR2 programme sometimes arrive at stores in remote locations after or very close to their expiry date, and new supplies have been ordered while the current disposal operation is taking place. Similarly, European Community (EC)-donated pesticides delivered to Rwanda in 1995 were poorly stored (despite being held within the EC compound in Kigali), and have as a result been seriously damaged and are now contaminating the environment.

Fraudulent practices of unreliable suppliers. It has been recorded that pesticides banned in one country have been supplied to another without the recipient country understanding that the products were obsolete before receipt. Elsewhere, in order to keep costs as low as possible, suppliers of pesticides have purchased substandard products to meet contract specifications that did not adequately define product quality standards. There are examples of consignments being left unused because an unreliable supplier adulterated the product to increase profits and it was no longer suitable for the intended purpose.

This kind of practice is inevitable in a market where money can be made. Only strict tendering procedures, tight specifications and stringent quality monitoring can prevent such practices. Unfortunately donors do not always employ these practices strictly enough and developing countries do not have the resources to do so.

Donations or purchases in excess of requirements

Inaccurate assessment of requirements. An assessment of pesticides needs is generally based on approximate estimates of the area to be treated. Insufficient consideration is often given to the actual agro-ecological conditions (e.g. variations in intensity of pest outbreaks, economic thresholds) and to factors that may limit the use of pesticides, such as the local application capacity (availability of spraying equipment, protective clothing and trained staff), storage facilities and the effectiveness of distribution systems. The ability of the envisaged users to pay for the product is another factor that is sometimes overlooked. In addition, there is a tendency to overestimate requirements in order to avoid shortages.

Centralized and up-to-date information on existing in-country stocks is sometimes not readily available or is incomplete, which complicates the assessment of additional requirements. In this case, the national authority responsible for the assessment of the country's yearly requirement of pesticides may not rely on these stocks and will keep them out of the equation when drawing up a list of products to be procured or requested from donors.

Lower than expected pest incidence. The extent of an expected pest outbreak is sometimes difficult to forecast. A lower pest incidence than expected may result in unused pesticide stocks. In the past, this was particularly true for outbreaks or invasions of migratory pests such as locusts. Countries that established large strategic pesticide stocks in preparation for possible upsurges or invasions often ended up with large quantities of unused products. Decentralizing such stocks further increased the risk.

The maintenance of strategic pesticide stocks in readiness for possible locust outbreaks is a strategy that continues in most countries affected by locusts. This strategy is endorsed by FAO and continues to be supported by some donors such as the EC and Japan. There appears to be a general lack of confidence in strategies that do not rely on strategic pesticide stocks. As a result, proposals including rapid mobilization of pesticides to deal with pest outbreaks and rotation of strategic stocks have not been tried.

FAO also coordinates activities to monitor and control migratory pests and, in particular, desert locusts. In this context monitoring efforts help to focus control efforts geographically and in time and thereby reduce the volumes of pesticides applied. Nevertheless the foundation of locust control programmes is still based on chemical pesticides, and affected countries continue to hold strategic pesticide stocks that have been, and continue to be, a major contributor to obsolete stockpiles. For example, Morocco currently has the largest stockpile of obsolete pesticides in Africa, which is almost entirely the result of strategic stocks of locust control pesticides. The Moroccan authorities and FAO defend continuation of this strategy despite the accumulation of obsolete stocks.

Other strategies have been proposed, including rapid mobilization of pesticides from producers, rotation of stocks, biological control agents and zero control. There has been little progress with any of these options other than recent FAO approval of the biological control agent Green Muscle, based on the fungal pathogen *Metarhiziium anisopliae.*

Overstocking of products with a short shelf-life. Most currently used pesticides have a two-year shelf-life. Tropical conditions characterized by excessive heat, high humidity and/or strong fluctuations in temperature may reduce this already short life span. During medium- or longer-term storage periods, these products degrade and become unusable. Overstocking of such products is a common cause of pesticides becoming obsolete.

Excessive donations. Aid agencies have sometimes provided pesticide donations far in excess of requirements. In several cases this has involved products manufactured in the home country of the aid agency or funding government (see the section on The cost of obsolete pesticide stocks, on p. 12).

Under some agricultural input supply programmes lasting a number of years, the provision of pesticides is automatic until notice is given to stop. This system, which depends on feedback, does not always work effectively. In some cases, it has led to an accumulation of pesticides when demand dropped and supply was not adjusted.

Examples are known of unsolicited pesticide donations, where pesticides were offered to a developing country by a donor country having excessive or unwanted pesticides. Since developing countries may be concerned that refusing a gift could be considered undiplomatic, or may believe the gift to be useful, these donations were accepted but in some cases were never used and were simply added to obsolete pesticide stockpiles.

See the section on Insufficient communication between aid agency and recipient country, on p. 8.

Removal of subsidies. Many countries are reducing or removing subsidies from pesticides. The rationale behind the adjustment of pricing policies is both technical and economic. Direct and indirect subsidies on pesticides are not desirable because they stimulate overuse and over-reliance on pesticides and frustrate the introduction of integrated pest management (IPM) or other sustainable production systems.

Moreover, structural adjustment programmes require the removal of subsidies from agricultural inputs so that market forces will determine the extent of pesticide use.

This often causes a sudden drop in demand for pesticides because farmers can no longer afford them. As a result, stocks may remain in store longer than planned and are at increased risk of becoming obsolete.

Inadequate coordination among and within aid agencies

Poor coordination among aid agencies. Insufficient coordination among aid agencies providing pesticides, especially for locust and other migratory pest control operations, has been a major factor in causing excess donations of pesticides. Recipient governments do not usually have any guarantee that the required pesticides will be provided by the donor agency first contacted. In emergency situations, this may lead to simultaneous requests for assistance being made to several agencies, with the hope that at least one will react in time. In the end, the requested amount may be received from more than one donor. Given this undesirable situation, FAO is actively seeking to enhance donor coordination in emergency situations, at both the international level and the national level in recipient countries.

Administrative procedures within aid agencies. Slow processing of requests for pesticides in some cases has meant that the pesticides have arrived too late. Project or programme funds are often allocated for spending within a certain period. Consequently, timing for the procurement of pesticides is sometimes determined by budgetary factors, rather than by actual requirements. This means that recipient countries may be pressed to accept pesticide supplies on a "now or never" basis, which in many cases conflicts with the principle of providing pesticides only when they are actually needed.

Several aid agencies have not yet assigned responsibility for the appraisal and processing of requests for pesticides to a specific technical office within the agency.

Instead, the country desk concerned processes such requests. There may be little coordination among country desks, or between country desks, technical departments and procurement departments. Without a specifically designated technical office to appraise requests for pesticides, it may be difficult to build up an institutional memory to avoid repetition of mistakes.

Commercial interests and hidden factors

Pesticide manufacturers, distributors and traders commonly find themselves in situations of conflicting interest. On the one hand they seek to promote and sell their own pesticides, and on the other are asked for advice on pest control strategies. This frequently occurs where extension services are under-resourced and overstretched and farmers are desperate for advice. The information given by pesticide companies is free, while crop consultants and agronomists charge for their advice.

Agrochemical companies, or their local agents, often take the initiative in advising plant protection services and other large-scale users on their pesticide requirements. Sometimes such advice forms the basis for requests to donors. However, assessments may be in excess of actual requirements. Moreover, the recommended product may not necessarily be the most appropriate for reasons such as those outlined in the section on Unsuitable products and packaging, on p. 7.

Large sums of money are involved in pesticide supplies. As a result, a variety of hidden interests may play a role in decisions concerning pesticide procurement or donations. Often these interests are not strictly related to the best technical solution to pest problems. Companies may use a range of aggressive marketing methods that result in procurement of quantities in excess of actual requirements, or of low- quality or otherwise inappropriate products. Some individuals involved in pesticide procurement may have personal financial interests.

Donor countries may place increased emphasis on the supply of pesticides because of the spin-off for the national pesticide industry, thereby increasing the risk of donations being supply- rather than demand-driven.

Supply-driven donations of pesticides are more likely to become obsolete because their nature and quantity are not necessarily linked to actual needs in the recipient country but may be based solely on what is available from the donor. Tied aid may restrict the range from which products can be selected because the producers in the donor country may not make the most appropriate products for conditions in the recipient country.

Such hidden factors often complicate a sound technical approach to pest and pesticide management and should be identified and addressed in policy decisions.

PROBLEMS RESULTING FROM PESTICIDE STOCKS

Storage and handling of pesticides, even when products are in good condition, present significant hazards to those working with the pesticides, the public at large and the environment. Adherence to good practice guidelines such as those produced by FAO and GCPF can minimize risks by eliminating exposure, or reducing it to a minimum.

In the case of obsolete pesticide stocks, the hazards are greater, and the control of personal or environmental exposure can be much more difficult. As a result, the risks to health and the environment are greater and, unfortunately, in many cases are realized.

The poor condition and inappropriate location of many obsolete pesticide stockpiles are described in the section on Description of pesticide stocks, on p. 3. The problems arising from these conditions are summarized in the following sections.

Persistent organic pollutants

The effects of POPs on health and the environment range from acute toxicity to intergenerational endocrine disrupting effects. POPs are bioaccumulative and once in the environment cannot be removed. POPs are also transported by climatic and environmental processes over long distances. They tend to move from warmer climate regions, where most obsolete pesticide stockpiles are held, to colder climates, even as far as the poles where they accumulate in the fatty tissues of humans and wildlife at the top of food chains.

Extensive monitoring of POPs' body burdens, effects on health and movement in the environment is being carried out in Canada, northern Europe and the United States.

Little or no work has been carried out in the tropics where POP insecticides have been extensively used and now form a significant proportion of obsolete pesticide stockpiles. The POP insecticide DDT also continues to be stored and used in several tropical countries for the control of malaria vectors.

Product deterioration

As pesticides decompose they form by-products, many of which have toxic properties. Some by-products of decomposition are more toxic than the original poison. While little information is available to storekeepers and users on the hazards of pesticides in developing countries, virtually none is available on the breakdown products of stored pesticides. Once this process of decomposition begins, the products are effectively unidentified and need to be handled as such. The assumption needs to be made that all unidentified products belong to the highest hazard category for the purposes of handling, transport and disposal.

In the process of decomposition, pesticides can change their physical state, liquids crystallize to solids or solids liquefy. Many pesticide decomposition processes form gases where the volume is greater than the original product. This can lead to high pressure being generated in the containers, which sometimes explode, or the contents shoot out when opened. This can make handling more difficult and can significantly alter the behaviour of the chemicals in the environment.

Open or damaged containers

The most obvious consequence of open or damaged containers is spillage of the contents. The released pesticides find their way into surface waters as a result of runoff; into groundwater as a result of leaching through soil; and into soil on which they have been spilled. They can thus contaminate other materials.

Where pesticides are stored in the open, people who happen to be working, living, passing by or playing in the vicinity will be exposed to them and may suffer acute or chronic health effects. There are many examples of children playing, livestock grazing, people working, cooking, drawing water and growing food around dumped and leaking pesticides.

Product identification

Where there are obsolete pesticide stocks it is common to find containers from the original pesticide suppliers that were unlabelled when supplied; products that have been transferred from their original, leaking containers into new, unlabelled containers; illegible labels; labels in foreign languages; and labels lacking basic information. In all such cases the products must be assumed to belong to the most hazardous class of products and need to be managed as such.

Movement of obsolete pesticides

Obsolete pesticide stocks may be in poor condition and might be contaminating the environment and harming health. However, the movement of these products without appropriate safeguards can aggravate the situation.

The Table below summarizes the types of exposure presented by existing stocks of obsolete pesticides and describes the potential compounding effects of moving these pesticides without appropriate precautions.

THE COST OF OBSOLETE PESTICIDE STOCKS

Quantification of the externalities of pesticide use is difficult and complex. In general terms such an analysis must include the cost of obsolete stock creation, management and disposal. Without attempting to put actual prices on these externalities, the following paragraphs identify the factors that should be included in considering the cost of obsolete pesticide stocks.

Purchase of original pesticide stocks

Capital costs are invested in the procurement of pesticides, which subsequently became obsolete. There is the "opportunity cost", i.e. the funds spent on the pesticides were unavailable for other purposes. Since the pesticides were not used, the investment was clearly wasted and could undoubtedly have been more effectively used in other ways.

Transport and storage

Proper transportation of pesticides in accordance with international law (for transboundary and marine transport) and best practice is more costly than transportation of unregulated goods. These methods were probably applied in bringing the pesticides to their ultimate destination and, again, these high shipping costs were wasted since the pesticides were not used.

Ironically, in many cases, it is the inefficiency of the pesticide distribution system that has led to pesticides becoming obsolete even before, or very soon after, they arrive at their ultimate destination because their expiry date has passed.

Pesticide storage incurs costs. In many cases donor or government money has been invested in the construction of new pesticide stores to accommodate stocks, which then became obsolete. Obsolete pesticides taking up storage space in scarce stores have sometimes led to new pesticide stocks being stored inappropriately elsewhere, for example, outside. This in turn accelerates the deterioration of new pesticides and may render them obsolete before they are used.

Replacement costs

Obsolescence as a result of unsuitability of the product or its packaging (see the section on Unsuitable products and packaging) means not only that the investment in purchase, transportation and storage of the original pesticides was wasted, but that the pest problem, for which the pesticides were intended, had to be solved by other means, incurring costs, if indeed the problem was solved at all.

On the assumption that obsolete pesticides were purchased to deal with a pest problem, they need to be replaced with other control tools or pesticides. There are clearly costs associated with this.

Problems resulting from obsolete stocks and their movement

Current environmental hazard from obsolete pesticide stocks	Potential compounding effects of movement
Leakage of pesticides to soil and dispersal in soil through capillary action and soil microfauna	Movement and transfer of pesticides from one container to another could generate additional leakage and increase the area contaminated
Leaching of pesticides to groundwater through contaminated soil	Disturbance of pesticides and their movement could increase the area contaminated and cause additional leaching to groundwater sources beneath the contaminated area. Exposure of pesticides during periods of
Surface water contamination by surface runoff, wind dispersal or animal transport. For example, stores sitting on floodplains, which periodically	Disturbance of pesticides could cause additional pesticides to enter surface water through surface runoff or air movement. Exposure of pesticides during periods of rainfall could increase surface water contamination
Dispersal of pesticides by air through volatilization or wind dispersal of pesticide dusts or pesticide-contaminated soil particles	Additional exposure of pesticides to air during repackaging processes could lead to increases in volatilization and wind dispersal. Exposure of pesticides during periods of intense solar radiation, high temperatures or high winds could increase contamination
Contamination of vegetation through uptake of pesticides in soil and surface contamination of plants. Contaminated vegetation may be crop plants, food sources for people, livestock or wildlife	Increased release of pesticides to air, water and soil during their movement could result in additional exposure of vegetation to pesticides and, hence, additional contamination
Direct or indirect toxic effects on the human population, livestock and wildlife resulting from exposure to pesticides that have been released into the environment. Pesticides that can also enter the food chain and contaminate several organisms The toxic effects of exposure could be short-term and acute, or long-term and chronic	Additional releases of pesticides to the environment could result from their disturbance and movement thereby increasing the potential for organisms to be exposed to pesticides
Looting and pilfering of obsolete stocks leading to banned, dangerous and unidentified pesticides to be used	Possible increased vulnerability of stocks being moved. Greater numbers of people employed on clean-up projects having access to the stocks, with the risk of removal of chemicals for use or sale
Acts of war may result in additional dispersal of stocks when storage areas are attacked or damaged inadvertently	If pesticides are being repackaged and moved during a time of conflict, dispersal may be increased
Explosion and fires may occur spontaneously in stores where there are decomposing pesticides. Fires starting elsewhere and spreading may also damage stores	Movement, mixing and opening of containers may result in explosions or fires
Natural disasters such as hurricanes and floods can lead to widespread dispersal of stored pesticides	If pesticides are being repackaged and moved during a time of natural disaster, dispersal may be increased

Deterrence of development of alternatives to pesticides

The existence of pesticide stocks and the investment made in their procurement often act as a deterrent to investment in research and development or procurement of pest management

techniques or materials that may be more sustainable and cost-effective than synthetic chemical pesticides.

There is an assumption among many donors and national authorities that chemical pesticides form the mainstay of pest control strategies and that other systems such as IPM, integrated vector management (IVM), traditional indigenous methods and organic agriculture are unproven, unscientific or unreliable. This is increasingly demonstrated to be untrue based on actual experience and research. In fact, reliance on chemical pesticides has been shown to be unsustainable economically and environmentally, especially in relation to pest management where pest resistance and resurgence often result.

The existence of obsolete pesticide stocks is often seen as an unfortunate but unavoidable consequence of pesticide use rather than an unacceptable cost and barrier to the effective development and implementation of alternatives.

Health and environmental effects

Poor storage and leakage of obsolete pesticides result in greater human exposure and environmental contamination than would normally be the case. Clearly there are heavy costs associated with people becoming ill as a result of exposure. Chronic illness, reproductive problems and birth deformities bear high long-term costs for individuals and communities. Environmental contamination is prohibitively expensive to remedy. In some cases the technical resources do not exist even if money were available. Where contamination is carried beyond national boundaries, the costs arising from the resulting health and environmental consequences are extremely high.

Barriers to development

A major theme of the current development efforts directed by many multilateral and bilateral development agencies is the alleviation of poverty and sustainable development. Neither of these fundamental goals is fully achievable where obsolete pesticide stocks exist. As long as these chemicals continue to contaminate water sources, agricultural land and air, the basic needs of poor communities cannot be effectively provided.

Drilling wells in contaminated aquifers and constructing irrigation schemes on contaminated lakes and rivers are bad practices. Cultivating food crops or grazing livestock on contaminated land are also unacceptable.

Measures, therefore, need to be taken at the start of sustainable development programmes to remove obsolete pesticides stockpiles in order to prevent further contamination and to demonstrate that these stockpiles are unacceptable in the context of sustainable development.

Disposal costs

Disposal of obsolete pesticides currently costs between $3 and $5 per kilogram or litre of pesticide or contaminated material. The cost varies with the location, condition and type of waste and the methods used for its destruction. On the basis of global estimates totalling 250 000 tonnes of obsolete pesticides, about $1.25 billion would be needed to destroy all stocks.

WHY THE SITUATION IS DIFFICULT TO RESOLVE

Technology

Obsolete pesticides are classed as hazardous waste. Extensive training and sophisticated safety and handling equipment are needed to deal with obsolete pesticides safely and adequately. In industrialized countries entire industries are built on the removal, transport and disposal of hazardous waste, whereas in developing countries little expertise and few appropriate facilities exist for its management. The problem is compounded by inadequate infrastructure, the wide dispersal of obsolete stocks and their deteriorated condition, as described in the sections on Estimated size and geographical distribution of obsolete pesticide stocks, and Description of pesticide stocks, on p. 3.

The options available for the management or destruction of obsolete pesticides in a safe and environmentally acceptable manner are extremely limited. They are described in some detail in the FAO provisional guidelines on the disposal of bulk quantities of obsolete pesticides (FAO, 1996b). The technical, economic and political complexities are discussed in several papers by Greenpeace and the United Kingdom Pesticide Action Network (PAN) (Greenpeace International, 1998; UNEP, 1999e). Briefly the technology options are:

- *High temperature incineration.* This includes dedicated hazardous waste incinerators, adapted cement kilns, and mobile units.
- *Chemical treatment.*
- *Engineered landfill.*
- *Long-term controlled storage.*
- *Reuse/reformulation.*
- *New technology.* Various technologies under development, or newly commercialized, can deal with hazardous materials using variations on the above-mentioned methods, or other physical, chemical or biological processes. None have been tested in developing countries. Most have limitations that would preclude their use for the destruction of obsolete pesticide stocks.

A small pilot study coordinated by a coalition of non-governmental organizations (NGOs) and intergovernmental organizations (IGOs) funded by the Global Environment Facility (GEF), supported by UNDP and implemented by the United Nations Industrial Development Organization (UNIDO) is about to commence trial use of a new non-incineration technology for the destruction of hazardous materials in developing countries (J. Weinberg, pers. comm., 2000). This may lead to the development of viable options for future use.

In the majority of cases where obsolete pesticides from developing countries have been destroyed, they have been repackaged and shipped to Europe for incineration in a dedicated hazardous waste facility. This route is currently viewed as the only available and viable option by FAO, which is the lead organization on obsolete pesticides.

Funding

The removal and destruction of obsolete pesticides is expensive. Developing countries do not have the necessary resources and are therefore dependent on external funding. Donors

are often reluctant to fund such activities because they are not considered to contribute to development (see the section on Barriers to development).

Many donors base their funding programmes on long-term development programmes that are negotiated in advance. There is generally little or no capacity for rapid mobilization of funds for purposes other than emergency aid.

Developing countries often choose not to prioritize their obsolete pesticides problem for development assistance for fear of diverting development money away from other projects. It is therefore not built into development programmes in advance and funding is not allocated for solutions.

The majority of donor funding to support obsolete pesticides disposal has come from donor agencies that were not responsible for supplying large quantities of pesticides. In many cases the donors of pesticides that are now obsolete can be identified, but these donors have not generally contributed to disposal efforts.

The international community could put pressure on donors whose donated pesticides have become obsolete to maintain their responsibility for these products and fund their disposal.

The private sector is another potential source of funding. GCPF has made a commitment to provide support for the disposal of obsolete pesticides that are attributable to its member companies. Generally this commitment translates to payment of the destruction costs which amount to approximately 25-30 percent of the total disposal cost. In some cases GCPF companies have paid all the removal and destruction costs for some chemicals, but in others no contribution has been made. There are ongoing efforts to standardize the process of industry participation in disposal projects.

Private funding sources, such as foundations or industry other than pesticide manufacturers, have not been approached, and pesticide manufacturers, other than GCPF companies, make no contribution to disposal.

Awareness

A lack of awareness of the scale and significance of obsolete pesticide problems results in the inability to prioritize action on the part of governments and donors. This is reflected in action plans developed with the assistance of the United Nations Institute for Training and Research (UNITAR) that do not prioritize obsolete pesticides, and helps explain why there are relatively few requests to donors for assistance in implementing solutions.

Awareness-raising may need to be redirected to national focal points responsible for developing plans of action on chemical management and to those responsible for development funding.

Technical capacity

Little or no technical capacity exists in developing countries for the handling and safe disposal of obsolete pesticides. Experience of this type of work in developing countries is also limited to a few companies in industrialized countries. Existing companies can handle the current small scale of disposal work. In fact, there is overcapacity and some companies

are struggling to maintain viable businesses. Disposal prices are low as a result of supply exceeding demand.

Should the scope of disposal work for obsolete pesticides and POPs increase significantly, it may be that a lack of expertise and technical capacity will be generated and prices may rise as a result of demand exceeding supply.

This could be an argument in support of development of expertise in developing countries for the handling and management of hazardous chemical waste. For example, the establishment of roving field teams trained and equipped to repackage waste and clean contaminated sites in preparation for international shipment and disposal.

Difficulty in preventing new stocks

Lack of alternatives to chemical pesticides. Agricultural production and health protection systems that rely solely on intensive chemical inputs, such as those developed and promoted in the 1960s and 1970s, are widely acknowledged by IGOs, development agencies and donors as being economically and environmentally unsustainable. Current emphasis is on development of an integrated approach using a range of tools to control pests, of which chemical pesticides may form a component. One outcome of such an approach is a reduced reliance on chemical pesticides.

IPM and IVM systems are slower to implement than chemical control regimes since the systems are relatively complex and require institutional support, practitioners to be trained and, in many cases, research. There is no pre-existing distribution infrastructure for IPM and IVM techniques such as exists for pesticide supply.

In certain situations pesticides are seen as the control methods that are most effective and/or cheapest and are therefore often used in preference to non-chemical options. This is particularly common in migratory pest and disease vector control.

Farmers, extension officers and health officials also lack confidence in non-chemical pest management techniques that have not been successfully demonstrated in their countries. They therefore commonly resort to chemical use despite such problems with pesticides as pest resistance and resurgence, health and environmental problems, cost and externalities. These problems are often well researched and documented in the developed countries but not in developing ones. Evidence of these problems is not readily available to advisers and users of pesticides in developing countries, and proven alternatives to pesticides are often unavailable.

Although alternatives to chemical pesticides exist, support is needed for research and implementation to increase confidence in their effectiveness and their availability.

Aid systems. Tied aid on the part of donors often requires the purchase of specific products. Agricultural production and pest management using IPM or similar systems need investment in training and research rather than procurement of products. Tied aid is therefore a disincentive for use of alternatives to pesticides.

Pesticides continue to be supplied to developing countries under conditions that have led to obsolescence, and may continue to do so. Bulk supplies, large containers, inappropriate formulations, slow distribution and poor storage conditions all contribute to obsolescence.

Not all donors and development organizations are sufficiently aware of obsolete pesticides and other problems associated with pesticide use in developing countries. Awareness-raising programmes should be directed to these organizations.

There continues to be a lack of coordination among donor and development agencies and within some of the larger organizations. Pesticide donations are sometimes made in contradiction of policies supporting IPM or other sustainable development programmes. Examples include the EC where food security units supply pesticides and pesticides are procured for locust control, while the EC development directorate promotes IPM.

There is an expectation from donors that countries receiving aid for the disposal of obsolete pesticide stocks will take steps to ensure that future accumulation of obsolete pesticides will be prevented. Such steps can include agricultural policies supporting IPM, regulation of pesticides, tightening of import controls, improved storage and distribution and other similar measures.

These prevention measures can easily be undermined in many countries because they are new, unproven and hence fragile. When such countries are offered grants to buy agricultural inputs with an encouragement to spend some of the grant on pesticides, it is possible that pesticides will be bought in excess of actual needs and stockpiles will accumulate and possibly become obsolete.

Pesticide distribution. Pesticide distribution in developing countries is often slow and inefficient. Import controls and pesticide regulation are also often inadequate, mainly as a result of lack of resources. There is commonly lack of coordination between government departments and agencies responsible for pesticide ordering and supply, and corruption sometimes influences decisions.

Pesticide companies may be making efforts to improve pesticide distribution and product stewardship, but progress is slow. Pesticides are often sold inappropriately and there are few controls. For example, products are smuggled across borders to avoid taxes or because they are cheaper, and then sold with foreign language labels; traders sell products for use on crops for which they are not approved; expiry dates on labels are commonly ignored; excessive quantities of pesticides are sold, sometimes on the basis of advice to use excessive dose rates.

Pesticides provided to developing countries are increasingly supplied from others where controls are less stringent than those originating from GCPF companies.

The result of these and other examples of malpractice and lax controls is inefficient and excessive pesticide distribution which, in part, results in the continued accumulation of obsolete stocks

Chapter 2

Current activities to deal with existing pesticide stocks

ACTIONS TAKEN BY INTERGOVERNMENTAL ORGANIZATIONS

IOMC

IOMC is designed to be a cooperative undertaking among IGOs. Within the framework of their respective constitutional mandates, IGOs work together as partners to promote international work in the environmentally sound management of chemicals. The participating organizations are UNEP, the International Labour Organization (ILO), FAO, WHO, UNIDO, UNITAR and OECD.

The mandate of IOMC is coordination, with the scientific and technical work carried out through the existing structures of the participating organizations, either individually or jointly. As such, the activities and interests of IOMC member organizations described below are reflected in the work programme of IOMC. One result has been the creation of a subgroup concerned with obsolete pesticide issues, which commissioned this baseline study. IOMC has no activities of its own, but plays an important role in coordinating the activities of its constituent organizations.

IFCS

The Intergovernmental Forum on Chemical Safety (IFCS) discussed the issue of obsolete pesticides and chemicals at the Third Inter-Sessional Group meeting in Yokohama in December 1998 (ISG3). As a result, addressing obsolete chemicals was identified as one of 17 priority areas for discussion at the Forum III meeting in Brazil in October 2000. The document identifying these priorities states (IFCS, 2000):

"The identification, neutralization, and safe disposal of obsolete stocks of pesticides and other chemicals (especially polychlorinated biphenyl [PCB]) must be urgently facilitated particularly in developing countries and countries with economies in transition. As well, future stockpiling of other obsolete pesticides and chemicals must be prevented. With respect to the final disposition of chemicals, the Forum and IOMC organizations should promote the use of less polluting and safer technologies.

By 2004, IOMC Participating Organizations should have established relevant action plans for all regions, and at least two countries in each region should have commenced implementation of their National Plan with respect to disposal (New recommendation - Forum II, ISG-3)."

It therefore falls to IOMC members to support the implementation of these modest targets.

FAO

FAO, through its Obsolete Pesticides Programme, is acknowledged as the lead organization in matters related to the prevention and disposal of obsolete pesticide stocks in developing countries. The project has been running since 1994 and has been funded primarily by the Netherlands, with additional support from UNEP Chemicals for Latin American country inventories and from Japan for Asian country inventories.

FAO-led activities on obsolete pesticides include:

- organizing and running workshops and consultation meetings to raise awareness and generate action on obsolete pesticides in affected countries and regions;
- publishing guidelines on prevention and management of obsolete pesticides (see FAO publications in Annex II, on p. 35);
- initiating and coordinating completion of national inventories of obsolete pesticide stockpiles;
- initiating and formulating disposal projects for FAO member countries;
- supervision, monitoring and follow-up of disposal and prevention operations in the field;
- public outreach to raise awareness of the problems of obsolete pesticides globally.

In addition, FAO has initiated the formation of a tripartite facility on obsolete pesticides which brings together FAO, representing the international community; GCPF, representing industry; and PAN-UK, representing NGOs. This group discusses barriers to progress and attempts to stimulate action on obsolete pesticides through the members' respective constituencies. FAO is also a key participant in the IOMC coordinating group on obsolete pesticides.

In the broader context of plant protection, FAO published and is in the process of updating the International Code of Conduct on the Distribution and Use of Pesticides. Many of the causes of accumulation of obsolete pesticides can be directly attributed to non-compliance with articles of the Code of Conduct. The updated version will address the issues of prevention and disposal of obsolete pesticides directly in several articles.

FAO also promotes IPM as the most acceptable form of pest management in agriculture through its own programmes and as a partner in the Global IPM Facility, which is based at FAO headquarters in Rome.

FAO also hosts the joint UNEP/FAO Secretariat of the Rotterdam Convention on Prior Informed Consent. Compliance with this convention will help prevent unwanted pesticides arriving in developing countries. It will also reduce trade in the older, more hazardous pesticides that make up a high proportion of obsolete pesticide stockpiles.

UNEP Chemicals

Currently the main focus of UNEP Chemicals activities is the negotiation process leading to the POPs Convention, and activities relating to the implementation of requirements included in the draft Convention. Seventy-five percent of POPs chemicals are pesticides, and between 20 and 30 percent of quantified obsolete pesticide stockpiles are POPs. There is therefore significant overlap and interest in obsolete pesticides.

Principal activities relating to obsolete pesticides are:

- financial support for FAO's work in Latin America;
- inventory-taking in accordance with the FAO-defined format in the Russian Federation;
- awareness-raising with regard to obsolete pesticides in the framework of the POPs negotiation process;
- partnership in the Secretariat of the Rotterdam Convention;
- participation in the IOMC coordinating group on obsolete pesticides.

UNEP Chemicals has also been instructed by IOMC/IFCS to look at stockpiles of chemicals other than pesticides and PCBs. Such stockpiles may not be designated as hazardous waste, but may be industrial by-products, unwanted chemicals or pure chemicals for use in industrial processes. Their management may have implications with regard to the management of obsolete pesticides.

In addressing POPs and other chemical management, UNEP is exploring possible funding sources that may also support obsolete pesticide management.

On the technical front, UNEP is investigating chemical destruction technologies and has compiled a list of existing PCB destruction facilities. UNEP is also compiling information on possible alternatives to POPs. Where these are pesticides, UNEP is assisting the lead organizations: FAO for agricultural pesticides; WHO for health pesticides.

UNEP recognizes that the POPs Convention places the responsibility of dealing with POPs stockpiles and sources, and of finding replacements for existing POPs uses, at the country level. It is also intended that the convention will generate resources to support these activities. At the same time, while these areas of activity are a priority for UNEP Chemicals, the organization recognizes that its own priorities cannot be imposed on countries, which must be left to decide their own priorities for action. This stance closely mirrors that of UNITAR (see the section on UNITAR, on p. 20).

OECD

The OECD Pesticides Working Group is the key meeting-point of pesticide regulators in OECD countries. As such the group generates guidance, policy and creates opportunities for information and experience-sharing on matters relating to pesticide regulation.

The group discussed the issue of obsolete pesticide stockpiles at its meeting in November 1998. It became clear that some OECD countries had obsolete pesticide problems of their own, notably Poland; other OECD countries were supporting activities to prevent and dispose of stockpiles in developing countries; but many others were unaware of the problem. As a result of this, the United States Environmental Protection Agency (USEPA) hosted a meeting on obsolete pesticides in September 2000.

The OECD Development Assistance Committee (DAC) provides a forum for OECD countries to discuss matters relating to the scope and nature of their development contributions and policies. In this context DAC's Working Party on the Environment has produced a series of guidelines on aid and the environment (OECD, 1995). A section in these guidelines addresses obsolete pesticides and their disposal, and makes recommendations for recipient countries and aid agencies.

WHO

The health sector is a major user of pesticides. This fact is often overlooked in awareness-raising and processes related to the better management of pesticides. WHO proposes that national health authorities always be included in training and awareness-raising exercises dealing with obsolete pesticides. WHO acknowledges that it should work on awareness-raising with national health authorities, and that FAO should maintain the lead on obsolete pesticide inventory-taking and further action.

WHO is aware that DDT, one of the POP pesticides and a common feature of many obsolete pesticides stockpiles, is still used in many developing countries for the control of malaria vector mosquitos. WHO is leading efforts in the search for alternatives to DDT through its DDT Working Group, and the effective control of malaria through the Roll Back Malaria Programme. In the meantime, there is concern that sources of new DDT are limited and there is often no information on whether the new DDT meets WHO standards. However, WHO also wishes to prevent the transfer of DDT from obsolete pesticide stockpiles to active use in the health sector, without the most stringent controls, and to prevent long-term reliance on DDT in the health sector. The DDT working group has been advised to liaise with the pesticide industry and its representative organizations with regard to ongoing, high-quality DDT supplies while they continue to be needed. The Secretariat of the Basel Convention is concerned that DDT, which may be designated as waste, is being traded and transported between developing countries without adequate compliance with the requirements of the Basel Convention.

Destruction technology for obsolete pesticides, POPs and other hazardous materials is also of concern to WHO, partly because incinerators generate dioxins and furans, which harm health, and partly because the health sector generates hazardous clinical waste requiring disposal. According to WHO, dioxin levels in developing regions such as Africa are currently low. It is desirable that they remain so and, therefore, WHO is not advocating widespread installation of incinerators that might produce more dioxins. While it is preferable that waste be dealt with close to its source, WHO accepts that the lack of adequate facilities in developing countries means that waste needs to be exported for destruction in industrialized countries.

UNIDO

UNIDO has no activities specifically supporting prevention and disposal of obsolete pesticides. However, it does provide technical support for activities related to chemical production and use, and hazardous waste management in developing countries.

UNIDO will be the executing agency for the GEF-funded programme to demonstrate non-combustion technology for the destruction of POPs in developing countries. The project has been developed in collaboration with NGOs and will provide an important boost for technologies that might provide a solution to obsolete pesticide and POP destruction in developing countries. The scope of this project has been scaled down from the four to six countries that piloted the destruction of hazardous wastes, to two countries where only PCBs will be destroyed. Nevertheless, the piloting of non-incineration destruction technology in developing countries is an important precedent.

UNIDO supports hazardous waste management in developing countries, and has recently recruited an expert in this field. The thrust of UNIDO's approach is to minimize the production

of waste by applying clean production methods and better controls. Where waste exists or continues to be generated, reuse and recycling are promoted. UNIDO advocates waste treatment close to the source, where possible.

UNIDO is wary of advocating the use of any specific technology for waste destruction. Most existing technologies, such as incineration or landfill, are seen as potentially polluting or temporary solutions. Its programmes are therefore based on waste minimization and there is hope that the non-combustion technologies may offer a solution.

As a technical agency, UNIDO does not finance programmes but can help countries that are prioritizing environmental and waste management issues to develop proposals for integrated packages to raise donor funds. A number of integrated pollution control programmes are being implemented. These will inventory waste sources, produce a manual of best practices and train authorities. These programmes primarily focus on industrial waste streams, but need not exclude pesticides.

To promote cleaner and safer pesticide production, UNIDO has supported the creation of the Regional Network on Safe Pesticide Production and Information for Asia and the Pacific (RENPAP). This network with its training, research and development activities could play an important role in prevention of future obsolete pesticide accumulation.

UNIDO is also supporting the production of botanical pesticides such as neem, which has the potential to generate income and replace imported chemical pesticides in marginal areas. Biopesticide production is also promoted, as are the development and use of safer pesticide application technology.

UNIDO has also created a network of clean production centres in collaboration with UNEP in 19 countries worldwide. These provide local technical advice on clean production issues. Since the advice provided by individual centres is not centrally coordinated or linked to a central policy, it is possible that local advice could contradict central policy. A current example relating specifically to pesticides is local UNIDO support for a pesticide formulation plant in Ethiopia producing endosulfan, which is a highly toxic organochlorine insecticide.

UNITAR

UNITAR has no activities devoted specifically to obsolete pesticides. It is, however, a member of IOMC and is aware of the obsolete pesticides issue and the work being done.

A key activity of UNITAR, which relates indirectly to obsolete pesticides, is the development of national profiles to assess the national infrastructure for the management of chemicals (UNITAR, 1996). These national profiles are prepared through a participatory process involving all stakeholders in the country. The Intergovernmental Forum on Chemical Safety (IFCS) encourages their preparation and, to date, 70 have been completed.

The important benefit of national profiles is that they encompass all chemicals management issues and highlight gaps and priorities for action. In some cases obsolete pesticides are identified as a priority, but in many countries other issues of chemical management take higher precedence over obsolete pesticides. External agencies should be aware of the setting of national priorities and avoid imposition of their own, although awareness-raising for particular issues is appropriate and may result in changes in prioritization. Similarly, external

agencies should refer to the national profile as a starting-point for all action associated with chemical management.

On the basis of the national profile, a country is able to develop an action plan. This should be transparent and have clear targets, and can be used to mobilize resources. UNITAR can assist with this process and is developing guidelines.

SBC

The Basel Convention deals with the control of transboundary movement of hazardous waste as well as their environmentally sound management and minimization. Obsolete pesticides clearly fall within the scope of the Convention. As part of its activities, the Secretariat of the Basel Convention (SBC) responds to problems identified by countries and relating to hazardous waste, and the issue of obsolete pesticides has been raised by numerous developing countries, particularly in Africa. In this regard, African parties to the Basel Convention request assistance and advice in the case of transboundary movement of obsolete pesticides, as well as when considering disposal of obsolete pesticides in an environmentally sound manner. An area of interest to the parties to the Basel Convention concerns the export of obsolete pesticides considered hazardous wastes in the exporting country for reuse in importing countries.

There are some similarities between obsolete pesticides and other hazardous wastes such as PCBs and used oils. Dealing appropriately with obsolete pesticides is likely to benefit the appropriate management of other wastes.

The Conference of Parties of the Basel Convention has given SBC a mandate to help solve obsolete pesticide problems in developing countries. Current SBC activities relating to obsolete pesticides include:

- Caribbean Inventory of Discarded Chemicals and Hazardous Wastes. This identifies hazardous waste generators and proposes the development of an integrated system for managing them, including development of clean production technology, local solutions where appropriate and export for treatment where necessary.
- Mauritius Seminar 1997. This has developed a plan of action for African countries.
- Inventories of hazardous waste generation. Several surveys have been carried out in African countries including Benin, Côte d'Ivoire, the Gambia, Madagascar, Mauritius and Senegal.
- A continental conference on the environmentally sound management of unwanted stocks of hazardous wastes, including obsolete pesticides, has been planned to be held in Morocco from 8 to 12 January 2001.
- Parties to the Basel Convention have been assisted in the export of obsolete pesticides destined for disposal operations, particularly final disposal in OECD countries.
- Technical guidelines on the management of hazardous waste, adopted by the Conference of the Parties have been published (see SBC publications in Annex II, on p. 36).

Three stages of management are required relating to the problem of obsolete pesticides to which SBC can contribute on the basis of its expertise:

- Dealing with the root causes. The problem and its causes are known, the specifics have been identified and the international community needs to take action to address these causes.
- Solving the problem. Technical and financial needs should be addressed. SBC sees export for incineration as the only viable solution for the next five to ten years, but hopes that more sustainable, possibly locally based solutions will be developed during that time. SBC is concerned that donors and industry are nervous about being "ambushed" for funds to solve obsolete pesticide problems. The situation needs to be dealt with sensitively. SBC suggests that the creation of a discretionary fund of about $50 million would help to make significant progress on the issue of obsolete pesticides. Some of this money could be sought from private sources as well as from donors and industry.
- Preventing continuation of the problem. Although the causes of accumulation are known, and in many cases have been or are being addressed, there are other cases where these practices continue. These need to be identified and stopped. Once the situation is under control, measures must be put in place to prevent future accumulation of obsolete pesticide stockpiles.

ACTIONS TAKEN BY OTHERS

Self-funded disposal

Some countries, having identified the problem of obsolete pesticides, have made it a priority for action and allocated resources of their own to dispose of the stocks in an acceptable manner. The largest contributor to this type of operation has been South Africa, which recently disposed of 603 tonnes of its own waste and waste from Namibia and Swaziland. Jamaica and Qatar also funded the clearance of their obsolete pesticide stocks using their own funds.

It should be noted that each country that has benefited from donor assistance to dispose of obsolete stocks is also expected to make contributions in kind to the operation in the form of customs exemptions, personnel, office facilities, vehicles and similar resources.

Denmark

Denmark has supported the use of a cement kiln for the destruction of obsolete pesticides in Mozambique. Consultants advising the Danish development agency DANIDA recommended this course of action. The incineration programme was also integrated as an element in a wider project that included refurbishment of the cement kiln at Matola in Mozambique.

International and local environmental NGOs objected to the proposed incineration plan and protested to the Danish and Mozambique governments. As a result of the international opposition, the project was halted for re-evaluation and for new decisions to be made with public consultation.

Finland

The Finnish development agency (FINIDA) contributed $824 000 towards the removal and destruction of pesticides from Nicaragua in 1998. The project was carried out by the Finnish

disposal company Ekokem, which shipped the waste for incineration at Ekokem's facility in Finland.

Germany

The Agency for German Technical Cooperation (GTZ) ran a pilot programme on obsolete pesticides from 1991 to 1999 (GTZ, 1999). During this period GTZ expertise was provided to 25 projects where surveys, detailed inventories or actual disposal operations were carried out.

Prominent among these projects were the removal of 60 tonnes of dieldrin from the Niger in 1991, 70 tonnes of dieldrin from Madagascar in 1993, 160 tonnes of DDT and monocrotophos from Mozambique in 1994, 200 tonnes of dieldrin from Mauritania in 1997 and 360 tonnes of mixed products from Zambia, which left the country completely free of obsolete pesticides.

In addition, GTZ pioneered the use of a cement kiln for the destruction of obsolete pesticides in a developing country when 57 tonnes of dinitro-o-cresol (DNOC) were incinerated in the United Republic of Tanzania in 1996. A number of factors coincided to make this trial use of a cement kiln possible. These included the existence of a modern facility; a large stock of DNOC, which is a non-chlorinated pesticide with a high calorific value making it suitable as a co-fuel in a cement kiln; and willingness on the part of the kiln operators to participate in the trial. However, while important lessons were learned from this experience, it has not necessarily served to provide a model for similar operations, since the circumstances were unique. The cost was significantly higher than it would have been for export and destruction of the waste in Europe. The high cost was mainly related to the relatively small amount of waste incinerated and the prohibition on the import of waste from other countries for destruction in the Tanzanian cement kiln.

The Netherlands

The Netherlands has been a key supporter in matters relating to obsolete pesticides. It has funded the FAO obsolete pesticides programme since its inception in 1994, and has also funded several national disposal programmes including those in Ethiopia, Seychelles, the United Republic of Tanzania and Zanzibar, Yemen, and Zambia. The Netherlands also funded a detailed inventory of stocks in the United Republic of Tanzania and is currently funding a similar exercise in Pakistan.

The bilateral support for national programmes was made easier by the autonomy given to embassies of the Netherlands in those countries to allocate funds to such projects. This differs from the more common situation in which development programmes need to be negotiated in advance, as described in the section on Funding, on p. 14.

In 1999, the Netherlands reduced the number of countries that are supported by bilateral development programmes in order to make better use of limited capital and labour, and to increase the effectiveness and quality of aid delivered. This change potentially excludes a number of countries with obsolete pesticide stockpiles that are currently seeking funding. Nevertheless, the Netherlands continues to acknowledge the importance of obsolete pesticide prevention and disposal and will continue to support FAO work in this area, as well as country/regional programmes.

Norway

Norway has participated in a number of FAO-coordinated consultations, UNEP workshops and a task force mission to Ethiopia. The country's primary contribution has been expertise in the use of cement kilns for the destruction of hazardous waste including obsolete pesticides. This technology is used extensively in Norway, and Norwegian experts have suggested using modern adapted cement kilns in developing countries to destroy obsolete pesticides (K.H. Karstensen in FAO, 1998). (See also the section on Technology, on p. 13.)

The Norwegian Agency for Development Cooperation (NORAD) has recently approved funding to Viet Nam for training, completion of a detailed inventory and site assessment, and development of an action plan to deal with the obsolete pesticide stockpiles (K.H. Karstensen, pers. comm., 2000).

Sweden

The Swedish development agency SIDA supported the task force visit to Ethiopia in 1998 that prepared the detailed proposal for the Ethiopian disposal project, which SIDA has also made a commitment to fund in part.

SIDA has published a report calling on donors to play a greater role in supporting capacity building in developing countries for better pesticide management to reduce the hazards from pesticides. This includes a call for more support for a range of specific activities including disposal of obsolete pesticide stocks (SIDA, no date).

United States

USAID has contributed to the disposal of 60 tonnes of dieldrin from the Niger, to the reformulation of 86 000 litres of carbaryl in Senegal, and to the disposal project in Ethiopia.

The United States Environmental Protection Agency (USEPA) has been active in awareness-raising and support for international activities relating to obsolete pesticides and has developed a training package on inventory-taking, targeting Latin American countries. The organization also contributes information, advice and materials gained from its extensive domestic experience of dealing with hazardous wastes and pesticides. EPA hosted the OECD/FAO/UNEP Workshop on Obsolete Pesticides in September 2000.

World Bank

Examples of World Bank activities in the field of POPs and obsolete pesticides include: GEF funding for a UNEP-implemented regionally based assessment of persistent toxic substances; establishment of a POPs trust fund to encourage the involvement of developing countries in the elimination or phasing out of POPs; and efforts to help phase out DDT use for malaria control. The World Bank is open to financing the disposal of obsolete pesticide stocks if borrowers want to incorporate pesticide disposal components in projects. However, countries seem to have preferred to look for grant money rather than use loan or credit funds.

World Bank financing of pesticide disposal operations has so far been limited. An example of its involvement is in Honduras, where it initiated and managed several activities to address contamination when hurricane Mitch flooded stores that contained toxic waste. Activities

included disposal of 250 tonnes of toxic waste, largely obsolete pesticides, and monitoring of contamination. This initiative was funded from a Netherlands Trust Fund. The World Bank also financially supported a disposal operation carried out by Finland in Nicaragua, and is contributing towards cleaning up ground contamination in Yemen resulting from the burial of pesticides on a World Bank/IFAD-sponsored farming project during the 1980s.

Regional banks

The Asian Development Bank is known to have supported environmental assessment and disposal activities for some obsolete pesticides in Nepal. Some 114 tonnes of pesticides are thought to have been burned in cement kilns, while other pesticides were spread on land or buried in landfills during the mid-1990s. Proposals for the remaining 80 tonnes of pesticides include local incineration, land application and landfill. UNDP has also contributed to this project. It is not known to what extent, if any, FAO or other guidelines have been followed.

The African Development Bank and the Inter-American Development Bank are not known to have had any involvement in obsolete pesticide matters.

GCPF

The Global Crop Protection Federation (GCPF) represents 12 major pesticide manufacturing industries and several regional industry organizations, which in turn represent pesticide producers and traders in their regions. GCPF members are committed to a process of product stewardship that effectively means implementation of the International Code of Conduct on the Distribution and Use of Pesticides. Dealing with obsolete pesticides is seen by industry as "part of its commitments to the principles of product stewardship" (GCPF, 2000).

GCPF has a project team that coordinates industry activities on obsolete pesticides. The industry position on obsolete pesticides is posted on the Internet at www.gcpf.org/ and states:

"If a company owns a product, the responsibility for the product clearly remains with that company. In contrast, responsibility of purchased stocks lies with the present owner. GCPF member companies are willing to help find appropriate solutions for products they originally manufactured or supplied."

The GCPF statement also includes commitments on the part of member companies that include the following:

- GCPF member companies are willing to provide assistance for stocks that they manufactured or supplied.
- The GCPF coordinator - backed by the obsolete stocks project team - acts in a facilitating role in a multi-stakeholder approach among industry, the government/stocks owner, and other involved stakeholders.
- The level of assistance is decided on a case-by-case basis after verification of the stocks and will be an individual company decision.
- Prevention of obsolete stocks is of major concern to GCPF.

GCPF companies and regional industry associations have contributed to a number of inventories and disposal operations, and have made commitments to other projects that are

being developed or are currently running. A list of projects with indication of industry involvement also appears on the Web site mentioned above.

NGOs

Most NGO activity in this area is focused on awareness-raising and generating action to solve problems caused by obsolete pesticides in developing countries.

There is widespread concern among environmental NGOs about the polluting effects of destruction technologies currently in use. Incinerators, even the most sophisticated installations operating in Europe and the United States, are believed to emit dioxins and products of the incomplete destruction of hazardous chemicals, including some of the unaltered waste in the incinerators. Most IGOs consider incineration to be the only acceptable method for destruction of obsolete pesticide stocks from developing countries and therefore the stand of these NGOs puts them in potential conflict with current practice. The concerns of the environmental NGOs are well documented in a paper produced by Greenpeace (Greenpeace International, 1998).

NGO efforts to promote alternative destruction methods for hazardous chemicals are yielding results with the initiation of the pilot project for non-combustion destruction technologies for POPs in developing countries (see the section on UNIDO, on p. 19).

ASSESSMENT OF THE ADEQUACY OF THE CURRENT EFFORT

The first disposal operation for obsolete pesticides consisted of the removal of 50 tonnes of dieldrin from the Niger in 1991. To date, about 3 000 tonnes of obsolete pesticides have been disposed of from 14 countries at a cost of almost $14 million. Additional money has been spent in preparation for operations that have not yet taken place. This works out at an average of significantly more than $5 000 per tonne of the obsolete pesticides that have actually been disposed of. Thirty-five countries that have carried out inventories still await clean-up operations and, of the countries where operations have taken place, 12 still have stocks that require disposal. In addition, nine African countries have not yet completed inventories.

Good progress has been made in completing preliminary inventories in most African and Near Eastern countries. Several regional workshops were held throughout the region to raise awareness and stimulate action. This progress has been achieved through the efforts of the FAO obsolete pesticides programme whose primary focus for six years has been Africa and the Near East. Other regions have received less attention until recently because of lack of resources.

FAO is the main focus of all work on obsolete pesticides. The obsolete pesticides programme in FAO consists of a single chief technical adviser. The status of the obsolete pesticides programme is that of an externally funded project, which is not an integral element of FAO work. Elevation of the status of the project is subject to the approval of the FAO Biennial Conference of Parties in November 2001. If external funding for the obsolete pesticides project cannot be secured, the project may have difficulty continuing.

UNEP Chemicals gives some support to the FAO project. In addition, UNEP Chemicals, with FAO guidance, coordinates the taking of inventories and awareness-raising in the Russian Federation. Obsolete pesticides are seen as an extension of the POPs issue, since many obsolete pesticides are POPs. It is hoped that the POPs Convention and financial mechanisms built into it will help to generate substantial funds, which could help in dealing with obsolete pesticides. Obsolete pesticides are an extension of pesticide management issues, and their domain is firmly within FAO, as is acknowledged by UNEP Chemicals and all other organizations referred to here.

Germany and the Netherlands have been the major contributors to efforts towards the prevention and disposal of obsolete pesticide stocks. The Netherlands recently reduced the number of countries with which it is working bilaterally, and hence potentially the number of countries in which disposal and prevention projects can be funded. Similarly, Germany's GTZ has ended its obsolete pesticides programme and is now able only to offer its technical expertise where other agencies pay for their services.

Total financial contributions from all bodies towards the prevention and disposal of obsolete pesticides amount to almost $25 million. This includes funding for the FAO programme, and activities other than actual disposal. The number of contributing organizations is limited to ten, of which most contribute minimal amounts that are strictly restricted in scope to certain countries or types of activity. For example, South Africa contributed $2 million towards cleaning up its own obsolete stocks and those in neighbouring, closely aligned states; GCPF only contributes towards the destruction of attributable products; Shell (not a GCPF member as it no longer produces pesticides) has only contributed towards the destruction of its own products.

At present, efforts to identify and dispose of existing obsolete pesticide stockpiles and prevent the accumulation of new ones are grossly inadequate. The FAO coordinating programme itself is too small and insecurely funded to make significant progress, and there are insufficient funds and technical resources to dispose of significant quantities of obsolete pesticides.

The table in Annex I gives some indication of the financial resources needed to dispose of identified obsolete pesticide stocks. The table assumes a disposal cost across the board of $3 per kg or litre of waste. This could rise or fall depending on a variety of factors such as condition and location of the waste.

Money alone will not immediately solve all obsolete pesticides problems. Currently there is a shortage of expertise to handle this type of waste in developing countries. It will take time for additional resources to become available where they are needed, and that time could be usefully exploited for the training of additional personnel for fieldwork, project management, monitoring and other tasks.

It is possible that the expertise and initiatives of other organizations may be exploited in various ways. For example, while the activities of UNITAR and UNIDO in developing countries do not specifically relate to obsolete pesticides in isolation, the expertise they provide and the stakeholders involved in their processes could help with more efficient implementation of programmes for the prevention and disposal of obsolete pesticides. Better coordination among agencies could therefore help to deal with obsolete pesticides more efficiently and effectively.

Chapter 3

Current activities to prevent the accumulation of new pesticide stocks

Prevention of accumulation of obsolete pesticides is often closely integrated into other processes related to general pesticide management. Many of the organizational activities that help to prevent accumulation have already been referred to, and are summarized below.

ACTIONS TAKEN BY INTERGOVERNMENTAL ORGANIZATIONS

FAO

FAO supports agricultural production that reduces reliance on pesticides as far as possible through the implementation of IPM. This is promoted through FAO's own programmes as well as through the Global IPM Facility in which FAO is a partner with the World Bank, UNEP and UNDP, with financial support from the governments and people of the Netherlands, Norway, Switzerland, the United Kingdom and the United States.

In acknowledging that pesticides are still widely used, FAO has issued and is currently updating the International Code of Conduct on the Distribution and Use of Pesticides. In addition, the Organization works to improve pesticide regulation and management in developing countries. Many other FAO publications support better pesticide management and contribute to the prevention of accumulation. Among these are specific guidelines on the prevention of accumulation of obsolete pesticides (FAO, 1995b).

UNEP Chemicals

UNEP Chemicals works extensively to promote better management of chemicals in all sectors. Often this is done in collaboration with other organizations having expertise in specific areas of chemical production, use and management. In the case of pesticides this would normally be FAO for agricultural products, and WHO for health-related products.

The POPs process aims to stop the production and use of specific chemicals, most of which are pesticides. Where these have residual ongoing uses, UNEP is working to help find alternatives to these chemicals. Where possible such alternatives are based on integrated pest control techniques (IPM, IVM), non-chemical controls or least hazardous pesticides.

OECD

The OECD Pesticides Working Group generates guidance and policy, and creates opportunities for information and experience sharing on matters relating to pesticide regulation. Better pesticide regulation and management result in less obsolescence and, while the group primarily responds to the needs of OECD countries, many of its outputs are relevant for use in developing countries and economies in transition.

The OECD-DAC Guidelines on Pest and Pesticide Management advocate donor support for IPM as a development strategy, as well as strengthening pesticide management capacity in developing countries. In addition, the guidelines call for better donor coordination to avoid oversupply of pesticides and the accumulation of obsolete stocks, and positive donor response to recipient country-led initiatives such as disposal of obsolete pesticides.

WHO

In order to prevent accumulation of obsolete pesticides, WHO works to raise awareness among regulatory authorities and helps to ensure that good regulatory and management systems for health sector pesticides are in place. WHO wants better coordination among different national authorities including import authorities. For the purposes of better pesticide regulation and management, WHO and FAO have been requested to consider the preparation of an instruction manual on the use of OECD data for pesticide registration and re-registration.

To minimize pesticide use, WHO has developed and offers training in the use of prediction tools for pest outbreaks and integrated control methods, which reduce the need for emergency responses that rely on high chemical inputs. In addition, WHO is researching alternatives to DDT in malaria vector control.

However, it should be noted that, despite these efforts, WHO continues to recommend the use of chemical pesticides for the control of many disease vectors because of the lack of viable alternatives. Such pesticides are frequently supplied in bulk to countries and health authorities that have weak regulatory regimes and control mechanisms. The pesticides can then become obsolete and be diverted from their intended uses, thereby causing serious health and environmental problems in their own right.

UNIDO

UNIDO is supporting cleaner and safer pesticide production with moves towards less hazardous products based on botanical or biological agents. Wider use of these products will result in reductions in the imported chemicals that contribute to obsolete pesticide stockpiles. Helping pesticide producers in countries that do not belong to OECD to adhere more closely to the International Code of Conduct on the Distribution and Use of Pesticides will also help reduce obsolescence through basic improvements such as good and secure labelling, more robust packaging and higher quality products.

UNITAR

UNITAR's support to the production of national profiles on chemical management and subsequent action plans based on full stakeholder participation is helping to improve chemical management in developing countries. Ultimately this will lead to reduced obsolescence of pesticides, as well as other chemicals.

SBC

SBC is concerned with the generation and handling of hazardous waste. Prevention of further accumulation of obsolete pesticide stocks is a concern, and SBC is keen to support or facilitate prevention. While the majority of SBC expertise is in the management of waste, it sees a role in supporting the development of strategies that could keep future problems

under control. For example, developing solutions for the ongoing management of pesticide containers and small amounts of pesticide waste is within the remit of SBC and would help to prevent the accumulation of stockpiles.

ACTIONS TAKEN BY OTHERS

Donors

To a considerable extent, bulk donations of pesticides are a thing of the past. Most aid agencies have now adopted strategies that avoid the procurement of bulk quantities of pesticides and instead support IPM and the transition to a market economy. However, some donor strategies designed to help developing countries produce food and deal with pest outbreaks unwittingly contribute to the oversupply of pesticides, and in some instances to the accumulation of new stocks of obsolete pesticides.

Some donor institutions play contradictory roles. For example, while the EC has a policy of promoting IPM and better pesticide management (CEC, 1998), and funds these activities with a portion of its budget, it also has programmes that support or encourage intensive pesticide use by continuing to fund bulk pesticide purchases (Dinham, 2000). The French Government does not seem to procure pesticides for development programmes, but the French International Cooperation Centre on Agrarian Research for Development (CIRAD) recommends their extensive use (Ton *et al.,* 2000).

There are a vast number of donor agencies operating in developing countries. The activities of the larger and more prominent donors tend to be more noticeable, but the role of smaller donors should not be ignored. It may be useful to carry out a survey of donors and their activities and how they comply with the OECD-DAC Guidelines on pest and pesticide management.

World Bank

The World Bank has established a binding safeguard policy on pest management which stipulates that its financed projects involving pest management follow an IPM approach. Furthermore, the policy provides criteria for the selection of pesticides. The policy itself does not pay specific attention to the prevention of obsolete pesticides, but this issue will be specifically addressed in a guidebook that is currently under preparation and aims to assist World Bank staff with implementation of the safeguard policy on pest management.

The World Bank is a funding partner of the Global IPM Facility, which promotes agricultural production systems that minimize or eliminate their reliance on chemical pesticides.

Nevertheless, the World Bank also continues to provide loans for the procurement of pesticides and employs pesticide industry staff who develop strategies that promote pesticide sales.

Industry

GCPF supports the transition from state-controlled pesticide procurement to a market-driven system. This tends to lead to pesticides being imported in quantities, container sizes and

formulations that will be bought and used by the local population, without wastage. This results in less obsolescence. However, there is also evidence that private traders are reluctant to declare obsolete stocks of pesticides for fear of being punished.

GCPF also extends training to its distributors to ensure best practice in storage and handling, and appropriate stewardship of products. These practices contribute to reduced obsolescence.

GCPF companies and regional trade organizations support some container collection schemes that will reduce the number of containers accumulating and needing disposal, and will ensure safe handling of those containers collected.

However, not all pesticide trade and use in developing countries, even from GCPF companies, can be said to adhere fully to the requirements of the International Code of Conduct on the Distribution and Use of Pesticides. The second questionnaire on implementation of the code shows significant weaknesses in industry compliance with articles of the code relating to its activities (e.g. Article 8: Distribution and Trade; Article 10: Labelling, Packaging, Storage and Disposal) (FAO, 1996c). Much still remains to be accomplished. Responsibility for implementation of the code lies with governments.

Industry claims that, in regions where the greater problems exist, such as Africa, pesticide trade is least profitable and there is reluctance to invest in product stewardship, safe-use programmes, etc. Similarly, the technologies that can make pesticide use safest and reduce obsolescence to a minimum (for example, plug-in packs for tractor-mounted sprayers) are expensive and, therefore, difficult to introduce into developing countries. Other technologies, such as soluble packaging, are sometimes unpopular because dose rates and tank mixtures are hard to manipulate and these practices are often unsafe.

NGOs

NGOs and donors differ among themselves. Some NGOs support rural development programmes that are heavily reliant on pesticides. Others insist that agriculture in developing countries should be based solely on non-chemical controls using indigenous methods for pest control. Within countries, some NGOs play a leading role in the implementation of IPM, while other NGOs in the same country perpetuate farmers' reliance on pesticides and chemical fertilizers.

There is no single NGO network or umbrella organization that can develop and transmit policy to all organizations. However, several networks are active in trying to eliminate pesticide hazards, support IPM and other sustainable agricultural production systems, eliminate environmental hazards including those from obsolete pesticides, and carry out other similar relevant activities. Prominent among the NGO networks is the Pesticides Action Network (PAN) with centres in Africa, Asia, Europe, Latin America and North America and affiliated organizations around the globe. The International POPs Elimination Network (IPEN) links over 200 organizations on issues related to POPs and other chemicals. The close association between POPs and obsolete pesticides means that IPEN is concerned with the safe elimination of stockpiles while ensuring that they do not recur.

ASSESSMENT OF THE ADEQUACY OF THE CURRENT EFFORT

Several factors contribute to reductions in the accumulation of obsolete pesticides. These include:

- better regulation of pesticides in developing countries, including better control over imports, adherence to packaging and labelling requirements, quality controls and product registration;
- better management of pesticides, including storage and handling, as a result of the activities of FAO, industry and others;
- decentralization of pesticide supplies within countries and transfer of pesticide import and distribution to the private sector. In the simplest terms this means that each product is of commercial value to someone and is less likely to be wasted and allowed to become obsolete. This has not occurred universally and, where centralized purchase and distribution still occur, obsolescence is still widespread;
- greater awareness of the problems of obsolete pesticides and accumulated hazardous chemical waste as a result of the efforts of FAO and other IGOs. This has resulted in greater attention being given to the problem and its causes on the part of national authorities, industry, donors and others;
- greater environmental awareness results in fewer inappropriate practices, such as burial, dumping or uncontrolled incineration of obsolete pesticides. This may not directly contribute to reduced accumulation of obsolete stocks, but it is likely to reduce the scale and seriousness of the problems to be addressed.

It is reasonable to assume that the rate of accumulation of obsolete pesticide stocks is slower now than it was a decade ago. However, pesticides are still becoming obsolete and are being added to existing stocks. In some of the countries where obsolete stocks have already been disposed of, new obsolete stocks are accumulating. The situation is therefore not under control and more action is needed in the key areas described in the following sections.

Locust control

Strategic stocks are being held in susceptible countries, particularly in Africa and the Near East. Many of the pesticides supplied remain unused beyond their expiry dates and thus become obsolete.

A change in strategy is urgently needed to prevent further accumulation of obsolete pesticides while providing assurances to affected countries that their economies and food security will not suffer in the event of a locust outbreak, for example.

Public health pesticides

In most countries, the procurement and distribution of pesticides for the control of disease vectors remain in the public domain. The involvement of the health sector, alongside the agricultural sector, has been limited with respect to best practices in pesticide management.

Inadequate training, a lack of resources to ensure good stores, and poor information transmission, for example, on pesticide usage and pest infestation levels, frequently lead to oversupply and subsequent obsolescence of pesticides.

The health sector must be fully included in national and international efforts to prevent the accumulation of obsolete pesticides.

Poor distribution

Most pesticides have a shelf-life of two years. In many cases it takes almost two years, and some cases more, for pesticides to reach their point of use in remote parts of developing countries. At the point of use, plant protection officers, health officials or farmers are in no position to turn away products that they need without knowing that a replacement is available.

Greater effort needs to be made to provide alternative means of pest control to communities in remote areas, and to ensure rapid delivery of products with a limited shelf-life to these areas when necessary.

Lack of alternatives

Sometimes obsolete and even banned pesticides are delivered for use against pests for which no alternative control is known locally, although alternatives may be identified if efforts were directed towards seeking alternatives. This is an extreme symptom of over-reliance on chemical pesticides in which a chemical solution is sought in preference to a non-chemical one.

All parties, including IGOs, governments, development agencies and donors, NGOs and researchers, should collaborate to develop and promote pest management methods that reduce reliance on chemical pesticides.

Annexes

Annex I - Summary of known obsolete pesticide stocks

Summary of known obsolete pesticide stocks, July 2000

Country	Total	POPs	Disposed of	Actual disposal cost (US$)	Resources needed (assuming US$3/kg or litre)	Comment
Algeria	207	197			621000	
Benin	421	0			1 263 000	
Botswana	18 249	0			54 745 680	
Burkina Faso	74	0			222 000	
Burundi	169	0			507 000	Revised survey needed
Cameroon	225	9.5			675 000	
Cape Verde	35	0			105 000	
Central African Republic	238	25			714 000	
Chad	0				0	Unknown total - large quantities were buried
Congo, Democratic Republic	591	0			1 773 000	
Congo, Republic	2	0			6 000	
Côte d'Ivoire	7	0			21 000	Revised survey needed
Egypt	591	0			1 773 000	
Equatorial Guinea	146	0			438 000	Revised survey needed
Eritrea	223	25.3			669 000	
Ethiopia	1 500	146			4 500 000	Disposal operation in progress since April 2000; Netherlands, USAID and Swedish funding
Gambia	0	1.6	21		0	
Ghana	50	0.1			150 000	
Guinea-Bissau	9	0			27 000	Revised survey needed
Guinea	4				12 000	
Iran, Islamic Republic	1 139	2			3 417 000	

Iraq	232				696 000	
Jordan	0	0			0	
Kenya	56	7			168 000	
Kuwait	32	0			96 000	
Lebanon	177	0	10	101 000	531 000	FAO/TCP funding
Libyan Arab Jamahiriya	44	0.02			132 000	
Madagascar	65	12.25	70	600 000	195 000	70 tonnes removed by Government of Germany- GTZ in 1996
Malawi	127	0.8			381 000	
Mali	13 761				41 283 000	
Mauritania	38	0	200	800 000	114 000	Disposal carried out in 1997 funded by GTZ and Shell. Some stocks remained
Morocco	2 265	7			6 795 000	
Mozambique	443	11.5			1 329 000	Disposal operation being funded by DANIDA
Namibia	43	0	202	2 000 000	129 000	South African funding
Niger	116	0	60	790 000	348 000	Funded by USAID/Germany-GTZ
Nigeria	22	0.014			66 000	
Qatar	0	0.06	5		0	Self-funded disposal
Rwanda	451	0			1 353 000	232 tonnes of this is EU- donated mancozeb
Sao Tome and Principe	3	0.4			9 000	Ministry of Health data only
Saudi Arabia	241	24.8			723 000	
Senegal	151	78.5	110	340 000	453 000	86 tonnes of carbaryl reformulated locally with USAID funding + 24 tonnes disposed of overseas
Seychelles	0	0	12	100 000	0	FAO disposal 1997 funded by the Netherlands
Sierra Leone	7	0			21 000	Revised survey needed
South Africa	0	0	603		0	Self-funded disposal completed 1999 but additional unquantified stocks believed to exist
Sudan	666				1 998 000	

Swaziland	0	0.1	9		0	Disposal funded by South Africa
Syrian Arab Republic	327	1.5			981 000	
Tanzania, United Republic	1 136	239.5	57	450000	3 408 000	GTZ incineration of 57 tonnes of DNOC; Netherlands-funded detailed inventory
Togo	86	0.8			258 000	
Tunisia	882	0			2 646 000	
Uganda	214	0	90	200 000	642 000	FAO disposed of 50 tonnes in 1993; Novartis disposed of 40 tonnes of fluometuron in 2000
Yemen	1 540		262	990 000	4 620 000	Disposal carried out in 1996 with Netherlands and FAO/TCP funding. Remaining stocks are buried pesticides + contaminated soil
Zambia	0	28.5	360	1 190 000	0	GTZ, Netherlands and FAO/ TCP funding
Zanzibar	0		280	980 000	0	Disposed of in 1995 with Netherlands funding
Zimbabwe	27	0.13			81 000	
Africa and Near East total	47 031.56	819.37	2 351		141 094 680	
Nicaragua	1 031	277.2	413	780 000	3 093 000	World Bank loan + FINIDA funding for second phase
Peru	9	0			27 000	
Suriname	31	0.3			93 000	
Trinidad and Tobago	71				213 000	Includes industrial chemicals
Venezuela	753	108.6			2 259 000	
Latin America total	1 895	386.1			5 685 000	

Annexes

Annex II - Bibliography and further information

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