FAO Programme on Prevention and Disposal of Obsolete Pesticides

Obsolete, unwanted and banned pesticides and persistent organic pollutants (POPs) are serious environmental hazards. Leaking and corroding metal drums filled with obsolete and dangerous pesticides dot urban and rural landscapes in most of the developing countries around the world as one can witness from the various pictures given below. These chemical leftovers have become villains in the agricultural world they were designed to help, affecting not only a nation's agriculture and its environment, but also fundamentally the health of its people and consequently development in general, be it in rural areas or under urban conditions. The most notorious of the persistent chemicals are organohalogens: carbon-based substances containing chlorine, fluorine, bromine or iodine. Around 11,000 organochlorines have been identified, most of which do not occur naturally. They include roughly 50 pesticides such as toxaphene and DDT; solvents such as perchloroethylene and multiple-use chemicals such as PCBs. However, the relative indestructibility of these chemicals, a boon for industry, has become a threat to human health and to the environment.

Obsolete pesticide stocks

Source: *FAO*

The FAO representative reported that obsolete pesticide inventories were carried out/updated in 2001 with support from FAO. Globally, close to 220 thousand tons were registered. Over 4 500 tons of obsolete pesticides were reported in seven of the SEAR countries (see Table 5 and Annex 10, Documents 1.2 to 1.8). Additional information was delivered at the workshop by the country delegates (Annex 9). The inventories are incomplete and would need to be updated urgently. Indeed, the storage conditions are often poor; besides the risks of leakages to the immediate environment, these stocks could also be stolen and brought back into the market.

6.1. Prevention of stocks build-up

Implementing IPM and/or less pesticide-reliant cropping systems is a key part of the prevention of the unnecessary accumulation of obsolete pesticide stocks.

The FAO expert wished to pinpoint that in 2003, following negotiations with donor agencies and the private sector, FAO achieved an agreement with all parties to no longer donate pesticides

Table 5 Obsolete pesticide stocks in SEAR countries

Country	Obsolete stocks (MT)	Remarks
Bhutan	68	Most of these stocks have been disposed of;
India	3,350	Most of them are organic persistent pesticides.
Indonesia	19	All belonging to the WHO toxicity classes I and II;
Myanmar	137	Mainly locally formulated products.
Nepal	96	Significant volumes of Aldrin, Dieldrin and DDT. Some Donation of DDT by Indonesia in 1994. A disposal operation was prepared in 1998 (ADB ready to lend 577 000 US$), but due to poor inter-sectoral coordination it failed. DDT and Endosulfan are reported to be used for fishing in rivers and ponds.
Sri Lanka	165	Stocked in 73 409 containers, in Sri Lanka, half of the stocks are Carbofuran (WHO Toxicity Class II).
Thailand	48	Scattered in over 480 locations.

Source: FAO, see Annex 11, Documents 1.2 to 1.8.

in emergencies on a bilateral basis, but to coordinate all emergency donations with FAO. This agreement could be an example for drug donations in the health sector.

Obsolete pesticide stockpiles pose serious threats to health and the environment. Removing them is costly and technically complex and is therefore an operation that is largely unviable. Alongside efforts to remove existing stocks of old chemicals, countries must put in place measures to prevent re-accumulation of obsolete pesticides. Prevention programmes should be of equal status to initiatives for obsolete pesticide disposal and should be adequately funded in national projects.

Prevention encompasses initiatives to reduce reliance on pesticide use in agriculture and health care. Reducing pesticide use is the most effective way of preventing build up of pesticide stocks that may later become obsolete. At the same time, since pesticides will continue to be used, prevention programmes should address the entire life cycle management of pesticides from their manufacture or import, through distribution and use to waste management after use. Countries should identify areas of weakness in pesticide life cycle management and develop activities to build capacity and fill gaps wherever they exist.

Analysis of main causes of accumulation of obsolete pesticides

In many countries, where a range of products has been banned or withdrawn for health or environmental reasons, the fate of existing stocks in the country is often given scare consideration. Stocks remain where they are stored and eventually deteriorate.

The government authority responsible for national pesticide stocks often does not have adequate storage capacity to store all its pesticides safely. 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.

Storekeepers of major stores and those responsible for national stocks are often not familiar with the rules for good stock management (proper stacking, product segregation, principle of "FIFO", etc.). Contamination and improper stacking may alter the condition of other products and may impede a consistent application of the principle of "FIFO". Stock records may not be regularly updated and communicated to the central authority responsible for establishing the country's pesticide requirements.

Drums and other packaging materials are often damaged through rough handling or in transport. Unnecessarily long periods of exposure to direct sun during transit is another important factor that affects both the container and its contents.

Because laboratory facilities for pesticide quality control are not available in most developing countries, it may be impossible to determine whether a pesticide may 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.

Products may have been donated that were unsuitable for their intended use and have therefore remained in store and deteriorated. Inappropriate active ingredient or formulation.

Bulk quantities of pesticides are commonly supplied in 200-litre metal drums. For countries without good repackaging facilities this may create problems if the pesticides are intended for use by plant protection and rural extension staff or small-scale farmers.

In some cases, pesticides are not used because the potential 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.

In several cases, the quantity, active ingredient, formulation or packaging of donated pesticides are inappropriate for the intended use.

Consignments not used because the product had been adulterated by an unreliable supplier in order to increase profits and was no longer suitable for the intended purpose.

Inaccurate assessment of requirements due to not readily available or is incomplete information on needs and existing in-country stocks.

Countries sometimes established large strategic pesticide stocks in preparation for possible pest upsurges or invasions which do not occur, ending up with large quantities of unused products.

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. Overstocking of such products is a common cause of pesticides becoming obsolete.

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.

Many countries are reducing or removing subsidies from pesticides. As a result, stocks may remain in store longer than planned and are at increased risk of becoming obsolete.

Slow processing of requests for pesticides, in some cases, has meant that the pesticides have arrived too late.

Agrochemical companies, or their local agents, often take the initiative to advise plant protection services and other large-scale users on their pesticide requirements. Sometimes such advice forms the basis for requests to donors. However, companies may not always put the public interest above their own commercial interest and assessments may be in excess of actual requirements.

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.

Reducing the need for pesticide use

Participants agreed that there is an urgent need to address the problem at source and initiate and strengthen national and regional programmes that reduce reliance on chemical pesticides, such as IPM and IVM (see Box 7).

No to imports of banned chemicals

Efforts to control the use and trade of restricted or banned chemicals have led to the development of the Rotterdam Convention's Prior Inform Consent (PIC) treaty, a proposed convention that would require exporting countries to provide information on whether the chemical that they are exporting is restricted or banned nationally. The status of signature/ratification of key "chemical" Conventions is presented in Table 6.

6.2. Disposal options

The FAO expert informed the participants on the collaborative programme for the disposal of obsolete pesticides established by FAO in 1994 with the financial support of the Government of the Netherlands, as part of a concerted international programme to solve the problem. The cost of disposal is high. There is a need for as much

Table 6 SEAR Parties to Conventions

Participant (as per 01.06.2006)	Signature/Ratification			
	POP (2001)	Rotterdam (1998)	Basel (1989)	Montreal (1989)
Bangladesh	2001	no	1993	
Bhutan	no	no	2003	2004
Democratic People's Republic of Korea	2002	no	no	2001
India	2002	2005	2005	2003
Indonesia	2001	1992	1993	1998
Maldives	no	no	1992	2002
Myanmar	2004	no	no	1993
Nepal	2002	no	1996	1994
Sri Lanka	2001	no	1992	2002
Thailand	2005	2002	1997	2003
Timor Leste	no	no	no	no

Sources: 3w.basel.int/index.html; 3w.pops.int; 3w.pic.int; 3w.unep.org/ozone/ and Country Presentations (Annexe 10)

Box 8

Integrated pest and vector management

Irrigated agriculture exposes rural people to health risks associated with vectors of human disease and to potential ill effects from agricultural and public health use of pesticides. Collaboration between sectors of health and agriculture to jointly address these problems is generally lacking, leading also, to the risk of resistance build-up among the disease vector populations. In June 2006, WHO applauded the findings of the evaluation of an inter-sector project in rice irrigation systems in **Sri Lanka**, which uses the Farmer Field School (FFS) approach to integrate management of vector-borne diseases and improvement of rice productivity, a concept coined by integrated pest and vector management (IPVM). Rice farmers in intervention villages graduated from the FFS and were found to conduct vector control actions and reduce agricultural use of insecticides. Project partners developed a new curriculum integrating an agricultural and a vector-borne disease component. The intervention motivates and enables rural people to actively participate in vector management activities and to reduce several environmental health risks. There is scope for expanding the curriculum to include health effects of pesticides. Benefits of the approach for the health sector's own disease control strategy have not yet been optimally utilized. Also, evaluation and monitoring tools need to be developed and the institutional basis of IPVM be broadened. Source: WHO, SEARO, June 2006. See more at: www.ipmcommunity.org

as US$500 million to clean up critically affected areas of the developing world. The potential for environmental disaster will be complicated and more expensive if the situation is not dealt with, swiftly and safely. High temperature incineration in dedicated hazardous waste incinerators is the currently recommended method for disposal of obsolete pesticides (and pharmaceuticals). This is outlined in the joint FAO, UNEP and WHO Disposal Guidelines. But such sophisticated incinerators do not exist in developing countries. It is therefore necessary to re-package pesticide waste in new UN approved containers where they exist in developing countries, transport them overland to a major port and then by sea to a country where there is dedicated hazardous waste destruction facilities.

Shipment has to comply with the International Maritime Dangerous Goods Code (IMDG-Code) and the UN Basel Convention on the restrictions of transboundary movement of toxic waste. FAO estimates the cost of disposal ranges between US$ 3000 and US$ 4500 per tonne depending on a number of factors.

The workshop participants were encouraged to liaise with this FAO programme to start and strengthen inventory activities in their countries.

FAO's programme would typically support countries to carry out similar initiatives as reported by the delegate from **India**, where, in collaboration with FAO, a comprehensive inventory of banned and obsolete pesticides in the country started in 2006. It aims at increasing national capacity in pesticide and hazardous waste management. Capacity building measures are planned for trained master trainers and the local staff of the major stakeholders – both from the government and private sector – in the safe handling and storage of pesticides and inventory taking, using environmental assessment tools. Trainees are made aware of the need to

FAO coordinated disposal operations took place in Bolivia and Seychelles. Photo credits: FAO

safeguard and centralize the identified unsafe and obsolete stocks at selected sites. National authorities are carrying out a project to decide on the final disposal of a part of obsolete stocks. At the same time a review of current mechanisms for the prevention of accumulation of obsolete pesticides in the future has also started.

Obsolete pesticides tend to be a mix of contaminated chemicals, stored in obsolete containers together with wrapping and other materials, all of which need to be safely disposed of, including contaminated soil. To this end, no disposal or management method should be applied in a developing country which would not be permitted in advanced industrialized nations.

Local disposal facilities must be part of a national strategy for the management of hazardous waste, with full approval of all stakeholders, and not *ad hoc*, isolated solutions for a specific problem.

Hazardous waste management options include:

- High temperature incineration
- Chemical treatment
- Engineered landfill
- Long term controlled storage
- Reuse/reformulation
- New technology

High temperature incineration

The basic hazardous waste incineration rules consider that the process is officially approved and is carried out in a licensed facility under independent monitoring. The US EPA Toxic Substances Control Act (TSCA) Complex Organics Incineration Criteria requiring 1200 Degree Celsius/2 seconds and the EU Directive 2000/76/EC on Incineration of Waste requiring 1100 Degree Celsius/ 2 seconds need to be implemented. In case of cement kilns, residence time should be above 3 min at more than 1100 Degree Celsius. This will ensure that the "Self cleaning process" takes place properly and complex organics are destroyed, and minerals and ash become incorporated into the cement. Where such appropriate cement kilns are already available, input and emission monitoring systems

Box 9 Bhutan success story

Obsolete pesticide stocks in Bhutan were identified from 1990. Volumes mounted as direct pesticide subsidies were finally phased out in 1993. By 1997 the stocks amounted to 68MT. Most pesticides had come via India, but Bhutan's request to that country to take the stocks back was turned down. It was with the help of Denmark, that 50% of the stocks were re-packaged by Danish hazardous wastes specialists, as per international requirements, and stored in UN approved containers in Paro in 1999. An attempt to incinerate part of the stocks in a cement factory, close to the Indian border failed due to opposition from the local population. In 2002, the Swiss Development Cooperation (SDC) agreed to sponsor the final disposal of the stocks under the condition that Bhutan would become Party to the Basel convention, which took place in June 2003. The disposal operation, supervised by international experts, brought the re-packaged stocks by road from Paro to Kolkata, by ship to Hamburg and finally by road to Basel, Switzerland. The operation ended in 2006. (Annex 10, P2).

Box 10 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal

This is a signifcant international treaty, designed to reduce the movements of hazardous waste between nations, and specifically to prevent transfer of hazardous waste from developed to less developed countries (LDCs). It does not, however, address the movement of radioactive waste. The Convention is also intended to minimize the amount and toxicity of wastes generated, to ensure their environmentally sound management as closely as possible to the source of generation, and to assist LDCs in environmentally sound management of the hazardous and other wastes that they generate. The Convention was opened for signature on March 22, 1989, and enforced on May 5, 1992. A list of parties to the Convention, and their ratification status, can be found on the Basel Secretariat's web page. Of the 166 parties to the Convention, Afghanistan, Haiti, and the United States have signed the Convention but are yet to ratify it. Basel has listed 47 categories of hazardous wastes requiring special consideration. Top of the list are the following: Y1: Clinical wastes from health care facilities; Y2: Wastes from the production and preparation of pharmaceutical products: Y3: Waste pharmaceuticals, drugs and medicines; Y4: Wastes from the production, formulation and use of biocides. More at: www.basel.int

must be installed and the waste input must be carefully regulated. New skills must be developed and maintained amongst operating staff, as it normally does not deal with contaminated material, soil and containers

Chemical treatment

This highly sophisticated disposal option provides limited or no solution for contaminated materials and containers. As it presents significant potential hazards, it requires high levels of expertise with supporting infrastructure.

Engineered landfill

Landfill of hazardous waste is very tightly controlled in EU and US. Important investment in infrastructure is needed and long term management and maintenance have to be planned for. Landfill is not a permanent solution; leachate and gas must be monitored and treated as hazardous waste.

Reuse/reformulation

It is important to point out that when the active ingredient of a particular chemical has dropped, by half for example, it is not possible to simply double the dose to obtain the original concentration. Indeed, the missing active ingredient may have triggered chemical reactions and created new, unwanted compounds with unknown toxicity. By doubling the dose, we would also be doubling the amount of these unknown compounds. Reformulation is thus, a complicated and very specific process, needing specialized infrastructure. The final product must not present additional unacceptable hazards. The question remains: who benefits from such a solution—people and the environment, or pesticide manufacturers and owners?

Dealing with stockpiles of obsolete pesticides is quite different from ongoing waste management and there are no "fit all" solutions. (Annexe 10, P18).

Source: *http://www.fao.org*