

# Moving the mountain – managing containers

*Tens of thousands of tonnes of used pesticide containers are generated every year. In developing countries many find secondary uses, most notoriously for drinking water. It is vital that systems are put in place to remove this toxic waste. Mark Davis discusses the options available and the challenges ahead.*

Organizations like the Pesticide Action Network, the Food and Agriculture Organisation of the United Nations and others have been working for years to eliminate or minimise pesticide use. However, their use continues and is accompanied by the unavoidable generation of hazardous waste, most commonly in the form of empty containers. In the absence of well thought out and sustainable solutions, these empty containers find other uses, most infamously for drinking water. Where they do not find a new purpose containers are commonly dumped or buried taking their toxic residues with them into soil and water, or burned to disperse a new set of toxic by-products and vapours into the air. Without a solution to this problem it cannot be claimed that pesticides are managed throughout their lifecycle.

Most governments, reputable pesticide manufacturers, NGOs and intergovernmental organizations subscribe to the International Code of Conduct on the Distribution and Use of Pesticides. This advocates 'proper' pesticide container management with primary responsibility resting with governments and industry. While most countries do not have an adequate system in place progress is being made and lessons learned from the experiences of some countries.

Probably the best example of a nationwide pesticide container management system is in Brazil. The system is backed by a law passed in 2000 that obliges pesticide manufacturers, distributors and users to play their part in keeping the system running. Users must triple rinse all containers, store them temporarily, take them to collection centres and keep the paperwork that records transactions. Distributors must provide and operate the collection centres and inform customers about the system. Manufacturers must provide the mechanism for recycling or destruction of the collected containers. Government plays a role in regulation and public information.

The success of the Brazilian scheme is reflected in the exponential growth of containers passing through the system – from 187 tonnes in 1987 to 711 tonnes in 2000 to 7800 tonnes in 2003 representing 35% of all containers. Careful planning and development means that about 95% of containers are recycled and the remainder incinerated.

Several other countries operate schemes including Canada where 70% of containers

were collected in 2003/4, France where 25% were collected in 2003 and Hungary where 45% were collected in 2003 (table 1).

The proportion and quantities of containers collected in each scheme are hugely variable. The costs and complexity of the schemes may provide a partial explanation of why they are not more widespread.

The infrastructure for container collection and treatment requires significant capital investment in collection centres, shredding and crushing machines and vehicles, as well as operational costs. If schemes are charged to burn or landfill the containers, this raises costs as in France and Canada. If the containers are sold as a resource to recyclers or incinerator/furnace operators, costs will be reduced as in Australia and Brazil. The costs for processing one tonne of containers can range from \$759 in Australia to \$3612 in Canada. In some cases users are charged to have their containers processed, whereas elsewhere costs are hidden by schemes directly charging companies on a market share basis, or a hidden levy included in the price of pesticides.

## When is clean not clean?

The common basis of all container management schemes is cleaning at source. It is widely accepted that triple rinsing while pouring the rinsate into the tank mix, leaves a container 99% clean and prevents residues from entering the environment in an uncontrolled manner.

Pesticide users need to be informed

**Table 1.**

Country	Collected weight (2003) (tonnes)	Collected proportion (2003) (%)	Levy to users	Overall cost
Australia	1652	35	€0.024/litre or kg	€759/tonne
Belgium	483	92	n/a	€1463/tonne
Brazil	7800	35	n/a	unknown
Canada	658	70	€0.3/container	€3612/tonne
France	1840	25	n/a	€2000/tonne
Germany	1545	52	n/a	€1075/tonne
Hungary	760	45	€0.04-3.5/container depending on size	€947/tonne
USA	3175	28	n/a	€1006/tonne

*Source: Report of the OECD pesticide risk reduction group seminar on pesticide risk reduction through good container management, 22 June 2004, Bonn, Germany.*



*Triple rinsing pesticide drums removes 99% of residues, Mauritania* Photo: Mark Davis

about the importance of triple rinsing and trained how to do it. Many industrialised countries have largely succeeded in doing this, but there is a need to refresh the information and training on a continuous basis which is costly and needs organization.

No matter how much information and education is provided, some containers will never be returned while others will be returned dirty, risking contaminating handlers and the environment. Brazil trains and protects workers and constructs collection sites to capture any spills. This again raises the cost of the operation and infrastructure.

In industrialised countries, tractor mounted sprayers, self propelled sprayers, helicopters, and other highly engineered equipment is widely used. Pesticide containers can be designed for use with such equipment. This may include mechanisms that allow containers to be attached directly to the equipment with no need for high risk mixing and loading of chemicals, and may also include high pressure rinsing tools that can be more effective than manual triple



Metal pesticide drums are crushed after use, Mauritania

Photo: Mark Davis

rinsing in cleaning containers. With such equipment it is also possible to design reusable containers in the knowledge that they will be properly handled and returned in good condition.

However, developing countries tend to have no infrastructure for container collection, little or no information and training for triple rinsing, and little (if any) highly engineered application equipment. There is often a shortage of water with which containers can be rinsed. Some pesticide formulations are not water soluble and the containers can only be adequately rinsed with solvents that are not easily available, and may in themselves be hazardous.

While well performed triple rinsing may remove 99% of pesticides, the remaining residues have been found to be absorbed into the material from which plastic containers are made. This poses a problem regarding possible future uses of these containers. It is essential that newly fabricated products are not going to transmit pesticide residues into the food chain or the environment. This can be achieved by ensuring that pesticide containers are only provided to manufacturers that guarantee their use only in the fabrication of products that will not be recycled again in the future and will not be used for food or water. Examples are wiring conduits that are embedded in walls, containers for other chemicals or concrete reinforcement.

## Where containers go

Pesticides are packaged in a huge variety of container types, materials and sizes, such as paper sacks, plastic bags, plastic bottles, metal drums, ranging from less than 1 litre or kilogramme to 200 litres or more. The main factors determining how they are treated are the material type, condition, cleanliness and quantity. Different materials need to be separated and those which are 'recyclable' identified. Metal can be cleaned and

recycled. Plastic can often be recycled, and as it has a relatively high calorific value it can always be 'recycled for energy'. Paper and plastic bags are not generally recycled as they are not easy to decontaminate. Cardboard and wood in which smaller containers are packed can be recycled or burned.

Local infrastructure and economics are important. A key question is the location of a suitable recycling facility. While a small number of facilities may exist in industrialized countries or countries with economies in transition, in most developing countries there are no such facilities. Is it worth transporting these materials over long distances to a recycling facility? How much material is generated? Is it in one location or spread over the countryside? Can the volume of material be reduced by crushing metals or shredding/grinding plastics? Answers to such questions will determine the viability of collection schemes.

## Who pays?

Managing pesticide containers needs investment, and clearly several stakeholders have roles to play. Industry must design containers that are recyclable while ensuring that pesticides are safely contained, and that containers are not so attractive for secondary uses. Containers must be easy to clean and handle and made of materials that minimize absorption of pesticide.

End users of pesticides must be educated

and collection points provided. The collected containers may need to be sorting and an industry that can accept and process the container materials must exist.

Underpinning the system with legislation can be effective, but legislation is only effective if enforced. This clearly is a role for government authorities.

Most successful schemes are run by pesticide manufacturers and distributors in collaboration with government, users and other organizations. The industry clearly understands the economics and logistics involved and can make the schemes work. They also operate effective distribution networks that simply need to be operated in reverse to collect empty containers that were previously supplied full of pesticides.

Money, materials, logistics, agreements, political support, information, education and many other factors all play a role in pesticide container management. It is complex and costly and perhaps for these reasons is often neglected. Nevertheless, container management is an integral part of pesticide management. It is time that many more schemes like that in Brazil were seen operating around the world, especially in developing countries.

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## Case study: Locust control pesticide containers

In the period between September 2004 and June 2005 the Food and Agriculture Organisation of the United Nations (FAO) supplied 2.2 million litres of pesticides to control swarming desert locusts in the Sahel countries Chad, Mali, Mauritania, Niger and Senegal. After the swarms subsided there was a need to collect the thousands of empty containers generated and remove them from circulation.

FAO trained local teams and placed a locally recruited coordinator in charge of operations. Virtually all the drums and canisters were collected and placed in secure sites in the affected countries.

FAO then bought machines that would wash containers and crush them to render them unusable and reduce their volume. Advice was sought from the main suppliers of pesticides used in the campaign on how to clean their containers effectively. Since most locust control pesticides are formulated using organic solvents in Ultra Low Volume (ULV) formulations the containers could not be washed only with water, and specialist solvents had to be bought for the task.

So far two machines have been supplied, to Mauritania and Mali. In Mauritania following some initial technical problems the machine worked continuously and has now cleaned and crushed virtually all the containers from products supplied by FAO, and many more besides. In Mali the machine was supplied more recently and is in the process of dealing with the containers. Additional machines are on order and will soon be supplied to the other countries. North African countries are now ordering their own machines.

The machines clean the containers very effectively but only crush metal drums. Plastic containers are cleaned and crushed to make them unusable, but they tend to spring back so their volume is not much reduced. This makes transportation and further treatment impossible. Machines that shred and bail, or grind and bag, the plastic are needed and FAO is researching available options on behalf of the countries.

In addition to the FAO-supplied pesticides, countries accepted donations from bilateral donors and bought their own pesticides. While the containers may be dealt with, the more serious problem is that a high proportion of the pesticides supplied by routes other than FAO remains unused and risks becoming obsolete. Action to prevent this from happening is being coordinated through FAO in collaboration with the countries and other intergovernmental agencies.

Despite logistical and technical difficulties, the machines have demonstrated that pesticide container management is possible in developing countries. More needs to be done, but there is no longer a need to stand helplessly by as pesticide drums are traded and used for anything from feed troughs to water barrels.