

Cleaning a polluted site in Mali

Mali is one of seven countries in the Africa Stockpiles Programme, where government-led teams have been identifying and safeguarding toxic stockpiles of obsolete pesticides. A heavily contaminated site in Molodo urgently required soil remediation as it was contaminating local groundwater supplies. Demba Sidibe and Cheikh Hamallah Sylla report on a locally appropriate technology for soil remediation.

The small town of Molodo lies in the central delta of the Niger river. It has a population of around 5,000 inhabitants and is one of five agricultural production zones in the Niger area. However, the Crop Protection Office of the Ministry of Agriculture in Molodo had been sitting on a toxic hazard. Its soil had been contaminated by pesticide spillage over many years and urgently required remediation.

Remediation in Molodo

In July 2008, the African Stockpiles Programme in Mali (ASP-Mali) carried out an operation to remediate the contaminated soils in Molodo. They worked in collaboration with a number of government departments including the Ministry of Agriculture and the Ministry of Environment and Sanitation¹. Technical help came from the United Nations Food and Agriculture Organisation (FAO) and the University of Wageningen and funding from the World Bank. The operation involved several procedures including safeguarding the obsolete pesticides, cleaning and decontamination to rehabilitate the site.

Safeguarding the waste pesticides

A total of 2,406 litres of obsolete pesticides was recovered from the site including:

- 400 litres including various products and rinse water from empty containers; this had been generated by the container management project pilot of the locust control campaign of 2004/05 conducted by National Centre for Locust Control in collaboration with the FAO
 - 1,976 litres of solvent used to dilute fenthion in eight big barrels of oil; this solvent had been stored since 1983
 - 30 litres of dieldrin recovered from the empty container storage site.
- At the end of the operation clean sand was spread out to absorb any spills left by the repackaging. This sand was then collected and treated along with the other wastes.

Removal of empty containers

In total 259 empty containers were removed or dug up from the drainage ditch where they had been stored

- 176 empty 20 litre dieldrin kegs

- 3 empty 20 litre cyanophos kegs
- 3 empty 5 litre parathion kegs
- 56 empty kegs of unknown products
- 20 empty plastic fenthion bottles
- 1 empty 200 litre drum of an unknown product

These had been triple-rinsed and were considered safe for disposal. They were loaded into a container and transported to a municipal landfill belonging to the Ministry of Environment and Sanitation at Noumoubougou, 35km east of the capital Bamako.

Cleaning the most polluted zone

The soil in the contaminated zone was excavated to a depth of two metres, placed in a truck, then transferred to a ditch. The soil was then mixed with layers of compost to encourage microbial degradation. After the soil was removed powdered carbon was spread in the empty ditch to bind dieldrin which is a persistent organic pollutant.

Clean soil was used to refill the excavated area at the original contaminated site.

Decontamination by land farming

Land farming is a soil decontamination technique which involves taking polluted soil and encouraging the biodegradation activity of soil microbes. In Molodo the soil was spread out in a zone called the 'land farm', and evenly mixed with compost and cow manure. Then some plants such as Vetiver (*Chrysopogon zizanioides*) and Jatropha (*Jatropha curcas*) which extract and fix pollutants from the soil were planted in rows spaced at 40cm or 50 cm respectively. The perimeter of the ditch was also planted.

Soil samples were taken by the Central Veterinary Laboratory in order to establish the contamination levels on the land farm. Samples will be taken from the same locations at later dates using GPS coordinates in order to regularly monitor the ongoing reduction in contamination in the land farm soil.

The clean area, the land farm, and the ditches containing the contaminated soils were fenced off to prevent people or animals from entering and to allow the plants to grow. Warning signs were placed at vari-

ous points.

Successful operation

In total, 12 people belonging to the various agencies had participated in the different operations. Twenty laborers had worked on the site. These latter had a medical visit at the beginning and at the end of the operation. No poisoning incidents or any other accident was reported during the work. This is partly explained by the good environmental management plan for the site elaborated by ASP-Mali following FAO and World Bank guidelines and by the rigorous application of the risk reduction measures contained in the plan.

Extensive publicity

All the operations were covered by various media. A documentary on land farming was made. Television and national radio as well as local radio stations covered the events.

High ranking officials from Niono and Molodo visited the site and expressed their satisfaction with the project.

The Minister of the Environment and Sanitation also visited the site on 31 July 2008, expressing his satisfaction. He encouraged ASP-Mali to research realistic technical solutions for remediation in the Malian context and to explore how to fund similar operations at other sites.

Experts from Chad are now thinking of visiting the Molodo pilot site to learn about the land farming process.

Looking to the future

Land farming was successfully used for the first time in Mali by a team of people from many different government ministries. It is an option for treating soils contaminated by pesticides and should be possible to carry out in most localities by a national team and at relatively low cost compared to other options. It should be integrated as a key decontamination option in the national plan for soil decontamination of ASP-Mali.

1. The work was carried in collaboration with the Ministry of Agriculture, the National Centre for Locust Control, the Air Force, the Crop Protection Office, the National IPM Programme, the Central Veterinary Laboratory, the Ministry of Environment and Sanitation and the NGO Sahel Solidarity representing Pesticide Action Network Mali.

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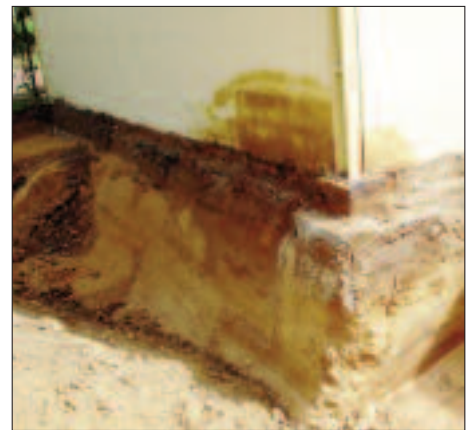
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1. Decanting liquids into larger drums



2. Empty drums were loaded onto a container



3. The contaminated soil was removed to a depth of two metres



4. Contaminated soil was mixed with compost and cow manure



5. Vetiver and Jatropha was planted to remediate soils



6. Vetiver planted to extract and fix pollutants



7. The work zone



8. Soil samples were taken by the Central Veterinary Laboratory



9. Signs were placed at the entrance and inside the zone



10. Signs were placed at the entrance and inside the zone



11. Those working on the site were given a medical examination before and after the work



12. Officials from Mali's Ministry of the Environment visited the site