Opening address

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Obsolete pesticide stocks continue to pose serious environmental and health problems in the developing world. The negative impact goes on unabated, irrespective of efforts being made at various levels. Nevertheless, widespread awareness is gradually but definitely increasing on a global scale. Governments, people, NGOs, organizations, schools and academics, etc. are either discussing or providing platforms for discussions, understanding or working towards the promotion of a better environment. While such enthusiasm and efforts have much promise for the future, the immediate focus is on the environmental problems left behind from years of misuse and abuse of pesticides. Developing countries lack the means, the resources and the expertise to cope with the problem of obsolete and banned pesticide stocks. Added to existing environmental and health problems, there are negative developments and discouraging news about drawbacks, incidents or accidents taking place in a number of countries involving pesticides such those as briefly described below.

The French monthly newspaper, *Le Monde diplomatique*, indicates incidents of pesticides poisoning the small farmer. "On 5 November 1997, a warehouse belonging to the multinational Hoechst exploded in Tananarive, Madagascar. The ensuing inferno polluted rice fields and drinking-water. On 29 December 1997, a similar incident took place at another pesticide store in Surabaya, Indonesia. The most serious incident occurred in Cordoba, in the Mexican State of Veracruz on 3 May 1991 when the Anaversa Company's factory exploded and caught fire, and thousands of litres of pesticides were burned, causing massive pollution in a populated area. In the countries of the South, the chemical hazard comes on top of the common ills and sufferings. Mortality from infectious diseases, a major health problem in the developing world, may be exacerbated by exposure to pesticides that depress the immune system."

The 1999 Asia Pulse Pte Ltd noted that "the massive use of pesticides is perceived as a big threat in Asia. Pesticide use had soared for a variety of crops such as cereals, industrial crops, cotton, sugar cane and plantation crops. In India, treated areas had expanded from under 6 million hectares in 1960 to more than 80 million hectares in the mid-1980s. During the same period, growth in the consumption of pesticides in some Asian countries had picked up as a result of market penetration by large chemical companies and had grown to about US$2.5 billion annually, according to the World Bank estimates of the region. Many of the pesticides exported to Asia had been banned or restricted for health and environmental reasons in their countries of manufacture, including products such as DDT, chlordane and heptachlor. In Pakistan, a groundwater sampling programme in the cotton-growing areas of Faisalabad in Punjab province revealed pesticide contamination in all samples taken, ranging from depths of 10 to 12 metres." Incidents or events described as above are common occurrences in many countries.

At the other end of the spectrum however, there are a few signs of encouragement. *ENDS Daily* in Denmark dated 23/3/99 notes that Denmark had recently announced the cutting of pesticides use in agriculture. This follows an advisory report suggesting a series of ways to reduce environmental and health risks. Danish measures to restrict pesticides use are among the toughest in Europe, and the Government recently proposed banning altogether the use of pesticides in private gardens. It is noted that this could be achieved without damaging agricultural competitiveness. From such an example, developing countries can learn, if they have to set free from the environmental damage, human health risks and

accumulation of obsolete stocks to dangerous levels.

Pesticides have accumulated above the level of tolerance. Human suffering needs to be relieved in the countries of the less fortunate and with fewer means. It is impossible to look at long-sustained damage and environmental contamination in isolation. They need to be looked at from various angles. All land-based activities connected to pesticide use ultimately affect the greater human environment to which everything belongs. Street runoff, contaminated or polluted soil, contaminated ditches, channels, rivers or streams all find their way either to lakes or the high seas or the oceans. For example, the Mediterranean Sea is a basin for wastes, contaminants and/or polluted waters or spillage from factories or farmlands from many European, Near Eastern or African countries. Farmers or state farms bordering or farming along the Nile River drain their waste back into the Nile, which ends up in the same sea. Such is the perfect example of pollution that brings the North face to face with the South. This is also a reflection giving a mirror image that does not allow national vis-à-vis regional problems to be considered as isolated cases or less significant issues. A problem in one part of the globe is a shared problem in another part of the planet. Persistent Organic Pollutants (POPs) released somewhere on the surface of the earth show their impact entirely on the opposite part of the world from the source of contamination or pollution.

In the effort to clean up the environmental devastation rendered in Africa and the Near East, it has been and still is the Government of the Netherlands that came to realize the need for help. It alone took the lead in providing the necessary financial support to enable the FAO interregional programme on prevention and disposal of obsolete pesticide stocks to be set up. It is now nearly five years since the programme began in mid-1994. Since then, more information has been generated in Africa, basic guidelines have been developed and awareness continues to expand as noted above. Yet more remains to be done. A concerted effort to clean up the regions involved has not yet be achieved. Those that benefit most from pesticides have lacked the initiative to make aggressive moves. Of the total 20,000 tonnes of pesticide stocks estimated to exist in Africa, so far only 3,214 tonnes or 10.8% have been removed. At this rate of progress, clean-up and disposal will take over 30 years provided that additional stocks do not accumulate. The total sum involved for disposal to date, involving a number of agencies and also including costs of the first and second phases of the FAO/Netherlands project, is approximately US$23.5 million. Contributions have been spearheaded by the Netherlands with 35% followed by Denmark 26%, Germany 13%, South Africa 9%, USAID 8%, Bilbao-Spain 4%, FAO/TCP 4% and the Shell Company with 1%.

Since the problem of obsolete stocks is vast, complicated and expensive, neither the responsibility nor the financial burden can be left to only one nation. It needs a concerted international effort to alleviate the poor from the environmental damage inflicted upon them. It was in anticipation of improved food production, a better environment and better health that pesticides were originally accepted as donations or purchased by the poor. Developing countries did not anticipate the suffering, the repulsive pesticide odour, the life-threatening environmental disaster or the mountain of pesticide waste that they cannot dispose of, because they lack both the knowledge and the facilities. The spirit and objective of this and other similar FAO consultations are to find ways and means to reverse this negative trend of development, to eliminate the waste and to avoid unacceptable waste or accumulation of obsolete stocks in the environment.

Let us join hands to create a partnership to enable the poor to experience better living conditions, a clean and sound environment and to open up avenues for a better future for the next generation.

Status of obsolete and unwanted pesticide stocks in Africa and the Near East

Alemayehu Wodageneh
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Prevention and disposal of obsolete pesticides

Background

Inventories of obsolete pesticides are available from 54 countries, 45 of which are in Africa and 9 in the Near East. However, since the inventory secured is indicative of the type and variety of pesticides involved in various countries, the results should not be considered complete or final because the data refer only to declared stocks. Experience has shown that additional stocks continue to be found or discovered afterwards either during the process of field disposal operations or through revised countrywide surveys. It is invariably necessary to make revisions of country stocks from time to time and update the inventory already at hand.

Two summary tables are provided below. The first shows the status of stocks for all the countries in which inventories have either been undertaken or indications obtained. The second is a summary table of only the countries where cleaning up and disposal of stocks have taken place.

TABLE 1
Obsolete pesticide stocks in 54 countries

	AFRICA	Total in tonnes	Total disposed of
1	Algeria	207	
2	Benin	421	
3	Botswana	18,249	
4	Burkina Faso	74	
5	Burundi	169	
6	Cameroon	225	
7	Cape Verde	35	
8	Central African Rep.	238	
9	Chad	0	
10	Congo	2	
11	Congo Dem. Rep.	591	
12	Côte d'Ivoire	7	
13	Equatorial Guinea	146	
14	Egypt	591	
15	Eritrea	223	
16	Ethiopia	1,500	
17	Gambia	7	14
18	Ghana	50	
19	Guinea-Bissau	9	
20	Guinea (Conakry)	4	
21	Kenya	56	

22	Libya	44	
23	Madagascar	135	135
24	Malawi	111	
25	Mali	13,761	
26	Mauritania	38	200
27	Morocco	2,265	
28	Mozambique	443	160
29	Namibia	43	202
30	Niger	116	60
31	Rwanda	451	
32	Sao Tome and Principe	3	
33	Senegal	150	
34	Seychelles	0	12
35	Sierra Leone	7	
36	South Africa	0	603
37	Sudan	666	
38	Swaziland	0	9
39	Tanzania	1 136	57
40	Togo	86	
41	Tunisia	882	
42	Uganda	214	50
43	Zambia	0	360
44	Zanzibar-Tanzania	0	280
45	Zimbabwe	27	
TOTAL AFRICA		**44 282**	**2 142**

NEAR EAST			
1	Iran, Islamic rep.	1 139	
2	Iraq	232	
3	Jordan	0	
4	Kuwait	2	
5	Lebanon	177	10
6	Qatar		5
7	Syrian Arab Republic	327	
8	Saudi Arabia	241	
9	Yemen	1,540	262
TOTAL NEAR EAST		**3 658**	**277**
GRAND TOTAL		**50 359**	**2 419**
Total existing and disposed of			**52 778**

TABLE 2
Summary of obsolete pesticide stocks disposed of in Africa and the Near East

Year/Country	Pesticides	Quantity (tonnes)	Agency/country involved
1991 Niger	Dieldrin	60	USAID/Germany(GTZ)
1993 Madagascar	Dieldrin	135	70 tonnes by Germany (GTZ) & 65 t. by GCPF, Swiss and Government.
1993 Uganda	Dieldrin	50	FAO/UNCDF
1994 Mozambique	DDT/Monocrotophos	160	Germany (GTZ)
1995 Tanzania (Zanzibar)	Various	280	the Netherlands(DGIS)/USAID
1996 Seychelles	Various	12	FAO/the Netherlands(DGIS)
1996 Tanzania	Dinitro-O-Cresol (DNOC)	57	57 tonnes Germany
1996 Yemen	Various	262	FAO/the Netherlands(DGIS)/KfW-Germany
1997 Mauritania	Various	200	Germany(GTZ) & (Shell also contributed 37.5%)
1997 Qatar	Various	5	Government
1997 Zambia	Various	360	FAO/the Netherlands(DGIS)/Germany(GTZ)
1999 Lebanon	Mainly Fenitrothion	10	FAO 1999
1999 Iraq	Contaminated containers		90,000 tonnes by FAO (different weights) 1999
98/99 South Africa	Various	603	South African Government1998/1999)
98/99 Swaziland	Various	9	South African Government 1998/1999)
98/99 Namibia	Mainly HCH	202	South African Government 1998/1999)
1999 Gambia	Various	14	Industry and Overseas Develop. Corporation
Total		**2,419**	

Note: Disposals undertaken in Uganda, the Niger, Mozambique and Madagascar were limited mainly to Dieldrin and few other types of stocks. There are still stocks (pesticides, contaminated soil or empty and contaminated empty pesticide containers) in these countries that still require disposal.

Since studies involving environmental impact assessment, critical laboratory analysis or comprehensive risk assessments are expensive and time consuming, they were not attempted. Even if funds had been available for such tasks, experts to cover all affected countries within a reasonable time frame are not available.

Tables 1 and 2 highlight the fact that the inventory of stocks so far secured for Africa and the Near East is over 52,000 tonnes out of which only 2,419 tonnes have been disposed of. The quantities of obsolete stocks are likely to increase much above the total indicated as more stocks are being identified compared to the original 20,000 tonnes estimated to exist in Africa. Progress in disposal is very slow and painstaking simply because the financial resources are lacking.

At the current rate of progress, the total time-span needed to dispose of the entire stocks in Africa will be more than 50 years. This will be the case only if further accumulation does not take place in the ensuing period. But if the necessary financial resources can be secured, disposal of the entire estimated toxic waste in Africa can be completed in less than 10 to 15 years. So far, major disposal operations have been conducted mainly with the commitments and involvement of various donor agencies and organizations. The chemical industry has

only participated in disposing of stocks from the Gambia and Madagascar with contributions of US$58,000 and US$133,000 respectively.

Removal of stocks from The Gambia by the chemical industry (Global Crop Protection Federation (GCPF)) involved a total of 14 tonnes part of which was obsolete Methyl bromide, paid for by the Commonwealth Development Corporation (CDC) based in the United Kingdom. Disposal of stocks from Madagascar was a collaborative effort among GTZ, the Swiss Government, the Government of Madagascar and GCPF. The sum of US$133,000 was contributed towards the disposal while contributions by the other three stakeholders were not made available to FAO.

Between 1991 and 1988 the chemical industry had removed from Africa a total of 1,511 tonnes toxic waste. This was part of the overall waste generated as part of direct pesticide sales and distribution efforts by the Chemical Industry in 4 countries, namely, Côte d'Ivoire (821 tonnes), Kenya (70 tonnes), Tanzania (160 tonnes), Malawi (70 tonnes). Since the stocks removed were strictly company waste, disposal information was neither provided to FAO officially nor considered part of the waste management campaign in Africa.

Compiled information of inventories of stocks of pesticides

Limited copies of two versions of compiled inventories of stocks have been distributed under separately showing a list of obsolete pesticides identified.

Table 3 gives the status of POPs and other pesticides or POPs' candidates identified in the FAO inventory. Most of the pesticides involved are dangerous to the environment and to the human health.

TABLE 3
POPs and others considered to be high-risk pesticides

No	Pesticides (POPs) and candidates
1	Aldrin
2	Chlordane
3	DDT
4	Dieldrin
5	Endrin
6	Heptachlor
7	Hexachlorobenzene
8	Mirex
9	Toxaphene
10	Pentachlorophenol
	Other POPs' candidates
1	HCH
2	BHC
3	Lindane
4	Unknown (should contain POPs)
5	Endosulfan
6	Fenitrothion

The overall inventory of stocks indicates that the most dangerous products make up nearly 33 % of the total inventory compiled to date in Africa and the Near East. The overall FAO inventory of obsolete pesticides highlights pesticides that are subject to the prior informed consent (PIC) procedures by indicating which were identified and what quantities were involved (Table 4).

Pesticides subject to the procedures of prior informed consent (PIC)

TABLE 4
Substances subject to PIC procedures and those that are POPs

No.	Product	Category
	2,4,5-T	Pesticides
	Aldrin	Pesticides (POPs)
	Captafol	Pesticides
	Chlordane	Pesticides (POPs)
	Chlordimeform	Pesticides
	Chlorobenzilate	Pesticides
	DDT	Pesticides (POPs)
	Dieldrin	Pesticides (POPs)
	Dinoseb and dinoseb salts	Pesticides
1	1,2-dibromoethane (EDB)	Pesticides
1	Fluoroacetamide	Pesticides
1	HCH (mixed isomers)	Pesticides
1	Heptachlor	Pesticides (POPs)
1	Hexachlorobenzene	Pesticides
1	Lindane	Pesticides
1	Mercury compounds,	
1	Pentachlorophenol	Pesticides
1	Methamidophos	Pesticides
1	Methyl-parathion	Pesticides
2	Monocrotophos	Pesticides
2	Parathion	Pesticides
2	Phosphamidon	Pesticides
2	Crocidolite	Industrial
2	Polybrominated biphenyls (PBB)	Industrial
2	Polychlorinated biphenyls (PCB)	Industrial
2	Polychlorinated terphenyls (PCT)	Industrial
2	Tris (2,3 dibromopropyl) phosphate	Industrial
Pesticides		
1	Endrin	Pesticides (POPs)
2	Mirex	Pesticides (POPs)
3	Pentachlorophenol	Pesticides (POPs)
4	Toxaphene	Pesticides (POPs)
Chemicals		
1	Dioxins	Chemicals (POPs)
2	Furans	Chemicals (POPs)
3	Hexabromobiphenyl	Chemicals (POPs)
4	Polyaromatic hydrocarbons (PAHs)	Chemicals (POPs)

Countrywide surveys

Owing to unavoidable political and related difficulties, surveys and countrywide surveys have either been delayed or have not been possible to conduct in some countries. In addition to the need for further revised surveys and updating of inventories in the countries where obsolete stock surveys have already been secured to date, at least 10 countries in Africa and 6 countries in the Near East require thorough surveys and inventories. In Africa the countries concerned are: Algeria, Angola, Djibouti, Egypt, Ghana, Lesotho, Liberia, Libya, Nigeria and Somalia and in the Near East: Bahrain, Iran, Jordan, Oman, Saudi Arabia and the United Arab Emirates.

Latin American countries

Limited funds have been made available by UNEP and the Canadian Environmental Agency to initiate surveys and for taking inventories in several Latin and Central American and Caribbean countries. The FAO Plant Protection Officers in the region are provided with the necessary guidelines and directions on inventory taking of obsolete stocks developed under project GCP/INT/650/NET. They follow up and assist in monitoring survey operations in collaboration with the Plant Protection Services of the various countries concerned.

Overview

The problems and issues associated with obsolete and banned pesticide stocks continue to be major environmental and human health hazards. Neither the facilities, nor the expertise or resources are available to speed up disposal operations. Widespread unawareness of the inherent danger of pesticides is not uncommon. There are no acceptable alternative methods of disposal available at least for the moment. The currently preferred method for disposing of toxic pesticide wastes is high temperature incineration. Although there are indications of developments in some developed countries, there are no destruction methods that are reliable or commercially viable. Since the burial of pesticide waste is only a short-term solution, it is discouraged as much as possible. The long-term negative consequences of burial of pesticides are more hazardous and harmful to the environment simply because contamination of soil and groundwater sources cannot be avoided.

The worst scenario faced in many developing countries is the fact that sales and distribution of pesticides have increased steadily in many countries while the mechanism to protect the environment and people is lacking., Pesticides almost always end up in the hands of people who are the most unaware, poor or less able to protect themselves. There are also a host of related minor or major problems that have to be dealt with. There is a need for a united front at all levels within each country and on a global basis to exercise strict legal measures and others to protect affected countries from long- and short-term environmental calamities. There is urgent need for a concerted global action for both institutional and conventional problems. Adoption of the principle of “returning to sender” pesticides that are dangerous, illegally acquired, sold or distributed, received or bought, should be the first major step in achieving the objective followed by other more effective international measures.

Papers presented and/or ideas expressed

PAN (UK) activities in the area of prevention, management and disposal of obsolete pesticides

Mark Davis
Pesticide Action Network (PAN),United Kingdom

The quantities of obsolete pesticides in developing countries have been repeated so many times that, like the WHO figures for casualties from exposure to pesticides, they are an indelible element of all our pesticide vocabularies. There are over 20,000 tonnes of obsolete pesticides in Africa and the Near East, 100,000 in developing countries worldwide and 3,000,000 poisoning incidents each year where 20,000 people may die.

To date fewer than 2,500 tonnes of obsolete pesticides have been disposed of from 14 countries at a cost of approximately US$13.7 million. Additional money has been spent in preparation for operations that have not yet taken place. This works out at an average of US$5,293 per tonne actually disposed of. Several countries that have carried out inventories still wait to clean up waste, and in countries where operations have taken place most still have stocks that require disposal. In addition, nine African countries have not yet completed inventories.

It is also notable that despite all the efforts of FAO, which is coordinating activities on obsolete pesticides, only nine sources have made any contribution towards cleanup operations. Of the chemical industry only Shell, which no longer produces pesticides, has contributed towards the destruction of its own now obsolete products dieldrin and aldrin. No companies that currently manufacture and sell pesticides in developing countries have contributed funds to date, despite public commitments made. Of the international agencies supporting development in developing countries, only FAO has made any contribution with nothing forthcoming from major agencies such as the World Bank, regional development banks and the European Union that have been so generous in funding pesticide supplies in the past. Most of the funds contributed have come from national development agencies in the United States and European countries including Denmark, Germany, the Netherlands, Sweden and the Basque country. Other countries that have donated or are the sites of major pesticide manufacturers such as the United Kingdom, France and Japan have made no contribution towards cleanup efforts.

The Pesticide Action Network (UK) has been active in raising awareness and stimulating solutions to the obsolete pesticide problems primarily in developing countries since 1994. It has worked closely with FAO as the leading organization in this area but has also initiated discussions and activities in the European Commission, OECD and UK-DFID. It has also participated in dialogue with the pesticide industry, toxic waste handling industry, developing country governments and donor agencies. Many of these discussions focused on specific problems but also at the strategic and policy levels.

PAN see its role as an NGO to ensure transparency in processes evolving from the FAO consultations, ensuring that all participating bodies take responsibility for preventing and solving problems associated with obsolete pesticides, and ensuring that the role of NGOs, particularly in countries with stocks of obsolete pesticides, is acknowledged.

OECD

OECD has not previously discussed the issue of obsolete pesticides despite the fact that its Member States are the major contributors to the problem. The Pesticide Action Network (UK) gained the agreement of the Secretariat and Chair of the OECD Pesticides Forum

(now the Working Group on Pesticides) to make a presentation on obsolete pesticides at one of its meeting.

This took place in November 1998, when FAO was invited to share PAN's allocated slot to raise awareness to its work. The presentation was well received with particular interest from Poland, Canada, Australia, the United Kingdom and the United States. It is hoped that this issue will remain on the agenda of the Working Group on Pesticides and lead to a greater involvement and more support from the Governments of Member States in disposal operations and prevention strategies.

Industry

The major pesticide manufacturers represented by the Global Crop Protection Federation (GCPF) have made a public statement declaring willingness to help provide assistance and technical expertise for the disposal of obsolete crop protection product stocks in Africa and the Near East (www.gcpf.org/industryframes.html).

At a donors' meeting to discuss funding of a major clean-up operation in Ethiopia, GCPF declared that its members would pay the destruction costs of any obsolete pesticides in Ethiopia attributable to member companies. Destruction costs are currently about US$1 per kg or litre of product which is about 25-30% of total disposal costs.

This offer, however, raises many questions including:
What definition of "obsolete" is GCPF using? Will they, for example claim that pesticides past their "use by" date are still usable? What constitutes "attributable"? Some old pesticides have been transferred from corroding drums, others have no labels. What if products are formulated locally from GCPF-derived active ingredients?

Many of the pesticides have leaked from corroded containers into the soil below. Does the GCPF offer include removal and treatment of contaminated soil and, if so, to what degree of contamination?

Representatives of the Industry have been asked these questions to which they provided verbal assurances that their intentions are honourable. They suggested that the public announcements represent minimum offers of assistance with final contributions likely to be significantly higher.

It is important to note, however, that GCPF statements do not necessarily commit individual member companies, and ultimately each company will act as it sees fit. This makes the task of negotiating for contributions with several companies extremely daunting and possibly not worthwhile if arguments about attribution, obsolescence and properties of the products need to be negotiated with each company.

UK-DFID

This UK-based organization, noted that the UK Government Department for International Development (DFID) did not participate in recent FAO consultations and did not contribute to any disposal operations or related activities, despite the location of major pesticide manufacturers in the United Kingdom and the supply of many gifts of pesticides from the country to developing countries.

The presentation of the issue of obsolete pesticides has generated some interest at DFID not least because significant amounts of now obsolete pesticides came from the United Kingdom. Addressing the current problems of obsolete pesticides also fits in with the Department's interest in PIC and POPs. It is hoped that DFID will recognise the importance of this issue and agree to support disposal operations and related activities with funds.

Developing countries

PAN was invited to participate in an expert task force mission to Ethiopia to assess the current situation and propose appropriate solutions for the estimated 1200 tonnes of obsolete pesticides in the country.

Using the information gathered during the task force visit PAN assisted in the preparation of a detailed proposal for the disposal of Ethiopia's obsolete pesticides, which was presented initially to a meeting of donor representatives in Ethiopia. It also made direct contact with donors to try to obtain their support for the operation.

PAN has also contributed to a FAO co-ordinated workshop on prevention and disposal of obsolete pesticides for French-

speaking African countries. Working directly with representatives of countries dealing with the burden of obsolete pesticides emphasizes their helplessness. Many complained that they have little or no control over pesticides still entering their countries. This is particularly true of pesticides supplied under the Japanese KR2 programme and is common to many African countries.

During the course of this workshop delegates also visited the site where obsolete pesticides are being reformulated. Several shortcomings in the standards of this operation put the health of workers at the facility at risk and may also be contaminating the environment and putting local residents at risk. PAN has raised these issues with the funding agency in an effort to ensure that, like all other solutions, these practices meet the highest acceptable international standards of health, safety and environmental protection.

Technology

The technologies available or under development for the destruction of obsolete pesticides all have strengths and weaknesses, advocates and detractors. Greenpeace has done extensive work in this area in the search for appropriate solutions to POP stockpiles. PAN has been asked by FAO to review the technologies in relation to pesticide destruction in developing countries.

PAN's view is that the ideal strategy is to prevent the creation of waste in the first place. Nevertheless, existing stocks of obsolete chemicals exist and need to be dealt with. Developing countries do not have the technology, money or skills base to provide appropriate solutions and therefore international support is needed. Raising money for the destruction of old chemicals is extremely difficult and, once achieved, the funds must provide permanent solutions, not temporary ones. The development of facilities for the management and destruction of hazardous waste should be part of a long-term national strategy in developing countries. Such a strategy should be designed to deal with all types of hazardous waste that will inevitably be generated, for example from hospitals, industry and the ongoing use of pesticides. It is inappropriate to put destruction facilities in place to deal with existing stocks of chemicals if they are not developed as part of a national strategy.

The only option currently available that offers permanent destruction in conditions that are acceptable by European or United States standards is incineration in dedicated high temperature incinerators. The only facilities of this type that are currently willing and able to import waste from developing countries for destruction are based in Europe.

The nature of obsolete pesticide stocks is that they consist of mixed products, are often contaminated and include solid containers and other materials such as heavily contaminated soil. Few, if any, of the newer technologies are able to deal with such cocktails of waste. Landfill does not offer permanent solutions and cannot be relied upon to be safe in developing countries. Chemical treatment is too product-specific, requires extensive knowledge of chemistry and can be extremely hazardous. The use of cement kilns is possible in some cases but is also limited, cannot deal with contaminated soil and metal containers, and the adaptations required have not so far proved to be cost effective. The destruction of hazardous waste locally also requires the support of local populations which is often not forthcoming.

Transboundary shipping and incineration in Europe may not be perfect solutions, but they are the best currently available. The developing countries that are currently suffering the consequences of inappropriate pesticide supply from the industrialised countries cannot be expected to continue suffering under that burden while better solutions are sought.

Awareness raising

As an independent NGO PAN is in a unique position to say what needs to be said. Using the expanding knowledge base that has been developed by virtue of PAN's consistent involvement in this area we have promoted the issue has been promoted at various conferences and meetings of OECD, EC and UK-DFID. Articles have been written in *Pesticides News* and the issue has been referred to in other journals. PAN has tried to get mass media coverage for the issue with limited success, but continues to try.

PAN also writes to agencies that have played a role in creating the obsolete stocks or mismanaged them in trying to solve problems. It has communicated with the World Bank about the burial of pesticides on a farm managed by Bank agents in Yemen; with the EC about mancozeb supplied to Rwanda which has been fire damaged and requires disposal; with USAID that funded reformulation of carbaryl in Senegal in appalling health and safety conditions.

Conclusions

The prevention, management and disposal of obsolete pesticides in developing countries and newly emerging nations of Eastern Europe demand attention. NGOs can do much to raise awareness and stimulate action to deal with obsolete pesticides. They can also do much to monitor disposal activities to ensure that appropriately high standards are maintained. The prevention of accumulation of obsolete pesticides is an integral part of getting rid of the old stocks and fits well into PAN's aim of reducing pesticide use and pesticide hazards. There are many ways in which contributions can be made towards these ends.

Update on the activities of GTZ in the area of prevention and disposal of obsolete pesticides and associated containers

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and
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Pakistan

On the request of the Government of Pakistan, the Royal Netherlands Embassy (RNE) in Islamabad is assisting in the assessment, safeguarding and disposal of up to 300 tonnes of obsolete pesticides in the Punjab Province with GTZ being the prime contractor. Cooperation is based on a Memorandum of Implementation (MOI) which was signed by all parties in April 1999.

The prequalification for the commercial disposal companies was carried out by GTZ, as the first step in the tendering process for the safeguarding and disposal operation in Punjab. Six of the seven companies passed the criteria set for the prequalification and will receive the prepared tender documents to give their bids for the planned safeguarding and disposal operation. A site visit was organized from 17 to 20 May 1999.

The necessary equipment and safety gear for the continuation of the analytical survey in the remaining 100 pesticide stores in the province of Punjab has been shipped to Pakistan. The survey will start as soon as the material is in Pakistan and the Department of Agriculture in Punjab is ready for work.

It was agreed that the issue of a contribution of the GCPF-Pesticide Industry to the project will be raised again once the tender is closed and all relevant information (prices per tonne for incineration, transport, etc.) is available.

Mozambique

Approximately 73 tonnes of obsolete pesticides and chemicals for the formulation of pesticides have been collected, safeguarded and transported to Beira. They are now ready for shipment to Germany, where they will be disposed of in the high temperature incinerator of BASF in Ludwigshafen.

Namibia

Approximately 250 tonnes of BHC (technical product) were safeguarded and transported to a temporary storage place in South Africa in February 1999. Together with additional stocks from RSA the waste has been sent to the United Kingdom for disposal. The operation was conducted jointly by the Governments of South Africa and Namibia. It completed initial work done by GTZ in 1995 when different disposal options had been elaborated and submitted to the Namibian Government for decision. GTZ supported the operation with US$115 000 (DM200 000).

Madagascar

The major stakeholders in this operation – the authorities from Madagascar (Ministère de l'Agriculture/Direction de la Protection des Végétaux), the Swiss Development Corporation (SDC), GTZ and GCPF have agreed on a Memorandum of Understanding (Convention multi-partite). This document is ready for signing. Furthermore the Government of Madagascar has signed the Basel Convention and ratification is expected by the end of August 1999.

The actual quantities of pesticides for disposal are 46 757 litres and 29 678 kg. High-temperature incineration is planned to be executed in Switzerland. Costs for repackaging, transport to Basel and incineration are estimated at US$200 000 and will be shared between SDC, GTZ, DPV and GCPF companies. DPV, with the assistance of the Swiss-funded and GTZ managed project VOARISOA (Environ-ment and toxic products), has already done a great deal of basic work which is not yet included in the figure of US$200 000 national inventory, analytical survey, collection of pesticides from different sites and organization of an intermediate storage place near Tamatave (see detailed country report). Great emphasis was given to evaluating the reasons for the accumulation of obsolete stocks. A wide range of causes has been identified and an anti-stock build-up prevention scheme is currently being prepared. GTZ will give technical and financial support for both the disposal operation and implementation of the prevention programme. The disposal operation is likely to be completed by the end of 1999.

International Workshop "Towards prevention of obsolete pesticide stocks – Lessons learned from disposal operations in Africa"

As the GTZ Pesticide Disposal Project is scheduled to terminate in October 1999, a critical review of its work should be undertaken in order to draw some conclusions for future efforts in this area. It was intended to do this in an international workshop which would allow an open exchange between key players, such as representatives of African countries, FAO, the Basel Secretariat, members of the international donor community, NGOs and GCPF. The workshop would be entitled 'Towards prevention of obsolete pesticide stocks –lessons learned from disposal operations in Africa".

Unfortunately GTZ is not able, for the present, to finance the activity. because the necessary funds for the international workshop will not be available in 1999 due to budgetary restrictions in GTZ. They will be lost unless the disposal project is extended. The final decision of the Federal Ministry for Economic Cooperation and Development is expected by the end of May 1999.

Alternative sources of funding are currently being evaluated and all preparatory work would aim at developing synergies with FAO, the Secretariat of the Basel Convention and other relevant institutions and organizations. Conse-quently, the above-mentioned partners would be consulted at a very early stage of preparation of the event.

GCPF supports elimination of obsolete stocks of crop protection products

Klaus Wettstein
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Global Crop Protection Federation(GCPF)

In response to FAO Press Release 99/31, the Global Crop Protection Federation (GCPF) reaffirms its support for a multi-stakeholder approach to the elimination of obsolete stocks throughout the world.

GCPF member companies accept full responsibility for the life-cycle of products under its ownership. However, purchased stocks are clearly the responsibility of the owner.

Nonetheless the crop protection industry is committed to working with other stakeholders (owners, suppliers, donor agencies, aid organizations, exporting governments and regional bodies, as well as hazardous waste disposal companies) to eliminate stocks that it originally manufactured or supplied.

Individual companies decide the level of technical and financial assistance on a case-by-case basis after verification of the stocks and their origin.

In 1996, GCPF committed itself to help eliminate obsolete stocks of crop protection products in Africa and the Near East. In addition, prevention of future obsolete stocks is a major concern of GCPF.

Specific projects

GCPF assumed a leading role in the four countries FAO named as priorities in 1997: the Gambia, Madagascar, Malawi and Senegal.

The projects in the Gambia and Madagascar were expected to be completed in 1999, and industry contributions in these countries are likely to far outstrip initial commitments undertaken in 1996.

Industry funding is in place in Senegal, but outstanding contributions from the donor community have kept incineration of stocks from being completed. In Malawi, most stocks identified were reusable after re-formulation and repackaging; destruction of truly obsolete stocks awaits the completion of an updated inventory to be carried out by the Malawi Government and FAO.

The Mauritania project – financed in part by Shell as noted in FAO Press Release 99/31 – is the only completed project to date.

The crop protection industry also assists in Brazil, Ethiopia, Mozambique, Pakistan, South Africa, Sudan and Tanzania. In several cases, industry assistance is on hold until inventories and verifications of origin can be completed.

A complex undertaking

Crop protection disposal projects are complex undertakings, involving many areas of expertise such as project design, inventory production, stakeholder identification, fund seeking, bilateral agreements and contractor selection. This complexity is often at odds with the need for a speedy resolution.

The crop protection industry calls for continuing cooperation with FAO and other important stakeholders to eliminate current obsolete stocks and to prevent future recurrences.

For further information, reference may be made to the crop protection industry's position on obsolete stocks at www.gcpf.org or contact Kristen E. Sukalac, GCPF Communications Coordinator –
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Disposal of obsolete pesticides in Tanzania

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Background

Like most other African countries, Tanzania has significant stockpiles of obsolete pesticides. A rapid assessment of pesticide wastes carried out in 1990 in the coffee- and cotton-growing areas revealed huge quantities. These are pesticides that are no longer used for environmental or health reasons, and pesticides that can no longer be used because they have expired as a result of prolonged storage. Obsolete pesticides are hazardous wastes which should be disposed of.

More recently, the problem has risen of disposing of 65 000 litres of expired pesticides that were used for controlling locusts. While progress has been made by disposing of these through burning in a cement kiln, the Government of Tanzania directed that a study be undertaken to obtain the correct picture of stocks of chemicals existing in the whole country.

Heightened by the successful disposal of hazardous chemical waste on the islands of Zanzibar (Unguja and Pemba) in 1995 and 1996, funded through the Government of the Netherlands, the National Environment Management Council requested assistance from the Netherlands Government in order to execute a detailed nationwide survey concerning mainly obsolete pesticides.

Quantities and storage conditions

A detailed inventory conducted in 1997 and 1998 identified over 1 000 tonnes of obsolete pesticides and about 200 tonnes of veterinary wastes comprising vaccines and drugs. There are more than 250 different products stored in more than 325 different storage facilities scattered throughout the country. The stock includes about 150 tonnes of DDT for agricultural use. (See Annexes 1, 2, 3, 4 and 5 for countrywide distribution of obsolete chemicals).

Most of the obsolete products are kept in substandard stores, many of which lack impermeable floors and/or have poor ventilation. At several locations containers are even stored in the open, exposed to direct sunlight and rain.

As time goes by the containers deteriorate and start leaking. Unfavourable climatic conditions and high temperatures inside poorly ventilated stores accelerate this process. High temperatures also increase the pressure inside drums, thus producing leakage and a large number of severely contaminated stores. (The inventory report shows 40 stores with high handling risk and/or environmental pollution. Roughly 33% of the recorded waste is stored in these 40 stores.)

Health and environmental hazards associated with obsolete pesticide stocks

The health and environmental hazards associated with obsolete pesticide stocks are determined by the persistence and toxicity of the products concerned, the location of storage and the condition of the containers and the stores.

About a third of the volume of obsolete pesticides stored in Tanzania are persistent organochlorinated compounds that pose

TABLE 5
Examples of environmentally hazardous obsolete products in Tanzania

Products	Quantity of product containing active ingredient	Comments
DDT	Approx. 150 mt	POP
Aldrin, Dieldrin	Approx. 6 mt	POP; WHO Ib
Fenthion	Approx. 700 litre	WHO Ib
PIC-list products	Approx. 240 mt	Products are banned or severely restricted in a number of countries
All POP-list products together	Approx. 200 mt	Serious immune and metabolic effect, neurological defects, reproductive anomalies and cancer

a long-term risk to the environment and public health. These products tend to remain in the ecosystem and accumulate in food chains. The DDT and some of the other organochlorines are classified as Persistent Organic Pollutants (POPs) and are subject to special international attention because of their capability of long-range transport, their persistence in the environment and their suspected disrupting effect on the immune, reproductive and endocrine systems.

Several of the other products can be classified as extremely hazardous (WHO Recommended Classification of Pesticides by Hazard: Class Ia). Under the present guidelines (OECD, World Bank, FAO) such products are considered unsuitable for use by small-scale farmers and should generally not be provided as aid, because their safe use cannot be guaranteed in most developing countries. Many of the products are very toxic to fish and aquatic ecosystems.

The health and environmental hazards associated with obsolete pesticides are amplified by the fact that the majority of storage facilities are located in towns, villages, near water bodies (sea, lakes, rivers, irrigation schemes), in the open and in water catchment areas. People in the surrounding area often complain about vapours and odour. Many storage sites are accessible to unauthorized persons and products are being stolen for unauthorized use. In some cases children have been found playing and animals were grazing near the open storage facilities.

Unless adequate action is taken, it should be anticipated that all obsolete pesticides at present kept in Tanzania, sooner or later, may end up in the environment. The environmental impact of leaked concentrated pesticides is far worse than the impact of their normal intended use. The implications for public health and the environment can be severe, particularly if groundwater or rivers are becoming contaminated. Point-source environmental contamination with concentrated pesticides may cause a major setback to the development of the area concerned. Contamination of large water bodies such as rivers and lakes could cause an environmental disaster.

Both acute poisoning as a result of direct contact with obsolete pesticides and chronic poisoning through intake of contaminated water or food are realistic possibilities. Natural resources such as fish stock, and drinking and irrigation water may be severely affected.

Serious contamination has occurred and will continue if not abated. For example in Vikuge, Kibaha, soil samples taken from an area near where DDT had been stored in the open showed high levels of DDT at 1 m depth in the ground.

Outline of the disposal operation

The obsolete pesticides will be repacked and shipped or transported for incineration at a dedicated hazardous waste incineration plant in a country to be identified, e.g. one in Europe. A limited amount of the obsolete chemicals will be incinerated locally in cement kilns. Shipment and incineration of the pesticides will comply with all relevant national, regional and international

regulations governing the transport and incineration of hazardous wastes.

These regulations include the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, the Bamako Convention, the International Maritime Dangerous Goods Code (IMDG), the relevant EU regulations for the transport and labelling of dangerous goods and the regulations for transport and incineration of hazardous waste in the country of destination.

In summary, the project will:
repackage and label all products for shipment in accordance with IMDG;
clean up heavily contaminated sites, where possible;
centralize obsolete stocks at regional depots;
collect all stocks from regional centres and other locations and take to a central depot in or near Dar-es-Salaam or elsewhere;
ship the waste for incineration in a dedicated hazardous waste incinerator.

Collection and transport of pesticides to regional depots will be done as much as possible by local contractors. The Government will supervise and monitor all activities. Where necessary, products will be repackaged prior to local transport. In the case of high or multiple hazards, a specialist foreign contractor will handle stocks.

A foreign contractor specializing in hazardous waste management will be contracted to:
collect waste from sites with high or multiple hazards;
repackage all waste that has not yet been repackaged by the local contractor;
label all waste and perform the necessary formalities for shipment of the waste;
oversee the transport of waste from the regional depots to the central depot in Dar-es-Salaam;
arrange for shipment and incineration of the waste.

The Government will play a supervisory and monitoring role during field operations. All Government of Tanzania staff involved have already been trained and local contractor staff will be trained in the safe handling of hazardous waste and be provided with the necessary protective gear in order to execute all activities.

Field operations will be monitored by a representative of the main consultant and Government staff. This is to ensure that all contractors comply in full with national, regional and international safety standards and transport regulations.

Tanzania is committed to disposing of these stockpiles of obsolete chemicals and establishing an effective management system on hazardous waste. Through the financial support provided by the Netherlands Government, we have been able to complete phase I of the cleaning operation as been completed. Phase II will involve repackaging, collection and final disposal of the chemical waste. The operation is expected to cost US$5.94 million (approximate estimate), and thereby reduce health and environmental risks.

Overall objective of the pesticide disposal

Pollution control and hazardous waste management capacity will be increased to prevent severe environmental and health hazards caused by deteriorated stocks of obsolete pesticides and other chemical wastes.

Risks

The disposal operation cycle will ensure that it poses no risks to the environment and to public health. Equally, efforts will be geared towards preventing future accumulation of pesticides.

Risk reduction of accidents during national and international transport of the pesticides

The risk of environmental contamination as a result of accidents during national and international transport is smaller than the risk associated with the transport of new pesticides, which is broadly considered to be acceptable. Packaging will be in full compliance with IMDG regulations and will be considerably safer than the average packaging of the original product. Additional safety measures will be taken, such as the use of drip-trays inside shipping containers. The

disposal company will ensure that it has sufficient insurance coverage to handle any emergencies and claims.

Risk reduction of accumulating new stocks

The risk that new stocks will accumulate is reduced through a package of preventive measures. Moreover, a large share of the stocks concerns DDT which has a restricted use. Once the present stock has been eliminated it will not be replaced. The Government has put in place new pesticide legislation that prevents the importation of persistent and environmentally dangerous pesticides. The chance that a large volume of new products might accumulate has been further reduced by present donor policies that are more careful about pesticide donations. Review of regulations and implementation of a training programme to improve pesticide storage practices, as proposed under this project, will further reduce the risk.

Request for assistance and special consideration

The Government of Tanzania is fully aware that a definitive and environmentally sound solution is required for the obsolete pesticide stocks in the country. The costs of a disposal operation are beyond the country's financial capacities, and therefore assistanceis once again being sought from the international community.

In May 1998 an appeal for assistance from the international donor community was initially made by the Acting Director-General of NEMC on behalf of the United Republic of Tanzania during the FAO Third Consultation on Prevention and Disposal of Obsolete Pesticide Stocks, which was held in Rome in March 1998. At that meeting, Denmark and the Netherlands expressed willingness to fund phase II.

A stakeholders' meeting was held in Tanzania from 21 to 29 September 1998. The meeting was facilitated by an external consultant. During the meeting and also through separate consultations with representatives (embassies) of the Governments of Denmark, Norway, Switzerland, and the Netherlands, and the International Federation of the Chemical Industry, the discussion focused on multi-donor funding and also on how to reduce costs. The Netherlands pledged, in principle, to give US$1.0 million. Over a two-year period, Denmark withdrew their initial response because they were faced with opposition to a similar disposal project in Mozambique at the same time. The International Federation of the Chemical Industry pledged to provide US$1 000 per tonne of their products. These are estimated at 200 tonnes and therefore the expected amount is approximately US$200 000. Funding that is being sought now is to the tune of US$4.74 million.

Reasons for assistance

Such assistance fits well within the recommendations of the OECD/DAC Guidelines for aid agencies on pest and pesticides management, which were published in early 1995. A significant section of the Guidelines is dedicated to obsolete pesticides and agencies are called upon to assist with the disposal of these pesticides, particularly when such leftovers are pesticides under aid arrangements.

International assistance to help solve the problem of obsolete pesticides is also called for by FAO, UNEP Chemicals, UNEP Secretariat for the Basel Convention, the International Forum on Chemical Safety and Greenpeace.

Special consideration

Within the spirit of international conventions and policies such as the Basel Convention on the Control of Transboundary Movement of Hazardous Waste and their Disposal and UNCED/Agenda 21, obsolete pesticides in developing countries are increasingly regarded as an international environmental problem which all parties have a responsibility to help solve.

International momentum is gathering towards a phasing out of POPs. POPs are now broadly acknowledged to cause serious immune and metabolic effects, neurological defects, reproductive anomalies and cancer. They remain in the environment for long periods and accumulate in food chains. Over 20% of the obsolete pesticides in Tanzania

are POPs. Disposal of these pesticides will decrease the release of such substances into the environment, and therefore reduce health and environmental risks.

The project is designed to address a severe, widespread environmental problem which poses high health and environmental risks extensively in the country. If not adequately addressed, the environmental damage may be irreparable.

The way forward

Norway is known to be an international leader in disposing of chemical/pesticide waste by incinerating in cement kilns. During the stakeholder meeting it was realized that local incineration by use of cement kilns would reduce costs. Norway has offered to fund the feasibility study of Tanzania Portland Cement, Wazo Hill, in Dar-es-Salaam and Tanga Cement Company in Tanga factories. The feasibility report by the Norwegian consultants has been completed and is now being discussed by the National Technical Committee on Chemical Waste Management.

The preliminary feasibility study report indicates that in principle both plants are suitable for pesticide burning, from a technical point of view. The Tanga Cement Company is preferred because it has a large kiln and is better for higher chlorine tolerance and thermal buffer capacity. Other reasons for giving preference to the Tanga Cement Company are minimum risk to population around the factory, easiness of transportation and electricity stability.

As a follow-up to the feasibility study report, three task forces have been formed, to address the following issues:

Preparation of an Environmental Impact Assessment prior to the local trial burn and the actual incineration, if it takes place.
Assessment of existing local analytical laboratories for actual quantification and identification of obsolete chemicals.
Preparation of procedure and guidelines for local incineration, which will be part of the permit issued to the incinerating plant.

The disposal methods envisaged form a clear indication of the commitment of the Government of the United Republic of Tanzania to get rid of hazardous chemicals. The methods are a demonstration of concerted efforts to minimize pollution and, where possible, to avoid future accumulation of such chemicals.

TABLE 6
Obsolete pesticides: summary per region
(Amount in units: 1 m^3 = 1000 litres = 1000 kg)

No.	Region	Kgs/litres
1	Arusha	55 463
2	Coast	182 056
3	Dar-es-Salaam	221 051
4	Dodoma	517
5	Iringa	26 072
6	Kagera	28 177
7	Kigoma	2 793
8	Kilimanjaro	81 651
9	Lindi	5 904
10	Mara	38 385
11	Mbeya	48 414
12	Morogoro	31 686
13	Mtwara	11 479
14	Mwanza	17 266
15	Pwani	22 040
16	Rukwa	3 400
17	Ruvuma	374
18	Shinyanga	24 475
19	Singida	1 383
20	Tabora	18 162
21	Tanga	65 244

TABLE 7
Veterinary waste: summary per region
(Amount in units: 1 m^3 = 1000 litres = 1000 kg)

No	Region	kgs/litres
1	Arusha	12 832
2	Coast	403
3	Dar es Salaam	123 014
4	Dodoma	144
5	Iringa	20
6	Kagera	25 486
7	Kigoma	6 072
8	Kilimanjaro	5 541
9	Lindi	2 279
10	Mara	9 520
11	Mbeya	9 142
12	Morogoro	6 220
13	Mtwara	942
14	Mwanza	13 755
15	Pwani	0
16	Rukwa	0
17	Ruvuma	471
18	Shinyanga	1 329
19	Singida	2 685
20	Tabora	4 383
21	Tanga	1 546

The Madagascar Working Group on Obsolete Pesticides

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Three different actions have been undertaken in Madagascar in order to overcome the problems linked to the management of obsolete stocks of pesticides.

The first action was carried out in 1993 by the Division of Plant Protection (DPV) in close collaboration with GTZ's "Pesticide Project" and the support of the Shell company. Thus, 44 tons of dieldrin were removed from the locust station "Betioky", in the south of the country, and incinerated in the United Kingdom. The second action took place in 1994. A first partial inventory on obsolete stocks was carried out by DPV in collaboration with FAO. Thirteen different sites were surveyed and 76 tonnes of pesticides recorded, which were thought to be obsolete. Between 1996 and 1998 a third action was organized. This time the inventory was carried out at the national level and concerned 62 different sites. It registered 170 tonnes of long-term stocked pesticides of which, after analysis, 76 tonnes were found to be obsolete and/or unwanted, and were to be incinerated in Switzerland by mid-99. This last action was undertaken by a Multidisciplinary Working Group (MWG) led by members from DPV, the Ministries of Health and Environment, the National Association of Pesticide Importers and Distributors – PHYTOMAD –, the state-owned sugar farms and the Voarisoa Project. GCPF and the GTZ Pesticide Project have also contributed to the different activities undertaken.

Most of the costs linked to the inventory – approximately US$80.000 – were supported by the SDC-financed Voarisoa project. In response to a request from DPV, GTZ and GCPF will finance – with up to US$200 000 – the elimination operation and the implementation of a MWG-developed stock build-up pre-vention scheme.

The total costs amount to approximately US$ 320.000 (or US$4.000 per obsolete tonne).

Activities carried out between 1996 and 1999 were:

Countrywide inventory with the participation of the stock owners and the local authorities.
Consolidation of the Multidisciplinary Working Group.
Collection of samples and quality analysis of the lots registered.
Interpretation of results and definition of obsolete and unwanted quantities.
Issue of recommendations for the owners of the remaining, still usable, quantities.
Conditioning, transport and central storage of the obsolete pesticides ready for re-export and elimination.
Request for assistance directed to GTZ.
Collaboration with the ratification of the Basel Convention.
Organization of the local export procedures for the obsolete stocks.
Development and implementation of a stock build-up prevention programme.

The following results were obtained:

Storage sites registered : 62 sites.
Quantities of long-term stocked pesticides registered: 175 tons.
Samples collected and analyzed: 300.
Amount declared obsolete and/or unwanted: 76.5 tonnes (29 678 kilos and 46 757 litres). Thirty tonnes of the 76 tonnes registered in 1994 had been used.
Amount to be exported for incineration: 80 tonnes (76.5 tonnes plus 3.5 tonnes of contaminated materials).
Amount declared perishable and to be used rapidly: 100 tonnes.
Coordination: 15 meetings of the MWG, 6 meetings with local authorities, 3 public presentations, 5 press articles, 4 local radio broadcasts.

Lessons learned

Most obsolete stocks were found in State-owned or State-conducted programmes.

Very little attention was paid generally to the storage and management conditions of these lots.

Those imediately involved (warden, warehouse manager, director) were generally not aware of the risks linked to pesticides and very few had taken any precautions.

Such actions have a better chance of impact if accompanied by a prevention scheme from the beginning.

Information from and participation by the local authorities and the public are of great importance and consistute a key element in the implementation of any prevention scheme.

The donor community should take more interest in the possible consequences of donating pesticides (KR2 should possibly no longer provide pesticides).

Without a clear and effective commitment from pesticide producers and distributors to assume responsibility in acting against the unnecessary accumulation of pesticide stocks, this problem will not be solved.

The cost of such actions does not stand in comparison to the value of the product.

TABLE 8

National prevention programme against the building of pesticide stocks – Madagascar

Obsolete Pesticides Multidisciplinary Working Group	*OPERATIONAL PLAN*	*AIMED RESULT No. 1* *All large pesticide consumers and a majority of retailers are informed on the principles of a rational pesticide use*	*Period of planification: 07/99 – 12/2000*	*Page 1*

No. *Activities*	*Indicators of success*	*Period of execution*																		*Responsible*	*Notes*
		J	***A***	***S***	***O***	***N***	***D***	***J***	***F***	***M***	***A***	***M***	***J***	***J***	***A***	***S***	***O***	***N***	***D***		
11. Promote the implementation of IPM	• The use of alternatives to synthetic pesticides is increased	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	MWG, Consultants	In close collaboration with the existing NGO IPM network, Voarisoa and MinAg. Costs : 20.000 FF
12. Diffuse the national pesticide legislation widely	• All the 8 big consumers and 50 % of the retailers are informed • 1 Radio programme (theatre) is prepared and broadcast by June 2000			**X**			**X**			**X**			**X**							MWG, DPV, Consultants	A complete brochure will be prepared, used and distributed during 4 information meetings (Tana, Tulear, Mahajanga, Ambilobe) Costs: 50.000 FF 1 Radio programme Costs: 20.000 FF
13. Promote the use of adequate conditioning	• 8 of the main 10 retailers are distributing pesticides in small flasks	**X**					**X**						**X**					**X**		DPV, PHYTOMAD	4 meetings Costs: 5 000 FF
14. Campaign against the re-use of empty pesticide packages	• All big retailers officially commit themselves to recuperating their empty packages • 50% of the empty packages are marked • 20% are recuperated by the end of 2000	**X**					**X**						**X**					**X**		DPV, PHYTOMAD Ministry of Health Ministry of Environment	Special case: Locust control campaign 4 meetings Costs: 2.500 FF
15. Contribute to reducing pesticide donations	• The quantity of pesticides included in KR2 donations are reduced by 50%			**X**					**X**											Ministry of Agriculture / Donations Service, PHYTOMAD, Donors	First meeting after obsolete pesticides have been exported Second meeting to check 2001 list Costs: 2.500 FF

TABLE 8
National prevention programme against the building of pesticide stocks – Madagascar (*cont.*)

Obsolete Pesticides Multidisciplinary Working Group	*OPERATIONAL PLAN*	*AIMED RESULT No. 2* *All large pesticides retailers and users are trained in safe handling, stock management, disposal and legislative aspects of pesticides*	*Period of planification: 07/99 – 12/2000*	*Page 2*

No.	*Activities*	*Indicators of success*	*Period of execution*																	*Responsible*	*Notes*
			J	***A***	***S***	***O***	***N***	***D***	***J***	***F***	***M***	***A***	***M***	***J***	***J***	***A***	***S***	***O***	***N***	***D***	
21.	Training on risks linked to the handling of pesticides	100 persons in high pesticide use areas are trained				**X**					**X**				**X**			**X**			Ministry of Health (REAMED), DPV, Voarisoa, Local authorities	Sites: Mahajanga, Tulear, Antsirabe, Alaotra Costs: 20.000 FF
22.	Training on pesticide stock management	50 % of all warehouses stocking pesticides follow the legal standards					**X**					**X**				**X**			**X**		Ministry of Health (REAMED), DPV, Voarisoa, Local authorities	Sites: Mahajanga, Tulear, Tana, Alaotra Costs: 20.000 FF
23.	Training on disposal management	100 persons, representatives of the 8 PHYTOMAD members and of the 8 big pesticide consumers, are trained					**X**					**X**				**X**			**X**		Ministry of Health (REAMED), DPV, Voarisoa, Local authorities	Sites: Mahajanga, Tulear, Tana, Alaotra (Collaboration with Basel Convention Secretariat) Costs: 20.000 FF
24.	Training on pesticide legislation	Legal conformity of stocking, handling, transport, distribution and disposal conditions are increased by 20% to 60% (1998 level: 40%)				**X**					**X**				**X**				**X**		Ministry of Health (REAMED), DPV, Voarisoa, Local authorities	Sites: Mahajanga, Tulear, Antsirabe, Alaotra Costs: 20.000 FF
25.	. Evaluations on training impacts	The training courses and sessions are recorded, reports are available. Knowledge improvements are measured				**X**		**X**						**X**						**X**	Working Group, Consultants Local authorities	Cholinesterase levels will be used to compare impacts *ex ante* and *ex post* GTZ, GCPF, FAO and others invited to participate Costs: 20.000 FF

TABLE 8
National prevention programme against the building of pesticide stocks – Madagascar (*cont.*)

Obsolete Pesticides Multidisciplinary Working Group	*OPERATIONAL PLAN*	*AIMED RESULT No. 3* *The national pesticide legislation is updated and considers the prevention against the build-up of stocks*	*Period of planification: 07/99 – 12/2000*	*Page 3*

No.	*Activities*	*Indicators of success*	*Period of execution*																	*Responsible*	*Notes*
			J	***A***	***S***	***O***	***N***	***D***	***J***	***F***	***M***	***A***	***M***	***J***	***J***	***A***	***S***	***O***	***N***	***D***	
31.	Up-date national legislation concerning: 1. Labelling 2. Re-formulations 3. "Returning to sender" regimentation 4. Harmonization of tender requirements	• 4 legal texts are prepared and submitted to the authorities for vote. Updating completed by 12/2000 • The national legislation is recognized to be in conformity with international standards (FA)																		**X**	DPV Working Group	Participation at relevant international meetings (FAO) planned
32.	Follow up the implementation of the national legislation	A nationwide survey is completed	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	DPV Working Group Consultants	Costs: 60.000 FF, funds still to be found

Perspectives

By September 1999 80 tonnes of obsolete pesticides will have left the country, ending an action started years before.

The Working Group will have started to implement the prevention programme, which is detailed above.

Information, training and updating the national legislation appear to be the main actions to take in order to prevent the unnecessary accumulation of pesticide stocks and their consequences.

A key element remains, nevertheless, a true and clear commitment from the pesticide industry to assure responsible care not only at international meetings but also and mainly on the ground,

The participation of the Global Crop Protection Federation, through NOVARTIS, in the Madagascar action is a starting-point. It should therefore receive major attention in order to constitute a model for future actions in other countries.

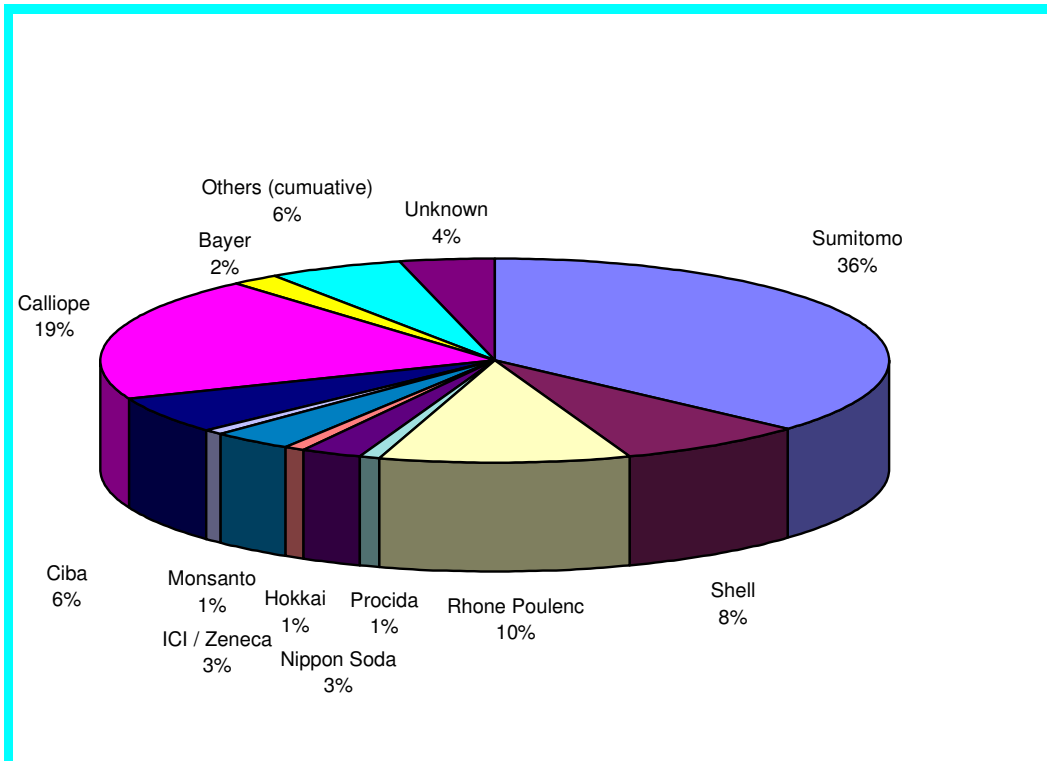

TABLE 9

Obsolete pesticide stocks in Madagascar

(Grand total 1993-1999: 100 tonnes)

Carried out by :	**Inventory 1993** DPV GTZ Shell	**Inventory 1994** DPV FAO	**Inventory 1998** DPV/ MWG Voarisoa
Possible obsolete stocks:	n.d.	76 000	176 500
Of which were used:	n.d.	30 000	100 000
Effectively obsolete:	43 500	36 500	76 500

US Environmental Protection Agency (USEPA)

Janice Jensen
Office of Pesticide Programs
US Environmental Protection Agency (USEPA)

International training module on pesticide disposal

Using the FAO guidelines on prevention and disposal of obsolete pesticides as the foundation, USEPA developed and piloted the course "Pesticide Disposal in Developing Countries" in Honduras and Indonesia in 1997. Based on these two initial deliveries, modifications are being made to the four-day course. For example, the lecture on how to take an inventory was expanded to provide specific examples why countries should use the FAO format. Modifications to the course will be completed by September 1999.

Intergovernmental Forum on Chemical Safety

Ms Jensen reported on the thematic session on obsolete chemicals and pesticides at the at the IFCS meeting in Yokohama, Japan, in December 1998. For industrial chemicals, the meeting recommended that work begin with PCBs, with UNEP and the Basel Convention working jointly on PCB management activities. For pesticides, the meeting acknowledged FAO as the lead UN agency and recommended, among other things, the need for increased political awareness of the problem; the need for programmmes to prevent the future accumulation of obsolete pesticides linked to disposal operations; and the need for FAO to have a sustainable funding base and adequate resources to address requests for clean-up assistance.

Work on obsolete pesticides in Central America

USEPA, funded by the US Agency for International Development, has a limited pesticide disposal project in Central America. Although inventory work has been slowed because of the effects of Hurricane Mitch, a workshop is planned for September 1999 for countries with completed inventories to develop national disposal proposals for donor funding. Once inventories from all Central American countries are finalized, a regional proposal will be developed.

UNIDO'S activities in the field of cleaner production of pesticides and disposal of unwanted stocks

Mayra Sanchez Osuna
Senior Industrial Development Officer
Cleaner Production and Environmental Management Branch
United Nations Industrial Development Organization (UNIDO)

UNIDO's activities in the field have been developed and implemented in line with the Organization's mandate to contribute to the industrial development of the developing countries and economies in transition in a sustainable and environmentally friendly manner. Specifically the activities undertaken by the Organization during the year elapsed from the last meeting are addressed to support the efforts of the Member states in the process of introducing:
Cleaner production methods;
Environmentally friendly technologies for minimization of industrial wastes;
Introduction of modern methods for performance of environment and ecotoxicology risk assessment studies;
Management procedures for pollution control.

The above have been applied by leading industrial sectors (including pesticide manufacturers) in developing countries. This approach has contributed to the introduction of good manufacturing practices principles at industrial scale and to support the national efforts for a cleaner environment.

Activities concluded in the field by May 1999

Regional Workshop on Ecotoxicology Risk Assessment for Asia and the Pacific Region. (Organized in Seoul, Republic of Korea from 20 to 24 April 1998).
Completion of the pilot plant for modern pesticide formulations in Nangtong, China.
Organization of the Second International Conference on Crop Protection Chemicals – Present Developments and Future Prospects into the next Millennium, (held in Nangtong, China from 11 to 14 May 1999).
Completion of the Ecotoxicology Research Centre in Pakistan.

All these projects and facilities are fully operational and could offer assistance for training specialists from other developing countries.

Ongoing related activities in 1999

Training activities for the introduction of composting technologies from municipal wastes in China.
Development of prototype seed dressing applicators suitable for African countries.

Pipeline activities to be started by the last six months of 1999

Forward-looking Policies on Agrochemicals to take China into the 21st Century.

WHO: obsolete stockpiles

Marco Jermini
Food Safety Regional Adviser
European Centre for Environment and Health
World Health Organization (WHO)

Obsolete stockpiles

As part of the country-level needs assessment exercise, and in collaboration with FAO, WHO will undertake to complement the inventory initiated by FAO with data on obsolete DDT stockpiles of possible public health origin.

WHO Plan of Action on DDT

In support of the World Health Assembly Resolution 50.13 on Persistent Organic Pollutants (POPs) and the Intergovernmental Negotiating Committee (INC) on POPs, WHO provided information on a proposal for the development of a Plan of Action for WHO Member States to reduce reliance on DDT for public health purposes. WHO will convene a panel of experts in Geneva, Switzerland in June 1999 to complete work on a draft plan, scheduled for completion for the POPs INC-3, to be held in Geneva, Switzerland, from 6 to 11 September 1999. The plan will have the following three strategic principles: to involve the countries concerned; to identify funding mechanisms early; and to ensure advocacy at all levels. For additional information, contact Dr. Robert Bos (bossr@who.ch), WHO, Geneva, Switzerland, tel. 41-22-791-3650 or look at www.who.int/peh

Information on obsolete pesticides in the former Soviet Union Countries and other European countries

Dr Jermini reported that the WHO European Centre for Environment and Health (ECEH-Rome Division and ECEH-Bilthoven Division), together with the United Nations Economic Commission for Europe, conducted environmental performance reviews (EPR) in Lithuania, Ukraine, Slovenia and Moldavia. These reviews included gathering information on waste management that may include inventories of obsolete stockpiles of pesticides. For additional information, contact Dr Carlos Dora (Cdo@who.it) or Dr Francesca Racioppi (Frr@who.it), WHO, European Centre for Environment and Health, Rome, Italy. Tel. (+39) 06-487751.

Information on waste management and chemical safety in European countries

National Environmental Health Action Plans (NEHAPs) collectively comprise a strategy to prevent and control environmental health hazards in Europe. Each country writes its own plan with its own sets of priority actions. The WHO European Office works with the countries to develop and implement their national action plans. Situation analysis and a plan of action regarding safe handling, packaging, transport and disposal of pesticides can be found in almost all country NEHAPs, either within the "Waste and soil" or "Chemical safety" sections. For additional information, contact Dr Dinko Kello (dke@who.dk), WHO, Regional Office for Europe, Copenhagen, Denmark. Tel. 45-39-17-1251 or at www.who.dk/eh/ehps/nehap.htm

Government of the Netherlands: statement on environmental, health and related issues

Johan Verboom
Ministry of Foreign Affairs
Environment Department, DML/BD
The Hague, the Netherlands

As a donor, the Netherlands attempts to deal with the environmental and health problems of pesticides in a broad sense, including support for the disposal of unwanted stocks, the prevention of the accumulation of stocks, and the reduction of pesticide use.
Specifically, the Netherlands has focused on the following five areas:

Legislation, with an emphasis on implementing the Prior Informed Consent (PIC) procedures in developing countries through FAO and, in West Africa, through implementation of the FAO Code of Conduct.
IPM, with the focus on vegetables and rice in programmes in Southeast Asia and Africa.
NGO support, with an emphasis on awareness raising.
Pesticide disposal, including involvement with other donors in disposal projects in Ethiopia, Tanzania, Yemen, Zambia, the Seychelles, Pakistan, and others.
Seed money to be given to FAO for the development of inventories of obsolete stockpiles in Latin America.

The Netherlands has funded the first two phases of the FAO project on the Prevention and Disposal of Obsolete and Unwanted Pesticide Stocks in Africa and the Near East, with funding for the third phase under consideration.

Norway: statement of support in related areas

Kåre Helge Karstensen
Research Director
Department for Environmental Technology and Analysis
(SINTEF)

Norway has so far mainly focused on IPM activities in Latin America and Southeast Asia. US$10 million have been given to FAO activities on the development and implementation of IPM in Southeast Asia. Countries where specific activities have been supported are Viet Nam and Nepal. These programmes will probably also include some bilateral parts, where management of obsolete pesticides in Nepal could be one issue. NORAD has also funded a feasibility study in Tanzania to explore the possibility of using a local cement kiln for the destruction of obsolete pesticides. The results of this study have been reported to NEMC in Tanzania and its recommendations are currently under consideration.

USAID's support for pesticide disposal initiatives – recent past and present

Joseph Vorgetts
Technical Specialist
and
Yene Belayneh
Ecotoxicologist
US Agency for International Development/Bureau for Africa
AELGA, USA

The United States Agency for International Development (USAID) has consistently taken interest and has played an active role, in safeguarding human health and preventing environmental hazards associated with dangerous obsolete pesticides in developing countries. In the recent past, the Agency has provided technical and financial assistance to a number of countries in Africa and southwest Asia, including the Niger, Tanzania/Zanzibar and Pakistan, to rid them of obsolete pesticides. In the Niger, 55 000 litres of dieldrin were disposed of in collaboration with GTZ and Shell; in Tanzania/Zanzibar, 245 000 kg of pesticides were disposed of in collaboration with the Netherlands Government, and in Pakistan, 5 000 litres of chlorinated hydrocarbons were successfully disposed of using cement kiln technology in collaboration with the Government of Pakistan. Most of these pesticides were left over from past locust/grasshopper and public health control operations. Currently, USAID is assisting Ethiopia, Mali and Senegal with pesticide disposal and management activities.

Ethiopia, with a staggering total of more than 1.15 million kg, probably ranks highest among the sub-Saharan African countries that have obsolete pesticide stocks. In recognition of the eminent danger this poses to human health and environmental safety, the USAID mission in Ethiopia provided US$1 million, through FAO, to support the pesticide disposal initiative in the country. It is anticipated that these funds will be used in accordance with the grant agreement between the Agency and FAO for various activities stipulated in the disposal plan as part of the international donor assistance programme. Funds under this grant will be available for the proposed activities until 31 December 2000.

The Agency, through its field mission in Mali and the Africa Bureau staff in Washington, has been instrumental in initiating a dialogue among the various ministries in the country to address the existing pesticide problems. To this effect, the obsolete pesticide problems in the northern region of Kolda, in Tin Essak, Anefis, Agulhock and Gao have been brought to the attention of the concerned authorities in the country, and initiatives have been taken by the host country authorities to launch a joint field mission to these and other areas to assess the extent and severity of the problem. USAID/Mali has also made a very important contribution to enhancing the country's overall pesticide management by providing state-of-the-art pesticide residue testing facilities at the National Veterinary Toxicology Laboratory in Bamako. To ensure effective and appropriate use of the facilities, USAID/Mali has sponsored training of technicians who are in charge of the facilities. This training was administered through the IPM Cooperative Research Support Program (IPM-CRSP).

The USAID mission in Senegal has provided funds to reformulate 110 000 litres of carbaryl (Sevin-4-oil) into 900 tonnes of dust at the cost of US$338 000 in local currency. The pesticides were provided in the early 1980s by international and bilateral donors including USAID. Without the

reformulation, the pesticides would otherwise pose a serious danger to human health and the environment, and cost host country and donors thousands of dollars for disposal (equivalent or greater than the cost of reformulating into a usable product). The reformulation process is a joint effort between USAID/Senegal and Rhone-Poulenc and is being carried out at the Senchim plant in Dakar. Monitoring and supervision are provided by the Department of Plant Protection.

Prior to commencing the reformulation process, various safety and mitigative measures were adequately described in the original project proposal and an Initial Environmental Examination (IEE) was developed which will ensure proper implementation of the measures. However, it was noted that procedures followed at the initial stage of the reformulation process were far below the proposed standards. Most of the safety procedures were not followed and persons involved in the reformulation activities were not using safety gear. The mission has since contemplated withholding payment for reformulation until all safety measures stipulated in the original project plan and the IEE are fully implemented. This and other dialogues with the company have resulted in some improvements, but still more needs to be done. It must be understood that the host country authorities involved in these activities are also equally responsible and it is unrealistic to expect USAID to act as a law enforcement agency where it has to rely on host country authorities for these actions.

One of the objectives of the Africa Bureau's Africa Emergency Locust/ Grasshopper Assistance (AELGA) Project, the Agency's sole mechanism for responding to emergency requests for transboundary crop pests, is pesticide disposal. This objective is intended to facilitate and provide technical input for disposal initiatives.

The Agency is also actively involved in providing technical assistance and guidance for better and safer handling and use of pesticides. It has been and still is instrumental in assisting host countries with the development of sound and effective policies and procedures for overall pesticide management and environmental protection. It plays a crucial role in preventing the accumulation of obsolete stocks by invoking environmental reviews and action plans before implementing emergency responses. It promotes and encourages the removal of subsidies and other policy-level interventions and supports privatization of the pesticide delivery systems to eliminate similar problems in the future.

Technology options for the management and destruction of obsolete or unwanted pesticides in developing countries

Overview

Obsolete pesticide stocks in developing countries pose a serious and acknowledged long-term threat to health and the environment locally. They also pose a threat to the global environment and to the health of people and wildlife far afield since many of the obsolete pesticides are Persistent Organic Pollutants (POPs). As long as stocks remain in place there is continued deterioration of containers and products which increases the risks posed. Changes in government or management regimes can undermine any arrangements such as long-term storage which is meant to stabilize the stocks. There is therefore an urgent need for permanent solutions to clear these stocks from the developing countries in which they are currently located.

A number of key considerations must be taken into account when selecting appropriate solutions for obsolete pesticide stocks in developing countries.

Obsolete pesticides tend to be mixed chemicals, often contaminated, plus contaminated soil and other materials and containers, all of which need to be safely disposed of. Some technologies are only able to deal with particular types of chemicals or waste materials and therefore their use can only be seen as a partial solution to the problem.

No disposal or management method should be applied in a developing country that would not be permitted in advanced industrialized nations. If appropriately high standards of health and environmental protection cannot be applied locally, then export of waste to a facility which can provide these standards should be considered.

Locally implemented initiatives must be part of a national strategy for the management of hazardous waste, with full approval of all stakeholders - not an isolated solution for a specific problem of obsolete pesticides which exists at the time of implementation.

Developing countries seeking solutions to their obsolete pesticide stocks suffer from a chronic lack of resources and therefore require external financial assistance to implement solutions. In general they also lack the expertise needed to construct, operate and support high technology installations for the destruction of organic chemicals. Such facilities also need a well-developed infrastructure to service them on an ongoing basis, and this is often inadequate in developing countries. In some cases the output of waste processing facilities also demands management much the same as industrial chemicals, pesticides or hazardous waste. These countries tend to have underdeveloped management capacity which should not be overburdened with additional waste problems.

The technologies available for dealing with obsolete pesticides are as follows:

High temperature incineration
Chemical treatment
Engineered landfill
Reuse/reformulation
New developing technology

The applicability and appropriateness of each of these options are discussed below.

High temperature incineration

The destruction of organic chemicals requires operating temperatures of at least 1 100°C, a residence time for the chemicals at that temperature of at least two seconds, and an ultimate Destruction Removal Efficiency (DRE) of at least 99.99%. Emission controls are needed to prevent dioxin and furan formation and other pollutants such as NOx, SOx and particulates from being emitted to the environment. These facilities require complex supporting infrastructures including stable electricity and water supplies, continuous supplies of fuel and waste to ensure constant and efficient operation. Other material supplies are also needed to maintain constant operation of, for example, emission control equipment, together with analytical laboratories and emission monitoring facilities.

The cost of construction for dedicated high temperature waste incinerators is about US$1 million for small fixed incinerators capable of burning 1-2 tonnes/day. Such incinerators are generally too small and inefficient to be relied upon for the destruction of significant quantities of obsolete pesticides. Mobile incinerators are available which are capable of burning 2-20 tonnes per day. They cost US$1.5-15 million, plus setup costs at the incineration site. Their mobility is relative since they generally require several trucks to transport them. They also require the same infrastructure and services as permanent installations. Large fixed incinerators cost US$10-200 million with a destruction capacity of 12-170 tonnes/day.

There is strong public aversion to waste incinerators particularly where they are intended for destruction of toxic materials. This is evident in industrialized countries as well as in developing countries where such facilities have been proposed.

An important consideration relating to the construction of new hazardous waste incineration facilities is that there is currently significant overcapacity of incineration facilities in industrialized nations such as the United States and Europe. European facilities are generally willing to import waste for destruction at a competitively low cost.

Cement kilns

Cement kilns are used in several countries for the destruction of hazardous waste. Generally only high calorific value chemicals are burned as fuel together with oil. Wastes of low calorific value need to be dealt with by other means. The technical specifications for incineration in modern cement kilns are often better than dedicated incinerators with higher temperatures, longer residence time, better oxygen availability and equivalent or better DRE.

The use of cement kilns in developing countries has been proposed and tried as a possible local solution for obsolete pesticides. A potentially positive aspect of this is the development of national capacity for the management of hazardous waste in general, including industrial, agricultural and clinical waste. Cement kilns however do not provide a solution for all types of waste and they cannot, for example, burn contaminated soil or drums. Their use must therefore be seen as part of an integrated solution for hazardous waste that incorporates other technologies.

Nevertheless, cement kilns should not be seen as a cheap and easy solution. Their use of chemical waste destruction can only be contemplated in the most modern installations where additional equipment is installed for waste input and emission controls. Full approval by all stakeholders should be sought and it is advisable to propose the use of the cement kiln as part of a national strategy and not as one-off solution to a critical obsolete pesticide problem.

The purpose of cement kilns is to produce cement and this objective should not be compromised by the introduction of chemical waste. Expert knowledge is also required for the careful loading of waste in order to avoid technical problems and unwanted emissions and to operate emission control, analytical and monitoring equipment. Similarly, staff are not trained to handle hazardous chemical waste or to deal with the consequences of any unexpected developments resulting from hazardous waste incineration. The necessary skills as well must be developed and maintained for as long as hazardous waste is incinerated at the installation.

Chemical treatment

Chemical treatment can be used to decompose hazardous wastes to constituent compounds. However these processes tend to be highly specific and are able to deal with only one chemical compound at one time. Obsolete pesticides tend to be mixed chemicals of several types and there is rarely sufficient quantity of one compound to justify chemical treatment.

Chemical treatment also provides limited or no solution for contaminated materials and containers. Furthermore, it poses significant potential hazards to people and the environment, as many of the processes themselves are hazardous. High levels of expertise with supporting infrastructure are required and appropriate processing facilities need to be constructed which makes it an expensive and complex option for a wide range of chemicals such as those found among obsolete pesticides.

In addition, chemical treatment generally produces larger volumes of less hazardous waste needing management or disposal.

Engineered landfill

Landfill of hazardous waste requires construction of sealed sites on geologically stable areas far from ground or surface water. Facilities must be in place to collect and treat leachate and gas released from the waste.

Landfill of hazardous waste is not generally permitted in the European Union and the United States and its use in developing countries should therefore normally be rejected as an option. Significant investment in infrastructure is needed. Long-term management and maintenance are required. It should also not be seen as a permanent solution since landfill linings deteriorate over time and ultimately waste must be removed to another site or a different solution found.

Reuse/reformulation

In some cases pesticides are found to be usable in their current state, or they can be reformulated to a form that can be usable. This depends on the condition of the pesticides, the quantities available and the existence of a potentially valid and approved use for the product.

It must be ensured that such solutions do not present any additional unacceptable hazards such as the creation of a hazardous pesticide product which puts farmers at risk, or the creation of a reformulation facility which causes environmental contamination for example. Facilities for safe and appropriate use or reformulation must be available.

The question should also be asked as to who will benefit from such a solution – is it local people and the environment who are protected from further exposure to hazardous waste pesticides, or is it pesticide manufacturers and the owners of products who may reap commercial benefit from the reformulation or reuse option?

New developing technologies

A number of new technologies have been developed for the destruction of toxic material. Few of these are currently in commercial operation and are therefore not under consideration as viable destruction options for the obsolete pesticides currently held in Ethiopia, for example. These stocks should only be treated in plants operating with proven technologies. In a country like Ethiopia there is no room for experimentation. Were the owners or operators of such technology in a position to take the removal of Ethiopia's obsolete pesticides and their destruction in accordance with European or United States standards upon themselves, they should be invited to bid in an open contract with other toxic waste disposal contractors.

The new technologies that are at the most advanced stage of development are summarized in Table 10.

TABLE 10
New developing technologies

Technology	Process	Comments
Gas phase hydrogenation	Hydrogen reacts with chlorinated or non-chlorinated organic compounds at high temperatures decomposing them primarily to methane and hydrogen chloride. The system is closed and therefore produces no emissions.	Only one commercial plant (in Australia) and one experimental plant (in Canada) are operating. The Australian plant is destroying DDT and PCB successfully. The developer proposes that this technology may be appropriate for use in a country with very large stocks of pesticides such as Morocco where treatment would take 3-4 years.
Electrochemical oxidation	An electrochemical cell generates oxidizing agents in an acid solution to attack organic compounds, which are decomposed into carbon dioxide, water and inorganic ions.	The system is not yet in commercial operation and would apparently not be capable of dealing with contaminated materials such as mixed pesticides.
Molten metal	Organic materials are decomposed in a vat of molten metal at high temperature generating gases and metals which can be recycled and inert waste materials which can be landfilled.	The technology appears to be on the verge of operating commercially in the United States. This may be an appropriate technology for the destruction of organo-metallic pesticides, since these cannot be incinerated. Since the technology has no proven track record its use in developing countries cannot be considered in the short term.
Molten salt	Organic chemicals are introduced onto a bed of molten alkaline salt at a temperature of about 1000°C to be decomposed to inorganic salts which are retained in the salt bed and must be disposed of to secure landfill.	The process is significantly more expensive than other comparable technologies which have greater destruction efficiencies. It cannot handle contaminated materials or materials containing large amounts of inert matter such as dry formulated pesticides.
Solvated electron process	Strips halogens from organic compounds using an alkaline solution containing free electrons and metal cations.	Primarily designed to decontaminate soils holding halogenated pollutants. Not appropriate for large quantities of mixed pesticides.
Supercritical water oxidation	Organic compounds dissolve in supercritical water at high temperature and pressure to form benign compounds	This process is under trial and not yet commercialized
Plasma arc	Waste is injected into a plasma arc field at extremely high temperatures of 5 000ºC–15 000°C at which compounds are broken down into their constituent atoms.	Only one such plant is known to be operating in Australia. Destruction costs are higher than incineration and destruction efficiencies vary. Dioxins can be produced at unacceptable levels.

Request for support to be brought to the attention of the European Union by FAO

To:
Director-General
DG-VIII
European Commission
Brussels

About obsolete pesticides in African, Caribbean and Pacific (ACP) countries

The FAO programme on the prevention and disposal of obsolete pesticides in developing countries has been working since 1994 to address the severe health and environmental problems associated with obsolete pesticides stocks in developing countries. The geographical focus of this programme, which has been funded by the Netherlands Government, has been Africa and the Near East.

Inventories carried out to date have identified an estimated 20 000 tonnes of obsolete pesticides in Africa alone. Many of these pesticides were donated by development agencies including the European Union (EU). Most of the products were supplied by pesticide manufacturers based in EU Member States and the United States. The reasons for the obsolescence of the pesticides are many and varied and include oversupply, inappropriate product specification, poor storage conditions and inadequate labelling.

Many of the obsolete pesticides are among the most hazardous products made. They contaminate the local environment threatening the health of local populations and wildlife. Soil and water sources are contaminated and rendered unusable. Many of the pesticides are also Persistent Organic Pollutants (POPs) and therefore threaten the global environment.

The European Commission has already acknowledged the issue of obsolete pesticides in the Lomé Convention and therefore the DG-VIII Directorate is to be commended for its efforts in raising awareness of the problems of obsolete pesticides with the publication of its manual on *The control of pesticides and IPM* which includes material on obsolete pesticides.

The fact remains, however, that while much can be done to prevent the future accumulation of obsolete pesticide stocks in developing countries, we are today faced with the problem of clearing existing stocks in a socially, environmentally and economically acceptable manner. Our extensive experience suggests that clean-up costs range from US$3 to US$5 per kg of waste. The total amount required to clear Africa and the Near East alone is therefore in the region of US$80 million to US$100 million.

It is intended to call upon the European Commission to support the efforts of FAO and its partners in clearing this toxic legacy from the developing world. The international community and the governments of the developing nations bear significant responsibility for the creation of these problems. It is time that action is taken solve them. Individual Member States of the European Union have been generous with their support for this programme of work, but the Commission has so far been unable to contribute.

The Fourth FAO Consultation emphazises the importance and urgency of the issue of obsolete pesticides in developing countries, and wishes the message to be brought to the attention of the DG-VIII

Directorate and staff to find ways of supporting alleviation and prevention activities in this area.

Annex 1
Recommendations

FAO Fourth Consultation on the Prevention and Disposal of Obsolete Pesticides Stocks

Delegates from international agencies, national governments, development agencies, NGOs and industry participated in the FAO coordinated Fourth Consultation on the Prevention and Disposal of Obsolete Pesticide Stocks in Developing Countries. During the course of the meeting they heard a series of reports addressing the current status of obsolete pesticide stocks and disposal operations.

It became clear that despite the dedicated efforts of FAO in particular and the many other organizations that support this work, progress in the implementation of solutions to this extremely serious and growing threat to human health and the environment is slow. The meeting heard that, of the 13 countries prioritized for action at the Second Consultation in 1996 and the additional five prioritized at the Third Consultation in 1998, progress had been made in only four countries: Ethiopia, Mozambique, Seychelles and Tanzania. In addition an assessment of contamination surrounding pesticides buried in Yemen has been carried out.

The latest inventory of obsolete stocks in African and Near Eastern countries confirms previous estimates that there are approximately 20 000 tonnes of obsolete pesticides needing disposal. The estimated cost for removal and destruction of these chemicals is about US$80-100 million.

The major barrier to implementation of cleanup operations and prevention strategies is the shortage of available funds. Donor agencies, governments and industry are called upon to increase their contributions towards solutions for this problem which is not only confined to the developing world, but which also affects the global environment because of the long-range transportation of many of the chemicals concerned.

In addition to financial constraints there are severe technical difficulties in the provision of safe and effective methods for the management or destruction of obsolete pesticides. Public concern over the impact of hazardous waste destruction on health and the environment justifiably adds a further dimension to an already complex decision-making process. These factors need to be weighed against the urgency of solving current obsolete pesticide problems which are already causing great harm, and the desire to develop national capacity in the management of hazardous waste materials which are inevitably generated from industry, agriculture and clinical activities in developing countries.

In considering these issues, delegates made the following recommendations:

FAO Committee on Agriculture (COAG)

Given the importance and magnitude of the problem of the disposal of obsolete pesticides worldwide and recognizing FAO's leading role in this area, the meeting recommends that this problem should be addressed COAG at its next meeting or at any other appropriate forum of FAO.

OECD

Recognizing that there is still a major problem with stockpiles of obsolete pesticides in many countries and that these stocks are causing significant harm to human health and the environment;
Recognizing that, despite the valuable leadership of FAO, solving the problem in Africa and the Near East will take more than 40 years at the current rate, and depends entirely on voluntary external funding [to achieve this];
Recognizing that the burden of responsibility for this problem is shared by OECD countries and industry, and

Building on the OECD Guidelines on Pest and Pesticide Management (DAC No 6, 1995).

The Fourth FAO Consultation of disposal experts recommends increased attention and resources by OECD countries be given to the issue of obsolete stocks in order to eliminate the existing stockpiles in as short a timeframe as possible, and prevent the future accumulation of obsolete stockpiles.

Asia

The consultation recommends that FAO develop an inventory of obsolete, unwanted and/or banned pesticide stocks in Asia and assess the magnitude of the problem, taking into account the high concentration of obsolete pesticides in Asia. It is acknowledged that external financial support is required in order for FAO to carry out this task.

General

The Consultation calls upon donor agencies, industrialized nations and the pesticides industry to increase their financial and technical support for activities related to the prevention, management and disposal of obsolete pesticides whenever necessary, and particularly in Africa and the Near East.

Capacity building for the management of hazardous waste

The Consultation supports the recommendations of the FAO Provisional Technical Guidelines on the Disposal of Bulk Quantities of obsolete pesticides in developing countries. In furtherance of these guidelines the Consultation recommends:

Local solutions for obsolete pesticide stocks should be supported as and when appropriate but must be developed as part of a national strategy for the management of hazardous waste. Such solutions must be based on social, economic and environmental acceptability.

Experience gained in other countries, with other waste management operations and with different technologies should be shared and used to assist in national capacity building for hazardous waste management in developing countries.

The use of local cement kilns should be considered as part of an integrated solution for obsolete pesticides and other hazardous wastes on the understanding that socio-economic, environmental and technological considerations are fully accounted for.

Annex 2
Papers and materials prepared for the Fourth consultation

Publication Series No. 6: the 3rd FAO Consultation;
FAO Pesticide Disposal Series No. 2, 3 and 4 Guidelines on (a) Prevention of accumulation of obsolete stocks, (b) Pesticide storage and stock control manual, (c) Disposal of bulk quantities of pesticides in developing countries;
Results of countrywide surveys and inventory taking in Africa and the Near East compiled in two versions (a) by country and by a list of pesticides;
Video presentation of problems and issues associated with obsolete and unwanted and banned pesticide stocks with a focus from the point of view of developing countries affected and from the global perspectives;
Various posters showing seriously affected sites in various countries, etc.

Annex 3
Programme for the Fourth Consultation

MONDAY, 24 MAY 1999

09.00 hours	Registration of participants.
09.30 hours	Opening of the Consultation.
09.45 hours	Election of Chairperson and Rapporteur. Adoption of Agenda.
10.30 hours	Introduction to the meeting.
10.45 hours	Update on activities: FAO.

Technical guidelines
State of implementation of FAO Portfolio presented in 1996 and 1997: Introduction.
Progress on involvement of agrochemical industry: Introduction.
Report of relevant experience and activities since the FAO Third Consultation which took place on 2 and 3 March 1998.

14.00 hours	Update on activities by other agencies in similar areas.
16.15 hours	Update of new developments regarding pesticide disposal techniques.
16.45 hours	Update of regulatory aspects regarding the transport of hazardous waste. (IMDG, Basel Convention, Bamako Convention, etc.).

TUESDAY, 25 MAY 1999

09.00 hours	Framework for international collaboration in pesticide disposal policy statement by FAO; portfolio of disposal projects: detailed review and updating; progress and future plans on involvement and financial contributions towards disposal operations by agro-chemical industry.
11.15 hours	Discussion on administrative and organizational modalities for disposal operations jointly funded by aid agencies and the agro-chemical industry.
14.00 hours	Planning of disposal operations for 1999-2000. The meeting may break up in smaller groups interested in specific countries. Discussion will involve preparation of workplans and further, case-by-case, discussions on administrative and organizational modalities for jointly funded disposal operations.
15.45 hours	Conclusions and workplan derived from morning session.
16.30 hours	Conclusion and statements by participants. Adoption of recommendations.
17.00 hours	Closing remarks by Mr. N. A. van der Graaff, Chief, Plant Protection Service (AGPP).

Annex 4

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