

## SHORT COMMUNICATIONS

### Obsolete Pesticides in Ethiopia

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#### Abstract

Obsolete pesticides are stocked pesticides that can no longer be used for their intended purpose or any other purpose and therefore require disposal. In Ethiopia, a survey carried out in 1997 revealed the existence of over 1150 tones of Obsolete Pesticide stock that require disposal. Among the stock included in the list, the majority are in the group of Organochlorines which are persistent and dangerous. There are 117 different types of pesticides comprising of several types of formulations originating from different countries. The "Dirty Dozen Pesticides" which threaten the general public are widely found scattered all over the country. Obsolete Pesticides are time bombs. Unless immediate action is taken, they could result in acute long term health and ecological threat, causing groundwater contamination, leaching and other types of pollution. So far there are records of misuse and mishandling and most of the suicide records are reported to be associated with such stock. There are several recommended options of disposal but the option selected for this case is shipment to a country with incinerator facility. The total cost required for disposal of the obsolete stock is over 4.5 million USD which is now requested for assistance. Unless these pesticides are disposed, there is a high risk of immediate and long-term causality. All concerned must therefore, act timely for the removal of the available huge stock and work closely to avoid further accumulation of obsolete pesticides

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#### Introduction

For nearly three decades, Ethiopia continued to experience a series of natural and other problems such as drought, famine, social and political upheavals. To alleviate these problems, the strategy has remained to depend on agricultural outcomes. Agriculture is the main stay of the Ethiopian economy. It provides employment for 85% of the population, generates 46% of the GDP and produces 90% of the foreign exchange earnings. Despite its dominant role in the national economy, agricultural production and productivity remained very low. Agricultural

pests are one among those that account for such low productivity.

In view of the need to increase food production, the policy among other things, was to import agricultural pesticides, fertilizers and related chemicals either through donations or by means of direct purchases. Various organizations such as the State Farms, Agricultural Inputs Supply Enterprise, Government Departments, Ministries such as Agriculture, Health, Coffee and Tea, organizations such as the Desert Locust Control Organization for East Africa were involved in the importation and use

of agricultural pesticides. While some of the materials and most of the supplies acquired were used in time for the purpose for which they were intended, a large stock of pesticides, unfortunately, were left in stores or in the open for a number of years. Most of these stocks subsequently became obsolete (pesticides that can no longer be used for their intended purpose or any other purpose) and have now resulted into serious problems, hence requiring disposal.

Pesticides are poisons. They are manufactured to kill pests but they may also kill other organisms including man unless properly used for their intended purpose. The World Health Organization (WHO, 1986) estimated that 1 million people are affected by insecticide poisoning every year and 20,000 die as a result of being unaware of the risk involved in handling insecticides. The danger is far greater when one looks into all pesticides. The risk associated with obsolete pesticides is further magnified.

Poisoning records in Ethiopia are not well documented and the little available information indicates that the situation is alarming. The following are few of the available documented incidents.

Over 500 people were reported to be poisoned at Addis Ababa (*Sidest Kilo* area) after consuming bread i.e. flour baked mixed with DDT 25,000 Kg of Aldicarb (Temik) was stolen from Tendaho State Farms and used for rat control around houses despite its fumigant property.

Over 16,400 Lts/Kgs was stolen from Jimma zone and over 2,000 Kg dumped around the store which resulted in death of 5 year old child, 7 cows, 3 goats, 1 donkey, 13 hens, 4 dogs, 3 hyena and 9 birds.

Farmers in Arsi area applied a pesticide sold to them as seed dressing and over 30 hectares were reported destroyed. Laboratory identification of product revealed the product to be chlordane and was found to inhibit germination.

There are continuous reports of suicide cases. Most causes of poisoning are results of the huge stock of obsolete pesticides that are found scattered all over the country.

The problem of obsolete pesticides is serious in Ethiopia. The large stock of obsolete pesticides available in a country with poor storage facility and management skill makes these pesticides unsafe if left for long. So far there are records of looting leakage and misuse and hence immediate action needs to be taken. The total stock of Obsolete Pesticides, according to the 1989/90, inventory was 500 tones. Due to alarming increase of causality reports by different organizations, the federal government of Ethiopia funded a project to carry out a survey to determine the type, quantity, location, condition of obsolete stock in the country. The study also aimed to address the method of disposal and cost required for the operation. Accordingly, a survey was carried out in 1996/1997 to address these issues.

## Materials and Methods

Inventory forms, sampling equipment and sampling instructions, safety devices (masks, goggles, gloves, boots & overalls) were made available to conduct the survey.

## Data Collection

The following two methods were utilized to conduct the national inventory

- A questionnaire was designed and sent to all governmental and non-governmental organizations suspected to handle obsolete stock. All were requested to report the pesticide they consider obsolete. The type, quantity, condition, location, manufacturer, date of manufacturer, expiry date & the reasons why they consider the product to be obsolete was the type of information requested in the questionnaire.
- Considering the first data, a strategy was designed to carry out a survey to determine the obsolete stock. A questionnaire was designed and filled by senior experts from Pesticide Chemistry Unit (PCU) in the Ministry of Agriculture. The questionnaire was filled based on the visual observation and primary physical analysis in the field. In conditions where decision can not be reached, samples were taken for analysis in the laboratory.

Pesticides were included in the inventory when found not to be in usable condition due to one of the following reasons.

- The use of the product has been banned at the international level for health and environmental reasons (e.g. DDT, Lindane, Dieldrin, Heptachlor, etc.).
- Products visually deteriorated beyond usability (e.g. caked powder, caked emulsion, products with change of physical property..).
- Products contaminated by other pesticides, mixed formulations etc. (e.g. DDT + Lindane, DDT + Actellic, Actellic + DDT, etc.).
- Products whose shelf life has exceeded and proved to be not usable by analysis. Analysis was carried out for products with no label, products that has not yet visibly deteriorated but whose shelf life has exceeded

## Results and Discussion

### Status of Stocks

From the survey, a total of over 1152 tones of obsolete pesticides were identified. This figure does not include heavily contaminated soils and containers. It was estimated that about 100 tones of contaminated soil and 25 tones of empty containers are found in the country. About 256 minor and major sites are affected involving at least over 120 different types of pesticides.

Looking on the regional distribution of the obsolete stock, Oromia, Amhara, and Dire Dawa regional states own the highest quantity of obsolete stock (Table 1). Nine organizations were involved in the accumulation of obsolete stock, out of which, the Ministry of Agriculture utilizing large stocks of pesticide for migratory pest control has the highest quantity of obsolete pesticide accounting to 444.7 tones found scattered all over the country at regional, zonal, Woreda MOA stores. Agricultural Inputs Supply Enterprise's (AISE), State Farms, Desert Locust Control Organization for East Africa (DLCO-EA), Ethiopian Grain Trade Enterprises (EGTE) are also found to store appreciable

quantities (Table 2).

### Data Evaluation

Observation of the pesticides in store revealed that Primiphos methyl (Actellic), Lindane, DDT, Carbaryl, Chlordane, Diazinon, Dimethoate and Zinc phosphide are the major pesticides found to be obsolete (Table 3).

Comparative illustration of the stock showed that they belong to those groups of pesticides that are highly toxic and dangerous. They are either internationally banned or classified as potentially dangerous (Table 4). Analysis of data based on the use of pesticides indicated that the highest accumulation belongs to insecticides accounting to 812.5 tones (70.5%). Other groups with significant quantity include Rodenticides, Fungicides and Herbicides (Table 5).

### Cause of Accumulation

The major cause of accumulation includes prolonged storage of pesticides in stores due to absence of pest for which they were intended for, ignorance on the use of pesticides, contamination and mixing up of pesticides due to over crowded storage or poor quality stores, banning of pesticides, import of improperly packed pesticides, import of excessive stock with out prior identification of the need, donations of pesticides with out prior consultation of the ultimate user, management problem – “first in first out” not observed’, government policy, company and organization motives.

### Disposal Considerations

Obsolete pesticide stocks require immediate containment and disposal. Unfortunately, there are no easy disposal methods that are safe, cheap and generally applicable under circumstances prevailing in Ethiopia. As there is large quantity of obsolete pesticides, the disposal option requires higher safety requirements.

### Shipping to a Developed Country for Incineration

In many less developed countries, there are no cost effective local options for pesticide disposal that are environmentally sound. Ethiopia is no exception. Hence, export to a country with a large-scale hazardous waste incineration (a high-temperature thermal oxidation process whereby

the pesticide molecules are decomposed into gases and unburnable solids (residues of slag and ashes)) is the most viable and suitable option.

### **Budget**

Budget required to carry out the disposal was determined during the preparation of the project document. It was estimated that a total amount of Birr 700, 000 (100,000 US \$) is required from the Federal Government of Ethiopia as a matching fund for local costs and a total of 4.22 million US dollar was required for the actual disposal (Table 6).

### **Conclusion**

Taking note of the estimated total stock of obsolete pesticides, at this moment, Ethiopia is the second country in Africa that has the largest stock of obsolete pesticides. Likewise, the environmental threat and risk to human life is also greater than many of its neighboring countries. Thus, the situation being desperate and urgent, it has become a matter of high priority and one of the major issues among the list of national concern requiring quick action.

A strategy to dispose of the obsolete stock was determined during the project period and the only suitable option for the 117 different types of pesticides was to ship the stock to a country with a Fixed Incinerator. The cost required to dispose the obsolete stock is beyond the countries' resources. Hence, the government has presented the issue to donors to assist in the destruction of the existing stock. As already indicated, these are results of past activities that have been

inherited and now pose real and serious problems. However, these can no longer be delayed or passed on to the next generation.

The problem of pesticide waste is widespread, serious and very urgent. Unless something positive is done quickly, the environmental loss and the damage to human health will be incalculable and irreversible. The magnitude of the problem is far deeper than one can imagine, the task of cleaning up the waste being so complicated and dangerous, finance being out of reach of the poor nation, disposal facility and expertise so lacking, the assistance and support of the donor community, organizations and the industry is crucial.

We live at the edge of danger and routine activities have become precarious to the public at large. Most pesticide stocks are located in urban areas and, because of this, people are in constant threat whether staying in door or moving around. The most threatened are children who are usually weak, innocent and who are also curious to play with or handle things contaminated or not. We need to remove these pesticides, we need a new beginning and to work under new conditions that are safe and normal. All concerned must act timely before worst casualties occur.

There is now an increasing need to dispose of these stocks of unusable pesticides that occupy valuable storage space and pose serious risks to store keepers. MOA and FAO are working together in finding possible donors to carry out the disposal operation.

Table 1. Obsolete pesticides by region

Region	L	Kg	Total
Addis Ababa	87715.50	63397.80	151113.30
Afar	90678.00	16802.00	107480.00
Amhara	48794.00	108865.10	157659.10
Benishangul Gumuz	7490.00	34355.00	41845.00
Dire Dawa	122040.00	34326.00	156366.00
Gambela	10725.00	1864.50	12589.50
Oromia	63620.20	25481.40	318431.60
Somali	3976.00	0.00	3976.00
Southern Ethiopia	46597.90	81143.70	127751.60
Total	9550.40	64923.10	74473.50
	491187.00	660488.60	
Grand Total			1151675.60

Table 2. Obsolete pesticides by organization

Organization	L	Kg	Total
AISCO	107622.3	203292.1	310914.4
AETSE	7692	1210	8902
AGTE	33466	37422.13	70888.13
Coffee & Tea	5656	11118.5	16774.5
DLCO-EA	113640	0	113640
MOH	310	0	310
MOA	95538.4	362644.77	458183.17
State Farms	99032.7	43585.7	142618.4
Wonji Sugar Factory	29395	0	29395
Grand total			1151625.6

Table 3. Major obsolete pesticides by type

Type	L	Kg	Total
Carbaryl	26064.00	32380.20	58444.20
Chlordane	0.00	34893.00	34893.00
Coumatetralyl	0.00	14876.00	14876.60
D.D.T	11380.00	47775.50	59155.50
Diazinon	26801.00	3836.00	30637.00
Dieldrin	24290.00	4055.00	27345.00
Dimethoate	30472.00	0.00	30472.00
Endosulfan	11571.40	0.00	11571.40
Finitrothion	22178.00	0.00	22178.00
Gusathion	17221.00	0.00	17221.00
Heptachlor	0.00	20353.50	20353.50
Lindane	575.00	104380.42	104955.42
Malathion	17853.00	8675.00	26526.00
Mixed pesticides	32750.00	37555.00	70305.00
Primiphos methyl	1600.00	170475.00	172075.00
Thiometon	28398.00	0.00	28393.00
Unknown	76473.00	58235.00	134708.00
Zinc phosphide	0.00	30247.00	30247.00
Total	327626.40	566737.22	894363.62

Table 4. Comparative illustration of the pesticides

Type	L	Kg	Total
Banned	36245.00	210457.42	246702.42
Mixed	109223.00	95790.00	205013.00
Primiphos methyl	1600.00	170475.00	172075.00
Others	345284.40	182550.78	527835.18
Total	492352.40	659273.20	
Grand total			1151625.60



Table 5. Obsolete pesticides by category

Category	L	Kg	Total
Avicide	337	0	337
Chemical	2643	1756.5	4399.5
Emulsifier	160	81	241
Fungicide	8014	26266	34280
Fertilizer	0	7825	7825
Herbicide	14803	7499.2	22302.2
Insecticide	356372.4	456138.8	812511.2
Nematicide	85	0	85
Rodenticide	0	59097.7	59097.7
Unknown	109938	100609	210547
Total	492352.4	659273.2	1151625.6
Grand total			1151625.5

Table 6. Cost of disposal for incineration.

Cost categories	Amount (t)	Unit price (US\$)	Total cost
Solids	623 232	1600	997 172
Liquids	480 955	1120	538 670
Soils	95	1440	136 171
Empties	25	1200	30 000
Others	-	-	2 517 987
Local cost	-	-	100 000

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