

The problem of obsolete pesticides disposal in Ukraine: Solution, ecology and economy

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In Ukraine, the problem of obsolete pesticides disposal is of special importance. Pesticides as well as other hazardous materials present a considerable risk to the environment. The massive application of pesticides affects not only the agriculture but the environment as well.

This year in April will be the 15th anniversary of one of the most tragic disasters, the Chernobyl explosion. It was 300 fold as strong as the atom bomb explosion in Hiroshima. It is known that pesticides are incompatible to irradiation. Apart from their direct effect on the biosphere, radioactive pesticides are especially dangerous, mainly pesticides that partly decomposed in the regions situated beyond the borders of the zone surrounding atomic power station as in the Chernobyl centre. This problem has not been studied until today nevertheless it exists. Radioactive pesticides accumulate not only in soil but also in plants and animals being our main source of food products.

Currently, more than 13,520 tonnes of obsolete pesticides are stored in 25 regions in Ukraine (Table 1). As it can be seen from this Table, the amounts of the stored obsolete pesticides vary considerably from region to region. The highest amount is stored in Kiev region (1,820 tonnes), followed by Kirovograd region (1,218 tonnes), Sums region (1,120 tonnes) and in Zaporozsk region (1,065 tonnes).

According to the statistics, a huge amount of pesticides results from the agricultural production, as 70.2% (42.4 million hectare) of the Ukraine lands (60.4 million hectares) are agricultural lands. Of this area, 34.3 millions hectares (81%) are arable land.

Table 1. The total stock of obsolete pesticides for each region and number of stores in Ukraine (till 01.10.1999)

Regions	Total in Tonnes	In storage at equipped stores	Number of stores for pesticides	
			Central	In husbandries
Republic Crimea	6,842	250.9	2	190
Vinnitsa	390.3	55.8	7	16
Volyn	200.4	134.9	14	188
Dnipropetriv'k	688.7	305.6	5	255
Donetsk	218.4	66.6	1	355
Zhytomyr	148.0	25.5	8	150
Zakarpattia	208.4	135.9	5	49
Zaporizhzhia	1,065.6	614.3	3	253
Ivano-Frankivsk	81.8			136
Kyiv	1,820.0	1,498.3	9	226
Kirovohrad	1,218.5	273.3	9	264
Lugansk	98.7			207
L'viv	468.0	161.4	9	221
Mykolaiv	806.8	482.1	6	190

Odesa	723.0	353.3	11	145
Poltava	757.33	480.5	6	244
Rivne	13.3			48
Sumy	1,120.0	657.4	5	432
Ternopil	152.2	3.7	2	136
Kharkiv	829.9	254.2	26	358
Kherson	419.7	364.3	5	51
Khmel'nitskiy	342.0	46.6	2	296
Cherkasy	446.2	66.4	1	271
Chernivtsi	36.3	8.0	1	32
Chernihiv	581.7	321.8	10	263
Total	13,520.4	6,560.8	147	4,976

Four republics including Russia, Ukraine, Moldavia and Uzbekistan applied 72% of all the pesticides. Application rate of pesticides, which is dangerous to the biosphere, amounted to 0.34 kg/ha in Ukraine. The majority of the pesticides used are obsolete pesticides due to their low quality or expired shelf-life period. Numerous products were not re-registered, but they are chemically and physically stable up to date.

Outdoor storage of numerous pesticides accelerates their decomposition, moistening, caking of powders and forming of sediments. They leak through the soil into the groundwater.

The amount of obsolete pesticides in Ukraine is presented in Table 2. Especially the dangerous group, called "C" group, contains unidentified compounds and amounts up to 8,583 tonnes. The majority of them belong to the products containing DDT. In the state and the collective farms 58 products of this kind are stored which amounts to 3,428 tonnes. Another group called the 5th group includes very toxic and toxic products (LD₅₀ 10-150 mg/kg) like DDT (1,801 tonnes), HCH (517 tonnes), intrathion (101 tonnes), TMTD (27 tonnes) and chlanozane (171 tonnes). The 4,900 tonnes of products stored in the state and the collective farms are presenting a special risk for the environment.

Table 2. The number of obsolete pesticides, their total weight and the different categories in stores in Ukraine

Indices	Group A Prohibited pesticides	Group B Deteriorated pesticides	Group C Unknown substances
The total number of preparations	58	165	-
Weight in tonnes	3,428.0	1,509.6	8,582.8
Total weight in tonnes	-	-	13,570.4
Weight in tonnes	Preparations of the group DDT: 2,495.0 (72.8%)	DDT - 57.2 Herbicides - 254.5	-

Table 3 illustrates the names of the most important banned products that are especially dangerous.

Table 3. Group A. Prohibited pesticides

Name	Category	Weight (tonnes)	LD-50 (mg per kg)
Calcium arsenate	insecticide	63.5	-
Chlanozane	seed dresser	170.9	-
Heptachlor	insecticide	13.4	350.0
HCH-technical	- // -	516.9	-
DDT - 5.5%	- // -	17.0	250.0-400.0
DDT - 20-25%	- // -	60.7	-
DDT - 30%	- // -	400.3	-
DDT - 50%	- // -	353.3	-
DDT - 75%	- // -	39.0	-
DDT	- // -	936.8	-
Dichlorethane	- // -	17.6	170.0
Ethersulphonate	- // -	17.1	-
ltrathion	- // -	26.8	75.0-85.0
Carbolineum	- // -	119.0	-
Metilmercaptane (tiophose)	- // -	1.2	140.0
Polychlorcamphene	- // -	25.8	300.0
Polychlorpinene	- // -	224.6	350.0
Radosan	seed dresser	44.5	60.0
Tiophose	insecticide	20.0	6.4
Fentiurame	seed dresser	103.6	780.0
Tsianplav	- // -	20.4	-
Tsirame	fungicide	101.3	1,400.0

Detoriorated pesticides (Table 4) present a similar situation.

Table 4. Group B. Detoriorated pesticides

Name	Category	Weight(tonnes)	LD-50, (mg per kg)
Agelon, 50% w.p.	herbicide	53.4	3,080
Adanite	- // -	3.6	-
Alirox	- // -	7.4	-
Atrazine	- // -	57.1	3,080
Bazotsene	- // -	8.5	-
Buthanole	- // -	51.3	-
Buthilether	- // -	15.1	-
Volatobe, 2.5%	- // -	25.5	-
Hexathiurame, 80%	- // -	56.7	-
HCBD	- // -	45.2	-
BCH, 25%	insecticide	36.2	-
Dolaphone, 85% w.p.	- // -	78.4	-
2,4 D	herbicide	60.0	-
Dursbane, 40.8% c.e.	insecticide	8.6	-
DCLC	- // -	89.8	-
Ethersulphonate	- // -	10.0	-
Keltane, 20% c.e.	akaricide	37.5	-
Cuprosane, 80% w.p.	seed dresser	7.8	-
Methafose, 40%	insecticide	50.1	-
Nitraphone, 60%	- // -	178.1	-
Pentatiurame, 50% w.p.	seed dresser	35.9	-
Preparation 30	- // -	38.1	-
Protrazine	- // -	19.5	-
Colloid sulphure	- // -	21.3	-
Simazine, 80% e.c.	gerbicide	48.6	-
Calcium Zianomide, 19%	defoliant	79.3	-
Zimete, 80 w.p.	seed dresser	52.9	-

In last years, the mass appearance of pests like locust (*Locusta migratoria*), cutworms (*Agrotinae*), stem and seed weevils (*Curculionidaew*) spider mites (*Acarina*), wireworms (*Elateridae*), grubs (*Melolonthinae*) have shown the need for the application of plant protection products, even the expired ones.

The difficult economic situation in Ukraine and the complete dependence upon the import do not exclude the necessity of the use of obsolete pesticides. Especially in Crimea Republic, a difficult situation is occurring where 684 tonnes of pesticides are stored, from which 190 tonnes are stored in 190 farms.

Nevertheless, everything should not be considered so pessimistic and hopeless. In 1996 a national program on the disposal of obsolete pesticide was executed. The first step towards solutions was the production of 102 special reinforced concrete containers in which 143 tonnes of pesticides wastes were stored.

Table 5 presents the disposal methods of the banned pesticides. The technology of pesticide storage in containers has been elaborated. For this purpose more than 200 containers have been manufactured, in which 313 tonnes of pesticides waste were stored in Kiev region. This amounts to 17% of the whole stock (1,820 tonnes) in the region. In Crimea Republic, 300 tonnes of obsolete pesticides represent 44% of the whole stock were collected. In L'viv region, 23 containers have been used.

Table 5. The ways of treatment of obsolete pesticides in Ukraine

1	Containment of preparations: <ul style="list-style-type: none"> • Kiev region: this technology was developed and used for the containment of 315 tonnes of pesticides in reinforced concrete containers (over 250 containers). That composed 17% of all the stock of the pesticides - 1,820.5 tonnes. • Republic Crimea: 300 tonnes of preparations were contained, i.e. 4,4% of all the preparation stock - 684.2 tonnes. • L'viv region: 23 containers were prepared.
2	The partial usage of the pesticides for pest control: in 1998 - 1,000 tonnes.
3	Incineration in the special reinforced concrete containers: the technology was developed.
4	Incineration mobile installations that are used for liquidation of rocket fuel: the technology was developed.
5	Incineration in stoves of cement kilns: the technology was developed
6	International collaboration: Ukrainian-Danish Project that is founded by Danish participants 250,000 USD the preparations are burned in cement kilns.

Apart from this and taking into consideration the complicated situation in Ukraine, 1,000 tonnes of pesticides belonging to this group were used in order to control mass appearance of pests in 1998.

The technology of pesticide incineration in special reinforced concrete containers was elaborated. It seems that the most promising technology of pesticide disposal is incineration in a special installation used for the incineration of used rocket fuel. This technology was completed. The technology of pesticide incineration in cement kilns is also elaborated and applied.

It can be emphasised that the International Program of Cooperation in this field was implemented. As an example, the Ukrainian-Danish program can be mentioned. The Danish party paid 250,000 US dollars and the incineration technology of pesticides in cement kilns was applied.

Ukraine is an agricultural country. During the 10 years of its existence, numerous legal regulations considering the environmental protection were issued and among them the control of pesticides use. A National Commission involved in pesticides was created. Currently, more than 220 plant protection products are registered. The current procedure provides careful ecological control of these products. Every year plant protection products worth 300-400 million US dollars should be applied in Ukraine. These amounts are presently ensured only in 30-50%.

Certainly there is the risk that the banned plant protection products will be applied in certain situations. Therefore, the solution of the treatment the obsolete pesticides has become of the highest priority, as it will radically improve the ecological situation in the country.