



## **International POPs Elimination Project**

*Fostering Active and Efficient Civil Society Participation in  
Preparation for Implementation of the Stockholm Convention*

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# **The Campaign to Raise Public Awareness of Pesticides, Including Banned and Obsolete Ones, and their Health Impacts**

**THE GEORGIAN ASSOCIATION OF ENVIRONMENTAL AND  
BIOLOGICAL MONITORING**

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## About the International POPs Elimination Project

On May 1, 2004, the International POPs Elimination Network (IPEN <http://www.ipen.org>) began a global NGO project called the International POPs Elimination Project (IPEP) in partnership with the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Program (UNEP). The Global Environment Facility (GEF) provided core funding for the project.

IPEP has three principal objectives:

- Encourage and enable NGOs in 40 developing and transitional countries to engage in activities that provide concrete and immediate contributions to country efforts in preparing for the implementation of the Stockholm Convention;
- Enhance the skills and knowledge of NGOs to help build their capacity as effective stakeholders in the Convention implementation process;
- Help establish regional and national NGO coordination and capacity in all regions of the world in support of longer term efforts to achieve chemical safety.

IPEP will support preparation of reports on country situation, hotspots, policy briefs, and regional activities. Three principal types of activities will be supported by IPEP: participation in the National Implementation Plan, training and awareness workshops, and public information and awareness campaigns.

For more information, please see <http://www.ipen.org>

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The views expressed in this report are those of the authors and not necessarily the views of the institutions providing management and/or financial support.

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# The Campaign to Raise Public Awareness of Pesticides, Including Banned and Obsolete Ones, and their Health Impacts

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## Introduction

The problem of safe application of chemicals, including pesticides attracts major attention now due to concerns about their health and environmental impacts. We can say that health and environmental aspects are increasingly integrated now in formulating sustainable development strategies of key economic sectors. These developments are clearly supported by the Basel, Rotterdam and Stockholm Conventions and many other intergovernmental treaties and documents.

In Georgia, with its intensively developed agriculture, inadequate systems of chemical management (including management of pesticides and agrochemicals) pose a serious threat of environmental contamination by pesticides. According to data from 2002, the country had accumulated about 400 tons of unused, obsolete and banned pesticides that are stored now in abandoned and heavily damaged storage facilities. The range of these pesticides incorporates 2,4-D, gezagard, sulphur, granozan, DDT, zinc phosphide, thiazon, ridomil, simazine, etc. (in addition to unknown amounts of packaging materials). These pesticides are partly stolen or disposed in landfills or ravines, while some of them have already been dispersed and contaminated soils, water and food. The majority of these pesticides are very persistent in environmental media and generate severe adverse health impacts.

Farmers, as well as many officials in charge of pesticide management, are inadequately aware of their adverse effects. Public health, agriculture and environmental specialists do not have a sufficient professional experience to prevent adverse impacts of pesticides. There are no manuals in the Georgian language on public inventories of banned and obsolete pesticides, their eco-toxic properties and rules of their safe application.

All these considerations suggested the need to implement the current project.

## The Project Aim:

To implement a research study in Georgia (Shida Kartli and Kakheti) on pesticide pollution matters, their health and environmental impacts, in order to identify the most serious problems and to develop recommendations for interested consumers on safe pesticide management and application.

## Project Objectives:

- to conduct a public assessment of documents and other sources of information on production, import, distribution and application of pesticides in Georgia in 1984 - 2004;
- to identify pollution hot-spots - i.e. storages of banned and obsolete pesticides;
- to conduct an independent analysis of statistical data on morbidity levels and health problems of residents, who live in close proximity to the hot spots;
- to organise field studies (environmental monitoring) in specific regions of the country;
- in order to engage local NGOs into primary inventories of banned and obsolete pesticides - to develop a reference manual for local NGOs based on the Methodological Recommendations for NGOs on Primary Inventories of Banned and Obsolete Pesticides, developed by Eco-Accord Centre;
- to publish the brochure "Pesticides - Remember about the Danger!" with information about the public environmental inventory of pesticides in Georgia and health impacts of pesticides.
- to conduct a seminar on "Health Impacts of Pesticides".

## The Project Methodology

The project was implemented in Kakheti and Shida Kartli - in regions with well developed viticulture and gardening (i.e. regions of particularly intensive application of pesticides and other agricultural chemicals).

In order to study and analyse contemporary application, storage and distribution of pesticides in Georgia, we analysed available information, relevant laws and regulations, we conducted an independent analysis of statistical data on morbidity and health problems of local residents who live in close proximity to pesticide pollution hot spots - i.e. unauthorised storages of pesticides, including banned and obsolete ones.

In order to involve local NGOs and community representatives to the independent inventory of banned and obsolete pesticides, we organised meetings with representatives of local NGOs in Gori (Shida Kartli) and Telavi (Kakheti). We examined storage facilities in Okami village (Goiiskiy district) and Sakobo village (Signagskiy district) and studied conditions of storage, qualitative and quantitative parameters of the pesticides stored.

"Norma" (a certified laboratory) conducted laboratory analysis of breast milk samples to estimate pesticide contamination levels. Seventy nine samples were analysed for presence of DDT, DDE, HCH and copper-based pesticides. Organochlorine pesticides were determined by thin layer chromatography (according to the Methodological Manual on Thin-layer Chromatographic Estimation of Organochlorine Pesticides in Water, Food Products and Tobacco Products, Moscow, 1981). Copper levels were determined by colorimetry with sodium diethyldithiocarbamate (according to "Copper Determination Methods; Raw Food and Food Products" GOST 26931-86").

In order to study health status of local residents and to identify risk groups, we developed a study questionnaire. The questionnaire included questions on the most important personal and household aspects, nutrition, age, health problems, numbers of pregnancies and children, abortions, including spontaneous abortions, labour conditions, health care services, etc. Overall, 128 respondents were

interviewed (farmers and their family members). They were directly engaged in viticulture, gardening, and vegetable cultivation and lived nearby pesticide storage facilities and dumps. In terms of age the respondents varied from 18 to 50 years.

In Kakheti we surveyed 62 residents of Nukriani, Sakobo, Mashnari, Vakiri and Tsnori villages, including 18 men and 44 women.

In Shida Kartli we surveyed 66 residents of Kheltubani, Mejriskhevi, Okami, Vaka and Ruisi villages, including 26 men and 40 women.

For comparison, we surveyed residents of the same regions who lived far away from pesticide storage facilities and did not work in agriculture (30 respondents, including 12 men and 18 women).

We organised public meetings and a seminar, published articles and the brochure, disseminated the Methodological Recommendations for NGOs, etc.

## Practical Effect of the Project

Based on the completed activities we developed and disseminated the following information materials:

- The Methodological Recommendations for NGOs on Primary Inventories of Banned and Obsolete Pesticides in the Georgian language;
- Brochure "Pesticides - Remember about the Danger!" on pesticide-related problems in Kakheti and Shida Kartli (in Georgian and in Russian).

## The Project Results

### 1. The public environmental assessment of documents and information on production, import, distribution and application of pesticides in Georgia from 1984 to 2004

Pesticides were applied in Georgia for about 80 years. Similar to other countries of the former USSR, Georgia went through all stages of development of pesticide application methods - from nicotine-containing pesticides, inorganic compounds of arsenic, nickel, iron, tin, mercury, sulphurs, copper, etc. to synthetic organic compounds (organochlorine pesticides, organic compounds of phosphorus, phenol-based preparations, nitro-compounds, carbamates, dithiocarbamates, triazines, derivatives of phosphonic and arylphenoxipropionic acids, pyrrolo, acetones and other modern labile low-dosage selective pesticides).

In 1940s - 1950s, in the USSR, organochlorine pesticides were broadly applied (including DDT, HCCH, aldrin, heptachlor, etc.). According to "Selkhozplodorodie" Co. (former "Selkhozkhimia"), about 1800 tons of DDT were delivered to Georgia to combat locusts only (see Table 1).

Table 1.

1	DDT 20%	1957	5 tons to combat locusts	To Kakheti
2	DDT 50%	1965	10 tons	To regions of Georgia
3	DDT 10%	1967 - 1968	430 tons	"
4	DDT 20%	1968	200 tons	"
5	DDT 30%	1968	1200 tons	"

In 1970, application of DDT for food/fodder crops was prohibited in the USSR. As a result, in 1971, all DDT preparations, listed in the List of Chemicals for Liquidation, were recalled. In the period from 1971

to 1975, in Georgia, all pesticide preparations from the List were prepared for burial at Yalgujinskiy burial site (the site was completed in 1976). From that time, banned pesticide preparations were buried there.

Another pesticide - HCCH - was used to combat locusts and (as 12% dust) for spraying of different crops at early stages of vegetation. In the case of vineyards, HCCH was primarily applied to combat phylloxera. See information on centralised supply of HCCH to Georgia in Table 2.

Table 2.

1	HCCH technical grade (100%) (residual amounts were buried at Yalgujinskiy burial site)	1965	20 tons	To regions of Georgia
2	HCCH (25% powder)	1986	198 tons to combat locusts	"
3	HCCH (12% dust) (residues were gradually recalled and were prepared for burial)	1989	195 tons	"

Aldrin and heptachlor were not delivered to Georgia.

According to TsINAO data of 1987, in the former USSR, the intensity of pesticide application (tons of active ingredients per hectare of cultivated land) reached 1.6 tons. In Georgia, the relevant figure reached 8.8. The share of persistent organic pollutants (POPs) in the overall amount of applied pesticides reached 80%. The annual average consumption of pesticides reached about 37 thousand tons. In 1998, 1999, 2000 and 2001, official reports suggest the following amounts of imported pesticides: 1660, 1890, 940 and 375 tons, respectively. More than 80% of these pesticides represent copper-containing pesticides (copper sulphate and copper chloroxide) - such a large share is associated with their low prices, affordable for farmers.

Now, approximate pesticide application intensities (in physical weight, kg/hectare) reach: 4.92 kg for vineyards, 1.25 and 0.61 kg for wheat and corn, 6.6 and 5.92 kg for vegetables and potatoes.

Georgia does not produce pesticides or import them in a centralised manner. "Azot" Plant in Rustavi recently re-launched production of nitrogen fertilisers.

According to the State Plant Protection Service (L.Mikadze, 2002), in recent years, up to 70 different brands of pesticides were applied in Georgia: pyrethroids, organophosphorus pesticides, compounds of copper, sulphur, fluorine and silicon, triazoles, mineral oil, benzimidazoles, dithiocarbamates, chlorinicotines, derivatives of ammine and phosphonic acids, pyrimidine, chlorophenoxyacetic acid, triazone, triazine and methane derivatives (methylbromide - a fumigant for cargo processing in vehicles).

The range of key pesticide suppliers incorporates: Syngenta (Austria, Switzerland), DuPont De Nemur (France), Dow AgroSciences (US), Bayer (Germany), BASF (Germany), Parijat Agency (India), NBTs Fabriomed Ltd. (Russia), FGUP VNIHCBR (Russia), etc. Officially imported pesticides are controlled at the border. All these pesticides are registered by the State Plant Protection Service (the national body in charge of registration of pesticides). There are two high capacity storage facilities for large batches of pesticides - one in Sagarejo (Kakheti) and another nearby Gori (Shida Kartli). Storage facilities of former "Selkhozkhimia", that were constructed in the Soviet period were liquidated, sold or dismantled after their privatisation. According to monitoring data of the Plant Protection Service of the Ministry of Agriculture of Georgia, overall, about 200 tons of obsolete pesticides are stored by different facilities.

However, results of the inventory of the Ministry of Environment suggest other figures: 300 tons of obsolete pesticides in 26 locations in Kakheti alone. These data are controversial. Actually, pesticide stockpiles in Georgia are much higher, as many banned and obsolete pesticides are not accessible for assessment - they are disposed of and hidden.

It is worth noting that organochlorine pesticides such as DDT, HCCH, aldrin, etc. are banned and the amount of imported pesticides in recent years substantially decreased. However, uncontrolled application of agricultural chemicals and residual banned and obsolete pesticides result in environmental contamination and pose a major threat to human health.

## **2. The national legislation on pesticides**

In the last decade, many laws and regulations were enacted in Georgia in the sphere of chemical management, including management of pesticides.

Key underlying laws:

- Law on Plant Protection from Pests (1994);
- Law on Protection of Soils (1994);
- Law of Environmental Protection (1996);
- Law on Water (1997);
- Law on Hazardous Chemicals (1998);
- Law on Pesticides and Agro-chemicals (1998);
- Law on Protection of Ambient Air (1998);
- The Forest Code of Georgia (1999).

In 2000, the following regulations were approved:

- The Regulations on the State Registration Testing, Expert Assessment and Registration of Pesticides in Georgia;
- The Procedures of Pesticide Labelling/Marking;
- The Procedures of Import of Samples, Standard Preparations and Analytical Standards of Pesticides and Agro-chemicals, Necessary for the State Registration Testing;
- Forms of Protocols on Administrative Offences;
- Activities of private economic actors, operating at pesticide markets are regulated by annually approved regulations on approval of quotas, issued by the Ministry of Agriculture, jointly with finance/economy agencies.

In 2002, the following legislative acts were approved:

- "On Basic Procedures of Issuance of Licenses for Business Activities" (the Plant Protection Service issues licenses for pesticide production and trade, as well as permits for import and export of pesticides);
- "On Registration Fees" (fees are paid for state registration testing, expert assessments and registration of pesticides);

In 2005, the Instruction on Storage, Transportation, Sales and Application of Pesticides and Procedures of Export and Import of Pesticides were approved.

According to international requirements (FAO, UNEP), Georgia established the State Register of Pesticides (Plant Protection Chemicals and Plant Growth Regulators) Approved for Application in Georgia, that is periodically updated. Since 1999, four issues of the State Register were published. The last edition of the Register (2005 - 2009) accounts for EPA recommendations on reduction of pesticide preparations, containing atrazine and 2,4 D.



The State Plant Protection Service is the national body in charge of registration of pesticides and fulfilment of Prior Informed Consent (PIC) procedures of international trade in banned and strictly restricted pesticides.

The country had banned application of pesticides, listed in the Rotterdam Convention (Order No. 133 n of the Minister of Public Health of Georgia of March 26, 2001). See the list of pesticides and industrial chemicals, including POPs (DDT, HCCH, aldrin, etc.), that are banned in Georgia, in Annex 1.

At the same time, it is necessary to note that there is illegal import of pesticides into the country (including obsolete, banned and falsified preparations that are offered at low prices).

There is only very limited information on locations and quality of numerous pesticide storage facilities that do not meet applicable requirements for storage conditions.

There are abandoned stockpiles of banned POPs and organochlorine pesticides (18 tons of chloropicrin alone).

The decommissioned pesticide burial site in Yalguja does not meet applicable standards.

There are no modern pesticide utilisation technologies.

The law on burial and elimination of banned and obsolete pesticides actually is not complied with.

The transition period and development of private businesses, as well as lack of finance resources hinder implementation of activities for removal, utilisation and processing of banned and obsolete pesticides. Inadequate systems of chemical management, including management of pesticides and agro-chemicals, generate major problems for the environment and human health.

### **3. Health status of local residents, who live in close proximity to pollution hot-spots in target regions**

In Georgia - a country with well developed agriculture - inadequate chemical management including management of pesticides and agro-chemicals, results in major health and environmental problems. Banned and obsolete pesticides require a particular attention, as their storages are abandoned now.

Poor environmental quality makes a tangible impact on public health statistics of Georgia. In particular, in comparison to 1991 - 1992, the number of stillborn cases per 1000 live new born increased almost by 4.5-fold. Against the background of declining birth rates, child mortality, incidence of birth defects, cancer and cardiovascular diseases increased.

Kakheti and Shida Kartli - regions of intensive application of pesticides - require particular attention, as viniculture, gardening and vegetable cultivation belong to dominating agriculture sectors there. Unfortunately enough, residents of these regions increasingly often complain about respiratory problems, allergies, gastro-intestinal and cardiovascular diseases. Birth defects and prenatal development pathologies were observed there. These health problems are reflected in National Public Health Reports of Georgia (2002, 2003, 2004, and 2005).

Health risks are generally assessed by such indicators as population morbidity, mortality and life expectancy. We believe that status of the human reproductive function and children's health belong to the most informative indicators of impacts of the whole array of health risks, including environmental, social, economic and other risks.

The World Health Organisation (WHO) defines reproductive health as the state of complete physical, mental and social well-being, not as a mere lack of diseases in the course of the reproductive process.

In order to assess health status of local residents and to identify risk groups, we surveyed residents of Kakheti and Shida Kartli and collected information on the most important personal and household aspects, nutrition, age, health problems, including the reproductive function status (e.g. numbers of pregnancies and children, abortions, including spontaneous abortions), labour conditions, health care services, etc. We interviewed farmers and their family members who were directly engaged into viticulture, gardening, and vegetable cultivation and lived nearby pollution hot-spots. As the control group, we surveyed residents of the same regions, who lived far away from these hot-spots and mainly had office jobs.

Analysis of completed questionnaires suggests that 87% of respondents of the control group were practically healthy and only 13% of the control group respondents reported some health problems, including cardiovascular disorders (atherosclerosis and hypertension) and respiratory problems (asthma and chronic bronchitis).

## **Kakheti**

The survey of health status of local residents who lived in close proximity to pesticide storage facilities and had occupational pesticide exposure in agriculture suggests that 38% of such respondents were practically healthy (the share is almost 2.28 times lower compared to the control group). The overwhelming majority of respondents reported pathologies of the gastro-intestinal tract, nervous and cardiovascular systems. In addition, there were numerous complaints about skin and eye irritation.

It is worth noting a high incidence of endocrine disorders (e.g. diabetes and thyrotoxicosis). In addition, there were numerous cases of reported surgeries in connection with uterus adenomyoma, ovary polycystic disease and other malignant tumours. Older respondents tend to report health problems more often.

In the case of surveyed women of the reproductive age, 51.6% of such respondents reported intoxication symptoms (skin irritation, rashes, dizziness, nausea, nose bleeding, allergies and asthma). Reproductive disorders inc. spontaneous abortions, premature birth, alterations of the menstrual cycle, stillborn cases, anaemia, birth defects, foetal asphyxia, etc. were observed among 56.7% of the surveyed women comparatively to 21.2% in the control group.

One woman – a resident of the village of Sakobo, who lived in close proximity to a former pesticide storage - gave birth to a boy with cerebral palsy. Besides that, several years ago, her other ten-month old infant died. Two daughters of the woman are absolutely healthy.

## **Shida Kartli**

In the case of Shida Kartli respondents, 42.2% of them reported health problems. The respondents mainly reported respiratory diseases, allergies, gastric-intestine and cardiovascular disorders (inc. chest pains, palpitation, etc.). The respondents rather often complained about headaches, particularly in the course of direct occupational contacts with pesticides (production of pesticide solutions, spraying). Respondents of the group reported symptoms of dysfunctions of the vegetative nervous system, including hastiness, irritability, insomnia, excitation, rapid fatigability, numbness and pains of limbs, swelling of hands, backaches.

Surveyed women reported reproductive disorders: low birth weight, anaemia of the newborn, spontaneous abortions, birth defects, etc.

Therefore, the questioning of representatives of the risk groups in Kakheti and Shida Kartli revealed that local residents predominantly complain about lack of access to free health care services, medical

consultations and adequate medical assistance. In addition to poor household conditions and low access to information, local residents reported health problems however, they do not always associate these problems with environmental contamination and their exposure to pesticides and other agro-chemicals.

It is worth noting that the majority of agricultural workers and farmers (as well as their family members) consider themselves to be healthy people. Many of them argued that only consumption of large quantities of pesticides may be dangerous for their health. Even an obvious poisoning is not always attributed to contacts with pesticides.

#### 4. Results of pesticide measurements in breast milk

Article 11 of the Stockholm Convention specifically refers to research studies, pertaining to "mitigation of POPs impacts on the reproductive functions" (Article 11, clause 2 (d)). These provisions provide opportunities for studies of POPs impacts in health of children and their parents, particularly in the course of the reproductive process *per se*, including conception, pregnancy, childbirth and breast feeding, for provision of necessary material, physical, mental and social conditions for mothers, fathers and their children. Contamination of breast milk causes particular concerns, as breast feeding is necessary for normal development of a child, but breast milk may be contaminated by chemicals, including POPs and pesticides.

Pesticides were intensively applied in all agricultural regions of Georgia until the 1990s. The share of POPs-pesticides reached 80% of the overall amount of pesticides applied. During those years, daily washout of DDT to the Chorokhi River reached 4.5 kg, while daily washout of the gamma-isomer of HCCH to the Mtkvari River reached 4.49 kg. Uncontrolled application of pesticides resulted in high levels of these chemicals in soils.

Table 4.1 contains data of the Ministry of Environment (H.Akhalia, 2002) on pesticide levels in soils in different regions of Georgia.

Table 4.1.

Pesticide levels in soils (mg/kg) in some regions of Georgia (1999).

Regions	DDT	DDE	HCCH
Sagarejo	0.002	0.002	0.005
Gurjaani	0.002	0.002	0.007
Kvareli	0.002	0.002	0.004
Telavi	0.003	0.001	-
Akhmeta	0.002	0.001	-
Dedoplistskaro	0.001	0.001	0.007
Mtskheta	0.002	0.001	0.014
Kaspi	0.001	0.001	0.001
Gori	0.002	0.003	0.009

We studied pesticide levels in the breast milk of women residents of Kakheti and Shida Kartli using thin layer chromatography.

**In Kakheti**, we surveyed nursing mothers - residents of Nukriani, Sakobo, Mashnari, Vakiri and Tsnori villages in Tsnori Maternity Clinic. In terms of pesticide application and storage, these settlements are under particular risks. Nursing mothers of the age group from 18 to 29 worked in fields, gardens and vineyards (depending of seasons).

DDT, DDE, and HCCH could not be detected in the breast milk of women residents of Kakheti using thin layer chromatography. However, all the samples contained copper as shown in Table 4.2

**Table 4.2.**

**Pesticide levels in breast milk of women residents of Kakheti, in mg/ml (2006)**

Locations	Copper
Nukriani	0.48
Sakobo	0.48
Mashnari	0.50
Vakiri	0.50
Tsnori	0.46

The sensitivity of the assay was 0.05 mg/ml

**In Shida Kartli**, we surveyed nursing mothers of Gori Maternity Clinic - residents of villages under particular pesticide-related risks. These mothers of the age group from 20 to 32 years were mainly residents of Kheltubani, Mejvriskhevi, Okami, Vaka and Ruisi villages. These nursing mothers were mainly housewives and agriculture workers (viniculture, gardening and vegetable cultivation). DDT, DDE, and HCCH could not be detected in the breast milk of women residents of Shida Kartli using thin layer chromatography. However, all the samples contained copper as shown in Table 4.3

**Table 4.3.**

**Pesticide levels in breast milk of women - residents of Shida Kartli, in mg/ml (2006)**

Locations	Copper
Kheltubani	0.40
Mejvriskhevi	0.40
Okami	0.56
Vaka	0.50
Ruisi	0.56

The sensitivity of the assay was 0.05 mg/ml

Results of the laboratory measurements show that organochlorine pesticides were not found in breast milk samples of surveyed women. Copper was found in all samples at the level, close to the relevant MAC. We may conclude that absence of organochlorine pesticides in breast milk might be associated with three reasons: 1) a young age of the nursing mothers surveyed, 2) low sensitivity of thin layer chromatography, 3) organochlorine pesticides were not applied in the surveyed regions for a long time.

The presence of copper in breast milk of women residents of Kakheti and Shida Kartli suggests application of copper-containing pesticides in these regions and potential contamination of food products by these substances.

Should we have opportunities to measure other pesticides that were applied in these regions, we could make more definite conclusions on health impacts of pesticides. In addition, the study should be repeated with a more sensitive measurement technique.

If a pregnant woman is exposed to pesticides, her child would be exposed even before birth. Infants may be exposed to persistent and bioaccumulative pesticides in breast milk. Therefore, it is crucially important to ensure protection of pregnant women and nursing mothers from toxic pollutants.

## **5. Working with local NGOs on practical application of the Methodological Recommendations for NGOs on Primary Inventories of Banned and Obsolete Pesticides**

In order to involve local NGOs and community representatives into independent inventories of banned and obsolete pesticides, we organised meetings with representatives of local NGOs in Gori (Shida Kartli) and Telavi (Kakheti). We conducted trainings to study methodologies of pesticide inventories at the base of the Methodological Recommendations for NGOs on Primary Inventories of Banned and Obsolete Pesticides, developed by Eco-Accord Centre. We translated the Methodological Recommendations into the Georgian language and distributed them among members of the general public.

Jointly with representatives of local NGOs of Gori we made a field visit to survey a pesticide storage facility in Okami village (Goriiskiy district) in order to demonstrate practical application of the methodology. We intended to categorise pesticides by types of packaging and to identify pesticides visually.

After the facility examination we found the following pesticides:

White to light grey powders: bazudin 40% w.p. in a PE bag; baitan 15% in a metal drum (25 kg.), HCCH 25% dust in a multilayer paper bag (20 kg), atrazine 50% w.p. in a multilayer paper bag; hexathiuram 80% w.p.

Light yellow powders: sulphur 80% w.p. in a multilayer paper bag; cyneb 80% w.p., prometrimne 50% w.p. in a multilayer paper bag, ciram 50% w.p. in a cardboard drum.

Grey DDT dust (5%) in paper bags, additional identification by odour.

In Galvani village we surveyed 2 storage facilities that were operational 2 years ago. Now, these storage facilities were completely dismantled. Nobody knows what happened to pesticides that were stored there. Even now a strong chemical smell is felt there.

In Sakobo village (Kakheti) a former pesticide storage facility was destroyed and dismantled. A strong pesticide smell is felt there. The site is covered by traces of fuel oil and burnt pesticides. Houses of local residents are located almost at the site of the former pesticide storage. There are fruit trees (plum-trees, fig-trees, pear-trees, peach-trees) and blackberries nearby. Local residents cooked tomatoes nearby at the open air. In the nearest house to the site we encountered a 12 year old boy who suffered cerebral palsy from birth. In the same family, another child died from acute respiratory deficiency at the age of 10 months.

## **Conclusions**

Different pesticides were intensively applied in Georgia - a country with developed agriculture (the annual quota reached 3000 tons).

Some former pesticide storage facilities were abandoned and dismantled. Some other storage facilities were privatised and are used for agriculture purposes now (new owners keep pigs there or closed them). Pesticides (including many hazardous chemicals) are stored at the open, often unidentified.

It is worth noting that pesticide stockpiles substantially decreased in the last 15 years: from 2400 tons in 1992 to 400 tons in 1997 and to 200 tons in 2002 (however, inventory data of recent years are rather contradictory). These contradictions might be attributed to the fact that some abandoned pesticides were stolen and used for different purposes or were washed out by rain and contaminated soils, groundwater and surface water bodies. There is only very limited information on locations and quality of numerous pesticide storages that do not meet applicable requirements to storage conditions. There are abandoned stockpiles of banned POPs and other organochlorine pesticides (18 tons of chloropicrin alone).

The decommissioned pesticide burial site in Yalguja does not meet applicable standards. There are no modern pesticide utilisation technologies. The law on burial and elimination of banned and obsolete pesticides actually is not complied with.

No research studies have been conducted in the country to study adverse health and environmental impacts of pesticides. However, the contemporary demographic situation is rather grim: high mortality, including infant mortality, growing general morbidity, growing incidence of malignant tumours, reproductive disorders, etc.

The survey of members of risk groups in Kakheti and Shida Kartli revealed that our respondents predominantly complain about lack of access to free health care services, medical consultations and adequate medical assistance. The overwhelming majority of respondents reported gastro-intestinal,, nervous and cardiovascular disorders.. We found a high incidence of skin and eye irritations, and endocrine disorders (e.g. diabetes and thyrotoxicosis). There were numerous cases of reported surgeries in connection with uterus adenomyoma, ovary polycystic disease and other malignant tumours. Older respondents tended to report health problems more often.

Surveyed women of the reproductive age reported reproductive disorders: spontaneous abortions, premature birth, alterations of the menstrual cycle, stillborn cases, anaemia, foetal asphyxia, birth defects, etc.

The study results show that organochlorine pesticides were not found in breast milk samples of women surveyed using thin layer chromatography as the analytical method. These results should be confirmed using more sensitive analytical measurement techniques. Copper was found in all breast milk samples, at levels, close to the relevant MAC.

It is necessary to note that in the course of the governmental inventory of pesticides in Kakheti, Singarskiy district was identified as the priority territory (more than 300 tons of banned and obsolete pesticides were found there). Now, the Ministry of Environment has implemented decontamination of the particularly hazardous pesticide storage site with support of the Dutch NGO Millieukontakt Oost Europa.

Obstacles to adequate management of pesticides and agro-chemicals in Georgia include:

1. Inadequate efforts for mitigation of adverse health and environmental impacts of pesticides;
2. Lack of necessary commitments to ensure provisions of medical and toxicological services at the national and local levels;
3. Insufficient professional experience, particularly in remote districts;
4. Insufficient access to information on adverse health and environmental impacts of pesticides and agro-chemicals;
5. Poor coordination and insufficient co-operation of governmental agencies, local authorities, businesses and the public;
6. Lack of public participation in decision-making.

## Recommendations

In order to reduce adverse health and environmental impacts of pesticides, including banned and obsolete ones, it is necessary to implement the following activities:

- To implement a campaign for public involvement in independent inventories of banned and obsolete pesticides;
- To register pesticide poisoning cases;
- To conduct environmental and biological monitoring of sites in regions of intensive cultivation of tea and citrus fruits and to study the problem of contamination of the Black Sea by hazardous chemicals;
- To conduct biomonitoring of breast milk and other media using sensitive analytical methods;
- To develop an action plan for prevention of adverse environmental and health impacts of pesticides;
- To neutralise, utilise or isolate abandoned residual pesticides.