

**Co-operation for Sustainable  
Rural Development:  
Drinking Water Supply,  
Eco-sanitation,  
Organic Agriculture**

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The report of MAMA-86 National Environmental NGO on implementation of project “Co-operation for Sustainable Rural Development: Drinking Water Supply, Eco-sanitation, Organic Agriculture” in 2003—2006 with finance support of MATRA Program of the Dutch Ministry of Foreign Affairs.

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## The authors' note

The report is a compilation of information materials on experience of information dissemination and awareness raising activities, as well as on implementation of demonstration projects (technical solutions) to improve access of rural residents of Ukraine to safe drinking water and adequate sanitation, that were completed in three years of the project implementation. The project was implemented by MAMA-86 National Environmental NGO (referred hereinafter as MAMA-86) in 2003—2006, with finance support of MATRA Program of the Dutch Foreign Ministry. We express our sincere gratitude to MATRA Program for the support provided to improve access of Ukrainian citizens to safe drinking water and to facilitate development of citizens' initiatives and democracy in our country.

MAMA-86 would also like to express its sincere gratitude to our long-term partner — Women in Europe for a Common Future (WECF) international network for their co-operations in development of the project proposals and implementation of project “Co-operation for Sustainable Rural Development: Drinking Water Supply, Eco-sanitation, Organic Agriculture”.

Regional organisations of MAMA-86 developed pilot projects at the base of research and broad local intersectoral discussions, experience of campaign “Drinking Water in Ukraine” of MAMA-86 and consultations with Ukrainian specialists and international experts who co-operate with WECF. Kyiv office of MAMA-86 ensured general coordination of the project implementation in Ukraine.

This publication primarily seeks to represent experience of co-operation between NGOs, local communities and all stakeholders in addressing local socio-environmental problems (including *inter alia* water supply and sanitation problems) by active information dissemination and awareness raising and by implementation of demonstration projects. The project implementation activities focused on three inter-related spheres:

- drinking water supply;
- eco-sanitation;
- organic agriculture.

The report contains designs and charts of technical solutions, information on associated costs and results of implementation of pilot projects. The eco-toilet design, shown in the report, was developed by Stefan Deegener — a WECF expert, from the Institute of Wastewater management of Hamburg Technology University (TUHH), Germany.

We hope that experience and information of the report will become a valuable resource for all interested parties dealing with rural development problems. The publication will be of interest for a broad audience, particularly representatives of NGOs, local authorities and industries/businesses, interested in or responsible for improvement of citizens' access to safe water and adequate sanitation in Ukraine.

## Introduction

### Water supply and sanitation in rural areas of Ukraine

Numerous governmental programs for reforms in the housing and utilities sector of Ukraine suggest that “in many regions, drinking water supply is a priority problem that must be addressed to protect health and improve living conditions and living standards of residents”<sup>1</sup>.

Reforms in the sector were initiated more than 10 years ago. In the course of reforms, substantial changes were achieved, including decentralisation of management functions in the sector, delegation of infrastructure management functions and responsibilities to local authorities, development of underlying laws and regulations in the sphere of drinking water supply, organisational and structural reforms in the sphere, improvement of economic mechanisms and introduction of tariff reforms for full cost recovery of utilities and implementation of activities for improvement of water supply and sanitation infrastructures and facilities.

However, all these reforms and actions are predominantly focused on centralised water supply and sanitation and users of these centralised systems. At the same time, problems of decentralised systems of water supply and sanitation that are mainly used by residents of small towns and rural settlements do not attract adequate attention of governmental authorities and reforms in the sector.

Official statistics suggests that quality of rural water supply in Ukraine still remains rather low in comparison with European and CIS countries. Notwithstanding that more than 55 thousand km of water mains and more than 70 thousand artesian wells were constructed in rural areas (mainly for water supply of large agricultural facilities, that met 98% of their water demand in mid-1990s), the overall rate of provision of centralised water supply services in rural areas was almost twice lower comparatively to average figures of the former USSR. Now, the number of rural buildings in Ukraine equipped by internal water supply and sanitation networks is 3 times lower than in Russia and 4 times lower than in Belarus.

According to official reports<sup>2</sup>, in 2004, only 4.1 million rural residents in Ukraine, from the overall figure of 15.7 million (or 26%) used centralised water supply services. Buildings of only 7.4% of rural residents are equipped by internal water supply networks. A similar situation is observed in connection with other amenities as well: sanitation (4.4%), water heating (8.4%), hot water supply (0.3%), street standpipes (18.6%). In 2003, the water consumption norm reached only 60 litres capita in rural areas, while in urban areas the relevant figure was as high as 320 litres.

5.7 million urban residents and 11.7 million rural residents use drinking water from local sources, including shallow wells, captages, springs etc. (it is worth to note that in the majority of cases these sources are of inadequate technical conditions).

Besides that, in 13 oblasts of Ukraine, more than 800 thousand residents of 1200 rural settlements rely on water trucks for drinking water supply.

The situation in the sphere of coverage by centralised sanitation services is much worse. In 2004, centralised sanitation systems served 95% of cities, 56% of townships and 3% of rural settlements.

Only about 8.8% of rural residents use centralised sanitation services (or less than 1.4 million residents). The rest of them (or 14.3 million persons) use decentralised sanitation systems — pit latrines or septic tanks that might be used by an individual household or by several households. Septic tanks should be regularly cleaned — owners should organise removal of sediments from septic tanks and

1 National program “Drinking Water of Ukraine” for 2006—2020. March 3, 2005. No. 2455-IV.

2 The national report on quality of drinking water and drinking water supply in Ukraine in 2004.

pay for these services. However, there are no official regulations that prescribe how often septic tanks should be cleaned. As a result, many septic tanks may be never cleaned<sup>3</sup>.

According to expert estimates<sup>4</sup>, about 0.9 billion m<sup>3</sup> (or 20% of the overall amount) of municipal wastewater are accumulated annually in septic tanks and pit latrines, that are outside governmental control and regulation.

Besides that, it is worth to note a specific problem of drinking water supply and sanitation in rural schools.

According to the Directorate of Sanitation and Epidemiological Services<sup>5</sup>, there are 20,961 secondary schools in Ukraine, attended by about 6 million schoolchildren. Overall, about 4 thousand secondary education facilities of Ukraine (or 20%) are not connected to centralised water supply. The most high shares of such schools are registered in Lvivska Oblast (44%), Ternopil'ska Oblast (39%), Chernigiv'ska Oblast (36%) and Volyn'ska Oblast (35%). 7.3 thousand secondary schools are not connected to centralised or local sanitation systems (or 35%). The most high shares of such schools are registered in Zakarpatska Oblast (78%), Chernivetska and Odeska oblasts (61% in each) and in Lvivska Oblast (50%). Technical state of water supply systems in rural areas is predominantly low. For example, in Lvivska Oblast, 50 schools use community wells for water supply purposes. In Zaporizska Oblast, water to 70 schools is supplied by water trucks and these schools lack centralised sanitation systems. The majority of rural schools are equipped by dirty and cold pit latrines, located at distances of 50 to 75 metres from school buildings.

The problem of wastewater treatment and utilisation is fairly relevant in rural areas, regardless specific sanitation systems in use (centralised or decentralised). From the overall figure of 52 million m<sup>3</sup> of wastewater inflows to rural sanitation systems, about 22% are discharged without treatment, 37% undergo primary treatment prior to discharge to surface water bodies and 41% undergo primary and secondary treatment.

Poor technical conditions of outdated sanitation networks, wastewater treatment plants or pit latrines and septic tanks, as well as irregular removal of accumulated wastes, result in wastewater releases and substantial bacterial and chemical environmental contamination, including groundwater pollution. Accounting for the fact that shallow wells fitted by ground water are used in rural areas as the key source of drinking water supply, the problem of safe water supply in rural areas may be resolved only by implementation of measures to prevent infiltration of untreated wastewater to environment and to introduce efficient wastewater treatment technologies.

Now, as a result of irrational usage of nature resources and high industrial loads, there are growing zones of polluted groundwater at large territories. Groundwater in these zones contains high concentrations of nitrates, traces of pesticides and heavy metals. These contaminants do not allow local residents to use such groundwater for drinking purposes.

Local facilities of the State Sanitary and Epidemiological Service monitor 7,810 rural water supply networks (from the overall number of 8,047). In 2003, 9.5% of rural water supply networks do not meet applicable sanitary standards, while in 2005, the relevant figure reached 8.7%. In particular, in 2005, 17.1% of water samples did not meet chemical sanitary standards and 7% of samples did not meet bacteriological standards.

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3 The national report on quality of drinking water and drinking water supply in Ukraine in 2003.

4 "The National Strategy of Development of the Water Sector of Ukraine and the Action Plan" — Interim Report, June 2002, DANCEE, the Ministry of Environment of Denmark, the State Committee of Ukraine for Housing and Utilities (COWI Report, 2002).

5 The letter of the acting Chief Sanitarian of the Central Sanitary and Epidemiological Facility of the Ministry of Health Protection of Ukraine of 22.03.2006.

At the same time, quality of water from decentralised water sources (wells and sources) is much worse. According to official data, in recent years (2003—2005), about 32% samples of water from decentralised water sources did not meet applicable chemical sanitary standards and 23—29.5% of samples did not meet bacteriological standards.

Experts of the Central Sanitary and Epidemiological Facility of the Ministry of Health Protection of Ukraine identified growing nitrate pollution levels in groundwater used for drinking purposes by the majority of rural residents. Elevated nitrate levels in water pose serious health risks, including children's water related methemoglobinemia. Nitrates suppress general human resistance to diseases and provoke higher morbidity, including higher incidence of infections and cancer.

Opportunities to resolve problems of water supply and sanitation in rural areas and provision of clean drinking water and adequate sanitation services to rural residents directly depend on reforms in the sector. Now, problems in the sphere are associated with incomplete transferring of rural water supply and sanitation infrastructures to local authorities, lack of specialised organisations in charge of their maintenance, lack of laboratory capacity at the operational level, lack of an adequate state program to support the development of rural settlements (including, in particular, state programs for provision of safe drinking water supply and adequate sanitation services to rural residents).

## **Project “Co-operation for Sustainable Rural Development: Drinking Water Supply, Eco-sanitation, Organic Agriculture”**

Since 2000, in the course of implementation of its campaign “Drinking Water in Ukraine”, MAMA-86 studied problems of decentralised water supply, in particular, the problem of quality of well water in rural settlements of Poltavaska, Chernigivska and Ivano-Frankivska oblasts. Results of independent research studies completed in the framework of the campaign implementation, suggest that quality of well water depends on environmental quality and technological problems of decentralised water supply. Regional organisations of MAMA-86 (Nizhyn, Poltava, Artemivsk and Yaremche) studied contamination of drinking water in rural settlements by nitrates, bacteria, oil and other pollutants. Experience of implementation of first pilot projects for improvement of access to safe drinking water in rural areas suggests: there are no state policy to address water supply and sanitation problems in rural areas, rural water supply systems and wells are critically deteriorated, well water in Poltavaska Oblast and Nizhyn rayon of Chernigivska Oblast is heavily contaminated by nitrates, in some villages of Poltavaska Oblast, well water is contaminated by oil, rural residents are poorly aware of problems of drinking water and their links with environmental quality and health impacts, authorities and rural communities lack knowledge and funds to address water supply and sanitation problems.

Preliminary activities in the course of MAMA-86 campaign “Drinking Water in Ukraine” and joint MAMA-86 and WECF information network project “Drinking Water for Democracy Building of Ukraine” (2000—2003) provided preconditions for development of a new network project to address fundamental development problems of rural communities, associated with improvement of drinking water supply, sanitation and protection of water sources from man-made pollution.

In November 2003, in partnership with WECF, MAMA-86 launched its project “Co-operation for Sustainable Rural Development: Drinking Water Supply, Eco-sanitation, and Organic Agriculture”. The project was implemented for 3 years and was supported by MATRA Program of the Dutch Ministry of Foreign Affairs. Project activities were implemented by regional organisations of MAMA-86 in Nizhyn, Poltava and Yaremche (Ivano-Frankivska Oblast), with support and co-ordination of MAMA-86 Kyiv office.

The project sought to address problems of water supply and sanitation as the key precondition for sustainable rural development with public participation and co-operation of all stakeholders.

Project activities included information dissemination at the level of three target communities on water supply and sanitation problems and options to address these problems, implementation of pilot projects in target villages in three key directions (safe water supply, eco-sanitation — construction of eco-toilets, and organic agriculture), involvement of rural communities and stakeholders into actions for addressing local development problems.

The project activities were implemented in three rural settlements: Bobryk village in Nizhyn rayon of Chernigivska Oblast; Vorokhta village (township) of Yaremche rayon of Ivano-Frankivska Oblast and Gozhuly village of Poltava rayon. In the course of study of local problems, members of project teams conducted independent analysis of drinking water samples from local water sources, public surveys and hydrogeological surveys of local areas. With participation of WECF experts, three socio-economic studies were conducted, as well as regional and national seminars, dedicated to problems of drinking water, wastewater management and eco-sanitation. In the framework of the project, 20 information materials were developed in three project directions. These materials were broadly disseminated during the information events (see Annex 1).



The following information dissemination and awareness raising actions were conducted in three years:

- three national seminars: "Water, Sanitation and Hygiene for All in Ukraine", "Eco-sanitation as a New Approach to Address Sanitation Problems" with participation of leading experts from Norway, Germany and Sweden; and a seminar for presentation of MATRA project results;
- four regional seminars with participation of WECF experts on drinking water, eco-sanitation and organic agriculture;
- more than 10 different trainings on project topics for different target groups, both in target villages and in summer camp seminars for MAMA-86 network;
- information actions (lessons, contests, lectures, actions for cleaning of river banks, other water sources, etc., press-clubs, radio- and TV presentations) in the course of Days of Water in 2004—2006;
- opening ceremonies of eco-toilets, the information centre on organic agriculture, etc.

In August — September 2004, the first demonstration project was implemented — construction of the eco-toilet in Gozhuly school.

Overall, the following pilot projects were implemented in the framework of MATRA project:

1. Drinking water supply:

- rehabilitation of the water supply network in Vorokhta village of Yaremche rayon (construction of 195 metres of water mains and connection of 4 households to the water supply network, more than 100 local residents were able to connect to the centralised water supply system);
- rehabilitation of wells (sources of drinking and technical water) and construction of water supply mains to the school in Bobryk village, construction of the artesian well to supply water to a kindergarten in Vertijivka village of Nizhyn rayon;
- rehabilitation of the community well in Gozhuly village (Poltava district). At the same time, natural fluoride pollution of water in Gozhuly was identified (fluoride levels in the water reached 7—9 mg/l, or in 5—6 times higher than the applicable standard) and awareness raising actions were launched to inform schoolchildren and their parents on prevention of dental fluorosis. According to the local school administration, 80% of schoolchildren suffer from dental fluorosis. In connection with these findings, independent water analysis was conducted, and Ukrainian and international experts were involved into search for technical solutions to address the problem.

2. In the area of eco-sanitation, two school eco-toilets and 7 household eco-toilets were constructed in Gozhuly and Bobryk villages, as well as 5 individual eco-toilets in Vorokhta, one eco-toilet in Bobryk and one eco-toilet in Vertijivka;

3. In the area of organic agriculture, in Bobryk village, at experimental fields, potato cultivation recommendations were tested (inc. application of improved potato cultivation technologies, based on application of environmentally clean and soil-protection technologies), separate fields were organised for strain renovation and cultivation of potato seed material). In Vertijivka village, the information centre on organic agriculture was launched; three farming facilities were provided recommendations and consultations on implementation of some elements of organic agriculture in Gozhuly village.

From the very beginning of the project implementation, MAMA-86 paid a close attention to development of constructive relations and partnerships with all stakeholders: rural communities, local au-

thorities, representatives of all governmental levels, utilities, businesses and the academic community. In the framework of the project, public initiative groups were established to discuss local water supply and sanitation problems and engage stakeholders for addressing them. During the project implementation these groups gradually transformed into actively operating community committees. All interested parties were invited to participate in seminars and public hearings, as well as representatives of all relevant authorities.

Results of implementation of MATRA project demonstrated efficiency of co-operation between NGOs and all stakeholders to address local problems. Moreover, the project results suggest that there is a substantial technical and information capacity to improve access of rural residents of Ukraine to safe drinking water and adequate sanitation. Drinking water supply and sanitation in rural settlements should be considered as priorities in state programs for socio-economic development of rural areas. Success in the sphere depends on state support and participation of all stakeholders in local decision-making and implementation of these decisions, introduction of efficient approaches and technologies and development of experience and information exchange.

## Improvement of access to safe drinking water: results of MATRA project implementation

Activities for improvement of access to safe drinking water in target villages — Vorokhta (Yaremche rayon), Bobryk (Nizhyn rayon) and Gozhuly (Poltava rayon) — included study of situation in villages, information dissemination and awareness raising actions at the level of village communities, implementation of short-term and long-term technical solutions and introduction of democratic mechanisms to address local water supply and sanitation problems.

These activities focused on village communities and local authorities. Information dissemination and awareness raising activities covered residents of all target villages or about 8.5 thousand residents (4,500 residents in Vorokhta township, 3,600 residents in Gozhuly village and 396 residents in Bobryk village). Besides that, some information actions were conducted in Vertijivka village of Nizhyn rayon with population of 4,864 residents, where Vertijivka village council is located (Bobryk village is administratively subordinated to Vertijivka village council).

The range of direct beneficiaries of the project (i.e. persons who directly benefited due to implementation of pilots for improvement of drinking water supply) incorporated about 500 residents of target villages and about 170 children and personnel of Bobryk school and Vertijivka kindergarten, namely:

- In Vorokhta township, 100 residents of the central part of the township were able to connect to centralised water supply, due to construction of the additional water main (195 m); samples of well water from 50 wells were analysed, besides that, nitrate levels in water from 80 sources were measured by express-testing. Five community wells, that are used by about 100 township residents, were cleaned and disinfected by mineralised water with high mineral contents, iodine, etc.
- In Bobryk village, 2 wells were repaired. One of these wells is used by the village school (36 schoolchildren and 15 teachers) and another well is used as a source of technical grade water. In Vertijivka village, a new artesian well was constructed to supply water to the local kindergarten (now, in addition to 21 staff-members of the kindergarten, 40 children attend the facility, while in 2007, the kindergarten will be attended by 100 children).
- In Gozhuly village, a community well was repaired (the well serves 96 households or about 280 residents).

Broad dissemination of information among local residents and local authorities, promotion of broad open discussions of all stakeholders on drinking water supply problems, permanent contacts with authorities at all levels, the project implementation allowed to mobilise local communities for implementation of practical project activities that substantially improved access to safe drinking water at the local level. Therefore, the project helped to address drinking water supply problems of more than 2 thousand residents of target villages and facilitated implementation of the following measures in target locations:

- in Vorokhta township, in 2005, rehabilitation works at the local water supply network were launched, a section of the water supply main was replaced (1300 m) and seven wells were constructed (total costs of these works reached UAH 296,702). In 2006, these activities allowed residents of 7 private houses and 4 municipal residential blocks (8 flats) to connect their households to the central water supply main at their expense (UAH 4,000). Plans for October 2006 stipulate reconstruction of the upper part of the water supply network. Costs of these works will be covered from the state budget (UAH 170,000).
- In Gozhuly village, where about 34% residents use centralised water supply, in October — December 2005, repair works were completed at the artesian well and 410 m of the water

supply main were reconstructed. The associated costs were covered from the rayon budget (UAH 45,000).

- In Bobryk village, 7 households switched to cleaner and more reliable water sources, while in Vertijivka village 6 new artesian wells were constructed. In addition, 21 residents (mainly parents of newborn children) started to take cleaner drinking water from neighbouring wells).

Studies of local water supply and drinking water problems allowed to gather information for several publications (see Annex 1).

Results of study of drinking water issues and practical experience of addressing local water supply problems in the framework of MATRA project were presented at public consultations and hearings on the National Program (“Drinking Water in Ukraine”) Draft, organised by MAMA-86 in December 2004. Due to active public lobbying of the document, the National Program was amended by provisions on addressing problems of rural water supply, introduction of local additional water purification technologies for residents of environmental disaster zones (areas contaminated by natural and industrial pollutants) and some vulnerable population groups (schools, hospitals, etc.) and budget allocations to address these problems.

In the course of the International Water Forum — “AQUA Ukraine”, in 2004—2006, reports on implementation of MATRA project were presented. These presentations incorporated intersectoral discussions on these problems and the project implementation results.

## Access to drinking water: Vorokhta township case study

Yaremche City Council controls important recreation territories of regional and national significance. Due to unique natural resources, these territories attracted and still continue to attract thousands of Ukrainian and foreign tourists.

However, the region faces serious problems of water supply, sanitation and solid municipal waste management. These problems are particularly acute in Vorokhta township with more than 4,500 residents. In 1896, one of the first water supply pipelines in the area was constructed there. The system with capacity of 100 m<sup>3</sup>/day served “Girske Povitrya” (Mountainous Air) sanatorium and used a mountainous stream as a water source. In 1948, the first and the only partial rehabilitation of the water supply system was completed. From that time, no repair works were made, but the water supply network gradually expanded. Almost a half of Vorokhta residents use water from the water supply network. Some other facilities also connected to the network individually: other recreation and catering facilities, a hospital, a drug store, a post office, the township council office, residential blocks, private households, etc.

However, in early 2000s, the problem of drinking water supply in Vorokhta substantially worsened. The township residents almost lost their access to clean drinking water due to poor technical state of the water supply network, deteriorated water intake, lack of a water protection zone, inefficient water filters and poor water disinfection, lack of laboratory water quality control and serious water losses from ruptured pipes. Ivano-Frankivska Oblast Sanitary and Epidemiological Department examined water in the network and found that water did not meet requirements of “Drinking Water” standard in terms of bacterial contamination and turbidity. The water supply system caused sanitary and hygiene problems in the township.

As the water supply system was and still is managed by “Girske Povitrya” sanatorium, in recent years, the sanatorium’s administration tried to address problems of the water supply system by its own means. However, the sanatorium did not have sufficient funds for these purposes. At the same time, other water users did not pay for water. As a result, the sanatorium administration had to switch off other users for several months and local residents used well water. These residents had particularly serious problems in low water seasons, when groundwater levels decreased and they had to use rainwater, snow melt water and even low quality water from a nearby river (technical grade water).

On the other hand, sanitation problems in Vorokhta township were also rather acute. The local sewer and centralised wastewater treatment plant were constructed many years ago and operate absolutely inefficiently, as a result, untreated wastewater is discharged to the river. Some residents use pit latrines and septic tanks. In the framework of MATRA project, Ivano-Frankivsk Capital Construction Directorate launched construction of modern wastewater treatment facilities with capacity of 100 m<sup>3</sup>/day. However, these wastewater treatment facilities were designed to serve only the central part of the township.

Besides that, the township faced the problem of solid household wastes. Unauthorised waste dumps are scattered at the whole territory of the township and nearby the settlement — along the river banks and nearby residential houses. The existing landfill is overloaded and authorities lack trucks for waste removal.

Due to its poor sanitary conditions and acute water supply and sanitation problems, Vorokhta township was selected as the target location for implementation of project “Co-operation for Sustainable Rural Development”. The project incorporated such important components as implementation of demonstration projects to improve access of local residents to drinking water and adequate sanitation.

Short-term objectives of the project incorporated the following ones:

- to attract attention of all branches of power to problems of water supply problems, sanitary and hygiene quality of Vorokhta township and the need to take practical steps for improvement;
- to promote community participation by establishment of a public committee to address pressing socio-environmental problems of Vorokhta township;
- to conduct information dissemination and awareness raising activities in the area on drinking water, sanitation and hygiene matters, focusing on young residents;
- to implement a pilot project to improve access of residents of the central part of the township to drinking water;
- to introduce new approaches and implement eco-sanitation-based technologies to address wastewater management problems;
- to study prospects for development of organic agriculture in the region.

Longer-term objectives of the project included:

- to identify sustainable solutions to address water supply and sanitation problems in Vorokhta township;
- to promote democracy building by supporting public initiatives and enhancement of role of the local community, particularly women, in decision-making, focusing initially on ensuring sanitary and epidemiological wellbeing in the township.

The project implementation continued 3 years (from November 2003 to October 2006).

### ***Rehabilitation of the water supply network in Vorokhta township***

#### *Implementation of the demonstration project*

In November 2003, the first project meeting was held — members of the project team of MAMA-86-Yaremche environmental NGO and WECF met representatives of Yaremche Town Council and residents of Vorokhta township. The meeting allowed finding that the problem of water supply in Vorokhta was discussed for several decades at different levels, but all these discussions failed to produce a constructive solution: at that time, design documentation and costs estimates for rehabilitation of the water supply network of the sanatorium had not been developed. At the same time, in the course of the meeting, representatives of the district-level authorities reaffirmed their willingness to co-operate in the framework of the project in order to address the problem of drinking water supply in Vorokhta. Yaremche town authorities committed to develop design documentation for rehabilitation of the water intake and the water supply network in Vorokhta township.

In April 2004, the design documentation for rehabilitation of the water supply in the central part of Vorokhta township, developed by “Dipromisto” design institute (costs of these design works were covered by Yaremche Town Council) was discussed in open settings. The discussion was attended by representatives of all stakeholders: the chair and the deputy chair of Yaremche Town Council, the chair and the secretary of Vorokhta Township Council, representatives of Ivano-Frankivska Oblast Sanitary and Epidemiological Department, the chief designer of “Dipromisto” design institute, managers of the sanatorium, the Chief Administrator of Vorokhta Hospital, oblast-level elected representatives, and the community representatives. The discussion allowed identifying the need to upgrade the design documentation, to incorporate additional measures to the design: inc. reconstruction of the water filters, design of sanitary protection zones and organisation of laboratory water quality control.

As its practical contribution to MATRA project, MAMA-86-Yaremche committed to address water treatment problems.

In order to identify the most optimal technology, tender procedures were organised. In January 2005, tendering proposals were distributed between interested organisations. Overall, 7 tender bids were received. These proposals were assessed by members of the tender commission (inc. representatives of local authorities, sanitary and epidemiological facilities, the Directorate for Housing and Utilities and MAMA-86-Yaremche). Besides that, these proposals were assessed by experts from Kyiv and Munich. The commission had a difficult task and it considered the bids in two stages. After completion of assessment of all proposals, three most prospective ones were selected. However, all these proposals needed some adjustments. The process of identification of the most optimal technological scheme was difficult, but it produced constructive outcomes. Finally, the water treatment technological scheme of “Free Fly” Co. was approved — the scheme incorporated a self-cleaning primary filter, a secondary filter and an automatic hypochlorite feeder. In addition, the company also offered Italian equipment and provided a cost estimate for installation of the technology proposed. According to their cost estimate, overall costs of equipment, installation works and personnel training reached €16,500.

In early spring of 2005, the problem of site selection for the water treatment unit with filters became particularly acute. Use of the already existing water infrastructure of “Girske Povitrya” sanatorium was considered as a rational option. However, local authorities are authorised to invest only into facilities of their own. Therefore, Yaremche Town Council and Vorokhta Township Council initiated the process of transfer of the water supply infrastructure to the local community. Relevant official requests were submitted to the Ministry of Health Protection and the State Committee of Ukraine for Housing and Utilities. Two months later, the negative answer was received from the Ministry. The Ministerial refusal forced the local authorities to develop the alternative option — to use the already existing water intake of “Avangard” sport training facility and to decide on its transfer to the community ownership.

The whole process was substantially delayed by several objective and subjective factors, including the failure to identify the site for construction of the filtration facility, protracted negotiations on terms and conditions of transfer of the water intake of the sanatorium to the local community, a long process of processing of the official allocation of the land plot, high costs of the water intake reconstruction works, etc.

Accounting for a limited time of the project implementation and lack of realistic prospects to complete the filtering facility as initially planned, the project implementation team developed its alternative option. The option stipulated construction of a new branch of water main (195 m long), that would allow to connect households of more than 100 residents of the central part of the township to the centralised water supply. MAMA-86-Yaremche conducted a tender on associated construction works. The tender was won by a private company of Yuriy Petrovich Tkachuk. These construction works at the additional water main were completed within two weeks in July 2006. (Annex 3, Photos 1—5) Costs of these construction works reached UAH 42,001.

Besides that, a low income household was connected to the water supply and sanitation system and a water meter was installed in their house. Now, in Vorokhta, similarly to the majority of other rural settlement of the oblast, residential consumers do not pay their water bills for metered consumption. Anyway, it is important to start awareness raising activities, explaining the need to use drinking water in a responsible manner, regardless specific water sources. Now, installation of water meters is mainly made to inform residents on actual water consumption and opportunities of rational water use. So far, these activities are focused on awareness raising. However, later, maybe very soon, after transfer of the water supply network to a township utility, Vorokhta residents will pay for water they use.

#### *Co-operation with authorities*

Since November 2003, activities to address water supply problems in Vorokhta reached their practical stage. Project activities and co-operation between the community and authorities allowed to

introduce a sustainable approach and to implement a range of actions that substantially accelerated rehabilitation of the water supply network in the township. Local authorities started to address these problems gradually and purposefully:

- A request was submitted on incorporation of measures to improve water supply in Vorokhta into the oblast-level program under National Program “Drinking Water in Ukraine” for 2006—2020 (financing of UAH 707,660).
- The Directorate for Housing and Utilities of Ivano-Frankivska Oblast State Administration submitted a request on financing of UAH 770 thousand in 2006 to the Directorate General of Economy for rehabilitation of the water supply in Vorokhta township in the framework of “Towards People” Action Program of the Cabinet of Ministers of Ukraine.
- Jointly with MAMA-86-Yaremche, design works were completed for rehabilitation of the water supply (total costs of the design works reached UAH 35,900, UAH 6,900 were allocated from the budget of MATRA project, UAH 17,500 were provided by Yaremche Town Council and UAH 11,500 were allocated by Vorokhta Township Council).
- A section of the central water supply main (1300 m) was replaced and 7 wells were installed (total costs: UAH 296,702).
- In autumn 2006, reconstruction of the upper part of the water supply network was launched. The reconstruction works were financed from the state budget (UAH 170,000). The funds were provided in response to request of MAMA-86-Yaremche (the request was accompanied by a detailed justification of the need to implement these works by Yaremche Directorate for Housing and Utilities).
- Construction of wastewater treatment facilities for the central part of the township had been completed.
- Design documentation was developed for construction of a landfill for solid municipal waste in Vorokhta township.
- Vorokhta township council reviews issues of management of community wells for incorporation of relevant provisions to the Program of Sufficient Supply of High Quality Drinking Water to Residents of Vorokhta Township for 2006—2020;
- The range of planned activities includes construction of a water intake, a water filtration facility and a water main. These works should be completed in the framework of comprehensive activities for attraction of investments into Yaremche in 2006—2008, approved by Decision No. 40 of the Executive Committee of Yaremche Town Council of May 23, 2006 (UAH 2.6 million).

MAMA-86-Yaremche closely co-operated with all branches of power in the course of development of programs and requests, in particular, with M. O. Shegrin — the Chief of Yaremche Directorate for Housing and Utilities — who developed measures for local action programs to be implemented in Yaremche and Vorokhta in the framework of the National Program “Drinking Water of Ukraine”. M. M. Gundyak — an elected representative of Yaremche Town Council — made a substantial personal contribution into approval of the program by the Town Council.

On December 22, 2005, Yaremche City Council endorsed its Decision No. 345-4/2005 on approval of the Program to Ensure Sufficient Supply of High Quality Drinking Water to Residents of Yaremche and Vorokhta Township for 2006—2020.



### *Community participation*

From the very beginning of the project implementation in Vorokhta, MAMA-86-Yaremche actively informed the local community on the project and involved local residents into discussions on socio-environmental problems of Vorokhta. It is worth to note, that fairly quickly a group of active township residents was identified. These residents organised the community committee. In the course of public discussions, the idea of development of a local action program was proposed to improve sanitary and hygiene conditions in the township. On December 30, 2004, the agreement on co-operation between the community committee and Vorokhta Township Council was signed. The parties of the agreement made commitments to co-operate for improvement of environmental and sanitary conditions in Vorokhta by means of development, approval and implementation of the Program for Improvement of Sanitary and Hygiene Conditions in Vorokhta Township. On April 12, 2005, the Executive Committee of Vorokhta Township Council approved the Program by its Decision No. 18. The Program incorporated search for alternative water sources for water supply in a part of the township, organisational arrangements for a landfill, completion of construction of wastewater treatment facilities in the central part of the township and reconstruction of the water intake and the water supply network in the central part of the township.

During the project implementation, 6 working meetings were held with participation of the community committee. On August 3, 2005, members of the community committee met with representatives of small businesses and authorities. At the meeting, Mykola Paliychuk (the Chairman of Yaremche Town Council) and the Chairman of Vorokhta Township Council reported to the community on progress in implementation of activities to ensure drinking water supply in the township.

The community committee actively participated in discussion making process on the alternative option of MATRA project for reconstruction of the township water distribution network. Members of the committee insisted that local households should be connected to the water main. The committee assisted members of MATRA project team in identification of optimal social and technical solutions and in development of the scheme, that stipulated construction of a water main at D. Galytskogo Str. and connection of low income households to the centralised water supply.

In 2006, members of the township community started to construct local water supply facilities. In the central part of the township, residents of 7 private houses and 4 residential blocks (8 flats) individually connected their houses to the water main. They paid more than UAH 4000 for associated works.

### ***Addressing the problems of decentralised water supply***

In the course of the project implementation, well water problems were also studied. MAMA-86-Yaremche monitored water quality in 5 community wells of the township. Analytical results demonstrated that in three of these wells, water contained excessive organic contents. In autumn, bacterial contamination of well water was higher, but after the winter, biological pollution indices were lower, maybe due to disinfection by low temperatures. Analysis revealed that, in November 2005, in 4 wells average coli-indices exceeded applicable standards twice (in one well the coli-index exceeded the standard in 23 times), while in April 2006, only in one well coli-index exceeded the standard in 2.3 times. In August 2006, in 5 wells, the experimental disinfection method was applied — water was treated by highly mineralised water. In September 2006, water samples from these wells will be analysed again.

In addition, in 2005, MAMA-86-Yaremche measured nitrates and nitrites in well water. Overall, 50 water sources were studied. Results suggest that in 37 sources water contains less than 25 mg/l, while in 9 sources nitrate levels varied from 25 mg/l to 50 mg/l, in 5 water sources nitrate levels were found to be in the range from 50 mg/l to 100 mg/l. In one water source, nitrate levels were rather high — from

100 to 500 mg/l. Results of these studies were mapped, the map of nitrate levels in water sources was displayed in the office of Vorokhta Township Council and all visitors can see the map.

Nitrate test kits were distributed among schoolchildren of Vorokhta secondary school. These test kits allow to measure nitrates and nitrites in water. In 2005—2006, they measured nitrate pollution levels in 88 water sources. The schoolchildren registered results of their tests and identified 49 clean wells (nitrate levels from 0 to 10 mg/l), 24 slightly polluted wells (from 0 to 25 mg/l), 9 polluted wells (from 25 to 50 mg/l), and 6 heavily polluted wells (from 50 to 500 mg/l). MAC for nitrates is set at the level of 45 mg/l. It is worth to note that some adult residents of the township also provided water samples for testing. Results of these children's tests induced some people to consider water quality problems. The children submitted their results to the local authorities in order to attract their attention to the problem. Besides that, these children took part in actions on the International Water Monitoring Day — 2005 and conducted express testing of 4 water quality parameters (Annex 3, Photos 6—7). In the future they plan to monitor water quality in rivers. They have already collected methodological materials for assessment of environmental quality of the Prut River. The children plan to organise a hydrological observation point at the river and measure water temperature, current velocity, nitrates, pH, odour, dissolved oxygen and water turbidity.

In such a way, children launched their own water project. It is important that young residents of the township participate in these actions. They established their environmental team in the school — 15 environmental activists — pupils of 7<sup>th</sup> to 10<sup>th</sup> forms. With assistance of MAMA-86-Yaremche, members of the environmental team got training on rational water use and protection of water resources. Now they raise awareness of other children and their parents.

Interactive seminars — when children teach other children — are considered as efficient environmental education tools. Experience suggests that interactive seminars make information more interesting and useful for all parties involved. Such seminars were conducted in Mykulychyn secondary school, Vorokhta secondary school and Yaremche secondary school No. 3 (with participation of children from “Snizhynka” sanatorium).

Lyubov Leonidivna Kepeshuk — the leader of the environmental team — plans to use already developed materials in extracurricular courses, open topical lessons, etc. Besides that, members of the environmental team intend to develop a plan of actions for their school for 2006—2007 academic year. These actions are dedicated to demonstration of energy and resource conservation options — i.e. with practical introduction of ideas of sustainable development.

Results of activities of the environmental team attracted attention of mass media outlets and were submitted to the leading specialist of the Department for Family, Youth and Sport of Yaremche Town Council for their presentation at a session of the Town Executive Committee. In the future, members of the environmental team plan to use mass media outlets for broad dissemination of information on their activities.

For three years, MAMA-86-Yaremche conducted information dissemination and awareness raising activities among different population groups. These activities included different meetings, open discussions, environmental lessons in schools, lectures in children's summer camps, participation in seminars for biology teachers and school directors, as well as large scale actions in the course of annual environmental events: the World Water Day (March 22), the World Day of Water Monitoring (October 18), actions “Live Water” and “The Week of Environmental Knowledge”, etc. Several leaflets and booklets were published: “Composting: A Simple and Efficient Method”, “Groundwater Protection”, “Microorganisms: Safe Drinking Water at Home”, “Iodine in Nature and in Water”, “Eco-sanitation and its Advantages”, “Everyday Hygiene”. Project highlights were regularly covered by mass media (newspapers, TV and radio channels). Information on major project events and results of MATRA project implementation in Vorokhta township were regularly posted on the web-site of MAMA-86. Every year

MAMA-86-Yaremche made presentations, reported on the project implementation and discussed the project results in the framework of “AQUA Ukraine” International Water Forum.

Summing up, it is necessary to note that MATRA project allowed to accelerate actions to address complex water supply problems in Vorokhta township, it facilitated development of relevant ideas and principles of their sustainable implementation in the future. The project results clearly demonstrated that socially significant problems should be addressed comprehensively, with close co-operation of all stakeholders and at the base of partnership.

## Results of the project implementation in Poltavaska Oblast

MAMA-86-Poltava dealt with drinking water problems in rural areas of Poltavaska Oblast since 2000. Analysis of official information, collected in the course of its activities in the sphere, suggests that more than 605 thousand residents (or 36% of the whole population of the oblast) use well water. In particular, more than 107 thousand children (or 35% of all children of the oblast) use water from shallow wells. More than 60 thousand children from the latter group (56%) use well water with high nitrates content. At the same time, cases of acute nitrate poisonings of infants were registered in the oblast. In 1997—2002, 6—13 cases of methemoglobinemia were registered. Minor patients needed rehabilitation treatment with application of hyperbaric oxygenation<sup>6</sup> (7 cases in 1997, 12 cases in 1998, 13 cases in 1999, 12 cases in 2000, 13 cases in 2001 and 6 cases in 2002). Acute nitrate poisonings of infants are caused by nitrates in water they drink or in water used to dilute dry milk mixtures.

Studying alternative solutions for the problem of rural water supply in Poltavaska Oblast MAMA-86-Poltava identified local water supply networks as a potential option. Such local networks were applied there from 1929. Local water supply networks relied on artesian wells that reached aquifers at depths down to about 200 m. Water from such wells does not contain nitrogen compounds, but it often contains high levels of mineral salts and need some additional treatment. In the Soviet times, local water supply systems operated in many villages of Poltavaska Oblast, but in late 1990s, technical quality of centralised water supply and sanitation systems substantially worsened. Many water supply networks gradually ceased their operation due to deteriorated electric equipment, while village communities generally lack funds necessary for rehabilitation of water supply and sanitation systems. In 2003, in the framework of implementation of technical solutions funded by NOVIB, MAMA-86-Poltava replaced electric pumps, that allowed to renew water supply in six villages of Poltavaska Oblast. Restoration of centralised water supply from clean and reliable local water sources and the need of additional water treatment were demonstrated in several pilot villages. MAMA-86-Poltava recommended this option as a solution for the problem of safe drinking water supply in Poltavaska Oblast.

Quality of well water directly depends on environmental quality. Environmental pollution is associated with intensive agriculture and low awareness of local residents of underlying causes of pollution by nitrates and other pollutants. Accounting for these factors, MAMA-86-Poltava launched its information dissemination and awareness raising activities among local residents and initiated involvement of local communities into addressing of local environmental and water supply problems.

Project “Co-operation for Sustainable Rural Development” allowed to improve understanding of water problems substantially, to continue addressing of rural water supply problems in Poltavaska Oblast comprehensively, in parallel with addressing sanitation problems. Gozhuly village of Poltava district was selected as the project area. The village is located nearby the central city of the oblast, at the distance of 2 km. Besides that, in the village, selected for implementation of MATRA project, local authorities were seriously interested in addressing of local water supply and sanitation problems.

There are 3,600 residents (994 households) in the village. The village community incorporates residents of Gozhuly village, residents of Biofabryka district (860 residents) and residents of nearby farmsteads. About 650 pensioners live in the village. The majority of village residents are employed in agriculture (about 53%), while the rest are employed in the village or in Poltava.

MATRA project in Gozhuly village incorporated demonstration activities in three spheres: water supply, eco-sanitation and organic agriculture.

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<sup>6</sup> “Model Technical Solutions for the Problem of Drinking Water in Urban and Rural Areas of Ukraine: Experience of MAMA-86”, Kyiv 2004, p. 39.

## ***Water supply***

Some local residents (about 34%) use drinking water from the centralised local water supply network that takes water from 200 m deep artesian well. In addition, there are 448 individual wells and one community well in the village, these wells are maintained by the village community.

Overall, there are 478 children in Gozhuly village, including 172 children under 6 and 306 children of the school age. 180 children attend the school and 30 children attend the kindergarten in Gozhuly Education Centre. According to the school administration, cases of dental fluorosis were registered for 80% of schoolchildren, in addition, some cases of children's nitrate poisoning were registered.

The water supply network in Gozhuly village was partially constructed in 1973 and 1982. At the time of implementation of MAMA-86-Poltava project, main problems of the centralised water supply in the village were associated with low quality of water, due to inadequate technical quality of water pipes and the sanitation system. Periods of water supply interrupts sometimes reached several weeks or even several months. The village school and residential blocks were particularly seriously affected. In addition to the water supply network, local residents used well water. They complained that quality of water in wells substantially worsened in the recent year.

Water supply situation in Gozhuly village is typical for the whole oblast. In November 2003, MAMA-86, in partnership with WECF, launched implementation of its pilot project in Gozhuly village. The project focused on study of water supply problems, implementation of information dissemination and awareness raising actions and community participation in addressing of local water problems.

The target group of the project included: children, teachers, public health workers, local residents and local authorities. Experts of R&D institutes and water utilities were involved into development of options to address water supply and sanitation problems.

### *Project objectives*

Short-term objectives:

- to study drinking water quality in Gozhuly village;
- to raise awareness of local residents and authorities of water and health problems;
- to facilitate multisectoral discussions and co-operation, public participation in addressing local health and environment problems;
- to exchange good practices of water treatment and water supply;
- to improve access of local residents to safe drinking water by use of deep aquifers and centralised water supply.

Long-term objectives:

- to implement ideas of integrated addressing of village development problems in the sphere of water supply and sanitation;
- to develop democratic decision-making on significant community matters, to develop co-operation of all stakeholders at local, national and international levels;
- to promote public participation in decision making and implementation of activities to ensure access of local residents to safe drinking water.

Project activities stipulated the following stages:

- study of the current situation and gathering information on local water supply problems, independent research of drinking water quality, analysis of local problems and priority-setting;
- publication of information materials on relevant water problems;

- information dissemination activities among different target groups and involvement of stakeholders into addressing of water supply and sanitation problems in Gozhuly village.

### **Project results**

In 2003—2005, MAMA-86-Poltava completed a series of independent analyses of water quality from the centralised water supply and wells in Gozhuly village, launched a children's project of nitrate pollution monitoring in wells, collected information and analysed water supply and sanitation problems in the village. The collected information was used for development of the following 5 project booklets: "Attention: Pesticides", "Eco-sanitation. What and How?", "Household Waste and Your Health", "Attention: Fluorine in Water", "How to Protect Your Family from Nitrates?"

The first project seminar in May 2004 focused on issues of drinking water quality and protection of water resources. The range of the seminar participants included WECF experts, specialists from the Rayon Sanitary and Epidemiological Department and the Public Health Department. In the course of discussions on water quality and children's health problems, the seminar participants got information that 80% of schoolchildren of the village school suffer from dental fluorosis, that water from the village water supply network is used for drinking and cooking, while in the course of supply interrupts, water from a nearby well is used for these purposes in the school. After the seminar, the information request was submitted to the Rayon Sanitary and Epidemiological Facility and preliminary independent tests of local tap water were conducted (including estimation of fluoride levels).

According to the official response of Poltavaska Oblast Sanitary and Epidemiological Facility, bacterial contamination was found to be the key water problem in the village. As for fluorine levels in water, fluorine contents in tap water reached 0.60—0.97 mg/l (MAC = 1.5 mg/l).

In summer 2004, preliminary independent tests of tap water from the village school were made in Munich (Germany) and in an independent laboratory in Poltava. These research studies allowed to identify fluoride levels in the range from 7.24 to 7.89 mg/l. In 2004—2006, 6 tests of water samples were made to estimate fluoride levels.

In December 2005, experts from the Institute of Geochemistry, Mineralogy and Ore Genesis of the National Academy of Sciences of Ukraine (Kyiv) were involved into the research studies. Results of their potentiometric analysis of fluoride levels in tap water suggested fluoride contents of 3.46 mg/l.

In 2006, fluoride levels in water were measured in February, and starting from May, fluoride contents were measured monthly, for 4 months. The monitoring results confirmed elevated fluoride levels, that varied in the range from 7.55 to 9.21 mg/l, or 5—6 times in excess of the relevant MAC.

Therefore, elevated natural fluoride levels in tap water in Gozhuly village were identified as the key water quality problems. In 2004, a booklet was produced on these matters and lectures on fluorine-related health risks were conducted for schoolchildren and other local residents.

Fluorine is an important element that participates in physiological processes in a human body. Fluorine may be found in all human tissues, but it predominantly concentrates in teeth and bones. Natural fluorine human demand reaches about 0.03 mg/kg body weight for adults and 0.15—0.1 mg/kg body weight for children. Adult intakes daily about 0.5—1.1 mg of fluorine with food and 2.2—2.5 mg with water. The gastric-intestinal tract absorbs 70% of fluorine contents in water and 35% of fluorine contents in food. A child's body accumulates up to 35% fluorine, while an adult accumulates 1.5% of fluorine. It is important that a human body absorbs fluorine from water better than from food. In natural water, fluoride levels may vary from 0 to 27 mg/l. Highest fluoride levels are registered in underground water sources. In Poltava, fluoride level in drinking water vary from 0.12 to 1.7 mg/l, while the applicable MAC is set at the level of 1.5 mg/l. Long term

consumption of water with elevated fluoride levels may cause adverse health impacts, particularly in the case of children. Toxic impacts of high fluoride levels in drinking water manifest themselves in the following health disorders:

- dental fluorosis — accumulation of fluorine in tooth enamel, associated with a specific enamel colouration and gradual destruction of tooth tissues;
- CNS dysfunctions: drowsiness, weakness, memory problems, headaches, convulsions, hyperhydrosis;
- cardio-vascular dysfunctions: tachycardia, brachycardia, arrhythmia;
- bone mineralization deviations;
- adverse impacts on thyroid gland;
- gastric-intestine dysfunctions: nausea, vomiting, diarrhoea, hepatotoxic effects;
- adverse impacts on hemopoietic organs;
- immune depression effects;
- acceleration of ageing processes.

In the framework of the project, technical solutions for the water supply problems were discussed, including, in particular, technical options to reduce elevated fluoride levels in water. Both Ukrainian and international experts participated in these discussions.

The first discussion was held in March 2005, in Soesterburg (the Netherlands), in the course of the working conference, organised by partnership “Women for Water”. The delegation of participants of the project in Gozhuly village also took part in the discussion: the school director, representatives of Poltavaska Oblast Council and Poltava Polytechnic Institute.

The problem of fluoride pollution was discussed with Dutch experts in the context of general water supply and sanitation problems in Gozhuly village. The experts assessed the problem as rather complicated and identified three strategic water treatment options: treatment by natural calcium minerals (the method was tested in experimental conditions, but its application in Gozhuly might require major adjustments to adapt to local conditions and available capacity); blending tap water with high fluoride contents with clean well water; switch to another source of water (e.g. a deeper aquifer).

Further consultations on the proposed options were continued in Ukraine. The Institute of Geochemistry, Mineralogy and Ore Genesis of the National Academy of Sciences of Ukraine studied natural and industrial fluoride pollution of water resources in Ukraine for almost 30 years. These research studies allowed them to identify 4 major biogeochemical areas with high fluoride contents in drinking water in Ukraine. In Poltavaska Oblast, a natural area of high fluoride contents in water exists. There, fluoride levels in water vary from 2—3 mg/l to 7—9 mg/l. These high fluoride levels result in high incidence of fluorosis and other endemic health problems among local residents.

In January 2006, samples of water from Gozhuly village were analysed in a laboratory of the Institute. Analytical results revealed high fluoride levels and confirmed findings of the analytical measurements made earlier in Munich. Moreover, the blending option was rejected as blending of water with high fluoride contents and well water with high levels of nitrates may result in synergetic toxic effects. The option of application of natural adsorbents was considered as promising but it required a series of laboratory tests. Experts of the Ukrainian Water Association confirmed that there are no industrial-scale water treatment technologies for removal of excessive fluoride from water at the Ukrainian market of

water treatment technologies. Search for alternative water supply sources became the most promising option.

In the framework of the pilot project, the project team did not have sufficient time and resources to address the problem of excessive fluoride levels. As a result, mainstream activities of the pilot project for improvement of access to safe drinking water focused on search for alternative water sources, (predominantly clean wells) and attraction of attention of local authorities to critical state of water supply and sanitation in Gozhuly village.

In Gozhuly village, one community well is used by residents of residential blocks. Due to technical problems of the water pumping facility in Gozhuly, residents of these blocks often encounter water supply interrupts; sometimes water supply was interrupted for several weeks. In the course of water supply interrupts, residents of these blocks (96 households) use water from the community well that becomes for them the main and the only water source. However, quality of water in the well and its technical state suggested the need on its cleaning and repairs. In July 2005, the district Sanitary and Epidemiological Facility analysed samples of water from the community well. They identified high levels of bacteriological contamination. In December 2005, MAMA-86-Poltava, with support of local authorities, organised clearing and repairs of the community well. MAMA-86-Poltava organised the well cleaning while the local authorities financed associated improvement works. Now, nitrate levels in the well are within acceptable limits. Residents of the residential blocks can use a reliable source of clean water in the case of interrupts in the centralised water supply system.

Microbiological contamination was found in tap water and in water from wells in Gozhuly village. The contamination is caused by poor technical conditions of the centralised sanitation network and interrupts in operations of the water pumping facility. Very often, leaks from sanitation pipes manifest themselves by poodles of dirty water. Contaminated water from the sanitation system infiltrates to groundwater and may pollute water in damaged water supply mains.

In 2004—2005, MAMA-86-Poltava, jointly with the community committee, submitted official requests to local and rayon authorities on drinking water supply and quality of the sanitation network in Gozhuly village. Several consultations were held with experts of the Institute of Hydrogeology (Kremenchuk) and representatives of rayon-level and oblast-level sanitary and epidemiological facilities on improvement of drinking water supply. In order to attract attention to these problems, a roundtable discussion was held in Gozhuly village in April 2005 on “Attracting investments to the region for introduction of modern eco-sanitation and water supply technologies”. The roundtable was attended by representatives of local and district-level authorities, utilities, public health and education facilities. The roundtable participants decided that the problem of drinking water quality should be considered as a priority and local authorities should allocate resources to address the problem.

In May 2005, in response to the request of the Village Council and the community committee, oblast-level authorities informed the villagers that UAH 369 thousand would be allocated in the oblast budget to address the problem of high quality drinking water supply in Gozhuly and Biofabryka (Biologichne) villages. In October — December 2005, budgetary allocations of the rayon State Administration allowed to cover costs of rehabilitation of the village water distribution network and the sanitation system. However, it is necessary to note that these funds were insufficient to resolve the problem completely.

#### APPLICATION OF FUNDS, ALLOCATED FOR REHABILITATION OF WATER SUPPLY AND SANITATION SYSTEMS

##### **Gozhuly village**

1. Rehabilitation of wastewater treatment facilities  
Re-laying of the pressure collector — 640 m                      UAH 83 thousand.



2.	Repairs of the artesian well	UAH 12 thousand.
3.	Repairs of the water supply network — 410 m	UAH 33 thousand.
4.	Rehabilitation of the sewerage pumping facility	UAH 41 thousand.
5.	Laying of the power supply cable	UAH 24 thousand.
	Total	UAH 193 thousand.

### **Biologichne village**

1.	Repairs of the separate collector — 350 m	
2.	Repairs of the pressure collector — 710 m	
	Total	UAH 176 thousand.

### **Information dissemination and awareness raising activities**

In the course of the project implementation, MAMA-86-Poltava conducted a broad awareness raising campaign among the villagers on drinking water problems and associated health impacts. A particular attention was paid to problems of nitrate and fluoride pollution of water in Gozhuly village. The key target group of the campaign included local residents, particularly schoolchildren and their parents. These information dissemination and awareness raising activities included:

- collection and analysis of information on local problems of drinking water quality and water supply;
- raising awareness of ordinary residents of Gozhuly village of water problems in general and local problems of drinking water and their health impacts, in particular;
- active promotion of public opinion and interests of the community, facilitation of participation of the village residents in addressing drinking water problems, both individually and at the level of community;
- facilitation of open discussions on water problems with participation of all stakeholders, promotion of constructive partnerships and co-operation between all actors.

In the course of collection of information on drinking water problems in Gozhuly village, MAMA-86-Poltava submitted official requests to water supply utilities. In their responses, these utilities argued that drinking water meets applicable state standards. Members of the project team decided to conduct independent research studies, that would allow to collect reliable water quality data and identify key local problems. Schoolchildren of the local school were involved to the research process — using nitrate test kits, these schoolchildren estimated nitrate levels in water samples from individual wells. These tests allowed to identify wells with low and high nitrate contents in water. In particular, schoolchildren were found to use water from a nearby well with nitrate levels in water in excess of 500 mg/l. These results allowed to produce a map of nitrate pollution in Gozhuly village. Unfortunately enough, the map demonstrated that there are only a few wells with low nitrate contents in water. The research results were discussed at the roundtable in April 2005 with participation of representatives of health protection facilities and administrations of all levels. Besides that, these results were documented and submitted to local authorities in the course of school events dedicated to the end of the academic year.

Study of the problem of nitrate pollution in rural wells was the central issue of the Children's water project that was launched in 2004. In the framework of the Children's project, children estimated nitrate levels in private wells of Gozhuly village for 2 years. Excessive nitrate levels were found in 60%

of the wells studied. The monitoring results were mapped — now, the map is displayed in the village school and all visitors may see the map.

Collected information on the problem and data analysis allowed to produce a series of booklets: “Attention: Fluorine in Water”, “Healthy Food is a Necessary Precondition for Health”, “How You Can Protect Your Family from Adverse Impacts of Nitrates”. Information was disseminated in the course of individual conversations with the village residents, meetings and roundtable discussions with participation of representatives of the village community, local authorities and other stakeholders.

Unfortunately enough, low awareness and inadequate understanding of water-related problems still remains a problem. In order to inform local residents better, MAMA-86-Poltava actively co-operates with mass media outlets. In three years of the project implementation, three newspaper articles were published, and 4 topical radio and TV presentations were aired.

Campaign “Drinking Water in Ukraine” includes activities for children as an important component. These activities incorporated children’s creative contests, lectures and lessons of diverse water-related issues, entertainment events and organisations of actions in Water Days in 2004—2006, jointly with the administration and teachers of Gozhuly Education Centre.

Information activities allowed MAMA-86-Poltava to attract attention of local authorities and public health specialists to problems of safe drinking water supply, to identify appropriate solutions jointly and to raise awareness of drinking water problems in Gozhuly village.

Now, it is particularly important to reform the water supply and sanitation sector in the oblast. Such reforms should seek to improve quality of water supply and sanitation services, to overcome the crisis in the water sector and transform water utilities into economically viable companies. However, the majority of representatives of water utilities do not pay adequate attention to the main aim of reforms in the water sector — i.e. environmental protection and improvement of human health and wellbeing.

MAMA-86-Poltava continues to look for potential options, that would allow to address drinking water problems in rural rayons of Poltavaska Oblast. MATRA project allowed exploring several ideas (search for alternative water sources, use of deep artesian wells, technologies of treatment of water with elevated fluoride levels, prevention of groundwater pollution by nitrates and other agricultural chemicals, etc.) These problems may be resolved only by active co-operation of all stakeholders — local authorities, communities and businesses. Interested community members also have a role to play in addressing of priority problems. Besides that, MATRA project confirmed importance of NGOs, such as MAMA-86-Poltava, that monitor relevant processes and promote co-operation and partnerships of all stakeholders.

## Improvement of well water quality in Bobryk and Vertijivka Villages of Nizhyn rayon

MAMA-86-Nizhyn studied problems of well water quality in Nizhyn and Nizhyn rayon for almost 10 years. Now, wells still remain the key traditional sources of water in rural areas. *In Chernigivska Oblast, almost all rural residents (98%) and a substantial share of urban residents (about 20%) use wells. In Nizhyn rayon, the share of rural residents who use well water, reaches 98%, while in Nizhyn Town the relevant figure reaches 33%. These wells are usually shallow, up to 10 m deep and reach groundwater aquifers.*

It is necessary to note, that ages-long traditions of construction and maintenance of rural wells are being gradually lost now. Living conditions and agricultural practices in rural areas substantially changed at the background of declining environmental quality. Due to reduction of land areas allocated for construction of residential houses in rural areas and non-compliance with applicable sanitary and hygiene standards, risks of chemical and microbiological contamination of well water substantially increased. Toilets, pit latrines (pit latrines) and manure/compost pits become now key sources of microbiological and nitrate pollution of well water.

In 20 recent years, at territories of intensive agriculture, the problem of nitrate pollution in rural areas (including, in particular, groundwater nitrate pollution) became rather acute. These adverse effects were associated with application of excessive doses of synthetic nitrogen fertilizers (saltpeters) and application of low quality organic fertilizers. Now, in Nizhyn rayon, excessive nitrate levels in groundwater (and in water wells) exceed relevant MACs in 5–10 times.

Besides that, sources of chemical pollution of wells include abandoned former storage facilities of mineral fertilizers and obsolete pesticides. These facilities are often located nearby rural settlements and are abandoned now.

Experience of MAMA-86-Nizhyn activities in the sphere of drinking water in Nizhyn and Nizhyn rayon shows that local residents and local authorities are not aware of contemporary pollution of the environment and drinking water. They are not aware of causes of their problems and potential options to improve the situation. Lack of information on the problem and available options to address it resulted in passivity of authorities and rural communities.

Bobryk village was selected as the target village for implementation of project “Co-operation for Sustainable Rural Development”. The village is administratively subordinated to Vertijivka Village Council of Nizhyn rayon.

Short-term objectives of the project included study of the contemporary situation and implementation of information dissemination and awareness raising activities, implementation of demonstration technical solutions for local problems of drinking water quality and water supply in Bobryk village.

Longer-term objectives of the project included promotion of sustainable development ideas in rural areas, initially in the sphere of addressing water supply and wastewater management problems; improvement of living standards of rural residents due to reduction of health risks and prevention of environmental pollution.

Project implementation was launched in November 2003, from the set up meeting of the project team with local authorities and members of the village community. The project objectives initially stipulated addressing problems of a typical minor village with population under 1000 residents. However, the local authorities were really interested in the project and expressed their willingness to co-operate in addressing water problems not only in Bobryk, but in Vertijivka village as well.

Now, there are 396 residents in Bobryk village, including 41 children. The majority of Bobryk residents are pensioners; there are only 53 residents of employable age. Vertijivka village is a central village with population of 4,864 residents, including 312 children and 2,116 residents of employable age. The share of pensioners in Vertijivka exceeds one third (37%) of the whole population. In the Soviet

period, the majority of them were employed by “Mayak” and “Avangard” collective farms. Now they work in subsistence agriculture, cultivate different crops and keep poultry or cattle. The majority of residents of employable age work in Kyiv.

There are no centralized water supply and sanitation systems in Bobryk and Vertijivka villages. Residents use water from individual and community wells. By the time of the project launch, there were 3 private deep wells (40 m deep) that were used for drinking water supply. At the final stage of the project, the number of such deep wells increased to 9. Six deep wells were connected to equipment for water supply to residential premises. Users of these new deep wells constructed these wells at their own expense.

### ***Implementation of the drinking water supply project***

The project was implemented in two stages. At the first stage, mainstream activities included collection of information on water supply problems, health status of local residents, potential causes and factors of adverse health and environmental impacts in Bobryk and Vertijivka villages; independent studies of drinking water quality (express-testing of nitrate levels in well water), organisation of hydrogeological studies in Bobryk village.

Analysis of collected information on morbidity levels in rural settlements of the rayon allowed to identify a clear trend: incidence of cancers and intestine infections increases. According to official statistics, in 5 recent years, incidence of these diseases increased annually by 1.9 to 3%. The trend might be attributed to drinking water quality. For example, from 2002 to 2003, incidence of cancer cases among residents of Nizhyn rayon increased from 1,967.3 to 2,000 cases per 100,000 residents, while the oblast average incidence for that period of time reached 1,661.1. Incidence of gastric-intestine diseases also increased from 16,539 in 2002 to 16,833 in 2003.

Since March 2004, MAMA-86-Nizhyn, with assistance of local residents, monitored nitrate levels in well water. Four field visits were organised, with participation of representatives of MAMA-86-Nizhyn and volunteers. In the course of these field visits, nitrate levels were measured in well water and sites of these wells were surveyed (84 wells in Bobryk village and 89 wells in Vertijivka village). Nitrate levels in 48% of wells in Bobryk village were found to exceed the MAC (45 mg/l) in 2 to 10 times. In Vertijivka village, 89 wells were studied, and 78% of them were found to be polluted.

In order to analyse hydrogeological situation at the territory of Bobryk village, the NGO involved experts of “Chernigivvodoproekt” Co. The survey was conducted to assess pollution of local water sources, including groundwater and to substantiate results of the public monitoring.

The hydrogeological survey allowed to map nitrate pollution of the village territory and aquifers. The experts assessed availability and prospects of use of local water resources. The survey results demonstrated that, due to geologic factors, natural water exchange processes at the territory of Bobryk village are slow and cannot guarantee natural water replacement in the aquifer. As a result, groundwater at depths of 6—7 m is not a good choice for drinking water supply. At the same time, groundwater in the aquifer at depths between 13 and 17 m is not polluted by nitrates. Therefore, the experts recommended the following measures to improve quality of drinking water supply in Bobryk village: to construct individual or community bore wells down to 20 m, isolating the upper aquifer. As for strategic options to address the problem, they recommended to focus on prevention of pollution of upper aquifers (e.g. by improvement of household practices and technical upgrade of toilets and pit latrines according to applicable sanitary standards and rules).

Besides that, the experts noted that wells in the village are not cleaned regularly — as a result, quality of well water declines, posing risks of water-related health problems.

In addition to the above causes of well water pollution at the territory of Bobryk village, the experts specified another potential source of dangerous pollution — a damaged storage facility of obsolete pesticides, located at the distance of 1 km from the village.

### **The problem of obsolete pesticides in Bobryk village**

The NGO failed to get information on technical quality of the pesticide storage facility in Bobryk village and specific pesticides stored there, as its previous owner went bankrupt and nobody is responsible for its protection now.

The abandoned pesticide storage facility was studied independently. As it was found, in mid 1980s, obsolete pesticides from nearby agricultural facilities were delivered to the site and stored for an indefinite period of time. Later, the building's roof was damaged and pesticides were affected by rainfall, snow and winds. The pesticides infiltrated to soil and groundwater. Moreover, local residents stole hazardous chemicals and applied them in their subsistence agriculture. Some “businessmen” even managed to sell these hazardous substances.

Taking into account, that local residents had no information on potential health risks, associated with application of falsified pesticides, MAMA-86-Nizhyn made several field visits to local marketplaces to study trade in pesticides and disseminated information on obsolete pesticides via mass media and in the course of individual communications with consumers. Results of study of pesticide-related problems in Bobryk village were used in booklet “Attention: Obsolete Pesticides!”, that was published by MAMA-86 with finance support of WECF.

Besides that, MAMA-86-Nizhyn submitted requests to Nizhyn rayon State Administration and the environmental authorities, demanding to improve safety of OPs management in the rayon. In response to the request, the State Administration invited the NGO to participate in activities of the rayon-level Permanent Commissions on Industrial Environmental Safety and Emergency Response. In May 2005, the Commission initiated inventory of all pesticides storages in Nizhyn rayon and developed measures to improve safety of storage of obsolete pesticides. According to Protocol No. 10 of session of the Permanent Commissions on Industrial Environmental Safety and Emergency Response of 04.10.2005, overall, stockpiles of plant protection chemicals in the rayon reached 46.7 tons, including 27.5 tons of obsolete pesticides.

The Commission endorsed an important decision — it submitted a request to Chernigivska Oblast State Directorate for Environment and Natural Resources on allocation of finance resources for utilisation of toxic chemicals. As at June 1, 2006, finance resources were allocated for utilisation of 14 tons of obsolete pesticides.

At all stages of the project implementation, residents of Bobryk village actively participated in actions for improvement of drinking water quality and safety. The villagers assisted in express-testing, supplied water samples from their wells for estimation of nitrate levels. If water samples did not meet water quality standards, they switched to safer water sources according to recommendations of MAMA-86-Nizhyn. For example, in Bobryk village, 7 households switched to alternative water supply sources, while in Vertijivka village 6 new deep wells were bored and 21 residents switched to drinking water from cleaner wells of their neighbors (mainly parents of new born children).

Rural children were very interested in the survey of water in wells. Jointly with the project team they participated in express-testing of nitrate levels in water from their wells.

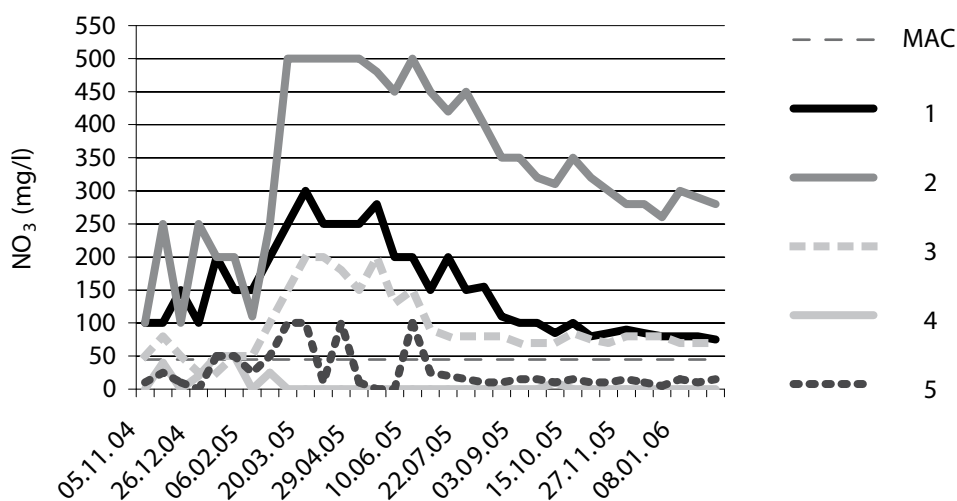
In Bobryk school, the Children's Water Project was implemented, that involved schoolchildren into monitoring of well water quality, depending on seasonal changes, air and water temperatures. Children

regularly monitored water in 5 wells, using express-test kits. Their monitoring activities continued from 2004 to 2006 and allowed to get a time series of nitrate levels in well water.

The Children's Water Project sought to involve schoolchildren and teachers into practical study of well water problems in the village.

The study covered 5 wells, located in different parts of the village, with different concentrations of nitrates and different water discharge rates. Nitrate levels were measured from May 2004 to September 2006. Water samples were taken every 14 days according to the schedule. Schoolchildren documented their results in a register and submitted these results biannually to MAMA-86-Nizhyn. Obtained data charts reflect fluctuations of nitrate pollution levels in the selected wells, depending on seasonal changes. The chart shows, that highest levels of nitrate pollution in well water were registered in March (see Chart 1).

Chart 1.  $\text{NO}_3$  levels in water samples from 5 wells of Bobryk village (2004—2006)



In the course of 4 field visits in 2004 for study of nitrate levels in well water MAMA-86-Nizhyn studied public opinion and interviewed local residents on problems, associated with drinking water. The survey revealed a rather low awareness of rural residents of safety and quality of drinking water from wells. Their awareness of good housekeeping practices was also found to be rather low. Almost all of 245 respondents had no information on quality of water they used.

In order to raise awareness of rural residents, MAMA-86-Nizhyn, jointly with experts and other project participants conducted a broad information campaign on quality of well water, causes of nitrate pollution, its health impacts and relevant prevention measures.

Four seminars were conducted for residents of Bobryk and Vertijivka villages with participation of WECF experts. In the course of these seminars, experience of practical solutions for problems of decentralised water supply and sanitation systems was discussed. At these seminars and in private conversations with local residents, they were advised to provide samples of drinking water they use for express testing of nitrate levels. Besides that, printed information materials were distributed among local residents, in particular, in Vertijivka village, 320 copies of booklet "Attention: Nitrates!" were distributed. Local authorities provided venues for the project events and assisted in distribution of announcement on project events among local residents.

Project activities attracted attention of ordinary residents and authorities of Bobryk and Vertijivka villages to the problem of well water quality. Moreover, these activities attracted attention of rayon-level authorities, specialists, sanitary and water protection services. They regularly participated in all information events of the project.

The second stage of the project implementation was dedicated to introduction of demonstration solutions to address local water supply problems in Bobryk village.

Water supply problems in Bobryk School were selected as the object of the pilot project. At the time of launch of the pilot, the school was attended by 46 schoolchildren. Water for drinking and cooking purposes was taken from a nearby individual well, located at the distance of 250 m from the school. According to the Sanitary and Epidemiological Facility, quality of water from the well met applicable requirements to chemical contamination. However, water supply in the school was substantially complicated by the need to deliver water in containers from the well to the school kitchen and other school rooms.

After analysis of alternative options to improve water supply in the school, the project implementation team decided to rehabilitate the well located at the territory of the school kitchen. Until recently, the latter well was used for drinking purposes of the school. However, due to non-compliance with sanitary well maintenance requirements (lack of a well lid, damaged roof, the failure to make regular sanitary cleaning of the well), the well water was seriously polluted by microorganisms and nitrates.

The pilot project for improvement of school drinking water supply included the following activities:

- rehabilitation of the well: cleaning (silt removal and disinfection of internal walls), restoration of damaged rings, construction of a clay isolation and restoration of the overground structures;
- construction of water pipelines to supply water to the kitchen;
- installation of a pump to pump water from the well.

Estimated costs of the technical solution reached UAH 5,973.45.

In parallel with addressing water supply problems in Bobryk School, wastewater management problems were also addressed. According to recommendations of the Technical Office of “Tvorets” Co., representatives of MAMA-86-Nizhyn developed necessary technical documentation, the working plan and the budget.

The old wastewater discharge system in the school children required repairs and complete replacement of old pipes, filled by silt and damaged by corrosion. Besides that, the wastewater collection pit should be cleaned from accumulated silt and sludge. In order to prevent infiltration of pollutants to groundwater, a filtering layer of sand and gravel (10 cm) should be made at the bottom of the pit.

### **The work plan for reconstruction of drinking water supply in Bobryk school**

#### **I. Preparatory activities:**

dismantling of old timber constructions of the well, preparing the kitchen room for plumbing works.

#### **II. Technical works for rehabilitation of the well and construction of the water supply and wastewater discharge pipes:**

1. Digging a trench (23 m) from the well to the school kitchen room for water pipes.
2. Digging a trench (10 m) for wastewater pipes from the school room to the wastewater collection pit.

3. Construction of a clay isolation layer around the well, including digging a trench around the well (1 m wide and 2 m in depth).
4. Installation of the water supply pipe into the well ring at dept of 1.3 m.
5. Cleaning of the well:
  - water is completely removed from the well;
  - internal walls of the well are cleaned from mud;
  - the well bottom is cleaned — removal of silt and occasional garbage;
  - in order to complete disinfection of the well, its external and internal construction are sprayed by 5% solution of calcium hypochlorite (0.5 l per 1 m<sup>2</sup>);
  - the well bottom is covered by a filtering layer (20—30 cm) of coarse sand, gravel or crushed stone;
  - after the cleaning and disinfection of the well and its filling by water to a normal water level, the well is disinfected for the second time, with dosages of active chlorine at the level of 100—150 mg/l. Dosages are estimated by the following equation:  $P = E \cdot C \cdot 100 / H$  (there P = weight of calcium hypochlorite, E = volume of water in the well (m<sup>3</sup>), C = target concentration of active chlorine in the well (g/m<sup>3</sup>), H = active chlorine contents (%));
  - after addition for the disinfection solution, the well is closed for 6 hours (at that time, water from the well should not be used);
  - after the end of the above period of time, a water sample is taken from the well for bacteriological and chemical analysis in a laboratory of the Sanitary and Epidemiological Facility.
1. Construction of the clay isolation (with layer by layer tamping).
2. Construction of a gangway around the well, paved by stone or bricks, covered by concrete or asphalt.
3. Installation of a lid and a timber roof that should be over 0.8 m from the ground level.
4. Digging drainage ditches around the well.
5. Making an opening in the wall of the school kitchen room to connect water pipes.
6. Laying water and wastewater pipes, sealing the opening in the wall.
7. Installation of the pumping unit and a washstand in the school building.

In order to supply technical grade water to the newly constructed eco-toilet, the project team decided to use the nearby well — the one used earlier to supply technical water to the school. The latter well also needed technical improvement to meet applicable hygiene requirements. The well improvement works included cleaning and installation of water pipes. These works were conducted in parallel with similar works in the drinking water well. However, in the case of the technical water well, a submerged pump was installed instead of a pumping unit. In the school, a water tank (100 litres) and a washstand were installed (Annex 3, Photos 14—15).

Estimated costs of these works reached UAH 4,275.

Residents of Vertijivka village of Nizhyn rayon also actively participated in works for improvement of drinking water quality. Parents of children, who used well water, were particularly interested in these activities.



On request of parents of children, who attended the local kindergarten (one of the largest kindergartens in Nizhyn rayon, it was attended by 45 children, and 70 others were at the waiting list at that time), a training was organised to raise awareness of water quality and adverse impacts of nitrates on children's health. These parents collected 46 samples of water from individual wells to check nitrate levels. According to results of nitrate testing, 21 households switched to cleaner wells and 6 Vertijivka residents constructed deep artesian wells allowing them to use water that meets water quality standards.

Now, in Vertijivka kindergarten, a deep well is being constructed to supply clean drinking water for children. Earlier, these children used well water, polluted by nitrates.

From initial days of the project implementation, MAMA-86-Nizhyn managed to establish partnerships with authorities at different levels. The NGO submitted its partnership proposals and signed co-operation agreements in the sphere of improvement of environmental quality and health status of rural residents.

In the framework of the project, representatives of authorities and experts of relevant services participated in seminars, meetings and discussed future activities.

In the office of Vertijivka Village Council, with support of O. I. Teslik (the Mayor of Vertijivka), project information events were held regularly to inform residents of Bobryk and Vertijivka villages on progress in the project implementation. Representatives of local authorities, jointly with members of MAMA-86-Nizhyn, consulted the village residents and conducted express-testing of drinking water samples from individual wells. Besides that, elected representatives of the Village Council also supported project activities and participated in these activities personally. Jointly with MAMA-86-Nizhyn, they visited individual households and recommended the villagers to test water they use.

These joint efforts in the sphere of well water problems allowed the village residents to get information on nitrates-associated risks, they were not aware of earlier. Due to the project, some local residents decided to switch to alternative water sources while some others drilled artesian wells to improve drinking water quality and reduce risks of water-related health problems.

Information dissemination activities on drinking water supply in rural areas were accompanied by implementation of demonstration projects, which addressed local problems and implemented with participation of all interested and responsible parties.

For the first time in the region, the project demonstrated options to address environmental problems by democratic means and promoted establishment of preconditions for sustainable development of rural communities and protection of the environment and health of rural residents.

### ***Main conclusions and project results***

1. Drinking water supply problems in Vertijivka and Bobryk villages were studied. A preliminary survey of wells and adjacent areas was conducted in these villages (overall, about 170 wells were surveyed).
2. Objectives for improvement of water supply were developed.
3. Environmental and hydrogeological research studies at the territory of Bobryk village (Nizhyn rayon) were conducted by Chernigiv R&D Institute "Chernigivvodoproekt".
4. The information campaign was launched to improve safety and quality of well water.
5. Two wells were reconstructed to supply drinking and technical grade water to the school in Bobryk village.
6. Water supply and sanitation systems were constructed in the school in Bobryk village.
7. The artesian well was constructed for the kindergarten in Vertijivka village.
8. The Children's Water Project was implemented in the school of Bobryk village.

## Addressing rural sanitation problems: results of the eco-sanitation implementation

Sanitary and epidemiological wellbeing of rural residents, improvement of drinking water quality and environmental quality in rural areas substantially depend on sanitation. Critical situation in the sphere of rural wastewater management is associated with low attention of local authorities and rural residents to the problem and lack of information on the problem and potential options to address it. Now, introduction of a comprehensive approach to planning and wastewater management at the community level and individual households for sustainable rural development is a rather relevant problem. Such an approach requires participation of all stakeholders, introduction of new, economically affordable and environmentally friendly technologies and broad public awareness raising of sanitary and hygiene issues.

In order to address rural wastewater management problems, in the framework of MATRA project;

- local wastewater management problems were studied;
- information dissemination and awareness raising activities were conducted at the level of communities, and new eco-sanitation approaches were presented;
- in three villages, pilot projects were implemented to demonstrate eco-sanitation technologies.

The main target group of activities in the sphere included residents and representatives of local authorities in project villages. At the same time, awareness raising activities on eco-sanitation covered residents of three target villages, representatives of neighbouring villages and rayons, and the national level as well. In three years, eco-sanitation approach and technologies were discussed at 4 seminars and 6 trainings at the level of rural communities, as well as at three seminars and 1 training for all stakeholders at the national level (representatives of the public, authorities and experts of industrial and academic entities). In order to present eco-sanitation and experience of introduction of eco-sanitation technologies in different countries, leading experts in the sphere were invited — Prof. Ralph Ottorpol from Hamburg Technology University (TUHH, Germany); Arno Rosmarin from Stockholm Environmental Institute (SEI, Sweden); Prof. Pitter Deineboll Jensen from Norway University of Life Sciences (UMB, Norway). WECF experts in the sphere of eco-sanitation from Hamburg Technology University participated in regional trainings.

In the framework of MATRA project, nine pilot projects were implemented (construction of eco-toilets). The range of direct beneficiaries of these pilots incorporated schoolchildren and teachers of two village schools (about 260 persons in total) and seven households (or 40 rural residents) of Vorokhta township (Yaremche rayon), Gozhuly village (Poltava rayon), Bobryk and Vertijivka villages (Nizhyn rayon):

- in Gozhuly village, a dry urine-diverting toilet was constructed, to be used by 200 schoolchildren and the school personnel;
- in Vorokhta township, 5 eco-toilets were constructed for rural households. Now, these eco-toilets are used by 5 families (30 persons, including 16 children);
- in Bobryk village, one eco-toilet was constructed for the village school (36 schoolchildren and 15 teachers), one individual eco-toilet for a local family of 2 persons, and in Vertijivka village 1 eco-toilet was built for a large family of 10 persons, including 6 children.

The design of the urine-diverting toilet (UDT) was provided by WECF. In 2003, jointly with “Medium & Sanitas” NGO (Romania), WECF constructed a similar toilet in rural school of Garla Mare village. The eco-toilet design and drawings for the Romanian UDT and all Ukrainian UDTs were developed by Stefan Degeener — a WECF eco-sanitation expert from TUHH. Technical documentation

for construction of school eco-toilets in Gozhuly and Bobryk villages were developed by Ukrainian specialists.

In the course of trainings on construction of individual eco-toilets, two local trainers were trained for further promotion of UDTs and production of necessary specialised ecosan equipment. The first batch of such equipment (8 sets) was manufactured, installed in individual eco-toilets and demonstrated at the exhibition, held at “AQUA Ukraine — 2006”.

Besides that, due to MATRA project, sanitation-related problems in Gozhuly village and Vorokhta township were actively discussed at the level of communities and public committees. These discussions raised priority of sanitation problems and attracted attention of local, rayon-level and oblast-level authorities to planning and implementation of activities to reconstruct sanitation systems and wastewater treatment facilities in these two villages.

For example, in Gozhuly village, due to active efforts of the public committee and local authorities, the Rayon State Administration allocated budgetary funds for reconstruction of water supply and sanitation systems in Gozhuly and Biologichne villages (the latter village is administratively subordinated to Gozhuly Village Council). In 2005, in Gozhuly village, repair and reconstruction works were completed at the local wastewater network for UAH 148 thousand. These works included: re-placement of the pressure collector main (640 m), rehabilitation of the sewerage pumping facility and laying of the power supply cable. In Biologichne village, the pressure collector main (710 m) and the separate collector main (310 m) were repaired for UAH 176 thousand.

Due to a series of public hearings on wastewater management and solid household waste problems, initiated by MAMA-86-Yaremche in the framework of MATRA project, the public committee of Vorokhta township developed proposals for improvement of sanitary and epidemiological status of the township, that were incorporated into the action plan of the township council. In 2005, construction of wastewater treatment facilities was completed (these facilities serve the central part of the township). Besides that, technical documentation was developed for construction of a new landfill in Vorokhta township.

Experience of introduction of eco-sanitation approach in Ukraine was presented at different international events: site events, organised by WECF and MAMA-86 at 12<sup>th</sup> and 13<sup>th</sup> Sessions of the UN Commission for Sustainable Development (2004, 2005), at Erevan Ministerial consultations Almaty+5 (November 2005), at the 4<sup>th</sup> World Water Forum in Mexico (March 2006), at the Symposium in the framework of the Water Week in Stockholm (2005) and at 2<sup>nd</sup> Conference on Dry Toilets in Tampere (Finland, 2006).

## **Eco-sanitation: implementation in Vorokhta township**

Another sphere of project activities in Vorokhta township included introduction of new approaches and technologies to address wastewater management problems, namely presentation and practical implementation of eco-sanitation approaches.

Information activities started from a seminar for the township residents. On April 7, 2004, Vorokhta was visited by WECF representatives (Margaret Samwell, Solomiya Babyak, Francisca Meinsinger and Catarina Betswell) and Anna Tsvetkova — the national project co-ordinator of MAMA-86. WECF experts informed the township residents about drinking water quality problems and eco-sanitation technologies for treatment of wastewater and sewage. Overall, 33 persons participated in the seminar.

Taking into account, that local residents use pit latrines, that are predominantly poorly maintained and substantially complicate sanitary and epidemiological situation in the township, the project team decided to conduct a practical training in Vorokhta on construction of an eco-toilet for an individual household.

In September 2005, MAMA-86-Yaremche organised a practical seminar in Vorokhta township on “Eco-sanitation as a Component of Sustainable Development”, with participation of Stefan Degeener — a WECF expert from Hamburg Technology University (Germany). The event included 2 seminars and a practical training. The training seminar was conducted in a private house of one local resident, who was interested in the idea of an individual eco-toilet. All interested local dwellers were invited to study new technologies and to see for themselves how one may construct a toilet with separate collection of urine and faeces for further composting.

On September 5, the first seminar was held for 27 residents of Vorokhta township. The seminar was dedicated to new resource conservation technologies, eco-sanitation and hygiene issues, and good international practices in the sphere. On the same day, construction of the individual eco-toilet was launched — construction works were completed in a week. All interested persons were able to observe the process of construction of the new toilet.

On September 9, the final seminar was held. The seminar was attended by 28 residents of Vorokhta and neighbouring townships. The seminar participants saw the newly constructed toilet and discussed its construction and maintenance issues. The event attracted attention of local residents and make them interested in new eco-technologies. The seminar participants were provided booklets on use and maintenance of the eco-toilet, hygiene rules, personal hygiene of boys and girls, use of urine and compost. After the seminar, four local residents decided to construct similar toilets individually. MAMA-86-Yaremche assisted in production of special equipment for eco-toilets.

From October 2005 to August 2006, in Vorokhta township, 5 additional eco-toilets were constructed in private households by joint efforts of local residents and MATRA project (Annex3, Photos 8.1—8.4, 9).

A dry urine diverting toilet (UDT) separates urine and faeces. Urine is collected separately in a special chamber or in a urinal and then by pipes it comes to a canister for further storage and sanitisation. After storage, urine becomes safe for use as a fertilizer for trees, bushes, cereals or vegetables.

Faeces are collected in 2 special composting chambers, located under the toilet room floor. One chamber is in use, while another chamber may be either empty, or used for composting. Alternated use of two chambers provides necessary time for complete composting of faeces in the toilet.

Eco-toilets do not use flushing. In order to maintain hygiene and sanitary conditions (to reduce moisture contents in faeces, to sanitize them and to improve composting) dry powders/covering

materials are added to the faeces chamber after every use of the toilet (ash, wooden chips, dry soil, or — preferably — a mix of these materials). In order to get a hygienically safe fertiliser, composting should take at least 1.5 year. The compost contains phosphorous, potassium, magnesium and nitrogen and may improve soil structure.

Application of eco-toilets improved groundwater protection. The technology efficiently prevents biological contamination, caused by discharge of untreated human waste to environment, particularly to drinking water sources and water bodies used for bathing purposes.

DUTs promote rational use of water resources. As the technology excludes flushing, it reduces water consumption substantially. In addition, the technology minimizes wastewater production and provides much simpler and efficient options to treat small volumes of urine and faeces, without the need to construct expensive sanitation networks. The eco-sanitation technology simplifies sewage treatment and requires less money, comparatively to traditional centralised sewage treatment systems.

Eco-sanitation represents a closed-circuit system, that maximizes utilisation of nutrients of human excretes, while minimizing costs and associated adverse health and environmental impacts.

In the framework of the demonstration project on individual eco-toilets building in Vorokhta township, for the first time in Ukraine, special eco-toilet equipment was manufactured with application of a mould. Eco-toilet seats resemble a standard toilet bowl with separation gathering of urine and faeces. The eco-toilet equipment is hand made one. In Mexico such equipment is broadly used now. Moreover, manufacture of equipment for eco-toilets creates new jobs.

In 2005, in the course of the training, the first set of equipment for the eco-toilet was manufactured with support of a German expert. He shared his experience with Roman Kudrin — a member of MAMA-86-Yaremche — who participated in construction of the first individual eco-toilet in Vorokhta township. Roman managed to acquire new skills and made his own contribution into further development of eco-toilets' design. In 2006, in the course of a training seminar in Stepanivka village (Odeska Oblast), Roman got eco-toilet construction training as a future trainer with a representative of MAMA-86-Nizhyn. He successfully applied his newly acquired skills and knowledge in the course of construction of 4 eco-toilets in Vorokhta, while in June 2006, he participated in construction of an eco-toilet in Bobryk village (Nizhyn rayon of Chernigivska Oblast), as a trainer.

Thus, for the first time in Ukraine, successful application of eco-sanitation principles was demonstrated for construction of eco-toilets in rural households. MATRA project introduced eco-sanitation technologies and develop preconditions for further scale up of individual eco-toilet construction technologies in Yaremche rayon. Now, 5 households in Vorokhta use eco-toilets. Two families used such toilets for a year and they are satisfied by the new technology, as the eco-toilets allowed them to improve household sanitary conditions and to avoid many problems, associated with pit latrines. In addition, they started to use organic fertilizers of their “own production”.

Now, one of members of MAMA-86-Yaremche can provide training on construction of eco-toilets and help on production of associated equipment. He substantially improved production processes and identified the most optimal materials for production of equipment for eco-toilets experimentally (see Annex 2.). Average costs of construction of one eco-toilet reach about UAH 1,500. Samples of such equipment were demonstrated by MATRA project at the exhibition in the framework of IV International Water Forum “AQUA Ukraine — 2006” in September 2006.

The demonstration project of eco-toilets' construction was accompanied by intensive information dissemination activities among residents of Yaremche rayon and Vorokhta township. Five booklets were published for the information campaign. One of these booklets — “On Eco-sanitation and Its

Advantages” — in addition to technologies of eco-toilet construction, was dedicated to modern methods of utilisation of household wastewater (particularly decentralised wastewater treatment systems, including biotechnologies, such as bio-plateaus, artificial wetlands). These materials were developed in response to pressing wastewater management problems that substantially aggravated in recent years due to development of private hotels, restaurants and other facilities in Yaremche rayon.

Booklet “Composting: A Simple and Efficient Option” for rural residents was distributed among participants of the training seminar on construction of eco-toilets. The booklet is dedicated to the problem of waste management, including organic wastes, it contains advice on construction of composting pits that allows to protect the environment and human health, to improve aesthetic value of rural houses and gardens.

Booklets “Groundwater Protection”, “Microorganisms: Safe Drinking Water at Home” and “Everyday Hygiene” were developed and used in the framework of the Hygiene and Sanitation Week, on the eve of the World Water Day in 2006. As the key event of the week, eco-lessons on “Culture of Water Use” were conducted in 4 schools of Yaremche rayon. Overall, about 300 schoolchildren participate in the event. Besides that, information leaflet “Culture of Water Use” was developed for schoolchildren.

MAMA-86-Yaremche many times applied to local authorities on matters of sanitary quality of settlements in Yaremche rayon and wastewater management problems, starting from the public hearings on the project of reconstruction of the water supply network in Vorokhta township. The organisation raised these issues in the course of elections-related meetings in spring of 2006. Even earlier, on November 9, 2005, representatives of Yaremche City Council, MAMA-86-Yaremche, the Centre for Reforms of Housing and Utilities, NGOs and governmental bodies actively participated in public hearings on green tourism, including, in particular the pressing problem of waste removal from private tourist-hosting facilities.

The team of MATRA project hopes that information dissemination and awareness raising activities, and practical experience of implementation of pilot eco-sanitation projects facilitated addressing sanitary problems in Vorokhta township. The project implementation results may be used in other rayons of the oblast and in other regions of Ukraine.

## Eco-sanitation for Gozhuly village school

There are 3,600 residents in Gozhuly village, 30% of them use centralised water supply and sanitation networks, about 0.5 of them have autonomous water supply and sanitation systems, while the rest of the village residents use pit latrines. In 4 recent years, the village encountered serious water supply and sanitation problems, associated with numerous accidents at the pumping facility and the collector. Since 2003, wastewater treatment facilities badly needed repairs and discharged untreated wastewater to sedimentation ponds, located nearby gardens of local residents.

Among other serious problems, rural schools in Ukraine lack centralised water supply and sanitation systems. There are 30 schools in Poltava rayon. 12 of them are equipped by standard toilets, 5 schools are equipped by standard toilets and pit latrines, while 13 schools have only pit latrines. Even in the case of connections to centralised water supply and sanitation systems, the situation in rural schools is not improved. Generally, these water supply and sanitation systems were commissioned 15–20 years ago and are prone to frequent water supply interrupts or failures of eclectic equipment. School administrations do not have sufficient finance resources for repairs, rehabilitation or reconstruction of these systems. In connection with these problems the majority of village schools additionally maintain pit latrines, located at distances of 50 to 75 m from school buildings. Schoolchildren have to leave school buildings in any weather and wait in queues. It is necessary to add, that only 10% of schools of the rayon are equipped by indoor toilets. As a result, the problem of safe drinking water supply and adequate sanitation is fairly relevant for the majority of village schools in Poltava rayon.

Consumption of poor quality water and use of dirty and cold toilets adversely affect children's health and cause diseases of urinary system, higher risks of infections and cancer, as well as general physical development problems. For example, statistical data of Poltavaska Oblast shows a visible trend of growing incidence of urogenital diseases (see Table 1). Moreover, in the case of children of Poltavaska Oblast, incidence indicators are higher than relevant national averages.

**Table 1. Incidence of children's urogenital diseases in Poltavaska Oblast and in Ukraine in 2003–2005, according to Public Health Statistical Centre of the Public Health Directorate of Poltavaska Oblast (cases per 1000 children).**

		2003	2004	2005
Incidence of urogenital diseases	Poltavska Oblast	40.9	44.7	51.0
	Ukraine	40.54	42.4	
Incidence of disorders of organs of the urogenital system	Poltavska Oblast	18.0	20.9	23.1
	Ukraine	22.6	23.3	
Renal infections	Poltavska Oblast	12.3	13.3	13.9
	Ukraine	9.14	9.4	
Chronic pyelonephritis	Poltavska Oblast	7.4	6.6	6.7
	Ukraine	5.2	5.35	
Acute glomeronephritis	Poltavska Oblast	0.32	0.26	0.20
	Ukraine	0.21	0.18	
Chronic glomeronephritis	Poltavska Oblast	0.53	0.52	0.55
	Ukraine	0.48	0.45	

Gozhuly village Education Centre was selected as the project area for implementation of the eco-sanitation pilot in the framework of project "Co-operation for Sustainable Rural Development".

The Gozhuly village Education Centre includes the school for 155 schoolchildren from 6 to 16 years old and 30 staff members, and the kindergarten for about 20 children. The school building is connected to centralised water supply and sanitation facilities for the kindergarten children and first form schoolchildren. However, the water supply and sanitation systems often get out of order and the school encounters regular water supply interrupts (for almost 7—12 days in a month). As a result, schoolchildren have to use the outdoor pit latrine, located at a distance of 40—50 m from the school, that may adversely affect their health.

The pilot project was aimed at improvement of sanitation facilities for local school and stipulated the following activities:

- Collection of information on wastewater management in the village and implementation of information dissemination activities among local residents on wastewater/sewage management problems, in connection with ensuring environmental, sanitary and epidemiological wellbeing at the level of individual households and at the level of communities; attracting attention of the community and local authorities to wastewater management problems.
- Promotion of the eco-sanitation approach.
- Demonstration of environmentally friendly, economically viable and efficient wastewater management technologies by implementation of the pilot project for construction of the eco-toilet in Gozhuly village school.

**Terms of implementation** of the eco-sanitation project: 2003—2006.

**Project budget:** Total costs of the eco-toilet construction in Gozhuly Education Centre reached about € 10 thousand.

### ***Project results***

The Rayon Department for Housing and Utilities analysed state of the sanitation system in Gozhuly village and concluded that the collector needed capital repairs, while pipelines and wastewater treatment facilities needed replacement. According to preliminary expert estimates, costs of rehabilitation of the sanitation system and wastewater treatment facilities in Gozhuly village reached about UAH 300 thousand. In April 2005, O. D. Bublik, the Mayor of the Village submitted a request to Poltavaska Oblast Council for allocation of funds for rehabilitation of the local sanitation network. In response to the request, Poltavaska Oblast Council promised to allocate UAH 360 thousand from the oblast budget for repairs of the sanitation network in the village. However, these funds had not been allocated. The village community called upon the Rayon State Administration to fund the solutions of the village sanitation problems. Due to persistent public lobbying, in autumn of 2005, some funds were allocated from the rayon budget for partial rehabilitation of the village sanitation network (UAH 198 thousand). However, these measures failed to resolve the whole problem, as the collector was partially repaired but the wastewater treatment facility was not. The Rayon State Administration explained its inadequate finance allocations by budget limitations and numerous other strategic facilities in the rayon that also needed urgent repairs.

In parallel with study of wastewater management problems in Gozhuly village, MAMA-86-Poltava launched information dissemination and awareness raising activities. In May 2004, the organisation conducted its first seminar on wastewater management, the eco-sanitation approach and promising technologies for utilisation of human waste. The seminar was attended by 30 representatives of the village community and local, rayon and oblast-level authorities. The seminar was conducted with participation of WECF representatives, project participants from MAMA-86 (Anna Tsvetkova), and MAMA-86-Poltava (O. Kovaliova and O. Gorishna). In the course of the seminar, the final decision was made to provide assistance to the school administration in the framework of MATRA project. The assistance was focused on addressing the school sanitation problem by construction of an eco-toilet.



On April 14, 2005, in Gozhuly village, a field roundtable discussion was held to mobilise investments for introduction of modern eco-sanitation technologies. The roundtable was attended by the deputy Chief of the Economy Directorate, the Director of Gozhuly village Education Centre, the Chief Sanitarian of Poltava Rayon, the Director of the municipal utility of the Directorate for Housing and Utilities, the Chief of the Sanitary and Hygiene Department of Poltava Rayon Sanitary and Epidemiological Facility, the Chief of the Finance and Planning Department of the Education Directorate and the Director of “Vestmarbudivnytstvo” Co.

On April 19, in Gozhuly Education Centre, a seminar was held for kindergarten personnel and teachers of secondary schools of Poltava rayon. The seminar was dedicated to sanitation problems of schools and ecosan toilet introduction.

In May 2006, another seminar was organised in Gozhuly Education Centre with participation of an expert from Hamburg University. The seminar participants (about 10 persons, including local residents and teachers) discussed advantages of eco-toilets, their design and maintenance.

### ***Implementation of the pilot project***

The toilet was constructed from July to September 2004. Design of the dry urine diverting toilet was developed with participation of Stefan Degeener — an WECF expert from Hamburg Technology University and the Institute of Municipal Wastewater Management.

Private construction company of Mr. Kiselyev was contracted to make construction works (the company was selected from three prospective construction companies). The official opening ceremony of the new toilet was held on October 30, 2004.

The toilet room was constructed as an extension of the school building. In order to ensure access to the new toilet, a part of a class-room was separated. As a result, the toilet may be entered without the need to leave the school building. In addition, the access corridor was connected to the school centralised heating system.

The toilet has 4 rooms (two for girls, one for boys and one for boys, equipped by urinals). Standard toilet bowls are replaced by plastic eco-sanitation squatting units. Chinese plastic eco-sanitation slabs allow to separate urine and faeces. Plastic pipes (32 mm in diameter) deliver urine to special PE tanks of Ukrainian manufacture (the tanks were sold by “Olbi” Co. — the official distributor of sanitation equipment in Poltava). These tanks were installed in a specially constructed underground cellar at the distance of 0.8 from the toilet room. The pipes are connected to the tanks in such a way that their discharge ends are 5—7 cm over the bottom. The design allows to minimize odours.

The design of the eco-toilet for Gozhuly Education Centre stipulates alternated use of 2 plastic tanks (2 m<sup>3</sup> each). Two chambers for collection and composting of faeces are located under toilet sections. New faeces are covered by a dry material. Wood ash is the most appropriate choice as its high PH facilitates destruction of pathogens and neutralises odours. As a result, hygiene conditions in dry toilets are better — they do not attract flies. In the school, dry soil with wood chips and sand were used. One chamber is used as “in-work” chamber, while another chamber remains empty (at the initial stage of use of the eco-toilet) or is used for composting. Every week (depending on intensity of the toilet use), faeces in the in-work chamber are levelled and new dry materials are added. To intensify composting processes, faeces are periodically stirred to enrich the mass by oxygen. Design of the eco-toilet allows easy access for such maintenance works and emptying of the chamber. When one chamber is almost full, another chamber should be cleaned and made ready for use. Composting takes not less than 1.5—2 years. After completion of composting, ready to use compost looks like dry soil and may be applied as a fertiliser. After cleaning of a chamber, a thick layer of compost should be left at the chamber's bottom for its further use.

If urine and faeces are used as fertilizers, it is important to separate and store urine and faeces separately (6 months for urine and up to 2 years for faeces). In the course of the project implementation, in the first year, urine from the toilet was delivered to the local wastewater treatment facilities. After the second year of the project implementation, one farmer from Gozhuly village, who actively participated in the organic agriculture project, decided to use urine from the school toilet as a fertiliser. The experiment will be launched in autumn of 2006.

When the eco-toilet was put into operation, MAMA-86-Poltava started to monitor the toilet maintenance problems, operation costs, consumption of water and other materials. Analysis of the monitoring results suggested a substantial reduction of water consumption, as water was used there only for hand washing and cleaning of the toilet room. Now, the school administration uses about 50 litres of water daily (on the average) for sanitary purposes (washing hands and cleaning of the toilet room). In other words, the toilet maintenance costs substantially decreased. Water bills were reduced by 20%, notwithstanding a higher water demand in the school canteen in the last year. Acetic acid or chlorine solutions are used for disinfection of the toilet room.

Since November 2004, the toilet was used by 155 schoolchildren (from 6 to 16 years old) and 30 personnel members of the school (Annex3, Photos 18—19). Before putting the toilet into operation, several trainings were conducted for teachers and schoolchildren on rules of use of the eco-toilet and personal hygiene. Besides that, in the toilet and the corridor, printed toilet use rules for boys and girls were posted. In the academic year 2005—2006, MAMA-86-Poltava again organised 2 seminars on eco-sanitation and rules of use of the eco-toilet for teachers and schoolchildren of the school. Since February 2006, teachers regularly conducted lessons for children of different age groups on eco-sanitation and hygiene matters (11 lessons in total for pupils of all forms). Now, due to these elementary hygiene awareness raising measures, even 6 years olds from the kindergarten in Gozhuly village are well aware of hygiene and sanitary rules. MAMA-86-Poltava regularly supplies information materials to the school. These information materials are distributed among the schoolchildren and posted at the special information board nearby the toilet.

The new school toilet got a major publicity among local residents, moreover, it is well known at the level of the rayon and Poltavaska Oblast. In April 2005, a meeting of directors of school of the rayon was organised in Gozhuly Education Centre. The meeting participants separately discussed issues of school sanitation. Experience of Gozhuly Education Centre made many participants of the meeting interested in application of eco-sanitation options to address typical problems of rural schools. Besides that, they discussed financing of repair works in school toilets in general and financing of construction of eco-toilets in particular.

In the course of eco-toilet use, some technical problems became visible and these problems were predominantly resolved. In particular, the both urine tanks needed replacement, as they were dug into ground without accounting for their load. The rayon State Administration assisted to resolve the problem and allocated budgetary funds for repair works. MAMA-86-Poltava replaced the old tanks by new ones, using MATRA project funds.

Another problem was associated with ammonia odour in the toilet section equipped by urinals. It was strange as a duly made (connected to pipes of necessary length) dry urinal (without water flushing) could not generate odours. The German expert was invited again to study the problem. He identified the cause — urine pipes were installed in a wrong way — at a long distance from the tank's bottom. Besides that, the ammonia odour was associated with many openings in a urinal instead of one opening as designed. All these deviations from the standard design were fixed, but some time later the odour appeared again. After many consultations and discussions on the matter, design faults were identified in the ventilation system. Now, experts try to solve the ventilation problems.

In May 2006, according to recommendations of the expert from Hamburg University, the school personnel installed the system to collect and remove rainfall. The new drainage system prevents rainfall flooding of urine tanks.

So far, there is another problem, the toilet should be officially transferred to the local administration — the problem requires co-operation of all interested parties. Now, the Sanitary and Epidemiological Facility may close the toilet as it operates without official permits of relevant services. It is necessary to note, that use of eco-toilets in schools, boarding schools and in other public places requires legislative support in the sphere and introduction of additional standards and rules (e.g. in connection with application of urine and compost as organic fertilizers). Besides that, some construction standards and rules should be also reviewed.

Eco-sanitation is a new approach and requires substantial information dissemination and public awareness raising activities. According to results of survey of schoolchildren and teachers of the school, conducted by MAMA-86-Poltava in springs of 2005 and 2006, the share of schoolchildren who are satisfied by the new toilet, increased from 60 to 75%, while among the teachers the relevant figure reaches 90% due to regular awareness raising activities in the academic year 2005—2006. However, children were found to ignore issues of application of organic fertilizers of human origin. At the same time, among the teachers, about 20% of respondents would like to have such toilets, while 50% of them assess application of organic fertilizers positively. Therefore, information dissemination activities among rural residents and experts' consultations remain rather relevant.

Summing up, it is worth to note that inadequate sanitation in rural schools creates many problems for physical and intellectual development of children. The problem may be addressed only by co-operation with local authorities and representatives of relevant governmental bodies, e.g. Sanitary and Epidemiological facilities. All stakeholders should realise associated risks of the sanitation problem and address the problem by joint efforts. Low public awareness of eco-sanitation problems also substantially hinders introduction of eco-sanitation ideas and technologies in rural areas.

MAMA-86-Poltava plans to continue its activities in the following spheres:

- promotion of eco-sanitation ideas and involvement of local residents into addressing the problem of protection of groundwater from pollution by household wastewater;
- eco-toilet use training of schoolchildren and adults;
- continued monitoring of the eco-toilet operations (economic, technical and human aspects);
- optimization of the model eco-toilet, that might be broadly used by rural schools of Ukraine.

Experience of Gozhuly Education Centre suggests that eco-toilets represent a potential optimal solution in conditions of non-existent sanitation networks or frequent water supply interrupts and a good alternative option for standard flush toilets. Provided support of local authorities and local residents (in particular, parents' committees), similar eco-toilets may be constructed in other schools of the rayon.

## **Eco-sanitation in Nizhyn rayon**

In the last century, living and working conditions in Ukrainian villages substantially changed. Reduction of allowed land areas for construction of private rural houses (0.06—0.10 hectare), a denser lay out of residential and auxiliary constructions, lack of sanitary protection zones around water supply sources, failures to locate auxiliary constructions (e.g. toilets, pit latrines, etc.) at safe distances from water sources — all these factors endanger sanitary and epidemiological wellbeing of rural residents. Traditional ages-long rural agricultural traditions gradually disappear. Lack of comprehensive approaches to physical planning, rational and safe development of rural areas with due accounting for environmental considerations resulted in substantial degradation of environmental and living conditions of rural residents.

There is another important factor, that aggravates the situation — rural residents lack elementary knowledge and relevant information on waste management, health and environmental risks, associated with wastewater and utilisation of human waste.

MAMA-86-Nizhyn studied problems of nitrate and bacteriological pollution of well water in Nizhyn rayon for 10 years. The research results persuaded the NGO, that causes of these pollution problems are associated with household practices of rural residents. Analysis of situation in many villages clearly suggests direct linkages between well water pollution and inadequate maintenance of rural wells and toilets. Now, toilets and pit latrines often belong to key sources of microbiological and nitrate pollution of soils and groundwater.

Mainstream activities in the framework of the demonstration eco-sanitation project of MATRA project were carried out in Bobryk village, administratively subordinated to Vertijivka Village Council of Nizhyn rayon (Chernigivska Oblast). The village is located at the distance of 18 km to the North-West from the rayon centre (Nizhyn).

The village is not equipped by a centralised sanitation network, all village residents use pit latrines at their backyards. Due to hydrogeological factors, natural groundwater exchange processes at the village area are slow, as a result, sanitary wellbeing of the village residents is seriously endangered.

The project objectives stipulated study of local wastewater management problems, information dissemination and awareness raising activities to inform local residents on wastewater management, basics of eco-sanitation; and implementation of eco-sanitation technologies for introduction of eco-sanitation technologies in Bobryk village.

Longer-term objectives of the project on wastewater management problems included community involvement into addressing these problems, promotion and introduction of sustainable development principles, associated with ensuring sanitary wellbeing of rural residents, prevention of environmental pollution and improvement of quality of life in rural areas.

In parallel with survey of water wells at the territory of Bobryk village (spring — summer of 2004), representatives of MAMA-86-Nizhyn also studied sanitary conditions of rural households. The survey results suggested that hygiene problems in the village were associated with non-compliance with applicable construction standards. Very often, pit latrines, poultry/cattle houses, manure, compost and garbage pits, and toilets are located nearby water wells. Pollution sources usually are not isolated and their locations are selected without due accounting for local landscape and geological features.

Besides that, the survey allowed to identify another substantial pollution source — decommissioned former cattle farms (one of such farms is located at the distance of 100 m from the nearest private house. At the same time, according to requirements of Construction Standards and Norms DBN 360-92 “Urban Development. Planning and Construction Works in Rural and Urban Settlements” such facilities should be located at distances of 300 to 500 m from human settlements.

In addition, the study results revealed that the cemetery in Bobryk is located in the central part of the village, in close proximity to residential houses. Such location of the cemetery also does not comply with the construction standards and may result in contamination of the village area.

In the course of the first survey, the village residents were interviewed about general hygiene and sanitary issues. The survey results confirmed their low awareness and lack of necessary knowledge on the above problems.

The first stage of the sanitation project implementation was dedicated to a closer study of waste management problems, including, in particular, management of human waste and associated health problems. Particular attention was paid to rural households with children. Members of the project team communicated with rural residents and informed them about sanitary improvements in household practices (e.g. safer manure storage, isolation of environmentally hazardous household facilities, etc. Ten helminth tests were made for children. Two children were found to be infected by seat worms.

Personal communications on elementary wastewater management issues accompanied the survey of wells and sanitary conditions of rural households. Villagers were informed about high nitrate levels in water samples from wells, located nearby manure hips/pits or the village cemetery.

Analysis of the collected information allowed to launch regular information dissemination activities. The first seminar on wastewater and human waste management problems was held in October 2004. WECF experts were invited to participate in the seminar: Margriet Samwel (drinking water issues) and Stefan Degeener (eco-sanitation issues). The seminar was dedicated to international experience of addressing the problem of management of human waste. The seminar was attended by residents of Bobryk and Vertijivka villages, representatives of local and rayon-level authorities, teachers of village schools.

The Bobryk village school was selected as the target facility for implementation of the pilot eco-sanitation project — construction of a toilet with separation of urine and faeces and their further processing for use as organic fertilizers. The second stage of the eco-sanitation project started from construction of the eco-toilet. These activities started from study of experience of colleagues from Poltava. Analysis of experience and practical difficulties of implementation of the first pilot project in Gozhuly village allowed to develop a clear scheme of legitimatisation of project documentation for construction of the eco-toilet for the school in Bobryk village. The scheme was successfully applied in May — October 2005. At the preparatory stage of the construction works, the following official documents were developed in the following sequential order:

1. The permit for initiation of the construction works, agreed with the Chief Architect of the rayon and the Chief of the rayon Education Department.
2. Decision of the Chief of the Rayon State Administration on the permit for design and construction works, signed by the Commission Chair, the first deputy Chief of the Rayon State Administration.
3. Development of the Architecture Design, signed by the architect of the Architecture Department of the Rayon State Administration.
4. Development and approval of Technical Terms of Reference, agreed with the Fire-fighters' Unit Commander.
5. Development of Conclusions of the Rayon State Administration, signed by the Chief Sanitarian of the Sanitary and Epidemiological Facility.
6. Development of the Construction Assessment Protocol, with participation of the Architecture Department of the Rayon State Administration.

7. Development of the construction project documentation by an architecture and design organisation.
8. Development of the cost estimate of works and materials by the technical office of the construction organisation.
9. Issuance of the permit for initiation of construction works, approved by the Chief Sanitarian of the Rayon Sanitary and Epidemiological Facility.

The Terms of Reference for the construction incorporated development of co-operation with representatives of governmental bodies, private businesses and local authorities. All construction-related arrangements were made in strict compliance with the due Ukrainian legislation, often against the established tradition of bribery. MAMA-86-Nizhyn informed the Rayon State Administration about all attempts to hinder construction of a socially beneficial facility. The transparent process of negotiations and approval of design documentations demonstrated a successful example of introduction of democratic standards and support of citizens' initiatives by authorities.

In December 2005, the design documentation had been completed and the construction project was ready for implementation. The NGO organised a tender to identify a construction company for the project implementation. The tender results allowed to select the optimal contractor. In December, co-operation agreements were signed with the Administration of Bobryk village school, the Head of Vertijivka Village Council and the director of the construction organisation. The school director asked to postpone the construction works to the end of the academic year. In June 2006, "Tvorets" Co. began the construction works. During the construction stage, a representative of MAMA-86-Nizhyn controlled purchases of building materials and followed the construction works on.

The eco-toilet was officially opened on September 1, 2006. Prior to the toilet's opening, a WECF representative Solomiya Babyak conducted trainings on use and maintenance of the eco-toilet for teachers and technical personnel of the school (Annex 3, Photos 10—12).

### ***Construction of private eco-toilets in Bobryk and Vertijivka villages***

In the course of eco-sanitation seminars, residents of Bobryk village expressed their interest in construction of individual eco-toilets. They asked about advantages of eco-toilets. One of participants of these seminars once said that one can easily construct such a toilet himself.

MAMA-86-Nizhyn selected the site for construction of a demonstration individual eco-toilet, accounting for readiness of its future owner to make his monetary and in-kind contribution to the construction works. The family of Shkurat V. P. became the first household in Bobryk village that has an eco-toilet of its own.

In order to acquire skills and experience of eco-toilets' construction, one representative of MAMA-86-Nizhyn attended a training-of-trainers seminar in Stepanivka village (Odeska Oblast). In May 2006, Stefan Degeener — the expert from TUHH, Germany — conducted there a regular training on construction of private eco-toilets and production of eco-sanitation equipment.

The newly acquired skills and experience was successfully applied at the seminar in Bobryk village on construction of individual eco-toilets. The representative of MAMA-86-Nizhyn developed the technical documentation, the workplan and the project budget. MAMA-86-Nizhyn organised purchase and delivery of construction materials, regularly controlled and consulted the owner at all stages of the eco-toilet construction. The first private eco-toilet in Bobryk village had been constructed in June 2006.

After participation in a seminar on eco-sanitation, one resident of Vertijivka village, a father of seven children, also expressed his intentions to construct a private eco-toilet at his backyard. The NGO de-

cided to support the construction of the second eco-toilet for him as well, to provide him consultations and assistance.

Therefore, the information campaign on eco-sanitation matters in Bobryk and Vertijivka villages managed to raise public awareness of local residents on wastewater management and application of new efficient and environmentally friendly technologies for utilisation of human waste. Implementation of pilot project allowed the rural residents to see for themselves all advantages of eco-toilets (inc. their simple and rational design, affordability).

## **Organic agriculture for healthier environment and improvement of drinking water quality in rural settlements**

Taking into account, that problems of ensuring high quality drinking water supply in rural areas were identified as priorities in the framework of MATRA project, the sphere of organic agriculture was considered as the base for long-term sustainable addressing of problem of water pollution (particularly groundwater) and land resources in rural areas.

Accounting for low awareness of rural residents and almost complete loss of traditional environment-friendly agricultural practices, poor environmental awareness of ordinary rural residents, in the framework of project activities the project teams focused on dissemination of information on organic agriculture and promotion of organic agricultural practices among residents of target villages. A particular attention was paid to linkages between environmental pollution, human safety, and problems of drinking water and food products in rural areas.

In the framework of information dissemination and awareness raising activities:

- agricultural problems of target villages were studied, contacts were established with Ukrainian organic agriculture experts and practitioners, as well as with scientists who study plant cultivation issues;
- three regional seminars were conducted on organic agriculture matters with participation of Sabina Brukmann — a WECF expert on organic agriculture. These seminars were also attended by Ukrainian experts and representatives of distinct and oblast-level authorities in charge of agriculture;
- series of trainings and practical training events for farmers and residents of Gozhuly village (Poltava rayon), Bobryk and Vertijivka villages (Nizhyn rayon) was conducted; these trainings were dedicated to problems of plant cultivation, subsistence agriculture, composting, etc.;
- the Organic Agriculture Centre in Vertijivka village was launched;
- model experiments were initiated for introduction of some elements of organic agriculture at private fields of farmers in Bobryk village;
- the study visit to Bavaria with participation of 6 Ukrainian farmers and agricultural experts was organised for participation in the international training seminar on organic agriculture and establishment of contacts with German organic farmers.

Implementation of MATRA project facilitated initiation and implementation of regular and long-term awareness raising activities on organic agriculture in Bobryk and Vertijivka villages of Nizhyn rayon.



## Organic agriculture: awareness raising activities in Nizhyn rayon

In the Soviet period, the command and control economic model favoured collective land ownership and promoted intensive agricultural practices. The system largely ignored interests of people and their wish to be masters of their own land. Collectivisation and elimination of viable private farms resulted in radical changes in property relations in the agricultural sphere and in loss of ages-long traditional knowledge and agricultural practices. Since initiation of Stalin's "Great Breakthrough", about 200 thousands of private farms were nationalised in Ukraine. Chernigivska Oblast was also heavily affected. In Nizhyn rayon alone, 175 persons were prosecuted (mainly efficient farmers). Resettlement of farmsteads' residents, loss of local knowledge and traditions, promotion of denser rural settlements (allowed land areas for construction of rural houses were reduced to 0,06—0.10 hectare) resulted in decline of efficient land use practices. Intensive agriculture technologies of the Soviet period prioritised quantitative indicators to the detriment of quality of agricultural products. Land-rehabilitation technologies, such as seed growing and crops rotation were largely forgotten. Issues of environmental protection and sustainable agricultural development were ignored by both rural residents and local authorities.

In the independent Ukraine, the new agricultural reform was initiated — the reform stipulates changes in land property relations and land privatisation. Decree of the President of Ukraine "On Priority Measures to Accelerate Reforms in the Agrarian Sector" of December 3, 1999, promoted privatisation of large land areas.

Chernigivska Oblast is a traditional producer of potatoes — in the Soviet period, the oblast produced about a fifth of all potatoes purchased by governmental agencies of the republic. Now, production of potatoes still remains among leading spheres of agricultural production in the oblast. Besides that, other vegetables are also produced in the oblast: cabbages, carrots, tomatoes and famous Nizhyn cucumbers, that were traditionally grown there due to favourable climate conditions and soils. Intensive agricultural practices, that heavily relied on application of chemicals (application of fertilisers, broad and poorly regulated application of pesticides and herbicides) resulted in extensive environmental contamination (inc. groundwater pollution), particularly by nitrogen compounds and pesticides.

In the framework of MATRA project, MAMA-86-Nizhyn promoted ideas of organic agriculture (OA) in the context of study of drinking water problems and dissemination of information on environmentally sound plant cultivation technologies and environmental protection problems in rural areas (particularly problems of protection of water and land resources). Project activities in the sphere were conducted in two villages of Nizhyn rayon (Bobryk and Vertijivka) and pursued the following objectives:

- 1) to explore opportunities to introduce OA principles and technologies, focusing initially on the most important regional crop;
- 2) to initiate active information dissemination and awareness raising activities among residents of the target villages in order to promote organic agriculture.

In parallel, in the course of independent public research of drinking water problems, MAMA-86-Nizhyn gathered information on specifics of local agriculture and agricultural facilities. These issues were discussed in the course of meetings with representatives of governmental bodies, including the Agricultural Department of Nizhyn Rayon State Administration, managers of "Oblderzhrodyuchist" Centre and different agricultural specialists.

Results of these preliminary studies suggested that rural population of Nizhyn rayon reaches 33,016 persons (with natural population growth of (-) 413 persons/year). There are 32 agricultural facilities of different ownership forms in the rayon and only 18 submit reporting to relevant governmental bodies, while the rest are on the brink of bankruptcy. Plant cultivation provides the bulk of agricultural rev-

venues in the rayon, while stock-breeding remains a loss-making activity. The rayon agriculture heavily relies on potatoes production. In 2003, potato fields covered 7,544 hectares of land (inc. 7,521 hectares in private farming facilities and only 23 hectares in agricultural facilities of other ownership forms). In other words, private owners control about 98% of potato fields in the rayon. In three recent years, the share increased and now it reaches 99.7%.

Similarly to other rural settlements of the rayon, all residents of Bobryk and Vertijivka villages cultivate potatoes. Potatoes belong to main components of the average daily diet of local residents. Local residents produce potatoes for their own consumption, for sale or to exchange for other food products (sugar, sunflower oil, cereals, etc.) Besides that, potatoes are used to feed cattle.

At the same time, the study results revealed, that potatoes' crop yields gradually decrease, adversely affecting local residents. While in 1999, the average potatoes crop yield of Nizhyn rayon agricultural producers reached 14,000—15,000 kg/ha, now, the relevant figure is close to 8,700 kg/ha. Potatoes production tends to decrease due to low revenues and lack of wholesale buyers. In the private sector, the crop yields decrease somehow slower. In five recent years, crop yields decreased from 20,000 to 13,000 kg/ha, depending on different natural and economic factors.

The study results suggested that both collective and private farming facilities of the rayon do not apply soil-protection technologies, people are not aware of underlying causes of declining soil fertility and crops yields. Potato beetles continue to damage potato fields seriously, local residents apply different pest control methods, including chemical ones, but without a major effect. Local residents still look for efficient methods of combating potatoes beetles.

In addition to potatoes, other crops are cultivated in the rayon, including cereals, sugar beets, oil plants.

Nizhyn cucumber is the most famous local crop. For the first time, cucumbers were introduced there in early 17th century. The most reliable hypothesis suggests that Greek merchants brought cucumbers to Nizhyn in the course of their trade voyages, and later the local cucumber variety emerged. "Nizhyn local" cucumber variety is famous for its delicate taste. In 1897, 100 standard freight cars of Nizhyn cucumbers were salted annually. In mid 20th century, Nizhyn cucumbers were exported to 56 countries. Quality of Nizhyn cucumbers was thought to depend on specific local soil, water, climate conditions, selection of cucumber seeds and salting conditions. The economic crisis in the agricultural sector resulted in almost complete elimination of Nizhyn cucumbers production. Large-scale farming facilities abandoned cultivation of Nizhyn cucumbers and now they are predominantly produced at small land plots of individual villagers. Inflow of other cucumber varieties and hybrids to Nizhyn rayon was uncontrolled. In recent years, nobody seriously managed production of seeds of Nizhyn cucumber. The Nizhyn Vegetable Processing Plant was renamed to "ATK Polissya", but the new facility reserved its rights to use "Nizhyn" trademark. As a result, the facility generated revenues by use of the well known brand for advertising purposes, but nobody cared about preservation of the endemic variety of Nizhyn cucumbers.

In that time, in 2001, a group of scientists from Nizhyn Agrotechnical Institute established a research group to restore production of Nizhyn cucumbers. The group was headed by I. M. Zhovnir — the head of a research laboratory of Nizhyn Agrotechnical Institute. In Vertijivka village of Nizhyn rayon, a demonstration farm was organised to restore cultivation of Nizhyn cucumbers. In parallel, elements of organic agriculture were applied at experimental cucumber fields of the Institute.

In order to identify causes of decreasing potato crop yields, to develop options for addressing the problem and to develop OA information dissemination and awareness raising activities, MAMA-86-Nizhyn initiated co-operation with specialists of Chernigiv Agricultural Microbiology Institute of the Academy of Agrarian Sciences of Ukraine.

Joint activities started from the co-operation agreement on the study of potato cultivation processes within a year. The co-operating parties sought to assess phytosanitary quality of potato fields in Bobryk and Vertijivka villages (Nizhyn rayon of Chernigivska Oblast) and develop recommendations for improvement of potato cultivation by means of general improvement of rural ecosystems.

The study was implemented in several stages and incorporated joint activities and research studies, namely:

1. Data gathering (interviewing local residents).
2. Study of quality of potato seed materials and quality of cultivated lands.
3. Laboratory examination of potato tubers for identification of plant diseases.
4. Development of a database on incidence of potato diseases in the region.
5. Development of recommendations to improve the situation.

The schedule of research studies and field visits was designed according to “Methodological Recommendations on Potato Research” (by V. S. Kutsenko, A. A. Osipchuk, A. A. Podgaietskiy et al. The Academy of Agrarian Sciences of Ukraine, the Institute of Potato Cultivation. — 2002, Nemishaev, pp.143—145 (Ukr.).

According to the work plan, at the first stage, specialists of the Institute and representatives of MAMA-86-Nizhyn jointly conducted a survey of local residents, using questionnaires, developed by the Institute specialists:

#### Questionnaire 1

Address, structure of cultivated land, analysis of agrotechnical system, sufficiency and quality of seed materials, assortment, phytosanitary quality of cultivated land, information needs.

#### Questionnaire 2

1. Preparation of potato seed materials to planting.
2. Terms of potato planting.
3. Do you allocate a separate plot to grow potatoes for production of seed materials.
4. How do you plant and cultivate potatoes.
5. Do you use green manure at potato fields.
6. What fertilisers do you apply at potato fields.
7. Potato planting schemes.
8. What additional crops do you plant at potato fields.

Local residents were interviewed in parallel with sampling of potato seed materials in February and March 2005 (February 22 and March 13) (Annex 3, Photo 13). 16 completed questionnaires were processed.

The survey of potato fields and sampling of seed materials were conducted in several stages in 11 private farms of Bobryk village and in 5 private farms in Vertijivka village.

In the case of potato seed materials, general indicators were assessed: the number of samples and weight of potato tubers. Disease-affected tubers were examined separately (e.g. potato scab, dry rot, late blight disease, viral infections).

The work plan of research activities included:

1. Preparatory activities: December 2004 — March 2005  
Development of the program and questionnaires.  
Field interviewing.  
Sampling of seed materials for examination.
2. Spring works: March — May 2005.  
Preparing seed materials for planting (March 2005).  
Selection of fields for cultivation of seed potatoes and market potatoes (April 2005).  
Examination of potato seed materials and sampling of potato sprouts (May 18, 2005).
3. Summer works: June — August 2005  
Sampling of full-grown potatoes (June 10, 2005)  
Collection of potato samples displaying symptoms of potato diseases.  
Laboratory identification of bacteria, fungi and viral potato diseases.  
Consultations on cultivation of seed/market potatoes.  
Research studies at the stage of potato budding and blossoming: July 14, 2005.  
Phyto-cleaning at private potato fields.  
Examination of samples collected.
4. Autumn works: September — October 2005  
Sampling of seed and market potatoes.  
Examination of samples collected.  
Consultations on preparing potato seed materials to storage.  
Examination of seed materials.

In the course of further studies, plant materials were sampled for laboratory identification of viral, fungi and bacterial diseases (Annex3, Photo 16). Samples were collected randomly, accounting for areas of potato fields, specific potato varieties, location of potato fields nearby other crops (vegetables, berries, fruit trees, etc.) Potato samples were examined for plant diseases and pests according to State Specifications 4014-2001 “Seed Potatoes. Sampling and Methodology of Quality Assessment”.

Potato seed materials were examined visually (fungi and bacterial diseases) and serologically (viral diseases). 109 samples were examined by immune-enzyme analysis and 10 samples were examined by electron microscopy. The examination results were compiled into a table and analysed.

In late 2005, independent surveys of public awareness of potato cultivation and research studies of phytosanitary quality of potato seed materials in Bobryk and Vertijivka villages were completed. The survey of local residents demonstrated that:

1. 100% of respondents have no idea about isolation of vegetable crops, including potatoes (the isolation allows to reduce spread of plant diseases, contamination of soils and agricultural products).
2. 48% of farmers do not know about the system of crops rotation.
3. 100% of respondents have no experience of application of green manure at potato fields — e.g. black radish and colza that allow to enrich soils by organic nutrients and reduce pathogen contamination (these plants produce organic compounds of sulphur that destroy or suppress growth of fungi and bacteria).
4. 50% of villagers manually plant potatoes, cultivate potato fields and harvest potatoes. Such manual operations often do not allow to meet technological requirements to potato cultivation. As a

result, the natural plant development becomes impossible and potato fields do not produce high crop yields. Besides that, such manual operations are labour intensive.

5. All individual potato producers apply organic fertilisers, but they do not process these fertilisers adequately — they apply manure after some storage mixed with fresh manure. Such fertilisers do not produce a desirable effect, moreover, they serve as a substrate for growth of soil bacteria and fungi that cause potato diseases (e.g. all types of potato scabs, dry rots, etc.)
6. Only a few villagers apply biological plant protection preparations (microorganisms that kill insects but are safe for human health).

The phytosanitary survey of potato fields in Bobryk and Vertijivka villages showed that:

1. Local potato seed materials are of low quality. Plant diseases and other defects were registered for 51% of samples.
2. In the majority of cases, potato seed materials were affected by fungi (all types of potato scabs) — 23.76%. These plant diseases hinder potato growth and reduce crop yields.
3. Almost 20% of seed potato tubers were affected by Deenerative alterations (cracks and deformed potato tubers).
4. 91.4% of potato seed materials and 100% of potato plants were affected by viral diseases at the stage of vegetation.

Results of these studies allowed the experts to develop recommendations that were used as the base for development of information materials for vegetable producers that covered a wide range of practical tips on preparation of potato seed materials and main stages of potato cultivation.

The study results and recommendations of experts were used in the pilot project for practical implementation of organic agriculture technologies in Bobryk village. Potato was selected as the demonstration crop of the pilot project.

Accounting for low awareness of local residents of potato varieties renovation, lack of skills and knowledge in the sphere of organic agriculture, the project team decided to start from collection of information on organic agriculture practices. At the initial stage of the project implementation, MAMA-86-Nizhyn developed the electronic database on national and international experience of OA and assembled a library of information and methodological materials. Booklets “Potatoes as the Alternative Bread” and other information materials were developed for the information campaign among local residents (see Annex 1).

Local residents were interested in the project implementation; they actively participated in interviewing and study of local potato cultivation and other agricultural practices in Bobryk and Vertijivka villages. Villagers provided samples of seed potatoes for laboratory examination and expressed their high interest in combating potato pests and diseases. Specialists of the Institute conducted a series of lectures on results of laboratory examination of local potatoes, prospective potato varieties and the need to apply varieties renovation and crop rotation practices, on biological methods to control potato pests and diseases. Residents of target villages were able to see new potato varieties for themselves, to buy seed materials and to get recommendations on their cultivations. Five farmers decided to use new seed materials and to co-operate with the demonstration project for adaptation of new more efficient potato varieties to conditions of Bobryk with application of organic agriculture techniques.

Introduction of organic agriculture in the region was co-ordinated by V. P. Shkutat — a resident of Bobryk village and a member of the Organic Agriculture Centre. The Centre was established in Vertijivka village in the framework of the project for regular information dissemination and awareness raising activities.

The Centre was opened in February 2006 to support active promotion of OA ideas and principles, to share local experience of cultivation of environmentally clean agricultural products. The Centre has the following objectives:

1. Development of databases on:
  - principles of organic agriculture: national and international experience;
  - soil protection technologies;
  - organic fertilisers;
  - plant protection: chemicals-free methods;
  - results of practical implementation of organic agriculture elements: local experience;
2. Provision of consultations to local residents on organic agriculture issues.
3. Seminars and trainings for teachers, producers of organic agricultural products and farmers.
4. Organisation and development of a production and management entity for potato varieties renovation in Bobryk village.
5. Training seminars for local residents on application of minimal ploughing, organic fertilisers and crop rotation.
6. Organisation of information dissemination and awareness raising events in schools of Bobryk and Vertijivka villages.

Vertijivka Village Council supported the idea of establishment of the OA Centre and allocated a room for these purposes. MATRA project provided a library, developed information materials and recommendations, based on results of practical adaptation of new potato varieties. Besides that, a set of Fokin's subsurface cultivators was provided. In the summer of 2006, monthly lectures were organised in the Centre on OA-related problems, practical experience of potato cultivation without application of chemical pesticides and mineral fertilisers, OA advantages and opportunities for OA application in subsistence agriculture, linkages between agriculture, health and environment in rural areas. About 20 villagers and 7 residents of Vertijivka already applied to the Centre for advice on OA methods. In addition, a practical training was conducted at the demonstration field of Mr. Shkurat (about 20 persons participated in the training).

In 2005, a demonstration field (0.1 ha) was allocated in the private farming facility of V. P. Shkurat for development of OA practices and renovation of potato varieties in Bobryk village. The project's funds were used to purchase seed materials of 5 new efficient potato varieties. Mr. Shkurat conducted all field research works according to recommendations of the Institute of Agricultural Microbiology. Three other local activists also participated in the experiment and were provided 5 kg of different potato varieties each. According to agreements with MAMA-86-Nizhyn and the Organic Agriculture Centre they cultivated the new potato varieties according to experts' recommendations and consultations.

After completion of the planned works, the project participants submitted information, they collected in the course of their experimental works. Their results were analysed and used for development of recommendations on cultivation of seed and market potatoes of the most promising potato varieties for the local conditions. These materials were printed and provided to the Organic Agriculture Centre in Vertijivka village for further dissemination.

In the course of survey of local residents of target villages in 2005, lack of efficient cultivators was found to be a serious obstacle for OA development. After liquidation of former collective and state farms, their agricultural machinery was mainly privatised. An ordinary private farmer was provided 2 hectares of land. The new land owners encountered a serious problem: they had no machinery and could not rely on manual labour only at their fields. Now, villagers started to raise horses for cultiva-

tion and transportation purposes. Horses were traditionally used in Ukraine for agricultural works, but now their use is problematic due to lack of relevant cultivation tools.

All things we think about now were thought about earlier. The need to switch to board less ploughing belongs to main principles of organic agriculture. The study of cultivation machinery markets demonstrated that it is possible to revive forgotten land cultivation tools that may be modernised by contemporary farmers. Even now, one can see individually produced ploughs, horse-drawn cultivators, disk harrows for board less ploughing etc. These land cultivation tools are often made at the base of traditional tools, improved and tested at private fields. These cultivators avoids overturning of upper fertile soil layers, to preserve natural soil structure and to make weed and pests control easier. Such cultivators are convenient for use and may be used for different operations, including board less ploughing, weeding and harvesting. Using such tools and one horse, an ordinary farmer can successfully cultivate crops at 1 hectare of land. However, it is necessary to organise manufacture of such cultivators at the industrial scale. To promote the idea, MAMA-86-Nizhyn developed technical proposals and submitted them to the Chair of the Federation of Organic Agriculture in Ukraine. In particular, the proposals incorporated the following provisions:

1. to systematise traditional plant cultivation tools.
2. to facilitate large-scale production of model agrotechnical tools.
3. to develop ToR for production of relevant tools. (Annex 3, Photo 17).

At the base of analysis of advantages of organic agriculture and associated risks, MAMA-86-Nizhyn developed brochure “Prospects of Development of Organic Agriculture in Ukraine” and other publications (see Annex 1.)

In the course of the project implementation, residents of Bobryk and Vertijivka villages studied organic agriculture and its advantages in their practical works. Participating in cultivation of environmentally cleaner agricultural products, some villagers managed to improve their professional skills and acquired new knowledge of efficient and safe agriculture. OA ideas gradually attract new adherents. At initial seminars on OA matters, participants perceived the new information sceptically, but later they became more and more interested. About 37 residents of Bobryk and Vertijivka villages opted to introduce some OA elements in their farms, e.g. composting, crop rotation, plant varieties renovation. However, to make these changes sustained, it is necessary to continue trainings, consultations and practical introduction of theoretical OA knowledge. Understanding of OA fundamentals needs time and consistent efforts are necessary for practical OA application. Therefore, the Organic Agriculture Centre should continue its activities as a production and management entity, supporting its own operations in the future.

## **Organic agriculture: co-operation with Gozhuly village farmers**

Poltavska Oblast has a substantial experience of development of organic agriculture.

Research studies of mid 1990s confirmed that 90% of cultivated land areas of Ukraine degraded and their natural fertility decreased: about 35.8% of lands are affected by erosion, 25.6% of land areas are acidified, 9.7% of land areas are affected by salination, while 8.9% of cultivated land areas are affected by water logging. On the other hand, under conditions of the economic crisis (including shortages of working capital), in recent years, application of mineral fertilisers, pesticides and other chemicals substantially decreased. As a result, land degradation processes were reversed. Now, there are large areas of environmentally clean black earth soils in Ukraine that may be used for application of organic agriculture practices in a rather short period of time. In Poltavaska Oblast, 2,180,700 hectares of cultivated lands are used for agricultural purposes now; black earth soils cover 90% of all cultivated land areas.

Principles of organic agriculture were used in Poltavaska Oblast from 1976. Due to efforts of “Agroekologia” facility, headed by S. S. Antonets, the concept of “biological plant cultivation” was implemented for more than 30 years in Shishaki village. Their agricultural practices allow one to classify their products as organic. In the oblast, 9,000 hectares of land are allocated for organic agriculture (2.4% of the overall cultivated land areas).

MAMA-86-Poltava started its activities in the sphere of organic agriculture in May 2003, in the framework of MATRA project. These activities incorporated study of contemporary situation in the agricultural sector, assessment of OA development prospects, promotion of OA principles and practical implementation of organic agriculture technologies in individual farms of Gozhuly village.

In three years of the project implementation, the following activities were completed:

- data gathering on the local situation;
- information dissemination and awareness raising activities among interested local residents (seminars, roundtables, field visits, trainings and consultations) on agricultural problems, impacts of intensive agriculture on quality of water and land resources, safety of drinking water and agricultural products, as well as on organic agriculture issues;
- development of recommendations on practical OA implementation, initially in three farms of Gozhuly village.

Analysis of the local situation showed that, in the Soviet period, Kirova State Farm operated in Gozhuly village. The state farm was liquidated later. Land areas of the former state farm were distributed among 491 new owners. Now, these land areas are mainly leased by “Promin” farming facility (about 720 hectares), “Sad” private farming facility (about 250 hectares) and a local poultry facility (about 20 hectares). 100 hectares of land are now controlled by the Village Council. In Biofabrika village, all land areas are state-owned, about 300 hectares are leased by local farmers. In Gozhuly and Biofabrika villages, farmers mainly cultivate barley, millet, wheat, corn, sunflower, beets and soy. At their subsistence agriculture plots, local residents predominantly cultivate fruits and vegetables (cucumbers, tomatoes, potatoes, cabbage, cherries, apples, etc.). In recent years, local residents tended to reduce cultivation of some crops (e.g. cabbage, cucumbers), as they can easily buy them in nearby located Poltava, at marketplaces.

Analysis of situation at food markets in Poltavaska Oblast suggests that consumers are increasingly more interested in healthy food and environmental protection. Consumers of organic food are motivated by the following requirements and expectations:

- healthy and environmentally safe food;
- a good taste;



- environmental protection in the course of food production operations;
- absence of GMOs;
- contacts (often direct contacts) with local (or regional) producers;
- high quality of food products.

The above motivation suggests that some consumers are ready to pay more (10—50% extra price) for organic food and demand for organic food products increases.

According to results of a survey, conducted by MAMA-86-Poltava in spring of 2005, up to 5% of Poltava residents were motivated to use organic food products and were ready to pay more for these products. Such a group of consumers represents the initial niche for organic products in the region, and for development of the domestic market for organic food products in Ukraine.

MAMA-86-Poltava conducted its first seminar on OA prospects with involvement of an international expert — Sabina Brukmann, the OA expert of WECF network. The seminar was held on May 14, 2004, in Gozhuly village. The seminar was attended by about 30 community members, representatives of local authorities and teachers of Gozhuly school.

The project team involved organic agriculture experts, specialists of Poltava Consumers' Co-operation University, Poltava Agrarian Academy and agronomists of "Agroekologia" private farming facility into the project implementation. In the whole period of the project implementation, these experts actively participated in project activities: they made presentations at roundtables and seminars, provided practical consultations to farmers. Overall, about 150 farmers and about 30 experts participated in the project.

Two visits for farmers were organised to the farming facility in Shishaki village, the farmers were able to study its operations, to get information on methods used there: e.g. minimal cultivation, agricultural production without application of herbicides and mineral fertilisers, application of biodynamic preparations. The farming facility in Gozhuly was twice visited by experts from Germany (Unserland network) and Switzerland (Biolan) for exchange of experience and discussions on OA problems. In the course of these meetings, foreign colleagues provided practice-oriented consultations and discussed prospects of co-operation.

On January 19—23, 2005, in Bavaria (Germany), in the framework of the project, a training seminar was conducted by WECF network, jointly with experts of Unserland network (Munich). Three farmers from Gozhuly village took part in the visit. At the seminar, Ukrainian representatives got information on ideas of organic agriculture in Bavaria, studied experience of different organisations, that facilitate development of organic farms and promote their products at local markets. The seminar participants visited different farms that produced potatoes, eggs and pasta, meat and bread. Ukrainian farmers got important information on experience of marketing of organic products, as our farmers face serious problems in connection with sale of their products. The visit made our farmers interested in introduction of organic agriculture principles in Poltavaska Oblast in general and in Gozhuly village in particular.

In order to promote OA ideas and to involve interested farmers into the project activities, the Club of Organic Agriculture was established. The Club organised meetings and lectures for individual farmers of Gozhuly village for exchange of experience and valuable practical information. In the course of Club meetings, participants discussed general theoretical OA issues and received practical recommendations on safe methods of pest control, application of natural fertilisers, composting methods, health impacts of polluted food products. Both Ukrainian and foreign specialists took part in these meetings. Local residents and Lyubov Mykolaivna Kompanets (the former secretary of the Village Council) actively discussed their personal experience of organic cultivation of currants. Gennadiy Tistchenko (the agronomist of "Agroekologia" farming facility) and Viktor Melnik (a farmer from

Illivtsy village) delivered lectures on application of biodynamic preparations. In June 2006, Sabina Brukmann (the OA expert of WECF) delivered a lecture on composting of organic waste and application of compost. In 2006, six meetings of the Club were held. Overall, 46 local residents participated in these meetings.

MAMA-86-Poltava developed and published a series of information materials, that were disseminated at the seminars, roundtables and other awareness raising events, including booklets “Pesticides” and “Attention: Nitrates”, methodological recommendations on composting, organic agriculture, etc. To develop a booklet on organic agriculture MAMA-86-Poltava co-operated with P. V. Pisarenko — the expert of Poltava Agrarian Academy.

In the course of development of awareness raising events, MAMA-86-Poltava actively co-operated with representatives of agriculture and food directorates of the Oblast State Administration, directors of food processing plants of Poltavaska Oblast, representatives of trade facilities of the city, specialists of Poltava Consumers’ Co-operation University and Poltava Agrarian Academy, representatives of youth NGOs, directors of agricultural facilities, farmers from different rayons of the oblast and journalists of rayon and oblast-level mass media outlets.

In the framework of information dissemination and awareness raising activities, 3 seminars were conducted, as well as 1 roundtable and 3 experience exchange study visits (see Table 2).

**Table 2. Information events of MATRA project in Gozhuly village**

22.03 — 23.03.2005	Seminar “Implementation of the ecological imperative of production development”
12.05.2005	Training seminar “Ensuring sustainable development of farming facilities of the oblast at the base of application of organic agriculture technologies and production of environmentally clean products”
12.07.2005	Roundtable “Implementation of project “Poltavshchina — the environmental standard of Ukraine”
12.11 — 13.11.2005	Working visit of organic agriculture experts from Germany and Switzerland.
22.11.2005	Training seminar “Main aspects of organic agriculture”
19.01 — 23.01.2006	Participation of 3 representatives of pilot farms in the practical training seminar of Unserland network (Munich, Germany).
28.06 — 01.06.2006	Working visit of organic agriculture experts of “Biolan” network (Germany).

Information dissemination and awareness raising activities of the project produced the following results:

- About 200 farmers and local residents got information on main principles and practical application of organic agriculture in Ukraine and abroad.
- Main legislative obstacles for OA development in Ukraine were discussed and identified: lack of underlying laws and regulations, including, in particular, a framework law on organic agriculture and certification of organic products.
- Prospects of development of economic model “agricultural producer — consumer” in the system of sales of environmentally clean products were reviewed.
- Awareness of local residents of environmentally clean products and methods of their cultivation was raised.

- Ukrainian experience of cultivation of environmentally clean crops of “Agroekologia” farming facility was shared.
- Three meetings were organised with farmers from Germany and Switzerland to share OA-related knowledge and experience and to discuss prospects of practical implementation of organic agriculture in farms of Poltava rayon.

Three farming facilities of Gozhuly village were involved into practical project activities. These facilities control 3000 hectares of land in total, cultivate cereals (barley, wheat, corn, buckwheat), beets, soy, lucerne and keep livestock. These farmers signed the agreement on co-operation with MAMA-86-Poltava in the framework of project “Co-operation for sustainable rural development”.

In spring of 2006, with support of MATRA project, independent testing of soils in pilot farming facilities was conducted. Prior to collection of soil samples, experts were consulted about the necessary soil parameters to be assessed. The experts provided necessary information on soil testing parameters, necessary for assessment of soil quality in terms of application of OA methods. Soil samples were analysed in May 2006 by Poltavaska Oblast veterinary laboratory. In the course of search for a facility to conduct soil testing, the project implementation team found that Ukrainian laboratories almost never conducted some soil tests for OA purposes. Laboratory results were submitted to G. Tischenko — one of “Agroekologia” experts — for development of practical recommendations on soil quality improvement by natural means (crops rotation, organic fertilisers). As a result, relevant methodological recommendations were developed — now the recommendations are being prepared for publication.

In the course of the project implementation, it became clear, that farmers of Poltavaska Oblast are very interested in development of organic agriculture there. Participants of seminars and roundtables many times stressed that one of key factors of successful OA development is associated with establishment of a Ukrainian system of organic food certification and quality control.

Besides that, it is necessary to note that there are some institutional, legal, finance, economic, social and psychological problems that need attention and addressing:

- It is necessary to establish relevant institutional infrastructure (particularly certification entities, associations of organic producers and relevant distribution networks); it is necessary to facilitate integration into already existing international organisations to promote access to foreign markets, besides that, the country lacks information and consultative support and competent advisory services.
- There is nothing like a governmental support for farmers in the course of their transition to organic agriculture (farmers may need compensations to cover potential losses in the transition period, in the case of changes in market demand and in connection with their additional expenses for technical modernisation purposes).
- It is necessary to overcome old stereotypes, environment-unfriendly approaches, passive attitudes of regulatory bodies to innovations and extreme population poverty.

In order to identify and implement follow up activities for promotion and development of organic agriculture in the oblast, it is necessary to develop an economic model of co-operation and development to serve interests and needs of different stakeholders in Poltavaska Oblast and in the whole country. It is necessary to ensure active co-operation of the following stakeholders:

- agricultural producers, inc. farms and their associations;
- governmental authorities;
- private consultative companies and certification entities;
- consumers’ unions;
- research facilities and NGOs.

In the course of working meetings with foreign farmers and experts, prospects of development of such a model, as well as options to address contemporary obstacles were discussed many times. Participants of these working meetings agreed that development of organic agriculture in Ukraine and establishment of necessary certification entities would require professional experts, efficient institutions and a modern legislative base, accounting for contemporary international and European trends. Therefore, it would be appropriate to apply major experience and tools of the International Federation of Organic Agriculture, the EU and leading counties in the sphere, e.g. Switzerland.

## Organic agriculture: OA development prospects in Vorokhta

Project activities in the sphere of organic agriculture (OA) focused on study of OA development conditions in Ivano-Frankivska Oblast in general and in Yaremche district in particular; implementation of information dissemination and awareness raising activities, and attracting attention of communities, farmers and local authorities to introduction of approaches that ensure resource conservation and minimise environmental pollution and degradations, including degradation of water resources.

Sheep breeding is a traditional trade in the Carpathian region. High altitude sheep breeding is a mainstream activity in the region and is closely associated with numerous local traditions. Unfortunately enough, in recent years, areas of high altitude pastures and sheep stocks continued to decrease there.

On April 20, 2005, MAMA-86-Yaremche and the Agriculture Directorate of Nadvirna district State Administration organised a seminar on “Organic Agriculture as a Component of Sustainable Development”. The seminar was attended by representatives of the oblast-level State Administration, the Seed Quality Control Facility, inspectors, representatives of the Rayon State Administration, the Oblast Sanitary and Epidemiological Facility, chairs of village councils, farmers, members of the Organic Agriculture Club, ordinary villagers and representatives of mass media outlets (47 persons in total). The seminar demonstrated that the audience was very interested in OA issues. The event facilitated discussions on state of agriculture in the rayon and prospects of OA development. The seminar participants got information on alternative cultivation techniques, new pesticide-free plant cultivation technologies, results of implementation of the oblast-level Program for Allocation of Pesticide-free Agricultural Zones, problems of high altitude sheep breeding, etc. In addition, a video-documentary was demonstrated at the seminar — “Agrotechniques of Natural Land Use”.

At the base of results of the seminar, MAMA-86-Yaremche developed proposals for the Directorate General for Agriculture and Food of Ivano-Frankivska Oblast State Administration. The NGO proposed:

- to incorporate agricultural lands of Nadvirne rayon to the list of pesticide-free zones;
- to stipulate finance allocations for implementation of the Program;
- to develop a system of incentives, including subsidies and development of markets for sale of environmentally clean products of farming facilities;
- to develop a system of OA trainings for farmers (inc. seminars, roundtables, etc.);
- to disseminate information on advantages of organic agricultural products among a broad range of consumers, by involvement of mass media, distribution of printed materials, etc.

Besides that, accounting for the trend of decreasing areas of high altitude pastures and sheep stocks, these proposals included the following specific provisions:

- the need to establish a sectoral facility (e.g. a department or a directorate for agriculture and food) at the level of Yaremche State Administration, as the Administration controls high altitude sheep breeding facilities. Alternatively, these facilities may be regulated by relevant entities of the neighbouring Nadvirne rayon,
- working meetings with people, who lease high altitude pastures in order to discuss their social protection problems (private business activities, taxation, work records, pension benefits, etc.).

The seminar allowed to develop contacts between farmers, individual owners of high altitude pastures and authorities on the one hand, and between farmers, the Organic Agriculture Club, governmental bodies and the general public. These contacts may promote their further co-operation.

In September 2005, MAMA-86-Yaremche received the official response of the first deputy Chief of the Directorate General for Agroindustrial Development to the public proposals submitted. According to the official response, in 1999 to 2003, soil samples from all farms of the oblast were analysed and special zones (based on their agricultural and environmental quality) were allocated for production of agricultural products that meet medical and biological requirements to healthy and children's food. As at 2003, according to conclusions of the commission of representatives of the oblast-level units of the Ministry of Agricultural Policy, the Ministry of Health Protection, the Ministry of Environment and the State Committee of Ukraine for Land Resources, 69 farming facilities of the oblast were granted status of special agricultural zones. Agricultural lands of Nadvirna rayon were not incorporated into the list of special zones, as they did not meet requirements to such zones — both in terms of their environmental quality and in terms of unfavourable locations (they are located far away from industrial facilities and highways with intensive road traffic).

At the same time, the NGO got information, that the Program for Development of Sheep Breeding for 2003—2010 was developed in Ivano-Frankivska Oblast to promote sheep breeding development in the Carpathian region. The document stipulates state subsidies (UAH 50 per 1 sheep over 1 year).

After the official response, information activities of MAMA-86-Yaremche focused on monitoring of existing OA programs and awareness raising of farmers and members of the general public in the sphere of organic agriculture. In addition to 2 articles in local newspapers, two information leaflets were published: “Ecotelephone Informs: Sheep Breeding as an Element of Rural Green Tourism” and “The Oblast Program to Support Sheep Breeding” (20 copies each).

## Annex 1

### The list of information and awareness raising materials, published in the framework of MATRA project in 2003—2006

Types of publications	Publications	Years of publication	No. of copies
<b>Kyiv</b>			
Report	Cooperation for sustainable rural development: drinking water, ecosanitation and organic agriculture (Ukrainian)	2006	600
Report	Cooperation for sustainable rural development: drinking water, ecosanitation and organic agriculture (Russian)	2006	500
Report	Cooperation for sustainable rural development: drinking water, ecosanitation and organic agriculture (English)	2006	300
Magazine	EcoMAMA № 4	2006	1,000
Booklet	Dry urine-diverting toilet — Principles, Operation and Construction(Ukrainian)	2006	500
Booklet	Eco-sanitation as a New Approach to Address Wastewater Management Problems in Ukraine	2006	2,500
Booklet	Attention: OPs!!!	2006	1,000
Leaflet	The Global Water Day 2006	2006	150
Leaflet	Water-related Diseases in Ukraine	2006	150
Leaflet	Dry Urine-diverting toilets	2006	100
Leaflet	Eco-sanitation. What and How?	2006	100
Poster	Water Bodies of Ukraine	2005	10,000
Leaflet	The International Day of Water Monitoring — October 18	2005	15
Leaflet	Occupational Safety in the Course of Water Monitoring	2005	15
Leaflet	Water Monitoring Manual	2005	15
Leaflet	March 22 — the Global Water Day	2005	100
Leaflet	On the Global Water Day	2005	100
Leaflet	State of Water Resources: Global and Ukrainian Situation	2005	100
Leaflet	Millennium Development Goals: Ukraine	2005	100
Leaflet	Dakar Declaration	2005	100
Leaflet	Dakar Declaration: Actions and Commitments	2005	100
Report	Models of the Technical Solutions of Drinking Water Problems in the Urban and Rural Areas of Ukraine	2004	1,000
CD	Eco-sanitation in Ukraine	2004	10
Leaflet	The Water Day 2004	2004	100
Leaflet	Water and Disasters	2004	100
<b>Poltava</b>			
Booklet	Practical Recommendations on Organisation of Organic Agriculture and Modern Resource Conservation Techniques	2006	100
Booklet	Household Waste and Our Health	2005	600

Booklet	How to Protect Your Family from Adverse Effects of Nitrates	2005	1,200
Booklet	Eco-toilets: What and How?	2005	200
Booklet	Fluorine	2005	165
Booklet	Attention: Fluorine in Water	2004	165
Booklet	Attention: Pesticides	2004	300
Booklet	Attention: Fluorine in Water	2004	50
Booklet	Composting: a Simple and Efficient Option	2004	50
Booklet	Pesticides! Your Health is in Danger	2004	50
Booklet	Healing Plants	2004	50
<b>Nizhyn</b>			
Booklet	How to pass to organic agriculture		1,000
Booklet	Instructions on ecologically clean potato cultivation by an organic method		1,000
Booklet	Economic options of organic agriculture implementation and development in Nizhyn District, Chernigov Oblast		1,000
Booklet	Treat Land with Love	2005	300
Booklet	Nizhin Cucumbers: Our Treasure	2005	300
Brochure	Prospects of Organic Agriculture in Ukraine	2004	1,000
Brochure	Potatoes as Alternative Bread	2004	1,000
Brochure	Hygiene for Girls	2004	1,000
<b>Yaremche</b>			
Booklet	Eco-sanitation and Its Advantages	2006	1,000
Booklet	Everyday Hygiene	2006	1,000
Brochure	Clean Rivers for Healthy Environment	2005	1,000
Brochure	Let Us Save Water — the Cradle of all Living Things on the Earth	2005	1,000
Brochure	How to Make Safe Drinking Water	2005	1,000
Brochure	Microorganisms: Safe Drinking Water at Home	2004	1,000
Brochure	Groundwater Protection	2004	1,000
Brochure	Iodine in Nature and in Water	2004	1,000
Brochure	Composting: a Simple and Efficient Option	2004	1,000



## Annex 2

### Tools and materials for construction of an eco-toilet (based on experience of “MAMA-86-Yaremche”)

**Table 1. Tools and materials for construction of a seat toilet from cement and sand.**

*According to materials provided by Stefan Deegener (a WECF expert).*

*App. costs: UAH 50 in 2005 prices.*

Materials	Units of measure	Units
Modelling clay	pack	1
Spatula	piece	1
abrasive paper 800—1000	piece	3
Plastic/metal pipe (Ø20 mm)	m	0.3
Paint (on oil-basis)	l	0.5
Paint-brush	piece	1
Hammer	piece	1
Bucket	piece	1
Cement M-500	l	8
Sand	l	10
Wire mesh 12*20 cm	piece	1
Soap	piece	1
Rag	piece	1

**Table 2. Tools and materials for construction of an eco-toilet with application of a self-aligning mixture.**

*A higher strength design. Designed by Roman Kudrin.*

*App. costs: UAH 94 in 2005 prices.*

Materials	Units	Costs (UAH)
Self-aligning mixture	25 kg	48.00
Sodium silicate solution	0.5 l	7.00
Machine oil	200 g	2.00
Abrasive paper 800—1000	8 pieces	16.00
Paint (on oil basis)	0.5 l	8.00
Wire mesh	10*12 cm	1.00
Metal-plastic pipe (Ø20 mm)	30 cm	4.00
Paint brush	2 pieces	4.00
Modelling clay	1 pack	3.00

The following tools are necessary for construction of a timber eco-toilet:

1. Petrol fuelled jig-saw
2. Electric fretsaw
3. Electric drilling machine
4. Electric screwdriver
5. Disk saw
6. Axe
7. Concrete mixer

**Table 3. A tentative list of materials necessary for construction of a timber eco-toilet (1.60 m \* 1.60 m., costs in 2005 prices).**

No.	Materials	Units	Costs (UAH)
1.	Bricks M-100	300 bricks	162.00
2.	Crushed stone + gravel	1m <sup>3</sup>	30.00
3.	Beams	4*(120*100*6000 mm)	100.00
4.	Sand	150 kg	24.00
5.	Cement M-500	3 bags * 50 kg	66.00
6.	Toilet lid	1 piece	22.00
7.	Scoop for wooden chips	1 piece	3.00
8.	Modelling clay	3 packs	6.00
9.	Spatula	1 piece	2.50
10.	Abrasive paper	6 pieces	6.00
11.	Ring Ø40—20 mm	1 piece	1.00
12.	Corrugated hose Ø40 mm	2 m	16.00
13.	Pencil	2 pieces	0.50
14.	Linoleum	4.8 m <sup>2</sup>	115.20
15.	Toilet brush	1 piece	6.00
16.	Glass washing surfactant	1 piece	7.80
17.	T-joint Ø50 mm	1 piece	3.00
18.	Pipe Ø50 mm	2 pieces (1 m each)	10.40
19.	Bend 90°, Ø50 mm	3 pieces	5.70
20.	Adapter Ø50/40 mm	2 pieces	2.40
21.	Pipe Ø50 mm	2 pieces (0.5 each)	7.00
22.	Paste for sewer pipes	1 tube	10.90
23.	Pipe Ø20 mm	1m	8.50
24.	Wood screws 15 mm	100 pieces	6.00
25.	Nails (70 mm, 100 mm, 200 mm)	3 kg	16.50
26.	Oil-based paint	0.5 kg	8.50
27.	Paint brush, 90 mm	1 piece	2.60
28.	Paint brush, 40 mm	1 piece	1.30
29.	Plastic bucket with lid	1 piece	8.90
30.	Door closer	2 pieces	6.60

31.	Galvanised steel sheets	4.36 m <sup>2</sup>	170.04
32.	Urinal	1 piece	95.00
33.	White spirit	0.5 l	3.20
34.	Timber ceilings	13 m <sup>2</sup>	234.00
35.	Butterfly screws for steel, 25 mm	50 pieces	17.50
36.	Canister (20 l)	1 piece	20.00
37.	Door handle	1 piece	7.00
38.	Insulation material	6 m	13.50
39.	Polypropylene pipe Ø100 mm	3 m	29.00
40.	Pipe cap Ø100 mm	1 piece	20.00
41.	Ring Ø50 mm	3 pieces	9.00
42.	Wire mesh	6 m	5.90
43.	Sealant	1 piece	11.50
44.	Screwdriver holder for butterfly screws	1 piece	10.00
45.	Peg	1 piece	1.00
46.	Abrasive wheels	2 pieces	12.00
47.	Drills	2 pieces	6.00
48.	Plugs	3 pieces	0.36
49.	Plugs	4 pieces	0.80
50.	Bend Ø50 mm	2 pieces	7.00
51.	T-joint Ø50 mm	1 piece	4.00
52.	Wide scotch-tape	1 piece	6.00
53.	Butterfly screws, 10 mm	100 pieces	5.00
54.	Pipe ring Ø20 mm	1 piece	1.00
	<b>Total materials:</b>		<b>UAH 1,355.10</b>

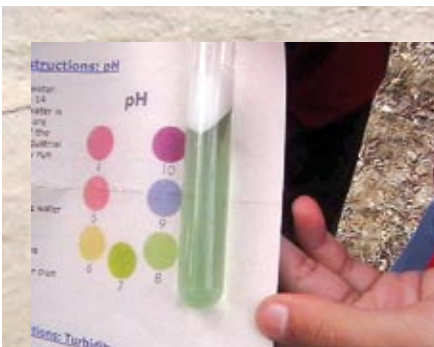


## Annex 3

**Photo 1—5.**  
**Rehabilitation of water supply in Vorokhta township, Ivano-Frankivska oblast**



**Photo 6—7.**  
**Children participation in the World Water resources Monitoring Day  
 in Yaremche, Ivano-Frankivska oblast**



**Photo 8.1—8.4.**  
**Building the ecosan-toilets in Vorokhta township,**  
**Ivano-Frankivska oblast**



**Photo 9.**  
**Making the ecosan sit**  
**equipment**





**Photo 10—12.**  
**Ecosan-toilet in Bobryk,**  
**Chernigivska oblast**



**Photo 13.**  
**New potatoes**  
**seeds presentation**  
**for the farmers**  
**from Bobryk and**  
**Vertijivka villages,**  
**Chernigivska oblast**



**Photo 14.**  
**Technical water well before the rehabilitation in v. Bobryk, Chernigivska oblast**



**Photo 15.**  
**Drinking water well reconstruction in v. Bobryk, Chernigivska oblast**





**Photo 16.**  
**Research of**  
**phytosanitary**  
**quality of potato**  
**plants in village**  
**Bobryk**



**Photo 17.**  
**Training at the OA Center in v. Bobryk, Chernigivska oblast**

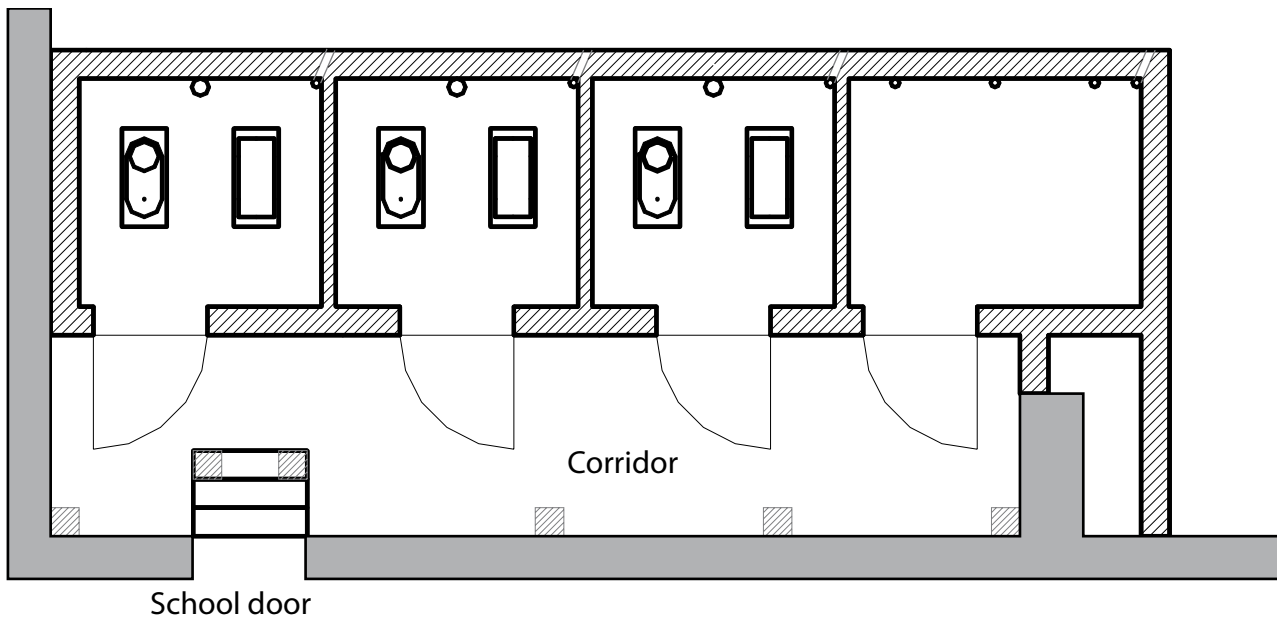


**Photo 18.**  
**Old school pit latrine in v. Gozhuly Poltavsky rayon**

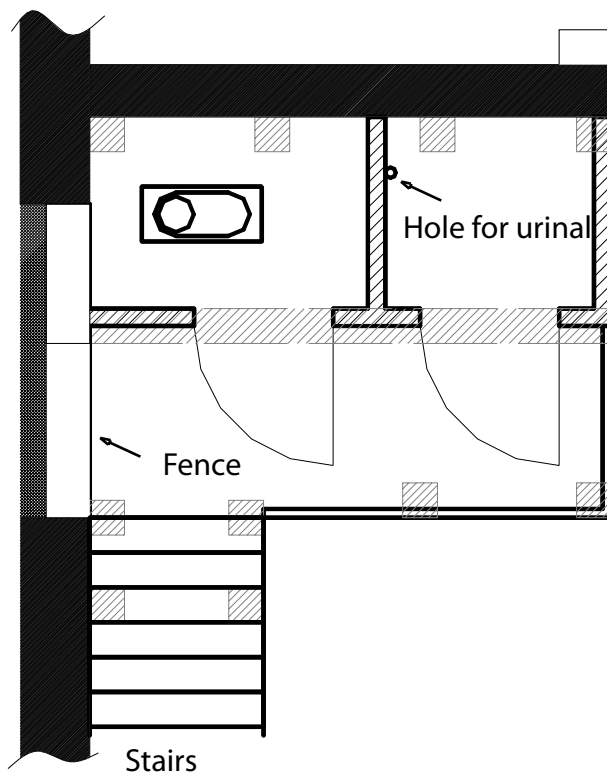


**Photo 19.**  
**New school ecosan-toilet in v. Gozhuly Poltavsky rayon (outside and inside views)**

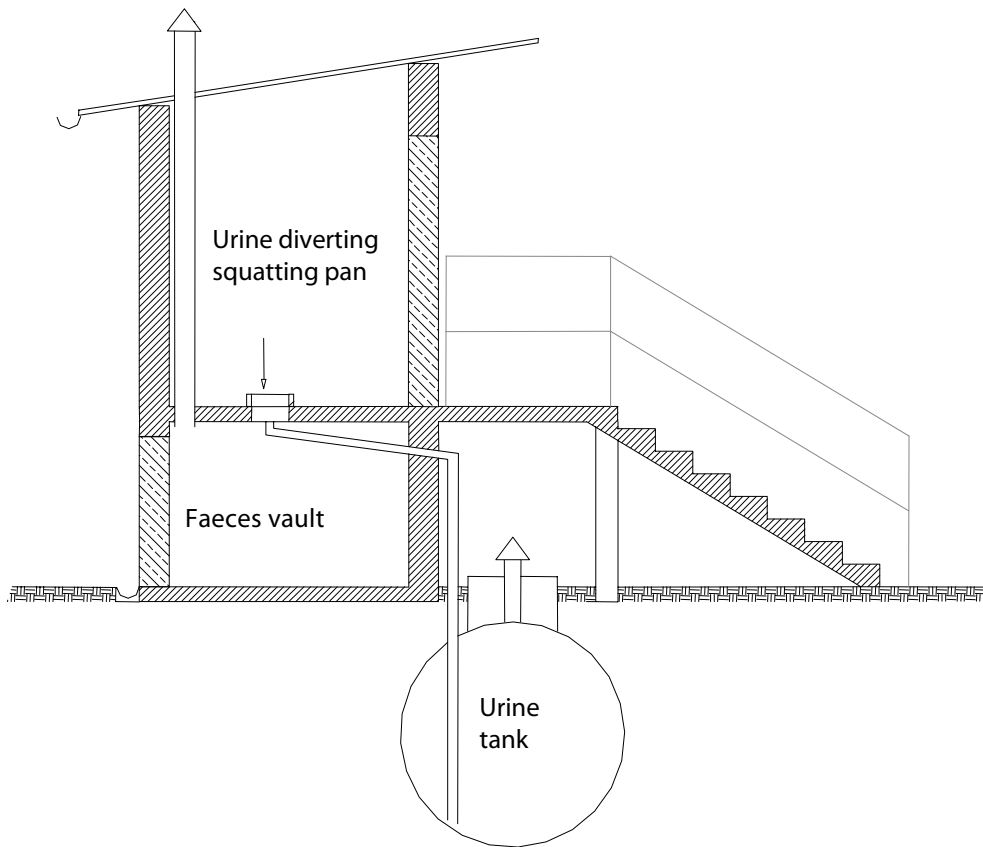




**Figure 1.**  
**Sketch of ecosan toilet for school in v. Gozhuly Poltavsky rayon**  
**(view from above)**



**Figure 2.**  
**Sketch of ecosan toilet for school in v. Bobryk, Chernigivska oblast**  
**(view from above)**



**Figure 3.**  
**Sketch of individual ecosan toilet (side view)**