Water Quality Protection in Polish Agriculture

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WATER QUALITY PROTECTION IN POLISH AGRICULTURE

Background

The Poland Agriculture and Water Quality Protection Project (PAWQP) is a four-year effort to address agricultural water pollution issues through a multi-focus approach. The overall goal of the project is to create a social, economic and political climate that will encourage both the recognition of agricultural-related water quality issues and the development of solutions. This project addresses these issues through multi-level education efforts, assistance in policy development, and demonstration of sustainable farming and waste management practices in selected watersheds in northeastern and northwestern Poland. Poor water quality resulting from agriculture and rural waste management practices presents a substantial risk to human and ecological health throughout Poland and in the neighboring Baltic Sea.

The PAWQP project is a cooperative effort between the U.S. Environmental Protection Agency and the Polish Ministry of Agriculture and Food Economy. The project is being implemented by the Center for Agricultural and Rural Development (CARD) at Iowa State University in Ames and the Institute for Land Reclamation and Grassland Farming (IMUZ) at Falenty.

Project activities are focused on three related levels for the overall goal of a social, economic, and political climate that encourages the development of agricultural water quality problems solutions:

1. Demonstration of economically and environmentally sustainable agricultural practices, to encourage farmers, ODRs, local officials, schools, and other agricultural professionals to adopt practices for rural areas.

2. Education and dissemination to the public, farmers, future farmers, governmental and non-governmental institutions and agricultural and environmental professionals in order to extend demonstration area results broadly throughout Poland.

3. Institutionalization and policy development program establishment in central and regional governmental institutions, addressing agro-environmental issues and bridging institutional between the agricultural and environmental research, and regulatory communities. The end result should be a strong, broadly based foundation supporting the sustainable agriculture development in Poland.

Introduction

Approximately 38 percent of the Polish population live in rural areas. The agricultural sector provides 25 percent of the employment and utilizes about 65 percent of the nation's land area. Thus, agriculture and related activities have a direct impact on much of the human population and ecological infrastructure of Poland. Poor agricultural and rural waste management practices contribute significantly to the degradation of surface and ground water quality, and affect urban populations who depend on these sources for drinking water. The connection between agricultural activities and water quality is especially apparent in Poland where sandy soils characterize many of the major agricultural areas. Nearly 100 percent of Poland lies within the Baltic Basin, so the effects of poor agricultural practices extend beyond Poland's borders and affect much of northern Europe through contamination of the Baltic Sea.

Studies have shown that:

- Polish agricultural production nitrogen losses exceed 1 million tons per year. Ground water and surface water receive about 30 percent of the losses and another 40 percent is lost to the atmosphere through ammonia volatilization.
- The nitrate concentrations in about 60 percent of rural wells exceed Polish and European Union standards.
- Depending on the estimation method used, Polish agriculture contributes 50 to 80 percent of the nitrogen and 20 to 50 percent of the phosphorus loading in the Baltic Sea.
- Ninety percent of the nitrate pollution in groundwater derives from agricultural sources.

Commercial fertilizer consumption has declined since 1990, and reached the lowest values in 1993 (Table 1), but in some regions with good agricultural production traditions, the use of commercial fertilizers and livestock density have remained level or increased. Therefore, the nitrogen surplus is still fairly high and can be illustrated by the nitrogen balance on selected farms (Table 2). On the first farm the primary products are wheat and sugar beets; low livestock density requires a commercial fertilizer higher use and, as a result, a higher nitrogen surplus. The second farm is a pig operation. Fodder imported from outside are main sources of nutrients, not commercial fertilizers, and the nitrogen surplus is obviously high. The single product on the third farm is milk; recycling of nutrients on the farm is good and the nitrogen surplus is moderate.

Table 1. Balance of nitrogen, phosphorus and potassium in Polish agriculture, 1993

Balance component	Nitrogen kg N/ha	Phosphorus kg P/ha	Potassium kg K/ha
Total inputs	**74.8**	**6.3**	**14.3**
Commercial fertilizers	36.6	5.2	14.3
Imported fodder	6.4	1.1	1.3
Microbiological fixation	16.4	-	-
Atmospheric precipitation	17.0	-	-
Outputs	**10.7**	**1.97**	**3.44**
Plant products	6.95	1.18	3.44
Small grain	3.95	1.18	2.72
Potatoes	0.29	0.04	0.29
Sugar beets	1.74	0.23	1.17
Rapeseed	0.85	0.19	0.26
Fruits and vegetables	0.11	0.01	0.13
Animal products	3.78	0.79	0.72
Meat	1.82	0.42	0.17
Milk	1.93	0.37	0.55
Eggs	0.03	0.003	0.002
Surplus	**64.1**	**4.3**	**10.9**

The main agricultural source of water and atmospheric pollution in Poland is improper animal waste storage and handling. The slurry system was abandoned with the disappearance of state-owned farms. Now, the main system for storing livestock waste is the farmyard manure-urine system. Farmyard manure is typically stored directly on the ground, and the manure water seeps into the soil or runs off to the nearest drainage ditch or stream. However, the most dangerous animal waste is urine, which contains more than 50 percent of the nitrogen and almost 100 percent of the potassium excreted by livestock. Urine storage contributes to ammonia emission and urine containers in general are small capacity amd not tight enough. Frequent disposal of urine, often on frozen or snow-covered soil, causes excessive ammonia emission.

Project Activities

Education

The educational component of the project is centered on training farmers and extension service advisors and also on educating future farmers through the development of primary and secondary school curricula that focus on agriculture and water quality issues. Special education activities are implemented each year through organized on-farm field days that farmers, local officials, and representatives of other agricultural organizations attend.

Demonstration Farms

Prior to initiation of on-farm activities, a survey was conducted in selected target areas to establish a social, economic, agricultural, and environmental baseline. A parallel analysis of drinking water quality was performed on a broader area. Based on these surveys, five demonstration watersheds in northeast and northwest Poland were selected to reflect the diversity of conditions that characterize Polish agriculture. Each watershed contains from 40 to 100 farms; 2 to 4 were selected as demonstration farms. These sustainable technologies and land management practices are demonstrated on the farms:

- manure storage and handling
- domestic waste water management
- integrated fertilizer application methods
- integrated pasture management
- introduction of legume crops as nitrogen sources
- introduction of clover into grasslands
- no-tillage permanent grassland renovation
- cover cropping

- strip intercropping

On each demonstration farm, a nutrient balance is calculated and a soil as well as water monitoring system was established. This system was designed from both watershed level and farm level perspectives. The main aim of this monitoring is to obtain date ilustrating the water quality changes from introduced demonstrations. Such data are useful in education activities. The established monitoring covers:

- soil analysis for mineral nitrogen content in samples taken before and after the vegetative season,
- water analysis of samples taken each month from farm well drinking water,
- groundwater from below most demonstrations and from below the farmyards (near manure pads or barns),
- water from drainage ditches and streams,
- water from catchment outlets, and
- dry and wet precipitation from 9 points at demonstration sites.

Construction of Manure Pads and Urine Tanks

On 23 farms in demonstration watersheds, manure pads and urine tanks were constructed. The construction materials (cement, steel, wood, etc.) were bought from program funds when the labor was done by farmers. The Voivodship Fund for Environmental Protection and Water Management in. Ostroêka has sponsored 18 construction projects. Other farmers in the vicinity are now very much interested in construction on similar terms.

Drinking Water Quality

About 70 percent of the rural population uses well water from the farmyard area. Most of these wells are hand dug with a water table of 1 to 8 meters. In many cases, the wells are unprotected and exposed to contamination. The analysis of farm wells drinking water was used as an educational activity, so the farmers were involved in the sampling activity. the farmers were involved in the farmers. Each sample was analyzed for pH, nitrate, ammonia, phosphorus, chloride, sulfate, sodium, potassium, magnesium and calcium. Microbiological contamination was not analyzed.

Of the more than 1,500 samples analyzed, most wells were contaminated with nitrate, and in more than 50 percent, the nitrate concentrations were higher than the Polish standard for drinking water (10 mg NO_3-N/dm^3). In several cases, concentrations higher than 100 mg NO_3-N/dm^3 were found. The mean concentration of nitrate in all samples was as high as 22.3 mg NO_3-N/dm^3 (Table 3). Samples from the mountain area (Nowy Sacz) were generally exhibited the least contamination. Water samples from drilled wells were also contaminated with nitrates, but less frequently.

Table 3. The nitrate nitrogen concentration in samples of drinking water from farm wells

		Percent of samples in N-NO_3 concentration range				
	Samples	< 5.0	< 5.0	10.0 - 20.0	20.0 - 40.0	> 40.0
Region	Number	mg N/dm^3	mg N/dm^3	mg N/dm^3	mg N/dm^3	mg N/dm^3
Ostroêka	784	36.6	12.2	12.0	23.8	15.4
£om¿a	102	26.5	3.9	23.5	31.4	14.7
Nowy Scz	225	58.6	18.4	13.8	8.0	1.1
Szczecin	213	18.3	12.2	14.1	22.5	32.9
Total	1324	36.5	13.2	13.9	20.4	15.9

Ammonia pollution was not observed in as many samples, but in more than 7 percent the ammonia concentration was higher than the Polish standard (0.5 mg NH_4-N/dm^3) (Table 4). A special note should be made of the high concentration of phosphorus in many farm wells. While there is no Polish standard for phosphorus in drinking water, and the EU standard is a rather high 3 mg P/dm^3, phosphorus is the primary nutrient responsible for eutrophication of fresh water and the highest concentrations of phosphorus were found in the Szczecin area, particularly in the groundwater samples obtained from the farmyard and its vicinity.

Table 4. The ammonium nitrogen concentration in samples of drinking water from farm wells

		Percent of samples in $N\text{-}NH_4$ concentration range				
	Number	< 0.25	0.25-0.50	0.50-1.0	1.0-2.0	> 2.0
Region	of samples	mg N/dm^3	mg N/dm^3	mg N/dm^3	mg N/dm^3	mg N/dm^3
Ostroêka	784	73.7	10.0	9.2	3.9	3.2
£om¿a	102	75.5	12.7	3.9	4.9	2.9
Nowy Scz	225	98.9	1.1			
Szczecin	213	80.8	4.2	6.1	1.4	7.5
Total	1324	79.4	7.6	6.5	2.8	3.7

Potassium concentrations in most unpolluted groundwater in Poland do not exceed 5 mg K/dm^3 (Table 5). Thus, the concentrations found in the analyzed samples indicate that most wells are contaminated with potassium. The concentration of potassium was, in most cases, higher than that of sodium. This proportion was also maintained in the atomic ratio, indicating that the primary source of pollution in the sampled wells was animal wastes and a secondary source was domestic waste water. Chloride concentrations in most samples were also much higher than that typically observed in unpolluted groundwater.

Table 5. The potassium concentration in samples of drinking water from farm wells

		Percent of samples in K concentration range				
Region	Number	< 12.5	12.5-25	25-50	50-100	> 100
	of samples	mg K/dm^3	mg K/dm^3	mg K/dm^3	mg K/dm^3	mg K/dm^3
Ostrolêka	784	42.1	12.9	13.3	17.1	14.6
£omza	102	36.3	17.6	15.7	24.5	5.9
Nowy Scz	225	90.8	3.4	5.7		
Szczecin	213	9.4	8.5	7.0	11.3	63.8
Total	1324	39.1	11.8	11.8	153	22.0

Soil and Groundwater Analysis

Analyses showed that the groundwater was polluted with nutrients. With the exception of chlorides and sulfates, this pollution was considerably higher in the early spring, a result of intensive nutrient leaching during the winter. The magnitude of the contamination depended on the time of year and suggests the important role of the soil water regime in the nutrient leaching processes (Table 6). Some groundwater acidification was also observed, particularly on organic soil areas.

The application of 120 kg N/ha, in the form of ammonium nitrate, on meadows and pastures did not result in the groundwater contamination of nitrate levels above the Polish drinking water standard (Tables 6 and 7). The same situation was observed in groundwater below pasture with introduced clover (Table 7). However, the concentration of N-NO3 was observed exceeding the Polish standard during the winter and early spring (Table 7). Nitrate groundwater pollution was also observed below the pastures after sward renovation. Concentrations of N-NH4 exceeding the Polish standard were found of groundwater in organic soils (Table 6).

In pasture and fertilizer demonstrations, the nitrate nitrogen amount not used by plants and easy leached, was approximately 54.0 kg N/ha on farm No. 1 in the winter and 47.5 kg N/ha in the spring. On farm No. 2, these amounts were 60.5 kg N/ha and 46.5 kg N/ha. Therefore, the amount of leached nitrate was 6.5 kg N/ha from the weakly acidic soil on farm No. 1 (Table 6) and 14.0 kg N/ha from the strongly acidic soil on farm No. 2 (Table 7). The strongly acidic soil is enriched by ammonium nitrogen fixed with sorption complex (Table 7).

Table 6. Nutrient content in soil and water samples from a demonstration farm No. 1 on Szafranki watershed

		Soil				Water			
Kind of demonstration	Sampling date	C_{org} %	pH	$N\text{-}NO_3$ kg/ha	$N\text{-}NH_4$ kg/ha	$N\text{-}NO_3$ mg/dm^3	$N\text{-}NH_4$ mg/dm^3	P mg/dm^3	K mg/dm^3
Meadow fertilization (NPK)	10.93	21.2	5.4	67	4	1.5	0.04	0.06	3.5
	03.94		6.2	54	24	0.3	1.70	0.15	8.7
	11.94		6.5	51	5	1.2	0.03	0.01	2.7
Pasture fertilization (NPK)	10.93	5.5	6.2	64	3	3.4	0.01	0.05	9.9
	03.94		5.9	41	2	0.1	1.90	4.60	18.5
	11.94		6.0	34	6	2.2	0.06	0.02	7.1
Manure pad	10.93			4	127	0.43	13.8	0.17	241
	03.94					0.11	6.5	0.13	115
	11.94					65.9	0.07	0.54	307
Farm well	10.93	2.0	6.7	15	1				
	03.94		4.4	40	5	33.3	0.09	0.04	11.4
	11.94		6.9	15	3	44.8	0.05	0.02	21.6
Farmyard by barn	10.93	2.7	6.5	41	2				
	03.94		5.3	29	1	3.5	0.35	0.02	4.6
	11.94		5.7	10	4	3.2	0.04	0.01	23.7
Polish standard for drinking water				10.0	0.5				

There is some suggestion that the primary source of groundwater pollution is the farmyard. The chemical analysis of water samples taken from plastic tube monitoring wells installed in the vicinity of a manure storage pile, and/or barns, and as the analysis of samples of drinking water from farm wells confirm this assumption (Tables 6 and 7).

Table 7. Nutrient content in soil and water samples from a demonstration farm on Lady watershed

		Soil				Water			
Kind of demonstration	Sampling date	C_{org} %	pH	N-NO_3 kg/ha	N-NH_4 kg/ha	N-NO_3 mg/dm^3	N-NH_4 mg/dm^3	P mg/dm^3	K mg/dm^3
Pasture fertilization (NPK)	10.93	2.4	3.3	57	6	1.7	0.1	0.07	3.8
	03.94		3.8	40	14	12.0	0.2	0.01	3.6
	11.94		4.4	48	11	6.1	0.1	0.09	4.6
Pasture (introducing clover)	10.93	2.7	3.9	72	15	0.7	0.1	0.04	2.8
	03.94		3.7	53	14	6.3	0.2	0.01	1.1
	11.94		5.6	65	9	4.3	0.1	0.06	2.5
Manure pad	10.93			14	200	40.2	0.2	0.76	45.7
	03.94					164.0	0.4	0.12	131.0
	11.94					100.0	0.1	0.30	77.8
Farm well	10.93	1.4	6.5	11	1				
	03.94		7.0	27	2	4.8	0.1	0.01	4.5
	11.94		7.1	24	4	41.2	0.1	0.69.	132.0
Farmyard	10.93	2.0	7.0	20	1				
by barn	03.94		7.2	32	1	2.4	2.0	2.20	
	11.94		7.1	29	3	30.1	0.1	0.24	
Polish standard for drinking water				10.0	0.5				

During the winter and early spring, the concentrations of N-NO^3 in the water samples collected near the manure pad were more than 10 times the standard (Table 7). Groundwater can be polluted with N-NH_4 if conditions are unfavorable for the oxidation process and favorable to denitrification (Table 6). In such cases, the amount of ammonium nitrogen is very high (more than 200 kg N-NH_4/kg) in the soils beside the manure storage pile (Tables 6, 7, and 8). This nitrogen pool can undergo the nitrification process and nitrate—the product of oxidation—can subsequently be leached into the groundwater. Nitrate may also be lost from a farm and dispersed in the environment due to the denitrification process. Improper methods of animal waste storage and management are probably the main cause of frequently observed high nitrate concentrations in farm well drinking water (Tables 6 and 7). This is also a principal cause of potassium, chloride and phosphorus water pollution with which accompanies nitrate water pollution (Table 6, 7).

Table 8. Nitrate and ammonium content in soil profile in the vicinity of the manure storage pile

	Farm No. 2 23.03.93 Lady watershed		Farm No. 4 08.06.93 Rupin watershed		Farm No.6 08.06.93 Lady watershed	
Soil layer [cm]	$N\text{-}NO_3$ mg/dm^3	$N\text{-}NH_4$ mg/dm^3	$N\text{-}NO_3$ mg/dm^3	$N\text{-}NH_4$ mg/dm^3	$N\text{-}NO_3$ mg/dm^3	$N\text{-}NH_4$ mg/dm^3
0-20	14	200	64	15	170	0.1
20-40	15	119	33	32	240	2
40-60	4	76	17	30	188	1
60-80	3	41	3	23	71	8
80-100	12	3	2	15	40	18
100-120	20	1	2	14	13	25
120-140	6	46	2	12	13	5
140-160	15	1	27	0.1	7	8
160-180	15	1	27	0.1	5	6
180-200	-	-	-	-	5	4

Relationship Between Nitrate Content in Soil and Nitrate Concentration in Groundwater

It can be expected that an increase of the nitrate content in soil will be followed by greater nitrate leaching and, therefore, concentration in groundwater. However, such a correlation was not found in soil and water samples taken at the same time. The correlation between nitrate content in soil samples taken in autumnand nitrate concentration in groundwater samples taken two to four months later (Table 9). The relation between nitrate concentration in groundwater on subsequent sampling dates is demonstrated by a high value of the correlation coefficient for adjacent months.

Table 9. Correlation coefficients for nitrate concentration in the soil and groundwater

n = 54	G-10-93	W-11-93	W-12-93	W-01-94	W-02-94
G-10-93					
W-11-93					
W-12-93	0.29*				
W-01-94	0.40**		0.67**		
W-02-94				0.51**	
W-03-94				0.61**	0.84**

n = 57	G-10-94	W-11-94	W-12-94	W-01-95	W-02-95
G-10-94					
W-11-94					
W-12-94		0.65**			
W-01-95		0.40*	0.67**		
W-02-95	0.43**			0.72**	
W-03-95			0.55**	0.85**	0.78**

Notes: G - soil, W - groundwater 10-93........03-95 - sampling date

* α =0.05, ** α = 0.01,

Project Development

Because it is important to generate public support for clean water, and because the rural public has a major impact on water quality through their household practices, a program is being implemented to provide information and describe simple solutions for environmental problems connected with agricultural operations and rural households. A series of general information leaflets patterned after those available at U.S. Agricultural Extension Offices, will be prepared for use by the ODRs (Ocerodki Doradztwa Rolniczego—Agriculture Advisory Center) and local NGOs in the Pilot Voivodships. The leaflets will accommodate the Polish conditions, and will be modified when necessary tp reflect information developed through the project.

The PAWQP project team will also work with an environmental NGO in organizing and piloting a training program for local community leaders. It will demonstrate the benefits of merging advanced agriculture science and practice with enlightened and well-trained local community leadership to establish a sustainable basis to solve agriculture and water quality problems and to support long-term economic and social development.

The ultimate audience for technical education is current and future farmers who must implement a sustainable practices program. In order to maximize the effectiveness of project resources, we are focusing our efforts on "training the trainers"—ODR farm advisors and high school agricultural teachers. Under the direction of CARD and IMUZ, and in cooperation with the Ministry of Agriculture's teachers and ODR training centers, a number of institutions will cooperatively to develop an intensive education program to be held in demonstration ODRs. This program will be aimed at the ODR field advisors and agricultural technical high school teachers and will provide information on project activities and results and on sustainable practices that can be implemented by the general farm population. Materials are being developed for specific agricultural activities with high environmental risk potential, such as manure storage and management.

The final goal of the PAWQP project is to promote institutional innovation and policy changes that result in long-term commitments to sustainable agriculture and improved water quality in Poland. These initiatives will contribute to a new policy in Poland to continue the activities initiated by the PAWQP project.

Measuring project effectiveness is important in insuring the long-term viability of project activities; it demonstrates to donor organizations that their resources are well spent. Therefore, a second survey will be done in the demonstration areas to measure changes in farm and household practices, attitudes, and environmental awareness. The survey will provide information similar to the baseline survey and will allow comparisons to gauge the effectiveness of the project approach and activities in the demonstration areas. It will be a real-time measure of project effectiveness that may be environmentally reflected after a much longer period of time.

Long-term sustainability of the PAWQP project goals and activities will depend on successful assimilation into ongoing Polish institution activities. Consequently, CARD and IMUZ are negotiating with the Ministry of Agriculture and ORDs in the demonstration voivodship to assume responsibility for the project demonstration activities.

Project Evaluation

Program success will be measured by:

1. Analysis of monitoring and survey data to confirm demonstrated practices, adoption of practices by farmers, and changes in farmers' attitudes have improved water quality.

2. Program acceptance by local officials, indicated by their financial participation in expanding the project.

3. Educational programs and materials adopted by agricultural high schools and ODRs.

4. Evidence of increased cooperation among a wide range of governmental and non-governmental organizations at the national, regional and local levels.

5. Adoption of goals, methods and strategies by other donor organizations and/or multilateral organizations substantially leveraging the U.S. contribution.

6. The Ministry of Agriculture and/or voivodships/ODRs sustain major project elements.

7. Active support and participation by senior officials of MOAFE and MOSZNiL in the Interministry Task Force and Sustainable Rural Development Working Group.

Accomplishments 1992–1995

To date, activities appear to have been very successful in accomplishing project goals. Some of our most important accomplishments in the first three years include:

- Establishment of environmental and sociological baseline data characterizing the demonstration watersheds and their populations. This information is a benchmark for measuring project success and also provides information on problems and potential solutions for government agencies and the agricultural community.

- Twenty demonstration farms in five watersheds. These farms display a wide range of environmentally and economically sustainable agricultural practices aimed at improving human and animal waste handling, agricultural chemical handling, and runoff and erosion control, while concurrently maintaining or improving production and profitability.

- Soil and water monitoring system on demonstration and control farms to measure changes from established practices.

- Field days in years 1992, 1993 and 1994 on demonstration farms. They were extremely well attended by farmers, local and national officials, international guests and the media. Field days have proved to be an effective communication and education tool and have resulted in numerous farmers requesting technical assistance to adopt many of the demonstrated practices.

- Technical assistance, at no additional project cost, provided to several additional voivodships who wished to introduce sustainable technologies and practices.

- Financial commitments from Polish local and national government organizations. These funds are being used to enhance existing demonstrations and expand the demonstration activities to other areas in Poland. We have been invited to submit a proposal for funding by the National Environmental Fund.

- Iinitiation of a funded project expansion in the Raba River watershed in the Krakow Voivodship at the request of the voivodship government. This project aims to improve water quality in the Krakow water supply reservoir by introducing sustainable agricultural practices among the many small farms in its catchment area. Initial work has involved enumeration of the Poland Baseline Survey modified for Krakow conditions. Based on the results of this survey, we are working with local officials to establish demonstration farms and an educational program.

- A number of papers, reports, and seminars detailing project efforts and the results of investigations conducted under the project. These papers and reports have been presented by project staff and published in a variety of forums in the U.S. and Europe, serving to broaden the applicability of the project within Central and Eastern Europe. Interested individuals may obtain copies of these reports by contacting the project management.

Final Year Activities 1995-1996

The final year will focus on education and dissemination of project activities for the long term. The following activities will be highlighted:

- We will work with governmental and non-governmental organizations and educational institutions to develop educational modules that incorporate project findings and goals with respect to Polish agricultural problems and sustainable solutions for public educators, ODR advisors and the agricultural community.

- We will establish a working group to coordinate activities between the Ministries of Environment and Agriculture, and another to assist the Ministry of Agriculture in developing the capacity to address agro-environmental issues.

- During this final year, we will measure project effects by repeating the baseline attitudinal surveys to determine agricultural community acceptance of the project principles and practices.

- We are planning to hold a conference in September for decision makers throughout Poland and the surrounding Baltic Basin countries. The purpose is to exchange information on sustainable agriculture and rural development among all levels of government, and highlight successful implementation efforts in the region. We have formed a conference committee and obtained initial funding. Co-sponsors will be the U.S. EPA, the U.S. AID, the Polish Ministries of Agriculture and Environmental Protection, and the Ostroleka Voivodship.

- We will coordinate with bilateral and multilateral donor organizations during the final year of the project to ensure the expansion of sustainable agricultural activities across the region.