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The Challenge of the Nitrate Directive to Acceding Countries: A Comparative Analysis of Poland, Lithuania and Slovakia

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THE CHALLENGE OF THE NITRATE DIRECTIVE TO ACCEDING COUNTRIES: A COMPARATIVE ANALYSIS OF POLAND, LITHUANIA AND SLOVAKIA

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PREFACE

The work for this study was conducted as part of the Project on Sustainable Agricultural Development in the Central and Eastern European Countries (CEESA) funded under the EU 5th Framework Programme. The Project analyzed the context and prospects for sustainable agricultural development in twelve Central and Eastern European Countries (CEECs): Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia and Ukraine. The research group was composed of researchers from universities and research institutes from these CEECs, as well as from the Humboldt University of Berlin, University of Helsinki, Wageningen University, University of Newcastle upon Tyne and the FAO Sub-Regional Office for Central and Eastern Europe, Budapest.

The CEESA Project explored how the requirements of environmental protection and nature conservation have been taken into account during both the transformation of the political and economic institutions of the CEEC agricultural sectors and the preparation for EU accession. Local case studies were conducted in each of the above-mentioned CEECs. The findings were collected and subjected to detailed scrutiny and discussion at the CEESA Policy Learning Workshops (PLWs), which were field-based workshops that took place in the Czech Republic, Bulgaria and Poland. This volume presents the results of the Polish workshop; the Czech and Bulgarian workshops are described in volumes 1 and 3, respectively.

The CEESA PLWs helped advance the creation of a pan-European research community through the exchange of knowledge and by strengthening research partnerships and networks. We are confident that the results of the three CEESA PLWs will contribute to the understanding and solving of problems that are at the interface of agriculture and the environment. We are certain that this report will find an interested readership in all related fields.

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1 INTRODUCTION

1.1 Idea and Methodology of the Policy Learning Workshops

The CEESA Project brought together researchers from Central, Eastern and Western Europe. Their specific aim was to explore how the requirements of sustainability have been incorporated in the restructuring of agriculture in the CEECs during their transition to a market economy and in their preparation for EU accession. For many of the involved researchers it was their first opportunity to participate in such a pan-European research project. The researchers came from different research backgrounds and had worked in diverse theoretical, socio-economic and organizational contexts.

Although the Project offered a common framework for analysis, different conceptions of the participants led to different interpretations. It became obvious that a common understanding of the analytical framework required intensive discourse, which could not be achieved in a short period of time. Similarly, the project participants had to cope with empirical heterogeneity. Recommendations for the restructuring of various aspects of CEE agriculture (such as irrigation, landscape management or water protection) would remain meaningless for Eastern and Western European policy-makers if the context of transition were not sufficiently appreciated. Such a context includes historical, ecological, economic, political and social aspects.

These considerations called for an innovative approach to the exchange and communication of knowledge. As a result, the idea of carrying out the Policy Learning Workshops (PLWs) was brought into the CEESA Project.

The processes of transition, accession and enlargement should ultimately actualize the concept of "Unity in Diversity". Creating a common basis will hardly be achieved if the systems and methods of the West are simply transplanted to and copied by the East. Especially in the field of environmentally sound agriculture the West cannot provide the ultimate, ready-made solutions which the East could simply implement.

What is needed for sustainability, therefore, is a twofold development. This development would draw on successful Western and Eastern examples and expertise and would fully account for specific characteristics and the diverse circumstances of Eastern European agriculture and rural areas. On the one hand, this development involves building some basic institutions that resemble those in Western Europe. On the other hand, it calls for innovative solutions that are well adapted to local circumstances and created with the participation of all affected actors. In this respect a pressing need remains for mutual learning among scientists and experts from Western and Eastern European countries.

As previously mentioned, these insights led to the idea of carrying out the PLWs as part of the CEESA research process. In a microcosm, the CEESA Project experienced the transnational exchange and mutual learning that ideally characterizes the overall process of European integration. The PLWs were carried out after a one–year research period during which the case–study authors had prepared detailed background information on the topic under investigation. Each of the PLWs was preceded by a 4–day study tour, which brought together the various CEESA teams that had investigated similar topics. These tours allowed the teams (researching, for example, irrigation, landscape management or water protection) to conduct joint fieldwork 'on the spot' in relation to the host countrys' case study. The results of the study tour were subsequently presented to the PLW convened at the same location some time later.

Each PLW involved a detailed briefing of the case study in question, a field trip to observe the problem on the ground and to meet involved actors, and the preparation of comparative information about similar problems in other CEECs. The participants of the PLWs were asked to deliberate on specific solutions to the problem they examined as well as general lessons for national and EU policies.

1.2 Analysing the Topic of Agricultural Pollution and European Accession

In the Central and Eastern European Countries (CEECs) it has been recognized for some time that intensive farming practices cause the nitrate contamination of ground and surface water sources. This especially affects the drinking–water quality in shallow wells, which are still used by most of the rural population. How has this agri–environmental problem been affected by the momentous political and economic changes of recent years? How are the policies and institutions that relate to this issue being prepared for the challenges of EU accession? Within the CEESA Project these questions have been addressed through local case studies on comparable agri–environmental problems in different countries (specifically, in this instance, Poland, Lithuania and Slovakia). The intention was to understand in some detail what was happening 'on the ground'. Subsequently, the comparison of local case studies has allowed us to distinguish between the common and specific features of the country case–study problems. Thus we are able to begin identifying underlying patterns of agri–environmental change.

As well as analysing the problems, the policy group of the CEESA Project has also sought to identify challenges raised by EU integration and the relevant legislative requirements – in this case the specific demands of the Nitrate Directive (1991). During the PLW held in Ostroleka county, Poland the results of the case–study work and the comparative analysis were presented to a group of experts and officials involved in agriculture and water-protection issues from Eastern and Western Europe. The

objective was to identify the challenges arising from transposing the Nitrate Directive and the wider lessons for agri-environmental policy in the acceding countries.

1.3 Layout of the Report

The next two sections present a detailed description of the Polish case study of nitrate contamination of water sources from agriculture, as well as the transposition of the Nitrate Directive. Section 4 draws on material from the national case studies for Lithuania and Slovakia to compare the changing characterization of the problem of agricultural pollution, how it is regulated and the attitudes of interested actors. National strategies towards the implementation of the Nitrate Directive are then detailed and compared in Section 5. Finally, Section 6 draws out the specific issues that acceding countries face with regard to the implementation of the Nitrate Directive.

2 IMPLEMENTATION OF THE NITRATE DIRECTIVE IN POLAND

2.1 The Emergence of the Issue

Despite the fact that agriculture's share of GDP is just 4 percent, Poland remains largely an agrarian society. Farmland accounts for 59 percent of the total area of the country, and agriculture supports to varying degrees a quarter of the total labour force (almost 4 million people). However, it is the main source of income for just 600 000 of that 4 million. Most of the land was never collectivized, and the structure of farming remains mostly small–scale. The average farm size is 7.7 ha, and about a quarter of all holdings are less than 2 ha.

The total number of registered farms is 1.8 million of which about 1.25 million have livestock. The largest farms (with more than 20 ha) occupy about a third of the agricultural land, but they have only a fifth of the total livestock (Majewski et al., 2002). Most of the livestock is kept on farms of 5 to 10 hectares. They account for about half the number of livestock farms but about 63 percent of total production. Many of these farms pose threats to water quality. About 43 percent of the total number of farms are small (below 5 hectares), but their share of the total livestock is only 17 percent.

Although nitrogen, potassium and phosphorus occur naturally in groundwater in Poland, these elements are present in elevated concentrations in many locations. Pesticides are also present in groundwater in some areas. Heavy metals, however, exceed standard limits in just 2.5 percent of the samples tested (Pios, 1999). This pattern is in keeping with the supposition that agricultural activities – such as poor management of liquid animal waste and infiltration of fertilizers and pesticides – are important factors in ground water pollution. The problems of water quality are compounded by limited access to water resources. There is a distinct paucity of surface and underground water in more than half of the country, including most of western and southeastern Poland.

Detailed analyses of the negative impact of agricultural activities on water quality were first conducted in the early 1980s. Investigations by the State Sanitary Inspectorate of over 5 000 farms with more than a hundred units of large livestock revealed that a quarter were creating serious environmental hazards from the way they stored and managed liquid manure. Assessments of large–scale farms by the State Inspectorate for Environmental Protection found that only a small percentage of them carried out proper slurry management (Falęcka–Jabłonska, 1991).

Although such surveys concentrated on large ‘industrial’ farms, some environmentalists, water protection officials and a few scientists discerned a wider problem with the management of liquid waste and manure on most farms with animals for breed-

ing. The deteriorating water condition in private wells provided circumstantial evidence:

- in 1975 the water in 44 percent of wells was assessed to be of poor quality;
- in 1985 the proportion had increased to 54 percent;
- in 1990 the percentage increased to 61 percent (GUS, 2001).

Nevertheless, the risk posed to waters from inadequate management of farm wastes was not generally understood. The focus of attention was on cleaning up industrial pollution. Agricultural pollution was not taken seriously, and there was no systematic action to protect water from agricultural pollution.

Figure 1: Animal Waste Stored on the Ground in Polish Countryside

The accession negotiations with the European Union (EU) have transformed the political status of the farm–pollution problem. Poland is required to implement the environmental *acquis*, including the Nitrate Directive. Water pollution from nitrates is no longer a concern only of experts. It has acquired wider political ramifications in the context of debates and negotiations about how to prepare Polish agriculture to participate in the Single Market. The need for and the practicalities of equipping farms with manure storage facilities – in order to comply with the Nitrate Directive – have become matters of considerable contention involving a range of organizations.

2.2 The Nitrate Directive

The Nitrate Directive aims at reducing water pollution caused or induced by nitrates from agricultural sources. Member States are obliged to identify waters affected by nitrate pollution or likely to be so affected in the near future. (Nitrate pollution is defined as either a concentration of nitrate above 50 mg/l in freshwaters or eutrophication.) Agricultural areas that drain into these waters and that contribute to pollution should be designated Nitrate Vulnerable Zones (NVZs). In such zones, or across their whole territory if desired, Member States must draw up Action Programmes that contain mandatory measures concerning the application and storage of livestock manure and chemical fertilizers (Goodchild, 1998). The maximum amount of livestock manure applied to the land each year (including that from the animals themselves) should not exceed 170 kg N/ha. The Directive allows for Member States to have derogations from that restriction, but only where it can be justified and where it will not compromise the objectives of the Directive.

A Code of Good Agricultural Practice should also be prepared that regulates the times and circumstances under which manure may be spread, the storage and spreading technology to be used and the application norms for different crops. The length of the required period for manure storage varies by country, partly reflecting their climatic and soil conditions. The Code is mandatory within NVZs, but implemented on a voluntary basis outside the NVZs. Member States may decide to declare the whole country an NVZ or designate discrete NVZs (De Clercq et al., 2001).

The Directive stipulates that "Member States shall draw up and implement suitable monitoring programmes to assess the effectiveness of Action Programmes". Member States who apply the Directive throughout their national territory are required "to monitor the nitrate content of waters (surface waters and groundwater) at selected measuring points which make it possible to establish the extent of nitrate pollution in the waters from agricultural sources." Furthermore, a periodic review of NVZs is generally required every four years (EC, 1997).

When considering the challenges that the Nitrate Directive is likely to present to the acceding countries, it is important to be aware of the difficulties that the Directive is already causing the existing Member States. Most Member States have yet to implement it satisfactorily more than ten years after its adoption. Except for Denmark and Sweden, all other EU member states have been subject to legal proceedings because of either non–transposition or incorrect application of the Directive.

The nature of the problem and the form of the Directive do provide opportunities for procrastination. As with any diffuse pollution, the characterization of the problem depends on adequate monitoring data, and without that knowledge it may be difficult to specify exactly what monitoring actually is required. This uncertainty has been compounded by a lack of specificity about how to implement the Directive. Indeed, the Directive appears to give a great deal of freedom to individual Member

States to decide how much or how little to do, as long as the decisions can be justified.

There is no additional guidance on specific issues, such as how the monitoring networks should be set up, how the data assessment should be carried out or how zone boundaries should be defined. Thus, Member States have been left free to interpret the Directive for themselves and they have done so in ways that suit their needs. As a result, most have made proposals to the Commission that the Commission finds unacceptable (e.g. regarding the limited coverage of NVZs or monitoring inadequacy). However, the Commission has not been in a position to direct what should be done.

Because the Commission can only react to Member States' proposals, the process of resolving disagreements has proven to be a protracted affair. It takes time for the Member States to come up with proposals and implement them, however inadequate they may be. This is particularly true where countries have decided to designate discrete zones as NVZs, rather than the whole territory. The process can last years, involving collating and assessing the necessary data, turning the results into boundaries relevant to actual field boundaries and consulting with farmers and interested parties. If the first attempt proves to be deficient in some way, further work has to be done as part of the periodic review to improve implementation. This may include identifying or installing new monitoring points or undertaking additional sampling and analysis. All of this takes additional time and needs to be funded.

Behind the delays in implementation in the current Member States lies both the resistance of some influential groups to accept that nitrate contamination is a significant problem and an unwillingness by governments to put their own farmers at a disadvantage. More fundamentally some countries and regions seem unwilling to confront the over–intensive nature of their agriculture. In some regions of Western Europe there are simply far too many livestock, and structural reductions are needed to solve the problem of surplus manure. Despite these various difficulties, the Directive is regarded as having established a basic hygiene standard that seeks to ensure European water sources remain largely free of agricultural contamination (De Clercq et al., 2001).

2.3 The Organizations Involved in Poland

In Poland organizations with responsibilities regarding Nitrate Directive requirements include:

- The Ministry of Agriculture and Rural Development, as well as some of its subordinate agencies, including the Agency for Restructuring and Modernization of Agriculture (ARMA), the Agricultural Advisory Centres and various research institutes;

- The Ministry of Environment and some of its subordinate agencies, including the Environmental Protection Inspectorate, the Regional Board of Water Management and various research institutes.

Cooperation is weak between organizations responsible for agricultural policy and those responsible for environmental protection. They create their own programmes separately, and there is a lack of a coherent agri–environmental policy. As a consequence, although various initiatives have been taken, the environmental situation in rural areas shows little improvement.

The Ministry of Agriculture coordinates government policy in relation to agriculture and rural areas. It handles negotiations with the EU in this field. It is responsible for the SAPARD (Special Accession Programme for Agriculture and Rural Development) programme, which is partly funded by the EU and is intended to help prepare Polish agriculture and rural areas for joining the EU. The Ministry's agency, ARMA, supports investment and training aimed at accelerating the process of structural change in agriculture and rural areas. In principle, it should also be involved in the implementation of the Nitrate Directive (Karaczun, 2002). The agricultural advisory services also have a key role to play, and in some parts of the country they have begun to advise farmers on the steps they need to take to protect water sources. However, advisors tend to be production–oriented and often are not well–informed about environmental protection requirements.

The Ministry of Environment is responsible for creating a legal framework for environmental protection in relation to agriculture. Its Department of European Integration has coordinated the process of bringing Polands' environmental legislation into line with the EU's (including the Nitrate Directive). While the Ministry has been ready to take this responsibility, it has been reliant on the Ministry of Agriculture to characterize the extent of the problem and to help formulate a practicable implementation strategy for the Directive. The Ministry of Agriculture, however, has been slow both in undertaking any activities in this field and in cooperating with the Ministry of Environment to formulate joint actions to prevent agricultural pollution. The scope of collaboration between the two ministries is still very limited.

Other actors play only limited roles in implementing the Directive's requirements. Although there are many non–governmental organizations (NGOs) in Poland interested in environmental protection, few of them focus their activities (educational, lobbying or practical) on environmental protection issues in rural areas or on issues related to European integration. Farming organizations are much more interested in improving the competitiveness of agriculture. Local authorities in rural areas are under pressure to pursue rapid improvements in rural conditions. However, their commitment of sizeable shares of their funds to construct water–supply systems, roads or telephone lines seriously limits their capacity to finance infrastructure on farms. Thus external forces – mostly through the processes of European integration –

are providing the momentum for the protection of water against nitrates from agricultural sources.

2.4 Accession Negotiations and the Nitrate Directive

After the Treaty between Poland and the European Union came into force on 1 February 1994, a process of creating an appropriate institutional structure was launched to facilitate Polish accession to the Union. This process includes procedures for ensuring the compliance of new regulations with EU legislation.

It became clear that detailed preparations for membership would be needed, taking into account the EU's requirements on a sector by sector basis. A document adopted in 1996 on *Development of Rural Areas* set forth how to equip Polish agriculture so that it would be capable of competing within the Single European Market. However, it did not address important environmental issues (Duczkowska–Malysz, 1996).

A subsequent document – *Coherent structural policy for development of rural areas and agriculture* – adopted by the Government in 1999, identified additional obstacles, including some barriers to environmental protection (MARD, 1999). For the first time the Ministry of Agriculture formally referred to the necessity of protecting waters against nitrates of agricultural origin. The document indicated that once in force the draft Fertilizers and Fertilization Act (2000) would oblige livestock farmers to build appropriate storage for organic fertilizer and silage within 5 years.

In March 1998 the European Union officially launched accession negotiations with Poland. The bilateral screening of legislation revealed a significant discrepancy between Polish environmental laws and EU standards. According to the European Commission, only 8 percent of Polish environmental regulations were in full compliance with EU law (Niesyto, 2000).

The results of the screening process and consultations with representatives of the Ministry of Environment, businesses and environmental NGOs formed the basis for preparing the Polish negotiating position regarding the "Environment" (Niesyto, 1999). This position was sent to the European Commission in December 1999. The estimated cost for implementing the requirements of the Nitrate Directive would be about 3 billion euros, the largest part of which would be for the construction of liquid manure tanks (average estimated cost of about 5 000 euros per tank). The negotiating position was: *"Poland requests a transitional period of 8 years for implementation of the provisions of the Directive."* This was one of 14 directives for which Poland sought temporary derogations (Government of Poland, 1999).

In December 2000, the EU responded with its *Common Position*, which emphasized that transposition of the environmental acquis into national legislation and its implementation were major tasks. They were to be tackled as a priority (EC, 2000). Consequently, Poland was encouraged to reconsider its request for transitional peri-

ods for various directives. With respect to the Nitrate Directive, it was invited to present an implementation programme – based on identified vulnerable zones, detailed cost assessment and investment plan – to be achieved within four years of Polish accession.

The work to modify the negotiating position and fulfil the conditions indicated in the *Common Position* took the Polish Government more than a year. During this period a large number of studies were conducted, and implementation programmes were formulated. Regarding the transposition of the Nitrate Directive, the Government sought to identify waters that in the near future could become overly polluted with nitrates (water containing more than 50 mg NO_3/l). These would require the designation of Nitrate Vulnerable Zones. For this purpose, the Institute of Meteorology and Water Management prepared a report on *The designation of zones vulnerable to nitrate pollution from agricultural sources* (Institute of Meteorology and Water Management, 2000). From an analysis of 100 000 monitoring results of surface and ground waters over the period 1990–1999, the report concluded that there was no serious nitrate pollution problem, and that the state of Polish waters was generally better than in most EU countries (see Table 1).

Table 1: The Nitrate Concentration in Polish Waters – Monitoring Results

Level of nitrate concentration (mg NO_3/litre)	Surface water (%)	Underground water (%)
< 25	97.6	75.8
25 – 50	2.0	9.4
> 50	0.4	14.8

Source: Institute of Meteorology and Water Management (2000)

The report also maintained that in surface waters municipal sewage was the main source of high nitrate levels, and agricultural activity contributed no more than 10 mgNO_3/litre. In underground waters, however, nitrate contamination from agricultural activity was estimated at between 10 and 20 mgNO_3 /litre. However, it was argued that exceeding the critical threshold (50 mg/litre) was only a point–source problem around dug wells.

The Polish Government also referred to the low average stocking densities (approximately 45 LU/100 ha) and the low level of nitrogen applied (maximum of 155 kgN/ha, with most coming from organic sources). The Government decided that the current levels of water pollution and of agricultural development did not justify the designation of areas vulnerable to nitrate pollution (Polish Ministry of the Environment, 2001a). This became the basis for Poland's withdrawal of its request for a derogation on the Nitrate Directive. Its new negotiating position stated that:

> based on the intentions of the Nitrate Directive, the Polish legal regulations – including especially the Act of Fertilizers and Fertilization (2000), the Act on Environmental Protection and Development (1980), the Water Law (1974), and the Act on Access to Information on Environment and its Protection and on Environmental Impact Assessment (2000) – and the need to implement the rules of Good Agricultural Practice, [Poland] will carry out activities targeting the provision of manure storage facilities... (Government of Poland, 2001).

In its new negotiating position from May 2001 the Polish Government withdrew 6 (of 14) of its proposals for transitional periods for environmental directives. For the remainder it proposed shortening the periods or made its requests for derogations more specific (Government of Poland, 2001). The Commission accepted most of Poland's revised position, but insisted on the designation of NVZs where there was a recognized problem with nitrate contamination. Acceptance of this issue effectively closed the negotiations with the EU over the Nitrate Directive. However, some uncertainty still remained over the national strategy and the priority to be accorded to the Directive upon Poland's accession.

In an interview a representative of the European Integration Department in the Ministry of Environment identified the priority of environmental problems as:

- first, wastewater treatment;
- second, waste management;
- third, Integrated Pollution Prevention and Control (IPPC) for industrial plants;
- fourth, the nitrate pollution of waters.

Set against these priorities, the Ministry of Environment calculates that 35 billion euros is required to comply with the environmental requirements of the acquis, 10 percent of which is attributed to the Nitrate Directive.

The question of who will pay for the huge investments required by the Directive upon accession still remains unanswered. There is a view in the Ministry of the Environment that the nitrate problem exists at a local level and not nationally. Therefore, local authorities and the farmers themselves should solve it. However, if the problem of water protection from agricultural sources is treated as a local one, there is a risk that the necessary investment will not win the support of public funds (e.g. National or Regional Environmental Funds). Because the Nitrate Directive is not regarded as a critical issue for EU membership, it could also mean that investment in farm–waste management is not a priority for EU resources.

2.5 Preparations for Implementation of the Nitrate Directive

Approximately half of all farms in Poland have no waste storage facilities at all – these are mainly small–scale pig and mixed farms. Among medium–sized dairy or mixed farms, existing facilities are often insufficient and lack either a manure slab or a tank to contain liquid effluent. For larger and more specialized farms, the problems more typically pertain to the inadequate standards of storage facilities, which may therefore be prone to leakage or breakdown (Majewski et al., 2002).

A number of pilot projects have been carried out since the early 1990s aimed at highlighting problems of water pollution from agriculture and demonstrating practical remedial measures. Each has taken place in a limited geographical area, has involved some foreign funding and is described below.

- The Polish Agriculture and Water Protection Project was funded by the US Environmental Protection Agency between 1992 and 1995 and operated in two counties. It covered educational activities and demonstration farms (Rey, 1996).
- The Baltic Agriculture Ruvnoff Action Programme was a Swedish–led initiative that aimed at improving the quality of the Baltic Sea. The overall goal was to create conditions conducive to both the recognition of agriculturally related water–quality problems and the development of specific solutions. The demonstration farm programme operated in two phases between 1994 and 2002 in different parts of Poland (Sapek, 2000).
- A project to construct slurry tanks and manure slabs in two river basins was funded from the mid–1990s by the PHARE programme (Rynkiewicz, 2001).

In recent years the National Fund for Environmental Protection and Water Management has also supported many projects for the improvement of environmental infrastructure in rural areas. In the year 2000 it launched a three–year programme to:

- build slurry storage tanks on 1 100 farms,
- provide supplementary technical equipment for slurry tanks and environmental equipment for common usage (such as manure spreaders),
- arrange training for advisors and agricultural operators.

This is the biggest programme so far that is meant to improve the situation from the viewpoint of agricultural pollution. The total cost will be about US$16 million. According to the programme, a minimum of 30 percent of the total investment for slurry tanks should be from the farmers' own resources, and the manure pad should be constructed entirely from their own capital.

One of the areas benefiting from the programme is Ostroleka county. Many farmers have taken advantage of these various schemes to fund partly the installation of storage tanks for animal wastes. In order to maximize benefits, many have sought to im-

prove efficiency and expand their production, e.g. by increasing stocking rates. There is also pressure to change to milk production because far better returns are possible than from arable cultivation.

Figure 2: Construction of Slurry Storage Tank in Poland

3 THE LESSONS FROM OSTROLEKA POVIAT COUNTY

The county (poviat) of Ostroleka is situated northeast of Warsaw and covers 2 100 km^2. It is inhabited by over 140 000 people with 61 percent living in rural areas. Farmland covers approximately 61 percent of the territory (GUS, 2001). Low fertility and infertile lands predominate. The climatic conditions are also unfavourable for crop growing because of a short growing period, frozen ground at the beginning of the growing period and little precipitation (Karaczun, 2001). Therefore, animal production predominates (Table 2). The stocking density for this region in 1998 was 55.5 livestock units (LU)/100 ha (the national average was 45 LU/100 ha). Dairy cows were located in the northern part of the region, and pig breeding occurred mainly in the southern part.

Table 2: Types of Farms and Number of Animals in Ostroleka County

Number of farms	Number of farms by type			Number of animals	
	Plant	Animals	Mixed	Cattle	Pigs
12 325	1 412	6 650	4 073	84 663	88 282

Source: Own assessment based on Ostroleka Voivodship Statistical Yearbook (1999).

The housing of livestock mainly depends on slurry–based systems. These are more prevalent than elsewhere partly because cereal production is limited locally and thus there is a shortage of straw. Most of the farms, however, lack appropriate containers and devices for the storage of animal waste. Over 95 percent of livestock farms in the county do not have a manure pit for animal waste storage nor a liquid manure container consistent with the requirements of the EU Directive. Animal waste is stored directly on the ground, which may be quite permeable. Slurry management takes place only on a small percentage of farms (Kubel, 1997). On many farms liquid manure is not even collected. Where it is collected, it usually is stored in low capacity containers (1–3 month storage) that often leak.

As a result, there is extensive contamination from animal waste of the area's groundwater. In the early 1990s 50 percent of the wells had higher than allowable concentrations of nitrates, and 14 percent of cases had levels four times higher than allowed.

The regional administration recognized quite early the need for action to protect water resources against agricultural pollution and looked for an opportunity to help farmers to improve the situation. As a result, programmes demonstrating practical remedial measures have been carried out with the assistance of foreign funding. A key feature has been to equip a small number of demonstration farms, which have been used to increase farmers' awareness about the need for proper management of animal waste. As a consequence, groups of farmers have lobbied for the establish-

ment of local water–protection programmes financed by local and regional public funds, as well as by the farmers themselves. The idea has won the support of the Ostroleka administration.

In the late 1990s it became evident that existing efforts would not be enough to solve the problem. Approximately 8 000 farms in the area still needed to be equipped for animal–waste storage and management. Since the year 2000, two new programmes (described below) have been implemented in this region:

- Programme for the Reduction of Pollution by Nitrates from Animal Breeding (2001–2006) is financed by regional and local institutions. It supports the construction of storage tanks on medium–sized farms that are more than 10 ha in size and 10 livestock units (LU) in stock (Zalewski, 2001).
- Programme on Environmental Protection in Rural Areas (2000–2004) was launched by the National Fund for Environmental Protection and Water Management and financed by the World Bank, the Nordic Environment Finance Co–operation, the Global Environment Facility, PHARE and local authorities. It supports the construction of slurry tanks on medium/large farms. The number of animals on the farm is the most important criterion, with an eligibility minimum of 10 LU. Additional criteria are that farms must be owned by one family, livestock densities cannot be higher than 1.5 LU/ha and farms have to be economically efficient (Zalewski, 2001).

Thanks to these two programmes and the efforts of farmers, by 2002 approximately 200–300 farms per annum were having their waste storage facilities brought up to standard. However, about 1 000 farms a year would need to be equipped with waste–wmanagement facilities between the years 2000 and 2008 according to the County's Department of Agriculture and Environment Protection. This would be needed to fulfil the requirements of the Fertilizers and Fertilization Act (and hence of the Nitrate Directive). Current programmes, however, are only operating at a quarter of that rate. This is even in an area where county and regional administrations and farmers are particularly aware of the problem.

Funding Farm Waste Facilities

To comply with the law and EU requirements many farmers may be confronted with the choice of either constructing the necessary facilities on their own or switching away from livestock production. The costs of establishing facilities for the storage of solid manure and slurry depends mainly on their size, construction technologies and the quality of materials used. A medium–sized farm will typically need a 50 m^2 dung pad and a 40–50 m^3 tank for liquid effluent, whereas a large farm might require a slurry tank of 500 m3 or more. The costs of such installations have been calculated

by Majewski *et al.* (2002) based on the experiences of the National Fund for Environmental Protection and Water Management (and are presented in the Appendix).

Of course, farmers save from the reduced need to buy fertilizers. However, calculations for a range of farm types indicate that only the largest farms would gain a net positive income effect from the investment (Majewski et al., 2002). These largest farms include dairy farms over 62 ha and pig farms over 37 ha. Even for these large farms, however, investment in animalwa–ste storage facilities is not a priority. For smaller farms, the investment needed is in the range of 900 to 6 000 euros or 1 600 to 12 000 euros. These figures depend on whether partial or full investment is needed, as well as factors such as soil quality, the type and number of animals and the nature of other forms of agricultural production on the farm.

Initially a significant additional source of financing for the investment had been expected from EU pre–accession aid, especially the ISPA (Instrument of Structural Policies for Accession) and SAPARD programmes (1999). Now it is clear that those instruments will play only a limited role in the implementation of the Nitrate Directive in Poland.

ISPA was created by Council Regulation 1267/99/EC to assist environmental protection and transport development in the accession countries. However, it is meant to co–finance large projects undertaken by public bodies, and is therefore not suited to assisting in the type of investments needed to implement the requirements of the Nitrate Directive (Malinowski, 2001). The ISPA funds can, however, be used to improve the condition of water pipelines and sewerage infrastructure in rural areas (Polish Ministry of the Environment, 2001b).

Initially, Poland aimed at adopting a separate measure within SAPARD to finance construction of slurry tanks and manure slabs. The consent of the European Commission was sought to co–finance investments of this kind up to 65 percent to encourage take-up. However, the Commission insisted that, as with other private investments on farms, the maximum permissible level of support could only reach 50 percent. The Polish Government, therefore, dropped its attempt to establish a separate measure for the construction of manure tanks. However, farmers applying for funds under the SAPARD Plan's second measure (investments in agricultural holdings) still must address this waste issue. They either have to prove that their farms are managed in accordance with Nitrate Directive requirements, or they must guarantee that their investment will include the construction of secure waste storage with a six–month capacity.

Legal Harmonization

The Fertilizers and Fertilization Act (adopted by the Polish Parliament in July 2000) was intended to harmonize national legislation with the Nitrate Directive. The Act contains the major provisions of the Nitrate Directive regarding the storage and ap-

Figure 3: Underground Slurry Storage Tank

plication of fertilizers, as well as the permissible doses of natural fertilizers. The Act also requires farmers to store slurry in tanks with capacities sufficient to store at least four–months' worth of manure production (Fertilizers and Fertilization Act, 2000).

The regulations under the new Water Law (1974, amended in 2000) also include provisions for implementing the Directive, namely requirements regarding the designation of vulnerable zones and the monitoring of waters at risk of pollution from agricultural sources. The Water Law also indicates the organizations that will be responsible for the implementation of the individual provisions. The relevant officials and their responsibilities are described below:

- The Minister of Agriculture will be responsible for the elaboration of a set of rules detailing Good Agricultural Practice in cooperation with the Minister of Environment.
- The Minister of Environment, in cooperation with the Minister of Agriculture, will establish the criteria for designating waters vulnerable to nitrate pollution and guidelines for the preparation of an Action Programme to tackle the problem.
- The Director of the Regional Board of Water Management will designate the surface and ground waters sensitive to agricultural pollution, especially zones that are vulnerable to nitrogen runoff from agricultural

sources. Moreover, the Director will establish an action programme for each of these zones with deadlines to limit nitrogen runoff.

- The Inspector for Environmental Protection will assess the eutrophication of waters every four years and will ensure that the concentrations of nitrates are measured.

The Fertilizers and Fertilization Act of 2000 together with the requirements contained in the amended Water Law (2000) should contribute to the better management of organic and mineral fertilizers. Indeed, the Fertilizers and Fertilization Act is the first Polish legal regulation for the management of fertilizers.

There may, however, be some negative consequences. The Fertilizers and Fertilization Act was adopted upon the condition that manure (whether solid or liquid) would no longer be treated legally as waste, but rather as a natural fertilizer (Krutul, 2000). Previously, under the Waste Act (2001), the agricultural use of manure was conditionally allowed with appropriate permission. This permission will no longer be required, which will make the regulation of the use and disposal of manure more difficult. Eliminating manure from the list of waste and waste waters will mean that the penalties of the Act on Waste will no longer apply to farmers who dispose of manure in drainage ditches or rivers.

It is feared that the low level of environmental awareness and knowledge among farmers, along with the removal of formal control, will result in inappropriate manure management. Currently, there are no appropriate services that are capable of checking whether manure has been managed in accordance with the Code of Good Agricultural Practice and environmental protection requirements.

An additional concern is that if manure is not considered waste, then storage tanks may no longer be considered installations for waste disposal. Thus their construction may be ineligible for support from environmental funds. This issue was presented at a session of the Parliamentary Commissions for Agriculture and Environmental Protection. In response, Stanislaw Stec (MP) stated that in this situation there would be no problem because: "the funds not used for construction of manure tanks can be used for construction of wastewater treatment plants, which are more essential in rural areas than the tanks." (Parliamentary Paper No. 988, 1999) This statement illustrates both the misunderstanding of the EU integration-process requirements and the lack of knowledge about the environmental risks from agriculture.

There are still some potential discrepancies between Polish legislation and the Nitrate Directive. According to the requirements of the Directive, secure containers should be of a capacity to cover manure storage during the period when its agricultural use is impossible. According to the Code of Good Agricultural Practice the length of this period in Poland is six months. That was also the capacity of storage tanks proposed by the government in the draft Fertilizers and Fertilization Act.

However, it was amended during the parliamentary process by Members of Parliament concerned at the cost implications for farmers. As a result, in the adopted Act farmers are obliged to construct tanks of a four–month capacity.

The discrepancy between the Code and the Act may not prove critical. The four–month capacity required by the Act could be adequate for areas outside the NVZs, and an extended period of storage within NVZs could be enforced as part of the mandatory Action Programme. However, resources may be wasted. There may be a need for additional expenditure if farmers or funding agencies in areas subsequently designated as NVZs are induced to invest in waste–management facilities with only a four–month capacity.

Figure 4: Constructed Slurry Storage Tank

Conclusions

The 'integration gap' between Poland and the EU regarding the environmental acquis was wide. This was a result of the following:

- the priority accorded to ecological issues;
- the marked differences in the basis, orientation and complexity of the EU's environmental legal system compared to the Polish system;
- the low practical importance given to environmental protection programmes by the Polish public and politicians.

Even with substantial financial and technical assistance the full adoption of the environmental acquis by Poland will be a very demanding task. Moreover, since the beginning of the accession process it has been clear that environmental protection and agriculture would constitute important and sensitive fields in the negotiations.

However, negotiations during the accession process did not focus on improving the state of the Polish environment *per se*, but rather on the technicalities of legal harmonization. The probing nature of the exercise, which sought to expose the accession countries' weak points, has led to position–based negotiations. Formalism, defensiveness and point scoring were encouraged, rather than a cooperative approach in which both sides would try to resolve the specific problems of accession. The consequence may be that acceding countries formally transpose EU legal requirements but do not follow up with substantive changes in norms and practices.

Such signs are already evident in relation to the transposition of and preparations for the Nitrate Directive. In the first negotiation round, the Polish Government (concerned by the exacting requirements of the Directive) requested an eight–year transitional period. Because this approach was challenged by the Commission, Poland made its position more formal, based on a narrow interpretation of the Directive requirements. As a result it was concluded that possession of tanks for liquid manure was not an obligatory requirement of the Directive, and the other requirements of the Directive had already been enacted in Poland. Consequently, Poland withdrew its claim for a transitional period, even though that may have been a more realistic stance.

The process of European integration has also highlighted some longstanding problems in Poland. On the one hand, there is a huge lack of investment in equipment and infrastructure in rural areas, including the field of environmental protection. On the other hand, the Polish governmental bureaucracy has found it difficult to coordinate effective responses. However, projects undertaken locally and aimed at decreasing water pollution from agricultural sources have been successful. This indicates that if Poland were to use available domestic and international funding in an efficient manner, much could be done to address the case–study problem.

4 COMPARISON OF AGRICULTURAL POLLUTION IN POLAND, LITHUANIA AND SLOVAKIA

Lithuania

The case study area is the Northern Lithuanian karst region, which is part of the Lithuanian–Latvian transnational karst. It covers a fifth of the entire country. It has long been recognized that intensive farming practices in the region cause ground and surface water pollution. Drinking water quality is a particular concern in shallow wells, which are still used by the majority of the rural population (about 1 million people).

The break–up of the large state and collective farms and the removal of price controls and subsidies in the early 1990s led to a sharp decline in the use of mineral fertilizers, on the one hand. On the other hand, these events caused a considerable fragmentation in livestock production.

Despite an overall drop in the level of production, nitrate concentrations actually increased in water sources. In the most intensive agricultural regions, for example, the mean nitrate nitrogen concentration in rivers increased from 0.6 mg/l in 1989 to 2.5 mg/l in 2001 (Sileika, 2002). A number of factors are thought to be responsible, including:

- long delay periods between nitrate leaching and groundwater contamination;
- a sharp increase in the number of farms with inappropriate farming practices or inadequate facilities;
- the growth of pollution from non–agricultural sources (e.g. septic tanks and outdoor toilets);
- transnational water pollution.

Moreover, agricultural production has begun to increase again since 1997. While environmental pressures have not diminished over the past fifteen years, the complexity of regulating them has changed considerably because of a huge increase in the number of farm holdings.

To combat farm pollution across the region various efforts have been made. In 1993 an NGO named "Tatula" (after the main river running through the karst region) was established with a programme of promoting organic agriculture and pollution prevention (Zemeckis and Lazauskas, 2001a). In an area particularly prone to leaching the Birzai Regional Park (14 030 ha) was set up with special and detailed restrictions on agriculture (e.g. limited use of pesticides and fertilizer). These restrictions were approved in 1998.

Slovakia

The case study area, Corn Island, lies at the confluence of the Danube and Small Danube. It is one of the most productive agricultural areas in Slovakia with highly fertile soils. It is also a very sensitive area with rich groundwater sources (Kováč et al., 2001). Farmers have been using reduced amounts of mineral fertilizers and agri–chemicals in recent years (Macák et al., 2002) and livestock production is down compared with the socialist period. Despite these conditions, the nitrate contamination of water sources has not decreased significantly. This seems to be the result of a number of factors.

The existing protective measures from the socialist period have not always been applied. Formerly the state administration ensured that state and collective farms adhered to lower permitted dosages of mineral fertilizers and agri–chemicals. During the transition from socialism and the depressed economic conditions that followed, these restrictions were not enforced. After land privatization, the number of buildings housing animals increased, in many cases with no appropriate manure and slurry handling.

Overall, however, agriculture accounts for about a third of the nitrate pollution; domestic and municipal wastewater is responsible for much of the rest. A particular problem has been the proliferation of small food–processing operations (dairy, meat and others) in the last decade. In Corn Island only 20 out of 94 communities are connected to public sewers, and most inhabitants have to rely on septic tanks. Most also use water from dug wells. About 900 small local and private wells in the study area are estimated to have no sanitary protection zone to protect them from agricultural sources of nitrate. As a consequence of the pollution of private water sources, eight cases of blue baby syndrome were reported in 2000 in Slovakia, and four were from the case–study area. (This information was given by Mačak at the PLW.)

Problem Definition

While in Lithuania and Poland the water pollution problem was initially identified as a local issue, in Slovakia the groundwater sources under Corn Island were declared to be of international importance in the socialist period. They are the largest groundwater sources in Central Europe. In the early 1990s the water pollution problems in Lithuania and Poland likewise gained an international character as concern mounted in the Scandinavian countries over the nutrient enrichment of the Baltic. Localized pollution problems thus came to be seen as part of a Baltic Sea basin problem, particularly in the context of the Helsinki Convention (1992).

Within the basin Poland covers 40 percent of the cultivated area and 50 percent of the population. A series of studies coordinated by the Nordic Council identified Poland as the largest discharger of nutrients into the Baltic, responsible in 1995 for 30

percent of the nitrogen and 40 percent of the phosphorus. About 5 percent of the nitrogen load was attributed to Lithuania (Sileika, 2002). However, the diagnosis of the proportionate contribution of the main factors (i.e. industry, municipal wastewater and agriculture) to the pollution load is not straightforward.

In all three countries the processes involved in the adoption of the Acquis Communautaire have led (since the late 1990s) to a systematic Europeanization of environmental policy, including water protection policy. This has been repeated across the CEECs. National parliaments, ministries and regulatory bodies have had to contemplate the implications of adopting the Nitrate Directive. In doing so, they have wished not to place excessive burdens on their farmers. At the same time economic conditions have improved, and there is the prospect of unfettered access to EU markets. Therefore many of the commercially oriented, privatized farms are ready to intensify production, which might entail increased environmental pressure on water sources.

Regulation of Agricultural Water Pollution in Socialist and Post–Socialist Periods

In each of the countries laws regarding water protection were already in force in the 1970s (Slovakia from 1973; Lithuania from 1972; and Poland from 1962). Corn Island in Slovakia was declared a protected water–management area with important surface and groundwater accumulations in 1978. In Lithuania Protective Zones for Water Bodies (since 1974) and limitations on the application of slurry (since 1977) were in force. However, enforcement of these regulations was weak because of the overriding production interest of the governments and the lack of funding and marginal position of institutions in charge of environmental protection.

In Lithuania and Slovakia large state farms with livestock moved to slurry–based systems in the 1970s and 1980s. The spatial concentration of livestock–waste production resulted in considerable water pollution. While plans called for ever increasing levels of production, investment in waste management was not a priority. Slurry tanks or lagoons, if built, were often poorly constructed and had inadequate capacities. Therefore the slurry was often applied to the fields when it could not be absorbed by the soil or plant growth, e.g. when the ground was waterlogged or in winter when the slurry remained on the frozen surface, leading to extensive water pollution with the spring thaws. Although legislation mandated fines for improper disposal of animal wastes (e.g. for liquid manure disposed of in wells or water courses), they were negligible and did not serve as a deterrent.

In these countries, until recently, farmers were not legally obliged to construct proper manure storage facilities. The process of EU accession has brought about more severe water–protection laws in line with the requirements of the Nitrate Directive. In Slovakia the new Water Act of 2002 (like the Polish Water Law of 2000)

defines the storage, manipulation and application of mineral and organic fertilizers and appropriate soil cultivation. It identifies the appropriate farming methods in water protected areas. It also limits the creation or expansion of farm holdings with a capacity of more than 400 dairy cows, 600 calves, 500 young cattle, 5 000 pigs, 800 sheep or 50 000 battery hens. In Slovakia, as in Poland, all farmers are required to have proper manure storage facilities by 2008.

In December 2001 the Lithuanian Environmental and Agricultural Ministries issued a joint order as part of the process of implementing the Nitrate Directive. The order specifies the maximum stocking density (1.7 LU/ha) and requires that farms with more than 10 LU (about one–fifth of all farms) must eventually have a six–month manure storage capacity. In the short term farms with more than 300 LU, as well as newly established farms, must establish manure storage facilities. Farms with more than 150 LU should establish storage facilities within four years following EU accession, and farms with more than 15 ha of arable land must prepare annual fertilization plans (Sileika, 2001). The remaining farms with more than 10 LU should carry out the necessary modernization of their manure storage, but the timetable is unspecified.

Figure 5: Manure Stored on Concrete Pad

Enforcement and Inspection

During the Socialist period most farms in all the countries were effectively excluded from monitoring and enforcement, as Environmental Inspectorates primarily controlled industrial plants. Even if farms were formally controlled, site visits were rare and seldom unexpected.

In Poland and Slovakia, during and after the transition from socialism, there has been a much higher degree of continuity in rural and administrative structures than in Lithuania. Thus there has also been a greater continuity in enforcement and regulatory mechanisms.

In Lithuania, although some degree of continuity exists in personnel at the local level from the Soviet period, effective implementation and control have been made much more difficult by the very extensive land reform process that took place. This process dramatically increased the number of farms and created an extremely diverse set of actors in rural areas with contrasting farm sizes, degrees of specialization and levels of education (Zemeckis and Lazauskas, 2001b). Another implication of the Lithuanian land restitution is that many affected farmers have limited knowledge about the methods and principles of environmental protection with respect to the special rules on land use in sensitive areas. Whereas during the Soviet period the inspection of agricultural water sources was limited to a selection of big collective farms, today farms with more than 500 LU are obliged to prepare their own groundwater monitoring programmes (Kadunas, 2002).

In each country the work of environmental inspectorates is constrained by limited financial and human capacity. For example in Slovakia the inspection of water resources is carried out by the Slovak Environment Inspectorate through its five regional offices. These offices are organized according to the river basins and together employ about 30 people in total. The number of officials and the control system in general have not changed significantly since the socialist period. On average the staff provide 30 controls per inspector annually, including factories, municipal treatment plants and also farming enterprises. Inspectors who control water protection areas carry out perhaps 4–6 random inspections of different agricultural enterprises each year when they review the records of the previous 2–3 years. During inspections in 2001, 54 of 77 fertilizer plans inspected were found to be defective. Mainly the larger, market–oriented farms are inspected, and the smaller producers are ignored. If small family farmers are found to be in violation of environmental rules, they are obliged to pay the equivalent of 120 euros. Agricultural enterprises are obliged to pay 12 000 euros.

Attitudes of Actors and their Cooperation

In each country the responsibility for the preparation and implementation of the Nitrate Directive is shared between the Ministry of Environment and the Ministry of Agriculture. Usually the 'lead' ministry for the Directive is the Environmental Ministry, but the measures to be taken by the farmers are agricultural. Therefore good cooperation is required between these ministries, but it is not always forthcoming.

The roles of different institutions in the implementation of the Nitrate Directive are described in the Implementation Plan prepared by the accession countries. According to these plans, the Ministry of Agriculture in cooperation with the Ministry of Environment will be responsible for setting up the Code of Good Agricultural Practice. Additionally, the Ministry of Agriculture will be responsible for establishing and implementing the Action Programme. The sub–national offices of the Ministry of Environment will make recommendations for the designation of Nitrate Vulnerable Zones, which will be formally designated by the national governments. Other relevant actors include the Advisory Service, Environmental Inspectorates and regional or local authorities.

Farmers and national agricultural organizations have played a relatively limited role in the dialogue that has surrounded the technical transposition of the Nitrate Directive. Indeed, large parts of the farming community and rural citizens have little information regarding the practical implications of future EU rules and regulations.

5 STRATEGY OF THE ACCESSION COUNTRIES IN RELATION TO THE NITRATE DIRECTIVE

Questions have been raised about the general relevance of the Nitrate Directive to the accession countries on two main grounds. First, the overall input intensity in agriculture in these countries is typically low. Both the average use of nitrogen and the density of livestock are much lower than the limits set in the Nitrate Directive. Second, it is argued (especially in Slovakia and Poland) that municipal and residential effluents are major sources of nitrate pollution and are more of a problem than agriculture.

While the Directive is not seen to be a priority for these countries, it is expected to pose significant restraints and costs on their farming sectors and present major challenges for monitoring and regulatory systems. Just as Poland did, Lithuania and Slovakia also initially asked for derogations from the Directive until 2011 and 2008, respectively. At the insistence of the European Commission, they too modified their positions in 2001, and committed themselves to fulfilling the Directive's obligations upon accession. In each case, this will entail the elaboration of the Action Programme by 2004 and the implementation of the on–farm requirements by 2008.

The Likely Costs of Introducing the Nitrate Directive

The most challenging aspect of the implementation of the Nitrate Directive in Western Europe relates to those regions where the agricultural systems are just too intensive and need to be restructured. In the CEECs the most daunting issue is the heavy financial costs of implementing the Directive's basic on–farm and administrative requirements. These direct costs come from constructing manure storage facilities and acquiring manure spreaders, training farmers on the Code of Good Agricultural Practice and establishing the necessary monitoring and enforcement systems. Table 3 shows a rough cost estimate for each country to comply with the Nitrate Directive by 2008.

Table 3: Estimated Direct Cost of Implementing the Nitrate Directive

Country	Cost (million euros)
Poland	3 000*
Slovakia	545**
Lithuania	229***

*Sources: * Polish Ministry of the Environment (2001c), ** Ministry of Environment of Slovakia (2001), *** Sileika (2001). Note: the figure for Lithuania relates only to the construction of storage facilities and does not include the necessary administrative investments.*

These estimates should be treated with some caution. They are very sensitive to the number of farms included. The Polish estimate, for example, is based on the pessimistic assumption that 600 000 farms will need to be equipped with manure storage facilities. They also do not make allowance for the possibility that part of these costs could be borne 'in kind' by the farmers themselves, carrying out some of the construction work. Finally they do not include any assessment of the benefits of the Directive (whether in savings to the farmers in reduced payments for fertilizers or in the environmental, amenity and public health benefits of cleaner water sources).

The ability of farms to undertake all or part of the necessary on–farm investment depends on their profitability. For larger farms, the costs of installing storage facilities are a smaller proportion of their turnover or profit, and for the very large farms the savings on fertilizers mean that there will be a net financial benefit to the farm. In Lithuania, for example, farms that have 20–30 head of cattle will need to invest about 13 000 euros to build adequate manure and slurry storage, and the profit of such a farm is approximately 3 000 Euro per year. In contrast, for large farms with 300–500 animals the cost will be approximately 20 000 euros, but the profits of such farms may range from 14 000 to 145 000 euros per year (Zellei et al., 2002).

The ability to cover the costs also varies between sectors due to their different profitability. For instance, at the existing beef prices farmers are unable to save enough money from cattle breeding to invest in farm modernization. In contrast, pig production is profitable even if farms have to build storage facilities for animal waste (Sileika, 2001).

In all the countries, the smaller and medium–sized farms will not be able to fund the required investment from their own resources. Banks in general are not willing to provide loans for agricultural activities in the CEECs, and certainly not for what is perceived as an unprofitable investment. It seems inescapable that the provision of an integrated range of support schemes (backed by external assistance) will be necessary, if the acceding countries are to comply with the Nitrate Directive. The EU would seem the obvious source of assistance, given its imperatives on European integration, sustainable development and environmental protection. However, it remains uncertain to what extent the EU will contribute to assist farmers with the adoption of environmental protection measures.

Designation of Nitrate Vulnerable Zones

The Nitrate Directive offers two approaches to designating NVZs: (1) an inclusive approach covering the whole country or (2) the delineation of a number of discrete areas affected by nitrates. Poland chose the latter course, which inevitably is time consuming. By early 2003 only 3 out of the 7 Regional Water Management Boards had accomplished this task. The zones they have designated cover approximately 2–3 percent of the three regions.

In Lithuania the difficulty in distinguishing non–agricultural and agriculturally induced nitrate pollution has influenced the approach to designation. High nitrate concentrations have been documented in shallow wells all over Lithuania. Therefore it was decided to take this as a problem of the 'whole territory', even though it is thought that in many cases the nitrate arises from non–agricultural sources, such as outdoor toilets or gardening practices. However, the existing documentation is considered inadequate to convince the European Commission that a discrete zonal approach would suffice in Lithuania, especially considering the large proportion of the population dependent on wells. Moreover, a 'discrete zones' approach would require a more accurate surface–water monitoring network.

Thus with an Action Programme for the whole territory of Lithuania, monitoring and administration costs will be lower than if a 'discrete zones' approach were taken. This is probably true even though the costs to agriculture may potentially be higher because regulatory instruments have to apply to all farmers rather than just those in prescribed areas. It is very likely, therefore, that the whole of Lithuania will be designated as a vulnerable zone (Valatka, 2001).

The geographical focus of water quality issues will be expanded from specific fragile environments (such as karst areas and lagoons) to the entire territory. The designation of the whole country as an NVZ has the additional virtue of not discriminating between different groups of farmers, implying instead a commitment to uniform environmental standards and raising environmental awareness among all farmers. Such an approach would follow Danish advice. The Danish Government, which pioneered the Nitrate Directive, has followed such a strategy in its own implementation of the Directive.

In Slovakia two options for the designation of NVZs have been formulated by Irish experts within a PHARE project. The choice between them awaits a political decision. One option (covering only pollution from agricultural sources) would designate about a third of the agricultural land as a NVZ, while the other option (covering pollution from agriculture and municipal waste) would designate about two–thirds.

Monitoring

The establishment of an adequate monitoring system is a challenging requirement of the Directive. Nitrate contamination is a diffuse pollution, and neither the level of emission nor the environmental damage can be easily observed. To a considerable extent it is a problem that only monitoring reveals. Indeed, in the absence of effective monitoring the nature, the extent or even the existence of the problem might be unknown. The quality and extent of the monitoring are thus crucial not only in tracking the problem, but in characterizing it in the first place.

Determining the strategy for implementing the Nitrate Directive, including the designation of NVZs and the devising of Action Programmes, has to rely on already existing monitoring and survey data. Part of the strategy must then be to establish an adequate monitoring system in order to assess the effectiveness of Action Programmes adopted. Monitoring, however, is an expensive activity. It is hard to predict the cost of setting up an adequate monitoring system, or at least one that would be acceptable to the European Commission, because the Commission does not provide guidance on the matter. Instead, acceding countries have relied on advice from current Member States under twinning programmes.

The monitoring–related expenses will depend on the type of NVZ designation (whole country or discrete zones approach) and the degree of development and efficiency of the existing systems. In Slovakia the water–monitoring network has been functioning for surface water since the 1960s and for groundwater since the 1980s. The groundwater quality in the case–study area (Corn Island) is regarded an autonomous subsystem, and in 1999 it was monitored at 34 sites either two or four times a year. The existing Slovakian monitoring system for water quality is very comprehensive and meets EU requirements. In Poland the monitoring system for water protection was improved in the 1990s. In Lithuania the present national groundwater monitoring network dates from the mid–1970s (Giedraitiene et al., 2001). By the late 1980s in the karst region the system consisted of 130 observation stations where samples were collected 2–4 times per year. However, since 1991 there has been less groundwater monitoring due to general economic problems. On the whole, acceding countries have reasonable water–monitoring systems, which nevertheless require some investment in equipment and training to meet EU demands. Additional monitoring stations should be established for the assessment of runoff and pollution caused by agricultural activities.

Advisory Service

The establishment and development of advisory services and training centres will be crucial elements in the implementation of the Nitrate Directive. There is a need in the accession countries to communicate the environmental problems caused by agriculture and present practical solutions to farmers and advisors. Many farmers are unaware of nitrate pollution and of the steps they should take to avoid it. The equipping of advisory services and the education of farmers pose challenges that differ between the accession countries. The types of challenges depend on the fragmentation of their farm structures following the collapse of the socialist system and their specific legacy of agricultural advisory services.

In much of Poland there has been continuity in the farm structure, as small–scale private farms were the characteristic elements of most agricultural production during and after socialism. As a result, the advisory system supporting private farming

has enjoyed a considerable degree of continuity also. However, most of the advisors are production–oriented with very limited knowledge of environmental protection technologies and requirements. The advisory service is regionalized, and currently the more active and open advisory units are those that mainly provide widespread education, information and demonstration projects for farmers, including those on preventing farm pollution.

In contrast, during socialism in Lithuania the land was utilized by large state and collective farms, each of which employed at least one university–educated agronomist and veterinary officer. This meant that the communication of technical information was reasonably straightforward. At that time, in each region the agricultural department of the local administration included a chief agronomist and two others specialized in pesticide and fertilizer use. They were responsible for consulting with the specialists of the state and collective farms about new farming methods and technologies, including environmental requirements.

Since the collapse of the state farms, the larger farms (now in private hands) still have reasonable access to agronomic information and tend to be aware of environmental limitations applying to them (as they are subject to inspections). However, the many small farmers have much less access to information and their knowledge of environmental rules or good farming practices is very limited.

To address this situation, in 1993 the Lithuanian Ministry of Agriculture, the Association of Agricultural Companies and the Farmers Union set up a new advisory service with Danish assistance that mainly focuses on the medium–scale and small farmers. However, at the beginning of 2000 there were about a third of million owners and users of agricultural land (excluding members of horticultural associations). To provide even the most basic training to such a large number of agricultural operators and smallholders would be a daunting task.

In Slovakia large state and collective farms also dominated prior to 1989. Each employed a university–educated agronomist. However, unlike in Lithuania the large–scale farm structure continued even after the land–restitution process. The collective farms and nearly all state farms were privatized into large corporate farms (such as limited liability companies and joint–stock companies), each covering thousands of hectares. Individual private and household–plot farming is still a marginal category, occupying just 7 percent of total agricultural land. As a result, in Slovakia there is a high degree of continuity in farm management and farm structure, which is much more concentrated than in EU Member States. The large farms tend to be well–informed on agronomic and regulatory issues. In principle, the small operators can access the same advisory service that dates back to the socialist period. However, they are often ignorant of its existence.

6 SPECIFIC ISSUES FOR THE ACCESSION COUNTRIES IN THE IMPLEMENTATION OF THE NITRATE DIRECTIVE

In principle, owing to the low intensity of their farming systems these three accession countries should not face the type of difficulties with the Nitrate Directive that some Western European countries (e.g. Belgium and the Netherlands) have. Nevertheless there are still some specific issues that they must face.

Polluted Shallow Wells

Much of the rural population in the CEECs draw their water from private wells. Often poor in quality, well water is thus a critical public health issue. While the general protection of groundwater from agricultural contamination given by Nitrate Directive should help combat further decline, it may not lead to major improvements, at least not in the short term. One reason for this pessimism is because the problem of well–water contamination is most prevalent on small farms and smallholdings. These farms may not be brought within the ambit of the Nitrate Directive, either because it is not practical to do so or because they do not pose a wider public risk of pollution (i.e. beyond the confines of their own holdings). Moreover, farming may not be the only, or indeed the main, source of any contamination. Some comes from non–agricultural sources, such as outdoor toilets and septic tanks. Analysis of national monitoring data from Lithuania on the water quality in dug wells shows that it is affected by their location in relation to the farmstead, as well as by the intensity of farming activities and hydrological conditions.

The solution to the well–water problem should be the closure of highly polluted wells and the connecting of rural populations to piped water supplies. The accomplishment of such infrastructural development can take a long time. In the meantime, rural households should be advised on appropriate farming practices and the relative location of wells, septic tanks and kitchen gardens to minimize the risks posed to themselves and their neighbours.

Impact of the Nitrate Directive on Farm Structural Change

The private costs and benefits of implementing the Nitrate Directive favour the larger farms because the private costs are largely scale–neutral. This means that they impinge disproportionately on the finances of the smaller farm. At the same time, the private benefits of the Nitrate Directive (savings on fertilizer costs) rise with the size of the farm. The effect of the imposition of the Directive, it is feared, will tend to squeeze out the smaller farms.

Smaller farmers are not likely to fund the costs of waste–storage facilities from their own resources, but are unlikely to be favoured by those dispensing public funds for this purpose. For example, financial assistance provided under international aid programmes, including SAPARD, favour larger and expanding farmers with future production perspectives and competitive potential within the European market. Indeed, a number of funding programmes specifically link productive and protective investment together (including SAPARD farm investment grants). In the dairy sector, for example, the farmers who are most readily able to add the requisite slurry storage facilities are those who make major investments to improve and expand their milk production. They do this through the construction of modern animal housing and milking parlours.

In both Poland and Lithuania it is expected that the majority of the smaller farmers will never acquire proper manure storage facilities. Due to their uncertain future they are not targeted to comply with the Nitrate Directive. Among the medium–sized farms, the implementation of the Directive will contribute to the process of separating out those with the necessary means to modernize and expand and those that will be marginalized. In Poland the strategy for implementing the Nitrate Directive is expected to help consolidate the expanding, medium–sized commercial farms. This is the expectation in Lithuania as well, where the vast majority of new farms created by land restitution are relatively small–scale (under 10 ha). It is likely that the larger, more viable and market–oriented farms will be favoured to receive financial assistance to meet the requirements of the Nitrate Directive.

It is not inevitable, however, that the Nitrate Directive will squeeze out the smaller farmers. Most of them, particularly those still using litter systems, pose low pollution risks. In general it would be advisable to carry out a risk assessment survey to confirm to what extent the animal and other wastes of small farms do pose wider environmental risks. Depending on the results it is probably the case that most traditional small livestock farms could be exempted from the Nitrate Directive. For instance, in Lithuania the Code of Good Agricultural Practice does not regulate practices on small holdings nor impose specific requirements for manure storage on subsidiary farms with a small number of livestock (less than 10 LU).

In contrast, on Slovakia's Corn Island the animal density is rather high compared with other parts of the country, and the farm structure is much larger than the EU average. Slovakian agricultural operators fear that (as an implication of the Nitrate Directive) the EU might limit the livestock numbers in the case–study area, which would hit their competitiveness hard. This raises a more general issue. Farming groups in each of the three countries resent the fact that they are being obliged to comply with EU regulations, while being excluded from the full benefits of the Common Agricultural Policy. They see this as an effort to restrict their competitiveness within the enlarged EU.

Possible Environmental Problems Associated with Implementation of the Nitrate Directive

Slurry–based systems of animal housing are popular and are encouraged among livestock farmers wishing to expand and modernize. Unfortunately, these systems are more environmentally hazardous than traditional, deep litter systems. While the Nitrate Directive does not dictate a shift to any particular form of animal housing or waste treatment collection, many agricultural officials and farming leaders see that the Directive requirements are accommodated through the general modernization of commercial agriculture in the CEECs. Expanding and market–oriented farms that are investing in buildings and equipment are likely to have the outlook and wherewithal to respond to the challenge of the Nitrate Directive. They are also more likely to see it in their medium–term interest to do so.

It is important, therefore, that strategies to implement the Nitrate Directive do not encourage a general intensification of livestock production. Currently, 75 percent of farm animals in Poland are kept on litter systems, and 25 percent are on slurry based systems. For smaller and mixed farms, deep–litter systems producing farmyard manure are likely to be both more economical and more environmentally friendly. Solid manure is easier to control than liquid slurries. There is much less of it and it does not require the large lagoons and tanks that are not only costly to build but are demanding to maintain. If they are not well built and maintained, they can also pose a significant environmental hazard of their own. The potential pollutants in farmyard manure are less mobile and thus may reduce the risk of water pollution when spread on the ground, especially where there are free–draining soils. Manure with its high volume of organic solids can also be used as an effective soil conditioner, resulting in better soil structure with improved water holding capacity and less seepage. However, it is recognized that this approach may not be practical for larger farms.

Even so, it is imperative when financial resources (either national or international) are provided for agricultural modernization that the environmental requirements and impacts of the investment should be carefully checked. In Poland the Agency for Modernization and Restructuring of Agriculture provides preferential credits for young farmers to modernize their production and increase their competitiveness. However, the construction of proper manure storage facilities is not a requirement for receiving this grant. Consequently, this modernization programme might lead to increased environmental pollution if slurry storage and handling are not solved properly. In such cases, the elaboration and execution of appropriate waste–handling and management practices are vital to reduce the risk of environmental pollution.

Importance of Training and Advisory Service

There is a need for the very careful handling of animal wastes, especially in the areas of highly permeable soils. Implicit in the Nitrate Directive is the model of a farmer as

a competent technician and environmental manager. Success in reducing pollution will depend on the extent to which farmers behave in the desired roles. Therefore, investment in education and training is as important as, or even more so, than investment in physical infrastructure. An emphasis on technical fixes (such as six–month storage capacity) will not necessarily solve the problem, if farmers are unaware of the requirements of proper maintenance, waste handling and fertilizing practices. To be effective, strategies for the provision of training and advice to farmers should reflect the prevailing farm structures in the CEECs (especially the great disparities in farm size and the often large number of small farms).

Different Strategies Chosen by the Acceding Countries

The acceding countries have chosen different strategies regarding the implementation of the Nitrate Directive. Obviously they do not want to impose unnecessary burdens on their farmers or on their administrative and regulatory structures. Therefore they interpret the Directive in a way that suits their needs.

They face different challenges in terms of the number of agricultural operators who should comply with the Directive, as well as in their public and private capacity to carry out monitoring and training activities. They differ too in their imperatives to modernize the agricultural sector. Thus, while Lithuania is designating the whole country as an NVZ, Poland and Slovakia have taken the discrete zone approach. The two different approaches entail different costs for monitoring and administration and for the construction of manure–storage facilities. The approaches are also likely to influence how rapidly or slowly the Nitrate Directive is implemented in each country. Nevertheless, as with the current Member States, complete implementation will probably come about through an iterative process and will take several years.

LIST OF PARTICIPANTS

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APPENDIX[1]: COST OF IMPLEMENTING THE NITRATE DIRECTIVE IN POLAND

Appendix Table 1: Costs of Construction of Concrete Pads for Solid Manure

Area of pad (m^2)	Cost (Euro)
35	1 353
70	2 554
105	3 320
140	4 238
175	5 061
210	5 903

Appendix Table 2: Costs of Installing Covered (Fully Underground) Tanks for Slurry and Dung Water Storage

Tank capacity (m^3)	Cost (Euro)
30	3 649
45	5 364
60	6 876
90	9 243

Appendix Table 3: Costs of Installing Large Capacity Tanks for Slurry and Dung Water Storage (Open Tanks, Partially Sunk into the Ground)

Capacity (m^3)	Cost (Euro)
110	5 411
220	8 681
330	12 576
605	18 314
770	22 892
880	26 162

[1] For all Tables the source is: Majewski et al. (2002). For the purpose of the report net prices (without the VAT) were applied in farm-level calculations. As a consequence farmers' costs are lowered by 22 percent. The total costs may also be lowered by farmers using their own labour and basic materials.

Appendix Table 4: Costs of Equipment for Slurry/Dung Water Tanks

Item	Cost (Euro)
1 metre of PVC pipe (calibre 150 mm)	30
Tank for pumping 10 m^3	1 642
Pump for dung water tank	172
Pump for slurry tank	1 662
Slide for slurry tank (150 mm)	284