

Overcoming Agricultural Water Pollution in the European Union

SUSANNE M. SCHEIERLING

As the European Union's member countries make progress on controlling water pollution from homes and industry, their attention is turning to reducing water pollution from agriculture. Their experience shows that this can be achieved only through further integration of agricultural and environmental policies.

AGRICULTURAL water pollution is becoming a major concern not only in developed regions such as the European Union (EU) but also in many developing countries. The intensification of agricultural practices—in particular, the growing use of fertilizers and pesticides, and the specialization and concentration of crop and livestock production—has had an increasing impact on water quality. The main agricultural water pollutants are nitrates, phosphorus, and pesticides. Rising nitrate concentrations threaten the quality of drinking water, while high pesticide use contributes substantially to indirect

emissions of toxic substances. Increasing levels of nitrates and phosphorus in surface waters reduce their ability to support plant and animal life and make them less attractive for recreation.

Controlling water pollution from agriculture is made difficult by its particular nature. In most circumstances, agricultural pollution occurs over a wide area, and its sources are diffuse and difficult to identify. It also varies unpredictably over time and space, and depends not only on rainfall patterns and the land—slopes and soil characteristics—but also on farmers' land use and crop choices, production techniques, and fertilizer and pesticide use. Farmers' decisions, in turn, are affected by market prices for inputs and outputs, as well as by governments' agricultural support policies. In contrast to many industrial and municipal situations, few pollution treatment alternatives are readily available for installation on farms. Pollution control measures must rely heavily on approaches that affect farmers' land use and production decisions. Thus, agricultural policy, which directly influences these decisions, and environmental policy to control agricultural water pollution need to be coordinated and pursued with the same goals in mind.

Policy challenges

A policy for controlling agricultural water pollution needs to specify the level of water quality desired and what measures should be adopted to achieve this goal. Various problems, including incomplete

information about the costs and benefits of pollution abatement, make it difficult to determine the optimal level of water quality in terms of economic efficiency. Therefore, the choice is often made based on other criteria, such as human health concerns or the protection of current uses of the water.

Policies that can affect farmers' land use and production decisions include voluntary measures such as education and training, moral suasion, and technical assistance; regulatory measures such as performance standards (maximum discharge rates or maximum pollutant levels) and direct controls on outputs, inputs, or technology; and incentive-based measures such as taxes, subsidies, and transferable discharge permits. For pollution coming from a single source, it is often more efficient to adopt incentive-based measures, in particular an emissions tax, than regulatory measures for achieving a desired level of emissions reduction. But, since agricultural emissions' sources are diffuse, they cannot be addressed directly with an emissions tax or subsidy. Other incentive-based measures that could be used as proxies, such as taxes on output or on purchased inputs, do not provide efficient incentives for farmers to modify the ways in which they use inputs (for example, methods and timing of fertilizer application), even though such changes could significantly reduce agricultural pollution. Tax-based measures may therefore not be as effective in controlling pollution from diffuse sources as some other regulatory alternatives.

Susanne M. Scheierling,

a national of Germany, was a Consultant to the World Bank's Asia Technical and Eastern Africa Departments and is currently a research scholar with the Water Resources Project at the International Institute for Applied Systems Analysis in Laxenburg, Austria.

The choice of the appropriate measure is made more difficult by the fact that, besides efficiency, environmental policy objectives often include other criteria such as equity, acceptability, administrative simplicity, and risk reduction. Clearly no single measure can meet all the criteria, and a mix of measures will be imperfect in terms of meeting any single criterion—an effective policy therefore involves compromises.

Given these challenges, it is not surprising that effective control of agricultural water pollution is still an unresolved issue in many parts of the world. In the European Union, the situation has been intensified by a supranational agricultural policy that for decades has stimulated agricultural production and, indirectly, pollution. Environmental policy measures to reduce this pollution have to “compete” against agricultural policy measures.

France, Germany, the Netherlands, and the United Kingdom are among the EU member countries that have experienced especially severe agricultural water pollution problems and adopted a variety of measures. The experience of these four countries illustrates that the control of agricultural water pollution not only defies easy solutions but also necessitates the improved coordination and, ultimately, the integration of agricultural and environmental policies.

Community policies

Until the mid-1980s, the European Community generally had separate sets of policies for agriculture and the environment. On the one hand, agricultural policy, which encouraged the intensification of agricultural practices, did not take into account water quality or any other environmental implications. Environmental policy, on the other hand, rarely addressed the negative side effects of agriculture. As a result, agriculture became a major source of water pollution and, in some areas, a threat to drinking water supplies.

Agricultural policy. The Common Agricultural Policy (CAP), as incorporated into the 1957 Treaty of Rome, which laid the Community’s foundation, was generally seen as a step leading to the economic and, ultimately, political union of Western Europe. Its objectives included, among others, increasing agricultural productivity and ensuring a fair standard of living for the agricultural community. In order to achieve them, market price support

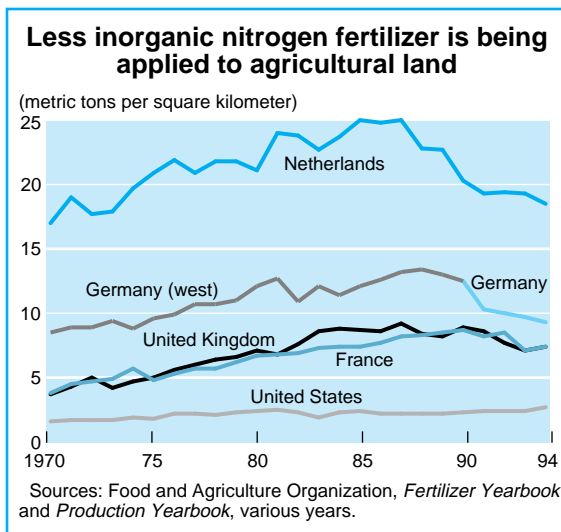
measures and both variable import levies and export subsidies were widely adopted. By the mid-1980s, about 90 percent of total agricultural output in the Community was covered by price supports, and expenditures for the agricultural sector represented about 65 percent of the Community’s budget. This policy, together with technological advances, stimulated intensive agricultural practices and production. Between 1960 and 1985, agricultural production, in mone-

phosphorus. During the 1980s, owing to improved sewage treatment and changes in detergent formulations, river pollution levels in many member states declined in terms of oxygen-consuming substances and phosphorus. But there was widespread evidence of high and increasing nitrate levels as a result of agricultural activities.

Environmental policy. Public concern about the environment led to the adoption of the first environmental measures in the early 1970s. In 1973, the first of a series of five-year Environmental Action Programs was adopted, and in the following years, several measures for reducing and preventing water pollution were introduced. Like the Community’s environmental policy in general, the policy on controlling water pollution relied primarily on the regulatory approach. It focused on setting quality objectives for particular uses of water and reducing pollution caused by the discharge of certain dangerous substances, but it did not explicitly address the issue of water pollution from agriculture.

Agricultural water pollution issues surfaced in connection with the 1980 Community Directive on drinking water, which required member countries to ensure that certain quality objectives (or maximum pollutant levels) for drinking water supplies were met by 1985. But, during the second half of the 1980s, it became obvious that most member countries had not achieved these quality objectives. In particular, the maximum pollutant level for nitrate, set at 50 milligrams per liter, was exceeded in many areas.

Although some member countries had provided penalties for infringement of the pollutant levels specified in the Directive, they were not enforced, and consumers were not informed of deviations from the quality objectives. Water suppliers often found that there was limited scope for reducing pollutant levels by blending water and, particularly when they were dealing with smaller groundwater sources, they were reluctant to invest in the relatively expensive technologies for removing agricultural pollutants. By the end of the 1980s, several countries decided to provide for investments to ensure that the Directive’s water quality objectives were met. For example, the water companies in England and Wales designed programs to invest £1.8 million between 1990 and 1995. In France, the average price for water was expected to double during the 1990s as a



tary terms, climbed dramatically, with increases ranging from 50 percent in France to about 85 percent in the Netherlands.

An indicator of the intensification of agricultural practices and the resulting pressure on water resources is the intensity of inorganic nitrogen fertilizer use (see chart). From 1970 to the mid-1980s, inorganic nitrogen use on agricultural land grew by 42 percent in the Netherlands and by 135 percent in the United Kingdom. Owing to the incentives provided by the CAP, inorganic nitrogen use in the four member countries reached relatively high levels, compared with non-Community countries. For instance, in 1985, nitrogen use intensity in Germany was about five times, and in the Netherlands more than ten times, higher than in the United States.

In the four member countries, agriculture became a major source of nitrate and phosphorus pollution of water during this period, while industrial and municipal discharges of these substances continually declined. By the end of the 1980s, agriculture accounted for 70–85 percent of the nitrogen pollution, and more than 30 percent of the phosphorus pollution, of the surface water in rural areas. In more urban areas, the corresponding figures were 50 percent for nitrogen and 5 percent for

result of planned investments in water purification.

Toward integration

The 1980s were years of intensifying crisis for the Community's agricultural policy. Owing to rapid growth in budgetary costs, mounting surpluses, and environmental damages, it was increasingly recognized that the policy's existing approaches were no longer sustainable. There was also a growing recognition that, in order to be effective, environmental policy had to be an integral part of other sectoral policies.

Agricultural policy. During the second half of the 1980s, a variety of new measures were adopted to solve the Community's agricultural policy crisis. These measures turned out to be insufficient to solve the underlying problems of the CAP, and more fundamental reforms were introduced for 1992–96. Their main feature is a reduction in support prices for a range of agricultural products. Compensation for the price reductions is granted through a range of direct payments made in connection with programs, such as rotational set-asides and maximum livestock densities, that are designed to limit production. An agro-environmental package is also included that aims at more environmentally friendly methods of production. Subsidies are offered to farmers who reduce livestock density, decrease fertilizer and pesticide use, or switch to organic farming or other more extensive forms of production.

In the four member countries, the CAP reforms already seem to have had some effect on agricultural practices: in the 1990s, agricultural production and inorganic nitrogen fertilizer use have been declining after more than two decades of growth (see chart). Because the time lag between the adoption of new agricultural practices and improvements in water quality can be considerable, it is too early to tell how the measures have affected agricultural water pollution. The overall environmental effects of the current reforms are not expected to be dramatic. This is because even though the share of direct payments in the Community's agricultural budget rose steeply, agricultural support continues to be dominated by production-oriented payments. Furthermore, the production-limiting measures were set at levels that affect only the more intensive enterprises, and the agro-environmental package will have an impact only where governments are willing to administer and finance particular programs.

Environmental policy. Agricultural water pollution issues were directly

addressed for the first time in the Directive on pollution caused by nitrates from agricultural sources, which, after two years of debate, was adopted in 1991. It requires member countries to designate as "vulnerable zones" areas of land that are likely to contribute to nitrate levels exceeding 50 milligrams per liter. Member countries were to establish "codes of good agricultural practices" to be implemented on a mandatory basis in vulnerable zones and on a voluntary basis in all other areas. In addition, action programs for the vulnerable zones needed to be established by the end of 1995 and implemented until 1999. Action programs must ensure that application of farm manure does not exceed specified limits and establish rules concerning periods and conditions for applying manure and inorganic fertilizer. Member countries may introduce additional measures, taking into account their effectiveness and their cost relative to other measures. By the beginning of 1996, five member countries had established action programs.

National control measures

Unlike the CAP, under which the Union (and formerly the Community) has almost exclusive competence, the common environmental policy leaves member countries considerable freedom to implement national measures. Reflecting their particular socioeconomic conditions and patterns of agricultural production, the four member countries have chosen quite different measures for controlling agricultural water pollution. As agricultural water pollution has become increasingly visible and been addressed by Community action, national governments have gradually extended the range of their control measures to include not only voluntary but also regulatory and incentive-based approaches.

An initial reaction to rising problems with drinking water quality in the 1980s was the development of voluntary measures to educate and inform farmers on how to improve production techniques. In 1984, for example, the French Ministries of Agriculture and the Environment created a new organization that was solely responsible for promoting education, information, and research on agricultural water pollution control. When it became obvious that this approach was not sufficient to induce broad changes in agricultural practices, the member countries gradually introduced regulatory measures. For instance, in 1984, the Dutch government forbade new "factory farms" for pigs and poultry, and in 1986 the German government imposed

greater restrictions on the use of pesticides.

Regulatory measures, especially those targeting special geographic areas, often were accompanied by compensatory payments. For example, in Germany, where special land-use restrictions were introduced in 1986, payments have been made to farmers in water protection zones. The regional government of Baden-Württemberg introduced a special levy on the water price—the so-called water penny—to fund the reimbursements. Partly as a result of monitoring and enforcement problems, an alternative approach—buying the land in water protection zones—has been applied in a few cases. German municipal authorities and Dutch water supply companies have purchased land in water protection zones and leased it back to farmers under strict land-use conditions.

Incentive-based measures, mainly subsidies, have been adopted since the late 1980s. For example, a program for environmentally sensitive areas in the United Kingdom provides grants to farmers to induce them to reduce the application of fertilizers and pesticides or to convert to organic farming. A relatively new approach encourages "negotiated agreements" between municipal authorities or water supply companies and farmers. For instance, in an effort to improve the quality of drinking water supplies, the city of Munich pays subsidies to farmers who agree to switch to less intensive practices. Another incentive-based approach has been adopted by the Dutch government for controlling manure production and disposal. It included establishing manure quotas for individual farms and a national manure bank to stimulate the distribution of manure supplies. From 1990 to 1994, manure quotas were gradually tightened, and in 1994 they became tradable.

Implementation of the 1991 Directive on nitrate pollution from agricultural sources was delayed in many member countries, and the European Commission has instigated several infringement proceedings. Some countries are currently taking steps to implement the Directive. According to the Commission, the trend is toward requiring farmers to keep records of their mineral accounts and to pay levies in vulnerable zones for manure applications that, on a per hectare basis, exceed the limit specified in the Directive. The German government, for example, did not identify vulnerable zones but instead established an action program throughout the country. Legislation adopted in the beginning of 1996 requires farmers to practice mineral accounting and to limit manure application as specified in the

Directive. The German environment ministry does not anticipate that farmers will have to reduce livestock densities as a result of this limit; rather, farmers who exceed the limit will probably lease additional land or establish manure banks. Owing to its high livestock intensity (more than five times the Community's average) and large manure surpluses, the situation in the Netherlands is more difficult. With farmers having already exploited many possibilities to reduce surpluses on a per hectare basis, compliance with the Directive will necessitate reducing livestock production, at least in some areas. Overall, the European Commission expects that monitoring and enforcement requirements will place heavy burdens on the member countries.

Conclusions

During the last decade, the EU countries have made efforts to reconcile their policies for agriculture and the environment. At the Union level, agricultural policy is expanding subsidies for less intensive and less polluting methods of production, and environmental policy has begun to directly target agricultural pollution of water.

In individual member countries, policies for controlling agricultural water pollution

have gradually been extended to incorporate a mix of voluntary, regulatory, and incentive-based measures. However, there has been a great reluctance to use measures other than voluntary ones. In cases where regulatory or incentive-based measures have been used, they were usually—in violation of the “polluter pays” principle adopted by the European Union—accompanied by payments to farmers. The implicit assumption seems to have been that farmers have a property right to use land as they see fit, and if the public wants less intensive land use, it must pay compensation. The irony is that the public is also paying for the agricultural support prices that encourage intensification.

In recent years, it has become obvious that this state of affairs is no longer sustainable. The new Agreement on Agriculture resulting from the conclusion of the Uruguay Round of multilateral trade negotiations and the planned enlargement of the EU to include countries of Central and Eastern Europe make additional reforms of the Union's agricultural policy very likely. In particular, direct income support is expected to increasingly replace agricultural price supports, which should provide efficient incentives for agricultural pollution

abatement. Environmental policies at both the European Union and national levels will increasingly address agricultural water pollution problems by imposing mandatory “codes of good agricultural practices.” Monitoring and enforcement will be facilitated by more sophisticated administration and information systems to register land uses and other activities of a shrinking population of full-time farmers. Still, there is much to be learned concerning agricultural pollution control and the effectiveness of various mixes of measures. Empirical work on alternative control policies currently is too limited to devise informed “packages of good control measures.” It is therefore important for many control approaches to be pursued in greater detail and to be more closely evaluated. [F&D]

This article is based on the author's study, Overcoming Agricultural Pollution of Water: The Challenge of Integrating Agricultural and Environmental Policies in the European Union, World Bank Technical Paper No. 269 (Washington, 1995).

NEW FROM THE INTERNATIONAL MONETARY FUND RESERVE YOUR COPY NOW!



Inflation and Growth in China

Edited by Manuel Guitián and Robert Mundell, this book is a collection of papers presented at a conference held in Beijing in 1995. Included among the sponsors were the IMF and the People's Bank of China. Against the background of experiences

from other countries, the conference examined China's reform program in detail. The papers in this volume allow readers to draw inferences about the existence and sustainability of a trade-off between inflation and growth.

US\$25.00. Available in English.
(paper) ISBN 1-55775-542-6 x + 305 pp. 1996
Stock #IGC-EA



Financial Programming and Policy: The Case of Sri Lanka

by a staff team led by S. Rajcoomar and Michael Bell with John Karlik, Michael Martin, and Charles Sisson

This book contains a series of workshops that introduce the process of formulating a hypothetical macroeconomic and structural adjustment program, which is a central element in the financial programming courses offered by the IMF Institute. In addition to elaborating key concepts for the major sectoral accounts, the workshops are designed to help users develop, step by step, a reference scenario for Sri Lanka.

US\$19.00. Available in English.
(paper) ISBN 1-55775-579-5 ix + 278 pp. 1996
Stock #FPSL-EA

TO ORDER, PLEASE WRITE OR CALL:

International Monetary Fund Publication Services, Box FD-396, 700 19th Street, N.W., Washington, D.C. 20431 U.S.A.
Telephone (202) 623-7430, Telefax: (202) 623-7201, Internet: publications@imf.org
American Express, MasterCard, and VISA credit cards accepted.

