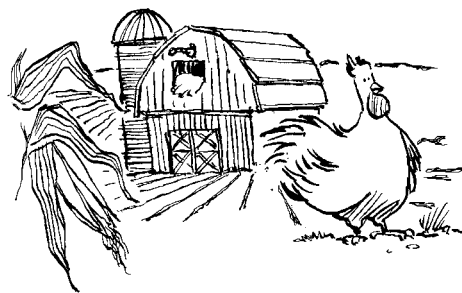




Fertilizer Management



EPA's State and Local Climate Change Program helps build awareness, expertise, and capacity to address the risk of climate change at the state and local levels. The program provides guidance and technical information to help state and local agencies prepare inventories of greenhouse gas emissions, develop action plans to reduce emissions, and educate their constituents. By emphasizing the many economic and environmental benefits of greenhouse gas reductions, the program encourages state and local decisionmakers to implement voluntary measures to reduce their greenhouse gas emissions.

Nitrogen Fertilizer

In 1997, the application of synthetic nitrogen and organic fertilizers accounted for about 36 percent of total U.S. nitrous oxide (N_2O) emissions. N_2O is a powerful greenhouse gas, about 310 times more effective at trapping heat than carbon dioxide on a molecule-for-molecule basis.

Most N_2O is produced naturally by microbial processes in the soil. These processes may be augmented by the application of synthetic nitrogen and organic fertilizers, leading to an increase in emissions from agricultural lands where these fertilizers are used. According to the Intergovernmental Panel on Climate Change, if fertilizer applications are doubled, emissions of N_2O will double, all other factors being equal.

Using nitrogen fertilizer more efficiently can reduce N_2O emissions resulting from their application. At the same time, avoiding excessive applications decreases the CO_2 emissions that occur during the fertilizer manufacturing process, which relies on natural gas or electricity generated from fossil fuels.

In addition to these environmental benefits of reduced N_2O emissions, the efficient use of nitrogen fertilizer reduces the runoff of nutrients that diminish water quality and aquatic life in streams, rivers, and lakes. In fact, many states require or encourage management of nitrogen fertilizer to protect water quality.

Avoiding excessive fertilizer applications to cropland also can reduce farmers' operating costs. A number of practices and technologies are available to increase the efficiency of fertilizer use and reduce N_2O emissions. Examples include matching the supply of fertilizer to the demands of specific crops, ensuring the appropriate timing of nutrient applications, using efficient irrigation practices, converting to nitrogen-fixing plants as cover crops and during crop rotation, and employing advanced fertilization techniques such as controlled-release fertilizers and nitrification inhibitors, which slow the conversion of ammonium to nitrate nitrogen.

Farmers generally are most motivated to use fertilizers efficiently when crop prices are low and/or fertilizer prices are high. Some fertilizer dealers support efforts to improve fertilizer efficiency as they recognize the opportunity to sell nutrient services, such as soil testing and farm-specific nutrient management plans, to farmers.

The Federal Role

Under the Climate Change Action Plan, the U.S. Department of Agriculture is sponsoring demonstration

BENEFITS OF IMPROVING NITROGEN FERTILIZER EFFICIENCY

- Reduced fertilizer costs for farmers.
- Potential for increased yield and profitability in some crops.
- Reduced emissions of nitrous oxide.
- Less nutrient runoff, improved water quality.
- Reduced emissions of CO_2 associated with fertilizer manufacturing.

projects and analyses of techniques to improve the efficient use of nitrogen fertilizers. USDA has modified its Nitrate Leaching and Economic Analysis Package (NLEAP), a model for determining the efficiency of nitrogen use, to allow users to estimate N₂O emissions that would result from various nitrogen management systems. Twenty states are using NLEAP to analyze nitrogen fertilizer management techniques. Based on their results, USDA will compile a database that nutrient management planners can use to select management systems that minimize nitrogen loss to the environment through leaching and atmospheric emissions.

The federal Environmental Quality Incentives Program (EQIP), established under the 1996 Farm Bill, provides technical, financial, and educational assistance to farmers and ranchers. Among other things, EQIP offers cost-sharing and incentive payments for land management practices such as nutrient and manure management.

In addition, through efforts by USDA's Natural Resource Conservation Service, private insurers in some states now offer crop insurance that protects farmers against potential yield reductions associated with the use of alternative nitrogen management techniques. The availability of this insurance provides a safety net to farmers who might otherwise be unwilling to experiment with new techniques.

Nitrogen Management Success Stories

Nebraska

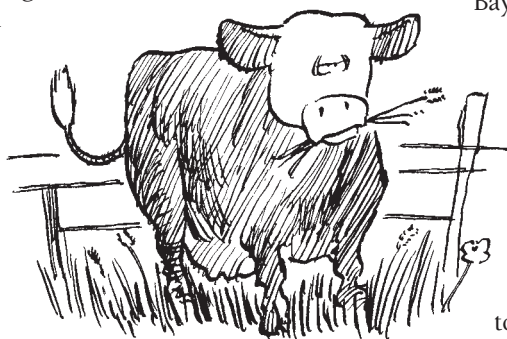
Thanks to outreach efforts by Nebraska Cooperative Extension and agronomists in state agencies, Nebraskan farmers have dramatically increased their use of deep soil sampling to determine the nitrogen fertilizer needs of their crops. Deep soil sampling reveals the amount of nitrogen already available in the soil for use by deep-rooted plants. In

1989, only 12 percent of dryland farmers and 49 percent of farmers who irrigated used deep soil tests. By 1994, deep soil sampling was used by 48 percent of dryland farmers and 76 percent of farmers who use irrigation. Nebraskan farmers who use deep soil tests report an average 33 percent reduction in the amount of nitrogen fertilizer applied, saving 77 million pounds of nitrogen annually statewide and reducing N₂O emissions by roughly 0.09 million metric tons of carbon equivalent per year.

Pennsylvania

A recent statewide survey of farmers in Pennsylvania found that 36 percent use a late-spring soil test to determine their nitrogen fertilizer needs. Those farmers reported a 40 percent reduction in their nitrogen fertilizer use in the five years since late-spring soil testing began. This practice saved 28 million pounds of nitrogen annually statewide and reduced N₂O emissions by approximately 0.03 million metric tons of carbon equivalent per year.

The State of Pennsylvania has made a commitment to reduce nitrate loadings into the Chesapeake Bay drainage area. Although the state does not require farmers to use nitrogen fertilizers more efficiently, the Pennsylvania legislature passed a nutrient management law in 1993 that requires certain farms to prepare and implement nutrient management plans for animal manures. The State Conservation Commission is responsible for developing regulations to establish minimum criteria for nutrient management plans that incorporate best management practices. The commission also provides financial assistance such as loans, loan guarantees, or grants for implementing nutrient management plans.



For More Information

Under the U.S. Department of Agriculture's program for improving the efficiency of nitrogen fertilizer use, the agency is developing a database of nitrogen management systems that minimize N₂O emissions.

Contact Charles Lander, Natural Resources Conservation Service
Tel: 202-690-0249

USDA's Environmental Quality Incentives Program offers financial, educational, and technical help to farmers and ranchers in designated priority areas, defined as "watersheds, regions, or areas of special environmental sensitivity or having significant soil, water, or related natural resource concerns."

Website: <http://www.nhq.nrcs.usda.gov/OPA/FB96OPA/eqipfact.html>

The California Department of Food and Agriculture's Fertilizer Research and Education Program (FREP) was created in 1991 to advance the environmentally safe and agronomically sound use and handling of fertilizer materials.

Tel: 916-653-5340

Website: <http://www.cdffa.ca.gov/inspection/frep/>

The Conservation Technology Information Center at Purdue University is a nonprofit, public-private partnership that promotes environmentally and economically beneficial natural resource systems for agriculture. Nutrient management is one of the cornerstones of the partnership's "Core 4" initiative, an integrated approach to increasing the adoption of environmentally sustainable agricultural management practices.

Tel: 765-494-9555

Website: <http://www.ctic.purdue.edu/CTIC.html>

CTIC Nitrogen Management Brochure: <http://www.ctic.purdue.edu/AgManagementPractices/NitroManage.html>

EPA's State and Local Climate Change Program helps states and communities reduce emissions of greenhouse gases in a cost-effective manner while addressing other environmental problems.

Website: <http://www.epa.gov/globalwarming/> and click on "Public Decision Makers" under the "Visitors Center."