ENVIRO-BRIEFS

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Crop Fertilization and Air Quality

Fertilization, including both organic and inorganic sources, accounts for nearly 40% of crop yield in North America. In some countries, up to 75% of total production is the result of fertilization. Obviously, proper nutrient use is essential if farmers are to continue to grow sufficient amounts of food to meet the needs of a growing world population. Without adequate fertilization, billions of people could face starvation.

At the same time, the use of nitrogen (N) fertilizers, particularly animal manure and other organic sources, can also impact environmental quality by returning certain global warming gases back to the atmosphere. The three gases of primary concern are nitrous oxide (N_2O), methane (CH_4), and carbon dioxide (CO_2). In addition, significant amounts of gaseous ammonia (NH_3) can be released into the air as a result of crop fertilization. With careful management, NH_3 losses are minimal.

All forms of N fertilizers—inorganic and organic—have the potential to release N2O to the atmosphere. However, direct loss of N_2O from fertilizer is usually less than 1%. Other factors, such as cropping systems, soil management, and unpredictable rainfall have a much greater influence on **N_2O** losses than do the various inorganic nitrogen fertilizer sources.

Liquid manure can greatly increase the rates of N_2O loss. In one southeastern U.S. study, high rates of liquid manure produced denitrification rates 10 to 100 times higher than those resulting from the application of inorganic N fertilizers. Denitrification is a key step in the production of **N_2O** in the soil and, thus, its loss to the atmosphere.

Methane gas released to the atmosphere because of agricultural production comes predominately from ruminant animals, livestock manure, wetlands, and rice production. Very little is associated with crop fertilization.

Improved fertilizer management can help to eliminate most losses of the global warming gases. High, efficiently produced crop yields can actually contribute to a drop in the production and release of global warming gases, particularly CO_2, because of crop fertilization. As crop yields increase (because of fertilization), more biomass is produced, resulting in the buildup of organic matter in the soil. Carbon is a component of soil organic matter, and as long as it is held in organic form, it is not available to be converted to CO_2 and released to the atmosphere.

Although crop fertilization has the potential to contribute to the production of global warming gases, **proper nutrient management minimizes its effect while significantly increasing the amount of food grown worldwide.** EB

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