Sound Science, Sound Air

Helping Agriculture and Air Quality at the Same Time

The goal of the Agricultural Research Service's national program on Climate Change, Soils, and Emissions (#212) is to help make farming both more environmentally friendly and more efficient.

Often, if you accomplish one, you accomplish the other. New management strategies to solve one problem can have multiple benefits, including addressing the four components of agriculture sustainability recently identified by the National Academy of Sciences in its book "Toward Sustainable Agricultural Systems in the 21st Century":

- Satisfy food, fiber, and biofuel needs.
- Enhance environmental quality and resources.
- Maintain agriculture's economic viability.
- Improve quality of life for farmers, farm workers, and society as a whole.

If you farm more efficiently, you have less loss of nutrients, soil, and pesticides to the atmosphere and water—and less exposure of farmers, farm workers, and communities to pesticides and other air pollutants.

Many of these losses come down to nitrogen: We put nitrogen into livestock feed as a protein source, and we fertilize crops with nitrogen. But feedlot cattle lose about 85 percent of the nitrogen in livestock feed fed to them—much of this as ammonia (a gas form of nitrogen) emitted from their urine and feces. Ammonia irritates people's skin, eyes, mouth, and lungs. Ammonia in water runoff from agricultural fields also carries nitrogen to waterways, leading to algal blooms that can deplete dissolved oxygen. Livestock managers would rather have nitrogen go only to livestock growth, and farmers would prefer that nitrogen applied to crops be taken up by the crops to enhance growth.

As the story on page 4 shows, our program researches the processes governing ammonia and other emissions so that we can design management techniques to better control them.

During the process of finding ways to reduce air pollution from agriculture, we collect data that state and federal regulators need to set accurate air-quality standards and make environmental policies affecting agriculture.

The articles on page 9 and 14 discuss two other air pollutants we study: dust from cotton gin operations and soil, and ground-level ozone, which is the most damaging air pollutant to plants by far.

As the ARS representative on the U.S. Department of Agriculture Agricultural Air Quality Task Force (AAQTF), I meet regularly with representatives of all USDA agencies, with the common goal of helping agriculture reduce air pollution. The group includes representatives of the U.S. Environmental Protection Agency (EPA) and other federal agencies, state agencies, and industry groups—as well as many others, including a veterinarian and representatives of a major medical clinic that researches rural and agricultural health and safety issues.

For agricultural air-quality research, good data and computer models to use this data are especially important. Agricultural air-quality data and models are also needed for many types of production and processing systems to help with decision support.

The "Characterization of Cotton Gin Particulate Matter Emissions Project," a major 4-year project, addresses this issue for cotton gin emissions. For this project, ARS scientists are intensively sampling emissions from cotton gins strategically located throughout the Cotton Belt. They planned the project with federal and state regulators and the cotton industry.

Regulators, researchers, agricultural industries, and those involved in human health issues share a commitment to ensuring that the best scientific data is available for the challenges involved in making decisions about agricultural air quality. On farms and ranches, emissions come from many sources over large areas of land ("non-point sources"), and because farming and ranching are outdoor businesses, weather conditions and other factors also come into play.

As the story on page 18 shows, air temperature and soil moisture are two of the many factors that determine the degree to which pesticides escape to the air. Other research has shown that temperature also affects how much ammonia is emitted from cattle feedlots. Wind direction and speed, among other factors, also can determine air-quality outcomes.

The diversity of agriculture also presents challenges for data collection and modeling, with livestock, crops, and management techniques varying from one part of the country to another.

Research provides a fundamental basis for developing technologies for reducing agricultural atmospheric emissions. However, interpretation and incorporation of those discoveries into working practice is necessary for realizing that potential.

We are greatly helped in reaching farmers and ranchers through our strong ties to the USDA Natural Resources Conservation Service (NRCS), which convenes and leads AAQTF meetings. For example, we work with the NRCS Air Quality and Atmospheric Change Technology Development Team in Portland, Oregon. This team is also developing National Engineering Handbook chapters on agricultural air quality, with recommended air emission management strategies.

As agriculture evolves, ARS adjusts its research accordingly to help the agricultural community meet the challenges of increased efficiency and regulatory mandates for lower air emissions. The data and models produced by ARS also ensure that regulators are equipped with the best possible science-based information to make sound policy decisions.

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