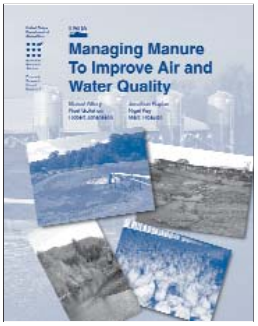
ERS Report Summary
Resources and Environment

Economic Research Service September 2005 U.S. Department of Agriculture



This is a summary of an ERS report.

Find the full report at www.ers.usda.gov/err9

Managing Manure To Improve Air and Water Quality

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U.S. environmental laws tend to focus on a single environmental medium (e.g., Clean Water Act, Clean Air Act, and Endangered Species Act). When a single pollution source can simultaneously affect more than one environmental medium, a single-medium approach to pollution control can confound policymakers concerned with economic efficiency. An uncoordinated set of policies that independently address different pollution issues can result in unnecessary and unanticipated economic and environmental costs.

Animal agriculture is facing just this situation. Animal agriculture produces a variety of pollutants, including organic matter, urea, ammonia, nitrous oxide, phosphorus, methane, carbon dioxide, pathogens, antibiotics, and hormones. Regulations to restrict animal farm emissions to the water might inadvertently increase emissions to the air, and vice versa.

What Is the Issue?

In 2003, EPA introduced revised Clean Water Act regulations to better protect surface waters from nutrients from concentrated animal feeding operations (CAFOs). When applying manure to crop or pasture land (the primary disposal method), CAFOs now must follow a nutrient management plan that specifies a manure application rate that minimizes the threat to water quality. The cost to farmers of meeting this requirement can be relatively high, primarily from moving manure to an adequate land base. A logical response by producers operating under a nitrogen-based plan might be to reduce the nitrogen content of manure spread on fields by enabling nitrogen to volatilize into the atmosphere from uncovered lagoons or by applying animal waste to land without incorporating it into the soil. But doing so also releases ammonia emissions into the air. As animal feeding operations are the primary source of ammonia in the United States, air quality regulations might require some States to regulate ammonia emissions from animal feeding operations.

What Did the Study Find?

Air and water quality regulations would be most cost effective if implemented simultaneously. This would allow farmers to select the most appropriate mix of practices that satisfy environmental quality goals while maximizing net returns. If environmental policies are uncoordinated, farmers may have to make costly changes to practices more than once before both environmental goals can be met.

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To meet a water quality goal, farmers tend to use practices that increase ammonia emissions to the air. Similarly, the practices used to meet an air quality goal would tend to increase nitrogen losses from fields to ground and surface waters. Meeting both air and water quality goals would likely cost more than meeting either air or water goals.

Depending on how the air quality regulations are applied, this could have two impacts on CAFOs and water quality. First, farms identified as CAFOs might need to increase the amount of land on which they spread manure in order to continue to meet nutrient application standards. This could be particularly costly in a region where animal concentrations are high and cropland available for spreading manure is relatively scarce. For example, requiring CAFOs in the Chesapeake Bay watershed to control ammonia emissions would increase producer costs of land-applying manure by $4 million per year. Failure to account for these costs when developing an ammonia regulation could lead to the false conclusion that the policy is efficient.

Second, an uncoordinated approach could reduce water quality. If ammonia reductions were required of both CAFOs and smaller farms, the water quality benefits from the regulations restricting CAFOs' nitrogen emissions might be diluted by increased nutrient applications on the smaller farms, which have no such nitrogen restrictions. In the Chesapeake Bay watershed, for example, the nutrient content of manure produced on farms not covered by a nitrogen application standard would more than double if ammonia restrictions were applied to all animal feeding operations. This would increase the risk of nitrogen runoff into the Chesapeake Bay.

Anticipating the different forms and pathways that nitrogen takes can keep air quality and water quality policies from working at cross purposes. Then, true solutions—like diet manipulation (to reduce the amount of nitrogen excreted by animals) or industrial uses of manure—might become clearer.

How Was the Study Conducted?

The study used three separate but related analyses to capture the full range of economic decisions (and consequences) that result from farmers' meeting environmental regulations. Data from the 1998 Agricultural Resources Management Survey of hog producers were used to estimate the tradeoffs that occur at the farm level when policies are designed to address pollutant flows to one environmental medium without considering flows to another medium. The broader impacts of coordinated policies, including the welfare impacts on both producers and consumers and regional shifts in production, were examined with a national model of the agriculture sector that tracks nitrogen losses to the environment. A case study of the Chesapeake Bay watershed was used to demonstrate the problems that hypothetical ammonia reductions would have for farms meeting the CAFO regulations in a region where land for spreading manure is relatively scarce, and for resource managers trying to reduce nitrogen loads.

At the heart of all three analyses are nitrogen loss coefficients that are derived from a mass-balance accounting of nitrogen in manure. These were obtained from EPA, and enabled us to estimate tradeoffs in nitrogen losses to the air and nitrogen applied to land as different manure management practices are employed.