

Chapter 1

Introduction

U.S. agriculture produces affordable food and fiber for domestic use and export and contributes significantly to the economic base of rural communities. But many agricultural activities also produce pollutants that can harm the environment. For example, animal production generates byproducts such as organic matter, urea, ammonia, nitrous oxide, phosphorus, methane, carbon dioxide, pathogens, antibiotics, and hormones. Without proper management, these materials can degrade surface water, ground water, and soils. Environmental policy aims to improve the management of agricultural systems such that environmental harm is minimized.

Mitigating pollution problems can challenge policymakers when more than one environmental medium is affected by a single pollution source. The correction of a single problem without simultaneously addressing others may not increase societal welfare as much as anticipated, and may even decrease it. Thus, an uncoordinated set of policies that independently address different pollution issues could result in unnecessary losses in societal welfare. Scientists and program managers are also aware of these trade-offs. However, environmental laws often focus on only one environmental medium (Clean Water Act, Clean Air Act, Endangered Species Act). Such narrowly focused programs may harbor large opportunity costs, especially with high interdependence in pollution flows between different environmental media (U.S. EPA, 1996).

Animal agriculture, in particular, has faced increasing environmental regulations in recent years. Growth and concentration in the industry over the past several decades has prompted concerns over environmental degradation in areas where production facilities are clustered. Concentrated animal feeding operations (CAFOs) have been regulated since 1974 under the Clean Water Act. CAFO regulations were strengthened in 2003 to reduce the threat of nutrients entering surface water, and were the subject of an earlier ERS study (Ribaud et al., 2003). But these regulations do not require control of potential air emissions from CAFOs. Confined animal operations are the largest source of ammonia emissions in the United States (Abt Associates, 2000). Ammonia emissions have long been encouraged as a justifiable byproduct of meeting water quality goals (Sweeten et al., 2000). Lagoons, for instance, are commonly used to store and treat manure waste from swine operations. These storage systems volatilize nitrogen, thereby reducing its concentration in lagoon effluent and reducing the cost of meeting land application requirements. But, the volatilized nitrogen compounds escape into the air, creating odors, contributing to fine particulates (haze), and hastening global climate change (National Research Council, 2003). Only recently has ammonia loss been viewed as a potential problem in terms of air quality (Sweeten et al., 2000).

The current uncoordinated approach to air and water quality protection has potentially costly implications for both animal producers and society in general. Some animal feeding operations already subject to water quality regulations may soon be required to meet ammonia emission regulations. Technologies adopted to reduce water pollution may be inadequate for

meeting both water quality and ammonia requirements, and might have to be abandoned or modified, at some cost, to comply with both sets of regulations.

Smaller operations not required to meet Clean Water Act regulations might be required to meet air quality regulations. If they change manure management practices to reduce ammonia emissions, the nitrogen content of the operations' manure will increase. If manure applications to the land remain unchanged, the risk of nitrogen runoff to water resources increases. A more coordinated approach to environmental quality protection could avoid these unintended consequences.

Research Objectives

This report assesses the potential economic and environmental tradeoffs between air and water quality when the animal sector is required to take potentially costly measures to abate pollution. To date, only a few analyses have discussed the cross-media problem (Helfand, 1994; Hohmann, 1994; Resources for the Future, 1996), and none explore the theoretical or empirical tradeoffs inherent in cross-media environmental policy. We extend this literature by acknowledging that multiple pollutants from animal feeding operations may enter different media; pollution control technologies effective in one environmental medium may conflict with technologies to control pollutants to other media. Examining the implications of regulating across environmental media may help guide future air and water quality regulations and improve the performance of existing policies.

To accomplish these objectives, this report:

- Reviews some of the potential pollution problems attributable to animal waste, the physical relationships inherent in the waste stream that complicate efficient manure management policy, and the environmental policy regime facing animal agriculture.
- Estimates the tradeoffs that occur at the farm level for hogs when policies are designed to address pollutant flows to one environmental medium without considering flows to another medium. This analysis best captures the production decisions that an individual producer makes when faced with market signals and regulatory requirements in the context of the farm's capital and resource bases.
- Analyzes the national impacts of coordinated policies, including the welfare impacts on both producers and consumers. This accounts for the price effects and regional adjustments missing from the farm-level analysis.
- Analyzes the implications of adding air quality regulations to existing Clean Water Act (CWA) regulations in a region where a limited land base increases the costs of meeting manure management requirements. This case study of the Chesapeake Bay watershed demonstrates how the costs of meeting CWA requirements are affected if ammonia emissions must also be reduced. It also demonstrates how water quality might be affected if ammonia reductions are required on farms not covered under the CWA.