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Technical Documentation of the Regional Manure Management Model for the Chesapeake Bay Watershed

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Abstract

The Regional Manure Management Model, developed for the ERS project on "Manure Management for Improved Water Quality," is used to evaluate the cost and feasibility of manure land application as a manure management strategy at the regional level. This model is a nonlinear mathematical programming model of animal manure-nutrient production and distribution applied to the Chesapeake Bay watershed. The model is designed to assess regional costs of manure management, transport, and land application in the Chesapeake Bay watershed, given the existing structure of the animal industry and manure-storage technologies currently in use. Manure-nutrient production is allocated within the basin to minimize costs to the animal sector, subject to land availability and policy provisions. A defining feature of the modeling system involves the integration—within an optimization framework of spatial data from a Geographic Information System and farm-level data from the 1997 Agricultural Census—aggregated to the county level. The framework captures important spatial interactions involving animal concentrations and land available for manure spreading that can significantly affect manure land application costs faced by animal producers.

Keywords: Technical documentation, regional analysis, Chesapeake Bay, animal waste, manure management, nutrient management plan, manure land application, manure transport, cost minimization, optimization model.

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