Conclusion and Future Extensions

The Chesapeake Bay Regional Model, developed under the ERS Manure Management for Improved Water Quality Project, provides a useful framework to assess the importance of spatial factors—spreadable land base, animal concentrations, and manure-storage technologies—on potential manure management costs facing animal producers. Indeed, findings from application of the model suggest that spatial factors underlying competition for spreadable land in the Chesapeake Bay watershed are an important consideration in accurately assessing the feasibility and costs of new manure management guidelines to the animal sector. The modeling framework is also notable for its integration of farm-level survey data from the Agricultural Census, aggregated to the county level, with geo-specific data from the National Land Cover Dataset. The resulting database—developed from public secondary data sources—captures important intra-regional variation in key cost determinants for animal waste management. Moreover, the reliance on national data series ensures data consistency across a watershed scale, while facilitating data update and model transferability to other watersheds. Results from an initial application of the modeling system are featured in a recent ERS publication (Ribaudo et al., 2003).

While the Chesapeake Bay regional modeling system was successfully applied as a part of the ERS's water quality analysis, the developers noted potential model improvements and extensions as limitations were revealed during the initial application. Many of these improvements and extensions are being incorporated for subsequent applications of the regional modeling framework. Areas of model development (not in priority order) currently identified include:

- Inclusion of air emissions by manure-handling technology;

- Developing a procedure to respecify the spatial grid sizes used for aggregating (binning) of animal operations to achieve more efficient and rapid model convergence;

- Incorporating model differentiation in manure-nutrient production and related management requirements across CAFOs and non-CAFO animal farms;

- Developing the data and model capacity to adjust the available land base for manure spreading to reflect stream buffer guidelines, use of municipal sewage byproducts, and agricultural land conversion;

- Developing consistent regional data on public cost-sharing for manure-hauling and other manure management options, the use of backhauling, and local manure-pricing practices. These factors can adjust the effective hauling costs faced by animal producers as well as the distributional pattern of manure management costs;

- Incorporating onfarm drying technologies as a manure management alternative;

- Developing a process to estimate within the model the cost of reducing the stock of animals as a means of addressing manure that cannot be land-applied within the basin;

- Developing a process to integrate our model findings on the spatial distribution of land-applied manure with other models designed to address nutrient transport and water quality.

Implementation of improvements and extensions to the Chesapeake Bay regional model will depend on research priorities, resources allocated to the project, and availability of supporting data. Cooperation with regional subject-area experts remains an important consideration, as many of these data items are local in nature and not readily available through national data series.