
Costs Associated with Development and Implementation of Comprehensive Nutrient Management Plans

Part I—Nutrient Management, Land Treatment, Manure and Wastewater Handling and Storage, and Recordkeeping

Introduction

Animal agriculture has changed dramatically over the last two decades (Kellogg et al., 2000). Livestock populations have become more spatially concentrated in high-production areas. Small- and medium-sized livestock operations have been replaced by large operations at a steady rate. The total number of livestock has remained relatively unchanged, but the average number of livestock per operation has increased and more livestock are kept in confinement. These changes in animal agriculture have resulted in increased concern about the utilization and disposal of animal waste. As livestock production has become more spatially concentrated, the amount of manure nutrients relative to the land available for application has grown. In some high-production areas, the amount of manure produced exceeds the capacity of the land to assimilate manure nutrients (Lander et al., 1998; Kellogg et al., 2000).

In October 1997, the U.S. Department of Agriculture (USDA) and the U.S. Environmental Protection Agency (EPA) were directed to work with other Federal agencies and the public to develop a Clean Water Action Plan (CWAP) that would chart a course toward fulfilling the goal of the Clean Water Act—"fishable and swimmable" water for all Americans. One of the key actions in the Clean Water Action Plan, released in February 1998, called for USDA and EPA to develop a joint unified national strategy to minimize the environmental and public health impacts of animal feeding operations. USDA and EPA released the *Unified National Strategy for Animal Feeding Operations* in March 1999 (USDA-EPA, 1999). The Strategy established a national performance expectation that all animal-feeding operations should develop and implement technically sound, economically feasible, and site-specific Comprehensive Nutrient Management Plans (CNMPs) to minimize impacts on water quality. It envisioned that this accomplishment should be achieved over a 10-year implementation period. The Strategy also called for a cost analysis to define the potential financial impacts of the initiative.

In December 2000, the Natural Resources Conservation Service (NRCS) released the *Comprehensive Nutrient Management Planning Technical Guidance* to provide guidance for the development of CNMPs, whether they are developed in the context of a USDA voluntary incentive program or as a means to help a livestock operation comply with the EPA's National Pollutant Discharge Elimination System permit requirements (USDA, NRCS, 2000a). The Technical Guidance is not a sole source reference for developing CNMPs. Rather, it is used in conjunction with the NRCS conservation planning process, as contained in the NRCS National Planning Procedures Handbook.

As defined in the Technical Guidance, a Comprehensive Nutrient Management Plan is a conservation system that is unique to animal feeding operations. It includes a set of conservation practices and management activities that address natural resource concerns dealing with manure and organic by-products and their potential impacts on water quality. A CNMP addresses the following elements:

- 1. Manure and Wastewater Handling and Storage.** This element addresses activities associated with the production facility, feedlot, manure and wastewater storage and treatment structures and areas, and any areas used to facilitate transfer of manure and wastewater. Generally, a combination of conservation practices and management activities are needed, such as manure storage, clean and contaminated water diversions, manure collection and transfer, runoff storage ponds, and mortality management.
- 2. Land Treatment Practices.** This element addresses activities associated with fields where manure and organic by-products are applied. Generally, this element deals with the establishment of erosion control practices on land receiving manure, such as residue management, contouring, and terraces.
- 3. Nutrient Management.** This element addresses activities associated with land application of all nutrients and organic by-products to meet crop needs and minimize potential adverse impacts to the environment and public health. Generally, this includes planning and applying nutrients with consideration of form

(e.g., manure, wastewater, commercial fertilizer, crop residue, legumes, and irrigation water), time of application, application rate, and application method.

4. Recordkeeping. This element addresses the documentation of management and implementation activities associated with a CNMP. Typically, this includes recording soil tests, manure tests, manure and wastewater field application dates and rates, acres applied, manure transfers, and operations and maintenance activities.

5. Feed Management. This element addresses activities that improve feed delivery, reduced feed wastage, or increased nutrient uptake by livestock to reduce the nutrient content of manure. Feed management is a planning consideration and is not based on specific criteria.

6. Other Utilization Activities. This element addresses alternatives to land application of manure, such as energy production (e.g., burning, methane generation and conversion to other fuels), nutrient stabilization and extraction for commercial fertilizers or other products, composting or pelletizing, and mixing or co-composting with other by-products to produce specialized use materials. Alternatives to land application are planning considerations and are not based on specific criteria.

A CNMP would be constructed to meet specific criteria for the first four elements. The last two elements, however, are planning considerations, and do not have a specific set of criteria associated with them. That is, feed management and alternatives to land application may be part of an individual CNMP depending on the producer's goals and preferences, but if the producer is not interested in these alternatives, the objectives of the CNMP would be met using only the first four elements.

This publication (Part I) presents the results of USDA's assessment of the costs for developing and implementing CNMPs based on NRCS criteria for the first four elements. Definitive information on CNMP costs is needed to develop policy, formulate budgets, and provide insight for the implementation of financial assistance programs, such as the Environmental Quality Incentive Program (EQIP). In a subsequent

publication (Part II), the potential for reducing CNMP costs with feed management options and the additional costs associated with alternatives to land application of manure will be explored. In addition to presenting the results of the cost assessment, Part I also provides a detailed documentation of data sources, modeling assumptions, and other information on how the assessment was conducted.

The first step in the assessment process is to identify the number of livestock operations that are expected to need a CNMP, which is presented in the next section. This is followed by an overview of the cost assessment process, and then by sections that present the cost estimates and detailed methods and assumptions used to estimate costs for each of the four elements. Also estimated are CNMP development costs, off-farm transport costs, and costs associated with off-farm land application. This publication concludes with a summary of CNMP costs broken down by livestock sector, farm size, and region of the country.