

**STRATEGY FOR MANAGING SURPLUS NUTRIENTS  
FROM AGRICULTURAL ANIMAL MANURE  
AND POULTRY LITTER IN THE  
CHESAPEAKE BAY WATERSHED**



**Chesapeake Bay Program**  
*A Watershed Partnership*

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## STRATEGY OVERVIEW

Agriculture is a significant source of nutrients entering the Chesapeake Bay, with animal manure and poultry litter contributing about half of the Bay watershed's agricultural nutrient load. As the acreage of cropland available for manure application is lost to development and phosphorus accumulates in cropland soils, the challenge of managing manure will only intensify. Many Bay states have taken huge strides to meet this challenge, however, additional actions will be required. The Chesapeake Executive Council directed the Principals' Staff Committee to develop a detailed strategy for addressing this issue.

From November 2004 through September 2005, the Chesapeake Bay Program held a series of meetings with dairy, poultry and swine stakeholders to develop sustainable solutions for reducing nutrient pollution from animal manure and poultry litter in the Chesapeake Bay watershed. Key stakeholders involved in crafting these solutions included producers, animal agriculture associations, the Farm Bureau, the USDA Natural Resources Conservation Service (NRCS), the USDA CSREES Mid-Atlantic Water Quality Program, universities, feed companies, nutrient management specialists, scientists, economists, state agricultural and water quality agencies, environmental groups, the Environmental Protection Agency (EPA) and the Chesapeake Bay Commission.

The nutrient load entering the Chesapeake Bay from animal manure and poultry litter is roughly equivalent to the load from human waste (about 20 percent). However, here the similarities end. Unlike human waste, where a combination of pollution prevention and enhanced nutrient reduction technologies are employed to control nutrient loads at wastewater treatment plants, there is no single solution for treating manure and litter nutrient loads. The Chesapeake Bay states illustrate this point in their Tributary Strategies with a commitment to take a number of actions to reduce manure and litter nutrient loads, such as implementing nutrient management plans, properly applying manure and litter to cropland, developing animal waste storage systems, restricting animals from streams, relocating barns away from streams, transporting excess manure and litter to areas in need and managing animal diets.

States already have many of these nutrient management programs in place and have made a commitment to step up their efforts to achieve even further nutrient reductions. In developing this strategy, stakeholders stressed the importance of this strong foundation in managing the overall nutrient balance on farms and identified four opportunities for better managing manure nutrients in the Chesapeake Bay watershed to keep agriculture viable:

1. Reduce surplus animal manure and poultry litter nutrients by adjusting animal diets.
2. Foster alternative uses for animal manure and poultry litter nutrients by building markets and technologies for manure and litter products that can be used for energy, fertilizers, soil amendments or compost on a variety of lands.

3. Develop a comprehensive inventory of manure and litter nutrient surpluses in the watershed.
4. Coordinate manure management programs throughout the watershed to address the regional imbalances of manure and poultry litter surpluses.

The intent of this strategy is to augment the existing successful programs implemented by the Bay watershed states by focusing attention on these areas where experts believe that additional nutrient load reductions can be efficiently and effectively achieved. This strategy represents the priority focus areas that will likely procure further nutrient reductions, have the greatest support for implementation and result in long-term sustainable solutions.

The Chesapeake Bay Program's Nutrient Subcommittee will play a large coordinating role in ensuring that this strategy is implemented. In the process, the subcommittee will continue to collaborate with the Chesapeake Bay Program's Scientific and Technical Advisory Committee and the USDA CSREES Regional Water Quality Programs in the mid-Atlantic states and New York.

## **REDUCE THE NUTRIENT CONTENT IN ANIMAL MANURE AND POULTRY LITTER THROUGH FEED MANAGEMENT**

### **Goal:**

*To build feed management into the everyday business of animal operations throughout the Chesapeake Bay watershed to reduce manure nutrients and on-farm nutrient surpluses while maintaining animal health and productivity.*

Making improvements in animal feeding on a farm can reduce manure nutrients and improve on-farm nutrient balances for all types of animal operations. Feed management is a source reduction approach that results in less manure and litter nutrients for the farmer to manage and often reduces feed costs. Our primary focus is on implementing feed and forage management programs on dairy farms, where significant manure nutrient reductions are possible.

In the poultry and swine industries, our objective is to ensure that we maximize current phosphorus reductions through feed management and find opportunities to achieve further nutrient reductions.

### **DAIRY OPERATIONS**

#### **Goal:**

*By 2010, to achieve a 20 percent reduction in phosphorus and nitrogen levels in manure in one-third of the Chesapeake Bay watershed dairy animals. By 2015, achieve these reductions of manure nutrients in one-half of the Chesapeake Bay watershed dairy animals.*

We will achieve this reduction by encouraging dairies to learn about on-farm nutrient balances and how precision feeding, forage management and grazing practices can help better balance nutrients on their farms. We will encourage dairy farmers to start this endeavor by reaching the Nutritional Research Council's recommended levels of dietary intake of phosphorus for dairy cows. The 2005 USDA award of \$4 million in Conservation Innovation Grants to support dairy feed management programs in the Chesapeake Bay watershed, coupled with the commitment from universities to conduct education and outreach, will serve as an excellent foundation for meeting this goal.

The Nutrient Subcommittee will work with the states to set up a system for tracking nutrient reductions from dairy feed management programs, considering dairy manure nutrient sampling and reports on feed management programs implemented in the watershed.

**Commitments:**

By April 2006, the Chesapeake Bay Program's Nutrient Subcommittee, in cooperation with the CSREES Regional Water Quality Programs in the mid-Atlantic states and New York, will form the **Chesapeake Bay Watershed Dairy Feed Management Team** and convene a kick-off meeting.

Participants will include, but not be limited to, feed specialists, feed companies, private consultants, veterinarians, nutrient management specialists, state Cooperative Extension and university specialists, Soil and Water Conservation Districts, NRCS Technical Service Providers, NRCS technical and nutrient management staff and environmental groups. Key coordinating agencies include state agricultural and water quality agencies, the EPA and NRCS.

By December 2006, the Chesapeake Bay Watershed Dairy Feed Management Team will produce the following:

- **Technical Assistance Plan:** A plan for creating technical assistance experts to meet the current and future farmer demand for assistance in creating, implementing and refining individual dairy feed management programs.

The Chesapeake Bay watershed states have a number of technical assistance experts who provide advice to farmers on a regular basis, such as nutritionists, feed specialists and veterinarians. It is critical to educate these technical assistance experts on dairy feed management so that they can assist farmers in creating and maintaining feed management programs. Additional feed management specialists are likely to come from the private sector, Cooperative Extension and conservation districts, although experts will vary state-by-state.

- **Educational materials:** By December 2006, the CSREES Regional Water Quality Programs in the mid-Atlantic states and New York, universities and Cooperative Extension will develop:
  - Education Plan: A plan for educating existing dairy service providers, including veterinarians, feed formulators, private consultants, county Conservation District staff and others on whom dairy farmers rely.
  - Outreach Materials: Feed management educational materials will include information regarding:
    - The benefits of implementing feed management in terms of reducing excreted nutrients and on-farm nutrient imbalances, promoting animal health and long-term cost savings;
    - The practices and options involved in feed management;
    - On-farm examples of feed management adoption in the region; and

- A resource list of feed management technical assistance experts, financial resources and tools for evaluating the effectiveness of feed management programs.

These materials will be adapted for different audiences and updated on an ongoing basis. The approach for convincing dairy farmers to implement precision feeding and forage management must be customized for each farm due to differences in farm size, the information available to the farmer and the level of manure management on the farms.

Other organizations that may assist in this effort include Soil and Water Conservation Districts, state agency and conservation organizations, producer and agricultural organizations, feed companies, private nutritionists, the EPA and NRCS.

- **Funding Mechanisms:** By December 2006, NRCS in each of the Chesapeake Bay states will adopt the National NRCS Feed Management (592) Standard and modify it, as appropriate, for each state.

Adoption of this standard will allow NRCS to provide producers with financial assistance for feed management through NRCS programs such as the Environmental Quality Incentives Program, the Agricultural Management Assistance Program and the Conservation Security Program. States will encourage the use of feed management in their ranking process and financial assistance for feed management.

The Nutrient Subcommittee will provide regular updates to the Implementation Committee on the progress made by the Chesapeake Bay watershed Dairy Feed Management Team.

## **POULTRY OPERATIONS**

### **Goals:**

*By 2010, achieve at least a 30 percent reduction of total phosphorus in poultry manure from pre-phytase levels through a combination of adjusting supplemental phosphorus levels in feed and by adding phytase.*

*Achieve phosphorus reductions beyond 30 percent if the science indicates that they are possible without detrimental impacts on bird health and growth.*

### **Commitments:**

By October 2006, the Chesapeake Bay Program's Nutrient Subcommittee will convene a meeting with the poultry industry, feed companies, state agricultural and water quality agencies, scientists and NRCS to:

- Map out the approach for achieving the 30 percent reduction goal, including refining methods of tracking and verifying current and future phosphorus reductions achieved by the poultry industry. Tracking methods should be consistent across the industry.
- Evaluate the science to determine whether further phosphorus and nitrogen reductions are possible by reducing nutrient levels in feed and optimally using phytase or other nutrient-reducing feeding approaches, without detrimental effects on bird health and growth.

If further reductions are possible, states will work with the poultry companies to incorporate the latest science into their feed formulation decisions to further reduce nutrient levels in poultry litter. It is critical that the poultry integrators help their contract growers by reducing phosphorus in feed.

## **SWINE OPERATIONS**

The swine industry is primarily integrated within the Chesapeake Bay watershed. Operations associated with a commercial integrator may already be feeding reduced phosphorus diets and/or feeds with phytase added to reduce excreted phosphorus. However, the extent to which swine feed management is implemented across the watershed and the resulting phosphorus reductions have not been fully quantified.

### **Commitments:**

The Chesapeake Bay Program's Nutrient Subcommittee will meet with university researchers, swine industry representatives, feed companies, the lead state agricultural and water quality agencies and NRCS to:

- By March 2007, develop a summary report that includes:
  - An assessment of the degree to which the swine industry is using phytase or other nutrient-reducing feeding approaches.
  - An assessment of the manure nutrient reductions resulting from swine feed modification and other nutrient-reducing approaches.
  - A list of information regarding the extent and effectiveness of nutrient-reducing approaches in the swine industry.
  - A plan for better tracking and verifying current and future phosphorus reductions achieved by the swine industry. Methods for tracking nutrient reductions should be consistent across the watershed.
  
- By July 2007, develop a plan for achieving further manure nutrient reductions in swine operations in the Chesapeake Bay watershed if science indicates that they are possible without detrimental impacts on animal health and growth.



## **BUILD MARKETS AND TECHNOLOGIES FOR LITTER AND MANURE PRODUCTS**

### **Goal:**

*To identify and promote a range of economically viable and environmentally sustainable alternatives to applying raw manure and litter nutrients to agricultural lands.*

*We will focus on developing technologies and building markets for litter and manure products for use as compost, soil amendments, fertilizers and energy throughout the Chesapeake Bay watershed, particularly in those regions with significant manure/litter nutrient surpluses.*

Even with feed management and other nutrient management programs in place, there are likely to be regions within the Chesapeake Bay watershed that still suffer from manure or poultry litter nutrient surpluses. On a watershed-wide scale, we import more nutrients (through commercial fertilizers, animals and people) than we export. In order to keep Chesapeake agriculture viable, we need to find opportunities to use litter and manure nutrients in place of imported commercial fertilizers. We believe that, after feed management, the best long-term sustainable solution to dealing with manure and poultry litter nutrient surpluses is to develop alternative uses for litter and manure nutrients such as compost, soil amendments, fertilizers or energy.

We have already demonstrated on the Delmarva Peninsula that poultry litter can be economically pelletized and marketed for various uses, such as fertilizers for golf courses and gardens. We recognize that developing dairy and swine manure products will take more time as we develop the technologies necessary to create these products.

To provide leadership in creating a market for these products, we are committing to procure manure and litter products for use on state and federal lands. We will start with a target of 20 percent and refine our goal as we learn more about the current use of these products in the watershed and future opportunities to market and use these products. In doing so, we want to avoid competition with other organic nutrients generated in our watershed, such as biosolids, by seeking new market opportunities. We will build on federal procurement programs that are under development, such as the USDA bio-based initiative and the EPA Comprehensive Procurement Guidelines.

## **IDENTIFY AND BUILD MARKETS FOR LITTER AND MANURE PRODUCTS**

### **Planning Target:**

*By 2010, 20 percent of the total fertilizer, soil amendments and compost used on state and federal lands will be composed of poultry litter or animal manure nutrients derived from sources generated within the Chesapeake Bay watershed states.*

Examples of the types of state and federal lands on which manure-based products could be applied are state universities, state and federal highways projects, military bases, state

and federal complexes, national and state parks, superfund remediation sites (managed, but not often owned by the federal government) and in the reclamation of abandoned mine lands or other appropriate land reclamation projects.

**Commitments:**

By June 2006, the states and federal agencies will outline their approach for how best to achieve the procurement goal. Recommendations could include how to make existing programs and legislation work better and/or propose new programs/legislation (either watershed-wide or state-specific initiatives).

By June 2006, the states and federal agencies will develop a target list of state and federal lands on which to promote the use of manure and litter nutrients based on criteria such as the highest volume of nutrients used and greatest willingness to accept manure and litter products.

By June 2007, on these target lands the states and federal agencies will coordinate funding efforts to:

- Ensure that they have sufficient staff resources to promote the procurement requirement to the state and federal procurement staff that purchase fertilizers and soil amendments.
- Work with state agencies and manure and litter product suppliers to assess barriers to using manure based products and develop solutions to overcome them.
- In at least one state agency in each jurisdiction and two federal agencies, secure contracts with manure and litter product suppliers to replace commercial fertilizers used on these lands with manure and litter sources of nutrients.

States will reach out to local governments in the Chesapeake Bay watershed to encourage them to use manure and litter products on local government-owned lands, including schools and park authorities.

By June 2008, the state and federal agencies will re-evaluate and revise, as necessary, the 20 percent planning target.

## **DEVELOP AND PROMOTE TECHNOLOGIES FOR PRODUCING MANURE AND LITTER PRODUCTS**

As we develop the market for manure and litter products, we must concurrently identify and promote the most promising manure and litter product technologies throughout the watershed. Examples of technologies that we are pursuing or are likely to pursue in the watershed are the following:

- *Poultry Litter Processing:*  
For the poultry industry, one successful technology for converting litter into fertilizer is pelletization for use on golf courses, sports fields and specialty horticultural crops. Other promising approaches are granulizing and composting.
- *Dairy and Swine Manure Solid-Liquid Separation and Composting:*  
For dairy and swine operations, where moisture content of manure ranges from 85-95 percent, a critical initial step to developing a manure product is employing technologies that separate solids from liquids. Another promising technology is composting. For composting, it will be important to identify a “dry carbon source” such as leaves, wood chips or certain food wastes, which are critical ingredients in compost. Also important are technologies that separate nutrients from the manure for further processing or transport away from the farm. For example, using chemical additives to extract phosphorus from manure for transport to more distant fields or for more precise application on fields near the barn.
- *Shared/Regional Technologies:*  
In many cases, today’s technologies for treating manure and litter and turning these by-products into economically beneficial resources have very high capital costs and significant management demands. Finding ways to share a technology among a number of farms or building a regional facility (for example, a regional composting or bio-energy facility) that services a number of farms could provide a viable way to handle surplus manure nutrients from smaller animal operations.
- *Bioenergy:*  
Bioenergy has received a lot of attention in the Energy Title of the Farm Bill and in the watershed states that have developed energy portfolios encouraging the use of manure and litter products in energy production. States should be looking for opportunities to use agricultural biomass to help meet their energy portfolio goals. Like other alternative uses, many questions remain regarding the viability of energy production, the scale(s) that may be most feasible in the Chesapeake region and the obstacles and impediments that must be overcome to make energy production economically viable and environmentally sound. Also, some bioenergy technologies, such as anaerobic digesters, do not alter the quantity of

nutrients themselves and would need to be combined with other technologies, such as solids separation and composting, to facilitate alternative uses of manure nutrients.

**Commitments:**

By April 2006, the Chesapeake Bay Program's Nutrient Subcommittee will create a Regional Manure and Litter Use Technology Task Force to identify and promote promising technologies for producing manure and litter products.

The subcommittee will collaborate with the following organizations in developing this task force: the Chesapeake Bay watershed states, EPA, USDA Agricultural Research Service, NRCS Technology Support Centers, universities, CSREES Regional Water Quality Programs in the mid-Atlantic states and New York, producers and conservation organizations.

The task force will:

- Identify promising technologies for producing litter and manure nutrient products in the Chesapeake Bay watershed, through regular communication with national and regional researchers.
- Develop a mechanism for transferring results of manure and litter product technology research to the region's educators, service providers and producers.
- Work with NRCS to develop interim practice standards for worthy tools and technologies. Interim standards allow the state to provide financial assistance for the technology while it is under NRCS national review.
- Recommend promising manure and litter product technologies for funding as demonstration projects through state and USDA programs, as appropriate.
- Support research to develop alternative uses of poultry litter and animal manure on topics such as:
  - Technologies for establishing poultry pellet plants scaled for smaller operations outside the Delmarva region.
  - Technologies for turning dairy and swine manure into a valuable product (solid/liquid separation, nutrient stripping or composting).
  - Technologies for bioenergy that build on lessons learned from failed projects and address issues related to funding, scale, air emissions and marketing.
  - Shared/regional technologies for handling manure and litter from smaller animal operations.

By March 2007, the Task Force will hold a workshop to share promising technologies and discuss mechanisms for communicating and promoting them.

## **INVENTORY SURPLUSES OF MANURE AND LITTER NUTRIENT SURPLUSES IN THE WATERSHED**

It is important to quantify the location and extent of organic nutrient surpluses generated in the watershed (manure/litter nutrients, biosolids, etc.) and the challenges in marketing manure and litter for alternative uses. This type of inventory will help manure managers formulate a plan for how best to deal with manure and litter nutrient surpluses.

### **Commitments:**

Conduct an inventory of the best available estimate of manure and litter nutrient and biosolid surpluses and the market demand in the Chesapeake Bay watershed, based on:

- Nutrients available for use on croplands versus the crop needs.
- Nitrogen or phosphorus-based Nutrient Management Plan implementation.
- True nutrient surpluses based on actual agronomic demands given nutrient soil tests.
- Factors affecting willingness to accept manure and litter products.
- Current alternative use projects and activities that use excess litter or manure.

This quantification should consider the latest data on manure and litter nutrient content resulting from improvements in feed nutrient use efficiency and plant nutrient uptake. The inventory should also include projections of how surpluses are likely to change as a result of fluctuating energy prices, animal operations expansions/relocations, changes in cropping patterns and acreages and other organic nutrient markets.

Within six months of completing the inventory, the Chesapeake Bay Program's Nutrient Subcommittee will convene a workshop with the animal industry and manure managers to present its results and discuss how best to manage manure and litter nutrient surpluses.

## **COORDINATE STATE MANURE MANAGEMENT PROGRAMS ACROSS THE WATERSHED**

Bay jurisdictions have differing programs and legal limitations for handling manure management. Although some jurisdictions regularly coordinate and communicate with others regarding their initiatives, no formal regional effort exists to coordinate these programs.

### **Commitment:**

By December 2006, the Secretaries and Commissioners of Agricultural and Water Quality agencies of each watershed state and the EPA will meet to initiate an ongoing forum for coordination of programs that manage manure and for information exchange related to management issues in the region. Overarching objectives will include:

- Ensuring that litter/manure management programs achieve an overall reduction in nutrient losses from agricultural operations.
- Ensuring that regionally consistent insecurity protocols are implemented when manure is handled, manipulated, managed or transported in order to prevent the transmission of pathogens and viruses.
- Reviewing potential marketplace responses to existing and proposed manure management and utilization programs, technologies or business enterprises and subsequent effects within the region.

The initial meeting will focus on manure and litter transport programs throughout the region and their potential effects on local manure and litter markets. Meeting participants will:

- Communicate issues regarding the potential for state transport subsidies to displace litter/manure markets in other states. Discuss options for resolving manure market displacement by discussing factors such as state transportation subsidies and current market demands.
- Develop a plan for how to regionally manage litter/manure nutrients (from all animal sectors) and biosolid nutrient surpluses in the watershed and build markets for both products.

## **TARGET FUNDING FOR MANURE AND POULTRY LITTER NUTRIENT MANAGEMENT**

To achieve further reductions in nutrient loads to the Bay from animal manure and poultry litter, we have committed to a number of actions. Meeting our commitments will take the combined efforts of the Chesapeake Bay Program partners, all watershed jurisdictions, NRCS, universities, Cooperative Extension, technical service providers, producer groups and of course, the farmers. Through these partnerships, we will be able to use our expertise and limited resources more efficiently. However, additional funding will be necessary as well. The greatest opportunity remains to garner additional support from the Farm Bill.

### **Commitment:**

States and other non-federal partners will identify opportunities to target funding in the Conservation Title of the Farm Bill towards promoting manure nutrient management approaches such as precision feeding, diet modification, new manure management technologies and the development of alternative use manure and litter products.