MANAGING AGRICULTURAL NUTRIENTS IN MARYLAND'S CHESAPEAKE BAY BASIN

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The Chesapeake Bay, with an area of approximately 5,960 square kilometers, is the United States of America's largest estuary. It receives about half of its water volume from the Atlantic Ocean and half from its 165,900 square kilometer watershed which includes areas of six states and the District of Columbia. The Bay is very shallow, averaging approximately 6.5 meters in depth. Compared to other coastal and inland bodies of water the bay has a large drainage basin for the volume of water it contains. For every cubic kilometer of water in the Bay there are 2,742.86 square kilometers of watershed (for the Baltic this ratio is approximately 43.62 square kilometers of watershed per cubic kilometer of water volume). This large watershed -area to water-volume ratio coupled with increased spring and summer halocline formation makes the Bay particularly vulnerable to the effects of nutrient pollution. In 1976 concerns regarding declining water quality within the Bay and its tributaries led to a six-year study of water quality of the Bay. About forty research projects coordinated by the Environmental Protection Agency (EPA) documented declining water quality and reduction in the numbers and diversity of fish, shellfish and submerged aquatic vegetation (SAV) in the Chesapeake Bay. Eutrophication and turbidity caused by soil sediments and increases in plant nutrient inputs were considered to be the main causes of these changes. Nutrient reduction was therefore considered to be a major consideration for improving habitat for benthic organisms and fish. Reduction in nutrients would result in reduced algal blooms and increased light penetration to SAV. Water quality models, simulating ecosystem processes, were used to establish 40% reduction goals for nutrients entering the Bay. These reduction goals were based upon 1985 loadings and were to be attained by 2000. In 1987 the Chesapeake Bay Agreement, adopting these 40% reduction goals, was signed by the states of Maryland, Virginia, Pennsylvania, the District of Columbia and the EPA.

In 1992, refinement of the water quality model led to the adoption of 'Tributary Strategies' which allocated nutrient reduction goals to each of the Bay's major watersheds. Within Maryland, watershed nutrient loads were determined on the basis of point source loads and land use loading rates and areas. A tributary strategy was developed for each of the state's ten major watersheds. These strategies are targeted at meeting Maryland's 40% reduction goal. Program and practice options for nutrient reduction within each watershed were evaluated and the most promising options identified. These strategies are a combination of existing regulatory and voluntary programs. Tributary plans provide the opportunity to integrate nutrient reduction efforts through a wide variety of initiatives and provide a framework for a comprehensive approach to nutrient reduction. One of the options identified as being able to play a major role in the reduction of nutrients from agricultural non-point sources is nutrient management planning.

Prior to the Chesapeake Bay Agreement, programs already existed to implement some aspects of water quality improvement, but no program was in place which specifically addressed nutrient management planning. In 1989 the Maryland Department of Agriculture (MDA) and the University of Maryland's Maryland Cooperative Extension Service (MCES) established the Maryland Nutrient Management Program (MNMP). The primary focus of this program is to place 0.54 million hectares of Maryland's 0.91 million hectares of farmland under nutrient management plans by the year 2000. Nutrient management planning is a series of best management practices (BMPs) aimed at reducing nutrient non-point source pollution by balancing nutrient inputs with crop nutrient requirements. At a cost to the citizens of the state of $5.00 per hectare per year, nutrient management planning is considered one of the most cost-effective means of controlling excessive nutrient applications. This paper will discuss the inception, development, implementation and success of the MNMP.

In Maryland the adoption of nutrient management plans by farmers is (with a few exceptions) voluntary, and the program therefore emphasizes how such planning enhances farm profitability through reduced input costs as well as improving water quality. To facilitate nutrient management planning the MCES has approximately twenty consultants based in county offices throughout the state. These publicly-funded consultants provide nutrient management planning services to clients following a priority which emphasizes producers with pollution problems, large livestock operations and those in priority watersheds or the 'Chesapeake Bay Critical Area'. The nutrient management plans developed are documents which incorporate soil test results, yield goals and estimates of residual nitrogen to generate field-by-field nutrient recommendations. By 1996 the program had placed approximately 0.34 million hectares under nutrient management plans. Also in 1996 consultants conducted over 6,500 on-farm visits. Two particularly successful elements of this program are the increased use of a pre-sidedress nitrate test (PSNT) for corn and the services for manure testing and spreader calibration. The MNMP is complemented by a range of other initiatives targeted at farmers which include dead bird composting and soil and water quality conservation plans.

The PSNT for corn, the major field-crop in Maryland, was developed in the region to reduce farmer use of 'insurance N' fertilizer as a sidedress application. PSNT is an in-season soil nitrate test which is taken when the corn is approximately 30 cm tall. Its use provides an accurate measure of soil nitrate, enabling farmers to tailor fertilizer use to existing soil nutrient conditions. The procedure utilizes inexpensive, readily available commercial meters, which can be used by consultants to produce rapid and reliable field specific results. In 1996 MCES nutrient management consultants, using this technique, tested about 11,000 hectares which resulted in an average per hectare savings of approximately 30.9 kilograms of nitrogen..

Manure testing and spreader calibration are provided free by the MNMP through a grant from the Maryland Department of Agriculture. This service is provided to all farmers regardless of whether they adopt a voluntary nutrient management plan. Consultants demonstrate the correct sampling techniques recommended by the University of Maryland Soil Test Laboratory which conducts the analyses. Consultants undertake on-farm calibration of manure spreaders to ensure that the tested manure is spread at the agronomically correct rate for the crop being grown. Approximately 1,000 farmers utilized these services during the course of 1996.

Since 1992 legislation has required the certification of nutrient management consultants and has enabled licensed private sector nutrient management consultants to play a major role alongside the public sector. Certification, examination and fees are administered by MDA in consultation with a Nutrient Management Advisory Committee. Continuing education courses are also conducted. The MNMP plays a major role in implementing this expanding education and training program. Licensed consultants and firms are required to report their planning progress to the MNMP annually. The area under nutrient management planning is monitored on a watershed basis enabling progress within tributary strategies to be assessed.