

NUTRIENT MANAGEMENT & THE CHESAPEAKE BAY EXPERIENCE: ECONOMIC AND ENVIRONMENTAL CONSIDERATIONS

The Chesapeake Bay is America's largest estuary, covering part of six states (New York, Pennsylvania, Maryland, West Virginia, Delaware, and Virginia) and the District of Columbia. With over 150 rivers and streams draining into the Bay, it has become degraded by nutrients and sediments from agricultural, urban and suburban runoff, wastewater, and other sources.

Federal, state and local initiatives to reduce nutrient and sediment pollution in the Chesapeake Bay have been debated for decades. The 1983 Chesapeake Bay Program set nutrient and sediment reduction goals, and developed strategies for reduction. On December 29, 2010, the U.S. Environmental Protection Agency established the Chesapeake Bay Total Maximum Daily Load (TMDL). The TMDL requires states in the watershed to develop Watershed Implementation Plans (WIPs) for achieving target reductions from agriculture and other sources. One key tool employed by producers to help achieve these water quality goals is nutrient management planning.

A Nutrient Management Plan (NMP) defines the nutrient needs of crops, and how best to provide the amount, sources, placement and timing of nutrient applications to maximize plant uptake, and improve yield.

Nutrient planning and management practices have private and public benefits.

- **Farmers** benefit by using NMPs to estimate nutrient needs based on yield goals, while minimizing environmental risk. In addition, they experience input cost-savings and/or production increases that result from greater nutrient use efficiency
- **Consumers** benefit through the high yields achieved in crop production, which result in lower costs at the supermarket.
- The **environmental** benefits include water quality and other environmental improvements.

The composition of public and private benefits varies greatly between practices, farm types, and locations.

Examples

- No-till planting often has significant private benefits including reduced labor and energy, but is not suited to all farms.
- Stream bank fencing and riparian buffers offer high public benefits but little to no private benefits.

New and Improved Ideas?

Historically, the concept of nutrient management was very simple. Producers estimated the nutrients needed by the crop by subtracting the amount of nutrients available in the soil (obtained through soil sampling and testing) from optimal level of nutrients needed to obtain yield goals (obtained from crop response data). They then applied the nutrients needed through the application of either manure or fertilizer.

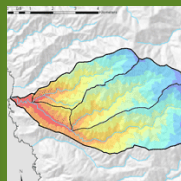
Today, however, in addition to this simple calculation of nutrient requirement, producers and Certified Crop Advisors (CCAs) take into consideration many more factors when developing NMPs that account for areas sensitive to soil erosion, soil characteristics, potential for nutrient loss (using nitrogen leaching indices and models such as the "Phosphorus-Index", and the Revised Universal Soil Loss Equation (RUSLE2)), crop rotations, and tillage practices.



Crops absorb nutrients from the soil such as nitrogen (N) and phosphorus (P). Nitrogen is abundant in animal manure, ammonium fertilizer, crop residues, and plant roots. Phosphorus is found in human waste and livestock manure and in the form of "rock phosphate."



Soil, Manure, and Plant Tests
ISU Extension



Geographic Information
From CSU: Monterey Bay



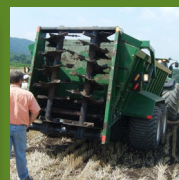
Best Management Practices



On Site Evaluation



Planning Software



Nutrients



What is a Certified Crop Advisor?

A Certified Crop Adviser (CCA) is a certified professional who provides crop management recommendations to farmers based on industry standards that accomplish environmental stewardship objectives.



CCAs must use new tools to address this complexity including geographic mapping, manure, soil and plant tests, conservation planning software, best management practices, and more versatile crop varieties.

Three broad cost categories associated with NMPs are preparation, implementation, and record keeping/maintenance. Specific costs associated with each category can vary greatly by region depending on local constraints. Nutrient Management Plans also impose non-monetary costs that cannot be easily quantified by the farmer such as the amount of time required to complete paperwork and potential loss of confidential business information. Moreover, difficulties surface because some benefits are not manifested immediately. However, federal and state conservation programs offer incentives to help offset the costs of adopting best management practices as part of a nutrient management plan.

Improving Waterways for Tomorrow

America leads the world in the production of food and fiber in part due to the widespread use of fertilizers. The adoption of Nutrient Management Planning ensures a future of clean water without compromising America's agricultural production. However, achieving significant water quality improvements will require the widespread implementation of nutrient management practices.

For further reading:

- Choices 3rd Quarter 2011 "Innovating Policy for Chesapeake Bay Restoration." with guest editors Marc Ribaud and James Shortle - <http://www.choicesmagazine.org/choices-magazine/theme-articles/innovating-policy-for-chesapeake-bay-restoration/>.
- USDA ERS Report "Nitrogen in Agricultural Systems: Implications for Conservation Policy" - <http://www.ers.usda.gov/Publications/ERR127/>.

BIOS

Luke Brubaker

Luke Brubaker is owner and operator of Brubaker Farms, in Lancaster County, Pennsylvania. Brubaker Farms was started by Luke's father in 1929 with 8 cows, and presently has 950 milk cows, 800 young stock, and raises 250,000 broiler chickens annually on 1,500 acres of cropland. The Brubaker family has implemented both voluntary and required measures to ensure the farm is environmentally compliant and economically sustainable: all tracts have approved soil conservation plans to ensure the soil resources are protected, a Pennsylvania Act 38 nutrient management plan has been implemented, and the farm carries a Pennsylvania Department of Environmental Protection (DEP) Concentrated Animal Feeding Operation (CAFO) permit. Brubaker Farms employs and supports 10 employees in addition to three farming families. Luke is an active member of the Lancaster County and Pennsylvania Farm Bureaus. Previously, Luke has served on the board of directors for the Lancaster County Farmland Trust and held the presidency of the Lancaster County Farm and Home Foundation.

Eric Rosenbaum

Eric Rosenbaum grew up on a dairy farm in southeastern Berks County, Pennsylvania. After receiving a B.S. in Agricultural Sciences from the Pennsylvania State University in 1999, he began his work as a Certified Crop Adviser (CCA), providing agronomic and environmental consulting services independent of product sales. In addition to being a CCA, Eric also holds professional certifications for integrated pest management, nutrient management planning, conservation planning and odor management planning. Eric established Rosetree Consulting in 2009 and has worked with 200+ farming operations to develop comprehensive management plans that maximize profits and minimize risk. The company's overarching goal is to provide its clients with the information and guidance necessary to make better decisions and have a more profitable operation while meeting all local, state and federal regulations.

Dr. Josh McGrath

Dr. Josh McGrath is currently an assistant professor and the Soil Fertility and Nutrient Management Specialist in the Department of Environmental Science and Technology, College of Agriculture and Natural Resources, University of Maryland. Dr. McGrath's group, the Lab for Ag and Environmental Studies, conducts research and extension focused on agricultural productivity and environmental quality as they relate to soil fertility, nutrient management, and water quality. Current research projects include in-situ treatment of agricultural drainage; sensor-based variable-rate nitrogen application; manure management in no-till; manure storage to reduce nutrient losses; and environmental persistence of manure-borne anti-microbial compounds. Dr. McGrath was born and raised in Smyrna, Delaware, graduated with a Bachelor of Arts from Johns Hopkins University in Environmental Earth Sciences, and earned his Ph.D. in Plant and Soil Sciences from the University of Delaware.

James Shortle, Ph.D.

Dr. Jim Shortle is a Distinguished Professor of Agricultural and Environmental Economics, and the Director of the Environment and Natural Resources Institute at Penn State University. The primary focus of his research is the design of economic incentives for managing environmental externalities, and also integrated assessment for environmental decision making. Currently he has research projects that examine economic and policy design issues for nutrient pollution and stormwater management, and integrated assessment models for climate change. He serves on the Environmental Economics Advisory Committee to the Environmental Protection Agencies Science Advisory Board, the National Research Council Committee on Science for the Environmental Protection Agencies Future, and on the Editorial Boards of Environment and Development Economics, and the European Review of Agricultural Economics. Dr. Shortle received his B.S. and M.A. from the University of New Mexico, and a Ph.D. in Economics from Iowa State University.

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