Center For Agricultural & Natural Resource Policy

RESEARCH BRIEF

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From Ohio to the Chesapeake

What can be learned from one of the most successful water quality trading program to date? Do auctions result in cost effective changes? How do the institutional arrangements affect farmer participation and program results? Dr. David Newburn at the University of Maryland takes a look at Ohio's Great Miami Trading Program to get answers and draw implications for the Chesapeake Bay Watershed.

AT A GLANCE

- There are two types of pollution sources:
  - point source pollution that comes from a single source such as a pipe in a wastewater treatment plant that releases waste into a water source, and
  - nonpoint source pollution that comes from many diffuse sources such as runoff and soil erosion from agricultural fields.
- The Great Miami Trading Program (GMTP) in Ohio is one of the largest water quality trading programs to deal with both point and nonpoint source pollution.
- The Miami Conservancy District (MCD) has relied on county-level soil and water conservation district (SWCD) offices to

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Conservation tillage is an agricultural best management practice that reduces soil erosion and agricultural runoff, thereby reducing nutrients like nitrogen and phosphorus from entering nearby waterways.

The Environmental Protection Agency (EPA) has started to use market-based trading programs to address environmental problems. When such a program is used to reduce water pollution it is known as a water quality trading program. As an example, these programs work by allowing wastewater treatment plants to offset their pollution load by paying farmers to adopt nutrient-reducing practices. One such practice is conservation tillage; farmers leave the previous year's crop residue on the fields after harvest to reduce erosion and runoff. If it is less expensive for farmers to reduce water pollution using methods like this than it is for wastewater treatment plants to install a new upgrade to their pollutant removal system, then trading can result in the same pollution reduction at a lower cost.

The EPA estimated that trading could save $140-235 million annually, and water quality trading programs have received support from national, state, and local governments.

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recruit and advise local farmers. SWCD offices have longstanding trusted relationships with farmers, resulting in high rates of farmer participation in the trading program.

- Unlike other water quality trading programs, the GMTP allows farmers to use a variety of best management practices, including conservation tillage, bank stabilization, cover crops, filter strips, grass waterways, fertilizer management, hayfield establishment, and livestock management.
- The program structure could be a good model for future trading programs in the Chesapeake Bay region because the Great Miami Trading Program has successfully incentivized agricultural landowners to adopt best management practices to reduce nonpoint source pollution.

PHOTO: HTTP://PHOTOGALLERY.NRCS.USDA.GOV/

Planting grasses, trees, and shrubs between crops and streams intercepts the runoff from the fields before it enters the water.

Despite this, these programs have been able to generate very limited trading activity. Of the 37 trading programs reviewed in 2008, a third were found to have no trades; the remaining programs had few trades.

There are a few reasons these programs are not working. Some programs are set up so that a trade can only take place if the wastewater treatment plant purchase credits from the farmer for offsets that are several fold larger than the required pollution reduction for the wastewater treatment plant. Others have high transaction costs associated with the trade, which reduce the incentive for both the farmer and the treatment plant. Another problem is that although it is cheaper to reduce pollution from nonpoint sources (e.g. runoff from farms and ranches), it is also more difficult to measure, and the credibility of a trade depends on the accuracy of pollution reduction measurements.

The Great Miami Trading Program

One water quality trading program that has been successful is the Great Miami Trading Program (GMTP), which is located in the Ohio River Basin and run by the Miami Conservancy District (MCD). Wastewater treatment plants in this area have been willing to participate in the program. In the Journal of the American Water Resources Association, Dr. David Newburn of the University of Maryland, with his coauthor Dr. Richard Woodward of Texas A&M University, evaluate the program's economic and institutional aspects by looking at several factors, including the cost effectiveness of the program and the innovations of the nutrient-reducing practices employed.

The Great Miami River Watershed covers about 4000 square miles, 70% of which is agricultural land. The most prominent use is for crops such as soybeans, corn, and wheat, but the land is also used for livestock, predominantly swine, beef cattle, and dairy. In 2005, 40% of the watershed's 1000 stream-miles were classified as impaired, meaning they did not meet federal water quality standards for attaining aquatic life.

This is not a problem that affects only southwestern Ohio. Water pollution from the Great Miami River flows into the Ohio River, the Mississippi River, and eventually the Gulf of Mexico. When nutrient pollution gets high enough, water quality become so low that marine life can no longer be sustained. High levels of nitrogen and phosphorus being added to the Gulf of Mexico via the Mississippi River has created a "dead zone" that is detrimental to aquatic life. This has damaged commercial fisheries, ecosystems, and recreation in the Gulf. Because the same pollutants can create dead zones in the Chesapeake Bay, water quality standards were recently tightened under the EPA's total maximum daily load (TMDL) requirement for the Chesapeake Bay Watershed.

In 2004, it was estimated that farmers in the Great Miami River Watershed could adopt best management practices to reduce water pollution for 30 times less than it would cost wastewater treatment plants to reduce pollution by the same amount. These treatment plants are a major source of pollution in the watershed, releasing millions of gallons of wastewater per day. With such a big gap in costs and expected future tightening of water quality regulations, the treatment plants know they can potentially save costs through a trading program.

How does the program actually work? A wastewater treatment plant that wants to participate must purchase credits from the GMTP to offset their required pollution reduction, but the plant can only purchase credits from agricultural sources that are upstream of the plant's discharge point. If a plant was allowed to purchase from a farmer located downstream, the water between the upstream plant's discharge site and the agricultural land could be over-polluted. However, if the farm is upstream, the water should be maintained below the maximum level of pollution allowed under the TMDL requirement.

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The number of credits purchased from a farmer for each credit that the wastewater treatment plant receives to offset pollution, known as the trading ratio, varies depending on the timing of the purchase and the status of the water body where the pollution is discharged. If the treatment plant purchases the credits before the TMDL regulations are finalized, that plant will receive a lower trading ratio, in which fewer credits must be purchased to offset the pollution. These lower trading ratios have incentivized treatment plants to invest early, creating higher initial demand for the program. The trading ratio is also lower if the plant is discharging in an unimpaired water body rather than those already listed as impaired under the federal Clean Water Act.

But there are two sides to this program; both treatment plants and farmers are needed for the program to work. This is where the county-level soil and water conservation district (SWCD) offices come in. Any farmer in the watershed is eligible to apply to the program. The farmer works with a local SWCD agent to create an application to request funds (essentially a bid in an auction) for the proposed adoption of new conservation practices on the farm. It must be a new practice and cannot receive funding from any other program, such as federal conservation programs like the Conservation Reserve Program (CRP) or Environmental Quality Improvement Program (EQIP). The SWCD agent helps the farmers to determine the reduction in pounds of nitrogen and phosphorus that will result from the adoption of the new practice. This is used to calculate how many credits the nutrient reduction is worth. The number of credits is calculated as the pounds of reduction in nitrogen and phosphorus multiplied by the duration of the contract. The contract length varies based on the proposed practice, but it is generally 5 or 10 years. If the practice involves livestock management infrastructure (e.g., manure ponds), the contract maybe as long as 20 years because these structures are expensive and long-lasting.

If the final bid meets the eligibility criteria, then it is ranked based on lowest cost per pound of pollution reduction. The lowest bids are taken first because the MCD wants to pay as little as possible.

Agricultural Best Management Practices Funded:

- Bank stabilization
- Cover crops
- Filter strips (narrow band of vegetation between crops or pasture and waterway to reduce erosion and nutrient runoff)
- Grass waterways (like wide filter strips, but they are located between two patches of cropland rather than between crops and water)
- Fertilizer management
- Hayfield establishment
- Livestock management (e.g. manure storage)
- Conservation tillage

PHOTO: HTTP://PHOTOGALLERY.NRCS.USDA.GOV/

Grass waterways and contour farming reduce soil erosion and the nutrient pollution from entering the water.

Rather than having a one-to-one trading ratio, the ratio is greater than one, requiring more reduction per credit purchased. This higher trading ratio creates a pool of extra credits that can act as insurance. Since it is possible that some of the agricultural projects will fail, these insurance credits reduce the risk that the pollution load will increase. Without this insurance, a failed farm project would result in the pollution load being over the legal maximum, generating fines against the treatment plants. In other words, without the insurance, the treatment plants would run the risk that they violate their requirements under the Clean Water Act.

The MCD acts as an intermediary between the treatment plants and the farmers assisted by the SWCD offices, which helps to reduce costs for the buyers and sellers. They also manage the insurance pool of credits, bearing the risk rather than the treatment plants, and supervise the water quality monitoring process. The SCWD is then the intermediary between the program and the farmers. They publicize the program, help the farmers submit the bids, and monitor and verify the adoption of funded projects. These agents can make use of their longstanding relationships with the farmers to encourage them to participate in the program. The farmers are more likely to get involved if they can work with someone from their community whom they can trust.

Is the Program Working?

As of 2009, the program had received 160 applications, 100 of which were accepted and funded from the $1.3 million budget of the program. Much of the budget had been contributed by the wastewater treatment plants, a good sign of the high demand on their part. The projects enacted up to that point had resulted in an 808,845 pound reduction in nutrients.

The diversity of project types proposed in the GMTP is unprecedented. All of the other water quality trading programs have only had trades involving one practice type. Meanwhile, eight different types of best management practices have been funded in the GMTP. Bank stabilization and cover crops prevent erosion, reducing the sediment that enters waterways. Filter strips and grass waterways are bands of vegetation that reduce erosion and nutrient runoff; this vegetation uptakes excess nutrients so that they do not flow into nearby water bodies. Conservation tillage uses last year's crop residue to reduce erosion and runoff. Fertilizer management, hayfield establishment, and livestock management projects

are also funded by the program. This diversity is good because if only one type of practice is pursued, there may be other low-cost opportunities that are ignored. By encouraging many different types of projects, the GMTP is more likely to fund projects with lower cost practices. This openness to a range of projects encourages the farmers to come up with new and interesting ways to reduce the pollution load.

Why use this auction rather than just setting a price for the farmers? There are some farmers who are willing to reduce their pollution for less than the price the program would offer them. By setting up this auction, those farmers are more likely to bid close to the smallest amount they are willing to accept for doing the nutrient-reducing project. Admittedly, a farmer would make more if he or she asked for more money, but they only make more if they are accepted, and it is the lowest bids per pound of nutrient reduced that are accepted, so there is still incentive to bid low.

So how has it been going? Initially, the program was very cost-effective because bids were fairly low, but as time went on the bids increased because some SWCD agents assisting farmers learned how to bid strategically, getting the most money while still being accepted. This is mainly because the program administration did not change the cutoff point for acceptance. If the cutoff point is more uncertain, farmers are more likely to submit lower bids. Learning strategy over time is a common problem in auctions that do not alter the maximum bid accepted over the years.

Some SWCD offices did not participate very much (few bids) or for very long (dropped out after early rounds of bidding). Sometimes this was the fault of the program. If the farmers in a particular county received higher payments from federal programs (e.g., CRP, EQIP) for adopting the BMP, then farmer participation rates were lower in the GMTP. In other counties, this was because of a lack of support from the SCWD offices. It should be noted, however, that the counties with the highest participation were generally counties in which the county offices worked closely with the farmers. Clearly, using SWCD offices as a middleman between the program and the farmers has mixed effects. When it was done right, it had created high participation rates that would be unlikely without the SWCD office being involved. But if the SCWD office did not promote the program well, it served as a barrier to farmers being aware of the option to participate in the program.

Lessons Learned: How does this apply to the Chesapeake?

- Create an agency that acts as a clearinghouse between buyers (e.g., wastewater treatment plants) and sellers (e.g., farmers). This agency handles the auction and all of the transactions so that the wastewater treatment plants and farmers do not need to seek each other out and bargain over a price.
- Collaborate with county SWCD offices who have longstanding relationships with farmers to gain trust and participation in the trading program. SWCD offices have institutional capacity (e.g, staff, buildings, vehicles) that can lower costs of trading since they already assist farmers with state and federal conservation programs.
- Provide lower trading ratios to early buyers to create higher initial demand in the trading program.
- Require higher trading rations in watersheds discharging into impaired waterways where nutrient reductions are needed most.
- Rather than focusing on one type of nutrient-reducing project, allow a variety of best management practices to be used, increasing the chance that the nutrient reduction is being done at the lowest cost.
- Farmers will not participate if the rates offered by the program are not competitive with existing state or federal conservation programs that the farmers could pursue instead.

The GMTP did a good job of keeping costs low, both for themselves and the participants. Using the auction setup helped to encourage farmers to reveal the lowest payment needed to adopt new BMPs. Using the SWCD offices to reach out to farmers prevented the program administrators from needing to do a costly search for willing farmers. The costs that the SWCD offices incurred to find participants and monitor projects were simply included in the bid. Such costs have only made up 3.9% of the program's budget, so using the offices was not too expensive. The local county offices also monitored the progress of the projects fairly cheaply, accounting for only 1% of the total budget. ■

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