



A Partnership for the Management of Nutrients and Protection of Water Quality

Indiana Farm Bureau, Indiana Pork, Indiana Soybean Alliance, Indiana Corn Marketing Council, Indiana Corn Growers Association, Indiana Dairy Producers, Indiana Beef Cattle Association, Indiana State Poultry Association, the Agribusiness Council of Indiana, and Purdue Extension



Strategy to Reduce Nutrient Pollution through Adoption of Practices that Improve Soil Health and Reduce Nutrient Losses

In an effort to continue Indiana agriculture's growth in awareness and action toward addressing nutrient related pollution issues, several agricultural organizations came together with the purpose of developing a unified strategy. Those partners include Indiana Farm Bureau, Indiana Pork, Indiana Soybean Alliance, Indiana Corn Marketing Council, Indiana Corn Growers Association, Indiana Dairy Producers, Indiana Beef Cattle Association, Indiana State Poultry Association, the Agribusiness Council of Indiana, and Purdue Extension.

The momentum for the development of this strategy has grown over the past several years as farmers and the agricultural organizations have worked to address legislative, regulatory, and legal initiatives regarding nutrient management. At the national level, the Environmental Protection Agency (EPA) has established a regulatory scheme in the Chesapeake Bay watershed to reduce the level of nutrients from all sources. The project impacts six states and the District of Columbia. The establishment of numeric nutrient criteria—numerical limits on the amount of nutrients which can be present in a water body—have been set in Florida because of litigation. A lawsuit has also been filed regarding establishing numeric nutrient criteria for all of the states which drain into the Gulf of Mexico, including Indiana. Here in our state, the Indiana Department of Environmental Management (IDEM) is working to establish numeric nutrient criteria for phosphorus in lakes and reservoirs. The Indiana State Department of Agriculture (ISDA) is also leading an initiative to draft a strategy for reducing the amount of nutrients which enter our waters as part of its responsibility in representing Indiana on the Gulf of Mexico Hypoxia Task Force.

Due to these events, we conclude that a more proactive and far-reaching strategy is needed for conservation and nutrient management programs. Current efforts are primarily led by agencies in state and federal government, Purdue Extension, and Soil and Water Conservation Districts. While those programs are valuable and highly successful in some areas, they often reach farmers who are already implementing higher level nutrient utilization and conservation practices. It is evident that much is to be gained by more widespread adoption of nutrient management and conservation practices and that additional people, resources and a coordinated strategy among all parties are needed to improve adoption by Indiana farmers.

The agricultural organizations reached out to these partners to better coordinate efforts and achieve a higher level of awareness of issues and penetration of the message around the state. To that end, we have received the assistance and support of numerous partners, including the ISDA, Office of Indiana State Chemist, IDEM, Natural Resources Conservation Service, Indiana Association of Soil and Water Conservation Districts, and Certified Crop Advisors.



Additionally, guidance was sought from members of conservation and environmental organizations to provide insight to assist in addressing concerns of the public.

In meeting with these partners, other federal agencies, members of the academic and scientific community, farmers, and consultants, it was soon clear that complete information for making nutrient management decisions is often not in the hands of those making application decisions. In addition, impacts from conservation practices are still being learned, and because agriculture is part of a dynamic system, certainty in results is difficult to achieve. Technological advancements in equipment and crop production inputs challenge our belief system with respect to what are best management practices. Soil types and their responses to various factors differ. Weather also plays a crucial role in how practices work in any specific year. Proper decisions can be made, but implemented practices may be ineffective if extreme weather events occur.

Some existing expectations for water quality improvements or adoption of practices and technology are likely impossible to achieve. Impairments of water bodies are often a result of cumulative impacts from natural and man-made activities over a period of decades or centuries. With respect to impairments linked to nutrients, this dynamic must be considered. Rather than set standards for nutrient reduction in water bodies that are not applicable in all similarly situated waters, we determined that it is more feasible to establish a strategy for making improvements to the land and for better utilization of nutrients within the field. By doing the best that agriculture can with managing nutrient utilization and water resources within the field, farmers can continue to make improvements in reducing agriculture's loss of nutrients to waters.

This determination led to the conclusion that increasing adoption of nutrient management and improving soil health should be the primary focus of our strategy. Nutrient management plays a critical role in ensuring that nutrients are applied in an appropriate manner based upon crop need and with a consideration of existing nutrient resources. The implementation of adaptive management practices will also play a crucial role as farmers review their decisions and changing conditions to improve upon nutrient use and minimize nutrient loss.

A soil health strategy focuses on implementing no-till, cover crops, advanced nutrient and pest management, crop rotations, buffers and smart drainage where appropriate. Of critical importance to an effective soil health strategy is to implement practices together as a system. Improved soil health leads to greater ability to manage water and nutrient resources by reducing runoff and erosion, improving water holding capacity, raising levels of organic matter within the soil, and creating the possibility that nutrient inputs can be reduced in some cropping systems. Of significant importance is that improved soil health should lead to reduced nutrient and sediment loading to lakes, streams and rivers. Additionally, improved ability to retain water will reduce the impacts of excessive rainfall and drought.

Adopting a strategy for soil health falls in line with activities already occurring within the state. Indiana NRCS has made soil health a focus for several years and is working with many of the



partners already identified to implement soil health strategies through the Indiana Conservation Cropping Systems Initiative. This strategy is consistent with a nutrient management approach which is gaining much attention in Indiana, the International Plant Nutrition Institute's 4R Nutrient Stewardship System (Right Source, Right Rate, Right Time, Right Place). The 4R strategy is based upon underlying nutrient management techniques developed by universities and which are currently taught to farmers and crop consultants by Purdue Extension. Through the leadership of The Fertilizer Institute and agricultural fertilizer retailers, messaging regarding the 4R approach is reaching consultants and farmers. By adopting a strategy for soil health which is supported by the principles underlying the 4R approach, we can immediately work to achieve greater understanding and implementation of strategies by farmers.

In developing this approach, the agricultural organizations relied heavily upon the input of farmers from varied backgrounds. Committees made up of crop farmers with diversified farming practices worked with livestock and poultry producers to develop key principles to guide decisions and recommendations which set the general framework for implementation of a strategy. The principles and recommendations are discussed below.

Guiding Principles

It is imperative that all parties understand that nutrient pollution is a complex issue with numerous sources. Agriculture, industry, residential and commercial practices—even nature—all contribute to nutrient pollution. Too often, the discussion focuses on finger pointing at other parties instead of focusing on improvements that will help reduce nutrient pollution. It is impractical to attempt to pinpoint what each sector contributes in the overall picture, and efforts to create precise labels create animosity and lack of progress. We are resolved to work with other sectors to identify practices that will make a difference, regardless of the overall impact from each source.

Intrinsic to the goal of making positive impacts is determining the measurable goals. As previously mentioned, we do not believe it is beneficial to set theoretical numbers or guidelines related to water impairment as a goal. We likely cannot achieve the desired results in a short time frame, let alone ever achieve the numbers that have been discussed. Thus, the focus should not be on meeting certain limits on nutrients in a particular water or "stopping hypoxia" in the Gulf of Mexico. It will take time and the management of preexisting conditions—such as nutrients already present in the water column and sediment—to achieve such a set of goals. Near term goals at a more local level may involve reducing harmful algal blooms or negative impacts to fish. Those goals are dependent upon local factors and how they are achieved depends on the current state of local watersheds. Those conditions include a consideration of farming practices which take place on every farm in the watershed. By focusing on improvements at the farm level, real improvement can be made and measured which will contribute to reducing water quality impairments over time.



Many tools exist to achieve positive impacts in reducing nutrient loss from agricultural production areas. Some practices are relatively inexpensive and easy to implement. Others require significant expenditures for new equipment. It is not economically practical for all farmers to purchase new equipment or structures to change production practices given their age, financial position, or size of operation. Further, some soil types are better suited for certain management practices than others. Additional challenges arise in trying to develop a system on each farm which is practical in implementation based on the requirements of time and manpower. A mandate for specific practices should be avoided. Rather, farmers should be given information about the options which exist so that they can make the best decision about what will work on their farm given the resources available. Efforts should be made to make capital and technical resources available in those situations where economics truly limit the ability to make dramatic improvements.

One difficulty in determining effectiveness is the general inability to create a baseline of present conditions since we know little about current practices at the farm and watershed level. Additionally, there is insufficient stream data to determine the sources of nutrients present in waters. In order to achieve a level of saturation with respect to monitors and gauges to collect sufficient data would take valuable resources away from implementation strategies that are often already too costly to implement. Data with respect to implementation of on-farm practices are flawed because the data generally captures only practices that are supported in some way through government programs. Thus, practices that farmers voluntarily implement are often omitted. It is important to attempt to capture a baseline of practices which already exist in order to focus resources and determine how the additional implementation of practices would impact water quality. We recognize this will be a difficult undertaking. Strategies for determining baseline levels of implementation and improvement over time may be gathered from aggregate data of farmer activities within watersheds. It is possible that well-crafted surveys can be used to gather information to measure implementation of practices as well as trends in how farmers respond to messages related to nutrient management and soil health.

There is recognition that farmers generally strive to achieve ever-increasing reasonable yield goals while simultaneously maximizing profits and protecting the environment. There is faith that conditions will be sufficient to reach the yield potential of the crops being grown, even though some conditions in any given year will be less than perfect to use the available inputs such as nutrients which can maximize yield. Any strategy must recognize that maximizing productivity is critical to meeting the food, feed, fuel and fiber needs of not only the United States but the rest of the world. Therefore, decisions must be made which allow for the best management of the resources for long-term sustainability of the entire production and use system.

Farmers have repeatedly shown throughout history that they can adapt to challenges and find a way to make improvements, whether in increasing production or changing practices to make substantial environmental improvements. Education has played a key role in many of those



changes and improvements, and we believe that farmers are in the best position to determine the practices that are most appropriate on their own farms in order to achieve reductions in nutrient loss. Legislative and regulatory mandates should be avoided to the extent practical. Where they are used, they should focus on educational initiatives to further improve attitudes and efforts in making on-farm improvements. Mandating practices has the potential to negatively impact water quality or create other concerns if the practice does not fit into a cost-effective, practical management system for that location. Thus, decisions must be made on a “whole-systems approach” which uses actual on-farm data and practices.

With that in mind, we believe that a wide-scale educational initiative should be the focus for making improvements. Those efforts are to be undertaken by the agricultural organizations in cooperation with our government and industry partners at the state and local level. The education should focus on awareness of issues, encourage adoption of management strategies on the farm, include information on practices that may be beneficial, and explain where support can be found in implementing those practices. In addition, mentoring of farmers by those already implementing nutrient management and conservation practices is a valuable tool. Combining real world experience with actual data from implementation of practices at the local level is most likely to have a positive impact on encouraging faster adoption of new practices.

Additional resources also need to be made available for research, analysis, and education on nutrient management practices and innovative technologies. It is possible that improvements can be made on the farm for water control structures and drainage. If practices can be adapted to reduce runoff or filter water before it leaves the field, it should provide positive impacts in increased yield, lower input costs, and reduction in nutrient loading to lakes, rivers and streams. Once nutrients leave the field, it is possible that green infrastructure such as two-stage ditches or constructed wetlands could be used to remove nutrients and sediments before the water flows to rivers and streams. Digesters and other management tools can be used on the farm with some livestock production systems to reduce nutrient loads or change the characteristics of manure to make it more economical to transport if fields are not agronomically available for manure application. However, there is still much to learn about these technologies, and research and education is important to achieve a level where economics and ease of management will allow for widespread adoption.

In reaching the goal of creating awareness and empowering farmers to review and adopt new management practices, focus should be on priority watersheds and critical improvement areas. Priority watersheds are best established in conjunction with our government partners who have data available to indicate where maximum results can be achieved. Critical areas are those areas within a field or geographic region which contribute a disproportionate share to nutrient loading in lakes, rivers and streams. These areas will vary, but are often locations where management practices have not been adapted or geologic or hydrologic conditions render the area highly susceptible to nutrient loss.



In creating a focus on priority watersheds and critical areas, it is imperative that financial resources and people are adequate and available to see real improvements. Large scale adoption of soil health strategies and improved nutrient management techniques is crucial for achieving measurable results. Nonetheless, those outside of priority watersheds or individual farmers who can make the largest improvements with the assistance of government should not be excluded from consideration for resources because of their location or lack of overall program adoption. For example, farmers in the worst financial position who have adopted the fewest strategies are often the individuals who can make the biggest singular impact in a watershed. The good that so many do through adoption of practices should not be negated by one's inability to obtain assistance in a reasonable manner.

Recommendations

2012-2013

- Review and develop models for organizational structure and program implementation
- Establish organizational structure to develop implementation strategies, coordinate activities of partners, and track progress of plan implementation
- Establish a council made up of representatives of partners and agricultural organizations to discuss analysis and research needs as well as to serve as a clearinghouse for educational materials
 - Create a focus on local research using on-farm trials which are conducted under research protocols and with a focus on cutting-edge information
- Review appropriation of local, state and federal resources expended in Indiana to determine whether money and staff directed for water quality improvements, soil health, and nutrient management are efficiently used and in a complementary manner
- Develop and implement an educational strategy for education on soil health (focusing on implementing no-till, cover crops, advanced nutrient and pest management, crop rotations, buffers and smart drainage where appropriate) and the 4Rs (Right Source, Right Rate, Right Time, Right Place)
 - Create and adapt educational material in conjunction with government partners, university researchers and extension, the fertilizer industry, and Certified Crop Advisors (CCAs)
 - Focus initially on agricultural nutrient retailers and consultants who advise farmers so that they can provide better information on nutrient management and conservation practices
 - Efforts should include all nutrient forms, including using available manure and poultry litter in addition to commercial fertilizer
 - Start an outreach program to encourage soil sampling which relies upon correct sampling procedures and that focuses on collecting data of sufficient scale to allow for improved nutrient management decisions



- Work to encourage cooperation and partnerships among nutrient retailers, third-party brokers, and livestock and poultry producers for efficient use of manure and compost
- Share responsibility for providing speakers at organization, commodity and industry meetings to expose farmers, retailers, and consultants to nutrient management and soil health initiative
- Work with media to provide an additional forum for communication of the initiative
- Identify partners within academia and Purdue Extension to provide university led educational programming in conjunction with association activities
- Continue conducting outreach on the updated Confined Feeding Operation (CFO) and Concentrated Animal Feeding Operation (CAFO) National Pollutant Discharge Elimination System (NPDES) Rules administered by the Indiana Department of Environmental Management
- Work with CCAs, organizations and partner agencies who are leading local peer groups to develop a standard whereby data can be aggregated to later share at the local level as an educational tool
- Work with agency partners to determine appropriate criteria and process for establishing priority watersheds and making appropriate watershed designations
 - Utilize partner organization and government agency information on existing watershed projects
 - Consider existing nutrient loading
 - Create initial focus on areas where water quantity issues have a disproportionate impact upon nutrient loss
 - Consider potential to impact farmer attitudes and practice implementation through education and outreach
- Establish programs for strategy implementation in priority watersheds
 - Establish baseline data for priority watersheds
 - Identify mechanisms and sources of nutrient loss in priority watersheds
 - Identify practices which can be used to reduce nutrient loss in that watershed and conduct outreach to farmers, ag retailers, consultants and advisors, and partner organizations
 - Develop a process to account for implementation of soil health strategies as well as improvements in soil health and reduction in nutrient loss
- Develop baseline data of farmer attitudes towards nutrient management and soil health practices as well as practice implementation
 - Use existing data from organizations such as the National Agricultural Statistics Service and Universities
 - Conduct surveys of farmers across the state
 - Conduct surveys of CCAs and other crop advisers to determine levels of program adoption for their clients



2014-2016

- Use organizational structure to review implementation strategies previously administered and develop new strategies to implement additional efforts
- Continue efforts to educate on soil health and the 4Rs of nutrient stewardship
 - Identify additional avenues and partners for educational programs
 - Provide education on outreach and practice implementation to key leaders, including members of the General Assembly and regulatory agencies, as well as local government officials in watersheds where soil health and nutrient implementation strategies are being implemented
 - Establish a robust peer mentoring program which partners farmers implementing soil health strategies and nutrient management with farmers interested in adopting new practices
 - Establish key focus areas such as timing of applications, use of efficiency products and increased use of cover crops
 - Provide information to the public on soil health initiatives, nutrient management and adoption of practices
- Explore development of incentive programs
 - Establish efforts to create or expand programs which provide assistance for practice implementation
 - Seek opportunities to create “safe harbor” programs whereby farmers who implement certain nutrient management and soil health practices receive assurance that regulatory action is not taken in relation to those activities for designated periods of time
 - Work with the Indiana State Department of Agriculture to explore creation of a certified nutrient stewardship program with sufficient and appropriate incentives that encourages agricultural producers to implement appropriate voluntary stewardship practices
- Work to encourage expansion of cooperation and partnerships among nutrient retailers, third-party brokers, and livestock and poultry producers for efficient use of manure and compost
- Evaluate success of education strategy
 - Review outreach efforts to determine the number of people exposed to discussions on soil health and nutrient management
 - Open avenues of discussion with farmers to better understand the advice and recommendations given by fertilizer retailers, consultants and CCAs
 - Conduct surveys to determine adoption rates of new practices
- Revise and update educational materials based upon best available data
 - Make materials more relevant on a local level by taking into account unique soil and climate factors as well as local production practices
 - Use data from local projects to better illustrate how various practices have performed in a similar geographic area and under specific weather related conditions



- Work with partners to establish more local peer groups and expand existing groups
 - Identify geographic locations which are currently underserved or which provide production practices or soil and water management conditions that are not readily identifiable within current groups
 - Identify agencies or organizations to provide financial and technical support
 - Identify peer group leaders
 - Identify farmers for peer group inclusion, specifically seeking farmers who have been reluctant to implement soil health strategies
- Identify topic or geographic areas which need on-farm analysis of practices or more in-depth research
 - Utilize the council created in the first year of implementation to identify the topics and assist in finding organizations/individuals to conduct the analysis or research
- Seek adoption of practices in priority watersheds and in critical areas
 - Work with partners to engage farmers in priority watersheds and in critical areas to adopt management practices which results in improved nutrient control and use
- Seek ways to provide additional financial support for adoption of practices on farm for those with the greatest financial need, including simplification and expansion of grant and cost-share programs
- Explore creation of a fund to provide assistance for analysis of on-farm practices, research, and education
 - Seek out availability of grants from organizations for soil health and nutrient management strategy implementation on farm
 - Consider increasing the fertilizer tonnage fee to provide funding for on-farm analysis, research, and educational programming
 - Explore other funding streams

2017-2022

- Use organizational structure to review implementation strategies previously administered and develop new strategies to implement additional efforts
- Continue education on soil health and nutrient management
 - Use local on-farm data in educational programming
 - Identify priority practices which have not yet been the focus of implementation activities
 - Expand outreach efforts to local, state and federal government officials on success of implementation and results
- Revise and update educational materials
 - Include revisions and additional information developed at a local level
 - Establish cost estimates for implementation of practices and economic impact of adoption



- Review and evaluate the implementation of soil health and nutrient management strategies
 - Consider impacts of regulatory programs such as the certified nutrient applicator program and the fertilizer use rule administered by the Office of Indiana State Chemist and the CFO and CAFO NPDES rule administered by IDEM
 - Consider voluntary initiatives, including those using programs developed under the soil health and nutrient management strategy
 - Consider support programs on nutrient management, soil health and water quality
 - Monitor practice implementation and farmer attitudes through surveys
 - Review existing data from organizations such as NASS and universities
 - Conduct follow-up surveys of farmers, CCAs and other crop advisors
 - Monitor program implementation in priority watersheds
 - Use water sampling data, where it exists, to review program implementation effectiveness.
- Continue expansion of peer groups
- Explore expanding the certified nutrient applicator program to include all nutrient application activities
- Focus efforts on development and implementation of green infrastructure and technology
 - Lead a review of drainage practices in Indiana to determine how to better manage water resources, including on-farm drainage
 - Explore opportunities for innovative technologies such as two-stage ditches, constructed wetlands, bioreactors, blind inlets, and tile-line management
 - Increase efforts for adoption of manure management technologies such as digesters