Performance Based Approach to Control of Agricultural Non Point Source Pollution:
A White Paper prepared for IATP and IEC

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INTRODUCTION

Nonpoint source pollution (NPS) from agriculture (see glossary) is elusive in its definition and control. Many articles, laws, regulations, demonstration projects and targeted control approaches have in general failed to make a significant change in the agricultural practices most often identified with pollutant (nutrients, pesticides, bacteria, sediment) discharge to surface waters or of nitrate levels of ground waters in areas of intensive row crop and animal agriculture, and seldom have they been able to demonstrate measurable improvements in water quality.

The vagaries of NPS, difficulty of identification of sources, widespread nature of sources, and in particular the dependency on weather and storm frequency lead to tensions between those farming the land and those whose charge is protecting natural resource base, especially resources off of the farm. The recent data on the effects of farming practices in Iowa on hypoxia in the Gulf of Mexico show how far off site the public's concerns can become. Tensions between the farming and environmental communities are not productive. It has resulted in confused legislative agendas, likely loss of funding for research and demonstration programs. Public support of ways to address NPS is not strong and part of this is because of the difficulty in defining the NPS issue. Indeed, this has been a public and scientific debate of long standing, and it seems the longer it goes on the less is gained. There are numerous issues intermingled with the policies and approaches to control of nonpoint source pollution.

ISSUES:

Good Science

The problem with good science goes far beyond any easy definition of science. The question becomes whose science is good?. Is my science OK because it gives me the outcome I want while yours is poor because I do not agree with it?. There is a growing trend to politicize science as shown by global warming debates and hypoxia. But the problem goes beyond politics and into the issues of communication of scientific results to the public and the data users (policy makers). Because of scientific uncertainty of the natural world, conclusions are seldom given without caveats of uncertainty.

Precautionary Principle

(Apple, D. 2001. The New Uncertainty Principle. Scientific American. http://www.mindfully.org/Precaution/Uncertainty-Principle.htm)

Given the uncertainty of our biological and physical world, some politicians and activists are insisting on caution first, science second. Although there is no consensus definition of what is termed the precautionary principle, one oft-mentioned statement, from the so-called Wingspread conference in Racine, Wis., in 1998 sums it up: "when an activity raises threats of human health or the environment, precautionary measures should be taken even if some causes and effect relationships are not fully established scientifically."

Credible Data

This is another divisive issue. Credible data very often requires expensive long term monitoring so that an outcome can be proved beyond doubt. For example, it might take 2 decades of monitoring of surface water quality to show for sure that a BMP (see glossary) is effective. By then practice may have changed, even climate may have changed, and often the credible data becomes very elusive. So is one to act based on less strong data such as spot monitoring, short-term monitoring, and even volunteer monitoring efforts with the precautionary principle in mind?

Landscapes

Landscapes or watersheds are more and more regarded as key to assessment of outcome based practices. Outcomes will be based on all activities in the watershed, not just changing for example fertilizer practices on a set of fields. Also, landscapes are the social and economical base for agriculture and changes in practices must also regard economies of the rural area when they are recommended. For example, one could change to resource conserving perennials such as grass and alfalfa, but the economy could be severely damaged if the farm economy is based on grain.

Climate

It is hard to deny that some major climatic shifts are occurring. While agriculture has some input and could have some remedies to offer for the carbon economy of a region, it is more critical to realize that outcomes of a decade ago might not be nearly as applicable today, and that it will be hard to predict what might happen in the future. Runoff, crop growth, pests, etc, all will be greatly changed in somewhat unpredictable fashion by climate change.

Farms

It would seem simple to define a farm. But even in Iowa this definition is a shifting one. Some financial units now are managed with several thousand acres with many absentee landlords. Who is the farmer and what is the farm here? Close to cities, small farms are springing up that produce vegetables, etc for the urban market. These are also farms, even if the operators come from different ethnic backgrounds than our typical Midwest farmer.

More and more farms are under at least quasi corporate control. Contract farming, working for large integrated animal producers, etc. are also changing farm and farmer definitions. The family farm is relatively easy to identify when one sees it, but it is a shrinking breed.

Economics
Agricultural economics is complex and interrelated with global economies as well as supply and demand. The control of market entry by large corporations greatly affects animal and grain prices. Various direct and hidden government subsidies affect the way crops are grown and processed. In general, the commodity farmer, the one producing corn and soybean as well as those growing meat and milk animals, are at the bottom of the price chain. Since farmers do not have collective action they have little opportunity for improvement.

Modeling
Because of the large scale of watersheds and the near impossibility to measure every related nonpoint source pollutant, models are used to help develop assessments. A long term example is the model used for 60 years or more to estimate soil erosion. This model is continually updated as circumstances change, but it is still a model based on general landscape characteristics and can not give specific field data.

Models become better with increased application of data and are never static. There are many good models available and they must be used wherever possible to help assess outcomes.

Standards
Water quality standards are critical for evaluation of suitability of water uses, drinking, swimming, habitat, etc. But they are often times lacking in precision or not even available. For example, there is still much debate about the appropriate level of nitrogen and phosphorus in steams relative to aquatic productivity. The alternative is to base water quality remedies on emissions per unit area, the so called TMDL approach. This also has its problems.

Voluntary vs Mandatory Water Quality Improvements
This issue has been around for a long time. Rules tend to work better for point source problems while the voluntary approach seems most suited for non point source problems.

CAN CERTIFIED MANAGEMENT SYSTEMS WORK FOR MIDWEST FARMERS?

Third Party Certification Important Part of Process

ISO 14000 (see glossary) includes a third-party certification procedure. For farmers this can assist in accessing niche markets, and in lowering insurance costs. With third-party audits, farmers gain credible documentation of environmental performance. This reliable documentation can be critical in public relations as well as helpful in access to markets (especially export markets) and premium prices. Taking advantage of consumer interest in responsible food production, for example, groups such as The Food Alliance support market-based programs that reward farmers for environmentally-sound practices. On the other side of the ledger, an EMS may also provide a competitive advantage by reducing

the costs for pesticides, fertilizers and other inputs as farmers who systematically evaluate their operations waste less and identify more efficient uses of inputs. Farmers who can demonstrate that their operations pose reduced risks can face fewer legal actions, loan denials, and encumbrances on the sale of real estate. They may qualify for lower loan rates and insurance discounts.
Independent third party certification will add to the expense of farming and marketing. Also, there will be problems finding the right groups for certification of various processes. The Certified Crop Advisors may well be the key certification party for crop protection and nutrient use. Other groups will need to be identified for marketing, such as certification of various food production and bio industrial issues. Farm*A*Syst is an excellent model.
EMS adds an important component: the continued reassessment of the performance of the system (if done properly and often).
http://www.agric.wa.gov.au/agency/Pubns/farmnote/2000/f10300.htm

In this manner it uses much the same philosophy as does Adaptive Environmental Management.

Advantages of an environmental management system? See
http://www.agric.wa.gov.au/agency/Pubns/farmnote/2000/f10300.htm

In recent years, environmental management systems have been successful in meeting the environmental management needs of many businesses, particularly in the mining and manufacturing industries. The benefits of environmental management systems are now being sought in Australian agriculture. These benefits include:

- Market access - satisfying customer demands for environmentally certified produce.
- Preventing trade barriers - avoiding trade limitations in the event of the environment becoming a non-tariff trade barrier.
- Community goodwill - greater public confidence in agriculture through a demonstration of environmental responsibility.
- Increased operational efficiencies - through more effective use of inputs, and reduced spending on correcting environmental problems.
- Improved resource management - through systematic identification of opportunities for environmental improvement.

- Reduced legal liability - a way of demonstrating due diligence to reduce legal liabilities.
- Property values - potentially enhanced through better resource management.

What is a Performance Based Approach?

Bill Batchelor, Iowa State Univ. Personal communication. 2003. Presented at the Ag States meeting, April, 2003.

- Voluntary efforts by producers to implement EMS to continuously improve their environmental performance
- Shift from compliance to performance
- Producers take ownership of environmental impacts
- Understanding the what and why of environmental impacts

Elements of an EMS

Bill Batchelor, Iowa State Univ. Personal communication. 2003. Presented at the Ag States meeting, April, 2003.

- Policy Statement and commitment
- Identification of significant environment impacts
- Development of objectives and targets
- Implementation plan to meet objectives and targets
- Monitoring
- Training
- Review and Documentation

Needs

Bill Batchelor, Iowa State Univ. Personal communication. 2003. Presented at the Ag States meeting, April, 2003.

- Models and standards
    - Crop models, Water quality models, erosion models, buffer standards, precision agriculture
- Ways to integrate information from many sources and guide producer through the EMS process
- Risk Assessment
- Monitoring

Some examples: The Iowa Soybean Association is implementing pilot level watershed experiments to use the EMS in agriculture NPS. This is called the Certified Environmental Management System for Agriculture (CEMSA). Farm*A*Syst http://www.uwex.edu/farmasyst/ coordinates grass roots programs that coordinates voluntary environmental assessment for watersheds and farmsteads. It is active in 46 states. Partnerships among public and private sector groups make its approach particularly strong. Recently government support has declined, limiting its activities.

Potential Drawbacks of EMS.

- Certification process: Cost/benefit and availability of certification agencies.
- Government support for programs, staffing, development of models

- Data and model availability
- Public understanding and acceptance
- Concern that this is an industrial approach to a biological problem
- Will voluntary approaches work with large industrial based agricultural operations?
- Why would "bad actors" suddenly change their behavior?
- How to define performance and measure progress
- Economic issues:
    - Who will pay for support costs?
    - Who will pay for monitoring?
    - Can benefits be recovered in the marketplace?

GLOSSARY:

ISO 14000 and 14001

ISO stands for the International Standards Organization, located in Geneva, Switzerland. ISO is a non-governmental organization established in 1947. The organization mainly functions to develop voluntary technical standards that aim at making the development, manufacture and supply of goods and services more efficient, safe and clean.

ISO14000 refers to a family of voluntary standards and guidance documents to help organizations address environmental issues. Included in the family ae standards for environmental labeling, performance evaluation and life cycle assessment

In September 1996 ISO published in final form ISO 14001, the environmental management systems standard. This is an international voluntary standard describing specific requirements for an EMS. ISO14001 is a specification standard to which an organization may receive certification of registration.

LCA (Life Cycle Analysis)

LCA is a technique to assess the environmental aspects and potential impacts associated with a product, process, or service, by:

- compiling an inventory of relevant energy and material inputs and environmental releases;
- evaluating the potential environmental impacts associated with identified inputs and releases; interpreting the results to help you make a more informed decision.

LCA is a controversial concept depending on where one might evaluate the process: e.g. cradle to grave or cradle to cradle.

Best Management Practices:

The U. S. EPA defines Best Management Practice (BMP) as “A practice or combination of practices that are determined to be the most effective and practicable (including technological, economic and institutional considerations) means of controlling point and nonpoint pollutants at levels compatible with economic and environmental quality goals”

Environmental Management Systems

An EMS is a continual cycle of planning, implementing, reviewing and improving the processes and actions that an organization undertakes to meet its business and environmental goals. Most EMS’s are built on the "Plan, Do, Check, Act" model. This model leads to continual improvement based upon:

- Planning, including identifying environmental aspects and establishing goals [plan];
- Implementing, including training and operational controls [do];
- Checking, including monitoring and corrective action [check]; and
- Reviewing, including progress reviews and acting to make needed changes to the EMS

Nonpoint Source Pollution

A: Nonpoint source (NPS) pollution, unlike pollution from industrial and sewage treatment plants, comes from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water. These pollutants include:

- Excess fertilizers, herbicides, and insecticides from agricultural lands and residential areas;
- Oil, grease, and toxic chemicals from urban runoff and energy production;
- Sediment from improperly managed construction sites, crop and forest lands, and eroding streambanks;
- Salt from irrigation practices and acid drainage from abandoned mines;
- Bacteria and nutrients from livestock, pet wastes, and faulty septic systems

Total Maximum Daily Loads (TMDL) (http://www.epa.gov/owow/tmdl/intro.html)

Total Maximum Daily Load is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources.

Water quality standards are set by States, Territories, and Tribes. They identify the uses for each waterbody, for example, drinking water supply, contact recreation (swimming), and aquatic life support (fishing), and the scientific criteria to support that use.

A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The calculation must include a margin of safety to ensure that the waterbody can be used for the purposes the State has designated. The calculation must also account for seasonal variation in water quality.

The Clean Water Act, section 303, establishes the water quality standards and TMDL programs.