Performance Based Approaches to Agricultural Conservation Programs dealing with Non-Point Source Pollution, Including Utilization of the Provisions of the Conservation Security Program

A Concept Paper Prepared For The Workshop On Performance-Based Farm Policies

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INTRODUCTION

Performance-based policies for agricultural conservation are being proposed to achieve measurable improvements in water quality and other natural resources using cost effective approaches (Winsten, 2003). Many good faith efforts have attempted to make a significant change in the agricultural practices most often identified with pollutant discharge of nutrients, pesticides, bacteria, sediment to surface waters or of nitrate levels in ground water in areas of intensive row crop and animal agriculture. Most of these have been based on voluntary adoption of best management practices (BMP) by farm operators or landowners and may focus on one primary practice. However, that is not always the best solution, particularly as weather patterns fluctuate. The best protection from erosion due to severe spring rains, for example, is with complete conservation systems that may include no-till systems for row crops along with practices such as terraces, buffer strips, and grassed waterways (NRCS 2004, Randall, 2001). Perennial cropping systems effectively control erosion, promote water infiltration and reduce nutrient loss (Randall, 2001; Jackson and Jackson, 2002; NRCS, 2002). Moreover, the widespread nature of nutrient and sediment sources, and the influence of ecological processes, management, and storm frequency lead to differential results from placing standardized practices (often termed BMP's) in different landscapes (Boody et al., 2005, Hatfield and Prueger, 2004).

Why are new approaches needed?

The Natural Resources Conservation Service (NRCS) estimates that soil loss from water erosion is about 1.07 billion tons annually. Average soil erosion rates in IA and MN are still at or above the soil replacement values (the notorious "T"). The U.S. EPA estimates that agricultural runoff contributes to about 60% of the impaired rivers, 30% of impaired lakes, 15% of impaired estuaries and 15% of impaired coastal shoreline (Amber Waves, 2003). Non point sources are estimated to contribute about 86% of the pollutants to Minnesota's impaired waters (Mulla, 2005). Water quality and erosion problems in the Mississippi River Basin are worsening and erosion and floods are increasing as spring-summer rainfall patterns have intensified in recent

years (Randall and Mulla, 2001; Faeth and Greenlaugh, 2002). Waterfowl populations are declining in the Upper Midwest in recent years and some grassland songbird species are in decline. MN DNR staff report declines in trout populations in southeastern Minnesota streams in recent years, despite a long period of recovery in the populations after the adoption of CRP and conservation compliance. Iowa notes a sharp decline in songbirds, including the goldfinch, the state bird. Nationally, the sharp increase in the hypoxic dead zone in the Gulf of Mexico is well documented as are other hypoxic zones such as those in Lake Erie (Dybas, 2005; Rabalais et al., 2002).

Taxpayers support conservation and pollution prevention efforts through publicly funded incentives, grants, enforcement actions, as well as in the marketplace. Conservationists are concerned about the costs to taxpayers for cleaning up the water on a repeating basis. They are understandably concerned that the public's money has not produced long lasting performance based soil and water conservation. This includes the funds required to temporarily retire land from pollution-causing production systems without the promise of long-term protection when the land comes back into production (i.e., the Conservation Reserve Program). Businesses and communities often have invested large sums for clean-up of their point discharges and find it hard to understand that the agricultural community would not be held accountable for their contribution. Members of the agricultural community, who collectively must be the ones who carry out conservation and nutrient reduction practices while continuing to make a profit, are often cynical. Unproductive tensions between the farming, business and environmental communities are heightened when agricultural industry leaders base their disagreements about conservation goals or programs primarily on the costs of environmental protection and its enforcement. In short, promises have not matched outcomes and with budget deficits projected long into the future, heightened confrontations are likely.

The total maximum daily load (TMDL) process mandated by the Clean Water Act could exacerbate these tensions because it could lead to cessation of development until non-point (NPS) pollution loads are reduced to the point where they no longer impair a given water body for its identified purpose. However, since TMDL's also may target animal feeding facilities, as well as many other agribusiness establishments, the agricultural community is still involved. And continued discussion of tile drains as possible point sources could lead to major conflicts between farmers and regulators.

Further, scientific analyses of the problems may reach differing opinions about the causes and solutions to non-point source pollution. The results are mistrusted by those not farming the land if the agricultural industry tries to downplay its role in non-point source pollution and by some agricultural leaders if dominant farming systems are singled out for their contributions to runoff. This has resulted in confused and often conflicting legislative agendas, and less funding for research and demonstration programs than are needed.

Despite these tensions, the feeling of partnership in solving a common problem and a sense of responsibility to the community and to future generations help explain why a growing number of farmers and land owners want to become positively involved in NPS management efforts. Stewardship pays, as Hopkins and Johansson point out. These authors provided data supporting growing evidence that there is a positive relationship between environmental performance and financial performance (Hopkins and Johansson, 2004). Conservation Resource Management (CRM) farms were more efficient than non-CRM farms, not only because CRM managers tended

to be better managers but also because of lower resource (fertilizer, pesticide, energy, labor) use (Smith et al., 2004). Similarly studies of organically certified farms show that while yields in some cases may be lower, net returns are often equivalent or higher even before an organic premium is considered (Pimentel et al., 2005). Moving from an orientation of maximizing yields of commodity program crops to one of farming for net profit and environmental gains can enhance creativity, innovation and partnership with NRCS technical staff and other natural resource advisors.

There are also good examples from the business sector of self defined performance-based environmental improvements that went well beyond any minimum standards at the time. One such example is the 3M Company, which in 1975 decided to create its Pollution Prevention Pays program. < http://solutions.3m.com/wps/portal/>
"As part of the 3P program, the company adopted an environmental policy that pledged to:

- solve environmental pollution problems
- prevent pollution at its source,
- develop products that have a minimum impact on the environment,
- conserve natural resources through recycling and reclamation,
- assure that the company facilities and products meet the regulations of all federal, state and local environmental agencies, and
- assist these agencies and other official organization engaged in environmental activities."

The company embraced this approach and improved its profitability at the same time (Batie, 2000). Public support for agriculture pollution prevention can also be strong, if there are measurable results and significant environmental gains can be shown (Westra et al., 2004; Welle, 2001).

In this concept paper, we describe key components needed to advance the concept of performance based policies for agricultural conservation, principles, testable policies, an analysis of tools, barriers to overcome and recommendations to provide a viable pathway forward.

WHAT IS PERFORMANCE?

Federal and state-based conservation programs are now measured by how many acres or feet of a given practice are installed on the landscape, numbers of practices adopted and participants, and amount of funding allocated. Standardized gains in environmental performance are presumed. However, incentivizing the achievement of environmental outcomes rather than the adoption of practices will be more cost-effective, allow more flexibility for and innovation by farmers and ranchers, and result in more extensive and predictable environmental improvements and services. Incentives will accrue not only from government programs but also new private markets for what are now public benefits. Cost-share and incentive payments for improved environmental performance can be linked to achieving certain quantitative results that are measured or estimated for a given environment.

Performance-based approaches will provide several positive outcomes:

- Improved environmental outcomes.
- Increased cost-effectiveness of programs.
- Farmer flexibility to choose how to meet goals.
- A solid foundation for green payment programs.

- ❖ A necessary base for non-point source trading programs.

Several steps are necessary and include identification of outcomes (goals), appropriate geographic scale, time frame and indicators in order to assess progress.

Prime Audiences

Even before outcome measures are considered, the target audiences must be identified. Obviously farmers are the prime target audience. Absentee land owners, farm managers, renters, bankers and others also have important decision making roles in the adoption of conservation practices. Any payment approaches must consider these groups (for this paper, we will use farmers to represent all groups). Policy makers must set the parameters and community stakeholders must be involved to help set the desired outcomes.

Define Outcomes

Central to the issues being addressed is defining what outcome(s) are desired. Outcomes can be ecosystem based, practice based, socio-economic based, or a mixture of all three. An ecosystem-based outcome would be, for example, the decline in the extent and duration of the hypoxic zone in the Gulf of Mexico, or a stream that meets water quality objectives and supports benthic organisms. A practice-based outcome might be the decline in the use of nitrogen fertilizer, or an increase in the amount of grassland and forests in the basin. It could even be the proportion of farmers/operators using best management practices. Socio-economic outcomes could include an increase in number or at least a decrease in the rate of loss of family farms in a watershed, an increase in the farm income and/or a decline in reliance on public subsidies, or local/regional purchasing of inputs, or sales of farm products.

Geographic Scale

Outcomes need to be tied to an appropriate geographic scale and indicator. With respect to water quality there are nested scales of surface water quality. Most watersheds programs are on a small scale relative to, for example, the Mississippi River Basin. Even small watersheds are difficult to assess. It is difficult for an individual farmer to manage for nutrient goals relating to the Gulf of Mexico, but easier to manage for local watershed or wildlife goals. One example of a nested approach would be to focus on total maximum daily loads that are targeted to a minor watershed scale, with an added goal of reducing nitrogen runoff and thus addressing hypoxia issues at a larger scale. Mulla et al. (2001) and others have described different scales.

Plot, Hillslope and Field scale

The basic level of management is normally the farm field. However, the field can range from hundreds of acres in a flat central Iowa landscape to a few acres in a hilly area of NE IA or SE MN.

Minor Watershed scale

Water quality is also a function of the watershed in which this field is sited. If moving water is diverted from a field but finds its way onto topsoil on another field down-slope then there may be no improvement in the stream.

Major Watershed level

The Minnesota River or the Des Moines River in Iowa aggregates small changes from many upland fields and the tributaries that drain those fields. A TMDL will be set for eutrophication

and sediment in Lake Pepin that will aggregate effects from the Minnesota River Basin, the St. Croix River Basin and the Upper Mississippi River in Minnesota above Lake Pepin.

River Basin and Coastal Estuaries
The EPA has set a goal to reduce riverine nitrate N export to the Gulf of Mexico by 30% by 2012 in order to substantially reduce the size of the hypoxic zone in the Gulf of Mexico (Rabalais et al., 2002). Some scientists believe that the reduction may need to be on the order of 40% and may need to include phosphorus.

Ground Watersheds
Surface watersheds are usually different geographically from ground watersheds. The latter may influence ground water over a smaller area such as much of southeastern Minnesota or a large area such as the Ogalala Aquifer. Pesticides or herbicides that enter groundwater may stay in residence for a very long time depending on the chemical and physical characteristics of each aquifer. Also surface water flows are highly influenced in some areas by groundwater tables.

Wildlife Management Needs
Areas that would adequately support a given wildlife species may overlap with surface watersheds, especially if aquatic species are of interest. Other parameters come into play such as corridors and minimum size of wildlife habitat for a given species.

Time Frame
Ecological outcomes can take years to materialize in a landscape. Migratory species may diminish due to impacts outside the farm or watershed. Situations such as cropping patterns and changing economics will alter with time, sometimes within a growing season. Climate or weather patterns may shift, or major changes may occur in the watershed such as urban development that can alter intended outcomes. However, funding and political will often are not sufficient to continue long-term measurement of the effects in a given watershed. EPA has recognized this by incorporating Management Development Plans (MDPs) into their 2005 Annual Plan and Budget. These plans recognize that environmental performance likely will not measurably improve in one year. MDPs are intended to provide EPA with a road map for developing improved long-term and short-term performance measures, tracking strategic targets that cannot be measured annually, and assessing progress towards closing performance management gaps.

Indicators of Success
Appropriate indicators may range from extent of adoption of practices to environmental outcomes. Other indicators would include economic and social performance, though these also are hard to define and measure. Of critical importance is selecting indicators that measure benefits to the intended resource. The list of indicators should be short, based on common sense, be appropriate to the geographical scale, and be developed through stakeholder discussion. They must be doable technically and financially and outcomes must be tracked with appropriate tools. We suggest a way of categorizing indicators that has been described by Flora and Flora and others (Flora and Flora, 1987; Flora et al., 1999 and Flora et al., 2004).

Natural Capital
In agriculture natural capital has been more typically related to production parameters. The North Central Soybean Research Program has developed soil electrical conductivity as a tool reflecting

a variety of soil physical conditions as well as the need for additional nutrient tests. Indicators for nutrient management could focus on end-- of-season residual nutrients in plant stalks to determine fertilizer usage or estimates of potential losses of nutrients from soil or in runoff. Pesticide residues in the environment and leaching potential could be performance indicators.

Most of these indicators measure the potential for adverse impacts of land management activities, such as the amount of pesticide runoff from crop fields into streams. Efforts to develop indicators for wildlife and habitat are relatively new and generally untested. There is controversy about whether to evaluate the status of plants and animals that thrive in converted agricultural ecosystems, or to compare ecosystem functioning or the flora and fauna present on working farms to species that may have been present prior to European settlement. Defenders of Wildlife are developing wildlife indicators that may be appropriate on agricultural land (Cohn and Lerner, 2003).

The Food Alliance and Wild Farm Alliance are developing indictors for wildlife as part of certification standards. NRCS and other entities have been assessing impacts on wildlife for some time (see website listings).

Indicators of agroecosystem functioning that can be used to observe changes on the farm were also included in the Monitoring Tool Box. It was developed by a team of farmers, researchers, agency staff and consultants led by LSP and MISA (Minnesota Institute for Sustainable Agriculture) and includes carefully chosen indicators that were compared to analytical tests. It provides record keeping and tests to observe changes in these resources from year to year.

The *Tool Box* contents:

- Farm family quality of life
- Farm sustainability with financial data
- Birds present and breeding by species
- Frogs present and breeding by species
- Soil physical, chemical and biological indicators
- Stream water quality, stream bank shape, fish and bottom dwelling organisms
- Pasture vegetation (species and percent cover)
- Others may need to be added to cover other issues

Social Capital

Social capital contributes to the formation of financial and human capital, and involves mutual trust, reciprocity, groups, collective identity, a shared future vision, and working together (Pretty 2003). Social capital that forms between or among like people or groups is called bonding social capital. Social capital that forms between or among groups with different interests is called bridging social capital (Flora and Flora 1987). We can describe this capital with different indicators that might include:

- Number of farms in a given geographic area
- Number and vitality of community institutions
- Rural population size and trends
- Opportunities for cross fertilization between different groups and points of view

Financial Capital
A variety of indicators are possible. Several people have proposed indicators that relate to financial performance on the farm in relation to the community (Levins, 2000). These might include:

- Net farm profit as distinct from gross farm profit
- Reliance on government payments by farmers
- Use of equipment, chemicals and non renewable energy
- Creation of jobs
- Cycling of money in local regional economies
- Number of input and processing businesses in an area
- Rural employment opportunities related to agriculture

PRINCIPLES

Maryland's Congressman Gilchrest says we should seek to "make the human infrastructure compatible with nature's infrastructure" (remarks at the Payments for Ecosystem Services conference in Washington D.C. in May 2005. In so doing, he said we can expect higher profits in the long run. As Batie (2000) points out, there is considerable agreement that more flexible, performance based regulations tend to reduce costs and lead to innovative approaches and that regulations or the threat of them may be necessary to spur businesses to search for innovations that may also reduce costs. Dobbs and Pretty (2001) raise an important question: Should public subsidies continue if the new farming systems are more inherently profitable while they also provide environmental benefits?

Payments That Are Fair To Taxpayers And Farmers

Welle and Uematsu (2005) suggest that the public's willingness to pay should be equal to or greater than a public payment for a given outcome. If farmers are reducing the number of marketable products they can sell while they increase the number of public benefits, then compensation should reflect that exchange. As new private markets develop it is an appropriate government role to assure equitable price structure and access for small, medium and large farms alike, and avoid unintended impacts that concentrate farm ownership.

Continuous Progress

Standards such as those promulgated by the Food Alliance are based on the idea of continuous progress. Similarly, performance systems need to be created in a context where farmers, their technical and financial advisors, researchers, agency staff and the community work together to redefine acceptable outcomes as we learn more. It may be premature to provide blanket protection from further regulations, which implies that we have found long-term solutions to given problems, despite rapidly changing circumstances. Yet, it is important to acknowledge good faith efforts.

Assurance Of Improvements Or Continuing Performance

Agro-ecological and social systems are dynamic. Farmers need flexibility to adjust to changing circumstances. However, benefits such as carbon sequestration in soil can be lost if no-till or pasture management are not continuous. For that reason long-term payments for carbon storage, perennial cover and some other performance measures may need to be viewed on a watershed scale. This situation could allow an individual farmer to change management of fields in areas

that are not especially sensitive provided that the watershed could still meet a specific performance measure as a whole or for a given outcome.

Graduated Payments Commensurate With Comprehensive Functionality

Nutrient dynamics in relation to dispersed food chains, restoration of water quality and hydrologic storage and creation of margins, edges and patches are examples of multiple benefits (Jackson and Jackson, 2002). This approach is also built into the Conservation Security Program (CSP) with the recognition that farming systems that meet all the resources of concern on all the farms would qualify for Tier III, but lower tiers allow for participation at less comprehensive levels of functionality.

SELECTED POLICY IDEAS

How should policies be developed to focus on performance rather than practices and what is the role of the CSP as a step toward performance-based conservation programs?

General Guidelines

The Economic Research Service (ERS) proposed four guidelines for designing an effective payment program (Claassen et al., 2001).

- explicitly address each program objective in eligibility criteria;
- minimize incentives for cropland expansion;
- coordinate agri-environmental payments with other farm programs; and
- coordinate land retirement with payments to reward good environmental performance on land in agricultural production.

They suggested that program requirements will be realistic if "payments are based on farming practices or environmental outcomes that are controllable by the producer and are observable." Lower outlays will result when subsidized actions are linked to high priority environmental services, and those who take the actions are given higher priority to participate in programs. This can be estimated through a physical process model (see below) by direct assessments, and through on-farm observation.

Development of an appropriate baseline will be necessary and might utilize averages based on a regional context. For example, a soil erosion baseline could be the average annual erosion rate for typical production systems involving the predominant crop rotation(s) and conventional tillage. It is important not to set the baseline too low or too high. It may need to be tied to protection of sensitive land. It is also important, despite the difficulties, to reward existing performance of those who are committed to high levels of stewardship without government support and to encourage additional stewardship on those lands, as well as incentivize those who need to convert from poorly performing systems (Claassen et al, 2001).

Boody et al. (2005) and Westra et al. (2004) showed that different kinds and levels of benefits might be achieved at a watershed scale based on the level of diversification and perennial cover on the land. It makes sense to develop graduated payment rates that reflect increasing ecosystem benefits to society. Farming for environmental outcomes will find greater acceptance and adoption by farmers if it is profitable and if payments are available from the public or private sectors. It is likely there are markets that can be easily developed, such as clean water, tourism,

and specialty niche products. Many state extension services are able to assist in small business development.

Some existing policies that provide clues to developing more robust performance based policies are described.

Phosphorus Index

One of the most promising management tools to manage P application to soils, particularly from P-rich animal wastes, is the P Index. This was developed by NRCS in 1994 (www.nrcs.usda.gov/technical/ECS/nutrient/pindex.html) It separates the main factors influencing P movement (transport, P source, P management factors) and provides a suggested management index for field staffs, watershed planners and land users with a tool to assess the various landforms and management practices for potential risk of P movement to water bodies.

The P index has been evaluated and modified by several states (summarized by Weld, 2003 http://psrwmri.psu.edu./phosphorus/Summary_Pindices.pdf). All states have implemented the P Index as at least one method to address P management as part of their USDA-NRCS 590 Nutrient Management Standard. Birr and Mulla (2001) reviewed a modified P index in 60 Minnesota watersheds and concluded the index can be used on a regional scale to prioritize P loss vulnerability using state and national databases.

The primary driver for the P index is managing application of animal wastes on land. Kogelmann et al. (2004) evaluated the potential impact of the P index in Pennsylvania. They concluded that areas with high animal density would be the most affected. Use of the P index has the potential to require considerable more land for manure application, increasing the cost of concentrated animal feeding operations (CAFOs). In fact in reviews of permits in Minnesota, Schimmel et al. (2001) calculated that for every increase in density of one animal unit/acre there was a surplus P level of 78 lbs/acre. Jackson et al. (2000) similarly found in an area in Iowa with 60,000 finishing hogs within a 2 mile radius that the CAFOS would need three times as much land to efficiently apply for nitrogen content and ten times as much for phosphorus as they were using.

Can the P Index become part of an outcome-based watershed planning as part of the CSP or on its own? This issue does not seem to have been addressed currently, but could be critical. Many watersheds that need management will have high animal densities and high P outputs. Testing of soils combined with soil loss estimates, calculations of the P index in relation to the assimilative capacity of the soils, and checks on losses of P from crop or animal operations could make the P Index a more performance based program, even though the index itself is primarily practice based.

Nitrogen Evaluations Related To Yield

The Iowa Soybean Association has been using on-farm research for several years. In some cases, they found that reducing N fertilization rates does not necessarily result in lower corn yields and that the university recommendations for manure N are sometimes too low, but that fertilizer N use is often too high for optimum yields (http://mrbdc.mnsu.edu/org/bnc/pdf/nrate_trials_iowa.pdf). Practical Farmers of Iowa and some other NGOs and research institutions has also tested indicators of environmental performance (see websites).

Emission Standards
Water quality and other standards may provide a definition of performance. They may represent minimum levels of achievement. The more demanding and perhaps measurable TMDL program will use standards related to intended uses to define load reductions of point and non-point source pollution necessary before further development can take place.

Conservation Security Program
The Conservation Security Program (CSP) pays farmers for maintaining and enhancing existing environmental stewardship and can be an important step in the direction of a performance based policy (Keeney and Kemp, 2002). Program details are described in a text box at the end of this paper. The CSP demonstrates the use of tiered payments for higher levels of achievement beyond a minimum needed for entrance into the program.

Enhanced payments are provided to farmers for such things as resource conserving crop rotations and managed grazing systems, exceptional conservation performance, addressing additional resource concerns, participating in a regional or watershed-wide conservation plan that involves at least 75 percent of the producers in a targeted area, and participating in on-farm research or monitoring efforts. The enhanced payments offer a great opportunity to help farmers develop performance measures for their farm. Unfortunately, the program has been poorly funded and implemented only in selected watershed areas around the country.

Environmental Quality Incentives Program
Programs such as Environmental Quality Incentives Program (EQIP) could be targeted to address particular natural resource goals. The Chief of NRCS and state conservationists have the authority under current rules to target at least a portion of the funds in this way.

Landscape Level Improvements
Another step is to target landscape protection and improvement of water quality based on diversifying targeted acreages into perennial and continuous living cover systems, such as proposed by the Green Lands Blue Waters Initiative (website). If the principles of adaptive management are built into these programs, and if the available and potentially available government and private tools are appropriately used, real progress is possible. The Soil and Water Conservation Society (2004) described a number of changes needed to achieve such improvements.

Ecolabels
Certified Organic, Fair Trade and Food Alliance are examples of ecolabels that include different agroecosystem and social considerations, as well as production related practice standards. Other certified programs are being developed as the need arises. Examples include Certified Forestry Products, the Sustainable Textile Standard (http://MTSsustainableproducts.com), Salmon Safe (http://www.pacrivers.org/salmonsafe, Earthcraft Homes (wwe.edcmag.com/) and Fair Trade Coffee (www.peacecoffee.com).

Innovative Financial Mechanisms for Promoting Conservation
There are several market based financing mechanisms for promoting conservation. These include: Cooperation with downstream water utilities (the New York City- Catskills example), carbon credits, and nutrient trading. Private initiatives that provide incentives include: conservation easements, technical assistance, risk management/green insurance, ecotourism,

certification programs and forest banking. Government programs that might encourage conservation include zoning, taxing, property tax credits, farmland preservation and environmental performance bonds (see Cameron and Muller, 2001).

TOOLS AVAILABLE TO MEASURE OUTCOME PERFORMANCE

It is often difficult to establish good outcome based watershed programs because they require measurements. Resources for monitoring are always hard to obtain. While ideally new watersheds should be established to provide the proper measurements rather than attempting to do assessments on existing watersheds, this is seldom practical. Few watersheds have proper background information such as the socio-economic status of the residents, or long-term measurements such as water quality. It is unusual to find watersheds that have developed sufficient background to satisfy needs of most models**.** Nevertheless, we usually must work with ongoing watershed programs to expedite data gathering

How might outcomes or the success of conservation programs be measured? The response to this question is critical to the establishment and monitoring of watersheds and will be necessary to evaluate the success of current and future government conservation policy and programs (see Smith and Weinberg, 2004; Hopkins and Johansson, 2004; Claassen, 2004). If background information exists, the program will be off to a head start.

Measurement tools will range from on-farm observation of trends based on interviews of participants and other stakeholders, citizen monitoring, direct measurements of water quality or the use of physical process models to estimate outcomes. Importantly, as stressed by EPA, the tools must include economic inputs. These tools must have a scientific base.

Physical process models can be an appropriate (and often the only feasible) way to assess decision making at the watershed level, but must be applied with caution and based on monitoring data (see PEPA conference, Westra et al., 2004). In addition, they usually require at least some additional data, which may be difficult to obtain at the quality required for the model. Further, most agricultural models are based largely on row crops or concentrated animal feeding operations and may require modifications to use with alternative farming systems. For example Westra et al. (2004) found that model parameters had to be adjusted for systems such as management intensive rotational grazing. Whenever possible, models must be related to ground truth data.

BARRIERS TO SUCCESSFUL ADOPTION OF WATERSHED BASED CONSERVATION PRACTICES

Farm decisions are based on many factors beside the conservation program being evaluated. An example might be conservation tillage, which is used by many farmers who do not have highly erodible soils because it is cost effective in terms of energy and labor savings. Did a cost-share incentive stimulate farmers to adopt something they would not otherwise have done? And impacts of conservation adoption always will be influenced by commodity support programs, as long as they continue to exist.

It is important to determine how the conservation programs affect environmental performance in the watershed. This is a major objective of the Conservation Effects Assessment Project watershed initiative (USDA). However, the current Conservation Effects Assessment Project (CEAP) should not be confused with performance programs (SWCS, 2005). At this point it is trying to look back at the effect of individual conservation programs on individual fields. The CEAP ARS Agricultural Research Service watersheds offer a chance to learn more about performance at a watershed level from existing programs.

There are other issues as well. Should farmers get paid for implementing the practices or for the outcomes? Should they get insurance if the outcomes do not happen but yield declines? What if outcomes look good for a while, and then decline in benefits over time, or visa versa? These types of issues may be addressed if adaptive management principles are used to modify practices and policies as new information is available.

Other issues include the problem of non-compliance by one large polluter in a watershed in ways that directly affect the intended outcomes. Does that negate any one in the watershed receiving payment? How consistent and reliable should enforcement and monitoring of adoption practices be before payments are made? Who monitors actual environmental outcomes and for how many years? How much does that cost? Will payments be dependent solely on rather stringent rules of compliance? Will there be graduated payments? And should at least a minimum payment be made when the watershed program gets underway? If models are used to evaluate outcomes, will payment be based solely on adoption of proven practices? Additionally, the models might be overly optimistic as has been shown in the Chesapeake Bay. Over optimistic assessments would lead eventually to loss of credibility and hinder further progress toward the objectives.

What payment approach might work best? Do cost share programs lead to long term maintenance of the practices once the payments expire? Are there more effective approaches that build stronger connections with local communities? How important to successful performance are upfront education and long-term management advice in a team setting?

Fortunately, federal programs in EPA and NRCS are addressing this issue and scientists have developed initial approaches. County governments have also gained some experience. We will learn much from these programs, but must continue to examine alternatives from the private/NGO sector.

An overriding issue is how to project potential performance into the future in order to pay today for those potential results. What combination of monitoring, observing, and modeling will be necessary to address this gap? We don't have sufficient ecological knowledge to predict with certainty how ecosystems will react to changing circumstances or intensifying production practices. Thus another critical gap to be addressed is that between good faith actions that happen to prove insufficient due to changing circumstances to produce the desired results.

Other barriers that must be overcome if watershed based conservation practices are to become successful include:

- Achieving conservation goals in the landscape may require some portion of the landscape to be diversified from strict commodity type farming. Those row crop farmers will have to risk incorporating some perennials that often do not give immediate returns, require

new equipment and are not familiar to the farmer. Waterways, wetlands and grassed areas are part of the mix. Moving out of program crops removes the possibility of utilizing current commodity support programs, which increases the risk.

- Lack of technical support to design and implement practices slows down adoption of government supported conservation programs. Lack of resources prevents adequate technical assistance and follow-up in management groups after planning is done.

- Land owners, farmers or bankers may lack information about practices and relative effectiveness of the practices. This issue is critical to the advancement of the CSP.
- Lack of capital and labor to implement appropriate conservation practices may limit the adoption of new systems or practices. Bankers may be nervous about changes.

- Reduced farm flexibility to adapt to changing markets or circumstances could result from the adoption of more permanent practices such as trees, or large riparian zones that are not able to be used for a production purpose.

- Political will may be insufficient. The problems occur at many levels.

    - It is often up to the government agencies to carry out legislative mandates. The agencies do not operate in a political vacuum. Most of the time, they must operate on limited funding because of priorities within their unit that use resources elsewhere. And agency heads usually operate at the behest of the elected leaders, which means they often have political boundaries that must be respected and may conflict with watershed or wildlife areas.

    - NGOs are critical bridges between the public and private foundations that also might desire change or progress toward cleaner environments. NGOs are not bound to the structure of government agencies, and may have more flexible infrastructure than general public organizations. But, they may be under resourced. They are usually at the cusp of change.

    - Congress is key in that it holds the important authorizing legislation and funding authority. Voluntary programs such as CSP will not advance without some government support. The current winds in Congress and in many states are not favorable to funding new environmental initiatives, especially if they are perceived to have higher administrative costs.

    - Financial costs, especially administrative costs for performance based initiatives are assumed to be higher than traditional conservation programs. While there is much to be said for voluntary programs to control non-point source pollution, administrative costs of voluntary programs may be high (Feather and Cooper 1995). Costs include emission monitoring, incentives, and technical assistance. It is important to evaluate benefits along with costs but the questions remain about who will pay and who will benefit.

RECOMMENDATIONS

In order to address the barriers and take advantage of opportunities to move performance-based agricultural conservation policies forward, government, researchers, non-profits, farmers and conservationists should work together. We recommend that:

- USDA make more funds available for research on performance based approaches for agricultural conservation and consider possible social impacts of using this approach.
- Scientists with community partners expand research to compare practices and actual performance in different ecological areas and under scenarios reflecting changes in precipitation patterns.
- Agencies, researchers with community partners evaluate modeling tools with alternative systems, as well as dominant systems, and with changing weather patterns. New CSP tools being proposed as screening tools should be similarly tested. For example, the Soil Conditioning Index may work well for no-till systems in dominate crops, but may not properly recognize that systems in long term organic rotations build soil organic matter despite tillage.
- Congress fully fund and USDA should fully implement CSP with continuous sign-ups. Prioritize funding starting with Tier III and enhanced payments for resource conserving crop rotations and managed grazing systems, exceptional conservation performance, addressing additional resource concerns, participating in a regional or watershed-wide conservation plan that involves at least 75 percent of the producers in a targeted area, participating in on-farm research or monitoring efforts, reducing fossil fuel energy use, integrating biological and genetic diversity, and enhancing pollinators.
- State conservationists and the NRCS Chief designate a portion of EQIP funds to use as place-based, targeted programs to achieve given outcomes.
- USDA fully implement the Partnerships and Cooperation section of the Conservation Title. It should allow testing of prototype performance-based approaches outside of existing conservation programs to determine if the performance based program is solidly designed, has built in monitoring and on-farm observation, and can be cost-effective.
- Local and state governments try innovative programs such as property tax credits for conservation that build in performance measures the community can understand and help measure.

From LSP Fact Sheet on CSP #1. January 2005

CSP has four different payment components:

· 1. Stewardship Payments, also called base payments, are automatic annual payments which are equal to the regional per-acre rental rate for a particular land use multiplied by a reduction factor. For example, a farm with a $100 regional per-acre rental rate can receive between $1.25 and $11.25 per acre, depending on whether it is eligible for Tier I, II or III.

· 2. Existing/Maintenance Payments are made annually to farmers for maintenance of existing practices that already deliver conservation benefits and are equal to 25 percent of the total "Stewardship Payment."

· 3. New Practice Payments are available as a one-time, 50 percent cost-share for a limited set of new practices that promote conservation activities. Currently, they are capped at $10,000 cumulative per contract.

· 4. Enhancement Payments are made for additional conservation practices, activities or results above and beyond those needed for basic eligibility and which are meant to provide exceptional stewardship benefits.

What Tier do you belong in?

At the core of CSP is a three-tiered system which allows farmers to participate in the program at the level they feel comfortable with. Farmers in Tier III would receive the highest payments. These tiers also leave open the option of improving stewardship on the farm, thus increasing payments over time. All tiers consider water quality and soil quality as priority resources, also known as "resources of concern."

· Tier I is the first level of participation in CSP. In Tier I, contracts are for five years, and a farmer must have addressed water quality and soil quality issues to the NRCS Field Office Technical Guide (FOTG) standards on all or part of the farm.

· Tier II has more stringent requirements. In Tier II, contracts range from five to 10 years, and farmers must have addressed water quality and soil quality standards as outlined in the FOTG for their entire farm. They must also be willing to address one additional resource—such as soil erosion or water quality—by the end of the contract period to a level that sustains the resource according to FOTG standards

· Tier III is the final and highest level of participation in CSP. In Tier III, contracts again range from five to 10 years, but farmers must have addressed all resource concerns to a "resource management system level" that meets FOTG standards on the entire farm. Meeting the resource management system level means all resources of concern are managed with sound and effective conservation.

What are the CSP qualifying criteria?

How a farmer addresses soil and water quality issues is used as criteria for CSP qualification. For soil quality, producers must have treated all gully erosion—ephemeral and classic—and have a Soil Conditioning Index (SCI) of 0.0 and higher. The SCI is a tool used to measure the trend of organic matter in the soil. SCI typically ranges between -1 to 1 and takes into account organic

matter, field operations and erosion. To address water quality criteria, farmers need to provide records for the past two years on nutrient management and pest management.

LITERATURE CITED

Batie S. 2000. Environmental Issues, Policy, and the Food Industry. http://www.aec.msu.edu/agecon/smith_endowment/documents/envissue1.pdf

Birr, A S and D J Mulla. 2001. Evaluation of phosphorus site index in watersheds at the regional scale. J. Env. Qual. 30:2018-2025.

Boody G, Vondracek B, Andow DA, Krinke M, Westra J, Zimmerman J, Welle P. 2005. Multifunctional Agriculture in the United States. *BioScience. 55(1):27-38. Available from http://www.landstewardshipproject.org/mba/Multifunc_Jan05_BioSc.pdf*

Cameron, M. Muller M. 2001. Innovative Financial Mechanisms for Promoting Conservation. Institute for Agriculture and Trade Policy. Minneapolis, MN.

Casey F, Schmitz A, Swinton A, Zilberman D. 1999. *Flexible Incentives for the Adoption of Environmental Technologies in Agriculture.* Kluwer Academic Publishers. Norwell, Massachusetts.

Claassen R. 2004. Have conservation compliance incentives reduced soil erosion?. Amber Waves June 2004. pp. 31-39

Claassen R, Peters M, Hansen L, Morehart, M. 2001. Agri-Environmental Payments: Rewarding Farmers for Environmental Performance. Agricultural Outlook May 2001 pp. 26-31. www.ers.usda.gov.

Claassen R, Hansen L, Peters M, Breneman V, Weinberg M, Cattaneo A, Feather P, Gadsby D, Hellerstein D, Hopkins J, Johnston P, Morehart M, Smith M. 2001. Agri-Environmental Policy at the Crossroads: Guideposts on a Changing Landscape. Agricultural Economic Report No. (aer794) 72 pp, January 2001 http://www.ers.usda.gov/Publications/aer794/

Cohn, J. P, and J. A. Lerner. 2003. Integrating Land Use Planning and Biodiversity. Defenders of Wildlife. www.defenders.org/habitat/landuse.pdf

Dobbs TL, Pretty JN. 2001. The United Kindom's Experience withAgri-environmental Stewardship Schemes: Lessons and Issues for the United States and Europe. Staff paper 2001-1. South Dakota State University, Brookings.

Dybas CL, 2005. Dead Zones Spreading in World Oceans. BioScience 55(7):552-558.

Faeth P , Greenlaugh S. 2002. Policy synergies between nutrient over-enrichment and climate change. Estuaries 25:869-877.
Feather PM, Cooper J. 1995. Voluntary incentives for reducing agricultural nonpoint source pollution. USA-ERS Agriculture Information Bulletin 716.Flora CB, Flora JL. 1987.

Agricultural technologies, farm structure, and rural communities: Livestock counties in the Great Plains. High Plains Applied Anthropologist 7: 6[end]11.

Flora CB. Flora, J.L with S. Fey. 2004. Rural Communities: Legacy and Change. (2nd Edition) Boulder, CO: Westview Press.

Flora CB. Kinsley M,. Luther V. Wall M,. Odell S,. Ratner S, Topolsky J. 1999. Measuring Community Success and Sustainability. (RRD 180). Ames, IA: North Central Regional Center for Rural Development. http://www.ncrcrd.iastate.edu/Community_Success/about.html

Hatfield JL, Prueger JH. 2004. Impacts of Changing Precipitation Patterns on Water Quality. Journal Soil and Water Conservation. 54(1) 54-58.

Hopkins J and Johansson R. 2004. Beyond Environmental Compliance: Stewardship as Good Business. Amber Waves April 2004 pp31-37. www.ers.usda.gov/amber...

Jackson LL, Keeney DR, Gilbert EM. 2000. Swine manure management plans in north-Central Iowa: Nutrient loading and policy implications. Journal Soil and Water Conservation. 55:205-212.

Jackson LL. 2002. Restoring Prairie Processes to Farmlands. In Jackson DL, Jackson LL. The Farm as Natural Habitat: Reconnecting Food Systems with Ecosystems. pp137-154.

Jackson D. L. and L. L. Jackson (eds). 2002. The Farm as a Natural Habitat. Island Press.

Keeney DR, Kemp L. 2002. A New Agricultural Policy for the United States Presented at the NATO Advanced Research Workshop, Krakow, Poland, November 6, 2002.)

Keeney DR, Kemp L. 2004. How To Make it Work: Required Policy Transformations for Agroecosystem Restoration. Presented at the Ecological Society of America annual meetings, Portland OR. August 2004. http:www.iatp.org

Kogelmann WJ, Lin HS, Bryant RB, Beegle DB, Wolf AM, Petersen GW. Journal of Soil and Water Conservation. 59:9-18, 2004

Levins, RA. 2000. A new generation of power. Choices 15, no. 2, pp 43-46.

Monitoring Team. 1998. The Monitoring Tool Box. Land Stewardship Project. White Bear Lake, MN 55110.

Mulla, DJ. 2005. Evaluating Alternative Agricultural Management Practices and their Impact on Phosphorus Losses in Ten Minnesota Drainage Basins. A report to the MPCA. St. Paul, MN.

Mulla, DJ,. Gowda PH, Birr AS, Dalzell BJ. 2003. Estimating nitrate-N losses at different scales in agricultural watersheds. Chapter 17. In: Y. Pachepsky, DE Radcliffe, and HM Selim, eds., Scaling Methods in Soil Physics. CRC Press

NRCS IA. 2004. May Rains Cause Sever Erosion in Iowa. Natural Resources Conservation Service News Release. www.ia.nrcs.usda.gov/news/newsreleases/2004/MayRains.html

NRCS. 2002. Internal appraisal and analysis of conservation alternatives. Natural Resources Conservation Service. www.nrcs.usda.gov./technical/land/pubs/rca

Pimentel D, Hepperly P, Hanson J, Douds D, Seidel R. 2005. Environmental, Energetic, and Economic Comparisons of Organic and Conventional Farming Systems. BioScience 55(7):573-582.

Pretty J N, Mason C F, Nedwell D B and Hine R E. 2003. The environmental damage costs of eutrophication of fresh waters in England and Wales. *Environmental Science and Technology* 37(2), 201-208

Rabalais N.N. 2002. Beyond science into policy: Gulf of Mexico hypoxia and the Mississippi River. Bioscience 52:129-142.

Randall G. Intensive Corn-soybean Agriculture Not Sustainable, U of M Scientist Says. University of Minnesota Extension News. August 28, 2001. http://www.extension.umn.edu/extensionnews/2001/IntensiveCornSoybeanAgriculture.html

Randall, GW, Mulla DJ. 2001. Nitrate-N in surface waters as influenced by climatic conditions and agricultural practices. J Env. Qual. 30:337-344,

Ray DE, De La Torre Ugarte DG, Tiller KJ. 2003. Rethinking US Agricultural Policy. Changing course to secure farmer livelihoods Worldwide. Agricultural Policy Analysis Center, Univ. of Tennessee, Knoxville.

Schimmel, J, Levins, RA, Keeney, DR. 2002. Phosphorus balance in nitrogen-based feedlot permits. Unpublished paper. Minnesota Pollution Control Agency. St. Paul, MN THIS WAS PUBLISHED IN THE GENERIC ENVIRONMENTAL IMPACT STATEMENT ON ANIMAL AGRICULTURE. IT'S AT www.mnplan.state.mn.us/eqb/geis/TWP_Economic.pdf

Smith EG, Clapperton MJ, Blackshaw RE . 2004. Profitability and risk of organic production systems in the northern Great Plains. Renewable Agriculture Food Systems19:152-158.

Smith K, Weinberg M. Measuring the success of conservation programs. Amber Waves. September 2004. pp 14-21

SWCS. 2005. Preliminary Findings of a Blue Ribbon Panel's Review of the Conservation Effects Assessment Project (CEAP). Soil and Water Conservation Society 12 pp. http://www.swcs.org/documents/CEAP_BLue_Ribbon_Report_033005110939.pdf

SWCS. 2004. Realizing the Promise of the Farm Security and Rural Investment Act: How Implementation of the Conservation Provisions Measures Up. Soil and Water Conservation Society 36 p. http://www.swcs.org/documents/RTPpdf_121304163048.pdf

Weld. 2003 (http://psrwmri.psu.edu./phosphorus/Summary_Pindices.pdf).

Welle PG, Uematsu H. 2005. Farm Profitability and Economic Efficiency Under Working Land Conservation Programs: Minnesota as a Case Study. Unpublished manuscript. Bemidji State University.

Welle, P.G. 2001. "Multiple benefits from agriculture: A survey of public values in Minnesota." Research paper. Bemidji State University Available from http://www.landstewardshipproject.org/mba.

Westra JV, Zimmerman, JKH, Vondracek B. 2004. Do Conservation Practices and Programs Benefit the Intended Resource of Concern? Agricultural and Resource Economics Review 33/1:104-120.

Winsten J. 2003. Executive Summary from a Workshop on Performance-based Environmental Policies for Agriculture. Washington, D.C. March 20-21, 2003. Henry A Wallace Center at Winrock International and the Farm Foundation. Available from http://www.winrock.org/events/wallace/pepa/PEPA_Workshop_Executive_Summary.pdf

Websites
IATP http://www.iatp.org
LSP MBA http://www.landstewardshipproject.org/programs_mba.html
LSP CSP http://www.landstewardshipproject.org/programs_csp.htm
GLBW www.greenlandsbluewaters.org
SWCS www.swcs.org
NRCS Wildlfife Habitat Management Institute. http://www.whmi.nrcs.usda.gov/
Wild Farm Alliance http://www.wildfarmalliance.org/
Food Alliance standards http://www.foodalliance.org/certification/standards.htm
http://www.dnr.state.wi.us/org/caer/cea/environmental/documents/environcase.pdf

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