Visions of Agricultural Conservation Policy Beyond 2002: Implications for Partnerships

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Abstract

This paper identifies the requirements for "smart" conservation partnerships – alliances that are necessary and foster cost-effective, durable solutions to key problems. The basic structure and operation of partnerships are discussed, with special attention to the central role of transaction costs in forming and maintaining such alliances. The second section reviews the agricultural conservation policy setting and constructs a concept of policy beyond 2002 based on emerging trends and necessary actions to fill policy gaps. In the third section, the policy implications for building effective public-private conservation partnerships to realize that vision are drawn. A checklist of attributes for "smart" partnerships is offered as a conclusion.

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The recent agricultural appropriations decision by Congress to keep conservation funding essentially level and zero out some potentially innovative programs sent a powerful message. Despite credible science documenting many serious problems, and despite forceful attempts by advocates and agencies to boost funding, other political and budget priorities prevailed. The dominant role of the federal government in agricultural conservation appears to be waning. This turn of events could reverse by 2002, but the trend easily could deepen when our buoyant economy finally subsides, and budget expenses for health care and social security rise.

What will agricultural conservation initiatives look like if federal support is diminished? It does not take rocket science to predict larger roles for state and local government and for the private sector. However, education, crime control and a host of other issues likely will keep non-federal governments from simply replacing the federal funding. And, the bold shift toward markets in agriculture places intense scrutiny on private funding for conservation. In such a conservative fiscal climate, there will be a premium on doing conservation "smarter," rather than throwing more money at it. Partnerships increasingly are touted as one of those smarter ways.

It is most fitting to discuss conservation partnerships at a session honoring Norm Berg. He has nurtured many during his distinguished career while leading the Soil Conservation Service, representing the Soil and Water Conservation Society and in his local Maryland conservation roles. Of course, the partnerships between government agencies and the conservation districts begun in the 1930s have been the backbone of agricultural conservation during this century. I expect Norm will agree that next century's conservation partnerships will be quite different from those in the past for the reasons outlined above.

My main task is to identify the requirements for “smart” conservation partnerships - alliances that are necessary and foster cost-effective, durable solutions to key problems. To that end, the paper first explains the basic structure and operation of partnerships, with special attention to the pivotal role of transaction costs in forming and sustaining such alliances. The second section reviews the agricultural conservation policy setting, and constructs a vision of policy beyond 2002 based on emergent trends and necessary actions to fill policy gaps. Third, the policy implications for building effective public-private conservation partnerships to realize that vision are drawn. A checklist of attributes for “smart” partnerships is offered at the close. Note that conservation and environmental protection are folded under the single label of conservation here for ease of exposition.

Partnership Basics

Consider the dictionary definition of partnership - *a relationship of individuals or groups marked by mutual cooperation and responsibility*. Note that mutual modifies "cooperation" and "responsibility.” Thus, creating a new partnership may yield net benefits, but likely will cause costs for each party as well. Part of the costs of new conservation responsibility may be compliance expenses, although the partnership may lower those costs over the long-term, for example by public-private research and development ventures. Added cooperation imposes the other expense, transaction costs.

A careful weighing of all potential benefits against the expected compliance and transaction costs will encourage socially beneficial alliances, but will not ensure them. Several real world complications stymie

such outcomes. In short, the partnership concept can be misused, and even abused. This criticism applies to all sectors - government, private for profit and nonprofit. Pledges to form ill-conceived alliances may occur when groups are unsure of a way forward on tough issues, the "let's get together and talk about it" process strategy. Lots of process does not guarantee the desired outcomes. I have personal experience with this problem. For two years, I tried to make a partnership work between public agencies in President Bush's Water Quality Initiative. The cost of seemingly endless meetings to build a coordinated approach among different agency cultures proved excessive, and ultimately foiled significant progress. It's also possible that groups may propose partnerships to gain the perceived benefits of cooperation without anticipating the high transaction costs. In essence, imperfect information and uncertainty impede mutually productive alliances. Stiglitz (1998) recounts instances of this impediment from his service as chair of the President's Council of Economic Advisors. In other cases, groups pledge to partner as a way to redirect the agenda or stall action that may impose net costs on their members. Stiglitz characterizes this as a form of noncompetitive behavior, in which too few or too large players affect the terms of the partnership inappropriately. This is noncompetitive behavior.

Despite these cautions, I believe that public-private partnerships for agricultural conservation will rise in number and effect. Indeed, they must if we are to make progress on nettlesome problems that have resisted voluntary-payment efforts, and not resort to inflexible one-size-fits-all regulations. The Western Governors Association just issued an eight point program to reform environmental policy and number two is to build collaborative approaches (State Environmental Monitor). Several examples suggest that the process of building partnerships is underway, such as the National Environmental Dialogue on Pork Production comprised of officials from USDA and EPA, heads of regulatory agencies from five states, and five pork producers convened by Americas Clean Water Foundation; the alliance between the World Wildlife Fund and Wisconsin potato growers to foster integrated pest management; and a host of public-private watershed-based initiatives. Unfortunately, there has been little independent evaluation of the performance of these alliances, a topic to which I will return later. In all of these cases, it is essential to remember, conservation partnerships are merely a means to an end, not an end in themselves. They may be necessary but cannot be sufficient.

Transaction costs - the costs of information collection, negotiation, monitoring and enforcement - play a pivotal role in explaining why partnerships develop and persist, develop and fail, or do not develop at all. Some economists leave monitoring and enforcement expenses out of transaction costs. I retain them here because of their crucial role in operating partnerships. Ronald Coase made the concept of transaction costs famous in a 1960 essay. In that article, he posited that transaction costs accounted for the persistence of monopoly, public goods and externalities. State regulation may be a transaction cost minimizing solution to those problems, but not always. Coase's insights about the fundamental role that transaction costs played in everyday life and the implications for structuring institutions to ameliorate externality and public good problems central to conservation have been widely misunderstood by many economists and social commentators (Ervin and Fox, 1998).

Economic analyses have often ignored or given short shrift to transaction costs in their preoccupation with finding the optimal levels of inputs or production. Perhaps transaction costs were considered as an overhead cost of doing business. This interpretation, however, ignores that transaction costs are variable, not fixed, and can be lowered or raised depending upon management decisions. The world of business, government and private not-for-profit organizations is awash in transaction costs. They consume resources, such as staff time that could have been devoted to other uses. They are genuine costs of doing business, running a government agency or operating a non-profit organization. And, they are critical to forming and operating a partnership. The recent realization of the key role of transaction costs in

operating modern complex institutions, has led to the renaissance for the concept under the label of the "new institutional economics." Public and private groups in agriculture have held conferences on the concept of partnering that recognized the key role of information discovery for bargaining, negotiation, and monitoring and enforcement strategies (CFARE, 1998).

The rediscovery of transaction costs is timely for analyzing conservation partnerships. Just the recognition of their role permits us to draw inferences about the conditions under which partnerships may form and why they may succeed or fail. For example, we can predict that larger potential benefits must exist for individual parties in partnerships that require the participation of diverse groups as opposed to alliances of small, close-knit groups because the transaction costs rise with group diversity. We also can predict that groups may strategically plan to delay partnership negotiations if by raising the transaction costs they avoid an agreement that is not in their long-run interests. And, we can expect that more partnerships will be formed and sustained to the extent that transaction costs can be lowered. Recall that creating a partnership requires new cooperation *and* added responsibility, both of which will raise transaction costs. The counterbalance to these costs must be perceived benefits, including avoided compliance costs, as was the principal motivation for industry groups in the national environmental dialogue on pork production. Framed this way, the economic problem in forming a partnership is to attain the highest net benefits rather than minimize transaction costs as Coase envisioned.

It's possible that many potential partners focus on the benefits of cooperation more than costs of cooperation and responsibility. There may be several desirable characteristics for conservation partnerships, such as open access and potential involvement of all affected parties, and transparency of operation and performance to ensure effective monitoring when public good values are involved. But we cannot forget that each added condition could also defeat a potential partnership. Perhaps this is why some of the most effective, sustained partnerships appear to occur at the watershed level where the objectives are clear and participation is relatively less diverse than for regional or national issues.

Agricultural Conservation Policy Setting

Consider the major emergent forces that will shape agricultural conservation policy beyond 2002, and hence define the opportunities for partnerships. Several factors are at work to alter the dominant traditional approach of federal agencies offering farmers education, technical advice and financial assistance on a voluntary basis.

Continued pressure on government budgets tops the list. Although we currently enjoy a federal budget surplus, the pressure to control budget expense will not abate. Indeed, it will likely grow as the costs of assuring adequate health care and social security coverage come into focus after 2002. As noted at the outset, agricultural conservation has not fared well of late in competition with other budget objectives. The most recent congressional appropriations decisions to allocate new funding for disaster and insurance programs suggest that agriculture's political interests are still centered on assisting producers to cope with adverse market and climatic shocks. Moreover, if the public mood to downsize the federal government continues, the competition for remaining federal funds will intensify.

If a tighter federal fiscal picture confronts a rising public demand for conservation services from agriculture in the 21st century, something has to give. Surveys generally show that a dominant majority of the public have robust preferences for improved conservation from agriculture (e.g., USDA NRCS, 1995). This is a natural consequence of rising incomes which boost the demand for conservation services, including countryside recreationists and non-farm residents. The rising income, recreation and rural migration trends show no signs of reversing.

An improved scientific base to understand the scope and severity of environmental effects from agriculture has likely contributed to the increased public demand for conservation. Several recent assessments of agro-environmental processes and problems have enriched our understanding of the issues - the National Research Council report *Soil and Water Quality: An Agenda for Agriculture* (NRC, 1993), the USDA's *A Geography of Hope* (USDA-NRCS, 1996) , the 1994 and 1997 Economic Research Service reports *Agricultural Resources and Environmental Indicators* (USDA-ERS, 1994 and 1997), and the Office of Technology Assessment reports *Agriculture, Trade and the Environment* and *Targeting Environmental Priorities in Agriculture* (OTA, 1995a and 1995c). These exercises have made clear that agricultural conservation problems are serious and prevalent in all regions, albeit uneven in character and severity. They tend to concentrate where production or land conversion pressure is intense and natural resources are vulnerable to damage. Water quality, wildlife and amenity uses of farmland, and biodiversity are the most important priorities at present, but carbon sequestration via land use and tillage could surpass each if progress on the Kyoto protocol accelerates (see Appendix A, page 75).

A diminished federal role, robust public demand for agro-environmental quality, and improved science to detect problems will encourage a shift of responsibility for conservation programs to state and local governments and the private sector. Early signs of this shift are evident. Ribaudo (1997) reports that 30 states now have some type of enforceable measure to control water pollution from agriculture, a significant jump over the last decade. Actions to regulate animal wastes are the most notable. The number of business-led initiatives to enhance agricultural conservation also appear to be rising (Batie and Ervin, 1998). Both compliance-push forces to preempt tighter controls and demand-pull incentives from green markets are coaxing more effort from many farms and agribusinesses.

If government budget pressure and public demand for conservation do indeed collide, and the trend to state/local government and private responsibility continues, a search for "smarter" approaches will accelerate (Ervin, 1998). Smarter in this context refers to initiatives that give maximum flexibility to farmers and ranchers to invent low-cost, systemic solutions which achieve more long-lasting conservation per dollar spent. Partnerships often are advanced as one of those smarter approaches.

A Vision of Conservation Policy Beyond 2002

The evolving policy setting suggests a series of actions to improve the efficacy and cost-effectiveness of agro-environmental policy (Ervin, 1997; Ervin, 1998; Ervin et al., 1996). Five steps drawn from that body of work can help identify needed public-private partnerships. The steps build on recent improvements in science, work with trends toward greater private sector responsibility for environmental protection, and more state and local government initiative. Following the steps not only will benefit the environment, but will ease the uncertainty and cost for the industry, and lighten the load on taxpayers. Why, you ask, would we not already be traveling such a win-win-win path? Because political and bureaucratic inertia do not yield easily to what may be in the long-term interests of the majority of constituents. Yet, there are signs around the country that we have already embarked on this journey.

Set Clear, Measurable Conservation Objectives and Performance Standards

The single most important step is to set objectives and performance standards. Without the guidance from clear objectives and the incentives provided by enforceable standards, conservation partnerships will be ephemeral, waxing and waning with cycles of climatic stress, prices and government budgets. Despite over 60 years of agricultural conservation programs, few objectives and performance standards apply. This

inattention to specific targets stands in stark contrast to other industries. Standards for air, land and water quality have been applied to firms in non-agricultural sectors, with few exceptions. Controlling the levels of sulfur dioxide and nitrous oxide concentrations to meet human health criteria in urban air sheds are prime examples.

Conservation objectives and standards are nearly absent in agriculture. Instead, mostly voluntary programs of education, technical advice and financial assistance have been used to entice farmers to adopt technology-based practices or retire vulnerable lands. Partnerships may be used to promote such initiatives, but they will prosper mostly on ample budgets. Current examples include the enrollment of buffer strips in the Conservation Reserve Program and the implementation of the Environmental Quality Incentive Program. The objectives guiding these programs are couched largely in terms of the use of certain management technologies or in achieving a given level of land retirement, not achieving ambient environmental conditions. Some direct controls exist, such as restrictions on certain pesticide use and the drainage or filling of wetlands drainage, but they largely preclude certain practices rather than aim to achieve specific environmental objectives.

Adroit political power and weak science on source-damage relationships have sustained an "input-based" approach, despite very different environmental programs in other sectors. Both of these factors are weakening. As farms grow in size and character to resemble other industries and farm numbers tumble downward, the political will to treat agriculture differently weakens. The science and technology necessary to identify the causes and effects of water, air and land pollution from such a large number of diverse farm production systems has improved. Much progress has been made of late with the development of geographic information systems and improved source-pollution-damage linkages. Major assessments have concluded that information exists to improve the precision of problem identification and better target damage reduction or benefit enhancement as the case may be (NRC; OTA, 1995b; USDA, ERS, 1994 and 1997). We know enough to do a better job of targeting resources to important problems than we do in our current programs.

Of course, there are political impediments to setting objectives/standards and targeting which usually implies shifting program resources. Nonetheless, the trend seems clearly in that direction. Numerous states have established controls on waste management for large animal operations. Others have set ambient performance standards, such as Nebraska's groundwater nitrate criteria that trigger controls, and Oregon's total maximum daily loads of nutrients in water quality limited streams. Congress enacted legislation that required maximum environmental benefits per dollar spent, a form of targeting for CRP and EQIP resources. The political inertia appears to be shifting slowly.

Grant Flexibility to Producers and Build Skills for Managing Integrated Systems

Farmers and ranchers justifiably fear that setting performance standards could easily translate into high expense for their operations. However, such actions need not equate with top-down controls that dictate specific farm practices. There may be circumstances where extreme public health risks require very tight controls, but in most cases there are good technical and economic reasons to avoid "command and control" approaches. In the more usual circumstances, producers will meet the performance standards best with "flexible incentives" to design and adopt practices that meet the requirements of their individual production systems (Batie and Ervin, 1997). Flexible incentives refer to environmental management tools that specify "what" targets are to be achieved, but allow choices as to the "how." The gains from flexible approaches include adaptation and innovation for specific farms and resources that lower long-term compliance costs. The gains, however, come at some cost - higher administration and enforcement expenses.

Without clear, measurable objectives, it becomes virtually impossible to implement a system of flexible incentives. After evaluating several major programs in the United States and Europe, Davies and Mazurek conclude that the success of voluntary (flexible), incentive-based approaches relies on just such objectives. The authors stress that there is no easy way around the need for legislation to improve environmental policy. The legislation can ensure that objectives are established through an open process that includes the views of all key stakeholders. This requirement has obvious implications for partnerships to be explored below. Hence, the virtual absence of conservation objectives and performance standards in agriculture has profound implications for the design of flexible, farmer-led environmental initiatives

If more responsibility (and discretion) for achieving conservation is shifted to farmers and ranchers, the value of management that helps meet the standards will rise. More proficient managers will find the lower cost or higher profit ways of attaining the standards. Case stories of operators who simultaneously have achieved improved environmental and economic performances for their businesses affirm the need for high management proficiency (Batie and Ervin, 1998). However, the characteristics of agricultural managers that build successful production and marketing systems have received relatively little analysis compared to other business sectors. This neglect may stem partly from government agricultural programs that have constrained market opportunities, instead encouraging producers to "farm the programs." With the scheduled phase down of those programs by the 1996 Federal Agricultural Improvement and Reform act and the rise in health, safety and environmental issues on the farm, attention to management skills should grow.

A strength of relying more on producer ingenuity to invent conservation solutions is that they can balance or tradeoff costs and benefits within their full operation. This is often referred to as managing an integrated agricultural system. No amount of detail in the Field Office Technical Guide substitutes for this inherent skill and incentive that only the operator possesses about their natural resources and the farm operation. Perhaps one reason why we have seen so little private innovation in solving persistent agro-environmental problems may be too much reliance on the FOTG. The restrictions imposed by previous commodity programs no doubt played a role as well. Early EQIP implementation discussions stressed more flexible approaches, but evidence is not at hand to assess if that promise is being fulfilled (Batie, 1998).

Create a Balanced Portfolio of Significant Incentives

Diversifying incentives to fit particular farm/resource conditions and guard against budget swings seems a sensible strategy for conservation programs, but has proven difficult. The vast majority of incentives for agricultural conservation programs have come from the federal government in the form of voluntary technical assistance and payment programs. Two realities could easily alter their dominance. First, the public prefers a smaller federal government. Second, pressure to cut federal and state government budgets for "discretionary" environmental programs will likely build as health care and other "entitlement" spending requirements grow.

Continued reliance on federal payments for conservation is risky for agriculture and the environment. A broader set of incentives could guard against excessive costs for agriculture and the environment. A review of flexible incentives shows a wide range of instruments, with no obvious silver bullet approach (Batie and Ervin, 1997). Some options include reduced transaction costs (e.g., one-stop permitting for all environmental requirements), regulatory penalties if minimum acceptable performance is not achieved, taxes on offending inputs or environmental pollution, rewards for trading "pollution rights" if farmers accumulate unused rights, and market returns for food and fiber products that deliver environmental

benefits as well (green markets). Note that the act of defining minimum performance standards, enforced with some form of sanction, automatically expands the traditional set. Local/state tax relief schemes also qualify but will be subject to the same stresses seemingly affecting all government budgets. Any of the options can stimulate participation if the incentives are "tangible and significant."

Some state experiments are underway to reduce farmers' transaction costs in dealing with multiple, often conflicting agro-environmental programs, and thus accomplish more conservation per dollar expended (Higgins, 1998). Idaho has just begun a program to coordinate all environmental requirements for farms and ranches into "One Plan." This effort appears to qualify as a public-private partnership, as does the Oregon effort to achieve water quality TMDLs. Oregon farmers in the water quality limited areas will use comprehensive farm plans that cover all applicable environmental requirements. If successfully implemented, the plans will protect the producers from civil penalties. The threat of regulation, if water quality targets are not met within a certain period, provides an incentive that when coupled with lower transaction costs could generate sufficient participation to meet the targets. The program is too young to determine if the incentives will suffice to achieve ambient water quality objectives.

Incentives via environmental regulation of farming by state and local governments appear to be rising. For example, several states have recently adopted regulations for livestock waste problems. The movement to regulation reflects a shift in the property rights to use the environmental resources affected by farm operations. The pattern is not developed well enough to discern the ultimate strength and scope of shift. Much attention is focused on controlling the odor and water pollution discharges from large confined animal facilities. Such identifiable environmental threats may pose sufficient risk in the public's mind to warrant more direct controls than the damages from diffuse, nonpoint problems. Still, increased regulations appear to be on a slow track for agriculture and the need to consider broader market-based incentives remains.

Stimulating as much private environmental initiative as possible through market incentives appears consistent with public sentiment to shrink government. The first step in this direction was taken in 1996 by decoupling commodity programs and linking farmers' decisions to market prices, referred to as “deregulation.” The deregulated market prices are still incomplete because of missing environmental costs and benefits of farming practices. Thus, reform of commodity programs is a necessary but insufficient step in harnessing the power of markets for conservation. Although FAIR continued to rely most on voluntary-payment programs, the rules for the CRP and EQIP involve quasi-market tests. Congress directed USDA to achieve the highest environmental benefits per dollar spent in both programs. EQIP is not mature enough to judge how well it will meet this test (Batie, 1998).

Can other market mechanisms improve farmer flexibility, lower cost and improve environmental performance? An approach popular in air pollution control is trading schemes for pollution rights (Sohngen, 1998). By first capping total pollution for a region, assigning "pollution rights" (levels) for each firm, and then allowing trading of those rights, the schemes obtain many benefits that markets afford, such as decentralized information processing and internal cost-saving reallocations. In agriculture, some early efforts have been made at nutrient trading (e.g., Fox River of Wisconsin and Tar-Pamlico Sound in the mid-Atlantic region). Experience at stimulating trades has not been promising in either case, apparently due to excessive transaction costs. The potential for net gains exists if the costs can be lowered.

Economists have also been fond of proposing charges on environmentally-damaging behavior (or payments to reward positive environmental behavior) that mimic the roles of prices in decentralized markets. Runge has advanced the concept of a "negative pollution tax" for agriculture to exploit the

efficiencies of market incentives but retain the agricultural tradition of rewarding socially-desirable environmental behavior. The NPT system would use a two-level threshold to define acceptable and unacceptable levels of pollution behavior. Above the minimum permissible pollution limit (T-min), farmers pay a rising per unit tax on pollution. The tax gradually increases up to the maximum permissible level (T-max). This intolerable level would define the maximum acceptable limit of, say, nutrients or pesticides, above which fines and penalties are used to choke off discharges that are considered unacceptable at the farm, county or state level. This upper limit might be the point beyond which excessive environmental or health risk occurs. The tax proceeds would be used to reward those for achieving pollution levels below the lower T-min limit. Thus the collected fees become a refunded reward for environmental "affirmative action."

A final approach is business-led initiatives that stem from firms' efforts to trim input waste that causes pollution, and to capture product markets that reward environmental performance (Batie, 1997; Batie and Ervin, 1998). Firms perceive that meeting global competition will require ever tighter cost control, and pollution reflects input waste and excess cost. The search for pollution prevention can be stimulated by government setting pollution limits, as has been done for air and water point sources. Or, it can be driven by the “green product” phenomenon, in which a growing segment of consumers wish to purchase food and fiber that meet certain environmental criteria. Firm evidence about the extent of either trend is not at hand. Some case data are impressive. Trade reports show that the natural foods market has grown at approximately 20 percent per year during this decade. This growth has spurred even conventional food retailers to enter what was once seen as a niche market. It is uncertain how far this trend will travel and to what extent it will address significant agro-environmental problems. It meets the market test and minimizes government intervention. The only requirement by the public sector is to ensure the property rights that assure the environmental performance attached to food and fiber are well-defined, secure, transferable and enforced. Thus, government may play a role in ensuring consumers have accurate information to make decisions, much as it does for food safety, medicine and other products, and in enforcing any applicable standards.

Stimulate Research and Technology Development

An underappreciated strategy to reach conservation objectives is R&D policy. There are sound reasons to doubt that agricultural research has been sufficiently responsive to conservation (Ervin and Schmitz, 1996). Missing or incomplete markets for many environmental services and natural resources hamper the effectiveness of price incentives to stimulate public and private R&D. Government policy failures inhibit R&D as well. For example, financial payments under voluntary programs mostly reward adoption of existing technologies, an approach that does not stimulate the search for new technology. Without such signals, R&D responses may concentrate on remediation rather than pollution prevention or avoidance of excessive resource degradation.

Available information hints that the public agricultural research system may not have been fully responsive to conservation needs. The on-farm unit costs of food have declined over the last 30 years, while the value placed on improved agro-environmental quality has risen. The differential trends suggest that environmental R&D should have increased relative to food production R&D, all other things equal. It is not clear that such a shift has occurred. The percentage of public agricultural research in the "natural resource" program area has climbed modestly from 12 percent to 15 percent, while the proportion in the "production" category has held steady at about 60 percent (Fuglie, et al., 1996).

Despite the imperfections in the R&D process, "complementary technologies" that simultaneously enhance environmental conditions and maintain farm profit are expanding (OTA, 1995a and 1995c). A partial

listing includes conservation tillage, soil nutrient testing, integrated pest management, rotational grazing and organic production systems. Others just emerging with unknown potential include "precision farming" and biotechnologies (genetic engineering).

Most of these require farm- and site-specific management of natural resources. Hence, public-private partnerships in developing and spreading such technologies may be fruitful. An example is the Sustainable Agriculture Research and Education program which has had considerable success according to independent evaluations (OTA, 1995b).

Each emerging complementary technology will likely fall far short of its potential under current R&D and agro-environmental policies. Why? Because all serious conservation effects of agriculture have not been effectively internalized into private decisions, such as downstream water pollution from nutrients, and voluntary-payment programs do not trigger well-targeted public or private R&D. These omissions ultimately trace back to the absence of clear objectives and performance standards. Moreover, conservation programs usually subsidize existing technologies developed with incomplete prices, rather than pursue joint public-private on-farm research to develop innovative solutions.

Devolve more Responsibility to State and Local Governments

The proper division of responsibility, authority and resources among levels of government has held political center stage in the United States for the last decade. Questions about how best we can govern ourselves are as old as our recorded history. The "devolution debate" was cast originally in issues other than environmental policy. That changed in the early 1990s. Political groups increasingly intent upon shifting the balance of power away from national government argued that the rise in centrally managed environmental programs since the 1970s was costly and inefficient. The environmental policy devolution battle has been joined.

Because of the highly variegated nature of agro-environmental impacts, it is virtually impossible to devise policies in Washington, or even in state capitals, that can effectively influence farm-level behavior. However, given the magnitude of the environmental challenge, it is equally clear that the financial resources needed must come in large part from federal sources. Moreover, the transboundary nature of many of the issues, such as the Mississippi River system links to the Gulf of Mexico, suggests that some federal role will be necessary to ensure that regional and national problems are effectively attacked. It's clear that devolution in and of itself is not a panacea.

Federal funding commitments may go primarily to support state-led initiatives, which in turn devolve financial and technical support to local and farm-level decision makers. Although it's too early to tell the outcome, this is the philosophy that USDA is following to implement the FAIR environmental provisions. In order to devolve such responsibility, clear accountability must exist "down the line" from federal to state and local authorities, and ultimately farmers themselves. But accountability need not imply lockstep regulation, and should promote flexible responses to local problems, such as individually designed whole farm planning schemes.

Some basic questions need to be answered about devolution to explore potential partnerships. First, what are we devolving - responsibility, authority, or resources, or some combination of all three? Posing this question raises the central issue of what government body will set the environmental objectives, and which government unit will be responsible for implementation and enforcement. Second, how do we measure "success?" Devolution means different things to different people. Some frame the issues around political process while others focus on environmental performance. A final cautionary question: who will step in

to fix situations if and when state and local actions fail? These costs could be large if irreversible transboundary environmental processes are involved. Such complex situations remind us that all levels of government will play roles in future agro-environmental policy, and therefore may engage in public-private conservation partnerships.

Public Policy Implications

Implications for public policy flow directly from combining the insights gained from the analysis of partnerships with the vision of future agricultural conservation policy. Each implication requires an active public role, but also involves joint public-private participation.

Establish Clear Conservation Objectives and Performance Standards

Without clear objectives and performance standards, there are no benchmarks to guide the formation, conduct and evaluation of partnerships. A movement to ambient standards is desirable whenever the science permits. Examples include minimum acceptable pollution concentrations, as in Nebraska for groundwater nitrate, in Florida for phosphorus from dairy farms surrounding Lake Okechobee, and in Oregon for nutrient TMDLs in water quality limited rivers and streams This is a huge and costly task, having been neglected for so long, and no doubt will take some time to accomplish. Davies and Mazurek stress that all key stakeholders must have a voice in the process to ensure that the objectives and standards are viable. Hence, a partnership of stakeholders is necessary to ensure that the objectives and standards reflect all legitimate interests in the agricultural landscape.

Set Significant Positive and Negative Incentives

There must be sufficient incentives to offset the expected costs of forming and sustaining necessary partnerships to reach the conservation objectives. The incentives are the drivers to spur alliances that can eventually lower compliance costs. Under most current programs, positive incentives are used, but budget limitations likely will hinder their reach beyond 2002. Negative incentives (disincentives) are growing to deal with perceived "bad actors," such as large industrialized animal confinement operations that pose excessive risks for environmental quality.

Grant Broad Producer Flexibility to Build Innovative Solutions

If we are to achieve cost-effective and durable conservation solutions, then producers must be full partners in the search for solutions. Given the heterogeneity of farms, farmers and natural resources, top-down efforts will be less effective and more costly in virtually all cases. Oregon is using such a flexible approach in water quality limited areas. Farmers in those watersheds must implement a whole farm plan that is consistent with landscape performance standards for controlling nonpoint water pollution to avoid potential penalties (Wolf, 1997). However, they can design practices that suit their particular farm and resource conditions to be approved by a local board of public and private officials.

Provide Credible Information to Foster Mutually Productive Alliances

The public sector plays an essential role in providing public good information to facilitate market functioning, such as price and harvest data. This same rationale applies to the provision of the best science on the nature of conservation problems, their consequences and possible solutions. A good example of this role is the natural resource and environmental indicators information that the USDA's Economic Research Service publishes (USDA-ERS, 1997). In the absence of credible information, poor (i.e., net cost) alliances are more likely to occur.

Ensure Fair and Balanced Bargaining

Government is the acknowledged referee in ensuring market transactions are free from excessive influence by any participant. The Federal Trade Commission can find a company in "restraint of trade" if there is

evidence of excessive power or collusion. Sanctions can then be applied including the divestiture of certain operations, and other penalties. Stiglitz' arguments about the distortionary effects of too few or too large players suggests that similar principles should be applied to public-private partnerships that influence social welfare. The form and home of the institution to carry out this role is uncertain.

Facilitate and Mediate Process to Lower Transaction Costs

A persuasive argument can be made that government, through its manpower and responsibility to represent all parties, may be able to lower the transaction costs of forming and operating conservation partnerships. This facilitative role is already being played by many federal, state and university employees in agricultural conservation. It is not clear however that it is being conducted in the most effective manner, for example with EQIP. More investment in training for the required skills to facilitate and mediate these delicate and controversial processes may deliver large benefits.

Build Operator Skills for Managing Integrated Systems to Achieve Economic and Conservation Objectives Simultaneously

This seems an obvious task for a public-private partnership. The extension system has declined in manpower over the last two decades, and is perceived to be less capable of educating about conservation issues in many areas. Recognizing the limits of extension resources, what is the potential of other education and technical assistance programs for conservation and environmental management, such as the Natural Resources Conservation Service? Their strength has arguably been in conservation technology and practices, and not economics. Private advisory firms increasingly provide joint production and environmental management services that augment the operator's capacity to achieve the dual objectives. These private firms may well enjoy a comparative advantage over their public counterparts in supplying the expertise necessary to discover complementary technologies and profitable green markets for unique farm situations.

Stimulate Research and Technology Development Partnerships

This is the era of public-private partnerships for R&D to solve many of society's most perplexing problems. Agricultural conservation appears to be an exception to that trend. To be fair, many joint public-private efforts are underway in federal government and at state universities. But for the reasons cited above, it is very likely that these efforts fall short of what may be necessary because of missing markets for conservation services and current technical and financial assistance programs that do not reward R&D innovations. A concerted effort to boost complementary agricultural production systems seems prudent (OTA, 1995a).

Conduct Monitoring and Evaluation to Assess Progress in Meeting Public Goals

Almost everyone agrees in concept that monitoring and evaluation of agricultural conservation programs should be performed by the public sector. But when push comes to shove, these tasks are seldom funded adequately. Congress has allocated few resources for such activities, primarily because evaluation has no natural constituency. The agencies understandably are reluctant to divert funding from program activities that generate support for future program funding. Without sound evaluations, there is little to assure that we are making the desired progress or have found an advantageous path. These sensible principles apply to public-private partnerships to judge which are doing well and which should be ended.

A “Smart Partnership” Checklist

Even though this paper has covered numerous complex subjects, I do not wish to leave the impression that the path to "smart" partnerships is complicated. Some common sense questions can be used to judge if your favorite agricultural conservation partnership is a smart exercise:

1. Does the best scientific information inform the problem definition?

2. Are there clear, measurable objectives with timelines?

3. Do performance standards exist to reward exemplary behavior and penalize bad actors?

4. Is there full and balanced participation by all parties affected by the problem?

5. Are sufficient incentives available to offset the added transaction and compliance costs?

6. Does the partnership take advantage of market mechanisms to achieve cost savings and stimulate R&D?

7. Does the agreement include a monitoring and evaluation mechanism?

If you answered "no" to one or more of these questions, you likely will spend more of your time and organization's resources than necessary and still not achieve durable conservation solutions.

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Appendix A

Priority Agricultural Conservation Issues after 2002

Several caveats apply to the following conservation issue discussions. This brief space cannot do justice to the complexity of each topic. Discussing general issue areas runs the risk of being inaccurate for any particular location due to the site-specific nature of agro-environmental problems. Each issue is described as if it stands separately, yet we know that they are linked ecologically and in the public's view of the total landscape. The enormous growth of the watershed concept is testament to the growing realization of interconnected ecosystems.

Water Quality

Water quality promises to be the signature agro-environmental issue for the first decade of the new millennium. There has been a gradual but unmistakable shift in agricultural conservation policy over the last two decades as water quality problems have overtaken concerns about conserving land productivity. The reduction of on-farm erosion is no longer *the* driving rationale. The shift may have been predictable as gross erosion has fallen by about a third since 1980 and scientific analyses have not revealed large productivity losses from erosion. The two issues are of course related but often treated separately in the policy process.

Highly visible water pollution episodes linked to farm practices, such as hypoxia in the Gulf of Mexico, have raised their profile among the general public. Visions of *Pfiesteria piscicida*, a toxic microbe, "killing estuarine fish populations and sickening swimmers and fishermen have put an ugly face on nutrient pollution that has stuck for the first time." No doubt, some advocacy groups have exaggerated public and environmental health concerns. And, potential polluters have been quick to shield themselves by pointing out the lack of firm evidence that links farm practices with degraded water quality. But the issues have a growing basis in science and resonate soundly with a citizenry who increasingly support aggressive action, especially when they perceive their or their children's health is threatened.

Water pollution from agriculture has numerous sources: water and wind-borne sediment; runoff, leaching or atmospheric deposition of synthetic and animal fertilizers, mostly nitrogen and phosphorus; pesticide runoff, leaching or drift; elevated temperatures from irrigation withdrawals or removal of streamside vegetation; leaching or runoff of irrigation salts, and; pathogens (e.g., fecal coliform) from animal manure. The importance of each source of pollution varies across the countryside, affected by natural resource conditions (e.g., slope, soil texture, rainfall and by farm and ranch practices).

Available monitoring data, albeit imperfect, suggest that agriculture holds the dubious distinction of being the largest source of remaining water quality impairments in the nation. Because of its expansive, diffuse and uncertain nature, reducing nonpoint source pollution from farms and ranches poses one of the major challenges in all of environmental policy. Despite numerous initiatives, we have made slow progress in resolving the problems. New efforts, such as the Environmental Quality Incentives Program are immature and not off to an impressive start (Batie, 1998). The policy trend is toward devolution and more direct controls, as a majority of states now have some enforceable measures to reduce water pollution from farming (Ribaudo, 1997). If agriculture is to avoid more stringent measures, partnerships between public and private groups may be key.

Assuming no dramatic changes occur, we can use the present conditions and trends as guides to identify critical agriculture water quality problems beyond 2002. The lack of science hurts here, in particular the

few evaluations of economic and social impacts of different types of pollutants. Based on dated and skimpy science, the estimated annual damages from sediment of between $2 billion and $8 billion claim the most economic weight (Ribaudo,1989). The effects from sediment, however, are not perceived to carry human health implications, and have not been a driving influence in policy. Pollution from nutrients delivered by fertilizer and animal manure runoff and leaching has been documented in many areas by USGS (Mueller and Helsel, 1996), and commands most policy attention because of perceived health effects (e.g., *Pfiesteria* outbreaks). Potential pathogens may also be carried by animal wastes. Pesticide residues in surface and ground waters are equally widespread, but the concentrations are almost always well below EPA standards, when standards exist (Gilliom, 1997). Nonetheless, the public has shown a willingness to endorse precautionary approaches to reduce these residues, even though the human and ecological health benefits are uncertain. Irrigation salts also cause important environmental problems in specific regions, particularly the west, but do not command national policy attention.

Wildlife and Agricultural Landscapes

The fastest growing agricultural conservation value may be the provision of positive environmental services from farming and ranching systems. This of course was a central theme in *A Geography of Hope* (USDA-NRCS, 1996). Wildlife recreation is an example. As one indication, the Conservation Reserve Program has been estimated to deliver over its life approximately $9 billion of small game hunting, waterfowl hunting, nonconsumptive wildlife uses (e.g., birdwatching) and freshwater fishing benefits (USDA-ERS, 1997). This is the largest single benefit category for the CRP. The spread of population into the rural countryside in many areas and rising incomes mean that those values will continue to rise.

During my Office of Technology Assessment assignment from 1994-1995, the wildlife benefits of the CRP were uppermost in the minds of Congressional staff and representatives as the CRP faced expiration. My judgment is that the breadth of those perceived benefits to farm and non-farm groups played a key role in its renewal. Policy officials also relate that farmland protection enjoys surprisingly broad and strong support. Local and state governments, often in alliance with private agriculture and environmental organizations, are taking the lead in this area, following the devolution mold described above. Despite the apparently rising values of wildlife and farmland amenity in many areas, there is relatively little systematic evidence to document the size, spatial patterns of demand and dynamics of growth. For example, the ERS environmental indicators volumes gives relatively little depth to these topics, except as they relate to the CRP. The American Farmland Trust has identified 10 priority areas that pose the greatest potential social losses from farmland conversion based on economic and environmental criteria (American Farmland Trust, 1997).

Biodiversity

Biodiversity is treated separately from the previous recreation-based category to focus specific attention on the conservation of plant, animal and insect species for broad production-related purposes. Production in this sense covers more than food and fiber, including medicinal products and other general ecosystem support services. My perception is that the protection of endangered species, wetlands and plant germplasm will rise in importance during the next decade as will conflicts about how to pursue such conservation. This issue is intertwined with the introduction of genetically engineered plant and animal species.

For most of this century, we have taken for granted that agriculture depends on and contributes to biodiversity. The sheer size of agricultural lands dictates that farm and ranch practices will have significant effects on species diversity. Conflicts have already surfaced in the west on grazing lands and riparian areas that affect habitat for endangered fish species. The rising pressure of migration into the

countryside for housing and recreation will exacerbate the conflicts as non-farm groups often value extensive land use and other practices that protect the diversity, but constrain production. I feel that one of the most demanding challenges facing agriculture in the 21st century will be the conservation of biodiversity while maintaining agricultural productivity growth. The contentious struggle for controlling the property rights on private agricultural lands makes this a key opportunity for public-private partnerships. For example, the Nature Conservancy has shifted its strategy for fostering biodiversity conservation from purchasing and idling critical farmlands to securing cooperative agreements that achieve biodiversity objectives but retain land in private ownership and production.

Greenhouse Gas Control

Slowly, as the post-Kyoto negotiations unfold, environmental, industry and government participants are appreciating the huge role that agriculture plays in the global carbon equation. Some estimates place the role as larger than all forms of energy production. Land use and tillage practices determine the amount of carbon stored in the soil or released to form carbon dioxide. Generally, reductions in tillage and extensive land use patterns sequester more carbon than intensive crop production with deep tillage, such as conventional or chisel plowing. More importantly, non-farm industries are recognizing that the costs of sequestering carbon in the soil by altering tillage or land use patterns are usually much smaller than altering their production or distribution processes. Hence, these non-farm firms can be expected to seek agreements (trades) with farmers to meet greenhouse gas reduction targets. A Canadian utility has already structured such an agreement, in effect purchasing tillage rights to the prairie farmlands. If the controls on greenhouse gases negotiated in the Kyoto treaty are ratified by signatory nations, this will spur more such agreements. The importance of this issue is that it holds the potential to bring revenue into agriculture for conservation, but not from the public treasury. In that respect, it works with rather than against the shift in responsibility for agricultural conservation toward the private sector.