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As Ecosystem Services Are Demanded of Agriculture, What of Agricultural Economists?

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What society needs from agricultural economists is changing. But what we have to offer is often misperceived and sometimes not perceived at all. The rapid spread of the ecosystem services paradigm presents an opportunity to contribute and a challenge to be relevant. This article examines our comparative advantages and impediments to communicating them, closing with suggestions for seizing this opportunity and ones like it.

What society asks of agriculture is changing. As recently as 1989, the National Research Council characterized agriculture as a "system of food and fiber production" (National Research Council (NRC) 1989, p. 4), echoing a report fifteen years earlier (National Academy of Science (NAS) 1974). If reports by the NRC offer a broad scientific view of the national interest, then that interest was for agriculture to produce food and fiber efficiently with minimal harmful environmental impacts.

In response to rising human pressure on global resources, society in the United States and elsewhere is now beginning to ask farmers to provide a host of new goods and services. The Kyoto Protocol on global climate change is stimulating the creation of markets for carbon sequestration by land managers, even in the United States, which famously is not a signatory. Cities are paying farmers to protect their water supplies. Land trusts are purchasing development rights for farm lands with the proviso that they be kept in farming and land uses that conserve green space. U.S. agricultural programs are paying farmers to provide wildlife habitat. The diverse ecosystem services of climate regulation, water quality regulation, aesthetic landscapes and wildlife habitat go far beyond agriculture's traditional role of food and fiber provision.

The pattern of ecosystem services provided by farms may be diverse, but it is also extremely patchy and *ad hoc*. Few of the new ecosystem services sought from agriculture have established markets. Indeed, the services themselves are often costly to measure, yet inexpensive and widely acceptable proxy measures are few. As a result, it is difficult to compare across sites the quality of diverse sets of ecosystem benefits that are potentially available. So when they exist at all, farmers' opportunities to profit from providing such services tend to be serendipitous, rather than representative of demand and supply conditions.

To develop an understanding of the ecosystems managed by farmers and the potential resulting ecosystem services is a huge and hugely multidisciplinary research challenge. It is huge, because the ecosystem services involved reach far beyond the fences bounding farm fields. It is hugely multidisciplinary because not only does it require the "regular" mix of agricultural scientists, it also requires a broad array of non-agricultural scientists, such as wildlife biologists, microbial ecologists, botanists, climatologists, hydrologists, and others. The next step after understanding agricultural ecosystem functions better is to understand and to influence people's choices in managing those systems. This step, of course, is where social scientists enter the picture.

A broad array of ecological and other biological scientists is already deeply engaged in understanding ecosystem functions and associated ecosystem services. One well-organized example is the U.S. Long-Term Ecological Research (LTER) network of 26 sites (http://www.lternet.edu/), which is currently

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engaged in a major network-level planning effort. A major objective of the planning effort is to link social science research more effectively with ecological research in the network. The push to integrate social scientists is motivated by the belief that research into human behavior with respect to the ecosystem could contribute to a more ecologically sustainable future. But when LTER ecologists refer to social scientists, they typically do not mean economists. Indeed, applied economists have had little role in the LTER system until recently (Redman, Grove and Kuby 2004). Why? Are economists ill equipped?

Among agricultural ecosystems, agricultural economists have a strong track record at conceptualizing and modeling human behavior as ecosystem managers (Antle and Capalbo 2002; Antle et al. 2001). On multidisciplinary agricultural research teams, economists often reveal a knack for framing the problem. Our grasp of economic incentive design and its institutional foundations can contribute to effective policy recommendations. Environmental economists have made great headway in developing methods for estimating the value of environmental goods and services that lack markets.

If economists are well-equipped as social scientist partners in ecological research and policy design, why don't we show up in the ecologists' address book? Based on personal observation, the primary reason would be that we are largely undifferentiated from the mass of social scientists. A few ecologists who distinguish us from other social scientists view economists as the enemy – defenders of the economic forces polluting the planet.

More effective communication that reaches scientific disciplines outside of agriculture can make a difference – even when related to agricultural applications. At the getting-started end of the research continuum, new funding opportunities exist to support cross-disciplinary research. The National Science Foundation several years ago opened a new program in Coupled Human Natural Systems; that program has been followed by the current Human and Social Dynamics program. Both programs call for multidisciplinary proposals linking biophysical with social sciences. At the results-reporting end of the continuum, the American Association for the Advancement of Science (AAAS) is also opening doors to social scientists as never before. At the publication stage, precious few applied economists consider submissions to journals like *Science* or *Nature*. Yet these journals have huge cachet across all disciplines, with journal citation index factors 30-50 times higher than the main disciplinary outlets in agricultural and environmental economics.

Understanding how others view what we bring to the table is key. The biggest drawing card for economists in multidisciplinary research, at least with ecologists, is probably nonmarket valuation expertise. The appeal of such expertise is exemplified by notorious attempts by ecologists at benefit transfer to place values on the Earth's ecosystems. Bioeconomic modeling skills are also highly relevant (Antle et al. 2001), although many biophysical scientists will need education in how such models can be constructed. Modelers share a common language of inputs, outputs, process equations and validation procedures that is robust across disciplines and can facilitate collaboration. Some of the most valuable contributions by economists in multidisciplinary research are appreciated only after it is agreed to collaborate, once research is being conceptualized. Skills at framing research problems and designing policy recommendations that are grounded in understanding of incentive design theory and policy precedents are good examples. Just as young business college graduates are counseled that they will be hired for their sales or number crunching skills rather than their grasp of strategic management, so too economists seeking a foot in the door with other disciplines need to appreciate which of our tools is sought by potential collaborators.

Why Partners Outside Agricultural Sciences Are Needed to Think About Agriculture

This essay began by stressing the diversity of ecosystem services that society increasingly seeks from agriculture. Major gaps in our understanding of how those ecosystem services are provided and how to induce greater provision create urgent needs for collaboration between economists and ecological scientists (Robertson and Swinton 2005). Ecosystems that are directly managed by humans are easier

to manipulate than those we influence indirectly. Agricultural ecosystems cover the largest land area of any class of managed ecosystems in the world (Millennium Ecosystem Assessment 2005). Managed to meet private objectives (chiefly profitability and food security), agricultural ecosystems have well understood drivers. Finally, agroecosystems already have a successful history of collaboration between economists and agricultural scientists (Antle et al. 2001).

Unlike many other areas of human intervention in ecosystem functioning, there is a strong precedent for government intervention to affect behavior with regard to management of agricultural ecosystems. In the United States, Japan and the European Union, farm subsidies are well entrenched. The historic justifications of alleviating rural poverty, protecting rural communities, and ensuring food supplies are being undermined by changing realities. In the United States, at least, the recipients of most farm subsidies are now richer than average, farm subsidies have not stemmed the tide of emigration that undermines rural communities, and food security concerns have waned with ample supplies. Meanwhile, the Doha Round of world trade negotiations faces failure if the wealthier countries will not sharply reduce subsidies that distort food supplies and prices (Josling 2005). Supporting farmers to provide ecosystem services from agriculture represents a means to maintain the precedent of supporting farm incomes without distorting the prices of traded agricultural goods, while at the same time addressing the underprovision of ecosystem services from agriculture.

Agricultural ecosystems constitute an ideal place to begin because they cover such a vast land area, the incentives and constraints of farmers are familiar, government intervention has a strong precedent, and the Doha trade talks and the upcoming U.S. farm bill debate make agricultural policy a timely issue. Despite this familiar base, the diversity of ecosystem services now sought from agriculture creates both new interest and the need to engage new partners. The moment is propitious.

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