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Why Economists Should Talk to Scientists and What They Should Ask: Discussion

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> *Before I built a wall I'd ask to know*
> *What I was walling in or walling out,*
> *And to whom I was like to give offense.*
> *Something there is that doesn't like a wall,*
> *That wants it down . . .*
> *He says again,*
> *'Good fences make good neighbors.'*
>
> —Robert Frost, "Mending Wall"

The three papers in this session are all examples of multidisciplinary research on environmental issues. They are interesting examples in that they are quite heterogeneous in approach and content. Rather than discussing each individually, I'll first give some overall views on the multidisciplinary approach that will provide some organization to my comments.

The perspective that multidisciplinary projects are the optimal method to organize agricultural research is pervasive in both scientific and policy discussions. Social scientists, especially rural sociologists (e.g., Busch and Lacy), were instrumental in articulating this view. A simple summary of the case for such research is that social problems are broader than the content of any discipline, and cooperation is necessary to derive knowledge to help society resolve these problems. Although questioning this view is probably politically incorrect, its premise has always made me uncomfortable. While my views on this issue are far from resolved, sharing the basis of my qualms is helpful in reacting to these papers.

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The basic problem with the multidisciplinary approach is that it is inconsistent with specialization. Gains from specialization are a fundamental principle of economics. In this context, it is worth recalling that Adam Smith articulated this principle in 1776 in the first economics book. He began *The Wealth of Nations* as follows: "The greatest improvement in the productive powers of labour, and the greatest part of the skill, dexterity, and judgment with which it is any where directed, or applied, seem to have been the effects of the division of labour" (p. 3). Disciplines are an academic division of labor. Of course, we can better understand why we specialize today. While time precludes a full review of this logic here, it arises from Herbert Simon's observation that we all have limited cognitive ability. As scientists, we cannot understand or hope to grasp all human knowledge about a social problem.

My continued unease with this issue arises from the persuasiveness of both of these opposing views. In preparing to discuss these papers, I reconsidered some major areas in farm management, which has been my main continuing specialty in agricultural economics. This review is helpful in understanding research in environmental economics and the papers in this session.

Successes in Farm Management

From its very beginnings, farm management has involved the interaction between agricultural economics and other agricultural disciplines. Some examples of such production management problems include fertilizer use,

animal rations, pest thresholds, and best management practices. The contributions of agricultural economists to these problem areas are apparent. Other disciplines have adopted simple economic criteria that they regularly apply in summarizing their research results. For example, agronomists use the principle of marginal product equaling the fertilizer-output price ratio, and animal scientists use least cost linear programming models to formulate rations. For economists to insist that they be involved in all this activity is largely rent seeking. However, agricultural economists were instrumental in developing the economic criteria used in each of these multidisciplinary problems.

The role of economists can be conceptualized in reference to the basic structure of economic optimization. Economic optimization involves two theoretical components: the choice set and the objective function of an economic agent. In most production and environmental problems, the choice set describes technical relationships that are the domains of biological and physical sciences. Development of the basic relationships in the choice set is the purpose of these disciplines. After some basic understanding of the choice set is developed, economists can refine the important relationships into a choice set and apply an objective function to perform economic analysis. Generally, this process involves several iterations. After initial economic analysis, the choice set requires further conceptual or empirical refinement that calls for extended research in other disciplines, rather than subsequent economic analysis. If one views this process over time, its multidisciplinary character is obvious. Furthermore, we have resolved the dilemma discussed above: multiple disciplines are involved in research on a problem while the efficiency benefits of disciplines are maintained. This simple model requires some adaptation for use in environmental economics, which is considered in the next section.

From Farm Management to Environmental Economics

Agricultural environmental economics has some distinct differences from farm management. The level of the analysis is for the whole economy rather than the firm level, so aggregation is necessary. The stochastic nature of agricultural environmental issues is even more pervasive than in agricultural production. Many environmental manifestations involve human health and ecosystem effects. Finally, the policy focus of this area requires considerations of political processes and administrative feasibility. Besides the challenges of economic analysis, a set of multidisciplinary problems exists. As Zilberman notes, the issues of environmental and health effects outside the agricultural sector require collaboration with sciences outside the traditional colleges of agriculture who may not have as much experience with our discipline and methods. Collaboration with other social sciences on the political and administrative problem can be even harder than cooperation with biological and physical scientists. Other social scientists study human behavior from a different theoretical perspective than economics. Their theoretical constructs can be hard to relate to economics and difficult for us to understand. A personal example concerns the relationships between attitudes in psychology and preferences in economics. While both have value components and are concerned with behavior, they are related but different concepts (Musser and Musser). From personal experience, empirical methods also differ sufficiently that it can be difficult to even appreciate the other sciences—my wife and I once had a major fight about whether or not random assignment works.

Despite these differences, the sequential nature of collaboration still seems relevant. Research on a problem involves: (*a*) definition of the choice set, (*b*) analysis of the choices, and (*c*) refinement of the choice set. In contrast to farm management, the timing of the economic inputs may be more diffuse. Our expertise in aggregation and integration compared to other disciplines may increase our role in definition and refinement of the choice sets. Still, these steps are largely the realms of other sciences. The next section applies this sequential model to considering the papers in this session.

Timing of Economic Analysis

Milon, Kiker, and Lee are obviously at the early stages of the first and second steps in the sequence of collaboration. The choice set and the objectives of the problem are still being defined. The stochastic and aggregation problems in this paper are profound, which may be contributing to difficulties in defining the policy goals and choice sets. Before much progress can be achieved, the policy goals must be less vague. Without progress on this step, the relation of producer and consumer choice sets to the policy goals cannot be specified. In essence, the research cannot draw on the work of other disciplines until this step is taken.

Kellogg and Goss are concerned with a much narrower issue. They are clearly defining an aggregate choice set on agricultural production and environmental effects with linkages to producer choices at watershed levels. The comments in the previous section about the role of agricultural economists in such an effort are apparent in this paper. Their analysis builds on research on these issues in other disciplines, but these disciplines do not have the expertise in aggregation that economists do. Subsequent aggregate economic analysis of these issues requires economic input into building the choice set.

Ribaudo and Hurley are largely focusing at the economic analysis level. Using environmental and producer choice sets from earlier research, they are aggregating the environmental consequences of disaggregated producer choices. The standard environmental economics focus of analysis of the tradeoffs between market output and environmental consequences of different policies characterize their research. While some attention has been directed to defining choice sets, the focus is on economic analysis of policy alternatives. The interaction with other scientists is therefore more limited than in the other two papers.

The three papers do have some common themes. Aggregation of stochastic environmental effects of agricultural production is a crucial issue in all three, and a major reason to interact with other scientists. This common theme is not surprising in that it is the essence of environmental effect of agriculture. Development of policies to control this pollution has largely been precluded because of these characteristics of agriculture and the environment. Thus, the authors are focusing on crucial issues in this area. However, the experience with these issues in other areas of agricultural economics is not encouraging. Aggregation of the market effects of individual agricultural firms has been a daunting problem even under certainty. The complications under uncertainty have been even greater. Accomplishing these tasks for environmental effects which require explicit collaboration with other disciplines makes the research area even more challenging.

Summary Comments

Applied agricultural economics research in production, resources, and environmental economics is always multidisciplinary. The choice sets that economists use in their optimization models always define relationships that are exogenous from economics. The economic analysis can be simultaneous or sequential with that of other disciplines. Even in the former, the research builds on knowledge from other disciplines. When the level of knowledge in the other disciplines is inadequate to define at least rudimentary choice sets, the role of the economist seems to be limited. It is unfortunate that the policy environment has become so enamored with multidisciplinary research that fruitful sequential work has to be hidden under the simultaneous framework.

As stated above, much research still remains to be done in the agricultural environmental area. As agricultural economists, we should remember that our main disciplinary contribution is to analyze individual market choices under different technologies and policies. The other basic equilibrium model of our discipline is concerned with the aggregate consistency of the choices of all economic agents (Varian). While this discussion has focused on the optimizing framework, the equilibrium framework is also useful in the aggregation problem, and a longer time constraint would have allowed more discussion of this framework.

References

Busch, L., and W.B. Lacy. *Science, Agriculture, and the Politics of Research.* Boulder CO: Westview Press, 1983.

Musser, W.N., and L.M. Musser. "Psychological Perspectives on Risk Analysis." In *Risk Analysis in Agriculture,* ed., P.J. Barry. Ames IA: Iowa State University Press, 1984.

Simon, H.A. *Administrative Behaviour,* 2nd ed. New York: Free Press, 1957.

Smith, A. *An Inquiry into the Nature and Causes of the Wealth of Nations.* [Reprint of 1776 ed.] New York: The Modern Library, 1937.

Varian, H.R. *Microeconomic Analysis,* 2nd ed. New York: W.W. Norton and Co., 1984.

Zilberman, D. "Economics and Interdisciplinary Collaborative Efforts." *J. Agr. and Appl. Econ.* 26(1994):35–42.