AGRICULTURAL ECONOMICS RESEARCH AND THE EXPERIMENT STATION SYSTEM

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Abstract

This paper discusses the role of agricultural economics research within the land-grant university system. Fundamental differences between research in the biological sciences and the social sciences are delineated. Implications of these differences for experiment station research programs are discussed. Recommendations are made which have potential for enhancing the role of agricultural economics within colleges of agriculture.

Key words: Agricultural Experiment Station, agricultural economics, research.

The unparalleled productivity of American agriculture has been exalted for at least a half century as a modern-day miracle by politicians, laymen, and scientists. Studies have documented the contributions of research at Agricultural Experiment Stations and credited the land-grant system for setting in place the forces which led to an "abundant and stable food supply" (Peterson and Hayami; White and Havlicek). Until recently, few, if any, in legislative or in other public positions even contemplated raising questions about the payoff of Experiment Station expenditures.

Payoff and accountability issues, however, began to surface gradually in the 1970s and continually in the 1980s. This scrutiny coincided with increased attention to the entire federal budget and with continued questions about government funding for farm price supports and income stabilization. Because of huge outlays of federal funds for commodity price supports, farm credit assistance, and concerns with respect to budget balancing legislation, debate on federal spending for agriculture is now increasing—be it spending for farm programs, extension education, or even basic agricultural research. What once was sacred is under attack, even by some individuals within the agricultural research community.

Schuh's critique of recent developments in the land-grant system suggests a need for further analysis of the research agenda of Agricultural Experiment Stations by those on the inside. This analysis is beyond the scope of a single article, but the issues are not transient and deserve the attention of agricultural economists. These issues will become increasingly important for the survival and continued growth of the tripartite research, teaching, and extension missions at land-grant universities.

The objective of this paper is to examine the emerging roles of agricultural economists and other social scientists within the contemporary research mission of Agricultural Experiment Stations. To do this, it is necessary to examine why research conducted within colleges of agriculture by agricultural economists and other social scientists is important to the land-grant mission. Social science research is important to the mission, in part, because its focus and potential contribution are unlike that of the research conducted by many other agricultural scientists. Scientists and administrators in Agricultural Experiment Stations may not fully appreciate the unique role played by the social scientists who conduct research on problems facing agriculture. Moreover, changes in the focus of agricultural economics research which have occurred in recent years are often not fully appreciated by many other agricultural scientists or by administrators. Our perspective is admittedly biased, and the evidence is primarily anecdotal. The views presented here are proposed as debatable premises, worthy of further discussion among agricultural economists, scientists in other departments, and station administrators.

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MYTHS AND MISCONCEPTIONS ABOUT ROLES FOR AGRICULTURAL ECONOMISTS

Historically, agricultural economists have had much in common with colleagues in the biological sciences, and agricultural economics only emerged as a separate discipline over the period 1910–1940. Early agricultural economists included many biological scientists who were concerned with attaching dollars to feed and fertilizer recommendations. W. J. Spillman, the first president of the American Farm Economic Association (now the American Agricultural Economics Association), was one of the first to estimate production functions from feed and fertilizer data, but his training was in the biological sciences, not the social sciences. Some biological scientists still believe the primary role of agricultural economists is to attach dollars to recommendations made by them. In practice, this service-oriented work now represents only a small part of the research conducted in most agricultural economics departments.

Economists distinguish between research which deals with the behavior and actions of a large group of decision makers (macroeconomics) and research which deals with the behavior and actions of a few, prototype farmers or consumers (microeconomics). However, most agricultural research in the biological and physical sciences is even more narrowly directed than is microeconomics. The emphasis of laboratory research conducted in agriculture is on the information needed to make a single decision within a single farm enterprise at one point in the production period. Applied microeconomists, in contrast, are usually interested in examining the entire set of decisions comprising the overall management strategy for an enterprise and in determining the optimal strategy across all productive farm enterprises, perhaps over more than one production period.

Agricultural economists, thus, are sometimes critical of other agricultural scientists about a lack of concern for the "big picture." The big picture at the micro level may be the total effect of individual management decisions on the profitability of the entire farm firm; whereas, at the macro level, the big picture may be the aggregate effects of research conducted by biological scientists on farmers, consumers, and the entire society. Biological and physical scientists, in turn, are critical of agricultural economists for a "loose" approach to research which involves the development and use of data from other than controlled laboratory or field experiments.

If economic research is to advance, agricultural economists frequently must rely on data from uncontrolled, historical happenings or develop other approaches for generating the needed data. The research orientation and data sources may result in research very different from that conducted by plant and animal scientists. Exceptions occur where research interests are very similar (Bradford et al.), but for the most part, the fundamental nature of agricultural economics research differs markedly from the biological sciences (Breimyer). These differences are not easily overcome in cooperative research efforts across departments.

Perhaps the most enduring misconception, albeit an often unspoken one, is that this broadly-focused, somewhat "loose" research conducted by some social scientists is unimportant relative to laboratory research with very specific objectives and a narrow problem focus. Agricultural administrators have sometimes focused budget cuts on research areas regarded as peripheral to the central mission of the Agricultural Experiment Station "to serve the needs of agriculture in general and farmers in particular." In such a setting, agricultural economists whose work has an orientation toward a specific agricultural commodity, perhaps employing experimental data generated by biological scientists, are sometimes safer from administrative wrath than agricultural economists whose research deals with problems relating generally to rural areas and rural people. For instance, once earmarked federal funds were eliminated, the broad-based community development research and extension programs built during the 1970s were quickly reduced or abandoned in most states, and most land-grant administrators moved funds back to commodity-oriented research and extension programs of primary service to commercial farmers.

Another misconception among some agricultural scientists is that research on social problems generally requires methodology and experimental designs analogous to those used for conducting laboratory experiments within the biological and physical sciences, and that the best research projects within the social sciences are those that have very narrowly-defined scope and objectives. Hatch and externally-funded projects in the biological

sciences generally provide a detailed set of instructions for the specific research to be conducted. Projects written by agricultural economists or other social scientists, particularly those that deal with broad issues, allow considerable flexibility for modification of even the major objectives as the research progresses.

To illustrate, consider two 5-year Hatch projects, one dealing with the current agricultural finance crisis, another with a livestock disease problem. In the research dealing with the livestock disease problem, the key variables can usually be observed in a laboratory setting under the control of the researcher. In the agricultural finance project, the key variables in the macro and agricultural economy are outside the control of the researcher and vary considerably over the life of the project. Therefore, the agricultural economics project must be constructed very differently with far more flexible and easily modified objectives.

Yet another misconception is linked to the measuring stick for scientific progress, which is often not as clearly defined in the social sciences as in the biological and physical sciences. The laboratory scientist is frequently faced with clear-cut experimental evidence that indicates when a research problem has, in fact, been solved. Problems that have not been solved constitute the waiting research agenda for the biological scientist. In contrast, it is not uncommon for agricultural economists reviewing works of peers to hold widely divergent views with regard to the contribution of a particular piece of research to the progress of the discipline. This disagreement is sometimes linked to the lack of a well-defined measuring stick for determining whether progress has been made within the discipline.

FUTURE ROLES FOR AGRICULTURAL ECONOMISTS

A primary reason for the existence of social scientists within Agricultural Experiment Stations is to provide perspectives on problems in agriculture that go beyond the individual-firm and single-commodity orientation of scientists concerned with technical production problems. Criticism of the work of Agricultural Experiment Stations sometimes has been directed toward their failure to understand the broader consequences of commodity-oriented agricultural research on all of agriculture or on the society as a whole (Hightower). If Agricultural Experiment Station directors are to adequately respond to these criticisms, a significant component of the research budget must be directed toward these broader, more macro-oriented concerns.

Increasingly, agricultural economists have conducted studies aimed at measuring these broad, macro-oriented consequences of biological science research. Phillips notes that "the technologies of the future demand a new research agenda by social scientists." He argues that new social science priorities should include "(a) studies analyzing prior research progress and the distributional consequences of these research programs, (b) assessment and design of new technologies so as to anticipate and avoid undesirable externalities, and (c) development of new institutions or the adaptation of old institutions to change to ensure or at least facilitate desirable public outcomes" (p. 977).

Bonnen also agrees with this emphasis. He suggests that "the demand for social science research is increasing and shifting toward such matters as statistical development, technology and institutional investment, research program evaluation, and to needed institutional innovations and the adaptation of old institutions to change" (pp. 964–65).

Much of the new agricultural economics research agenda still must depend on research progress in the biological sciences and should involve cooperative efforts between agricultural economists and the biological scientists. Envisioned are studies addressing the economic and social impacts of biotechnology, especially "genetic engineering," but also the entire spectrum of new biotechnology work. For example, agricultural economists could cooperate with biological scientists in using systems simulation as a means of conducting "experiments" regarding the economic and other social impacts of genetic improvements in crops and livestock on farmers and consumers. Cooperation among agricultural economists and biological scientists might also be needed to structure "expert systems" through "artificial intelligence."

Other research topics are of equal priority but generally will not require interdisciplinary cooperation. These studies include the economic analysis of the impacts on farmers and agribusinesses of changes in federal farm policy, world-wide monetary policy and international trade, energy pricing and supplies, and the intertemporal, risky nature of most environmental and market-generated events. A number of emerging research problems for

agricultural economists are only researchable using theories taken from outside the mainstream of economic thought. For example, overproduction in agriculture is closely linked to problems of asset fixity and investment/disinvestment decisions made by individual farmers. The conceptual framework for determining optimal capital investments for various types and sizes of farms and for determining strategies for financing these investments is borrowed primarily from the financial theory as applied to corporations using concepts such as those advanced by Modigliani and Miller, not the neoclassical theory of the firm (Copeland and Weston).

IMPEDIMENTS TO FURTHER COOPERATION AMONG AGRICULTURAL SCIENTISTS

Agricultural scientists, particularly agricultural economists and biological scientists, have rarely cooperated to the extent that station directors would like. Station directors are frequently critical of the organizational structure by which research is conducted within experiment stations but seldom attempt to make changes. These criticisms indicated that many problems facing the clientele which the Agricultural Experiment Station serves cross disciplinary bounds and demand expertise of faculty members in a number of different sciences. At the same time, much of the research is inherently disciplinary in nature.

Kohls, an agricultural economist and former experiment station director at Purdue, once wondered if "experiment stations and extension services of the universities [could] become more responsive to solving short run important problems. Such problems often require a team-of-disciplines approach. . . . It is usually more comfortable to work alone than in the harness of others" (p. 1013). A lack of cooperation between social and other agricultural scientists also may exist in agricultural research conducted by the federal government. Phillips and Dalrymple pointed out that the Agricultural Research Service and Economic Research Service seldom either cooperate or coordinate research efforts with the exception of a few ad hoc committees. This lack of cooperation is in part due to a lack of understanding of the basic differences between the social and biological sciences.

Publication Outlets for Cooperative Research

While some attempts have been undertaken to develop refereed journals that cross disciplinary lines, nearly all the prestige journals are disciplinary rather than cross- or multidisciplinary in scope. Instances in which published articles are co-authored by biological and social scientists are very rare. Agronomy has recently begun the *Journal of Production Agriculture*, in cooperation with the AAEA as well as the other agricultural disciplines. This journal should become an excellent outlet for research conducted by teams of researchers involving various disciplines, but it has not yet gained prestige among agricultural economists. Agricultural economics journals, such as the *Amer. J. Agr. Econ.* and the *So. J. Agr. Econ.*, rarely publish articles in which an author is an agricultural scientist from another discipline. An article in a biological science journal may occasionally be co-authored by a social scientist, but, again, examples are the exception rather than the rule. An agricultural economist who seeks approbation among peer agricultural economists obviously would not choose to persistently write for biological science journals.

Reward System Differences

Agricultural Experiment Station directors call for more research that crosses disciplinary lines, but they increasingly reward researchers based on refereed output which is usually disciplinary and with a narrow problem focus. Bonnen has suggested that "some colleges of agriculture, in pursuit of academic status, have shifted so far toward disciplinary research that they have lost effective connection with the institutions and problems of agriculture" (p. 963). Schuh argues that professors within colleges of agriculture have become peer- as opposed to mission-oriented.

The reality overwhelms the rhetoric, and researchers usually behave in accordance with a journal article reward system. Over the last several decades, major refereed journal outlets within agricultural economics have played an increasing role in determining the research agenda within agricultural economics departments. Few professors would dispute the increasing importance of refereed publications in all agricultural disciplines, particularly in the last 10 or 15 years. Although there appears to have been a general increase in the amount of all types of publishing at experiment stations, research reports and other forms of departmental and college publications appear to be of decreasing relative importance in comparison with the externally refereed academic journals at our experiment station and probably at many others as well.

Criteria for acceptance or rejection of journal articles within the agricultural economics journals (and in journals in economics and in many of the other social-science disciplines) are less well defined. At the core of the review process is the value-laden concept of the "importance" of the contribution to the literature. Thus, peer reviews in the social sciences may have a much greater value-laden component than those within the biological sciences. Lacy and Busch compared various disciplines within colleges of agriculture in terms of journal acceptance rates and found acceptance rates in agricultural economics of 27 percent and in rural sociology 21 percent; whereas, the acceptance rate for the comparable journals commonly used by animal scientists was 68 percent, agronomists 78 percent, and entomologists 81 percent. Compared with the biological sciences, the social sciences operate by a very different set of rules. Put in simple terms, the agricultural economics and other social science journals publish only those articles which the reviewers and editor, without doubt, believe make a significant contribution to the literature. In the applied biological sciences, articles are published unless the reviewers and editors are convinced without doubt that the material fails to make a significant contribution. This basic difference is generally not recognized by administrators within colleges of agriculture.

To agricultural economists and other social scientists, criteria for the rejection or acceptance of a manuscript for publication in a refereed journal within the other agricultural sciences appear to be comparatively simple and well defined. Within the biological sciences, peer reviews ensure that (1) the research on a technical level is well executed from the standpoint of the experimental design and laboratory work, and that (2) the identical piece of research has not been conducted elsewhere. Even point (2) appears to be of minor concern, since replicated research which either lends support to or contradicts earlier findings can be of significant interest. A biological science colleague indicates that failure to publish technically well-executed research within a refereed journal constitutes the withholding of evidence from other researchers, and that most editors of journals within the biological sciences would not like to do this. As a result, the rejection of most of the articles within the biological science professions probably is based on a lack of technically well-executed research.

ROLE OF EXPERIMENT STATION DIRECTORS

Experiment station directors surely must feel, at times, that they lose control of the research agenda to the current crop of journal editors. But it is the experiment station directors who collectively reward productivity largely based on refereed journal articles within narrow disciplinary bounds. Furthermore, refereed journal articles represent the one widely-recognized "currency" for the scientist seeking peer approbation and upward mobility within the profession.

If anything, this issue is of even more concern within agricultural economics than in many other agricultural disciplines. The journals affect agricultural economics research in a number of ways. First, the interests of the editor or the reviewers at other institutions may not necessarily be consistent with the needs and problems faced by agricultural economists at the state or local level. The significance of a research paper in dealing with an important issue at a state or local level is often of little if any importance in determining the publishability of a paper. More important is that the paper deals with a a problem of national (or perhaps international) concern or represents the application of a new technique or methodological approach of broad applicability. The editor appeals to the national (or even international) readership.

Experiment station directors devote considerable time to public-relations work aimed at convincing other departments as well as university administrators outside of agriculture that agricultural scientists engage in scholarly research which, at least, equals that conducted in other disciplines. Central to this public-relations effort has been an effort to increase the quantity of externally-refereed output produced by agricultural scientists in journals that are well regarded. There has been a corresponding decline in interest in departmental publications, however reviewed, that focus on problems of interest to farmers or agribusinessmen within the state, but of little regional or national concern.

Agricultural scientists of all disciplines clearly have responded to these signals, and, since 1970, refereed journal output has increased within most colleges of agriculture. Competition for page space within the major journals clearly has increased, and with the increased competition, the technical research quality probably has improved. But as analyti-

cal techniques have improved and competition has increased, the problem focus may have changed. The major agricultural economics journals increasingly have called for articles of national or regional as opposed to state or local applicability, and these articles often have had a restricted scientific scope. Researchers have found that articles dealing with new quantitative techniques or theoretical approaches often were less open to criticism than articles dealing with analyses of controversial public issues confronting agriculture. The surest and easiest route to professional success, it seems, was to become known as an innovator in the use of a sophisticated but very narrow quantitative or analytical technique. As a result, articles increasingly have become more esoteric, less readable by others not working with the same technique, technically more sophisticated, perhaps more scholarly in appearance, but often less related to controversial problems confronting agriculture, and less open to criticism by those unfamiliar with the particular technique.

This is precisely the point to which Bonnen is alluding. In the zeal of colleges of agriculture for hard evidence of academic excellence, many have become too narrowly focused along disciplinary lines. As a result, they now are less able to serve the needs of clientele groups within the state which form the basis of political support and often face controversial problems that cross disciplinary lines. A substantial inertia exists in most agricultural economics departments within colleges of agriculture to maintain the analytical focus in fashionable areas of research rather than to broaden a research program particularly to include efforts which in a significant way deal with controversial public issues, issues of concern at state and local but not national levels, or issues that require the cooperation of several disciplines.

Perhaps, as Schuh argues, it is appropriate that agricultural economists spend much of their time dealing with problems of national as opposed to state or local concern. After all, individual farmers (and consumers) are greatly affected by what happens in the world economy. However, it was during the late 1970s and early 1980s, when the stage was set for the most severe financial crisis to affect agriculture since the 1930s, that much of the agricultural economics profession took a turn toward technique-oriented research rooted in theoretical and quantitative complexity deemed publishable in prestige economics journals and away from the controversial problems of importance to agriculture and rural America.

Only in the last few years has there been a resurgence of interest by the profession in major macro problems confronting U.S. agriculture, brought about by the severe farm financial crisis, low prices for major agricultural commodities, and new federal farm policy proposals to deal with these issues. Issues now of concern to the profession are more nearly like the issues confronting the profession in the early 1960s. It is once again becoming clear that both an understanding of agriculture as well as an understanding of economics is important and needed if progress in dealing with the problems confronting agriculture is to be made by the agricultural economics profession.

CONCLUDING COMMENTS

Some encouraging events are now occurring, for example, three new publication outlets. Impetus for the development of *Choices* by the AAEA came about as a result of a need for a forum to deal with critical public issues affecting agriculture that is readable by policymakers, and a recognition that traditional refereed publications were inadequate for dealing with such issues. The agronomists are to be commended for starting the *Journal of Production Agriculture* as an outlet for research that crosses disciplinary boundaries. The Tennessee Valley Authority has started a new journal for dealing with policy-related issues. Each is an outlet for writings that might not have fit into the traditional national and regional agricultural economics journals. Each is gaining support among agricultural economists.

A perhaps oversimplified, but succinct list of other approaches for solving problems outlined in this paper could be offered. Such a list might include (1) developing more new refereed journals that focus on the publication of research conducted jointly by researchers across disciplines, (2) reorganizing the professional reward system at experiment stations such that researchers are rewarded primarily on the basis of mission-oriented criteria rather than primarily on the basis of criteria developed by the editors and referees of the academic journals, (3) rewarding researchers primarily by evaluating the significance and importance of the research in solving contemporary problems of greatest concern within

agriculture and rural America rather than on the basis of a simple count of the number of manuscripts published in academic journals, and (4) placing emphasis on more heavily rewarding researchers for research productivity that applies analytical techniques to problems facing agriculture rather than heavily rewarding the further development of the analytical technique itself.

Unfortunately, little of this list will likely be quickly and fully adopted. Agricultural scientists continue to behave consistently with a personal reward system emphasizing approbation from disciplinary peers. Most academic administrators are open to less *internal* criticism by faculty and other academic administrators if a reward system based on narrow academic criteria and stressing counts of refereed journal articles is used. However, a subjective system requiring administrative judgment as to the importance of a particular researcher's contributions to agriculture and rural people or even to society as a whole might ultimately make the administrator less open to *external* criticism from the taxpaying public.

The land-grant system was founded to fill the void unmet by the elitist private schools. When founded, perhaps even until recently, the land-grant system adhered to a tripartite mission of research, teaching, and extension. The foundation of the system of experiment stations was a balanced mix of basic and applied research, and the applied research has formed the basis for both agricultural college courses and extension education. Political support for funding comes about largely because the public receives most of the benefits that flow from the system.

While the Agricultural Experiment Stations increasingly focus research along narrow disciplinary lines and emphasize basic research primarily oriented toward peers, in real dollars, total state and federal funding for agricultural research has declined significantly over the last decade. Given the amount of state and federal funding to Agricultural Experiment Stations, the central thrust of Agricultural Experiment Stations must be to continue to supply the needed problem-solving research of benefit to the taxpaying public.

REFERENCES

Bonnen, J.T. "Historical Sources of U.S. Agricultural Productivity: Implications for R&D Policy and Social Science Research." *Amer. J. Agr. Econ.*, 65 (1983):963-64.

Bradford, G.L., J. A. Boling, S. R. Rutledge, and T.W. Moss. "Management Systems For Beef Cattle Backgrounding: A Multidisciplinary Approach." *So. J. Agr. Econ.*, 10 (1978):57-62.

Breimyer, H. F. "The Three Economies of Agriculture." *J. Farm. Econ.*, 44(1962): 679-99.

Copeland, T. E., and J. F. Weston. *Financial Theory and Corporate Policy.* 2nd ed. Reading, Mass: Addison Wesley, 1983.

Hightower, J. *Hard Tomatoes, Hard Times.* Cambridge, Mass.: Schenkman, 1973.

Kohls, R. L. "Economic Research and Education for Commercial Agriculture." *Amer. J. Agr. Econ.*, 56(1974):1012-13.

Lacy, W. B., and L. Busch. "Guardians of the Discipline: Journals and Journal Editors in the Agricultural Sciences." *Rural Sociology*, 47(1982):442.

Modigliani, F., and M. Miller. "The Cost of Capital, Corporation Finance and the Theory of Investment." *Amer. Econ. Rev.*, 48(1958):261-97.

Peterson, W., and Y. Hayami. "Technical Change in Agriculture." In *A Survey of Agricultural Economics Literature.* Ed. Lee R. Martin. Minneapolis: University of Minnesota Press, 1977.

Phillips, M. J. "Social Science Implications of Agricultural Science and Technology." *Amer. J. Agr. Econ.*, 65 (1983):977.

Phillips, M. J., and D. G. Dalrymple. "U.S. and Agricultural Research Assessment: Implications for Agricultural Economists." *Amer. J. Agr. Econ.*, 63(1981):993.

Schuh, E. "Revitalizing The Land Grant University." *CHOICES*, 2, 1 (1986):6-10.

Spillman, W. J. "Applications of the Law of Diminishing Returns to Some Fertilizer and Feed Data." *J. Farm Econ.*, 5(1923):36-52.

White, F. C., and J. Havlicek, Jr. "Optimal Expenditures for Agricultural Research and Extension: Implications of Underfunding." *Amer. J. Agr. Econ.*, 64(1982):47-55.