AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Federal Funding of Agricultural Research, Education, and Extension in the Land Grant Universities

An Economic Perspective

by Bruce R. Beattie and Robert Innes

The National Research Council (NRC) report on "Colleges of Agriculture at the Land Grant Universities: Public Service and Public Policy" contains several controversial recommendations for federal funding of agricultural research, education, and extension (AREE), including

- increase the role of "stakeholders" in the direction of research, education, and extension by tying the receipt of federal dollars to their input;
- implement a "new geography" of land grant college of agriculture (LGCA) funding by sending a larger share of federal formula funds to more populated states and allocating at least 25 percent of LGCA funds to regional centers and/or projects;
- increase "integration" of teaching, research, and extension by requiring that 50 percent of formula funds support "integrated" and/or multidisciplinary work; and
- increase "accountability" in agricultural research by directing a higher proportion of federal funds into competitive grants (USDA's National Research Initiative or NRI).

In sum, the NRC argues for the increased politicization of AREE, concentrating agricultural research and extension moneys in more populated states and regional centers, and increasing federal tethers on the conduct of scientific research and education. All of these directions, we believe, belie objectives of maintaining and increasing efficiency in the conduct of public AREE. In this article, we first lay out some relevant facts about the U.S. system of public agricultural research. We then discuss impli-

cations of both the factual setting and economic logic for research, education, and extension policy, and how these implications, in our view, argue against a number of the NRC's recommendations.

Some relevant facts

Agriculture's share of federal R&D. Agriculture's share of federal research and development expenditures (including agricultural education and extension) is about 2.5 percent today, down from 40 percent in 1940 (Fuglie et al.). While this decline reflects the farm sector's declining importance in the overall economy, agriculture's continued importance as a source of food and steward of the nation's natural resources suggests that the current federal investment in agricultural research, as a proportion of all federal R&D, is probably on the low side. Even when restricting "agriculture" to the "farmgate" level (which neither the NRC nor we advocate), agriculture represents 2 percent of the nation's population, generates 2 percent of the nation's private sector GDP, and is an important sector in rural counties that are home to more than 20 percent of Americans. The U.S. food system altogether (input supply, farm and ranch production, post-farm food and fiber processing and distribution) employs 18 percent of U.S. workers and accounts for 15 percent of GDP. Moreover, farmers and ranchers are stewards of vast land and water resources, with 42.5 percent of the nation's land area in private farms/ranches and over 80 percent of U.S. land in farms, ranges, and forests.

Returns to agricultural research. Economists have estimated consistently high economic returns to public agricultural research, on the order of 30 to 50 percent per annum, with some estimates as high as 200 percent (Huffman and Evenson; Alston, Norton, and Pardey; and Norton and Pardey provide comprehensive references). Moreover, estimated returns to U.S. agricultural research are comparable to those obtained in studies of other OECD countries. Though measures of economic returns *sometimes* miss some relevant benefits and costs of research (including deadweight costs of raising government revenues, effects on natural resource stocks, changes in input quality, nonagricultural spillover benefits, food safety benefits, and benefits of maintaining agricultural productivity), the overwhelming consensus among economists is that the true economic returns are high and suggest underinvestment in U.S. public agricultural R&D.

How the federal research dollar is spent in agriculture. About half of USDA spending on research, education, and extension goes to intramural federal labs (ARS, ERS, NASS, NAL, FS), about twice the percentage of all federal research dollars spent intramurally. The other half goes to the state land grant universities and 1890 colleges. The federal funding to states is divided evenly between *(i)* extension programs and *(ii)* research in the LGCA's state agricultural experiment stations (SAESs). About half of the money to states is dispersed as "block grants," or formula funds, and the remainder is dispersed through a combination of competitive grants (via the NRI) and congressionally earmarked special projects (popularly known as "pork barrel"). In recent years, real USDA funding of LGCAs has risen negligibly (only 3 percent from 1982 to 1992), but the composition of the funding has changed more markedly. From 1982 to 1992, real formula funding declined by 15 percent, competitive grants quadrupled (from a small base), and real earmarked project funding rose by more than a third (NRC). In 1992, earmarked AREE funding represented almost 20 percent of all earmarked research grants in the entire federal budget. As of 1994, politically earmarked AREE funding was more than twice that provided for the NRI and substantially exceeded the formula research funds sent to the states (Alston and Pardey, pp. 293 and 296).

How federal dollars contribute to state agricultural research, education, and extension. The USDA remains an important source of research funds for SAESs and state extension programs; however, these funds are a relatively small part of state agricultural research, education, and extension budgets, with states effectively matching federal dollars many times over. In 1992, for example, federal formula funds supported 10 percent of SAES budgets and 19 percent of state extension programs, while total USDA funding represented about 20 percent of SAES support and about 29 percent of extension support. Although the proportion of SAES funding from all USDA sources has remained roughly constant over the past twenty years, USDA's contribution to extension funding has steadily declined over the past half-century, down from 57 percent in 1940 to half that level today (NRC).

Implications

We believe these facts have important implications.

Preserve the mission and level of USDA funding for land grant universities. Federal funding of LGCAs has been designed to serve research, education, and extension needs of agriculture, the food system, rural America and its youth, families, and associated natural and environmental resources. For reasons discussed above, we believe that the current federal investment in these endeavors, if anything, is too small. The traditional foci of these investments should not be diluted by broadening the mission as

proposed by the NRC. Make no mistake about it: the combination of the NRC recommendation that stakeholders be given greater say in the identification of research and educational issues and that more of the *existing* formula funding be directed to more populated states does not bode well for the interests of agriculture, the food and fiber system, or rural America and its natural and environmental resource base. These are not the front-burner issues of urban America. To be sure, a cogent argument can and should be made for the federal government and the land grant universities to devote increased attention to the research and educational needs and opportunities of our nation's increasingly urban population. But jumping from a recognition of "urban needs and opportunities" to a recommendation that the present meager and highly productive federal investment in AREE be diverted to issues of interest to stakeholders of more populated states "does not compute."

The politicization of federal agricultural research funding should be reduced, not increased. Arguably, the most disturbing trend in federal AREE funding has been the increased use of political earmarking. Earmarked funding lacks both an economic (productivity) basis for its allocation, and the scientific accountability that applies to the other AREE funding mechanisms (i.e., formula and competitive grants). Increasing the "strings" attached to formula and competitive grant funds (including greater "stakeholder" influence over the research and education agenda and process), as proposed by the NRC, will clearly add to the politicization of research and education. Within states, there is persistent pressure to make AREE investments on a more political basis. The object of federal funding should be to encourage and permit resistance to such pressure—not acquiescence to it—thereby preserving the ability of LGCAs to work on problems that cross state and special interest lines. In sum, AREE funding should be made less political—and more productive as a result—by reducing the share allocated by congressional earmark and by keeping politics out of state allocations of the federal moneys insofar as possible.

Old Main on the campus of the University of Arizona.

University of Arizona Graphic Services

Do not diminish the share of untethered "formula funding" for LGCAs in a portfolio of AREE investments. With increasingly tight federal research budgets, the states and land grant universities should be given more, not less, discretion in the administration of the federal AREE dollars that they match many times over. The NRC's proposal to combine Hatch and Smith-Lever funds into a single grant would be a laudatory move in this direction. In view of funding cutbacks, it may also be appropriate to increase to states the share of AREE funding that is untargeted (under Hatch and Smith-Lever) rather than targeted. These steps would enhance states' and academics' freedom to research and teach/extend knowledge—freedom that is central to obtaining the most benefit from federal AREE investments. In contrast, the NRC's proposals to increase the federal tethers on formula and other LGCA funds, tying the funds to a more political process of research direction and to federal directives on faculty "integration" and teaching, go in exactly the opposite direction, impairing states' and academics' freedom at potentially high cost to AREE productivity.

Funding for LGCAs is a vital component of the federal AREE investment for at least two reasons. First, the state LGCAs are repositories of research talent that make them an efficient vehicle for advancements in AREE. And second, state AREE investments have spillover benefits across state lines, which argues for federal funding—indeed, funding with matching that recognizes in-state benefits as well.

In the allocation of federal AREE moneys to LGCAs, it is efficient to have a portfolio of re-

search investments, some of which is directed to contemporary priorities using targeted funding mechanisms, and some of which is long-lived and not directed—precisely the attributes of formula funds. With undirected "hard money" formula funding, brilliance can flourish to advance science, the academic disciplines, and interdisciplinary knowledge, prompting the innovations that are so valuable to our society and economy without being stymied by potentially mundane aspirations of ambitious bureaucrats and politicians who can squelch the creativity and innovation that academic freedom imparts. Providing "hard money" (formula funding) for research and education not only attracts talent and promotes creative freedom in agricultural research; it also economizes on R&D administrative costs. The discipline of the academic marketplace is a low-cost substitute for administrative overburden, and it provides more appropriate incentives, accountability, and stability for socially valuable research and education (Beattie and Watts).

Contrary to an unsubstantiated premise in the NRC report, competitive-grant funding need not be either more "accountable" or, by dint of "competition," more productive. Funding of competitive grants suffers from *(i)* well-documented pitfalls of proposal review (Chubin and Hackett); *(ii)* problems of "short-term myopia," with projects funded on a short-run basis without the longer-run commitments needed for extended research programs; and *(iii)* the huge loss of scientific time and effort in proposal writing and evaluation, which directly detracts from productive AREE activities. While unilaterally increasing competitive grant funding could hardly hurt, the diversion of funding from other AREE sources (aside from pork barrel grants) could hurt a lot. Moreover, it is unclear that any new AREE funds can be most productively employed in competitive grants, rather than in additional "hard money" (formula) support to the states. In fact, the only available evidence to date (admittedly scant) suggests that formula funding of AREE is more productive than competitive grants (Huffman and Just). In view of these observations, any increased funding for the NRI should certainly not come at the expense of hard money support to the states.

Should the formulas (by which formula funds are allocated) be revised? While we argued above that the proposal to "send formula funds to the cities" is a bad idea, perhaps some rethinking of the current formula is merited. Ideally, formula funds should respond over time to relative scientific productivity of the LGCAs, thereby providing LGCAs with maximum incentives to enhance this productivity. In doing so, the funding mechanism should remain a hard money source of funds with formulas that revise slowly over time. Unfortunately, the difficulty with tying gradual formula revision to scientific productivity lies in the measurement of productivity—neither a cost-free nor error-free proposition. Whether measurement problems outweigh potential incentive gains from formula revisions is unclear.

Do not hamstring agricultural R&D with inefficient edicts for regional and multidiscipline research. It is distressing that the NRC's Board on Agriculture should downplay the value of disciplinary and individual scientist research in favor of increasing applied, and more centrally coordinated, "problem solving" in the LGCAs. Like the call for diversion of AREE dollars to other issues, the constant chorus calling for more interdisciplinary research in order to address society's most pressing problems is based on an unsubstantiated premise that research conducted under "multidisciplinary" and "regional" edicts will be more productive than undirected funding of LGCAs.

One can be sympathetic to nonscientists who see the world as it is—a complex interdisciplinary morass of problems and opportunities—and who conclude therefore that complex, coordinated, interdisciplinary research and educational attacks on "real world" problems are likely to be the most fruitful path to progress. But how can one be sympathetic to the academic interdisciplinary and interregional priests (especially economists who should know better) who seem content to reason that simply because the world is a complex, interdisciplinary, and interconnected place, therefore interdisciplinary, interregional, administration-intensive research and educational teams are (or will be) more productive? To the contrary, there is abundant evidence (some of which we provided above) that individual investigator, mono-disciplinary, regionally uncoordinated research and educational efforts have been extremely successful in advancing science, education, and social well-being.

The matter of disciplinary (individual scientist) versus interdisciplinary (team) research and single university versus multi-institutional regional efforts, like high-tech versus chalk-and-blackboard teaching and like issue-based versus content-based extension programming, should be a matter of no concern to anyone other than the practitioners themselves. Economists, when offering prescriptive advice on nearly everything except the academic enterprise, invariably argue for institutional neutrality when it comes to choice of method (for example, discovery of least-cost input/means combinations). The idea is not to bias the means incentives one way or the other—it is the results that count, not how we get there.

Why is it when it comes to the academic enterprise that we seem so drawn to the bizarre idea that adding more constraints and restricting the free-

dom of professors—regarding choice of research topics, research and teaching methods, and extension strategies—will get us "higher up" the objective function? Economists know well that a constrained maximum is always less than the free (unconstrained) maximum when the constraint is binding, and that the choices of method, process, and approach are best left to the entrepreneurs (the people actually doing the teaching and research).

In fact, disciplinary scholars, particularly in the applied sciences of LGCAs, are keenly interested in "real" problems, and interact with other disciplines when such interaction can increase the value or usefulness of their research. And scientists already collaborate with others outside their respective institutions (that is, on a regional level) when the research benefits exceed the costs. Edicts on multidisciplinary and regional research promise only to increase administrative burdens (transactions costs) of research, diverting resources away from otherwise productive activity.

Society gets the most "bang for the buck" by putting the money on the stump, standing back, and letting the creative minds and energies of a decentralized and competitive academy have at it. Prioritizing, coordinating, and otherwise controlling/meddling in artistic endeavors does not lead to better music, or paintings, or research. We forget that scientific process is fundamentally a creative, artistic endeavor at our peril (Ladd). Would Garth Brooks's hit song "Friends in Low Places" have been better had the lyrics been developed via a mandated interdisciplinary effort with oversight and input of the "clientele" to whom he so poignantly speaks? Surely not.

Leave it to the practitioners

We must take care to maintain the high standard in agricultural research that has been set over the decades, while confronting the new research challenges that are posed by contemporary concerns about the rural environment, rural economies, and the process of adding value to food in the production and marketing chain. This objective calls for maintaining the mission of federal AREE funding to advance science in agriculture and rural America; reducing political targeting of research funding (with a smaller share of earmarked AREE "special project" funds in the portfolio of federal AREE investments); and continuing, and perhaps expanding, the use of "hard money" formula funds for AREE activities in a portfolio of federal AREE investments that also includes more competitive grant funding.

As in the past, the identification of the most interesting, promising, and productive research and teaching opportunities is best left to the practitioners. That approach has served America very well to date, making our public university system the envy of the world. Many of the NRC proposals would move U.S. agricultural research, education, and extension in the opposite direction, undermining the untethered academic inquiries that have proven so successful in the past, exacerbating the politicization of research and education, and increasing administrative costs of federally funded LGCA endeavors. If implemented, we believe the societal cost of these proposals will be reduced productivity of America's investment in agricultural R&D.

Bruce R. Beattie and Robert Innes are professors of agricultural and resource economics at the University of Arizona.

For more information

Alston, J.M., G.W. Norton, and P.G. Pardey. *Science Under Scarcity: Principles and Practice for Agricultural Research Evaluation and Priority Setting.* Ithaca NY: Cornell University Press, 1995.

Alston, J.M., and P.G. Pardey. *Making Science Pay: The Economics of Agricultural R&D Policy.* Washington DC: The AEI Press, 1996.

Beattie, B.R., and M.J. Watts. "The Proper Preeminent Role of Parent Disciplines and Learned Societies in Setting the Agenda at Land Grant Universities." *W. J. Agr. Econ.*12 (1987):95–103.

Chubin, D.E., and E.J. Hackett. *Peerless Science: Peer Review and U.S. Science Policy.* Albany NY: State University of New York Press, 1990.

Fuglie, K., et. al. *Agricultural Research and Development: Public and Private Investments under Alternative Markets and Institutions.* Washington DC: U.S. Department of Agriculture, Agricultural Economic Report Number 735, 1996.

Huffman, W.E., and R.E. Evenson. *Science for Agriculture: A Long-Time Perspective.* Ames IA: Iowa State University Press, 1993.

Huffman, W.E., and R.E. Just. "Funding, Structure, and Management of Public Agricultural Research in the United States." *Amer. J. Agr. Econ*76(November 1994): 744–59.

Ladd, G.W. *Imagination in Research: An Economist's View.* Ames IA: Iowa State University Press, 1987.

National Research Council, Board on Agriculture. *Colleges of Agriculture at the Land Grant Universities: Public Service and Public Policy.* Report of the Committee on the Future of the Colleges of Agriculture in the Land Grant University System. Washington DC: National Academy Press, 1996.