The Federal Role of University Sponsored Agricultural Research and Resolving Conflicts Arising Out of the Implementation of New Technologies

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Often in my work outside of the U.S. Department of Agriculture (USDA), I need to remind respected scientists and policy-makers that the federal government's sustained commitment to universities did not start 50 years ago with the release of Vannevar Bush's report "Science: The Endless Frontier" and the subsequent creation of the National Science Foundation. There is a rich history of federal support for university-based agricultural research. Starting with the enactment of the Morrill Act and the establishment of the land grant colleges in 1862, through the recent passage of the Agricultural Research, Extension, and Education Reform Act of 1998, the relationship between the federal government and the land grant universities has evolved into a partnership that is vital to the nation's economy and to its ability to produce an affordable, safe, nutritious, and sustainable supply of food and fiber.

While the distinction between the land grants and other public and private research universities is blurring, the land grants, especially through their commitment to public outreach and science associated the management of natural resources, make an invaluable contribution to the nation. However, before I address the role of the federal government in supporting agricultural research at universities, I would like to present some of the results of a recently released Presidential Review Directive that makes recommendations on how the broader federal government-university partnership might be strengthened.

First and foremost, the federal agencies participating in the review called for the development of a clear set of principles or expectations on which future policies can be based and past policies can be judged. While the partnership is often referred to, it has never been clearly articulated and usually is subject to multiple interpretations. For example, one of the hallmarks of the U.S. system

of research universities is the integration of research and education. What is the federal government's responsibility in promoting and supporting the dual role of scientist-teacher? Are agencies interested only in procuring research or are they also committed to the production of the next generation of scientists and engineers? Do federal policies support our expectation or do they work at cross-purposes with them?

PRINCIPLES OF THE PARTNERSHIP

When President Bill Clinton released the National Science and Technology Council (NSTC) report "Renewing the Federal Government-University Partnership for the 21st Century" during the May 1999 Medal of Science and Medal of Technology ceremony, he stated that "we must move past today's patchwork of rules and regulations and develop a new vision of the university-federal government partnership." The President asked the university community to work with the federal government to develop a set of principles that clearly articulates the shared expectations of the partnership. The following draft set of principles is extracted from the NSTC report:

Research Is an Investment in the Future. Government sponsorship of university research — including the capacity to perform research and the training of the next generation of scientists and engineers — is an investment in the future of the nation, helping to assure the health, security, and quality of life of our citizens. Government investments recognize that the expected benefits of research often accrue beyond the investment horizons of corporations or other private sponsors. Investments in research are managed as a portfolio, with a focus on aggregate returns; investments in individual research efforts that make up the portfolio are based on the prospects for their technical success, though not on a presumption that those outcomes can be predicted precisely.

The Linkage Between Research and Education Is Vital. The integration of research and education is the hallmark and strength of our nation's universities. Students (undergraduates and graduates) who participate in federally sponsored research grow intellectually even as they contribute to the research enterprise. Upon graduation, they are prepared to contribute to the advancement of national goals and to educate subsequent generations of scientists and engineers. Their intellectual development and scientific contributions are among the important benefits to the nation of federal support for research conducted at universities. There should be compelling policy reasons for creating or perpetuating financial or operational distinctions between research and education. Our scientific and engineering enterprise is further enhanced by the intellectual stimulation brought to campus by students from varying cultural, ethnic, and socioeconomic origins. Excellence is promoted when investments are guided by merit review. Excellence in science and engineering is promoted by making awards on the basis of merit. Merit review assesses the quality of the

proposed research or project and is often used in combination with a competitive process to determine the allocation of funds for research. Merit review relies on the informed advice of qualified individuals who are independent of those individuals proposing the research. A well-designed merit review system rewards quality and productivity in research, and can accommodate endeavors that are high-risk and have potential for high-gain.

Research Must Be Conducted with Integrity. The ethical obligations entailed in accepting public funds and in the conduct of research are of the highest order, and recipients must consider the use of these funds as a trust. Great care must be taken to "do no harm" and to act with integrity. The credibility of the entire enterprise relies on the integrity of each of its participants.

These draft principles are designed to capture the entire scope of the research university partnership with the federal government. Perhaps this is something the state agricultural experiment stations and colleges of agriculture should consider doing with the USDA or with the federal government more generally. To a large degree, this is done for you each time the Congress and the Administration pass a new research title of the Farm Bill. But I would argue that many of the provisions contained in these bills and the subsequent appropriations bills should be better grounded in a mutual understanding of the shared expectations of the partnership that exits between the government and the experiment stations and colleges of agriculture. Issues such as merit review; formula funds versus competitive grants; the extent of support for research targeted to local, regional, or national needs; technology transfer; and integration of extension, education, and research, could be addressed and expectations clearly articulated.

Federal Funding for Agricultural Research

One of the strengths of the federal research portfolio is its diversity — diversity of supporting agencies, as well as diversity of funding mechanisms. The tight link that exists between the research and agency mission allows for support of mission-relevant research that otherwise might not be supported. In theory, the diversity of funding mechanisms, i.e., intramural, extramural, formula, competitive, and special grants, should allow policy makers to direct research and related support activities to the best performer for a given purpose.The intramural programs should support long-term research or research support activities that are of regional or national significance, such as food safety and nutrition research, and germplasm conservation. Competitive grants are best suited for stimulating high quality creative science of national significance in research programs that do not necessarily require a long-term commitment on the part of the agency. Formula funds represent the federal commitment to supporting research in areas deemed important locally or regionally. Special grants support highly targeted areas of research that are unlikely to be funded through other means.

The administration views federal support for agricultural research as a core piece of the federal research and development (R&D) budget. It is included in the President's 21st Century Research Fund. When developing the President's budget and allocating resources among these programs, we attempt to balance these funding mechanisms. Both the Clinton and (George) Bush administrations have been seeking to increase significantly the size of competitive grants program in the USDA. In our view, competitive grants continue to be underrepresented in the USDA research portfolio.

Priority Setting

How do you determine what the proper balance is among these programs? Under times of growing budgets, this is much easier. When budgets are tight or actually shrinking, this becomes much more difficult as the tradeoff between programs needs to be carefully considered. You need to determine which programs will deliver the highest quality science with the most relevance to the highest priority research areas. Each year, the Office of Science and Technology Policy (OSTP) and the Office of Management and Budget (OMB) develop a R&D priorities memo that reflects current initiatives managed by the NSTC. In addition to stressing the NSTC's support for peer reviewed competitive research and other program attributes, the memo lists several special areas of emphasis that will receive favorable treatment during this year's budget cycle.

Program Attributes

- Favor investments that focus on long-term, potentially high-payoff activities and outcomes that would not occur without federal support, such as activities in the 21st Century Research Fund.
- Ensure that the government-wide portfolio of R&D investments establishes a desirable balance among fields of science.
- Maximize the efficiency and effectiveness of federal R&D investments, by, for example, favoring activities that employ competitive, peer-reviewed processes; encouraging collaboration among agencies, industry, academia, and the states when such efforts further the goals of the research; encouraging strategic collaboration with key international counterparts that will address fundamental science priorities as well as global energy, environment, security, and health challenges; and improving, phasing down, or eliminating programs that are not resulting in substantial benefits or are not important to an agency's mission.

Interagency Priorities for Agricultural R&D Budgets

Plant Genome: Promote the coordinated development of plant genomic information, new technologies, and resources that will improve our understanding of plant biology and be applied to the enhancement of economically important plants.

Climate Change Technology: Promote and coordinate research aimed at technologies capable of achieving reductions in U.S. carbon emissions at the lowest possible cost. Technologies include products and production methods that reduce greenhouse gas emissions and increase the efficiency of energy and materials used in transportation, buildings, and manufacturing while lowering the cost and improving the quality of the goods and services delivered and technologies which provide cost-effective renewable alternatives to fossil fuels.

Food Safety: Promote food safety research that provides a scientific foundation for sound food safety policy and regulation, innovations in food production to increase safety, consumer education to improve food safety practices, and global monitoring (surveillance) and response to outbreaks of food-borne illnesses.

Integrated Science for Ecosystems Challenges: Develop the knowledge base, information infrastructure, and modeling framework to help resource managers predict/assess environmental and economic impacts of stress on vulnerable ecosystems, with particular focus on invasive species, water and air pollution, changes in weather and climate, and land and resource use.

An overarching consideration in our priority setting process is the Government Performance and Results Act or GPRA. GPRA requires a new level of accountability to Congress and to the taxpayer. Increasingly, Congress and OMB are demanding an accounting of what the taxpayer will get for an increased investment in a program. OMB is required to ask agencies for this information when preparing the President's annual budget request to Congress. Inherent in the GPRA process is stakeholder input to identify high priority national needs.

With GPRA, there is a juggling act between qualitative and quantitative performance measures. There is a real danger in employing quantitative performance measures inappropriately. Agencies, OMB, and Congress need to understand when the use of more qualitative measures is better suited to gauge a program's performance. For example, the use of peer review by a committee of visitors rather than an accounting of published papers or patents.

One fundamental consideration in establishing programmatic priorities is industry's role in advancing research in any given area. This isn't always straightforward. For example, in the area of plant genomics, industry has a large investment that dwarfs anything we could hope to do in the public sector. However, access to industry generated information is limited and generally comes with strings attached. The question we need to ask is how important is this information to the future of publicly supported biological research and to agriculture? We believe the answer is very important. Unfortunately, until we are able to establish mutually acceptable data access provisions in this field of study, the limited public sector investment will almost certainly duplicate work conducted by the private sector. Plant scientists in the public sector need ready access to plant genomics information if they are going to capitalize on this technology to advance the scientific frontiers.

TECHNOLOGY CONFLICT RESOLUTION: WHAT IS THE FEDERAL ROLE?

One of the issues the organizers of this conference asked me to address is the role the federal government plays in resolving conflicts created by conflicting technologies. In my experience, the federal government is not particularly good at this and in cases that don't have environmental or human health implications market forces have largely driven resolution. In cases with environmental or human health implications, the federal government resolves conflicts through legislation and regulation. In cases where there are conflicting technologies, special programs can be established to shelter one technology over another, but the marketplace is usually where these get sorted out.

Three examples of conflicts that are in the process of sorting themselves out include the following: Organic versus biotechnology, human and environmental health versus chemical pesticides, and labeling based on risk versus the consumer's right to know.

Organic and biotechnology: This conflict clearly surfaced when the USDA issued proposed guidelines on what could be considered compatible with organic farming and what wasn't for the purposes of labeling. Several issues raised in the USDA proposal generated much controversy with the USDA receiving over 200,000 comments. Much of this was targeted toward the suggestion that under some circumstances biotechnology products might be compatible with organic production. All the proposed rule did was ask for guidance on this issue; it didn't propose to allow biotechnology products in organic production. Even so, the comments poured in to such a degree that Dan Glickman, Secretary of Agriculture, decided to take biotechnology off the table. In this case, the Secretary decided the organic industry didn't want it, and therefore, he acted accordingly. This was not a decision based on science or risk.

In another instance, the organic community and others have presented valid concerns about the use of transgenic crops expressing Bt toxins. Concerns are not focused on safety, but rather on the development of resistance. Here, the Environmental Protection Agency (EPA) and the USDA are working with the various stakeholders to develop resistance management plans.

Human and environmental health and chemical pesticides: We have been resolving this issue since the publication of Rachel Carson's *Silent Spring* in 1962. The latest manifestation of this was the enactment of the Food Quality and Protection Act of 1996 or FQPA. This law came about because of deep concerns on many fronts that our existing pesticide legislation was not adequate to protect the public's health, especially the health of more vulnerable populations like children. The requirements of FQPA are presenting a challenge to the EPA. Not only will the deadlines be difficult to meet, but the demands FQPA places on our ability to conduct risk assessments are also great. For example, FQPA requires an assessment of aggregate exposures of pesticides for multiple crops and also requires the consideration of exposures from

pesticides with similar modes of action when setting tolerances. These new requirements have caused us to question the adequacy of our databases and risk assessment models.

Labeling for health and safety reasons and consumer's right to know: Traditionally, the federal government has mandated food labeling when there is important health or safety information that needs to be conveyed to the consumer. Therefore, I believe that government mandated labels that do not convey facts on the nutritional or safety aspects of the food, as supported by sound science, should be discouraged. I believe the government should stay away from mandated labels that relate simply to how a product was made or where it was made. Exceptions to this have occurred; for example, the current effort to develop standards for organic foods and mandated country of origin requirements for some foods.

When it comes to labeling biotechnology derived food products, there is a growing consumer demand in many parts of the world for mandatory labeling. In numerous fora, such as the biosafety protocol negotiations under the Convention on Biological Diversity and the Codex Alimentarius, NGOs (Non-Government Organization) and many national governments are pushing for mandatory labeling requirements of genetically engineered food products. The United States is in the unique position of having a citizenry that has a great deal of trust in its food safety regulatory agencies and having the most advanced biotechnology product line. Our position is that these products don't need labels unless they are significantly different from products with which consumers are already familiar. For example, if a product has altered antigenic or nutritional properties, Food and Drug Administration (FDA) would require labeling. However, there is a serious disconnect between the U.S. government's approach to labeling than that of the European Union and many others countries. In order to avoid major losses in trade, we need to resolve this issue quickly.

CONCLUSION

The federal government has had and will continue to play a major role in promoting sustainable agriculture though its support for research at land grant universities and elsewhere. Key to the future success of federal efforts will be improved mechanisms of accountability as determined by both qualitative and quantitative performance measurements as mandated by GPRA. We need to apply the very best science to problems associated with the future of agriculture and peer review will be used increasingly to determine the quality of work supported by the USDA as it is with support from other government R&D agencies. We need to do a better job listening to stakeholders. We need to make sure that the nature of the partnership that exists between our universities and federal government is clear and that our policies that shape the partnership are not working at cross-purposes.We need to look carefully at our underlying

national goals for a robust economy and excellent public and environmental health and make sure that our diverse agricultural sector is contributing to achieving these goals in positive ways. As we continue to develop and adopt new technologies, conflicts will arise. It is not the government's role to determine which technologies succeed and which will not. It is the government's role to help pave the way for or enable technological developments in a manner that is consistent with our underlying national goals.