Agricultural research and environmental quality

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At the signing of the Hatch Act in 1887 establishing our system of agricultural experiment stations, the United States was predominantly a rural economy. Cropland, forest, and water resources were abundant and low in cost. The majority of our population was directly involved in agriculture and natural resources. The challenge to agriculture and agricultural research was to expand production--to grow two blades of grass where one grew before--to meet the needs of a rapidly growing population.

We have been eminently successful in meeting that challenge. Land and water resources were developed for agricultural production at exceedingly high rates. The agricultural experiment stations and the U.S. Department of Agriculture helped to transform agriculture from a simple way of life to a science-based business enterprise, first by means of hybrid seeds and a mechanical revolution and later by means of chemicals that boosted crop and livestock yields to levels unimaginable a hundred years ago. By virtually any standard, the creation of the agricultural research system by the Hatch Act has been among the boldest, most productive innovations of the century.

The current circumstances and those likely in the second century of the Hatch Act, however, are vastly different. The national economy is industrial, urban, and increasingly global in orientation. Our most productive cropland is already in use. Water is becoming increasingly costly as development slows and competition among industrial, urban, and agricultural users intensifies.

Even more disquieting is the mounting evidence of deterioration of environmental quality associated in part with high-tech agriculture and public policies that encourage profligate use of natural resources. These concerns are not held by organized environmental interests alone. Farmers too are increasingly concerned about both the sustainability of some production practices and the prospects of rising production costs as environmental policies become more stringent.

U.S. agriculture is certain to face as many difficult adjustments in the decades ahead as it did in the first century of the Hatch Act. Agricultural productive capacity has expanded substantially in many parts of the world. Continued expansion is in prospect as investments in research and education in developing nations come to fruition. The result will be increasingly intense competition for U.S. agriculture in both foreign and domestic markets.

Therein lies a potential dilemma for agricultural research and public policy in this country. Our urban, environmentally conscious society is unlikely to continue to tolerate blatant forms of environmental pollution, be they from agriculture or other sources. Whether through the marketplace or through public regulation to control environmental pollution, production costs could increase substantially in many areas and for many products. Economic efficiency gains could slow or reverse while foreign competition increases.

The escape from such outcomes would appear to be accelerated investments in public and private research and development to enhance long-term U.S. agricultural productivity. However, the simple research strategy of maximizing physical output--growing two blades of grass where one grew before--will no longer suffice. Constraints reflecting economic scarcity of natural resources and the need to maintain environmental quality must now be incorporated into research planning.

Research and information needs will be enormous. Expanded, more systematic monitoring systems are needed to detect and measure environmental pollution. Multidisciplinary research on the movement of pesticides and other toxins in natural resource systems and in the food chain, and their effects on the health of humans and other species should be accelerated. Models that better predict the interacting effects of weather, hydrology, nutrient cycling and movement, and soil temperature on crop growth and yield are needed to improve farm production management systems. Research in plant biology must be expanded to develop substitutes for chemical technologies. Genetic engineering promises broad benefits to agriculture and society but will require intensified research if we are to realize these benefits.

Not all of the needed research is basic in nature. In part, what is needed is the marshalling of current knowledge to focus more effectively on trade-offs between agricultural productivity and environmental quality. To do so may require administrative innovations to transcend the disciplinary specialization that has evolved in the land-grant university system. We might also explore new arrangements across states and between the public and private components of the research system to ensure maximum efficiency in use of limited human and financial resources.

In considering research needs, we should accept that the environmental risks associated with agriculture cannot be reduced to zero. Even the most primitive forms of agriculture incur environmental risks. At issue is not whether we should abandon the production systems that have evolved in the past century but whether we can modify those systems to reduce environmental risks.

As we enter the second century of the Hatch Act, new perspectives are called for. The horizons of agricultural research should be broadened to include more explicitly institutional, economic, natural resource, and environmental quality dimensions as well as traditionally defined productivity goals. The need for research is great and pressing; the potential benefits to agriculture and society are equally great.