Policy Forum

A Competitive R&D Strategy for U.S. Agriculture

DON HOLT

The United States must respond to global agricultural changes by accelerating its technological development and adopting policies that help farmers compete more effectively. Otherwise, U.S. farmers will be blindsided by the powerful forces of international competition.

Agricultural technology is improving rapidly throughout the world (*1*), in part because of international exchange of technology and overseas development of U.S.–style agricultural institutions. The U.S. share of the world market for wheat, coarse grains, and soybeans declined from 60% in 1979–1980 to 40% in 1985–1986 (*2*). Further loss in market share will have serious consequences for farmers and for the vast infrastructure of input, processing, distribution, and marketing industries, as well as financial and other service industries that are economically linked to U.S. agricultural production.

Although no consensus on appropriate agricultural R&D strategy has emerged, one persistent proposal is to de-emphasize production-related research. This potentially disastrous strategic error (*3*) has already had a negative impact on funding of applied research and extension programs.

Other proposed strategies are to emphasize basic research, rely on the private sector for applied research, develop new uses for and better ways to process crop commodities, develop and adapt new crops, and emphasize marketing research. These ideas represent important needs and opportunities, but they do not address the principal competitive challenge facing the majority of producers of major commodities.

The basis of competition among nations seeking shares of the international commodity markets is cost of production. An analysis of private firms operating in extremely competitive industries suggests that only two strategies are effective (*4*). A firm must either be a low-cost producer or achieve enough product differentiation to occupy a market niche. Because of the relatively undifferentiated nature of basic agricultural commodities and the rapid movement of agricultural technology in international circles, a nation's agriculture cannot attain an exclusive niche.

To implement a viable competitive R&D strategy for U.S. agriculture, the following changes should be made:

1) There should be much stronger programs of site- and situation-specific agricultural research, designed to yield information on which farmers can plan, implement, and manage profitable production and marketing systems in each of the specific soil, climatic, and socioeconomic situations of the nation's agricultural regions. This research, sometimes described as adaptive research (*5*), will require a more extensive, better-equipped, and better-supported system of research farms.

The author is director of the Illinois Agricultural Experiment Station, University of Illinois at Urbana-Champaign, Urbana, IL 61801.

2) The United States should create and maintain a superior delivery system for its agricultural production technology and farm management information, so that information is used earliest and most effectively by U.S. farmers and agribusiness people. A major feature of this system should be a technically sophisticated but user-friendly decision support capability. This support mechanism should be made up of traditional and nontraditional extension and educational programs that use advanced information technology, including computerized telecommunications networks and expert systems.

Site- and situation-specific research and extension programs benefit producers in other nations relatively little. Through such programs, the U.S. public can capture proprietary benefits from investment in basic, developmental, and adaptive research and from related extension programs (*6*), as well as from the research investments of other nations.

Historically, production-related, adaptive agricultural research and technology transfer activities have been conducted primarily by the U.S. Department of Agriculture–Agricultural Research Service, the state agricultural experiment stations, and the Cooperative Extension Service. The scale and level of sophistication of these programs must be increased to meet the competition. Individual farmers do not gain proprietary advantage from adaptive research and extension, and they cannot be expected to bear much of the cost.

Basic and private sector research will not provide U.S. farmers a competitive edge. Basic research is conducted worldwide and its results are widely disseminated and broadly applicable. Also, it does not provide answers to the farmers' specific management questions. Ultimately, basic research leads to more alternatives from which farmers must choose, thus creating a greater need for strong adaptive research programs. Private sector agricultural research and development is largely product-oriented. It generates such production inputs as crop varieties, fertilizers, pesticides, animal pharmaceuticals, computer programs, and machines. The major firms conducting this research are developing, manufacturing, and marketing their products globally. Thus, the competitors of U.S. farmers will have them as soon as or sooner than U.S. farmers.

Advances in biotechnology and computers are leading to thousands of new input products that will need to be tested, compared, and integrated into effective, geographically appropriate farming systems through adaptive research and extension programs. Private firms should not be expected to provide unbiased answers to questions about competing products. Such firms cannot afford to do much of the farm-scale, production and marketing systems research, because these studies involve combinations of input products and procedures from many suppliers and must be conducted at many locations over several years.

Alternative crops grown for carbohydrate, protein, oil, and fiber compete with major commodities for market share. Penetrating markets for other crops, many of which are perishable, is difficult.

To put the new crop strategy in perspective, in Illinois about 130,000 acres are currently devoted to crops other than field crops (*7*). If we could increase the number of acres used for alternative crops by a factor of 10, it would have little effect on the 20 million acres devoted to corn and soybean production.

New and improved food, feed, fiber, fuel, and chemical feedstock products made from raw agricultural commodities could expand the world grain market. However, the capital needed for the factories and facilities will flow to regions where supplies of the commodities are most plentiful, most reliable, of acceptable quality, and lowest priced, and to places of final distribution of finished products. In the global economy, that capital could flow to Brazil, Argentina, or elsewhere as readily as to the United States. The basis of competition among commodity producers will still be cost of production.

A well-focused, successful, national agricultural strategy can be built around the concepts outlined above, but there may be political difficulties in doing so. By means of adaptive agricultural research and extension activities, all other agricultural research activities come to fruition, but adaptive research has little glamour, especially compared to such fields as biotechnology. Conducting sound adaptive agricultural research is technically difficult and labor-intensive. It is an open-ended process requiring continuity of support. The experiments, which involve large organisms with long life cycles, need to be repeated at several locations over several growing seasons as well as each time genetic potential is improved and new and modified input products become available.

The results of such programs are seen in a steady stream of small, incremental improvements in productivity, efficiency, and quality. Collectively, those increments make the difference between success and failure, but they are largely invisible to their primary beneficiaries, the general public.

The public would have to invest $2.8 billion per year [2% of $140,000 billion (*8*) in cash sales] in federal and state funds to bring the adaptive agricultural research and related extension programs to the same level of support that private firms spend on R&D. This is a small amount relative to other public R&D investments, private R&D investments in other high technology manufacturing enterprises, investments in agricultural subsidies, and especially relative to the enormous potential for return (*9*).

The costs of agricultural production will equilibrate in the global economy. To the extent that U.S. agricultural technology and management skills are superior to our competitors, so that our assets, labor, and management are more productive, our asset values and returns to labor and management, in the long run, will exceed theirs. The nation that best combines high-quality, low-cost, efficient production and effective marketing of agricultural products will win the competition. The consumers of the world, including those in the United States, will be the big winners.

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