Chapter IX

Implications for Research Funding

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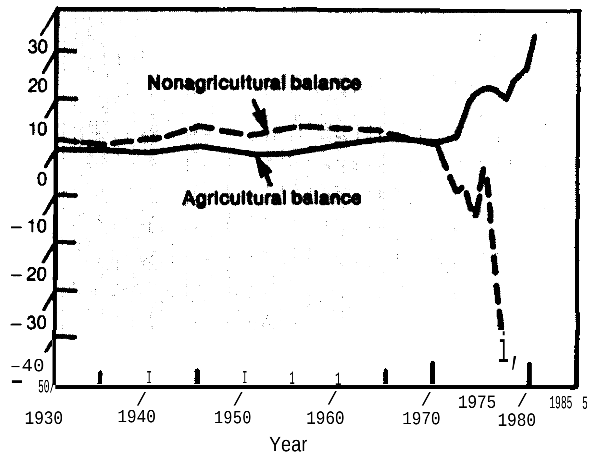
Information on the various aspects of funding U.S. agricultural research appears in several chapters of this report. This chapter brings together the more significant aspects of funding and identifies the pertinent issues as they apply to the overall assessment of research.

PRESENT SITUATION

In approaching this topic, it is well to keep in mind not only that the food and agricultural industry is the largest of all U.S. industries, but also that the application of science to agriculture has played a major role in bringing the United States to the center of world power and leadership,

One of the major ways in which agriculture has contributed to this status is the phenomenal increase in agricultural exports. The value of these exports rose from $2.9 billion in 1950 to $7.2 billion in 1970, and then increased sharply in 1975 to $21.9 billion and to $41.2 billion in 1980. This growth had the effect of increasing the agricultural balance of exports over imports from a deficit of $1,1 billion in 1950 to a positive balance of $23.8 billion in 1980. In contrast, the United States had a negative trade balance for all other commodities of $48.6 billion in 1980. Similar data for the period 1930-80 appear in figure 25.

Figure 25.—Agricultural and Nonagricultural Trade Balance—1930-80 (in billions of dollars)



SOURCE: USDA/ESS.

The fact that the rate of increase in yields of some commodities seems to be leveling off—together with the fact that the level of constant Federal dollars for some commodity research through U.S. Department of Agriculture (USDA) has been declining—raises concern as to whether the high level of agricultural exports can be maintained. Concern is also being expressed as to whether this disparity might lead to markedly higher food prices at home.

As discussed in chapter IV, most evaluations of food and agricultural public research indicate an internal rate of return that is quite favorable. For aggregate investment, rate-of-return estimates are predominantly in the range of 30 to 40 percent. The estimates range from a low of 23.5 percent to as high as 100 percent. However, these high rates of return are evidence of a problem of inefficiency. Economic efficiency calls for investment funds to be allocated in such a manner that the marginal returns in all categories are the same. The high rate of return on agricultural research indicates underinvestment by the public sector. The present funding situation reflects this fact.

Among the major Federal agencies conducting research, USDA ranks the lowest in dollar expenditures for research. In 1978, total Federal expenditures for research and development were $26.2 billion. USDA's expenditures were $381 million, or about 1.5 percent of the total. This compared to Department of Defense—45 percent; Department of Energy—16 percent; and Department of Health, Education, and Welfare—12 percent. USDA's status among Federal agencies represents a continuing decline in the Federal research and development budget—from a high of 39 percent in 1940 to 1.5 percent in 1978.

In addition to the low level of funding, the cost of conducting research has increased substantially. Research today requires more sophisticated and expensive equipment and support staff than was required 10 years ago. For example, new research horizons, such as genetic engineering and systems approaches to agriculture, are much more expensive than past traditional research.

Researchers are having great difficulty in replacing wornout or obsolete equipment and acquiring newly developed ones. Total capital expenditures per scientist doubled from 1975 to 1979 (Berlowitz, et al., 1981). In a recent study of five important physiochemical subdiscipline, it was shown that the cost of scientific instruments priced above $5,000 rose at an annual rate of 20 percent from 1970 through 1978, far exceeding the average rate of inflation (Berger and Cooper, 1979).

At many public institutions, operation and maintenance costs for scientific equipment could be supported by other budgets in the past, but now the costs exceed the capacity of institutional funds to meet them (Berlowitz, et al., 1981). When institutions cannot meet operation and maintenance costs, scientific equipment is improperly maintained, shortening the useful life thereof; support personnel are decreased and support activities accumulate; and faculty and graduate students function as technicians, with a consequent loss of time for research and training. These consequences greatly hinder a research program.

In addition to traditional research areas such as production efficiency, resource conservation, and crops and livestock, there are many new areas that require research such as environmental concerns, community services, community living standards, and human nutrition. Thus, many traditional research areas actually are receiving less funding today, because the total research funds are being spread among a wider range of research areas, some of which require considerable support.

With reduced budgets, much of the basic and long-term research efforts dwindle. Even worse, new opportunities, such as genetic engineering in plant or animal breeding (the new biology), do not receive attention due to the pressure to keep current projects active. For example, there is pressure to develop an insect-resistant sorghum during the next 3 years, rather than develop a whole new breeding system for sorghum.

It appears that the primary responsibility for this decline and low level of Federal research funding for agriculture has been USDA's. USDA leadership has not had much appreciation for the value of research and has not given it high priority (this is particularly likely to happen during a period of surpluses). To be sure, the Office of Management and Budget puts limits and pressure on all departments to stay within monetary budget levels, but departments have discretion within these limits to make priority adjustments within their departments. Up to 1980, the executive budgets have not shown the needed increases in agricultural research. As a general rule, Congress has appropriated the full requested budget level for agricultural research and in some cases has increased the level of USDA funding.

Although Federal funding of agricultural research has remained nearly static in constant dollars since 1965 and research on agricultural production has decreased, many other countries have had major increases in expenditures for agricultural research (see table 14, p. 162). Even as late as 1959, U.S. public expenditures for agricultural research were significantly greater than any of the countries or regions listed. This is not true today.

To view the data in the right perspective, one should keep in mind that most of the other countries probably badly needed an increased emphasis on agricultural research during the period surveyed, At the same time, the United States was still reaping broad benefits from a past era when research had received greater emphasis,

Since the productivity of agriculture and most industries relies heavily on research and new technologies, it is evident that if the United States is to remain the world leader in agriculture, a major change will be needed in the trend of expenditures in U.S. agricultural research.

What should be the extent of public investment in U.S. agricultural research? This question cannot be answered precisely. Evidence indicates, however, that it should be much higher than it is. The trend to relatively slight increases in agricultural research has resulted in actual decreases in most old-line agricultural research efforts. (The term "old-line research" refers to areas such as ways to increase productivity of animals or crops. Newer kinds of research that compete for the research dollar would include studies in areas such as environmental quality, energy from nonfossil fuel sources, etc.)

FUTURE SOURCE AND DISTRIBUTION OF FUNDS

From what source or sources should the funding for public-supported research come? There is little doubt that many States will continue to increase their investments in agricultural research, but the rate of increase will probably be less than needed. Some will fall behind; a few are already experiencing difficulties. There is ample evidence, based on beneficiaries and spillover effects of research, that from an equity standpoint the major source of funding should be the Federal Government.

The question also arises as to how agricultural research dollars funded by the Federal Government should be distributed. Again, there are no quantitative data to give precise answers. There are, however, past records and logic that can give some guidance. In the first place, USDA has the responsibility as the lead agency for the program and for working cooperatively with the State agricultural experiment stations (SAES) and other institutions. Since 1916, the relative amount of federally appropriated funds has averaged about 78 percent for USDA in-house research and 22 percent for the States in the form of formula and special grant funds. Since that system has served the United States well in the past, there appears to be no overriding rationale for a major change in this ratio.

Formula (Hatch) funds were first made available to the SAES on the basis that it was in the national interest to have a SAES in each State working on State and local problems. This need still exists, and now that we have a better knowledge of the beneficiaries and the spillover effects of research, the rationale for Federal funding is even greater today. Unlike research in many other fields, much agricultural research is site specific, simply because it is so closely related to the problems of a specific area. Hence there must be facilities and professional staff available for such research, none of which can be created or dissipated on short notice. Biological research must be long term and continuous to be effective. SAES are best equipped to manage the solution of local and State problems. Formula funding, therefore, which has been a continuing and secure source of funds, has been a mainstay in developing strong SAES. The need continues and will continue in the forseeable future.

Competitive grant funds are useful in providing flexibility in funding research areas that have high priority because of changing economic or other conditions or where new research indicates a greater effort has a high probability of being successful. These grant funds thus are concerned primarily with relatively short-term projects—i.e., 2 to 6 years (even though these may be on long-term problems). Another use of grant funds is to obtain expertise in certain research areas where it either is unavailable from the in-house staff or would not be desirable or efficient for in-house staff to conduct such research. All research institutions are eligible to compete for these grants, and the desirable level of funding for such grant research is probably best determined through experience. Unless some specific amount is set aside for grant funding, there may well be a tendency to contract for a less desirable level of research.

The SAES and the U.S. universities represent a tremendous resource—in physical facilities and in qualified personnel—for agricultural research and education. It is in the U.S. interest to use these resources in carrying out the national research effort wherever capability and mutual interest exist on specific objectives and programs.

CHAPTER IX REFERENCES

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