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Basic Research at State Stations

Twenty-two percent of federal-grant payments to state agricultural experiment stations support basic science.

H. C. Knoblauch

The state agricultural experiment stations, comprising a group of 53 state institutions, are conducting a broad and comprehensive program of research in phases of the life, physical, and social sciences related to agriculture. These stations, generally associated with land-grant colleges or state universities, have a long and successful history of research experience, and many of their findings have blazed new trails in basic fields of science. The federal government, recognizing the important part scientific research could play in solving farm problems, encouraged the establishment of state agricultural experiment stations and a continuing grant-in-aid program through passage of the Hatch Experiment Station Act of 1887. The program was further strengthened by subsequent passage of the Adams Act of 1906, the Purnell Act of 1925, the Bankhead-Jones Act of 1935, and the amendment to the Bankhead-Jones Act of 1946. Each of these provided for further endowment and increases in the federal-grant payments to states. In 1955, the five measures were combined by Congress into the Hatch Act Amended, which serves as the present authorization for grant-in-aid payments to the states.

In terms of the original goals for which the agricultural experiment stations were established, they have gone far beyond the most imaginative concept of their founders. The station system, as developed in the United

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Table 1. Analysis of federal-grant research by field of research. The percentage of basic research conducted in the various fields varies widely, the applied fields such as farm forestry, agricultural engineering, and agricultural meteorology all having less than 10 percent. The relative scope of the program in any one field may be determined by the total expenditures and the number of projects in that field.

Field	Projects		Expenditures			
	No.	Percent of total	Amount ($)	Percent of total	For basic research ($)	Percentage basic research
1. Forestry	91	1.7	309,033	1.2	19,179	6.2
2. Agricultural engineering	243	4.6	1,263,363	4.9	101,982	8.1
3. Meteorology	27	0.5	120,661	0.5	11,505	9.5
4. Agricultural economics	310	5.8	1,370,372	5.3	213,342	15.6
5. Veterinary science	232	4.4	1,343,568	5.2	234,883	17.5
6. Horticulture	435	8.2	1,582,106	6.1	288,256	18.2
7. Agronomy	629	11.9	3,097,789	12.0	575,713	18.6
8. Dairy husbandry	187	3.5	1,176,892	4.6	226,857	19.3
9. Animal husbandry	382	7.2	2,319,659	9.0	450,236	19.4
10. Entomology and zoology	380	7.2	1,523,417	5.9	323,550	21.2
11. Marketing	505	9.5	2,766,526	10.8	630,965	22.8
12. Soils	396	7.5	1,848,671	7.2	441,184	23.9
13. Food technology	228	4.3	1,155,924	4.5	292,444	25.3
14. Human nutrition and home economics	249	4.7	1,333,851	5.2	351,623	26.4
15. Rural life studies	106	2.0	448,745	1.7	120,781	26.9
16. Poultry husbandry	251	4.7	1,120,068	4.3	303,633	27.1
17. Botany and plant pathology	626	11.8	2,884,115	11.2	1,102,322	38.2
18. Agricultural chemistry	25	0.5	91,204	0.4	42,791	46.9
Total	5302	100.0	25,755,964	100.0	5,731,246	

States, has made tremendous contributions to science. Many of these have benefited not only agriculture but all mankind. Discoveries like streptomycin and Dicumarol, for example, while growing out of agricultural experiment station research, have advanced scientific progress in medicine.

The agricultural experiment stations provide a scientific service on many fronts. They pioneer in fields of study the usefulness of which may not be immediately apparent, but which may contribute to a broad advancement of knowledge. No matter how simple the problem brought to an experiment station may appear, the scientific finding of the answer often requires considerable basic research.

The federal government's research grants made to state experiment stations under the Hatch Act have for years served as incentives to the states to appropriate additional funds and to individuals and organizations to make private grants. Both federal and state monies can and should be used increasingly for problems requiring basic research. During fiscal year 1957, approximately 25 percent of the total support for research at the state agricultural experiment stations was derived from federal-grant payments under the amended Hatch Act. Both the state agricultural experiment stations, which administer and conduct the research under these funds, and the State Experiment Stations Division of the Agricultural Research Service, which administers the federal-grant program, have placed increasing emphasis on research aimed at basic problems in agriculture.

Surveys made during recent years indicate that the agricultural experiment stations devote a substantial amount of their resources to such research. In 1953–54, the National Science Foundation made a survey on the amount of funds used for basic research by the 53 agricultural experiment stations. The report, issued in 1957, showed expenditures for basic research as follows: 23 percent in the life sciences; 35 percent in the physical sciences; and 16 percent in the social sciences. The average total for experiment station funds for basic research was 23 percent of the total money available. The other 77 percent was reported to be earmarked for applied research—including a small amount for development (*1*).

A recent report on basic research in industry indicated that counting abstracts published by various industries gave a measure of the industry's effort in basic research (*2*).

Since 1951, the Department of Agriculture has reported annually to the Bureau of the Budget and to the National Science Foundation the estimated percentage of federal-grant funds going into basic and applied research and development.

Percentage figures may, of course, vary considerably, according to the definition of basic research used. To lend greater accuracy to the estimates of basic research performed with federal-grant funds, an analysis was made in 1958, on the basis of the definition developed by the National Science Foundation (*3*).

Table 2. Analysis of federal-grant research by major areas of research. This table combines the data given in Table 1 into five major areas, as follows: *Animal science*: animal husbandry, dairy husbandry, poultry husbandry, and veterinary science. *Economics and marketing, and related social sciences*: agricultural economics, marketing, and rural sociology. *Physical sciences*: agricultural chemistry, agricultural engineering, and meteorology. *Plant science*: entomology, field crops, forage crops, forestry, fruits and nuts, ornamental and drug plants, plant pathology, plant physiology, soils, vegetables, and weeds. *Utilization and home economics*: dairy technology, food science and technology, and home economics.

Area	Projects		Expenditures			
	No.	Percent of total	Amount ($)	Percent of total	For basic research ($)	Percentage basic research
Physical science	295	5.6	1,475,228	5.7	156,278	10.6
Utilization and home economics	477	9.0	2,489,775	9.7	644,067	25.9
Economics and marketing	921	17.4	4,585,643	17.8	965,088	21.0
Animal science	1052	19.8	5,960,187	23.1	1,215,609	20.4
Plant science	2557	48.2	11,245,131	43.7	2,750,204	24.5
Total	5302	100.0	$25,755,964	100.0	$5,731,246	

Analytical Study

Each of the 5302 federal-grant research projects in the files of the State Experiment Stations Division was studied. The study was undertaken by

33 specialists in the division, and in many cases two or more specialists made appraisals of specific projects and reports of progress in determining the amount of basic research involved.

Results

Figure 1 and Tables 1 and 2 present the results obtained from the analysis. The average for all stations for basic research was 22.3 percent, the range for the stations being from 3.2 to 46.1 percent. The relative ranking of each state is considered reliable, representing a composite rating of all fields by the several scientists who took part in the study.

It should be noted that the federal grants compose from less than 10 percent of the total funds available in some state stations to over 65 percent in others. A rather strong correlation exists between the level of nonfederal fund support and the amount of basic research supported by the federal-grant funds.

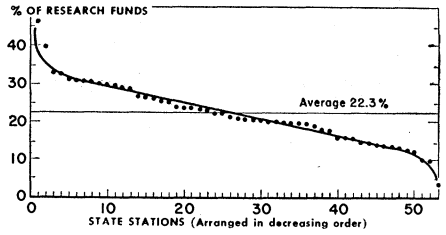

Fig. 1. Basic research in agriculture for fiscal year 1957 at the 53 state agricultural experiment stations, as estimated from an analysis of projects receiving federal-grant support. [U.S. Agricultural Research Service]

The sample of 5302 federal-grant experiment station projects can be considered representative of the total program of state station research, which, in 1957, involved an additional 6500 projects supported by state-appropriated and other funds. The total expenditures from federal-grant and nonfederal funds in 1957 were approximately $114 million. By applying the percentage figure obtained for basic research for projects supported by federal-grant funds to the total, it was found that the experiment stations used over $25 million of the funds available during the 1957 fiscal year for basic research (*4*).

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4. This article is an analysis of research undertaken at the state agricultural experiment stations with federal-grant support. It is adapted from an address presented before the Experiment Station Section of the American Association of Land-Grant Colleges and State Universities in Washington, D.C., 11 Nov. 1958.

Science in the News

Antarctic Treaty Signed by IGY Nations: Polar Region Established as Neutral Science Reserve

The United States and 11 other nations signed a treaty in Washington on 1 December which provides that Antarctica shall be used for peaceful purposes only and that the international scientific cooperation which characterized the 1957–58 International Geophysical Year shall continue. This is the first treaty in history to prohibit military operations and all forms of nuclear explosion in an entire continent, in this case an area of 5 million square miles, equal in size to the United States and Europe combined. This is also the first time that the Soviet Union has agreed to unrestricted inspection of an area as a guarantee of the enforcement of demilitarization provisions.

The importance of the treaty lies not only in what it covers but in what it implies. Many observers feel that it could set a precedent for an agreement about the use of outer space and for dealing with uninhabited and desert regions, including, for example, the moon. Newspaper editorials have pointed out that it might also set a precedent that would result in an easing of the U.S.S.R.'s concern about inspection of its lands in a disarmament arrangement.

Territorial Provisions and Membership

The treaty provides that all territorial and sovereignty claims, and the position of all governments regarding the recognition or nonrecognition of such claims, shall remain in *status quo* for the duration of the treaty. Seven of the 12 participants maintain that sections of Antarctica are parts of their homelands, and several of these claims overlap (see map on page 1643).

It was only a few years ago, in 1947–48, that Argentina and Chile were in bitter dispute with Britain over territorial rights in the Palmer Peninsula. Argentine and British naval vessels were even dispatched to the region. It was this crisis that led to an unsuccessful proposal by the United States in 1948 for an international agreement. Neither the United States nor the U.S.S.R. has attempted to establish claims in the Antarctic.

The new treaty is of indefinite duration, but after 30 years any party may call a conference for review and amendment. The pact is open to accession by other United Nations members and by such other states as may be agreed upon unanimously.

Thus, Communist China probably could not join, as it is not a U.N. member and its application for membership would probably be vetoed. But that would not prevent the Communist Chinese from sending a scientific expedition to the Antarctic if their intentions were peaceful. Of course, the treaty members would watch any such expedition carefully.