QUESTIONS AND ANSWERS ON AGRICULTURAL RESEARCH

In the U.S. Department of Agriculture and the State Agricultural Experiment Stations

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Questions and Answers
on AGRICULTURAL RESEARCH
in U.S. Department of Agriculture and
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AGRICULTURAL RESEARCH

Agricultural research in the United States has had a brief but surprisingly successful history. It represents a great, cooperative undertaking in which the Federal, State, Territorial, and county governments, private industry, farmers and farmer organizations, and private foundations are associated for a common purpose—to unearth new knowledge of benefit to agriculture and mankind. A close kinship exists between science and education. Contributions made by men of science from all Nations have benefited agriculture in the United States. This cooperative enterprise has been publicly financed to a considerable extent. Out of it have come many advances, such as mechanized agriculture, modern food processing, the discovery of vitamins, modern animal nutrition, and numerous lifesaving antibiotics, to mention but a few.

Agricultural research, beginning in an organized way with the establishment of the United States Department of Agriculture (USDA) in 1862, has developed through the years until today the State agricultural experiment stations and the USDA together constitute a large cooperative agricultural research organization, with a program designed to deal with problems of county, state, regional, territorial, national, and international significance.

Foreign visitors to the USDA ask many questions about the organization of agricultural research in the United States. So that visitors may have the information in written form for reference purposes, some of these questions and answers to them are presented in the following pages.

In its organizational sense, the term "agricultural research" means research carried on by the USDA and the State agricultural experiment stations. This publication, therefore, describes only that research which they conduct. The visitor should remember, however, that information of interest to the agricultural research worker is undertaken by and comes from many other public and private organizations.

The need for such widespread activity in agricultural research is inherent in the geography of the United States, including Alaska and Hawaii, and of Puerto Rico and the Virgin Islands. In the continental United States alone, around 5,500 known soil series are found on the 514 different types of farming areas. The number of soils is increasing with new surveys and classifications. The United States has five distinct climatic belts between the Atlantic and Pacific Oceans; and, from north to south, the climate ranges from arctic to tropical. Tremendous differences consequently exist in native vegetation and in the diversity of agricultural crops. Distances between producing areas and population centers also brings numerous marketing and distribution problems.

These many physical differences and consequent wide variations in agriculture are one basis for the dual structure of our publicly financed research. The other is the political organization of the United States. Through wide dispersal of Federal and State research establishments, science is brought close to farmers (see map, pp. 14 and 15). In each area, needs of farmers, marketing agencies, and consumers are thus readily determined. This has been particularly valuable in meeting the diversified problems that arise because of the great variations in farming
patterns in the United States. For example, corn and hog production is centered in the Middle West; wheat production is concentrated in the Great Plains States and the Pacific Northwest; cotton is grown in the Southern and Southwestern States; citrus fruits are produced mostly in California, Texas, and Florida; and though beef cattle production is centered in the Great Plains and Prairie Belt States, it is expanding in the Southeast.

Such broad diversity of agriculture explains the need for the cooperative research effort between the USDA and the States. Every field of cooperative agricultural research has made tremendous contributions to the technology of American farming. Foreign countries, too, have aided this research. The United States has drawn heavily on introduced plants and animals from foreign lands to supply valuable germ plasm for improving the crops and animals of this country.

Through exchange of information, results of agricultural research, here and in other countries, are made mutually available. Such information thus finds its way to the farthest corners of the world. This information exchange is currently being fostered through the technical consultation, assistance, and training programs conducted cooperatively by the USDA and the International Cooperation Administration, as well as other international and public and private agencies.
QUESTIONS AND ANSWERS ON AGRICULTURAL RESEARCH

What is the historical development of Federal-State cooperation (land-grant colleges and State universities, State experiment stations, cooperative Extension Service, and the USDA)?

In 1862, the Congress of the United States created what is now the United States Department of Agriculture (USDA). This Federal agency was directed to acquire and diffuse useful information on subjects connected with agriculture in the most general and comprehensive sense of the word. That same year Congress also passed the Land-Grant College Act, donating public lands to the several States and Territories in order to provide colleges for the benefit of agriculture and the mechanic arts.

In 1887, the Congress of the United States passed the Hatch Experiment Station Act, which provided for the establishment of an agricultural experiment station in connection with the land-grant institutions of each State and Territory. This foundation stone for the close cooperation and working relationship between State and Federal agricultural research resulted in the ultimate establishment of experiment stations in each State and in Puerto Rico and the Virgin Islands. The State stations are responsible only to their State, Commonwealth, or Territorial authorities, yet they are closely associated with the USDA.

In 1914, the Congress of the United States passed the Smith-Lever Act, which established the cooperative Extension Service as a means of carrying or extending to American farms and farmers information and findings from the land-grant colleges and universities and Federal-State agricultural experiment stations.

This publicly sponsored establishment of cooperation, linked closely through State and Federal legislation and even more closely through the kinship of related disciplines, has contributed immensely to the technological progress of farming and to the welfare of mankind.

What are the basic administrative problems of Federal-State agricultural research establishments in the United States? How do farmers' problems come to the attention of research personnel? How are they handled? How are agricultural research results made known?

Meeting the needs of the extensive research required in the Federal- and State-financed establishments raises some problems, such as: How to meet the most urgent needs in the various geographic areas in the different political divisions of the country; how to group the many different types of research undertakings to get results without waste of effort and duplication; how to establish close liaison and cooperative working relationships among the various institutions and individuals engaged in agricultural research; how to finance the required research and obtain competent and adequately trained scientific personnel; and how to provide wide dissemination of (a) the scientific information needed by the scientists engaged in research and (b) the results growing out of the research beneficial to farmers and the general public.

To understand how these problems are handled, it should be pointed out that State experiment stations are primarily concerned with the solution of problems of importance to the welfare of farmers and other people within the States. Solutions of problems that are national in scope or problems that cannot be solved by the individual States are carried on by the Federal Government, often in close cooperation with individual States or the experiment stations of several States. Regional problems usually are the subject of cooperation between the stations of the region and the USDA.
The demand for adequately trained scientific personnel is being met by the land-grant colleges and State universities. Although the organization of these institutions varies considerably, each includes three major services to agriculture. One of these is classroom education, which provides both undergraduate and graduate studies in science for preparing personnel to engage in farming, research, and other technical occupations. The second is research. Although this is done in various subject-matter departments, such as soils, agronomy, and pathology, the overall responsibility for agricultural research in each station is centered in a single administrator, the State experiment station director. The third basic service is cooperative extension work.

When serious production problems confront farmers, they usually make their needs known to their county agricultural agent, who is an employee of the Federal-State cooperative Extension Service. The State extension service then asks its experiment station and the USDA to put their scientific resources to work on the problems. Most stations have advisory committees and boards that bring problems to the station directors. Under the regional program, there are technical advisory committees, made up of specialists from participating State experiment stations and agencies of the USDA. On the national basis, there are advisory committees and an overall Agricultural Research Policy Committee. Farm organizations and numerous farmer production groups are also close cooperators with the land-grant institutions and the USDA.

Results from agricultural research are made known in a number of ways. The institutions carrying on research issue both technical and popular bulletins and reports. Publications in the official and technical press constitute the firm core of basic information. Dissemination of new results is far more widespread through such mass media as farm magazines, newspapers, radio, television, through the schools and colleges, and through the beyond-the-classroom educational programs that the cooperative Extension Service carries on in rural communities. The close association between research and extension work, both in the USDA and at the land-grant colleges and universities, is a factor that has played an important part in motivating farm people to adopt new farm practices developed through agricultural research.

How is agricultural research financed in the United States?

Federal research is financed by funds appropriated annually by the Congress of the United States. The Hatch Experiment Station Act of 1887 authorized an annual Federal grant of funds for the partial support of the State stations. Through the years, the Adams, Purnell, Bankhead-Jones, Research and Marketing Acts, and certain other supplementary acts have successively provided funds for increasing the scope of agricultural research, at both the State and Federal levels, to meet the growing needs of the American farmers in a rapidly expanding economy. In 1955, the Hatch Act and supplementary acts were consolidated into Public Law 352, which now serves as the authority for all Federal-grant payments to experiment stations. The State legislatures, also, have encouraged and supported research by consistently appropriating funds for the solution of agricultural problems within their respective States. The individual State stations also receive financial grants from many private institutions for work in agricultural research.

Federal appropriations for agricultural research during the fiscal year 1959–60 total approximately $123,637,000, of which $91,833,000 is available for direct research by USDA agencies and $31,804,000 to State agricultural experiment stations as Federal-grant funds. The States provide approximately $114,000,000, which averages about $3.50 for each $1 received from Federal grants. These Federal and State appropriations total $237,637,000 in public funds currently being spent on agricultural research. The amount of private research is estimated at $150,000,000.

In some cases, projects in which the USDA is engaged are financed in part by allotments of funds from other Federal agencies or by funds made available by private cooperators. Most research divisions cooperate with organizations of producers in their respective fields. In only a few cases does the cooperator actually turn over money to the USDA; usually the cooperator and the USDA each use their respective funds in conducting a program under a joint memorandum of understanding.

Extension work in the individual States is fi-
nanced cooperatively by Federal, State, and county governments; however, the greater part of the financing is provided by the county and State governments.

**How many Federal and State agricultural experiment stations are there in the United States?**

The State experiment stations are responsible for scientific operations and research at more than 500 centers, which include the main stations and outlying laboratories and farms. The USDA carries on research at almost 600 field locations in the United States and its territories. This number includes the Federal field stations and laboratories it operates and the State experiment stations at which USDA undertakes cooperative work. These locations do not include private agencies who conduct research under contract with the USDA.

**How many scientific people are employed in research by USDA? By the States? By private organizations?**

The USDA has approximately 4,800 full-time professional scientists engaged in research. The States have about 8,400 scientific personnel, some of whom are engaged part time in research and part time in teaching and extension work at the land-grant colleges and universities. The USDA and the States also employ many other persons in work related to research, such as subprofessional and supporting administrative personnel.

A large number of persons are also engaged in private agricultural research. These include scientists employed by farmer groups, industry, commercial interests, and those supported by some 55 foundations organized on a nonprofit basis to conduct or aid agricultural research.

**How is the USDA organized?**

The Secretary of Agriculture is responsible for the administration of the numerous functions and authorities assigned to the USDA by law, and for advising the President of the United States on Federal policy and programs affecting agriculture. He is directly assisted by the Under Secretary.

The USDA is organized into various service and administrative agencies, which are divided into six major groups. Each group is headed by an Assistant Secretary or other designated official who is responsible for the interpretation and execution of agricultural policies pertaining to his group. The agencies of the USDA and their group heads are:

- **Marketing and Foreign Agriculture**, Assistant Secretary: Agricultural Marketing Service, Commodity Exchange Authority, and Foreign Agricultural Service.
- **Agricultural Stabilization**, Assistant Secretary: Commodity Credit Corporation, Commodity Stabilization Service, and Federal Crop Insurance Corporation.
- **Agricultural Credit Services**, Director: Farmers Home Administration and Rural Electrification Administration.
- **Office of the General Counsel**, General Counsel: (The General Counsel is the chief law officer of the USDA.)

A simplified chart of the USDA organization is presented in figure 1, page 26.

**How is agricultural research organized in the USDA and in the States?**

The agencies of the USDA engaged in research are the Agricultural Research Service, Agricultural Marketing Service, Forest Service, Farmer Cooperative Service, Foreign Agricultural Service, and some others to a lesser degree. These agencies conduct comprehensive research in farm
management, soil and water conservation and management, crop and livestock production, entomology, plant and animal diseases, forestry, agricultural engineering, agricultural economics, processing and utilization of agricultural products, marketing (including both domestic and foreign markets), cooperative organizations, and home economics. While research is conducted in several agencies, overall coordinating responsibility is vested in the Office of the Administrator, Agricultural Research Service.

The research coordination in the USDA is diagrammed in figure 2 (p. 27) and the organization of ARS in figure 3 (p. 28).

In the fields listed, the USDA cooperates closely with the State experiment stations, and one of its responsibilities is to administer the Federal-grant funds made available to the States by the Congress. In marketing research, the USDA also maintains cooperation with marketing agencies and State departments of agriculture. The USDA conducts about 85 percent of the Nation's research in forest production and marketing. Forestry research, in addition to being carried on at a national laboratory and many decentralized research centers and experimental forests and ranges, also involves cooperation with various private agencies and State schools of forestry. More detailed information concerning the USDA agencies that conduct major research is given under other paragraphs of this publication.

The agricultural experiment stations in the States and Territories conduct research in varying degrees of emphasis in the physical, biological, chemical, engineering, economic, and other social sciences. Each station is attached to a land-grant college or State university and has a Director who conducts and administers the agricultural research program within his State and aids in the leadership of regional programs. Research projects in the USDA and in the State experiment stations are coordinated through central project offices in the State Experiment Stations Division of ARS and in the Office of the Administrator of ARS.

What is the relationship between the USDA and the State agricultural experiment stations?

Do State stations have a role in the programs of the USDA's regional laboratories?

Of other USDA field stations?

The USDA carries on extensive cooperation with the State agricultural experiment stations. These stations are responsible to the people of their respective States. They maintain close contact with their people and are in a position at all times to recognize and study the needs of agricultural producers, marketing agencies, and consumers.

Frequently, The USDA and a State agricultural experiment station are both interested in solving a particular problem. Usually the USDA is concerned because of broad regional or national interests; the State station is interested because of needs within the State. In such cases—and there are hundreds of them—representatives of the two agencies meet and decide on what part of the total research job each will undertake. On the basis of these discussions, a formal document is prepared and signed by both parties. Several agencies of USDA and any number of State agricultural experiment stations may join in a single cooperative undertaking to solve a problem of such scope that it extends over a considerable part of the country or into more than one subject-matter field of agricultural science.

The hybrid corn breeding program is an example of how the USDA and the State stations work together. The earliest work done on hybrid corn was in 1917 at one of the State experiment stations. In 1925, corn breeders in 12 States and the USDA decided to combine their efforts so that each State could reap the benefits of work done in other States. This program has made possible the fullest use of all information on hybrid corn. The phenomenal spread of hybrid corn in the United States is largely a result of the cooperative research program.

Another large-scale cooperative undertaking was made possible by the Bankhead-Jones Act of 1935, which provided for the establishment of regional research laboratories to mobilize scientific resources for a fundamental attack on some of the more important regional problems. The USDA regional research laboratories engaged in farm research and their locations are as follows:

Animal Disease Laboratory, Auburn, Ala.
Pasture Research Laboratory, State College, Pa.
Plant, Soil, and Nutrition Laboratory, Ithaca, N.Y.
Poultry Research Laboratory, East Lansing, Mich.
Salinity Laboratory, Riverside, Calif.
Sheep Breeding Laboratory, Dubois, Idaho
Soybean Laboratory, Urbana, Ill.
Swine Breeding Laboratory, Ames, Iowa
Vegetable Breeding Laboratory, Charleston, S.C.

These regional research laboratories are administered by the Agricultural Research Service. Each laboratory deals with a problem, or group of closely related problems, selected in cooperation with the State agricultural experiment stations of the region concerned. In addition to a special leader for the program, a group of collaborators from the State and Federal agencies acts as a scientific advisory board for the project. This board usually meets at least once a year to review progress and to make additional or revised plans for the following year's work. Although the research program of each laboratory is carried out on a regional basis, the subjects under investigation often are important to all major agricultural regions. The results obtained by the laboratories contribute to agriculture throughout the Nation.

Further impetus to regional research was brought about by the Research and Marketing Act of 1946. The act provides means by which regional committees of State and Federal agriculturists can meet to plan, recommend, organize, and carry out joint research projects of a regional nature.

The Utilization Research and Development Divisions are also located in each of the four principal regions of the United States, primarily for the purpose of finding new uses for the commodities of their regions (see p. 12). They may or may not have formal cooperative agreements with the State experiment stations. Each Division laboratory has an Agricultural Experiment Stations Relations Committee, composed of the directors of the State stations in the region and a director of a Utilization Research and Development Division Laboratory. This committee meets each year to review the work at the laboratory and to discuss matters of policy. Periodic meetings of technical representatives of the State experiment stations are also held at the Division laboratory. These meetings permit informal exchange of views and technical information between the laboratory and the experiment station personnel.

Most research at the Federal field stations is conducted in cooperation with State experiment stations, sometimes only with the station in the State where the Federal station is located, and sometimes with other stations in neighboring States that have an interest in the problem. To understand the relationship between the State stations and the USDA, it is necessary to remember that the Federal Government was formed by and at the direction of the independent States. The pattern of our research organization is a reflection of our political organization, in that the USDA undertakes primarily those problems which the States cannot solve for themselves. This pattern of cooperation has been developed voluntarily over the past 70 years. Cooperation with the State stations recognizes the autonomy of the States and their institutions. Insofar as possible, all points where differences might arise are covered by written agreements covering financial responsibility of each party, use of facilities, number of personnel, and other administrative and management matters.

**What steps are taken to coordinate research or to avoid duplication of research at the various Federal laboratories and field stations and State agricultural experiment stations?**

Coordination of Department research is accomplished by a system of project review wherein each project is reviewed, prior to approval, by all Department agencies having a related interest or responsibility. Such projects are also reviewed by staff members of the State Agricultural Experiment Stations Division, ARS, who are familiar with similar research at the State agricultural experiment stations. Reviewing agencies consider whether proposed projects involve any unnecessary overlapping or duplication of work and whether adequate provision has been made for consultation or cooperation on problems of mutual concern.

Research projects of the State agricultural experiment stations that are financed by Federal-grant funds are initiated by the stations themselves, but they are coordinated and approved by the State Experiment Stations Division, ARS.

A central file of all current USDA research projects is maintained in the Central Project Office of the ARS Administrator's Office. Each current research project in the file contains information on the nature and purpose of the work and is avail-
able to all who have responsibility for the conduct or administration of agricultural research. A similar informational file on all current Federal-grant-fund research projects is maintained by the State Experiment Stations Division, ARS.

Who may propose research work for the USDA and the States? How are priorities established? Who finally determines the selection of research projects?

Most research in the USDA, both fundamental and applied, originates in problems faced by the people of the United States. Some of these problems are of an emergency nature, such as an animal disease outbreak or a crop insect infestation. Others are not of an immediate emergency nature, but are important for the welfare of large groups of people and for the economy of our country. Examples of this type of research are studies on the composition of milk or cotton, or on the improvement of livestock. Even such basic research as that on the composition of cotton is directly related to the problems of the cotton grower, the processor, and the marketing organizations, as well as the consuming public. Problems that finally become research projects in the USDA may come from individual farmers, county and other extension workers, farmer cooperatives, processors, marketing agencies, industrial committees, or other civic groups. The problems may reach the USDA directly or through its field employees, commodity and functional advisory committees, land-grant colleges and State universities, farm directors of radio, TV, and press, or Members of the U.S. Congress.

Under provisions of Title III of the Research and Marketing Act of 1946, the Secretary has established an Agricultural Research Policy Committee and 24 Committees that are active in advising the Department on research and marketing programs. Representatives of producers, industry, State and Federal Governments, and science make up the membership. The Research Advisory committees for 1960–61 are:

- Economics
- Farm Equipment and Structures
- Food and Nutrition
- Forestry
- Home Economics
- Refrigerated and Frozen Products
- Soils, Water, and Fertilizer
- Transportation

The Research and Marketing Advisory Committees for 1960–61 are:

- Citrus and Subtropical Fruit
- Cotton and Cottonseed
- Dairy
- Deciduous Fruit and Tree Nut
- Food Distribution
- Grain
- Livestock
- Oilseeds and Peanut
- Potato
- Poultry
- Rice
- Seed, Feed, and Forage
- Sheep and Wool
- Sugar
- Tobacco
- Vegetable

Research projects that require new or additional funds are included in the proposed budgets of the subject-matter agencies concerned. After passing through administrative review in the USDA and the Budget Bureau, the overall budget is presented to Congress for appropriation of funds. The Congress usually appropriates funds for broad lines of work, such as research on insects. Specific projects written within the framework of the broad lines are developed and recommended by the subject-matter agency and approved by a research director or other official to whom approval authority has been delegated by the ARS Administrator. In recommending and approving such projects, USDA officials are instructed to give particular consideration to (1) their relation to other research in USDA and at the State experiment stations, (2) their likelihood of producing results, and (3) their scientific merit.

State experiment station research originates in much the same way as does Federal research. Major problems encountered by farmers, extension workers, rural communities, and local processing or marketing agencies are brought to the experiment station. The station director, in consultation with his technical and scientific staff, determines priority. Station projects may be carried on under State funds, private endowment, or Federal-grant funds. All Federal-grant fund projects are reviewed and approved by the State Experiment Stations Division, ARS, as required by Federal law governing use of such funds.
How are new varieties of plants and animals developed through research so as to benefit farmers? What steps are taken to prevent their exploitation and sale at exorbitant prices?

Promising strains of plants developed in cooperative breeding work by the USDA and the States are evaluated in field tests at many locations. Strains resulting from crosses or plant combinations by State or Federal breeders also may be tested under various climatic and soil conditions to determine their adaptability.

Once tests have indicated the superiority of a particular selection over existing varieties, experimental stations planning to release the selection for production arrange for increasing the seed in quantities sufficient to furnish supplies to crop improvement associations. At this time the new variety is officially named. The crop improvement associations are made up of outstanding farmers who are especially equipped to produce the seed under conditions that will insure its genetic purity. Association members build up commercial stocks of the seeds or plants and place them on the market for purchase by farmers and other growers. Essentially the same system is followed in the release of nursery stocks, although the increase may be made vegetatively by cuttings from planting stocks released to nurserymen equipped to make such increases. Generally, new varieties of crop plants are adapted to more than one State, in which case the foundation seeds are released to all appropriate States at the same time. Hence, when the seeds reach the commercial stage, they are available in a wide area and are in the hands of a number of commercial producers. Crop improvement associations are so organized that prices are controlled to the extent that the commercial seed producers get a reasonable profit for the extra care and work needed to produce the foundation seed, but not an exorbitant profit.

In some respects, the process for getting improved animals into production on the farms is similar to that for crop plants. The USDA develops a desirable strain of livestock or poultry and furnishes breeding stock or hatching eggs to the State experiment stations or—usually through the stations—to interested livestock breeders and producers. Because of the long time required to increase the number of animals of new strains for distribution to breeders, the USDA now places some of the surplus directly with breeders and producers.

What is the Agricultural Research Service? How is it organized? What are the functions of its constituent divisions? Do they cooperate on research problems or is each operated independently?

AGRICULTURAL RESEARCH SERVICE

The Agricultural Research Service (ARS) is the primary agency of the USDA engaged in agricultural research. This agency was established in 1942 as the Agricultural Research Administration, to consolidate most of the physical, biological, chemical, and engineering research in the Department. In the reorganization of 1954, when it was renamed ARS, research in farm economics was also included in its activities. On February 21, 1957, the organizational pattern, functions, and authorities of ARS were reassessed and adjusted to achieve the following primary objectives: (1) To provide recognition of the expanded interest in and importance of utilization research; (2) to provide organizational recognition in proportion to the current significance of the USDA’s overall objectives; and (3) to provide an organizational pattern more comparable to those of similar units in the USDA. This organization was specifically designed to carry out the functions and authorities delegated to the ARS Administrator through the Assistant Secretary for Federal-States Relations.

The readjustment resulted in the following essential changes:

Research programs were grouped according to similarity of scientific disciplines, relationships, and joint interest in areas of basic research to permit closer coordination in planning and executing both basic and applied research. Various research and regulatory divisions and branches, other than those concerned with home economics, were grouped into four organizational units covering (a) Utilization Research and Development, (b) Farm Research, (c) Regulatory Programs, and (d) Experiment Stations. Each of the four groups reports to a Deputy Administrator.
The establishment of a fifth group, the Institute of Home Economics, which reports directly to the Administrator.

Provision was made for increased emphasis on basic research.

**Functions of the Agricultural Research Service.** The ARS is responsible for:

1. Coordination of all research activities of the USDA.
2. The following research programs: Farm and utilization (except forestry) research; farm management and costs, land economics, and agricultural finance; economic aspects of farm labor ordinarily associated with farm management problems; soil conservation, except the national soil survey; control of undesirable plants; grass and range management, except on forest and related ranges (the term "forest" includes woodlands and brush-covered wildlands in mountainous areas); cotton ginning and processing; and certain research under the Housing Act of 1949.
3. The research investigations, inspections, experimentations, demonstrations, development work, service and regulatory work, control and eradication of insect, plant, and animal pests and diseases provided for in the Department of Agriculture Appropriation Act of 1954 (except forest pests and diseases, and research on off-farm handling, transportation and storage of agricultural products, including investigations of insect infestations of off-farm stored products); inspection, certification, and identification of foods for dogs, cats, and other Carnivora; inspection and certification service of animal byproducts not for use as human food; identification and certification (export) of federally inspected meat, meat byproducts, and meat food products.
5. Administration of the provisions of section 408 (1) of the Federal Food, Drug, and Cosmetic Act, as added by section 3 of the Miller Act of July 22, 1954, providing for certification with respect to certain pesticide chemicals for which tolerances or exemptions are sought.
6. The emergency eradication activities relating to contagious diseases of animals and poultry.
9. The program of payments to States and Puerto Rico under the Hatch Act of March 2, 1887, as amended (including the consolidation amendment in P.L. 352 (84th Congress)), and supplemental and related acts, and payments to State experiment stations under section 204(b) of the Agricultural Marketing Act of 1946.
10. Administration of Title III of the Research and Marketing Act, including responsibilities, functions, and operations of national advisory committees.
11. All administrative functions on behalf of the Secretary relating to the acquisition and administration of patent rights.
12. Administration of responsibilities delegated to the Secretary, effective September 8, 1954, pursuant to section 201(b) of the Federal Civil Defense Act of 1950 (64 Stat. 1248), by the Federal Civil Defense Administrator, which involves planning a national program and directing Federal activities concerned with research, diagnosis, strengthening of defensive barriers, and control and eradication of diseases, pests, or chemicals introduced as agents of biological or chemical warfare against animals or crops.
13. The use, administration, and disposition under Title III of the Bankhead-Jones Farm Tenant Act and the related provisions of Title IV thereof of lands which heretofore have been transferred or which hereafter may be transferred by agreement between the interested agencies with the approval of the Assistant Secretary.
14. Development and negotiation of foreign contracts and grants program under sections 104 (a) and (k) of Public Law 480.

The functions of ARS do not include work on forest pests and diseases. This phase of work is the responsibility of the Forest Service of USDA. ARS also does not have responsibility for research on off-farm handling, transportation, and storage of agricultural products, including investigations of insect infestations of off-farm stored products. This is specifically a function of the Agricultural Marketing Service of USDA.
Reservations. Final action in proceedings pursuant to section 7 and 8 of the Administrative Procedure Act, except orders in rule-making proceedings under the Hog Cholera Serum and Virus Marketing Agreement Act, is reserved to the Judicial Officer. The following are reserved to the Secretary:

1. Final action on regulations under the Hog Cholera Serum and Virus Marketing Agreement Act, previously requiring approval of the President.
2. The issuance, amendment, termination, or suspension of any marketing agreement or order or any provision thereof.
3. Designation of members of advisory committees under Title III of the Research and Marketing Act.
4. Determination as to the measure and character of cooperation with Mexico in the foot-and-mouth disease program pursuant to section 1 of the Act of February 28, 1947, the designation of members of advisory committees, and the appointment of commissioners on any joint commission with the Government of Mexico set up under such program.
5. Approval of requests for appointment of reserves for emergency outbreaks of insect pests and plant diseases.

Publicly supported agricultural research conducted in the United States includes: (1) Work done at State and Territorial stations financed by Federal grants and administered locally with overall statutory responsibility for use of funds vested in the State Experiment Stations Division of ARS; (2) work done by and administered by the Territorial Experiment Stations Division of ARS in Alaska, Puerto Rico, and the Virgin Islands; (3) work done by and administered by the various research divisions in the Utilization Research groups; (4) work done by agencies in the USDA other than ARS but coordinated by ARS; (5) contract research financed from Federal funds and executed by private and public institutions and industrial concerns having unique and singular facilities and skills not otherwise immediately available to the USDA; and (6) work done at State and Territorial stations financed under State and Territorial appropriations.

Increasing contributions to basic and applied research are being made by private industries, foundations, and other institutions. USDA research workers maintain close informal relationships with private research workers through literature, correspondence, scientific meetings, and conferences.

**ORGANIZATION OF RESEARCH DIVISIONS AND REGULATORY PROGRAMS IN ARS**

The research divisions and regulatory programs within ARS are distinct functional and administrative units, but their work is subject to coordination by the ARS Administrator (see fig. 3). Cooperation between divisions is encouraged. Research that falls within the province of two or more divisions is usually conducted cooperatively by the divisions concerned. For example, research on forage crop improvement might include work by the Crops Research Division on the breeding of more productive forage plants, the Animal Husbandry Research Division on the feeding value of different forage plants, and the Farm Economics Research Division on the economics of forage improvement on farm and ranch units. Cooperative research is also common between Utilization Research and Development, Farm Research, Institute of Home Economics, Regulatory Programs, and Experiment Stations.

An example of inter-program research is the joint project to find new drugs by Farm Research and Utilization Research and Development. Plant explorers are sent to all parts of the world by Farm Research to seek plant materials having potential value as sources for new drugs. The plant materials collected are screened by chemists in the Utilization Research and Development laboratories for certain properties indicating potential value. The materials showing promise are then analyzed by pharmacology specialists in the National Institutes of Health of the Department of Health, Education, and Welfare at Bethesda, Md. Cooperative research of this nature with organizations outside of ARS is quite common—sometimes it involves formal arrangements such as memorandums of understanding and contracts, and sometimes only informal collaboration.

**Pioneering Research Laboratories** have been set up in the research divisions for fundamental research on: Interfirm integration in farming; mineral nutrition; plant physiology; plant virology;
insect pathology; insect physiology; blood antigens; basic animal genetics; microbiological chemistry; chemistry of animal proteins; allergens in agricultural products; plant fibers; seed proteins; plant enzymes; and cellular metabolism. These laboratories are staffed by scientists whose main objective is to follow all possible leads in an effort to find new information of a basic and fundamental nature in areas in which knowledge is incomplete or lacking.

UTILIZATION RESEARCH AND DEVELOPMENT

A Deputy Administrator is responsible for the proper administration of four research divisions concerned with problems related to finding new or improved methods of utilizing agricultural materials, wastes, and byproducts by seeking to develop new and improved products from agricultural commodities; to finding better commercial methods for preserving foods and feeds; and to increasing the use of farm crops and byproducts as industrial raw materials. Each division works primarily on the major crops of its region. Four large laboratories and 10 smaller field research stations are under the direction of the regional divisions of their areas.

Eastern Utilization Research and Development Division, with headquarters at Philadelphia (Wyndmoor), Pa., conducts research and development work on utilization problems of concern to agriculture and industry in the eastern region of the United States. The Division works with apples and other eastern deciduous fruits, potatoes and other vegetables, tobacco, dairy waste products, animal fats and oils, hides, tanning materials and leather, honey, maple products, wool byproducts, plant steroids, and biologically active chemical compounds in relation to agricultural commodities; and conducts research on the preservation of dairy and meat products and on the chemical and immunochemical nature of allergens of agricultural products.

Northern Utilization Research and Development Division, with headquarters at Peoria, Ill., works with corn, wheat, and other cereal crops; soybeans and other oilseed crops; and agricultural residues, such as straw, corn cobs, hulls, husks, and the like.

Southern Utilization Research and Development Division, with headquarters at New Orleans, La., and Winter Haven, Fla., Weslaco, Tex., and Bogalusa, La., works with cotton, rice, sweetpotatoes, cucumbers, sugarcane, tung oil, peanuts and other oilseeds, citrus products, and naval stores such as pine gum, turpentine, and rosin.

Western Utilization Research and Development Division, with headquarters at Albany, Calif., with field stations at Pasadena, Calif., and Puyallup and Pullman, Wash., works with alfalfa and other forage crops, wheat, deciduous and citrus fruits, vegetables, poultry, eggs, rice, wool, mohair, sugar beets, and dried beans and peas.

Product and Process Evaluation Staff, with headquarters in Washington, D.C., provides counsel and advisory assistance of a staff nature to the Deputy Administrator in the evaluation of industrial practicability and market potential of products or processes that might be developed as a result of research by the Utilization Research and Development Divisions.

FARM RESEARCH

A Deputy Administrator is responsible for the proper administration of several research divisions concerned with problems in agricultural engineering, animal disease and parasites, animal husbandry, crops, entomology, farm economics, and soil and water conservation.

The Agricultural Engineering Research Division conducts a national research program and related functions on the efficient use of power, labor, machines, and materials in farming. It deals with problems of storage, transportation, and housing of general and specialized farms, mechanical operations of insect control, and other environmental factors affecting the growing and storing of farm products and the influence of environment on the health and production of farm animals, as well as the housing of the farm family. Studies are directed toward improving farm machinery and equipment for the many farm production operations, improving and developing methods of conditioning hay and grain, cotton ginning and packing, and preparation of various other crops for use on the farm or for sale. Research also is done on development of income-producing uses of electricity on the farm, including power, light, and other forms of electric radiation. Studies in farm structures have the aim of improving the design of farm storages and service buildings for efficient operation, strength, and economy in materials and construction; those in
animal housing involve the environmental factors that may affect the health and production of the animals. Farm housing research of the Division involves the engineering phases of the design and planning of more livable farm homes.

The Animal Disease and Parasite Research Division directs a national research program and related functions on diseases and parasites that affect domestic animals, fur-bearing animals raised in captivity, and poultry. It seeks to learn how infectious diseases and harmful parasites are transmitted, and to develop improved methods for their diagnosis, prevention, eradication, or control.

The Animal Husbandry Research Division directs a national research program and related functions on animal husbandry. The Division is concerned with the development of better livestock, poultry, and domestic fur animals through improved breeding, feeding, and management.

It conducts research in the breeding, feeding, nutrition, and management of dairy cattle, and in the physiology of milk secretion and of reproduction, with a view to developing more efficient dairy herds and lowering the cost of milk production. It supervises the national cooperative Dairy Herd Improvement Program designed to aid the dairy farmer.

It studies the effect of feeding and nutrition variations on animal and poultry, seeking better feeds, feeding methods, and nutrition. It studies the effect of breeding, feeding, management, age, sex, and processing methods on the quality and usefulness of animal and poultry products. It supervises national plans for improving production and breeding qualities of chickens and turkeys and reducing their mortality.

The Crops Research Division is concerned chiefly with improving the yield and quality and reducing the hazards of production of the following field and horticultural crops: Cereal, cotton and cordage fiber, forage and range, fruit and nut, oilseed and industrial, tobacco and sugar, and vegetable and ornamental. Attention is also given to introduction and development of new or specialized crops. Its research is aimed at developing varieties of crops with higher yields, better quality, and resistance to diseases, nematodes, insects, heat and cold, and drought. It also investigates the use of cultivation, competitive crops, pasturage, herbicides, and other means for brush and weed control in cultivated crops, pastures, and range lands. It conducts research on production practices of crops, including reseeding, fertilization, and grazing management of pastures and ranges. It introduces, tests and maintains seeds and plants of promising species from foreign countries for possible domestic use and for genetic improvement of crops now grown. It directs activities of the National Arboretum for research and education concerning tree and plant life. It studies chemicals used in crop production such as those used for treatment of cuttings to stimulate root formation; for prevention of preharvest fruit drops; for blossom thinning; for quick ripening; for better flavor and nutrition; and for the control or elimination of undesirable plants, nematodes, and disease-causing organisms. Fundamental research conducted by this Division includes modes of inheritance of desirable plant traits and studies of pathology, ecology, physiology, morphology, and cytology of the plants in the interest of obtaining an adequate understanding of transmission of desirable characters, disease control, and relations between environment, cultivation, yield, and quality.

The Entomology Research Division conducts a national research program and related functions on insects (except those affecting forests and stored products) with a view to developing practical methods for destroying the harmful ones and promoting the increase and spread of the beneficial ones, including honey bees. Its insecticide research includes the development of new insecticides and improved methods and equipment for their application, and seeks the answer to such puzzles as insect resistance to insecticides. Biological, cultural, varietal resistance, and other methods of control are examined. The Division conducts research in foreign countries to locate natural enemies of insect pests and noxious weeds that occur in the United States, and imports desirable species. Its personnel study insects that destroy or damage fruit, vegetable, feed, forage, and fiber crops and those that annoy or affect the health of man and animals, including pests that infest human habitations; classify and identify insects; and seek to develop methods, equipment, and apparatus to aid in enforcing plant quarantines and eradication or control of insect pests and plant diseases.

The Farm Economics Research Division conducts a national program of research and related functions on farm economics. It develops information on the potentialities, limitations, and
This is a reprint of the map included in Miscellaneous Publication No. 779, "The Research Program of USDA: Organization, Coordination, Nature, Location" issued November 1958.

This map, which shows only locations and comparative size of research activities at each location, was designed primarily as a "locations guide" in MP No. 779. Reference to that publication is suggested for a wealth of information about the Departmental organization for research; development and coordination of research programs and projects; and the nature, purposes, and locations of the 2,900 separate research projects included in the programs of Farm Research, Utilization Research and Development, Home Economics Research, Marketing Research and Statistics, Farmer Cooperative Service Research, Foreign Agricultural Service Research, and Forest Research.
Large numerals in States and small numerals associated with place names are used in this report to refer to respective States and places. For example, 17-10 means Florida, Orlando; 45-4 means Utah, Salt Lake City.

Symbols showing locations indicate nature and comparative numbers of research scientists at location, as follows:

- Contract research, no USDA research staff at location.
- 1 to 3 research scientists at location.
- 4 to 20 research scientists at location.
- 21 to 100 research scientists at location.
- Over 100 research scientists at location.
methods of management of soil, water, buildings, mechanical equipment, labor, and other farm resources for the most effective use of farm lands, for sustained productivity and improvement of soils, and for profitable farming systems. Such research is needed to produce food, feed, and fiber efficiently and as needed by an expanding population; to adjust cropping patterns and systems of farming to fit production more closely to market demands; and to maintain or improve net incomes of farmers.

This Division is concerned with the effective economic use of human and natural resources in agricultural production. The research program deals with major economic problems facing farmers in different farming areas in order to indicate adjustment opportunities that will constitute the most profitable, efficient, and sustained systems of farming in view of prospective prices, costs, and other conditions. Costs and returns aspects of conservation practices and of conservation farming systems are analyzed. Research on farming efficiency includes studies of farm labor and economic analysis of use of farm machinery and other technological developments, electrification, farm structures, fertilizer and pesticide usage, and livestock feeding practices. Statistical measures are developed and appraisals are made of farm output and productivity (nationally, and by commodity and region) of changes in costs of farm production and of costs and returns on different types of farms in major farming areas. Studies are made on the problems of low-production farms and their opportunities for income improvement. Studies of agricultural finance deal with farm credit facilities and farm indebtedness, financing of farm living and production, agricultural risks and insurance problems, and impact of taxation upon individual farmers and agriculture as an industry. Other research is concerned with land and water use and control, economic effects of various types of use, irrigation water laws, analyses of farm real estate values, land income, land tenure problems, and farm leasing.

The Soil and Water Conservation Research Division directs a national research program and related functions in the field of soils, water, fertilizers, hydrology, sedimentation, runoff, design of hydraulic and conservation structures, effects of land use and treatments on conservation of soil and water, engineering design aspects of drainage and irrigation, and the effect on output of alternative systems of conservation farming. It also involves research in soil chemistry, physics, microbiology, and relation of soils to plant and animal nutrition. The Division also compiles data on resources, supplies, production, and consumption of fertilizers and plant nutrients.

By investigating the relations between the soil and the crops it produces, research workers seek to develop a better understanding of the various soils of the country and to find ways to increase their fertility and productivity, including management systems that will conserve soil resources. Soil management studies involving many broad problems such as those associated with soil structure, or with saline and alkaline conditions, are carried out on major soils in the humid regions, in dryland regions, and under irrigation. Fertilizer investigations include study of qualities of various fertilizing materials, methods of analysis, and effects of various chemicals on yields and on other reactions of crop plants.

This Division provides a limited amount of research assistance to action programs where research data on specific problems are not available. Much of this is in the nature of field tests of soil, crop, and water management practices to meet local situations. It also collects and interprets facts about the influence of land use patterns on runoff, erosion, sedimentation, and flood damage as a means of developing information needed for watershed management, flood prevention, and sediment control in streams and reservoirs throughout the United States.

REGULATORY PROGRAMS

The ARS also has functions and responsibilities in the administration of various regulatory and control activities, as follows:

The Animal Disease Eradication Division administers laws and regulations to prevent the spread of diseases through interstate shipments of livestock and poultry, and to insure humane treatment of transported livestock. It conducts nationwide State-Federal cooperative programs and assists and cooperates with foreign governments in measures to control and eradicate livestock and poultry diseases. This Division provides Federal inspection at stockyards and assists States in the diagnosis of unknown disease conditions.

The Animal Inspection and Quarantine Division administers laws and regulations to protect our livestock and poultry from diseases of foreign
origin; to assure the humane exportation of only healthy livestock; to prevent the production and sale of harmful and worthless veterinary biologics; and to maintain, through a marketing agreement with manufacturers and handlers, adequate suppliers of serum and virus for the protection of swine against hog cholera.

The Meat Inspection Division administers laws that insure the wholesomeness of domestic and imported meat and meat food products from cattle, sheep, swine, goats, and horses; inspects and certifies canned and frozen food for cats, dogs, and other Carnivora; provides continuous inspection of the manufacture of processed butter; and designates methods of humane slaughter of livestock.

The Plant Pest Control Division conducts cooperative programs to eradicate, suppress, or control insect pests and plant diseases, including new introductions established in limited areas within the United States. It combats emergency outbreaks of insects or plant diseases that require organized control effort over wide areas and leads a nationwide insect survey as a basis for forecasting insect outbreaks and advising industry and farmers as to needed controls. It administers the Insecticide, Fungicide, and Rodenticide Act of 1947 and the responsibilities of the USDA pertaining to the Miller Amendment to the Food, Drug, and Cosmetic Act.

The Plant Quarantine Division enforces quarantines and regulations affecting plants and plant products, soil, and plant pests and snails as such, entering the United States from foreign countries, moving interstate, or between U.S. off-shore States or Territories and the mainland. It inspects and certifies domestic plants and plant products for export to meet plant-quarantine import requirements of countries of destination.

Note. In the course of administering the regulatory and control activities prescribed by law, officials often encounter problems requiring factual information for solution. These problems are referred to the Administrator and are assigned to the proper research divisions for study.

EXPERIMENT STATIONS

A Deputy Administrator directs and coordinates the administration of all programs and activities pertaining to State and Territorial Experiment Stations.

The State Experiment Stations Division administers the Federal-grant funds appropriated by Congress for the partial support of the State and Territorial Agricultural Experiment Stations. It is responsible for determining whether the Federal-grant funds allocated to each station are used in accordance with statutory authorization, and for coordinating grant-fund projects of each State with related work of the other States and of the USDA. It also takes an active part in the planning and coordination of the cooperative regional research projects of the State stations.

The Territorial Experiment Stations Division directs such research work in the Territories as is conducted under direct Federal appropriations in the Territories concerned. The State of Alaska, the Commonwealth of Puerto Rico, and the Territory of the Virgin Islands are included. This Division directs the Federal Experiment Station at Mayaguez, P.R., which serves as an outpost of the USDA for departmental agricultural research in the Tropics. This station also conducts research on the production of agricultural crops of value to the United States and on the development of improved cultural methods for certain tropical crops that will benefit economically the people of Puerto Rico. Problems of immediate concern involve the production of insecticidal crops, drug crops, vanilla, spices, and bamboo; the improvement of food and pasture crops, including plant breeding and insect pest, disease, and weed control; and plant introduction and propagation.

The Division has the responsibility for the operation of an agricultural research and extension program in the Virgin Islands. This program, originally established in the fiscal year 1953, is directed toward development and dissemination of agricultural information of direct benefit to farmers and rural people in the Islands.

That portion of the program of research for Alaska supported by direct Federal appropriations is a responsibility of the Division. This program, which is cooperative with the Alaska Agricultural Experiment Station, is aimed primarily at increasing the volume and efficiency of crop and livestock production in the State.

INSTITUTE OF HOME ECONOMICS

A Director, who reports directly to the Administrator, heads this Institute. The Divisions are
concerned with national programs on the follow-
ing subject matters.

The Clothing and Housing Research Division
is concerned with and evaluates the serviceability
of clothing and household textiles in relation to
consumer needs, to properties of fabrics, and to
construction, design, care, and reconditioning of
garments and home furnishings. It determines
the characteristics of housing and household
equipment needed to meet family requirements for
efficient housekeeping and comfortable living. It
develops information basic to wise planning, im-
proved use, and care of clothing, household
textiles, the house, its equipment and its facilities.

The Household Economics Research Division
is concerned with and investigates levels of food
consumption and nutritive value and economy of
customary diets of various population groups. It
conducts research on patterns of rural family ex-
penditures, household production for family use,
and economic problems of household management,
including the effect of the economic situation on
family living. Recommendations are developed
definite and economical use of food and other
family resources for higher levels of living. The
Division cooperates with other Federal and
State agencies in the coordination of nutrition
programs.

The Human Nutrition Research Division is
concerned with and conducts studies on the nutri-
tive requirements of people, the composition and
nutritive value of food to meet these needs, and
the physiological availability of nutrients in foods.
It develops new and improved methods to prepare,
preserve, and care for foods in homes and institu-
tions, to obtain the best nutritive values from food
purchases, to prevent deterioration in food qual-
ty, to make foods more acceptable in meals, and
to make best use of abundant or new foods on the
market.

FOREIGN RESEARCH AND TECHNICAL
PROGRAMS DIVISION

The Director of this Division reports to the Ad-
ministrator of the Agricultural Research Service. The Division has the following interagency
responsibilities.

It develops and negotiates foreign contracts and
grants under the authority of sections 104 (a) and
(k) of Public Law 480. These programs cut
across the activities of the Agricultural Research
Service, Agricultural Marketing Service, Forest
Service, and the Foreign Agricultural Service. Representa;
tives from these agencies make up a
board of directors, called the Policy and Program
Development Board, which has the responsibility
for establishing policy and reviewing and apprais-
ing the program of the Division of Foreign Re-
search and Technical Programs. The Board also
serves to coordinate activities under P.L. 480 with
other foreign programs of the USDA.

The Division also has the responsibility for co-
ordinating programs of technical cooperation and
training carried on by the Agricultural Research
Service with other agencies of the USDA, the In-
ternational Cooperation Administration, the Spe-
cialized Agencies of the United Nations, such as
FAO, UNESCO, ILO, and others, and negotiates
special agreements of cooperation with foreign
governments, private foundations, and other in-
stitutions or agencies engaged in international co-
operation in the field of agricultural research.

The Division also coordinates visits to all ARS
offices, laboratories, and field stations by both for-
eign and domestic dignitaries, scientists, students,
or private citizens.

What is the relationship of the Agricultural Research Center to the total research program
of the ARS? What type of research is carried on at the Center? How many people
are employed there?

The Agricultural Research Center (ARC) is
located near Beltsville, Md., about 15 miles north-
east of Washington, D.C. The activities of the
Center are administered by the ARS Administra-
tor's Office. It had its beginning in June 1910
when 475 acres of land were purchased east of
Beltsville for the purpose of establishing an ex-
perimental farm to be used by the Animal Hus-
bandry and Dairy Divisions of the then Bureau
of Animal Industry. The first major building
erected at the station was the large concrete dairy
barn nearest to Powder Mill Road. This barn
was erected in 1916, and soon thereafter parts of
the present Dairy Physiology and office buildings
were built. On July 1, 1924, a separate Bureau
of Dairy Industry was established and allotted
190 acres of the original tract of land. In 1925
Dairy Industry purchased an additional 129 acres
of land, and in 1926 and 1927 approximately 1,000 acres of land were purchased and added to the Animal Husbandry tract. In 1930, the Hayden tract of 920 acres was leased with option to purchase. The major acquisition of land was in 1937 when the Secretary of Agriculture transferred over 7,000 acres from the Farm Security Administration. Very few buildings were erected at the Station until after the acquisition of the approximately 1,000 acres in 1926 and 1927. Between these dates and 1933, several buildings of Zoology, Poultry, and Dairy Industry were erected.

In July 1933 it was decided to concentrate additional departmental activities at Beltsville into one large Federal agricultural research center. During the remainder of 1933 and 1934, funds were allotted to expand the activities at this location. On August 28, 1934, the Center was established and designated as the “Beltsville Research Center.” In 1935 it was renamed National Agricultural Research Center; in 1939 renamed Beltsville Research Center; and in 1946 again renamed Agriculture Research Center. Further expansion of the ARC was effected in the reorganization of 1953 when the Plant Industry Station was made a part of the ARC.

The ARC occupies two separate tracts of land on opposite sides of U.S. Highway No. 1. On the northwest side of the highway, 2½ miles northeast of the University of Maryland, is the Plant Industry Station, which covers approximately 1,030 acres of land. The larger tract of the ARC covers approximately 10,000 acres and lies to the east of the Baltimore & Ohio RR., which parallels U.S. Highway No. 1. Most of the research divisions within ARS do a part of their research at the ARC, some of which maintain headquarters there. A few other Federal agencies use the facilities of ARC. About 2,750 persons are employed at the Center.

The facilities of ARC include 968 buildings of all types equipped to meet specific research needs or to provide office and laboratory space. About 3,000 experimental farm animals, 10,000 mature fowls, and 5,500 small laboratory animals are kept at the ARC. There is an apiary for bees. In 31 greenhouses, 5 acres are under glass. There are experimental pastures, ranges, orchards, gardens, fields for cultivated crops, timber stands, and soil-treatment plots.

From the standpoint of research coordination, the ARC is closely related to the total research program of the ARS. For an attack on one problem, it is possible to assemble in one place the experience and abilities of many different kinds of scientists.

Another important advantage is in the cooperative relations with State experiment stations. For example, in the fundamental breeding work, new plants and animals are developed at the ARC and then sent to stations in various parts of the United States for further development or adaptation. Most of the research at the ARC deals with problems of national interest. Much of it is basic or fundamental research, with the goal of accumulating scientific information that can be applied elsewhere in finding solutions to specific, practical problems.

What other USDA agencies conduct research?

Research, in addition to that carried on by ARS, is conducted by the Agricultural Marketing Service, Farmer Cooperative Service, Foreign Agricultural Service, and Forest Service. All research in the USDA is coordinated through the Office of the Administrator, ARS. (See fig. 2, p. 27.) A brief description of the research activities of these agencies is presented below.

AGRICULTURAL MARKETING SERVICE

The Agricultural Marketing Service (AMS) is responsible for the marketing and distribution functions of the USDA. These consist of (a) marketing research, (b) economics and statistics, and (c) marketing services, regulatory activities, and food distribution activities. It is responsible for the coordination of statistical activities in the USDA, including the review of all survey plans, reporting requirements, and forms originating in the USDA, which require approval of the Bureau of the Budget under the Federal Reports Act. It reviews, approves, and gives leadership in developing marketing service activities carried on cooperatively by the State departments of agriculture and bureaus of markets.

MARKETING RESEARCH

Marketing Research participates in overall planning and formulation of AMS programs
and activities and coordinates the activities of (a) the Market Development Research Division, (b) the Marketing Economics Research Division, (c) the Market Quality Research Division, and (d) the Transportation and Facilities Research Division. Also, these fields of marketing research may involve contracts and grants with qualified foreign institutions, under the provisions of Public Law 480, where the results of such research will be of mutual interest and benefit to American agriculture and to the foreign country involved.

The Market Development Research Division is concerned primarily with the economic aspects of expanded outlets for new or established products, including market testing of new products; the determination of market potentials; the market surveys of industrial and household uses; preferences and buying patterns; new or improved distribution programs; improved merchandising methods and practices; and the economic feasibility of byproduct utilization. This research in market development is carried out in association with statistical services that measure market availability and rates of movement under differing merchandising procedures.

The Marketing Economics Research Division directs studies on market organization, costs, and practices, including economic analyses of marketing costs and margins; conducts research on the organization and operation of the marketing system from the standpoint of price making and efficiency of performing marketing functions; appraises the adequacy of market news and commodity grades and standards; and measures the impact of various phases of marketing on organization, costs, and efficiency of technological developments, government programs, laws and regulations, and changes in demand for marketing services and products. Such research involves the compilation of relevant statistical series to indicate changes in costs, prices, and price spreads as they occur and the factors contributing to them.

The Market Quality Research Division directs studies toward quality maintenance and improvement by solving physiological and pathological problems encountered as farm and food products move through marketing channels. The problems include spoilage and damage in handling, storage, and transportation; insect attacks or contamination of products in marketing channels; and quality evaluation, which includes development of objective measurements, tests, devices, and instruments for use in establishing standards and specifications for the quality of products and for inspection and grading, and in devising means to protect product quality.

The Transportation and Facilities Research Division conducts research to improve physical facilities and equipment and to devise methods for assembling, handling, storing, transporting, and packaging of wholesale and retail farm and food products. To increase the efficiency of marketing, the studies include transportation costs and services and their economic effects on agriculture and the planning and development of efficient facilities in special locations for off-farm conditioning, handling, storing, buying, and selling of farm products.

ECONOMICS AND STATISTICS

Economics and Statistics participates in the overall planning and formulation of AMS programs and activities, and coordinates the activities of (a) the Agricultural Economics Division, (b) the Agricultural Estimates Division, (c) the Outlook and Situation Board, and (d) the Statistical Standards Division.

The Agricultural Economics Division administers broad economic analyses and statistical programs covering agricultural prices and income, commodity outlook and situation, food demands and consumption, farm population and rural life, agricultural history, and related activities. Such research as is carried on in the field is ordinarily in cooperation with the land-grant colleges.

The Agricultural Estimates Division administers broad programs of crop and livestock estimates and reporting, which includes estimates of production, supply, price, and other aspects of the agricultural economy; collects statistics; conducts research on sampling techniques used in gathering and evaluating statistical data; and related activities. The Director serves as Chairman of Crop Reporting Board.

The Outlook and Situation Board provides for the technical review and approval of economic outlook and situation reports prepared within the Department.

The Statistical Standards Division adminis-
 ters a program for the review, clearance, coordination, and improvement of statistics in the Department and for electronic-mechanical data processing services for AMS.

**FARMER COOPERATIVE SERVICE**

The Farmer Cooperative Service (FCS) conducts research as a basic part of its program for helping farmers improve their economic position through cooperative associations that are soundly organized and effectively operated. Under authorizations in the Cooperative Marketing Act of 1926, the FCS carries on research, advisory service, and educational activities to assist agricultural cooperatives engaged in marketing farm products, purchasing farm supplies, and supplying business services essential to farmers in conducting their farming operations. The work conducted by FCS is directed toward assisting cooperative organizations to solve their problems through the development and use of essential, factual information. It is also directed toward bringing about a better understanding of sound cooperative principles and practices on the part of members, boards of directors, employees, and others interested in agricultural cooperatives. Studies of cooperative business enterprises cover such matters as organization procedure and structure, management policies, employee relations, merchandising, accounting, operating costs and efficiency, financing, and membership. The Service publishes the results of its research and studies in bulletins, circulars, and reports. It publishes current information and research results of interest to farmer cooperatives in a monthly magazine *News for Farmer Cooperatives*.

**FOREIGN AGRICULTURAL SERVICE**

The Foreign Agricultural Service (FAS) carries on broad research having to do with foreign aspects of agriculture, especially in the fields of foreign agricultural trade, policy, and production as they affect United States agriculture. An example is the regular gathering of information on the foreign demand for and the competition with our agricultural products. Another is the constant inquiry into foreign trade policies that affect the sale of United States farm products abroad. Such information—on crop production, livestock numbers, stocks, and world agricultural trade—is obtained largely through American agricultural attaches and through commodity experts sent abroad to make special studies.

**FOREST SERVICE**

The Forest Service (FS), in its nine forest range experiment stations, in the Forest Products Laboratory at Madison, Wis., and at research centers in Alaska and Puerto Rico, conducts investigations in the entire field of forestry and wild land management. This includes the growth and harvesting of timber; protection of forests from fire, insects, and diseases; grazing on forest and related ranges; improvement and management of wildlife habitat; forest recreation; efficient and economical utilization of forest products; research in forest economics and taxation; and watershed management and forest soils. Problems dealing with range grasses are handled cooperatively, with the ARS Divisions sharing the responsibility for those subjects. The Forest Service is also making a study of the Nation’s present and potential forest resources.

**How is agricultural information disseminated?**

**OFFICE OF INFORMATION**

The USDA's Office of Information coordinates within the USDA the dissemination of information useful to agriculture and controls work falling into three groups: *Publications*, which includes the editorial work, printing, and distribution of publications; *current information*, which includes press, radio, and television materials; and *visual*, which includes exhibits, photographs, graphics, and motion pictures, as follows:

**Publications.** The Publications Division is responsible for policy clearance and control of all publications of the USDA, both printed and processed, and for coordinating publications research. Through several series of technical and popular publications there is made available, to farmers and the public generally, information concerning results of research, conservation, regulatory, and service work of the USDA. Popular publications may be obtained through Members of Congress, county agents of the Extension Service, or direct from the USDA in Washington. A *Yearbook of Agriculture* is made available annually to Members of Congress, pursuant to law, and available generally by purchase from the Superintendent of Documents, Government Printing Office, Wash-
Current Information. Current agricultural information is disseminated by the Press Service, Special Reports Division, and the Radio and Television Service. Close cooperation is maintained with the daily and periodical press in disseminating useful information concerning programs of the USDA in an effort to help farmers reduce production costs, conserve the soil, improve the quality of their products, and widen their markets. Regular cooperation in assembling and broadcasting timely information to farm families is also maintained with three major radio networks. Special information is sent weekly to more than 700 radio stations for use of farm directors in program planning. In television, a weekly television packet reporting on research and action programs and containing suggested script and materials for ready use and adaptation for local delivery goes to more than 100 farm telecasters requesting this service.

Visual Information. Visual agricultural information is disseminated through the media of motion pictures, exhibits, illustrations, and photographs. The Motion Picture Service produces and distributes educational motion pictures designed to guide and instruct in the production and disposition of food, fiber, and oil crops. Through production and display of educational exhibits and through correlation of exhibit activities of the USDA, the Exhibits Service places before farmers, homemakers, and the general public, information on currently important agricultural situations and subjects, and especially the results of research. Illustrations and photographic production work of the USDA, with the exception of cartographic work, is performed by the Office of Information. A central file of all news and general illustration photographs is maintained.

USDA LIBRARY

The dissemination of research findings of the USDA to the general public is important, but it is also important to collect, collate, and disseminate research results from all possible sources to the researchers in the USDA and the land-grant colleges and State universities. The USDA Library maintains a collection numbering approximately one million volumes. It is one of the largest agricultural research libraries in the world. Its reference, lending, and photocopying services are available not only to the USDA staff but to all others interested in agriculture and the related sciences. The Bibliography of Agriculture, a monthly index issued by the USDA Library, makes the literature of agriculture known to everyone who needs it. The Department Library and its Law Unit located in Washington, D.C., provides service to Washington employees and to field employees not served by field libraries. The Agriculture Unit and Beltsville Branch, located at Beltsville, Md., serve Beltsville employees. Agency-administered field libraries are located at Albany, Calif.; Madison, Wis.; New Orleans, La.; Peoria, Ill.; and Wyndmoor, Pa.

FEDERAL EXTENSION SERVICE

The Federal Extension Service provides the leadership for all general educational programs of the Department. The departmental office is composed of administrative and professional personnel that serve as the liaison between departmental research and action agencies and the administrative and extension subject-matter staffs at the respective land-grant colleges.

What is the cooperative Extension Service?

The cooperative Extension Service is the educational arm of the United States Department of Agriculture and the State land-grant colleges charged with conducting off-campus education in subjects relating to agriculture and home economics. This national cooperative educational system was established by the Smith-Lever Act of May 8, 1914, "... to diffuse among the people of the United States useful and practical information on subjects relating to agriculture and home economics, and to encourage the application of the same . . . to persons not attending or resident in said colleges in several communities . . .".

The cooperative Extension Service is composed of 51 State and Territorial Extension Services, each an integral part of the State or Territorial Land-Grant College. Extension work is financed and carried out through a three-way partnership among local people, the State land-grant college, and the Department of Agriculture.
At the local level, county extension workers take the lead in organizing educational programs in which farm families, extension workers, and other leaders cooperatively develop local experience, scientific information, and government program aids into county extension programs. In all of this work, extension agents and specialists work closely with other agricultural agencies and with farm and civic organizations in helping people to identify and to solve their marketing, farm, home, and community problems.

How do American farmers receive and apply research results so quickly?

The basic job of the cooperative Extension Service is to help people analyze their situations and to make use of research findings and practical experience in developing solutions to their problems. In doing this, county and State extension workers have the vast resources of knowledge developed by governmental and private research agencies to draw upon.

By working closely with Department of Agriculture and land-grant college research staffs, Federal Extension Service specialists keep abreast of national research developments and share this knowledge with extension specialists of the individual State extension services, and assist them in incorporating this information into their educational program. State specialists, in turn, work closely with the research staffs of their own college and are responsible for keeping county extension workers well-informed on research developments and their application to the solution of individual problems.

County extension agents use many methods for helping people to apply the results of research to their problems. These include demonstrations, farm tours, working with individual or small groups of families, group meetings, newspaper articles, radio and television broadcasts, and the use of localized publications prepared by the land-grant colleges and the Department of Agriculture.

The flow of research is not a one-way proposition. In analyzing local situations, farm people, county extension workers and other agricultural leaders often uncover problems for which new research is needed before a solution can be reached.

Personally conducted tours through the USDA's many field stations, State experiment stations, and the Agricultural Research Center at Beltsville, Md., provide a valuable method for releasing research results. Each year these establishments are visited by many farmers, processors, marketing people, research workers, and others to observe at first hand the accomplishments being made in research. There are several pilot research farms where new techniques are tested within a complete farming system and modified as the need is shown. Farmers attend demonstrations at these farms and see findings of research applied on land of the same general type as their own. The wide- awake interest of American farmers in observing and using the developments of agricultural research is responsible to a great extent for the rapidity with which results are adopted. In fact, the progressive farmer is oftentimes eager to put the findings into practice even before the authorities are ready to recommend them.

The findings of research, in many cases, are carried by farm and commodity organization field staff members to their clients through individual contact and publications. Many commercial organizations do the same in selling products to farmers. In other words, many people help in communicating to the public the findings of research. While it is recognized that communication by mass media is a good way to get the information to a great number of people, it does not necessarily guarantee that individuals make use of the findings just because they are communicated. Extension workers are finding, too, that the best motivation for the use of research findings is the individual teaching approach; that is, individual contact with the farmer by the county agricultural workers.

How do commerce and industry benefit from agricultural research? How does the consumer benefit?

Results of agricultural research of interest and use to commerce and industry are published in the trade papers and magazines. Trade groups keep in touch with this work through commodity advi-
sory groups and the Agricultural Research Policy Committee. At each of ARS’s regional Utilization Research and Development Divisions, where the work is of direct interest to industry, a technically trained official is designated as liaison between the Division and industry. USDA representatives often attend meetings of industrial associations and discuss research results that pertain to their particular fields of interest. Publications aimed specifically to help trade are made available by the USDA. Frequently, when a research project has been completed and tested in a pilot plant, representatives of industrial groups are invited to see the operation and to discuss the possibilities of commercial adaptation.

Consumers benefit either directly or indirectly from all agricultural research since it deals with food, clothing, and shelter. For example, marketing research is conducted to find out how to get agricultural food crops from the farm to the consumer in the best possible condition, both in nutritive value and appearance, and at a reasonable cost. The research in nutrition and home economics is also largely of direct concern to consumers, as is the research on household insects, meat, dairy and poultry products, and rural housing and household equipment. Both urban and rural consumers become acquainted with research that benefits them in many ways. They read about it in city and farm papers and magazines, see or hear about it on television or radio, see new products in the stores with identifying display advertising, and receive publications issued by the USDA and the State experiment stations.

Are agricultural research findings made available to foreign countries? If so, how?

Since the inception of the program for foreign technical cooperation, which is now administered by the International Cooperation Administration (ICA) in the Department of State, the USDA has cooperated fully in making research information available to United States Operations Missions (ICA field offices) in three ways: (1) By training foreign nationals on an in-service basis in Federal laboratories, offices, and field stations or by developing study programs at institutions of learning; (2) by providing technical information and consulting services in response to requests from the overseas United States Operations Missions; (3) by special projects contracted between ICA and a subject-matter agency of the USDA. For example, ARS has special projects in (a) Regional Insect Control Project (in the Middle East and Africa), (b) Special Plant Program (interchange of plant materials), and (c) Technical Services on Salinity and Soil Fertility.

This work was first concentrated in Latin America in 1941 on the tropical and semitropical products that are grown there and imported in large quantities into the United States. The program has been extended in recent years to an increasing number of countries in Europe, Africa, the Middle East, and the Far East. The USDA has representatives in the United States Delegations to conferences of the Food and Agriculture Organizations of the United Nations where many technical agricultural problems are discussed.

Another important way in which research information reaches other countries is through foreign agricultural administrators, scientists, and students who visit the experimental laboratories and field stations in the United States. The USDA is helping to impart information in the field of agriculture to these visiting foreign nationals. During the period from July 1958 through June 1959, 2,460 foreign nationals visited the Agricultural Research Center at Beltsville, Md. The visitors were from 91 different countries, and represented about 16.3 percent of the total visitors to the ARC during that period. These same foreign visitors also traveled to many Federal and State field stations and land-grant institutions throughout the United States in order to obtain information concerning agricultural research, production, marketing, extension, and resident education.

An outstanding effort to assist in this endeavor is being made by the USDA Library, in that the published results of research are available not only to American farmers, the trade, and the U.S. consumer, but also to individuals and institutions of other countries. Although individuals must purchase publications for their personal use, institutions (particularly libraries) may often obtain them through the exchange programs maintained by the USDA Library. Under these programs, the Library sends the USDA's scientific and technical publications in exchange for similar publications of other countries. The USDA Library has exchange arrangements with 5,000 institutions.
in 145 countries, which means that the publications they receive are available on loan or for reference in their libraries. Publications received from other countries are likewise available in the USDA Library for the use of USDA's research staff and other interested persons. Notification of their availability is made through listing them in the Library's monthly *Bibliography of Agriculture*.

A recently established Publications Exchange Information Center in the USDA Library aids the land-grant colleges and State universities in establishing exchanges and in selecting foreign libraries to serve as repositories for their agricultural publications. The U.S. Department of State and the U.S. Information Agency also aid in the exchange of information. There are currently 164 Information Centers in 63 foreign countries. These centers maintain public libraries. Publications are freely available to all persons who wish to obtain current information about the United States.

There is also a vast amount of private and semi-private endeavor in the dissemination of research information. Farm magazines and scientific journals of agriculture published in the United States are circulated throughout the world. Some of our State colleges and other educational institutions cooperate with foreign institutions on specific projects. Numerous international organizations in specific fields of science offer international forums for the exchange of scientific information.
**Public Law 202, 83rd Congress, established the Farm Credit Administration as an independent agency effective Dec. 4, 1953. The Secretary of Agriculture names one of the 13 Board Members. Headquarters offices are maintained in the U.S. Dept. of Agriculture, Washington, D.C.**

* Services responsible for the conduct of research
ORGANIZATION FOR RESEARCH COORDINATION AND PROGRAM DEVELOPMENT IN THE USDA

SECRETARY
UNDER SECRETARY
ASSISTANT SECRETARIES

RESEARCH COORDINATION

AGRICULTURAL RESEARCH SERVICE

AGRICULTURAL MARKETING SERVICE

FARMER COOPERATIVE SERVICE

FOREIGN AGRICULTURAL SERVICE

FOREST SERVICE

AGRICULTURAL RESEARCH POLICY COMMITTEE

RESEARCH ADVISORY COMMITTEES

CENTRAL PROJECT OFFICE

FOREIGN RESEARCH & TECHNICAL PROGRAMS

AGRICULTURAL RESEARCH COUNCIL

ADMINISTRATOR,
AGRICULTURAL RESEARCH SERVICE

FOREST RESEARCH PROGRAMS

ADMINISTRATOR, AGRICULTURAL RESEARCH SERVICE coordinates all statistical and related economic analysis work of the Department.

Deputy Administrator for Experiment Stations directs and coordinates the administration of all programs and activities pertaining to State and Territorial Experiment Stations.

Figure 2