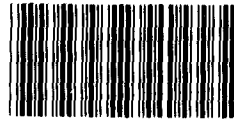




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UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

COMMUNITY AND ECONOMIC
DEVELOPMENT DIVISION



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B-205854

DECEMBER 28, 1981

The Honorable John R. Block
The Secretary of Agriculture

Dear Mr. Secretary:

Subject: Lead Agency Responsibilities To Keep
Informed of Personnel Needs in the
Food and Agricultural Sciences Are
Not Being Fully Met (CED-82-25)

We recently reviewed the U.S. Department of Agriculture's (USDA's) activities in carrying out its responsibilities as the Federal Government's lead agency for keeping abreast of personnel needs in the food and agricultural sciences. We found that USDA's Office of Higher Education has worked with university representatives to identify issues and concerns related to the need for graduates in the food and agricultural sciences, including developing formal supply/demand analyses. We believe, however, that the Office also needs to interact with industry and Federal agencies that use food and agricultural science personnel and obtain their input on such personnel requirements. Such interaction and input is necessary if the Office is to obtain a complete and up-to-date profile of the overall supply/demand picture and manpower development requirements for food and agricultural science personnel.

FOOD AND AGRICULTURE ACT OF 1977

Future growth of agricultural productivity and increases in production, distribution, and consumption efficiency require a continuing supply of qualified graduates in the food and agricultural sciences. In recent years some concern has been expressed that the Nation could face a shortage of such qualified personnel. Government and higher education representatives have cited difficulties in employing specific types of food and agricultural science personnel. In addition, some college and university educators project a decreasing number of graduates in some of the food and agricultural sciences. Moreover, technical advances, diminishing natural resources, and increasing global population may introduce changes that could require new specialties and training.

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The Congress reflected the above concerns in title XIV of the Food and Agriculture Act of 1977 (7 U.S.C. 3101 et seq.). The Congress designated USDA as the lead agency responsible for keeping abreast of such personnel needs and representing those needs in discussions within the U.S. Government and with the States, the universities, and industry.

Specifically, the act provides that the Secretary should

"keep informed of developments in, and the Nation's need for, research, extension, teaching, and manpower development in the food and agricultural sciences and represent such need in deliberations within the Department of Agriculture, elsewhere within the executive branch of the United States Government, and with the several States and their designated land-grant colleges and universities, other colleges and universities, agricultural and related industries, and other interested institutions and groups * * *."

USDA created the Office of Higher Education in 1978 to carry out the above responsibilities.

OBJECTIVES, SCOPE, AND METHODOLOGY

Our main objective was to see how well USDA was carrying out its responsibilities relating to food and agricultural science personnel needs as defined in the 1977 act. In addition, being aware of the congressional interest in the demands for and supply of food and agricultural science personnel, we wanted to gain some insight into whether the Congress was receiving complete and accurate information on the needs for such personnel. Although we did not want to make a supply/demand study, we did want to highlight any major problem areas that might be developing.

We tried to get a broad overview of the scientific personnel needs of industry and Federal agencies that employ food and agricultural scientists. We interviewed representatives of Government agencies and private companies and firms that are involved and/or employ scientists in the food and agricultural science fields. We also spoke with representatives of several universities. (The enclosure contains a list of companies and firms, Federal agencies, universities, and nonprofit organizations with whom we discussed personnel needs.)

We made our review at USDA headquarters in Washington, D.C., and at other Federal agencies in Washington, D.C., that use agriculturally related scientists. We spoke with staff members in the Office of Higher Education; the Administrator of USDA's Agricultural Research Service; the Administrator of USDA's Cooperative State Research Service; the Chief of the Employment and Placement

Branch in the Personnel Division of USDA's Science and Education Management Staff; 1/ the Chief, Staffing, Employment and Special Projects Branch, Food and Drug Administration; the Deputy Personnel Administrator, Environmental Protection Agency; and the Deputy Personnel Manager, National Institutes of Health.

We developed a structured questionnaire which we used in interviews with vice presidents of research and development at major companies and firms engaged in food and agricultural-related activities. The companies and firms were chosen to represent various components of the food and agricultural industry--food processing, seed products, paper, chemicals, pharmaceutical products, farm marketing, and farm machinery. Although our sample is not statistically valid, we think that we received a well-rounded overview of scientific personnel needs in major areas of the food and agricultural industry.

Lastly, we reviewed and analyzed related data, including studies prepared by USDA's Office of Higher Education, the National Science Foundation, the Departments of Education and Labor, and various academic and professional groups.

USDA'S OFFICE OF HIGHER EDUCATION
COULD MORE EFFECTIVELY FULFILL ITS
RESPONSIBILITIES BY INTERACTING WITH
INDUSTRY AND OTHER FEDERAL AGENCIES

The Office of Higher Education is a staff unit within USDA's Science and Education organization. The Office's present staff consists of the Assistant Director, who serves in that position for 1 year under the Intergovernmental Personnel Act; the Deputy Assistant Director, who is a permanent employee; a statistician, who spends 60 percent of her time at the Office, and a two-person support staff.

In carrying out its responsibilities, the Office of Higher Education has concentrated on obtaining university input on issues related to food and agricultural science personnel needs, including incorporating university input into its supply/demand study on such personnel needs. However, since one of the Office's objectives is helping assure that colleges and universities produce enough graduates to satisfy the Nation's current and projected needs in the food and agricultural science labor force, we believe it is important that it interact with industries, Government

1/The Science and Education Management staff handles personnel and other administrative matters for four program agencies in USDA's Science and Education organization: Agricultural Research Service, Cooperative State Research Service, Extension Service, and National Agricultural Library.

agencies, and others that use persons trained in the food and agricultural sciences to ascertain what those needs are.

Supply/demand study did not include
enough input from industry

We reviewed the Office of Higher Education's supply/demand study of scientists directly or indirectly related to the food and agricultural sciences. The study was made to (1) identify current and projected supplies of and demands for higher education graduates in the food and agricultural sciences and (2) analyze and interpret supply/demand relationships.

Information on the supply of higher education graduates was obtained principally from the Higher Education General Information Surveys administered by the Department of Education's National Center for Education Statistics. Occupational employment demand information was obtained primarily through the Occupational Employment Statistics Program of the Department of Labor's Bureau of Labor Statistics. In addition, throughout the study, the Office relied heavily on expert opinions obtained through a panel composed entirely of members of the academic community. In its methodology section, the study report states:

"The panel afforded the necessary expertise to overcome the inherent limitations due to the paucity of existing data as well as the inconsistent and incompatible data classification systems of the different information bases. Without such expertise, the development of a single analytical model would not have been possible."

The study collected data on all aspects of employment for graduates in the food and agricultural sciences. The study--entitled "Graduates of Higher Education in the Food and Agricultural Sciences: An Analysis of Supply/Demand Relationships, Volume I--Agriculture, Natural Resources and Veterinary Medicine"--was issued in July 1980. Volume II which covers graduates in home economics, was issued in February 1981. The study concluded that more college graduates will be needed than will be supplied to meet projected staffing needs through the 1980's. It also concluded that the Nation may have problems maintaining an adequate reserve of experts in the food and agricultural sciences to meet labor force needs. The Office plans to publish a third volume assessing sex, race, and ethnic characteristics of graduates in the food and agricultural sciences and of professionals in food and agricultural positions.

The House Committee on Appropriations cited the study's results in its report on H.R. 4119, the fiscal year 1982 appropriations bill for agriculture, rural development, and related agencies' programs. The committee said that USDA should take

the critical situation that was developing in higher education in the food and agricultural sciences (the shortage of masters' and doctoral degree candidates) into consideration in preparing its fiscal year 1983 budget. The committee requested that USDA report its suggestions for addressing the problem with its budget submission.

The Office of Higher Education's panel of experts for its supply/demand study did not include representatives of industries or Federal agencies that employ persons trained in the food and agriculturally related sciences. We believe that since employment needs of industry and government had been included in the demand side of the equation, input from these employment sources should have been included.

Our discussions with representatives of industries and Federal agencies that employ persons trained in the food and agriculturally related sciences showed an employment picture that was complex and had some problems. However, these were not problems which could be solved by simply producing more advanced degree graduates.

Industry and Federal needs--complex but not as bleak as USDA study indicates

Industry and Federal agency supply/demand requirements for agricultural scientists are complex and difficult to assess because they differ from one industry sector to another and from one agency to another. For example, the food-producing sector may hire dairy scientists and food chemists while fertilizer manufacturing companies may hire entomologists and plant pathologists. Changing economic conditions and personal preferences of employees and employers also affect supply/demand analyses. Nevertheless, our interviews with industry and agency representatives indicated that the situation regarding food and agricultural scientists is not as bleak as the USDA study indicates.

Industry needs

Vice presidents and directors of research and company personnel managers told us that various experiences in hiring and retaining personnel can be attributed to several causes, such as the degree of technology needed, the type of research being done, and the particular specialties required by a company. Job amenities, such as salary, location of business, husband-wife employment opportunities, research environment, and professional camaraderie, also affect hiring and retaining personnel.

Except for engineers with graduate degrees (master of science--M.S.--and doctor of philosophy--Ph. D.) and doctors of veterinary medicine with Ph. D.'s in toxicology and pathology, most companies' personnel needs were being met. The personnel

shortages that existed seemed to be because a particular company or firm was seeking very specialized individuals or because of job amenity factors, rather than overall supply shortages.

Several industry representatives said that the supply/demand relationships for engineers has traditionally been very cyclical. They said that the current shortage may take care of itself in several years because engineering enrollments at the undergraduate level are up. According to these spokespersons, if history repeats itself, when these students graduate, supply may well exceed demand, and many may elect to pursue advanced degrees. Veterinarians with Ph. D.'s to do research may be in short supply for some time because of the years of training required--4 years of college, 4 years toward a doctor of veterinary medicine degree, and generally another 3 to 5 years for a Ph. D.

A major chemical company vice president told us that, regarding agricultural scientists, it is important to know the specialty needed because within the same general category of scientists, such as chemists, shortages or oversupplies can exist in particular specialties. For example, one firm had not filled several openings for Ph. D.'s in physical inorganic chemistry. According to the firm's vice president, only a few firms need this specialty; accordingly, most chemists specialize in organic chemistry for which there is more demand.

Our interviews with company representatives indicated that while the level of education needed varied from one sector of the food and agricultural industry to another, and even with companies within the same sector, industry needs for scientists with M.S.'s and Ph. D.'s may not be as great as USDA's study concluded when it projected shortages of graduates with advanced degrees.

For example, the vice president of a food processing company told us that food processing companies need only a few highly specialized Ph. D.'s to lead research projects. He said that such companies meet the bulk of their research personnel needs with individuals with bachelors degrees. In this regard, two food processing company vice presidents expressed a need for more technicians with practical hands-on experience who can make things happen, rather than scientists who can explain why things happen. In contrast to the USDA study which concluded that a sufficient supply of associate degree recipients existed to meet most types of employment demand, both vice presidents were interested in junior colleges turning out more food technicians. Another vice president told us that enumerating specific specialties which his company hired was not necessary because any well-trained scientist could be used interchangeably.

We asked the company representatives about salary levels for their companies' scientific staff. Starting salaries seemed to be about the same for specific specialties. However, as

starting salaries rise, and as some companies give commensurate across-the-board raises and others do not, mid-level scientists may change companies to get higher salaries. Companies may also pay moving expenses and help with housing costs to encourage mid-level scientists to relocate.

Several companies' representatives cited job location issues as a major factor in recruitment success or failure. Mid-life career changes are difficult because prospective employees have to satisfy family desires as well as their own. Two-family careers were also cited as causing companies to lose potentially desirable employees.

Federal agencies' needs

Federal agencies' scientific personnel needs are subject to a number of outside influences that can make predictions of future hiring rates tenuous. Agencies may have personnel openings but be under a hiring freeze. Also, personnel ceilings may change unexpectedly which can change projected recruitment figures. Federal agencies also are affected by the same factors of personal preferences that affect industry and university recruitment.

Some Federal agencies, including USDA, the Food and Drug Administration (FDA), and the Environmental Protection Agency (EPA), draw at least a part of their personnel from the pool of scientists trained in agriculturally related fields. We asked representatives of these agencies about their interactions with USDA's Office of Higher Education, the scientific specialties which their agencies required, their recruitment plans, and their retirement projections.

We found that USDA's Office of Higher Education has done little to interact with other Federal agencies regarding food and agricultural science personnel needs. For example, the Chief of the Employment and Placement Branch in the Personnel Division of USDA's Science and Education Management Staff told us that his primary contact with the Office of Higher Education is through reading the Office's publications. He does not serve with representatives of that Office on any intradepartmental committees to discuss problems in or explore alternative solutions for recruiting scientific personnel for USDA. Likewise, the Chief of FDA's Staffing, Employment and Special Projects Branch told us that no interagency committees existed to discuss problems common to Federal agencies that use agriculturally related scientists.

Personnel representatives at USDA, FDA, and EPA said that it was hard to make more than short-term predictions as to scientific personnel needs. As for numerical recruitment predictions, personnel offices at EPA had worked up recruitment plans

for fiscal year 1982, but a hiring freeze was placed against that agency, with expectations that there would be reductions in force throughout the year.

Retirement is another area where predictions are more a matter of intuition than hard statistical data. The Administrator of USDA's Agricultural Research Service cited the age of scientists and potential retirements as a major personnel problem. He believed that as research scientists retired, the Service would have difficulty hiring replacements because of an inadequate supply of qualified personnel. He said that the average age of USDA research scientists is 49. On the other hand, the Chief of Science and Education's Employment and Placement Branch said that the retirement figures were meaningless because very few members of the scientific staff retired when they could. He said that his experience has been that generally scientists liked their work and stayed on as long as they could. This being the case, it is hard to predict what types of scientists will retire and which types will need to be recruited in the next several years.

CONCLUSIONS

The above comments from representatives of industry and Federal agencies that hire scientists trained in agriculturally related specialties illustrate that it is important for the Office of Higher Education to get a full range of views in order to keep adequately informed of scientific manpower issues. Industry officials and representatives of Federal agencies may perceive employment demand issues differently than does the academic community. Industry officials seem to be less concerned about hiring scientists with advanced degrees and more concerned about hiring junior college graduates in the food and agricultural sciences than the Office of Higher Education's supply/demand study indicates. Predictions of Federal agencies' scientific personnel needs need to be obtained from agency officials who are knowledgeable of current policy realities. In order to provide more balanced information, representatives of a cross section of users of food and agricultural scientists should be represented on any expert panels that the Office of Higher Education assembles, especially when information the Office generates may lead to congressional actions.

RECOMMENDATIONS TO THE SECRETARY OF AGRICULTURE

We recommend that to better carry out USDA's responsibilities to keep informed of developments in the Nation's personnel needs in the food and agricultural sciences and to represent such needs in deliberations, the Secretary of Agriculture instruct the Office of Higher Education to interact with a cross section of organizations

(industry and Government agencies, as well as universities) that employ graduates trained in food and agriculturally related sciences.

Such interaction could be achieved through interagency committees or periodic meetings or conferences at which issues of concern to a cross section of users of food and agricultural scientists could be discussed and updated information on the supply of and demand for such personnel could be obtained. Such meetings need not be funded by USDA, but could be attended on a voluntary basis by representatives of industries, universities, and Federal agencies that employ relevant personnel. USDA's Office of Higher Education should also include representatives of a cross section of users of food and agricultural science personnel on any expert panels it assembles to assist it with any supply/demand analyses it might undertake.

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We discussed our findings with the former Assistant Director of the Office of Higher Education on September 23, 1981, and the newly appointed Assistant Director and the Deputy Assistant Director on November 12, 1981. They agreed that the Office should expand its contacts to include the views of both industry and other Federal agencies, and that such interactions should be started soon.

The Assistant Director and Deputy Assistant Director also told us that they were completing the third volume of their supply/demand study which includes an assessment of sex, race, and ethnic characteristics of graduates in the food and agricultural sciences and of professionals in food and agricultural positions. Moreover, they said they wanted to start working on compiling statistical information on the characteristics of students entering agricultural studies. They said that given the Office's limited staff, it would be hard to accomplish all that they would like to.

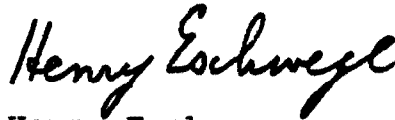
We believe, however, that the resources of this small Office should be used in a manner most consistent with USDA's lead agency responsibilities. Accordingly, we believe that a priority of the Office should be to interact with all users of food and agricultural science personnel to keep informed of and focus attention on major issues in manpower development in the food and agricultural sciences. Although detailed statistical studies such as those mentioned above may provide interesting information, they should not be priority efforts in relation to the Office's primary responsibilities.

As you know, section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee

on Government Operations not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of this report to the above committees; the Director, Office of Management and Budget; the House Committee on Agriculture; the Senate Committee on Agriculture, Nutrition, and Forestry; other committees and Members of Congress; the Director of Science and Education; and your Inspector General.

Sincerely yours,



Henry Eschwege
Director

Enclosure

COMPANIES AND FIRMS, FEDERAL AGENCIES,
UNIVERSITIES, AND NONPROFIT ORGANIZATIONS CONTACTED

We discussed scientific personnel needs with representatives of the following organizations.

Companies and Firms

Abbott Laboratories - operations include development of animal health products and agricultural and chemical products

Beatrice Foods Co. - processes and distributes food products

DNA Science, Inc. - commercializes advances in biotechnology and genetic engineering

Dart and Kraft, Inc. - operations include manufacturing, processing, and distributing food products

Dean Foods Co. - buys, processes, and distributes dairy and specialty food products

De Kalb Agresearch, Inc. - operations include seed development and animal breeding research

Doane-Western, Inc. - agricultural marketing research service

E.I. Du Pont de Nemours and Co. - operations include producing fungicides, herbicides, seed protectants, and animal feed supplements

General Foods Corp. - processors of packaged grocery products

Hershey Foods Corp. - chocolates and confectionary products and pasta

International Harvester Co. - operations include manufacturing of tractors and farm equipment

International Minerals and Chemical Corp. - operations include production of fertilizer and animal products

Merck Sharp and Dohme Research Laboratories Division, Merck and Co., Inc. - operations include research and development of animal health and feed products

Pennwalt Corp. - Agchem Division produces, among other things, pesticides, fungicides, and herbicides

Ralston Purina Co. - operations include processing soybeans and manufacturing pet foods and cereals

Scott Paper Co. - manufactures and sells paper products

Union Camp Corp. - manufactures and sells paper products

Universities

Cornell University - College of Agriculture and Life Science

Purdue University - Department of Agricultural Engineering

Texas A&M University - College of Veterinary Medicine

University of California, Davis Campus - College of Agriculture
and Environmental Science

University of Illinois - College of Agriculture

University of Maryland - College of Agriculture

Government Agencies and Nonprofit Organizations

American Society of Agronomy

American Veterinary Medical Association

Cold Spring Harbor Laboratories

College Placement Service

National Academy of Sciences

National Institutes of Health

National Science Foundation

Office of Technology Assessment

Rockefeller Foundation

U.S. Department of Agriculture

U.S. Department of Education

U.S. Department of Labor

U.S. Environmental Protection Agency

U.S. Food and Drug Administration