

a lower cost, tend to fare relatively better in difficult economic conditions.

Earnings

Earnings of paralegals and legal assistants vary greatly. Salaries depend on education, training, experience, type and size of employer, and geographic location of the job. In general, paralegals who work for large law firms or in large metropolitan areas earn more than those who work for smaller firms or in less populated regions. In 2000, full-time, wage and salary paralegals and legal assistants had median annual earnings of \$35,360. The middle 50 percent earned between \$28,700 and \$45,010. The top 10 percent earned more than \$56,060, while the bottom 10 percent earned less than \$23,350. Median annual earnings in the industries employing the largest numbers of paralegals in 2000 were as follows:

Federal Government	\$48,560
Legal services	34,230
Local government	34,120
State government	32,680

According to the National Association of Legal Assistants, paralegals had an average salary of \$38,000 in 2000. In addition to a salary, many paralegals received a bonus, which averaged about \$2,400. According to the National Federation of Paralegal Associations, starting salaries of paralegals with 1 year or less experience averaged \$38,100 in 1999.

Related Occupations

Several other occupations call for a specialized understanding of the law and the legal system, but do not require the extensive training of a lawyer. These include law clerks; title examiners,

abstractors, and searchers; claims adjusters, appraisers, examiners, and investigators; and occupational health and safety specialists and technicians.

Sources of Additional Information

General information on a career as a paralegal can be obtained from:

- ▶ Standing Committee on Legal Assistants, American Bar Association, 541 North Fairbanks Court, Chicago, IL 60611. Internet: <http://www.abanet.org>

For information on the Certified Legal Assistant exam, schools that offer training programs in a specific State, and standards and guidelines for paralegals, contact:

- ▶ National Association of Legal Assistants, Inc., 1516 South Boston St., Suite 200, Tulsa, OK 74119. Internet: <http://www.nala.org>

Information on a career as a paralegal, schools that offer training programs, job postings for paralegals, the Paralegal Advanced Competency Exam, and local paralegal associations can be obtained from:

- ▶ National Federation of Paralegal Associations, P.O. Box 33108, Kansas City, MO 64114. Internet: <http://www.paralegals.org>

Information on paralegal training programs, including the pamphlet "How to Choose a Paralegal Education Program," may be obtained from:

- ▶ American Association for Paralegal Education, 2965 Flowers Road South, Atlanta, GA 30341. Internet: <http://www.aafpe.org>

Information on obtaining a position as a paralegal specialist with the Federal Government is available from the Office of Personnel Management (OPM) through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call (912) 757-3000; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the OPM Internet site: <http://www.usajobs.opm.gov>.

Life Scientists

Agricultural and Food Scientists

(O*NET 19-1011.00, 19-1012.00, 19-1013.01, 19-1013.02)

Significant Points

- A large proportion, about 41 percent, of salaried agricultural and food scientists works for Federal, State, and local governments.
- A bachelor's degree in agricultural science is sufficient for some jobs in applied research; a master's or doctoral degree is required for basic research.

Nature of the Work

The work of agricultural and food scientists plays an important part in maintaining the Nation's food supply by ensuring agricultural productivity and the safety of the food supply. Agricultural scientists study farm crops and animals, and develop ways of improving their quantity and quality. They look for ways to improve crop yield with less labor, control pests and weeds more safely and effectively, and conserve soil and water. They research methods of converting raw agricultural commodities into attractive and healthy food products for consumers.

Agricultural science is closely related to biological science, and agricultural scientists use the principles of biology, chemistry, physics, mathematics, and other sciences to solve problems in agriculture. They often work with biological scientists on basic biological research and on applying to agriculture the advances in knowledge brought about by biotechnology.

Many agricultural scientists work in basic or applied research and development. Others manage or administer research and development programs, or manage marketing or production operations in companies that produce food products or agricultural chemicals, supplies, and machinery. Some agricultural scientists are consultants to business firms, private clients, or government.

Depending on the agricultural or food scientist's area of specialization, the nature of the work performed varies.

Food science. Food scientists and technologists usually work in the food processing industry, universities, or the Federal Government, and help meet consumer demand for food products that are healthful, safe, palatable, and convenient. To do this, they use their knowledge of chemistry, microbiology, and other sciences to develop new or better ways of preserving, processing, packaging, storing, and delivering foods. Some food scientists engage in basic research, discovering new food sources; analyzing food content to determine levels of vitamins, fat, sugar, or protein; or searching for substitutes for harmful or undesirable additives, such as nitrites.

They also develop ways to process, preserve, package, or store food according to industry and government regulations. Others enforce government regulations, inspecting food processing areas and ensuring that sanitation, safety, quality, and waste management standards are met. Food technologists generally work in product development, applying the findings from food science research to the selection, preservation, processing, packaging, distribution, and use of safe, nutritious, and wholesome food.

Plant science. Agronomy, crop science, entomology, and plant breeding are included in plant science. Scientists in these disciplines study plants and their growth in soils, helping producers of food, feed, and fiber crops to continue to feed a growing population while conserving natural resources and maintaining the environment. Agronomists and crop scientists not only help increase productivity, but also study ways to improve the nutritional value of crops and the quality of seed. Some crop scientists study the breeding, physiology, and management of crops and use genetic engineering to develop crops resistant to pests and drought. Entomologists conduct research to develop new technologies to control or eliminate pests in infested areas and to prevent the spread of harmful pests to new areas, as well as technologies that are compatible with the environment. They also conduct research or engage in oversight activities aimed at halting the spread of insect-borne disease.

Soil science. Soil scientists study the chemical, physical, biological, and mineralogical composition of soils as they relate to plant

or crop growth. They also study the responses of various soil types to fertilizers, tillage practices, and crop rotation. Many soil scientists who work for the Federal Government conduct soil surveys, classifying and mapping soils. They provide information and recommendations to farmers and other landowners regarding the best use of land, plant growth, and methods to avoid or correct problems such as erosion. They may also consult with engineers and other technical personnel working on construction projects about the effects of, and solutions to, soil problems. Because soil science is closely related to environmental science, persons trained in soil science also apply their knowledge to ensure environmental quality and effective land use.

Animal science. Animal scientists work to develop better, more efficient ways of producing and processing meat, poultry, eggs, and milk. Dairy scientists, poultry scientists, animal breeders, and other related scientists study the genetics, nutrition, reproduction, growth, and development of domestic farm animals. Some animal scientists inspect and grade livestock food products, purchase livestock, or work in technical sales or marketing. As extension agents or consultants, animal scientists advise agricultural producers on how to upgrade animal housing facilities properly, lower mortality rates, handle waste matter, or increase production of animal products, such as milk or eggs.

Working Conditions

Agricultural scientists involved in management or basic research tend to work regular hours in offices and laboratories. The work environment for those engaged in applied research or product development varies, depending on the discipline of agricultural science and on the type of employer. For example, food scientists in private industry may work in test kitchens while investigating new processing techniques. Animal scientists working for Federal, State, or university research stations may spend part of their time at dairies, farrowing houses, feedlots, or farm animal facilities or outdoors conducting research associated with livestock. Soil and crop scientists also spend time outdoors conducting research on farms and agricultural research stations. Entomologists work in laboratories, insectories, or agricultural research stations, and may also spend time outdoors studying or collecting insects in their natural habitat.

Employment

Agricultural and food scientists held about 17,000 jobs in 2000. In addition, several thousand persons held agricultural science faculty positions in colleges and universities. (See the statement on postsecondary teachers elsewhere in the *Handbook*.)

About 41 percent of all nonfaculty salaried agricultural and food scientists work for Federal, State, or local governments. Nearly 2 out of 3 worked for the Federal Government in 2000, mostly in the Department of Agriculture. In addition, large numbers worked for State governments at State agricultural colleges or agricultural research stations. Some worked for agricultural service companies; others worked for commercial research and development laboratories, seed companies, pharmaceutical companies, wholesale distributors, and food products companies. About 4,000 agricultural scientists were self-employed in 2000, mainly as consultants.

Training, Other Qualifications, and Advancement

Training requirements for agricultural scientists depend on their specialty and on the type of work they perform. A bachelor's degree in



Many agricultural and food scientists conduct research in offices and laboratories.

agricultural science is sufficient for some jobs in applied research or for assisting in basic research, but a master's or doctoral degree is required for basic research. A Ph.D. in agricultural science usually is needed for college teaching and for advancement to administrative research positions. Degrees in related sciences such as biology, chemistry, or physics or in related engineering specialties also may qualify persons for some agricultural science jobs.

All States have a land-grant college that offers agricultural science degrees. Many other colleges and universities also offer agricultural science degrees or some agricultural science courses. However, not every school offers all specialties. A typical undergraduate agricultural science curriculum includes communications, economics, business, and physical and life sciences courses, in addition to a wide variety of technical agricultural science courses. For prospective animal scientists, these technical agricultural science courses might include animal breeding, reproductive physiology, nutrition, and meats and muscle biology.

Students preparing as food scientists take courses such as food chemistry, food analysis, food microbiology, food engineering, and food processing operations. Those preparing as crop or soil scientists take courses in plant pathology, soil chemistry, entomology, plant physiology, and biochemistry, among others. Advanced degree programs include classroom and fieldwork, laboratory research, and a thesis or dissertation based on independent research.

Agricultural and food scientists should be able to work independently or as part of a team and be able to communicate clearly and concisely, both orally and in writing. Most of these scientists also need an understanding of basic business principles, and the ability to apply basic statistical techniques. Employers increasingly prefer job applicants who are able to apply computer skills to determine solutions to problems, to collect and analyze data, and for the control of processes.

The American Society of Agronomy offers certification programs in crops, agronomy, crop advising, soils, horticulture, plant pathology, and weed science. To become certified, applicants must pass designated examinations and meet certain standards with respect to education and professional work experience.

Agricultural scientists who have advanced degrees usually begin in research or teaching. With experience, they may advance to jobs such as supervisors of research programs or managers of other agriculture-related activities.

Job Outlook

Employment of agricultural scientists is expected to grow more slowly than the average for all occupations through 2010. Additionally, the need to replace agricultural and food scientists who retire or otherwise leave the occupation permanently will account for many more job openings than will projected growth, particularly in academia.

Past agricultural research has resulted in the development of higher yielding crops, crops with better resistance to pests and plant pathogens, and chemically based fertilizers and pesticides. Further research is necessary as insects and diseases continue to adapt to pesticides, and as soil fertility and water quality continue to need improvement. Agricultural scientists are using new avenues of research in biotechnology to develop plants and food crops that require less fertilizer, fewer pesticides and herbicides, and even less water for growth. Agricultural scientists will be needed to balance increased agricultural output with protection and preservation of soil, water, and ecosystems. They will increasingly encourage the practice of "sustainable agriculture" by developing and implementing plans to manage pests, crops, soil fertility and

erosion, and animal waste in ways that reduce the use of harmful chemicals and do little damage to the natural environment. Also, an expanding population and an increasing public focus on diet, health, and food safety will result in job opportunities for food scientists and technologists.

Graduates with advanced degrees will be in the best position to enter jobs as agricultural scientists. Bachelor's degree holders can work in some applied research and product development positions, but usually only in certain subfields, such as food science and technology. Also, the Federal Government hires bachelor's degree holders to work as soil scientists. Despite the more limited opportunities for those with only a bachelor's degree to obtain jobs as agricultural scientists, a bachelor's degree in agricultural science is useful for managerial jobs in businesses that deal with ranchers and farmers, such as feed, fertilizer, seed, and farm equipment manufacturers; retailers or wholesalers; and farm credit institutions. Four-year degrees also may help persons enter occupations such as farmer, or farm or ranch manager; cooperative extension service agent; agricultural products inspector; or purchasing or sales agent for agricultural commodity or farm supply companies.

Earnings

Median annual earnings of agricultural and food scientists were \$52,160 in 2000. The middle 50 percent earned between \$40,720 and \$66,370. The lowest 10 percent earned less than \$31,910, and the highest 10 percent earned more than \$83,740.

Average Federal salaries for employees in nonsupervisory, supervisory and managerial positions in certain agricultural science specialties in 2001 were as follows: Animal science, \$76,582; agronomy, \$62,311; soil science, \$58,878; horticulture, \$59,472; and entomology, \$70,133.

According to the National Association of Colleges and Employers, beginning salary offers in 2001 for graduates with a bachelor's degree in animal science averaged \$28,031 a year.

Related Occupations

The work of agricultural scientists is closely related to that of biologists and other natural scientists, such as chemists, conservation scientists, and foresters. It is also related to managers of agricultural production, such as farmers, ranchers, agricultural managers. Certain specialties of agricultural science also are related to other occupations. For example, the work of animal scientists is related to that of veterinarians and horticulturists perform duties similar to those of landscape architects.

Sources of Additional Information

Information on careers in agricultural science is available from:

- ▶ American Society of Agronomy, Crop Science Society of America, Soil Science Society of America, 677 S. Segoe Rd., Madison, WI 53711-1086.
- ▶ Food and Agricultural Careers for Tomorrow, Purdue University, 1140 Agricultural Administration Bldg., West Lafayette, IN 47907-1140.

For information on careers in food technology, write to:

- ▶ Institute of Food Technologists, Suite 300, 221 N. LaSalle St., Chicago IL 60601-1291.

Information on acquiring a job as an agricultural scientist with the Federal Government is available from the Office of Personnel Management through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call (912) 757-3000; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the Internet site: <http://www.usajobs.opm.gov>.