

FISHERS AND FISHING VESSELS

Faster than average growth is expected as agricultural and food scientists develop new products using biotechnology and work to limit the negative environmental impact of agriculture.

A bachelor's degree in agricultural science is sufficient for most jobs in product development; a master's or Ph.D. degree is generally required for research positions.

Opportunities are expected to be good.



SUMMARY

The work of agricultural and food scientists plays an important role in maintaining the Nation's food supply by ensuring agricultural productivity and food safety. Agricultural scientists study farm crops and animals and develop ways of improving their quantity and quality. They look for ways to improve crop yield, 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. Some agricultural scientists look for ways to use agricultural products for fuels.

In recent years, advances in the study of genetics have spurred the growth of biotechnology. Some agricultural and food scientists use biotechnology to manipulate the genetic material of plants and crops, attempting to make these organisms more productive or resistant to disease. Advances in biotechnology have opened up research opportunities in many areas of agricultural and food science, including commercial applications in agriculture, environmental remediation, and the food industry. Interest in the production of biofuels, or fuels manufactured from agricultural derivatives, has also increased. Some agricultural scientists work with biologists and chemists to develop more efficient processes for turning crops into energy sources, such as ethanol produced from corn. Another emerging technology expected

to affect agriculture is nanotechnology—a molecular manufacturing technology which promises to revolutionize methods of testing agricultural and food products for contamination or spoilage. Some food scientists are using nanotechnology to develop sensors that can quickly and accurately detect contaminant molecules in food.

Many agricultural scientists work in basic or applied research and development. Basic research seeks to understand the biological and chemical processes by which crops and livestock grow, such as determining the role of a particular gene in plant growth. Applied research uses this knowledge to discover mechanisms to improve the quality, quantity, and safety of agricultural products. Other agricultural scientists 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.

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universities, or the Federal Government to create and improve food products. They use their knowledge of chemistry, physics, engineering, microbiology, biotechnology, 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. Others engage in applied research, finding ways to improve the content of food or to remove harmful additives. They also develop ways to process, preserve, package, or store food according to industry and government regulations. Some continue to research improvements in traditional food processing techniques, such as baking, blanching, canning, drying, evaporation, and pasteurization. Other food scientists enforce government regulations, inspecting food processing areas and ensuring that sanitation, safety, quality, and waste management standards are met. Depending on the agricultural or food scientist's area of specialization, the nature of the work performed varies.

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Food technologists generally work in product development, applying the findings from food science research to improve the selection, preservation, processing, packaging, and distribution of food.

Plant scientists study plants, helping producers of food, feed, and fiber crops to feed a growing population and to conserve natural resources. 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,

TRAINING, OTHER QUALIFICATIONS, AND ADVANCEMENT

A bachelor's degree in agricultural science is sufficient for private industry jobs in product development or applied research, but a master's or doctoral degree is generally required for research jobs at universities.

EDUCATION AND TRAINING

Training requirements for agricultural scientists depend on the type of work they perform. Most jobs in the farming and food processing industry require a bachelor's degree, but a master's or doctoral degree is usually required for research positions at universities. A Ph.D. in agricultural science is also needed for college teaching and for advancement to senior research positions. Degrees in related sciences such as biology, chemistry, or physics or in related engineering specialties also may qualify people for many 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 agricultural science courses. However, not every school offers all specialties. A typical undergraduate agricultural science curriculum includes communications,

mathematics, economics, business, and physical and life sciences courses, in addition to a wide variety of technical

CERTIFICATION AND ADVANCEMENT

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

The American Society of Agronomy certifies agronomists and crop advisors, and the Soil Science Society of America certifies soil scientists and soil classifiers. Certification is not necessary to work in these occupations, but it may improve opportunities by providing proof of a worker's qualifications. Certification in agronomy requires a bachelor's degree in agronomy or a related field and 5 years of experience, a master's degree and 3 years, or a doctoral degree and 1 year. Crop advising certification requires either 4 years of experience or a bachelor's degree in agriculture and 2 years of experience. To become certified in soil science or soil classification, applicants must have a bachelor's degree in soil science and 5 years of experience or a graduate degree and 3 years of experience. To receive any

FISHING VESSEL EMPLOYMENT

Agricultural and food scientists held about 31,000 jobs in 2008. Soil and plant scientists accounted for 13,900, food scientists and technologist for 13,400, while the remaining 3,700 were animal scientists. In addition, many people trained in these sciences held faculty positions in colleges and universities. (See the statement on teachers—postsecondary elsewhere in the Handbook.)

About 20 percent worked for manufacturing companies, mainly in food and pharmaceutical manufacturing, and another 15 percent worked in educational institutions. The Federal Government employed about 7 percent, mostly in the U.S. Department of Agriculture. Other agricultural and food scientists worked for research and development laboratories and wholesale distributors. About 12 percent of agricultural scientists were self-employed in 2008, mainly as consultants.

Job Outlook

Job growth among agricultural and food scientists should be faster than the average for all occupations. Opportunities are expected to be good over the next decade, particularly in food science and technology and in agronomy.

Employment change. Employment of agricultural and food scientists is expected to grow by 16 percent between 2008 and 2018, faster than the average for all occupations. Job growth will stem primarily from efforts to increase the quantity and quality of food produced for a growing population. Additionally, an increasing awareness about the health effects of certain types of foods and the effects of food production on the environment, will give rise to research into the best methods of food production.

Emerging biotechnologies will continue to play a large role in agricultural research, and applying these advances will provide many employment opportunities for scientists. For example, they may use findings from genomics to create agricultural products with higher yields and resistance to pests and pathogens. New developments will also be used to improve the quality and safety of prepared food products bought by consumers.

Agricultural scientists will also be needed to balance increased agricultural output with protection and preservation of soil, water, and ecosystems. They increasingly will help develop sustainable agricultural practices by creating and implementing plans to manage pests, crops, soil fertility and erosion, and animal waste in ways that reduce the use of harmful chemicals and minimize damage to the natural environment. In addition, demand for biofuels—renewable energy sources derived from plants—is expected to increase. Agricultural

Projection Data

Occupation Title	SOC Code	2008	Projected Employment	Change