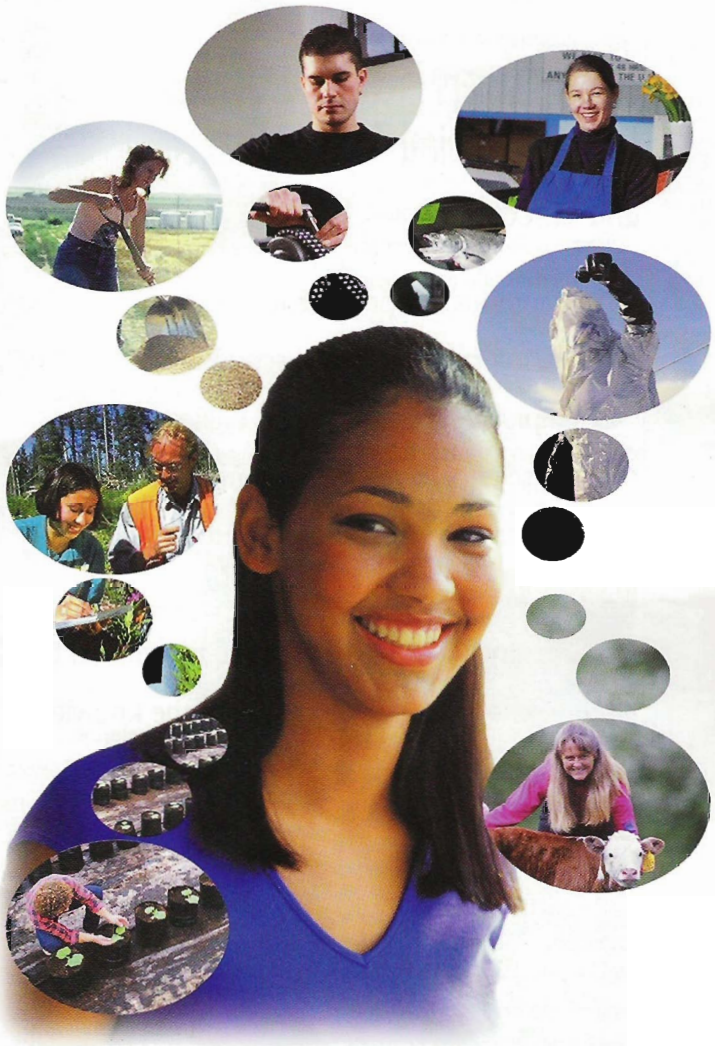
CAREER CLUSTERS—FOCUSING EDUCATION ON THE FUTURE

Agriculture, Food & Natural Resources



Preparing for Career Success in Agriculture, Food and Natural Resources

CC9001

Career Clusters Prepare All Students for College, Technical Training, Apprenticeships and Careers

Career Clusters prepare learners of all ages for the information age as schools, colleges, and employers are striving for higher achievement in science, math and communication. One key to improving learner achievement is providing learners with relevant contexts for studying and learning. Career Clusters offer a context by linking school-based learning with the knowledge and skills required for continued success.

The Concept of Career Clusters

Career Clusters identify the knowledge and skills learners need as they follow a pathway toward their career goals. The knowledge and skills identified form a strong basis for learner success in high school, college, technical training, apprenticeship programs and the workplace.

How to Pursue Education and Training in Agriculture, Food and Natural Resources

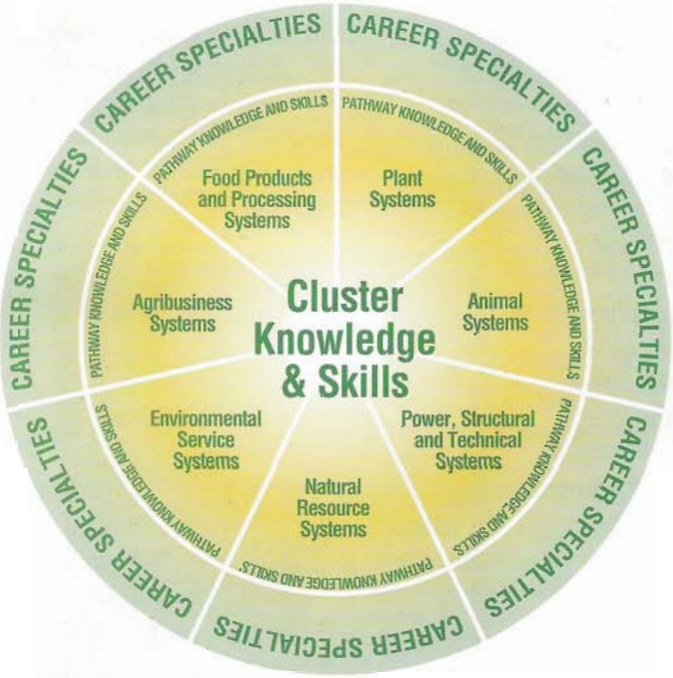
There are thousands of challenging educational and training opportunities within the high-skilled world of Agriculture, Food and Natural Resources. Learners need a solid background in math, science, communications and

technical skills. Education and training can be obtained in high schools, technical colleges, two-year community colleges, four-year colleges, apprenticeship programs, and career technical schools/ institutes. Along the way, career guidance professionals assist learners in assessing their educational goals, interests, abilities and skills to facilitate a good match to the cluster's many pathway options.

Learners participate in relevant educational opportunities framed in the context of the cluster. They gain knowledge and skills through coordinated workplace learning experiences such as site visits, job shadowing and internships. If they choose, they may achieve valuable skill certifications that lead to employment. Colleges and universities offer advanced degrees and industry certifications that prepare learners for professional and technical careers. Apprenticeship programs prepare learners for journeyworker status.

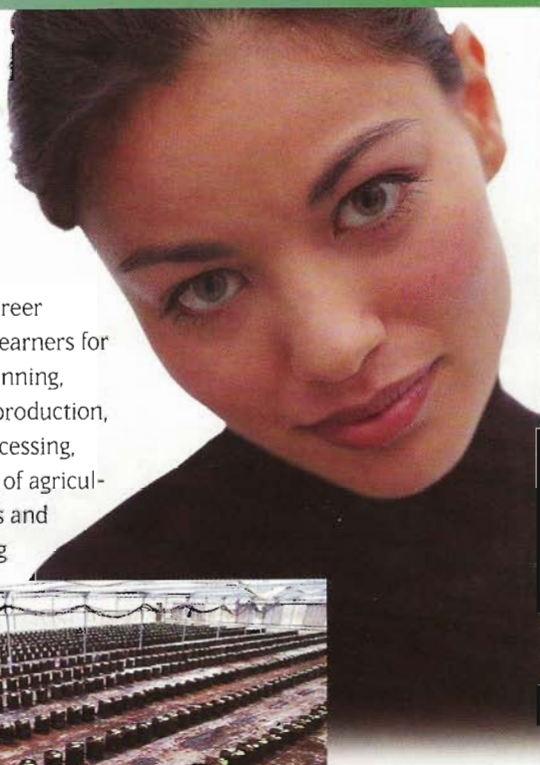
Career Pathways at a Glance

The Agriculture, Food and Natural Resources Career Cluster is divided into seven pathways. Pathways are grouped by common knowledge and skills required of occupations in these career fields. Each pathway provides instruction as a basis for success in an array of careers and educational pursuits.



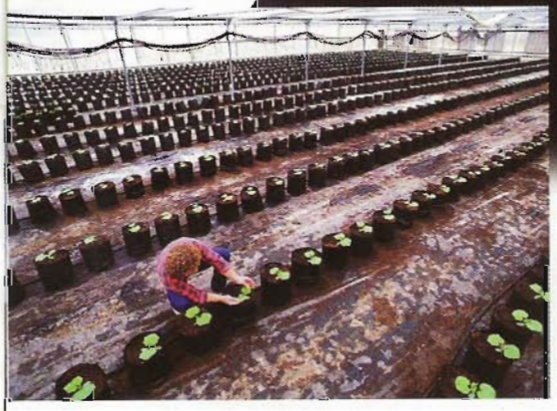
The Seven Pathways

- Food Products and Processing Systems
- Plant Systems
- Animal Systems
- Power, Structural and Technical Systems
- Natural Resource Systems
- Environmental Service Systems
- Agribusiness Systems



What Is the Agriculture, Food and Natural Resources Career Cluster?

This diverse Career Cluster prepares learners for careers in the planning, implementation, production, management, processing, and/or marketing of agricultural commodities and services, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products. It also includes related professional, technical and educational services.



Employment Outlook

Employment opportunities will continue to increase for those who provide and market an expanding array of food, forest, and veterinary medical consumer products to a growing world population.

Continued globalization of the food, agricultural and natural resources system will increase opportunities for graduates who understand the socio-economic factors that define international markets. Graduates who know how to satisfy the diverse consumer needs and preferences in different cultures, and who have the language skills to communicate effectively, will have the best opportunities to be employed by the growing number of multi-national businesses.

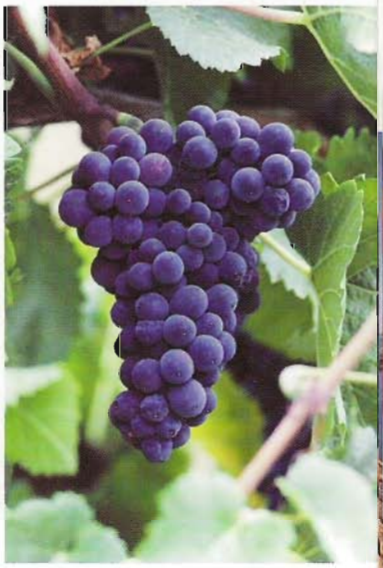
Food Products and Processing Systems

Overview

People who work in the food products and processing pathway discover new food sources, analyze food content and develop ways to process, preserve, package or store food according to industry and government regulations. They create new food products to meet consumer needs and inspect food-processing areas to ensure that sanitation, safety, quality and waste management standards are met.

Credentials

- Students preparing to work as food scientists/technologists take courses such as food chemistry, food analysis, food microbiology, and food processing operations.
- Agricultural and food scientists/technologists should be able to work independently or as part of a team and be able to communicate clearly and concisely, both in speaking and in writing. Most agricultural scientists also need an understanding of basic business principles.



Sample Occupations

- Food Scientist
- Bacteriologist
- Food and Drug Inspector
- Toxicologist
- Biochemist
- Meat Cutter-Grader
- Food and Fiber Engineer
- Produce Buyer
- Meat Processor

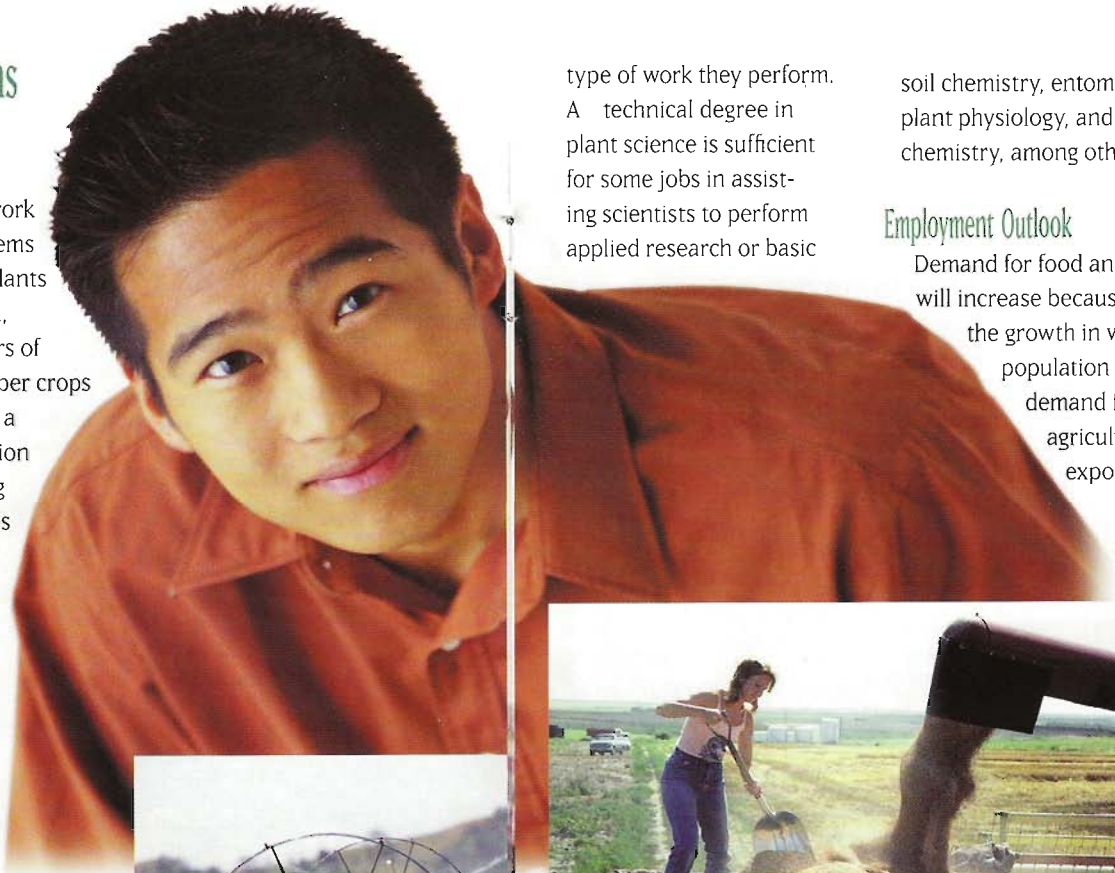
Employment Outlook

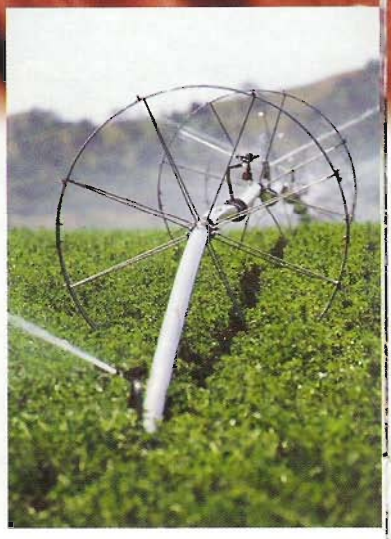
An expanding population and an increasing public focus on diet, health and food safety will result in strong job opportunities for food scientists and technologists.

Plant Systems

Overview

People who work in the plant systems pathway study plants and their growth, helping producers of food, feed and fiber crops continue to feed a growing population while conserving natural resources and maintaining the environment. Individuals in this pathway also develop ways to improve the nutritional value of crops and the quality of seeds. They use genetic engineering to develop crops resistant to pest and drought.





Sample Occupations

- Plant Breeder and Geneticist
- Soil and Water Specialist
- Certified Crop Advisor
- Botanist
- Tree Surgeon
- Education and Extension Specialist
- Golf Course Superintendent
- Greenhouse Manager
- Forest Geneticist

Credentials

- Training requirements for plant scientists and technicians depend on their specialty and on the type of work they perform. A technical degree in plant science is sufficient for some jobs in assisting scientists to perform applied research or basic research, but a master's or doctoral degree is required to supervise and conduct basic research.
- A typical undergraduate agricultural science curriculum includes communications, economics, business, and physical and life sciences courses. Those preparing to work as a crop or soil scientist take courses in plant pathology, soil chemistry, entomology, plant physiology, and biochemistry, among others.

Employment Outlook

Demand for food and fiber will increase because of the growth in world population and in demand for U.S. agricultural exports as developing nations improve their economies and personal incomes. Plant 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. These new advances will continue to provide a demand for careers in plant science.

Photo courtesy of USDA.

Animal Systems

Overview

People who work in the animal systems pathway work to develop better, more efficient ways of producing and processing meat, poultry, eggs and dairy products. They study genetics, nutrition, reproduction, growth and development of domesticated farm animals. Some individuals inspect and grade livestock food products, purchase livestock or work in technical sales or marketing. Others 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. Animal care workers train, feed, water, groom, bathe and exercise animals. They also clean, disinfect and repair their cages.

Sample Occupations

- Animal Geneticist
- Aquaculturalist
- Animal Nutritionist
- Animal Scientist
- Poultry Manager
- Embryo Technologist
- Veterinarian
- Feed Sales Representative
- Artificial Insemination Technician

Credentials

- Training requirements for animal scientists and technicians depend on their specialty and on the type of work they perform. A technical degree in animal science is sufficient for some positions that assist animal scientists in conducting applied research or basic research, but a master's or doctoral degree is required to supervise and conduct basic research.
- For prospective animal scientists and technicians, these technical animal science courses might include animal breeding, reproductive physiology, nutrition, and meats and muscle biology.

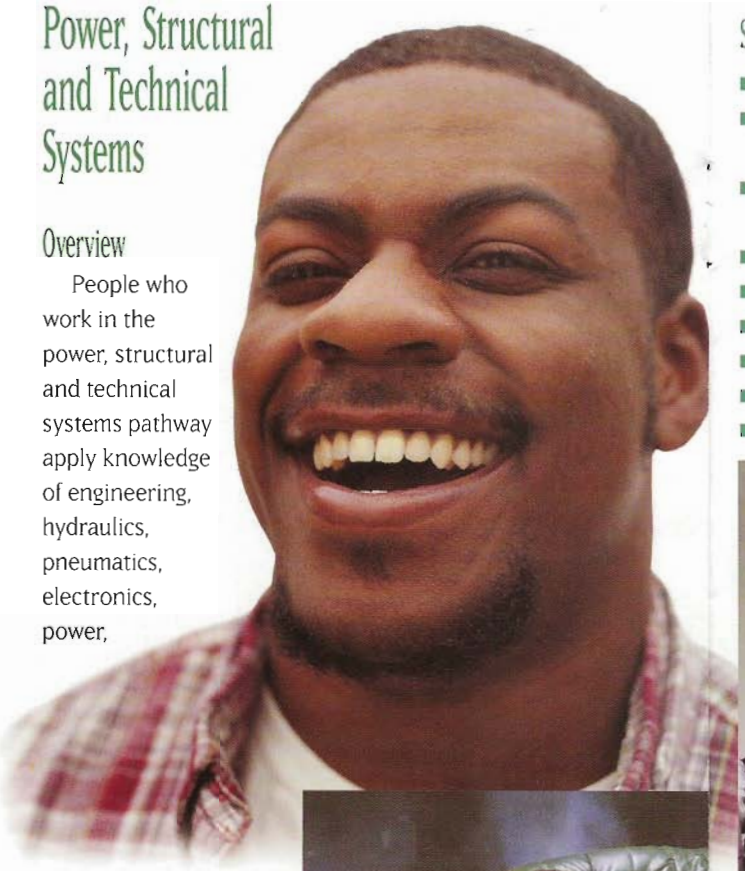
Employment Outlook

Demand for food and fiber will increase because of the growth in world population and in demand for U.S. agricultural exports as developing nations improve their economies and personal incomes.

Aquaculture will continue to provide some new employment opportunities over the next decade. Over fishing has resulted in declining ocean catches, and the growing demand for certain seafood items—such as shrimp, salmon, and catfish—has spurred the growth of aquaculture farms. Aquaculture output increased strongly between the early 1980s and mid-1990s, and continued growth is expected.

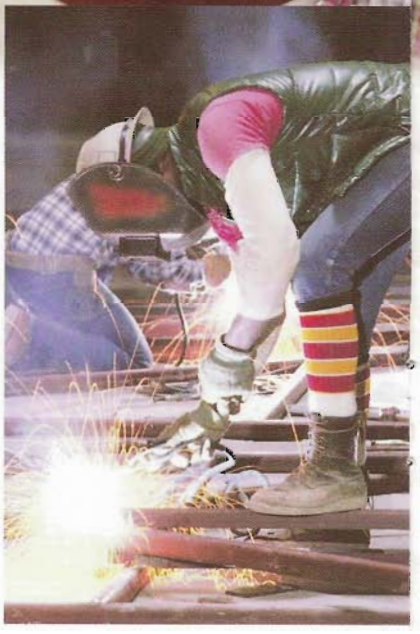
Photo courtesy of USDA.

Power, Structural and Technical Systems



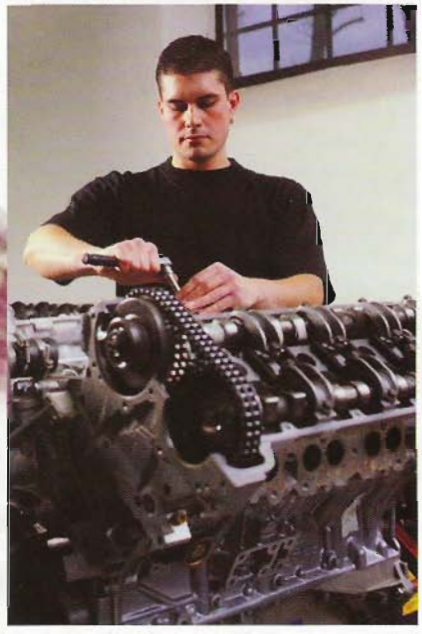
Overview

People who work in the power, structural and technical systems pathway apply knowledge of engineering, hydraulics, pneumatics, electronics, power, structures, and controls to the field of agriculture. They design agricultural structures as well as machinery and equipment. They develop ways to conserve soil and water and to improve the processing of agricultural products.



Sample Occupations

- Remote Sensing Specialist
- Global Positioning System Technician
- Electronics Systems Technician
- Agricultural Engineer
- Recycling Technician
- Equipment Parts Manager
- Machinist
- Communication Technician
- Welder



Credentials

- All levels of postsecondary degrees and certificates are available. Degrees range from an associate degree to a Ph.D., and certifications include Certified Welding Machine Operator, Certified Safety Professional, Certified Machinist, Structural Engineer and others.
- Machinists who operate computer-control programmers train in various ways—in apprenticeship programs, informally on the job and in secondary, vocational or postsecondary schools.

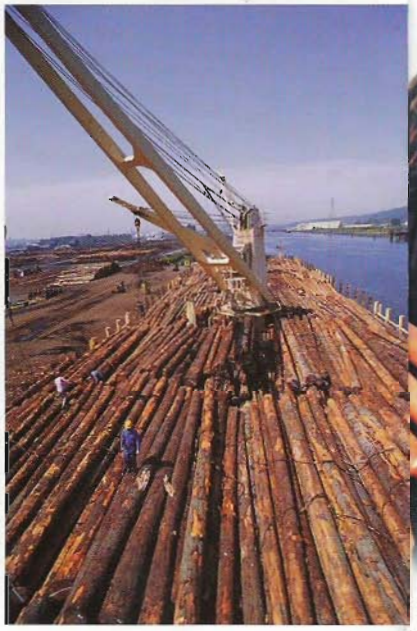
Employment Outlook

Employment of individuals in the power, structural and technical systems pathway is expected to grow about the same as the average for all occupations through 2010. Increasing demand for agricultural products, continued efforts for more efficient agricultural production and increasing emphasis on the conserving of resources should result in good job opportunities in the coming years.

Natural Resource Systems

Overview

People who work in the natural resource systems pathway perform a variety of tasks from helping to develop, maintain, and manage the forest and natural environment to catching and trapping various types of marine life for human consumption, animal feed, bait and other uses. Forest and rangelands supply wood products, livestock forage, minerals and water; serve as sites for recreational activities; and provide habitats for wildlife. Conservation scientists and foresters manage, develop, use and help protect these and other natural resources.



Sample Occupations

- Wildlife Manager or Technician
- Water Monitoring Technician
- Park Manager or Technician
- Natural History Interpreter
- Fish and Game Officer
- Forest Worker or Logger
- Forest Manager or Technician
- Fisheries Manager or Technician
- Mining Engineer or Technician

Credentials

- An associate or bachelor's degree in forestry is the minimum education recommended for a professional career in forestry. In the federal government, a combination of experience and appropriate education occasionally may substitute for a four-year degree in natural resources but job competition makes this difficult.
- A bachelor's degree in range management or range science is the usual minimum educational requirement for range managers.

Technicians in all areas typically receive their training through a combination of community colleges and on-the-job training.

Employment Outlook

Nearly 4 out of 10 conservation scientists and foresters are employed by the federal government—many in the U.S. Department of Agriculture (USDA). Employment of foresters is concentrated in the western and southeastern states, where many national and private forest and parks, and most of the lumber and pulpwood-producing forests are located.

Photo courtesy of USDA.

Environmental Service Systems

Overview

People who work in the environmental service systems pathway are involved in water and air pollution control, recycling, waste disposal and public health issues. Environmental engineers and technicians conduct hazardous-waste management studies, evaluate the significance of the hazard, offer analysis on treatment and containment, and develop regulations to prevent mishaps. They design municipal sewage and industrial wastewater systems. They analyze scientific data, research environmental projects and perform quality control checks.

Photo courtesy of USDA.

Sample Occupations

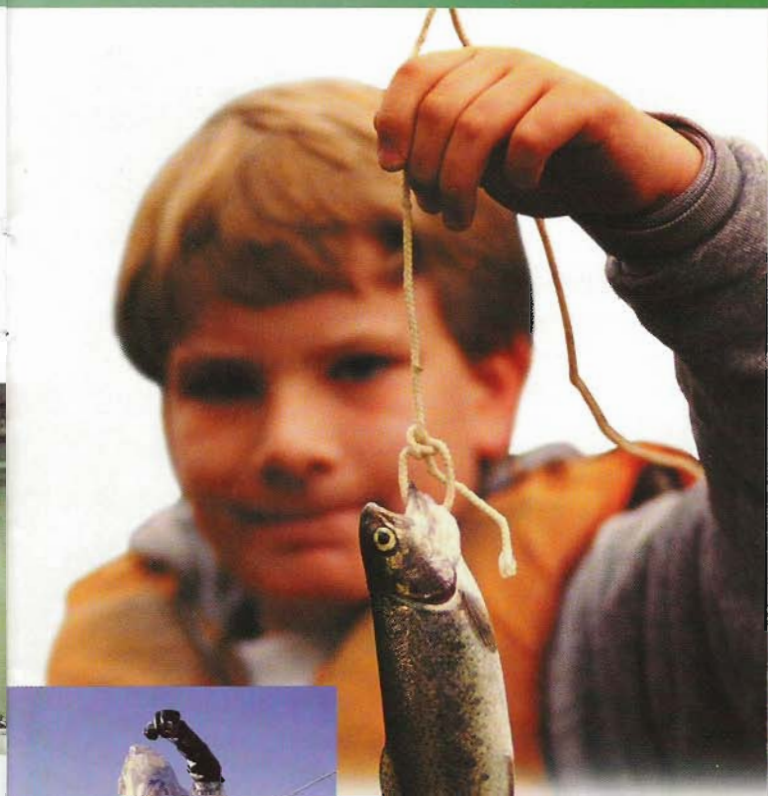
- Pollution Prevention and Control Manager
- Environmental Sampling Technician
- Health and Safety Sanitarian
- Hazardous Materials Handler
- Water Environment Manager
- Toxicologist
- Solid Waste Disposer/ Recycler
- Environmental Compliance Assurance Manager
- Water Quality Manager

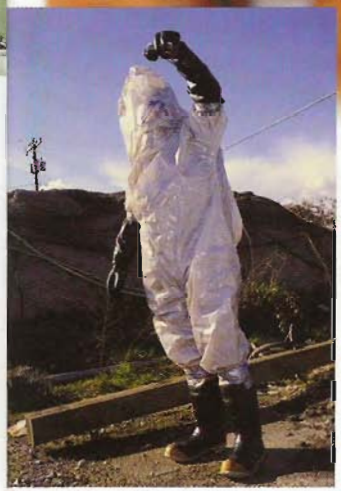
Credentials

Federal regulations require a license to work as a hazardous material removal worker. Most employers provide technical training on-the-job, but a formal 32- to 40-hour training program must be completed to be licensed as an asbestos- and lead-abatement worker or a treatment, storage and disposal worker.

Employment Outlook

Employment of environmental engineers and technicians is expected to increase faster than the average for all occupations throughout the next decade.

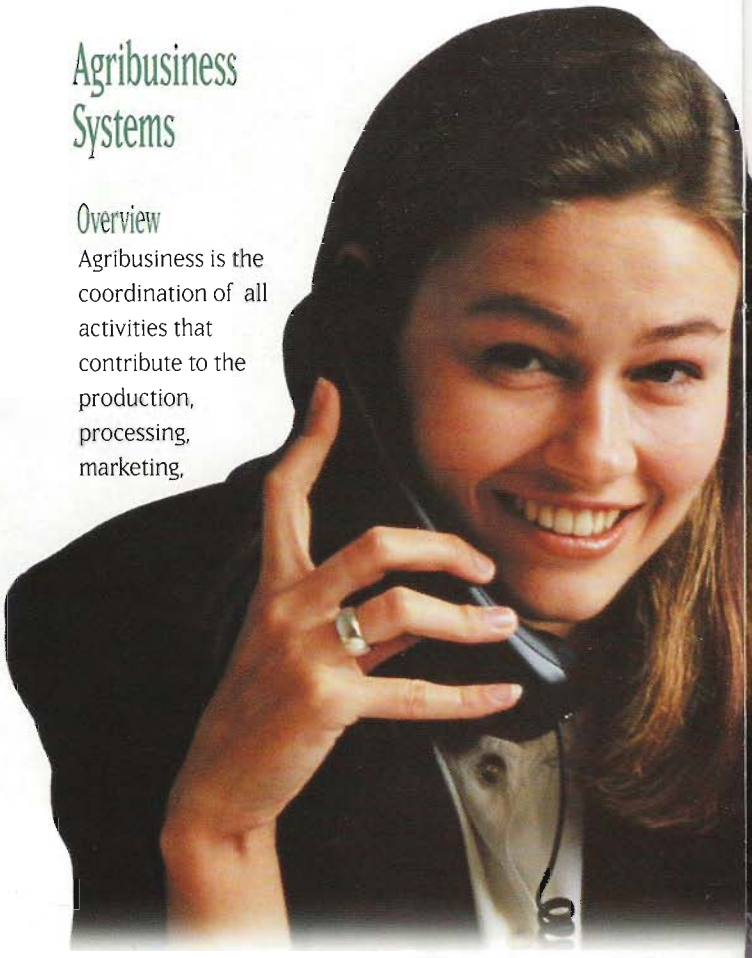




More environmental engineers and technicians will be needed to meet environmental regulations and to develop methods of cleaning up existing hazards. A shift in emphasis toward preventing problems rather than controlling those that already exist, as well as increasing public health concerns, also will spur demand for these positions.

Jobs in environmental service systems, such as water safety with 88,000 jobs and hazardous materials with 37,000 jobs, can provide good opportunities for qualified applicants. These opportunities are the result of a combination of factors—relatively few applicants, the need for a high number of replacements each year and an average growth rate.

Agribusiness Systems



Overview

Agribusiness is the coordination of all activities that contribute to the production, processing, marketing, distribution, financing and development of agricultural commodities and resources. This includes food, fiber, wood products, natural resources, horticulture, and other plant and animal products and services. Agribusiness is a high-tech industry that uses satellite systems, computer databases and spreadsheets, biotechnology and many other innovations to increase efficiency and profitability.

Sample Occupations

- International Agri-Marketing Specialist
- Agricultural Loan Officer
- Agricultural Commodity Broker
- Farm/Ranch Manager
- Agricultural Economist
- Livestock Buyer/Seller
- Feed/Farm Supply Store Manager
- Agricultural Products Buyer
- Agricultural Salesperson

Credentials

Not everyone who works in agribusiness has the opportunity to grow up on a farm or ranch. Many receive their agricultural work experience from on-the-job training and college courses in agriculture. Both will prove valuable to those preparing for a career in agribusiness.

Employment Outlook

Market pressures will continue the long-term trend toward consolidation into fewer and larger farms and ranches over the next decade. Good opportunities will continue for people in agribusiness who support the production of agricultural commodities.

Photo courtesy of USDA.

The 16 Career Clusters

Agriculture, Food & Natural Resources
Architecture & Construction
Arts, A/V Technology & Communications
Business, Management & Administration
Education & Training
Finance
Government & Public Administration
Health Science
Hospitality & Tourism
Human Services
Information Technology
Law, Public Safety & Security
Manufacturing
Marketing, Sales & Service
Science, Technology, Engineering & Mathematics
Transportation, Distribution & Logistics

States' Career Clusters

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