



## Agricultural Engineering Overview

The Field - Preparation - Accreditation -  
Day in the Life - Earnings - Employment -  
Career Path Forecast - Professional Organizations

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### The Field

Agricultural engineers apply knowledge of engineering technology and biological science to agriculture. They design agricultural machinery and equipment and agricultural structures. Some specialties include power systems and machinery design; structures and environment; and food and bioprocess engineering. They develop ways to conserve soil and water and to improve the processing of agricultural products. Agricultural engineers work in research and development, production, sales, or management.



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### Preparation

Agricultural Engineering graduates may improve crop production system, design animal facilities, analyze food production systems, or test machinery. They must have strong analytical skills and be detail oriented. In addition, they must work well in team situations as they are often called upon to work in a group setting with other engineers and with others outside of engineering.

### Agricultural Engineering Programs

A bachelor's degree in engineering is required for almost all entry-level engineering jobs. Accredited agricultural engineering programs usually provide broad studies in the physical, chemical, and biological sciences in addition to course work in civil, mechanical, and/or chemical engineering. It is important to select a program that is accredited in Agricultural Engineering. Programs accredited in Agricultural Engineering are sometimes also called Biosystems Engineering, Bioresource Engineering, or Biological Engineering.



### Admission Requirements

Admissions requirements for undergraduate engineering schools include a solid background in mathematics (algebra, geometry, trigonometry, and calculus) and science (biology, chemistry, and physics), and courses in English, social studies, humanities, and computer and

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information technology. Bachelor's degree programs in engineering typically are designed to last 4 years, but many students find that it takes between 4 and 5 years to complete their studies. In a typical 4-year college curriculum, the first 2 years are spent studying mathematics, basic sciences, introductory engineering, humanities, and social sciences. In the last 2 years, most courses are in engineering, usually with a concentration in one branch. For example, the last two years of an agricultural engineering program might include courses in avian biology, soil science, plant physiology, and manufacturing systems engineering.

## Co-ops

Internships and Coops provide students with a great opportunity to gain real-world experience while still in school. Many universities offer co-op and internship programs for students studying Agricultural Engineering.

## Courses of Study

Students specializing in Agricultural Engineering will learn to integrate engineering analysis and design with biology to address challenges in the production, processing, packaging, and distribution of diverse agricultural products. It requires knowledge of a range of subjects which may include field machinery design, soil science, plant physiology, avian biology, engineering hydraulics, and entomology. Students pursuing a degree in agricultural engineering usually complete a diverse curriculum to prepare them to work toward improving agricultural systems.

## Accredited Programs

Those interested in a career in Agricultural Engineering should consider reviewing engineering programs that are accredited by the Accreditation Board for Engineering and Technology, Inc. (ABET). The following is a current list of universities offering accredited degree programs in Agricultural Engineering.

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| <ul style="list-style-type: none"> <li>• <b>University of Arizona</b></li> <li>• <b>University of Arkansas</b></li> <li>• <b>Auburn University</b></li> <li>• <b>California Polytechnic State University, San Luis Obispo</b></li> <li>• <b>University of California, Davis</b></li> <li>• <b>Clemson University</b></li> <li>• <b>Colorado State University</b></li> <li>• <b>Cornell University</b></li> <li>• <b>Florida A &amp; M University</b></li> <li>• <b>University of Florida</b></li> <li>• <b>University of Georgia</b></li> <li>• <b>University of Hawaii at Manoa</b></li> <li>• <b>University of Idaho</b></li> <li>• <b>University of Illinois at Urbana-Champaign</b></li> <li>• <b>Iowa State University</b></li> <li>• <b>Kansas State University</b></li> <li>• <b>University of Kentucky</b></li> <li>• <b>Louisiana State University and A&amp;M College</b></li> <li>• <b>University of Maine</b></li> <li>• <b>University of Maryland College Park</b></li> <li>• <b>Michigan State University</b></li> <li>• <b>University of Minnesota-Twin Cities</b></li> <li>• <b>Mississippi State University</b></li> </ul> | <ul style="list-style-type: none"> <li>• <b>University of Missouri-Columbia</b></li> <li>• <b>University of Nebraska-Lincoln</b></li> <li>• <b>State University of New York College of Environmental Science and Forestry</b></li> <li>• <b>North Carolina Agricultural and Technical State University</b></li> <li>• <b>North Carolina State University at Raleigh</b></li> <li>• <b>North Dakota State University</b></li> <li>• <b>The Ohio State University</b></li> <li>• <b>Oklahoma State University</b></li> <li>• <b>Oregon State University</b></li> <li>• <b>Pennsylvania State University</b></li> <li>• <b>Purdue University at West Lafayette</b></li> <li>• <b>Rutgers, The State University of New Jersey</b></li> <li>• <b>South Dakota State University</b></li> <li>• <b>University of Tennessee at Knoxville</b></li> <li>• <b>Texas A &amp; M University</b></li> <li>• <b>Utah State University</b></li> <li>• <b>Virginia Polytechnic Institute and State University</b></li> <li>• <b>Washington State University</b></li> <li>• <b>University of Washington</b></li> <li>• <b>University of Wisconsin-Madison</b></li> </ul> |
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## Day In The Life

Agricultural Engineers combine engineering principles with biological and agricultural sciences. They work to develop equipment, systems, and processes that help improve how the world's food supply is produced and distributed. They are involved in problem solving, and must have the ability to analyze a current system with an eye toward improving the current process. They often have to look beyond a specific challenge, such as a machine, or storage solution, and consider a larger system, and how improvements or changes would affect the whole.



### Job Duties

Agricultural engineers often work in teams and their duties involve analysis of current methods and equipment applied to the production, packing, and delivery of food products. They might work in a group with other engineers, or those outside of engineering, to solve problems related to systems, processes, and machines. They may be involved in designing a water irrigation system, or in determining alternative uses for agricultural byproducts. They may participate in legal or financial consulting regarding agricultural processes, equipment, or issues.

Some agricultural engineers focus on machinery, and may design equipment used in agriculture and construction. These engineers might have a special interest in crop handling, hydraulic power, or the growth of specific crops. They may be employed by machine manufacturing firms. Other agricultural engineers may find themselves designing buildings or other structures used for livestock, storage of grains, or experimental growing facilities. Still other agricultural engineers might focus on developing systems for food processing, such as drying processes, distillation, or long term storage.



### The Workplace

The type of job agricultural engineers have often determines whether they work inside or outside. However, most work inside a majority of the time. Some agricultural engineers whose tasks require visits to farms, animal operations, or seed manufacturers may find that they travel frequently. Many agricultural engineers find that working directly with growers, for example, provides immediate job satisfaction as it allows them to interact with people their work affects.

### Teams and Coworkers

Almost all jobs in engineering require some sort of interaction with coworkers. Whether they are working in a team situation, or just asking for advice, most engineers have to have the ability to communicate and work with other people. Engineers should be creative, inquisitive, analytical, and detail-oriented. They should be able to work as part of a team and to communicate well, both orally and in writing. Communication abilities are important because engineers often interact with specialists in a wide range of fields outside engineering.

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## Earnings

Earnings for engineers vary significantly by specialty, industry, and education. Even so, as a group, engineers earn some of the highest average starting salaries among those holding bachelor's degrees. According to the U.S. Department of Labor, Bureau of Labor Statistics, the median income for agricultural engineers is \$66,030. Entry-level salaries vary based on your areas of expertise, experience, education, supervisory responsibility, accountability for projects, and the geographic location, size, and industry of the employer. In terms of starting salaries, the average starting salary for agricultural engineers who have earned a Bachelor's degree is \$49,764.



## Employment

Agricultural engineers hold about 3,100 jobs. This represents 0.2% of the 1.5 million jobs held by engineers in the U.S. About one third work for professional, scientific, and technical services, supplying consultant services to farmers and farm-related industries. Others worked in a wide variety of industries, including crops and livestock as well as manufacturing and government. The following is a partial list of employers of Agricultural Engineers:

Corporations		U.S. Federal Government and State and Local Affiliates
<ul style="list-style-type: none"> <li>• 3M Worldwide</li> <li>• Abbott Laboratories</li> <li>• AGCO Corporation</li> <li>• Anheuser-Busch Companies</li> <li>• Archer Daniels Midland Company</li> <li>• BASF</li> <li>• Black &amp; Veatch</li> <li>• Blount International, Inc.</li> <li>• Bobcat</li> <li>• Briggs &amp; Stratton</li> <li>• Campbell Soup Company</li> <li>• Cargill Foods</li> <li>• Case IH</li> <li>• Caterpillar, Inc.</li> <li>• CH2M Hill</li> <li>• ConAgra Foods, Inc.</li> <li>• Cummins Engine Company</li> <li>• Dole</li> <li>• Dow Chemical Company</li> <li>• DuPont</li> <li>• Fleetguard, Inc.</li> <li>• FMC Corporation</li> <li>• Ford Motor Company</li> </ul>	<ul style="list-style-type: none"> <li>• General Mills, Inc.</li> <li>• Good Year Tire &amp; Rubber Company</li> <li>• Heinz</li> <li>• Hormel Foods Corporation</li> <li>• Hyster Company</li> <li>• ICI Group</li> <li>• JMLord, Incorporated</li> <li>• John Deere</li> <li>• Kraft Foods</li> <li>• M &amp; M Mars</li> <li>• Monsanto</li> <li>• National Wildlife Federation</li> <li>• New Holland</li> <li>• Owens Corning</li> <li>• Pioneer Hi-Bred International, Inc.</li> <li>• Proctor and Gamble</li> <li>• Purina Mills</li> <li>• Sunkist</li> <li>• Toro</li> <li>• Tyson Foods</li> <li>• Vermeer Manufacturing Company</li> </ul>	<ul style="list-style-type: none"> <li>• Department of Agriculture</li> <li>• Department of Energy</li> <li>• Department of Defense</li> <li>• Environmental Protection Agency</li> <li>• Federal Emergency Management Agency</li> <li>• NASA</li> <li>• National Oceanic and Atmospheric Administration</li> <li>• Natural Resources Conservation Service</li> <li>• US Army Corps of Engineers</li> <li>• US Navy</li> </ul> <p data-bbox="1049 1501 1271 1537"><b>Other Employers</b></p> <ul style="list-style-type: none"> <li>• Consulting Firms</li> <li>• Colleges and Universities</li> <li>• Peace Corps</li> <li>• Professional Associations</li> <li>• The World Bank</li> </ul>

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## Career Path Forecast

According to the US Department of Labor, Bureau of Labor Statistics, agricultural engineers are expected to have employment growth of 9 percent over the projections decade of 2006-2016.

This is about as fast as the average for all occupations. More engineers will be needed to meet the increasing demand for using biosensors to determine the optimal treatment of crops. Employment growth should also result from the need to increase crop yields to feed an expanding population and produce crops used as renewable energy sources. Moreover, engineers will be needed to develop more efficient agricultural production and conserve resources.



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## Professional Organizations

Professional organizations and associations provide a wide range of resources for planning and navigating a career in Agricultural Engineering. These groups can play a key role in your development and keep you abreast of what is happening in your industry. Associations promote the interests of their members and provide a network of contacts that can help you find jobs and move your career forward. They can offer a variety of services including job referral services, continuing education courses, insurance, travel benefits, periodicals, and meeting and conference opportunities. A broader list of professional associations is also available at [www.careercornerstone.org](http://www.careercornerstone.org).

### **American Society of Agricultural and Biological Engineers ([www.asabe.org](http://www.asabe.org))**

The American Society of Agricultural and Biological Engineers is an educational and scientific organization dedicated to the advancement of engineering applicable to agricultural, food, and biological systems. Founded in 1907 and headquartered in St Joseph, MI, ASABE comprises 9,000 members in more than 100 countries.

### **International Commission of Agricultural Engineering ([www.cigr.org](http://www.cigr.org))**

The International Commission of Agricultural Engineering (CIGR, Commission Internationale du Génie Rural) was set up by a Constituent Assembly on the occasion of the first International Congress of Agricultural Engineering, held in Liege, Belgium in 1930. It is an international, non-governmental, non-profit organization regrouping, as a networking system, Regional and National Societies of Agricultural Engineering as well as private and public companies and individuals all over the world.

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