Unit 11) Careers in Agriculture

Globally, agriculture accounts for over 36 percent of world employment according to the United Nations' agency specializing in world labor and employment issues. The International Labour Organization reports that agriculture is still the main employer in the poorest regions of the world, such as sub-Saharan Africa where almost 70 percent of the people work in agriculture and agriculture-related jobs.

In the United States, more than one in seven people are employed in the agriculture industry. In Kansas, the number of people employed in agriculture and agriculture-related jobs is slightly higher than the national statistic. Nearly one in five workers in the state of Kansas work in the agriculture industry.

There are more than 250 career fields available in agriculture. In addition to production agriculture, the agriculture profession includes everything from atomic physics, bioengineering, and computers to lasers, robotics, and space satellites. Many of those employed in the agriculture industry do not have a farm background or experience in production agriculture but training in agriculture is often helpful.

The Agriculture Profession

Agriculture– the application of the physical, biological, and social sciences and the principles of management to food production, preservation and processing, crop and livestock production, marketing, and processing, culture of flowers, turf grass, and ornamentals, life processes of plants and animals, natural resources management, economic development, agricultural education and communication, and related fields.

Kansas State University Undergraduate Catalog 2006-2008

"It may be hard for an egg to turn into a bird; it would be a jolly sight harder for it to learn to fly while remaining an egg. We are like eggs at present. And you cannot go on indefinitely being just an ordinary, decent egg. We must be hatched or go bad."

C.S. Lewis, Irish author and scholar

Every year, the agriculture industry needs more people to fill science, business and communication positions than universities are able to supply. According to the U.S. Department of Agriculture, more than 48,000 jobs are available each year in agriculture. As new technologies emerge, agriculture-related career opportunities incorporate those technological advances.

Career Explorations

"I think, at a child's birth, if a mother could ask a fairy godmother to endow it with the most useful gift, that gift would be curiosity."

Eleanor Roosevelt, First Lady of the United States, 1933-1945

Career Opportunities

The agriculture industry is huge, which means that there are thousands of job opportunities for recent college or technical school graduates each year. Many years ago, most agriculture-related careers involved production agriculture - farming or ranching. Today,

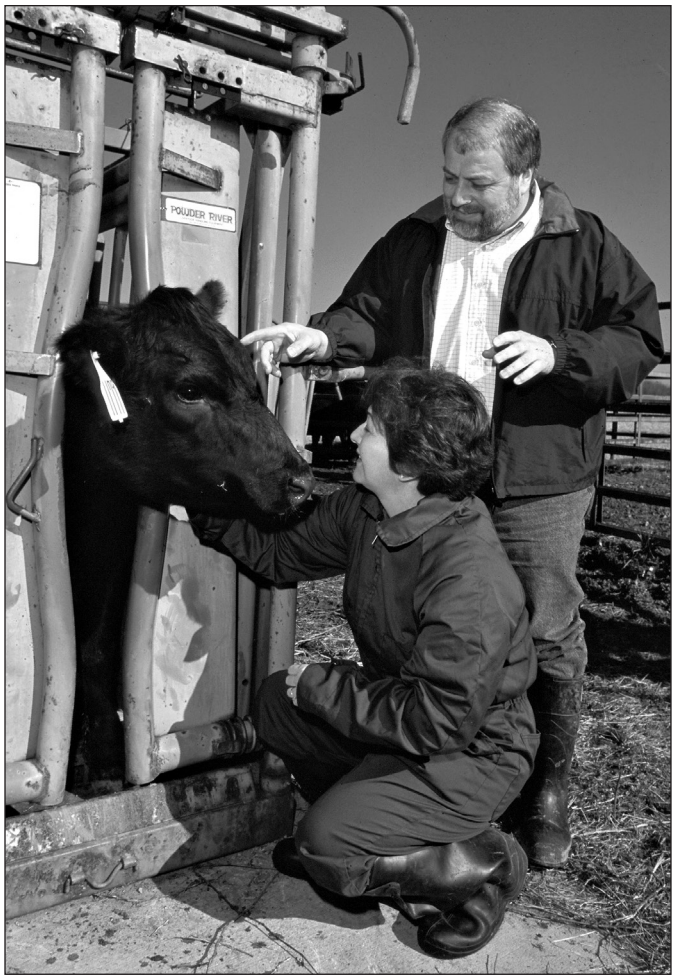
Agronomists Consulting with Wheat Producer

Credit: Scott Bauer, USDA ARS

however, less than two percent of the jobs in the United States are involved in production agriculture. Agribusiness accounts for twenty percent of the jobs in agriculture.

According to a 2005 study by Purdue University, employment opportunities for U.S. college graduates with expertise in the food, agricultural, and natural resources systems are expected to remain strong through 2010. The study projected over 52,000 job openings for new college graduates from 2005–2010, but only 49,300 qualified graduates to fill those positions. Graduates in agricultural studies were projected to fill 32,300 positions while the remaining 17,000 openings would be filled by graduates from programs of study such as biological sciences, engineering, business, health sciences, communication and applied technologies.

According to the study's projections, agriculture graduates will have the greatest opportunities in management and business, where the expected number of openings will be greater than the number of qualified candidates to fill those positions. Specialties in science and engineering will also offer a large number of new positions. There will also be many opportunities in specialized agriculture and forestry production for niche markets. The number of qualified graduates for agriculture-related positions in education, communication, and governmental services may exceed the number of available positions so competition for jobs in those fields may be greater during the next few years.



Veterinarians Examining Beef Heifer
Credit: Scott Bauer, USDA ARS

Higher Education– the non-compulsory educational level following the completion of high school; generally provided by colleges, universities, and other institutions (such as technical schools) which award an academic degree.

Preparation for Higher Education

Middle school or junior high is the time to start thinking about pursuing a higher education, whether that means a vocational or technical school or a university. Choices made in middle school can impact a student's ability to get accepted in the college or training program of his or her choice. These decisions can also affect a student's ability to qualify for financial aid, including scholarships, when he or she graduates from high school.

Students should start their path to higher education by pursuing classes in middle school or junior high that will allow them to take college preparatory classes in high school. Even if a student does not plan to pursue a college education, this broad set of classes will help the student earn a better living, contribute to the community, and generally enjoy life. Students often change their minds and if college becomes an option, the necessary coursework will be complete and the transition to a college or university will be much smoother.

Each high school has requirements for graduation. Meeting the requirements for high school graduation does not guarantee admittance to the college or university of a student's choice. For example, the Kansas Board of Regents institutions require high school graduates to qualify for admission to the six state universities: Emporia State University, Fort Hays State University, Kansas State University, Pittsburg State University, the University of Kansas, and Wichita State University. The Kansas Board of Regents adopted a "Qualified Admissions curriculum," meaning that Kansas high school graduates who earn a specific grade point average (GPA) in the courses specified in that curriculum are guaranteed admission to the six state universities. However, there are additional high school coursework requirements for the State Scholar program, which provides state-sponsored scholarships to Kansas high school graduates meeting the financial need requirements. The school

Qualified Admissions – Kansas Board of Regents

Admission of high school students to Kansas state universities is described by the Qualified Admissions Statute. The state statute does not apply to Washburn University, community colleges, technical colleges or schools, or private colleges or technical schools in Kansas.

State of Kansas students must meet the following requirements to be guaranteed admission to any of the six Kansas state universities (Emporia State University, Fort Hays State University, Kansas State University, Pittsburg State University, the University of Kansas, and Wichita State University):

- Graduate from an accredited high school; AND
- Achieve an ACT composite score of 21 or above (or SAT score of 980); OR
- Rank in the top one-third of their high school's graduating class; OR,
- Complete the Qualified Admissions curriculum with at least a 2.0 grade point average (GPA) on a 4.0 scale.

Biologists Collecting Fish
Credit: Scott Bauer, USDA ARS

guidance counselor can help students review the requirements of different colleges and programs in order to choose high school courses that will meet those requirements while offering students a wide variety of opportunities beyond high school.

High school activities are also important in preparing for higher education. Colleges look at student activities to get a better idea of who the student is. Activities often help admissions officials decide if the student would be a good member of their school community or if they could add to the school in some way. Community service projects, school activities, and community involvement demonstrate leadership, good time management, and the ability to work cooperatively – qualities that influence admission as well as selection for scholarships and honors.

Researcher Collecting Soil Core in Wetland
Credit: Peggy Greb, USDA ARS

U.S. Department of Education Guidelines

The U.S. Department of Education recommends the following courses for students in high school who are considering pursuing a higher education:

English – 4 years
Good reading, writing, speaking and listening skills are essential to do well in college and to succeed in any job. Most employers rate good communications skills as one of the most important factors in getting and keeping a good job.

Mathematics – 4 years
Mathematics teaches logical reasoning and helps develop good problem solving skills.

History & Geography – 2–3 years
Studying the history, government, economics, and geography of the United States and the world helps students better understand past, present and potential future events.

Laboratory Science – 3–4 years
Laboratory science explains the mysteries of the world. Science teaches how to be a careful observer and to use logical reasoning to answer questions.

Foreign Language – 3–4 years
Studying a foreign language can help students understand and communicate with people from other cultures here and abroad. Learning a foreign language is the best way to begin to understand another culture.

Visual & Performing Arts – 1–2 years
Visual and performing arts add to the appreciation of and enjoyment of life. Studying the arts helps develop creativity and gives students the opportunity to express themselves.

Challenging Electives – 1–3 years
Electives are courses each student chooses to complete his or her high school education. If one area of the curriculum, such as science, is of particular interest, students may select an additional science course. Students may choose to explore another area by taking a business course. Agriculture Science is an elective offered at many high schools.

Higher Education

"A dream becomes a goal when action is taken toward its achievement."
Bo Bennett, American businessman

Kansas Access

Kansans believe in higher education. In Kansas, public institutions of higher learning include the six state universities, 19 community colleges, and 11 area vocational-technical schools/colleges. Most

Kansas Board of Regents

The Kansas Board of Regents governs six state universities and supervises and coordinates 19 community colleges, five technical colleges, six technical schools and a municipal university.

The Kansas Board of Regents' website – ***www.kansasregents.org*** – includes a complete listing of all private and public universities, colleges, and private and out-of-state institutions authorized to operate in Kansas, and links to their websites.

of the community colleges in Kansas offer an associate's degree in agriculture or a specific agriculture program.

Two of the state universities offer bachelor degrees in agriculture: Kansas State University (College of Agriculture) and Fort Hays State University (College of Health and Life Sciences). Kansas State University's College of Agriculture offers 13 bachelor of science programs, 10 master of science programs, nine programs leading to the Ph.D., and a pre-veterinary medicine program. At Fort Hays State University, the Department of Agriculture offers two bachelor of science degrees - Agribusiness and Agriculture. Four areas of specialization are offered with the Agriculture major.

In addition to the public institutions, there are over 20 private two and four-year colleges in Kansas. Many of these colleges also offer programs of study related to agriculture and natural resources, such as McPherson College's Environmental Stewardship major.

Selecting a major is an important decision but many college students decide to switch majors or pursue additional coursework outside their main program of study. Advisors can help identify a program that is the most compatible with individual career goals and interests. Often, course work from several majors is combined to fit individual interests.

Kansas Community Colleges

The website of the Kansas Association of Community College Trustees – ***www.kacct.org*** – provides information about all 19 public community colleges in Kansas, and links to their websites.

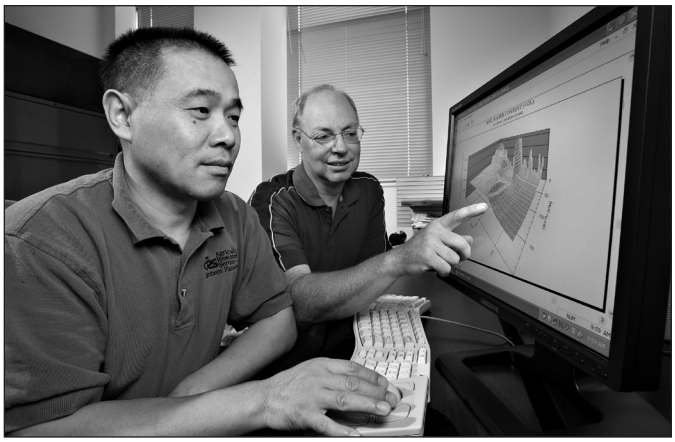
Kansas Technical Schools and Colleges

The Kansas Board of Regents governs five technical colleges and six technical schools in Kansas.

All private and out-of-state institutions operating in Kansas must be authorized by the Kansas Board of Regents. This includes business enterprises offering instruction for business, trade, technical or industrial occupations leading to a certificate, diploma, or academic degree.

The Kansas Board of Regents' website – ***www.kansasregents.org*** – provides links to the websites of all state technical colleges and schools, as well as all private institutions authorized by the board.

Entomologists Examining Apples
Credit: Scott Bauer, USDA ARS



Scientists Studying Cropping Sequences
Credit: Stephen Ausmus, USDA ARS

Park Ranger Flagging Tree
Credit: Jonas N. Jordan, USACE

Sampling of Agriculture Careers and Higher Education Choices

This is only a sampling of the many educational opportunities in Kansas that prepare students for careers in agriculture and natural resources. This list is not complete. It only includes a few of the degree programs and some, but not all, of the Kansas institutions offering those degree programs. In addition, several different degree programs might lead to a specific career – not just those included in this sample.

Most community college programs offer students the opportunity to transfer to a university and complete a bachelor's degree in their selected field of study.

Career	Description	Institution of Higher Learning	Academic Major–Degree Option
Agribusiness Manager	Agribusiness managers study the economic principles that guide business behavior and the economic activities of society. They lead their companies in decision-making. Agribusiness combines the traditional business background with agriculture and the global economy. Career opportunities can be found with farm input manufacturers, food manufacturers, wholesale and retail businesses, the farm credit industry, banks, commodity trading and grain merchandizing firms, and government agencies.	1) Kansas State University 2) Fort Hays State University	1) B.S. in Agribusiness (College of Agriculture) 2) B.S. in Agribusiness (College of Health & Life Sciences)
Fertilizer and Chemical Applicator	Certified commercial applicators work for cooperative associations, fertilizer and chemical companies, farms, and ranches. Responsibilities include working with chemicals, operating application equipment, maintaining accurate records, and maintaining equipment.	Barton County Community College	A.A.S. in Agriculture – Fertilizer & Chemical Application Fertilizer & Chemical Application Certificate
Firefighter	A firefighter rescues people and property from all types of accidents and disasters, including fires; attends emergency incidents such as vehicle accidents, floods, and spills of dangerous substances; and promotes fire safety and enforces fire safety standards. A wildland firefighter's work includes basic firefighting skills and those specific to outdoor conditions, such as prescribed burning, wildfire suppression, and fire preparedness.	1) Hutchinson Community College 2) Butler Community College 3) Dodge City Community College	1) A.A.S. in Fire Science, Wildland option available 2) A.A.S. in Fire Science 2) Fire Science Certificate 3) A.A.S. in Fire Science
Fisheries Biologist	A fisheries biologist conducts research and studies the biology of fish, habitat requirements, population changes, diseases, and food requirements. Many fisheries biologists work for state or federal agencies while others work for corporations, power companies, and aquaculture businesses.	1) Hutchinson Community College 2) Fort Hays State University 3) Kansas State University	1) A.A. in Natural Resource Management – Aquatic option (Wildlife Biology) 2) B.S. in Biology – Fisheries (College of Health & Life Sciences) 3) B.S. or B.A. in Biology – Fisheries, Wildlife & Conservation Biology (College of Arts & Sciences)

Scientists Excavating Roots
Credit: USDA ARS

Ethanol Lab Technician
Credit: ICM, Inc.

Key

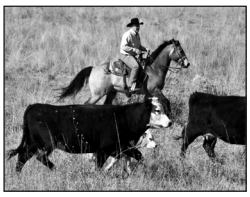
B.S. – Bachelor of Science
B.A. – Bachelor of Arts
A.S. – Associate in Science *
A.A. – Associate in Arts *
A.A.S. – Associate in Applied Science **

* requires transfer to complete B.S. or B.A.

** prepares students to enter an occupation directly; most students do not transfer into a bachelor degree program.

Sampling of Agriculture Careers and Higher Education Choices (continued)

Career	Description	Institution of Higher Learning	Academic Major–Degree Option
Forester	Foresters manage, develop, and protect forests and their resources for economic, recreational, and conservation purposes. Their responsibilities might include planting trees, monitoring trees for healthy growth and determining when to harvest trees, appraising timber, managing wildlife habitat, monitoring water quality, or maintaining forest facilities.	1) Cloud County Community College 2) Fort Hays State University 3) Barton County Community College 4) Highland Community College 5) Pratt Community College	1) A.S. in Pre-Forestry 2) Biology – Pre-Forestry* (College of Health & Life Sciences) *requires transfer to complete B.S. 3) A.S. in Pre-Forestry 4) A.A. or A.S. in Pre-Forestry & Conservation 5) A.S. in Mathematics & Science – Pre-Forestry Note: the University of Missouri waives non-resident tuition for pre-forestry students from Kansas and Nebraska.
Heavy Equipment Operator	Heavy equipment operators maneuver scrapers, motor graders, bulldozers, backhoes, front-end loaders, and other heavy equipment. Job opportunities exist with local, state, and federal agencies, general construction companies, and road and highway construction firms.	North Central Kansas Technical College	Heavy Equipment Operation Certificate Note: this is the only training program in the state for heavy equipment operation.
Agricultural Service Technician	Agricultural equipment dealers and agricultural businesses employ skilled service technicians. Agricultural service technicians diagnose, adjust, and repair farm machinery, such as tractors, harvesters, and other farm equipment.	1) Garden City Community College 2) Fort Scott Community College 3) Pratt Community College 4) North Central Kansas Technical College	1) A.A. S. in John Deere Ag Tech Program 2) A.A.S. in John Deere Tech Program 3) A.A.S. in Agriculture Power Technology 4) A.A.S. in Agriculture Equipment Technology Note: manufacturers provide training components and equipment for these programs while agricultural equipment dealers provide internship experiences and often guarantee employment for graduates.
Range Manager	Range managers conduct research on grasslands; study concepts, methods, and ecological principles; and apply range management practices that utilize grassland resources for food production (grazing), watershed protection, recreation, and wildlife.	1) Kansas State University 2) Fort Hays State University 3) Highland Community College 4) Pratt Community College	1) B.S. in Agronomy – Range Management (College of Agriculture) 2) B.S. in Biology – Range Conservation (College of Health & Life Sciences) 3) A.A. in Agronomy 4) A.S. in Agriculture – Range Management
Food Scientist	Food scientists develop, evaluate, market, and manufacture food products. They work for food processing companies, food equipment and ingredient suppliers, and government agencies. They may be involved in research, food inspection, sales and marketing, or the development of regulations.	Kansas State University	B.S. in Food Science (College of Agriculture)



left to right: ***Heavy Equipment Operator***
Credit: Larry Rana, USDA
Range Manager
Credit: Stephen Ausmus, USDA ARS
Firefighter
Credit: Bob Nichols, USDA

Sampling of Agriculture Careers and Higher Education Choices (continued)

Career	Description	Institution of Higher Learning	Academic Major–Degree Option
Veterinarian	Veterinarians diagnose and treat diseases and injuries of all species of animals, including companion animals, wildlife, and domestic livestock. Veterinarians also advise animal owners and promote the health of animals, engage in research, and develop commercial animal health products. They may specialize in the prevention and control of communicable animal diseases. Veterinarians are employed in private practice, government service, or industry.	Kansas State University	Doctor of Veterinary Medicine (College of Veterinary Medicine) Note: requires completion of pre-professional curriculum (undergraduate) and admission to the professional program.
Veterinary Technician	Veterinary technicians perform general veterinary activities under the supervision of licensed veterinarians.	Colby Community College	A.A.S. in Veterinary Technology
Wildlife Biologist	Wildlife biologists perform a wide variety of duties including managing wildlife populations, researching plants and animals and the environments in which they exist, mapping and measuring natural resources, and analyzing satellite images. Wildlife biologists also manage public lands for state or federal agencies, as well as corporate and privately owned lands.	1) Barton County Community College 2) Hutchinson Community College 3) Fort Hays State University 4) Kansas State University	1) A.S. in Pre-Wildlife Science 2) A.A. in Natural Resource Management – Terrestrial option (Wildlife Biology) 3) B.S. in Biology – Wildlife Biology (College of Health & Life Sciences) 4) B.A. or B.S. in Biology – Fisheries, Wildlife & Conservation Biology (College of Arts & Sciences)
Furniture Designer	A furniture designer designs furniture for manufacture. This might include studying market trends; preparing drawings, blueprints, manufacturing specifications and cost estimates: building models or prototypes; and working with both customers and manufacturers.	Pittsburg State University	B.S. in Technology – Wood Technology A.A.S. in Technology – Wood Technology Bachelor of Applied Science in Technology – Wood Technology (designed for technical program graduates with an associate degree) Note: Students in this wood processing program choose an emphasis between wood product manufacturing and residential construction.
Park Ranger	Park rangers manage local, state, and national parks and recreation areas; plan, develop and conduct interpretative programs about historical, natural and scientific features; and serve as law enforcement officers. They are employed by public agencies such as the National Park Service, the USDA Forest Service, and state, city, and county park and recreation departments, as well as private businesses at resorts, lodges, estates, and other areas.	Kansas State University	B.S. in Horticulture, Forestry & Recreation Resources – Park Management & Conservation (College of Agriculture)
Animal Nutritionist	Animal nutritionists formulate diets for domestic, companion, and exhibit animals. They conduct research, advise clients, develop and evaluate products for animals, and are involved in the manufacture and marketing of feed products. They work for feed and pharmaceutical companies, zoos, and livestock industries.	1) Kansas State University 2) Fort Hays State University	1) B.S. in Animal Science or Feed Science (College of Agriculture) 2) B.S. in Animal Science (College of Health & Life Sciences)

Sampling of Agriculture Careers and Higher Education Choices (continued)

Career	Description	Institution of Higher Learning	Academic Major–Degree Option
Agricultural Producer	Agricultural producers (farmers and ranchers) produce food, feed, fiber, and fuel to meet the needs of the U.S. and for export. Today, farming and ranching involves complex scientific, business, and financial decisions. The type of farm or ranch determines the specific tasks carried out by the agricultural producer. Tasks include working with plants and animals, making managerial decisions, marketing agricultural products, operating machinery, maintaining equipment and facilities, keeping records, and supervising employees. Many agricultural producers are self-employed and enjoy working outdoors.	1) Kansas State University 2) Fort Hays State University Note: Almost all Kansas community colleges offer 2-year degrees or certificates in agriculture programs, as well as transfer opportunities to 4-year degree programs at Kansas State University and Fort Hays State University.	1) B.S. in Agriculture - many specialization options (College of Agriculture) 2) B.S. in Agriculture - many specialization options (College of Health & Life Sciences)
Agronomist	Agronomists deal with interactions among plants, soils, and the environment. They develop new crop varieties, study water movement in the soil, and investigate soil chemistry. They work for seed, crop consulting, lawn care, and agrichemical companies, farm cooperatives, banks, government agencies, and food production companies.	1) Kansas State University 2) Fort Hays State University 3) Barton County Community College 4) Colby Community College 5) Dodge City Community College 6) Hutchinson Community College 7) Pratt Community College	1) B.S. in Agronomy (College of Agriculture) 2) B.S. in Agronomy (College of Health & Life Sciences) 3) A.S. in Agronomy 4) A.S. in Agronomy 5) A.A.S. in Agronomy 6) A.A. in Agronomy 7) A.S. in Agronomy
Horticulturist	Horticulturists work to improve crop yields, quality and nutritional value, resistance to insects, diseases, and environmental stresses, in addition to adapting plants to grow in different climates and soils or for specific food uses or processes. They may work in public gardens, greenhouses, garden centers, residential and commercial landscape installation and care, golf course and sports turf management, or be employed as plant breeders, genetic engineers, crop inspectors, or research scientists.	1) Kansas State University 2) Coffeyville Community College 3) Hutchinson Community College 4) Johnson County Community College	1) B.S. in Horticulture (College of Agriculture) 2) A.A. in Horticulture 3) A.A. in Horticulture 4) A.A.S. in Horticulture 4) Horticulture Certificate 4) Landscape Technician Certificate
Wind Turbine Technician (Windsmith)	Responsibilities of a wind turbine technician would include operating and maintaining wind turbine units, performing mechanical and electrical troubleshooting, making repairs, and preventative maintenance. Positions are available with commercial wind farms and industries related to the production and utilization of wind energy.	Cloud County Community College	A.A.S. in Wind Energy Technology Wind Energy Technology Certificate
Water Plant Operator	A water plant operator controls equipment that filters and purifies water for human consumption and industrial uses. Responsibilities might include operating, repairing and maintaining pumps and valves that regulate the flow of water, testing water samples, recording data, and responding to consumer questions and complaints.	Dodge City Community College	A.A.S. in Environmental Water Technology

Career Paths

"Go confidently in the direction of your dreams. Live the life you have imagined."

Henry David Thoreau, writer, philosopher, and naturalist

The future is bright for Kansas students who seek a higher education. Many of those students who never considered a career in agriculture may find themselves working in an agriculture-related field. Kansas students have access to many technical and academic programs that will prepare them for a variety of careers in agriculture and natural resources.

Small children are often asked, "What do you want to be when you grow up?" As they grow up, the question becomes harder to answer. High school students are asked, "Where are you going to go to school?" Once they have chosen which school to attend, questions still come up concerning their program of study and the career opportunities related to their studies. As long as consumers need food, fiber, and fuel, Kansas students will find opportunities in agriculture-related careers.

References

Agricultural Practices and Food Technologies. 2006, International Food Information Council. < http://ific.org/food/agriculture/>

Executive Summary: The Key Indicators of the Labour Market. 5th ed. 2007, International Labour Organization. <http://www.ilo.org/public/english/employment/strat/kilm/download/exsum.pdf>

Goecker, Allan D., Jeffrey L. Gilmore, Ella Smith, and P. Gregory Smith. *Employment Opportunities for College Graduates in the U.S. Food, Agricultural, and Natural Resources System 2005-2010*. 2005, Food and Agricultural Information System. <http://faeis.ahnrit.vt.edu/supplydemand/2005-2010/>

Preparing for College: A Guide for Students, Families, and Educators. Rhode Island Office of Higher Education. <http://www.ribghe.org/col-prep.htm>

State Fact Sheets: Kansas. 2007, U.S. Department of Agriculture Economic Research Service. <http://www.ers.usda.gov/statefacts/KS.htm>

Teacher Resources

Websites:

College of Agriculture
Kansas State University
www.ag.k-state.edu

College of Health and Life Sciences
Fort Hays State University
www.fhsu.edu/chls

Career Links in Biology
Fort Hays State University
www.fhsu.edu/biology/careerlinks.shtml

Careers in Agriculture
Florida Department of Agriculture and Consumer Services
www.florida-agriculture.com/consumers/careers.htm

Careers in Biology
Emporia State University
www.emporia.edu/biosci/carebiol.htm

Careers in Botany
Botanical Society of America
www.botany.org/bsa/careers/

Careers in Plant Pathology
The American Phytopathological Society
http://www.apsnet.org/careers/careers.asp

CareerZone
New York State Department of Labor
www.nycareerzone.org

Food, Agriculture, and Natural Resources Careers
USDA Living Science
www.agriculture.purdue.edu/USDA/careers/index.html

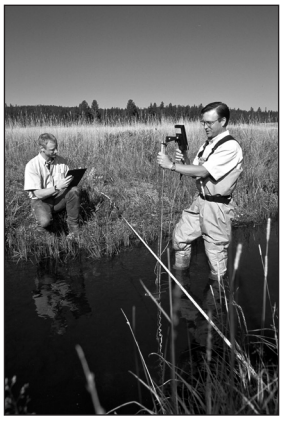
Kansas State Department of Education
www.ksde.org

Occupational Outlook Handbook
U.S. Department of Labor – Bureau of Labor Statistics
http://www.bls.gov/oco/home.htm

Studying Soil Samples
Credit: Scott Bauer, USDA ARS

Measuring Soil Temperatures
Credit: Stephen Ausmus, USDA ARS

Examining Switchgrass
Credit: Scott Bauer, USDA ARS



Measuring Streamflow
Credit: Peggy Greb, USDA ARS

Teacher's Resources (continued)

School to Careers
Iowa Public Television
www.iptv.org/stc

U.S. Department of Education
www.ed.gov

Notes: