

Employment Opportunities for College Graduates

in Food, Agriculture, Renewable Natural Resources, and the Environment

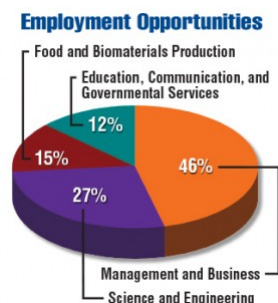
United States, 2015-2020

Opportunities

During the next five years, U.S. college graduates will find good employment opportunities if they have expertise in food, agriculture, renewable natural resources, or the environment. Between 2015 and 2020, we expect to see 57,900 average annual openings for graduates with bachelor's or higher degrees in those areas.

According to our projections, almost half of the opportunities will be in management and business. Another 27% will be in science, technology, engineering, and mathematics (STEM). Jobs in sustainable food and biomaterials production will make up 15%, while 12% of the openings will be in education, communication, and governmental services.

The projections in this report are based on data from several sources. The Bureau of Labor Statistics forecasts a 10.8% increase in the U.S. labor force between 2012 and 2022 due to job growth and openings from retirement or other replacements. We expect employment opportunities in food, agriculture, renewable natural resources, and environment occupations to grow more than 5% between 2015 and 2020 for college graduates with bachelor's or higher degrees.



Job opportunities for food, agriculture, renewable natural resources, and environment graduates in STEM areas are expected to grow. Expect the strongest job market for plant scientists, food scientists, sustainable biomaterials specialists, water resources scientists and engineers, precision agriculture specialists, and farm-animal veterinarians.

We expect to see a strong employment market for e-commerce managers and marketing agents, ecosystem managers, agriscience educators, crop advisors, and pest control specialists.

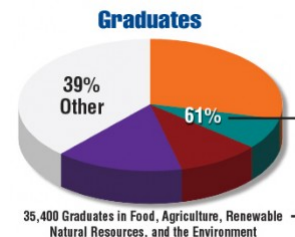
Growth in job opportunities will vary. Employers in some food, agriculture, renewable natural resources, and environment areas will struggle to find enough graduates to fill jobs. In a few areas, employers will find an oversupply of job seekers. Employers will continue to seek to hire a diverse workforce reflective of society as a whole.

Graduates

An average of 35,400 new U.S. graduates with expertise in food, agriculture, renewable natural resources, or the environment are expected to fill 61% of the expected 57,900 average annual openings. Most employers prefer to hire graduates with this expertise. However, because we anticipate more annual job openings than can be filled by these graduates, employers will need to look to other areas such as biology, business administration, engineering, education, communication, and consumer sciences to fill the remaining 39% of openings.

College graduates with expertise in food, agriculture, renewable natural resources, and the environment are essential to our ability to address the U.S. priorities of food security, sustainable energy, and environmental quality. Graduates in these professional specialties not only are expected to provide answers and leadership to meet these growing challenges in the United States, but they also must exert global leadership in providing sustainable food systems, adequate water resources, and renewable energy in a world of population growth and climate change.

Look to graduates of food, agriculture, renewable natural resources, and environment higher education programs if you are seeking to hire female graduates with STEM degrees. While other U.S. higher education programs have encountered challenges enrolling women in STEM specialties, women make up more than half of the food, agriculture, renewable natural resources, and environment higher education graduates.



U.S. National Center for Education Statistics data from 2012–2013

show that women earned 52% of the bachelor's degrees, 55% of the master's degrees, and 48% of the doctor of philosophy degrees. Women earned 77% of the Doctor of Veterinary Medicine degrees. Women also outnumbered men in STEM areas such as animal behavior and ethology, animal sciences, botany and plant pathology, conservation biology, entomology, environmental science, food science, nutrition science, sustainability studies, and wildlife biology.

Graduates who are mobile and have work experience will have more opportunity. Graduates with technical and professional skills will have more options if they are willing to find employment in other states or countries. Graduates who have completed internships or work experiences related to the jobs they apply for are more likely to be hired.

Many food, agriculture, renewable natural resources, and environment graduates will have interests, skills, and experiences that lead them to employment in other industries. This will further widen the gap between numbers of graduates with expertise in these areas and the growing number of employment opportunities.

Project Consultants

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- Kirby Barrick, University of Florida
- Richard A. Cavaletto, California Polytechnic State University – San Luis Obispo
- Cameron Faustman, University of Connecticut
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Management & Business

Trends and Forecasts

Between 2015 and 2020, expect an average of 26,700 annual job openings in management and business in the United States for new college graduates with expertise in food, agriculture, renewable natural resources, and the environment. This represents almost half of the annual job openings.

Most graduates with bachelor's degrees in business management will enter sales and technical service jobs. Those with advanced degrees will more likely enter careers as economists, financial analysts, lending executives, marketing managers, and human resources specialists.

New jobs in agribusiness companies should remain relatively stable during the next couple of years with some increased hiring expected in the latter part of the five-year period. This follows expanded hiring by agribusinesses during the past couple of years. Expect to see some continued consolidation of agribusiness organizations.

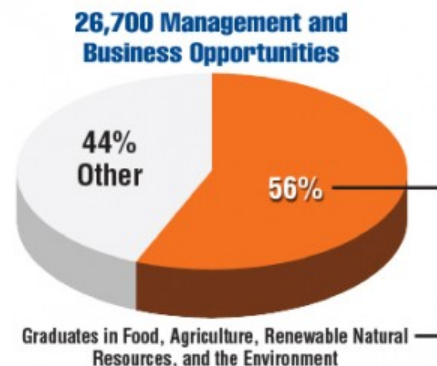
Forest ecosystem management opportunities should remain strong in both the public and private sectors.

Anticipated increases in the housing and building construction industry will spur growth in forest biomaterials businesses as well as in landscape contracting and management.

As consumers purchase more fresh fruits, vegetables, and organic crops, related purchasing and marketing strategies and personnel will change.

Forest management companies and agribusinesses will continue to hire environmental consultants to ensure environmental quality and to comply with governmental regulations.

Growing e-commerce operations in all industries will increase employment opportunities for graduates with specialized skills in online marketing and social media.



Selected Occupations

- Sales and Service Representative

- Financial Analyst
- Forest Products Manager
- Agricultural Economist
- Land Use Manager
- Agricultural Loan Officer
- Farm Labor Specialist
- Landscape Contractor
- Forest Ecosystem Manager
- Marketing Specialist
- E-commerce Specialist
- Grain Merchandiser

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Science & Engineering

Trends/Forecasts

Food, agriculture, renewable natural resources, and environment higher education programs will continue to produce a growing number of graduates in science, technology, engineering, and mathematics (STEM) disciplines in the next five years.

Consumer demand for nutritious and safe food will contribute to strong demand for food scientists and technologists in new product development, food processing, and food safety. As our population ages and more people retire, the demand for dietitians and nutritionists will remain strong.

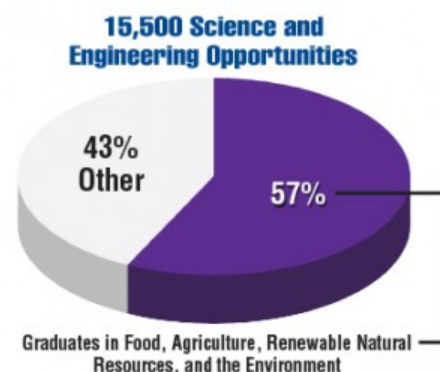
Job openings in nutrition, human medicine, and healthcare will increase between 2015 and 2020. Increasing numbers of bachelor's degree graduates in biochemistry, nutrition, applied biology, food science, animal physiology, and animal behavior will pursue professional programs and earn licenses in human medicine and healthcare.

Plant science graduates at all degree levels will find excellent career opportunities. They will find many opportunities for plant geneticists, plant pathologists, and insect biologists to develop higher-yielding crops adapted to less-than-optimal growing conditions. Demand also will be strong for expertise in production of sustainable products made from wood and other biomaterials.

Concerns surrounding evolving water use and availability, especially in the western United States, will heighten the demand for watershed scientists, hydrologists, irrigation engineers, and plant geneticists.

Over the next five years, colleges of veterinary medicine are expected to graduate slightly more Doctors of Veterinary Medicine than in the past. We likely won't have enough veterinarians working with food animals in rural areas because of economic challenges in establishing and maintaining practices.

Food-animal nutritionists will see a continued strong employment market in research and development programs connected with feed and animal-health companies.



Increasing computerization in the nation's food production and distribution system underscores the need for computer programming and support specialists for precision agriculture applications.

While there will be more jobs connected to the environment, there will be even more graduates in environmental science and management, soil science, natural resources, and conservation management. Because of this, graduates in most academic majors related to the environment will see a very competitive job market.

More than enough animal sciences bachelor's degree recipients are expected in the next five years, but graduates in some specialties will fare better in the employment market than others. Most animal sciences students expect to apply to colleges of veterinary medicine or graduate programs. A few will be admitted, but more than enough animal sciences graduates will seek positions working with companion animals, equines, and animals in zoos. Graduates with expertise and experience in traditional food animal production, however, will be in demand, especially in poultry, dairy, and swine operations.

There likely will be an oversupply of college graduates with wildlife biology and wildlife management degrees. Entry positions in wildlife occupations typically require a master's degree and related work experience.

Economic conditions have limited the personal advancement of turf science and management graduates within the golf course sector. Relatively more opportunities are available in establishing and maintaining turf for athletic or recreational uses in community, college, or professional venues.

Selected Occupations

- Food Scientist
- Plant Scientist
- Veterinarian
- Watershed Scientist
- Biological Engineer
- Dietitian
- Environmental Scientist
- Irrigation Engineer
- Insect Biologist
- Animal Scientist
- Fisheries Biologist
- Soil Scientist

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Food & Biomaterials Production

Trends/Forecasts

As farms and ranches continue to consolidate, we will see fewer new openings each year. More individuals filling these jobs will have bachelor's degrees, but farm or ranch experiences will still be very important in hiring decisions.

Numbers of job openings in sustainable forest management are expected to stay about the same, as will the number of graduates.

While numbers of large commercial farms and ranches will decrease, there will be more producers growing fresh fruits, fresh vegetables, and organic crops located near towns, cities, and metropolitan centers.

More consumers will search out locally grown foods.

Poultry and swine production managers will be in demand.

Foresters and ecosystem managers will continue to find jobs with government agencies and private forest management firms. However, relatively more of the new positions will be in the private sector.

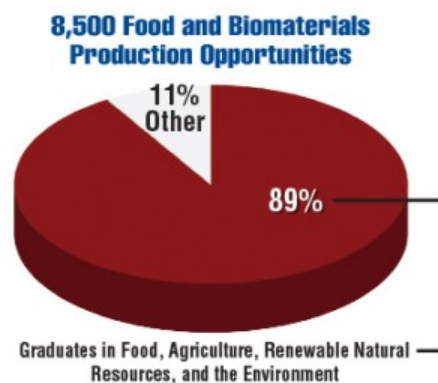
Precision agriculture specialists who provide products and services for farmers and ranchers will likely be in demand.

There will be continued strong demand for qualified and certified pest control specialists in agriculture and forestry.

As in the past, certified crop advisors will be sought by growers of major agricultural commodities, including wheat, corn, soybeans, and cotton.

More often than in the past, food production consultants will find jobs working with growers to assure compliance with contracted production management operations.

Graduates with degrees in sustainable crop production and management will likely fare better in the employment market than will those with degrees in animal production and management. Graduates in animal specialties will continue to outnumber those with crops credentials in the next five years.



Selected Occupations

- Farmer
- Forest Manager
- Rancher
- Crop Management Consultant
- Poultry Production Manager
- Organic Crops Grower
- Range Manager
- Viticulturist
- Precision Agricultural Specialist
- Swine Production Manager
- Fruit and Vegetable Grower
- Aquaculturist

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Education, Communication & Governmental Services

Trends/Forecasts

Graduates will find excellent employment opportunities for agriscience teachers in high schools and middle schools. Graduates in agricultural education have skills that qualify them for a wide range of occupations. Because about one-third of the graduates chose occupations other than teaching, schools face an ongoing shortage of qualified high school and middle school teachers.

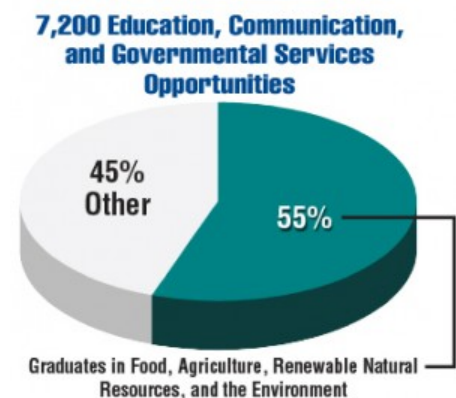
Growing demand for outdoor recreation will contribute to good opportunities for naturalists and forest recreation workers.

Consumer demand for safe food means a continued need for governmental inspectors of food processing operations and of imported food and agricultural products. A 2014 report from the U.S. Government Accountability Office notes that nearly a third of the more than 2 million people in the U.S. federal civilian workforce will be eligible to retire in 2017. The high retirement rate among governmental workers will create opportunities for graduates over the next five years. The USDA will be one of many agencies encouraging graduates to pursue careers with them.

Growing enrollments in community colleges and universities could contribute to more opportunities for post-secondary and higher education teachers in agricultural, forestry and conservation, and environmental disciplines. However, in some states economic conditions and support of higher education may lead to more adjunct and part-time faculty in lieu of full-time positions.

Colleges of agricultural and life sciences will face increasing challenges as they search for faculty members with interests and aptitudes to teach undergraduate courses in applied business and technology. Such faculty members will be in demand to meet the evolving needs of agribusiness, industry, and government.

Urban foresters will likely see more opportunities in cities and municipalities. Negative effects of invasive species may contribute to hiring opportunities in some regions of the United States.



Increasing regulations in food production, food safety, water management, and environmental quality will increase jobs for specialists in these areas.

Even though jobs for communication specialists with social media expertise are increasing, there will likely be more than enough qualified graduates. Multimedia skills will be particularly important for jobs in reporting and broadcast news. A growing agritourism industry will employ graduates. Agricultural communication majors will find more opportunities in marketing, event planning, and public relations occupations.

Selected Occupations

- High School Agriscience Teacher
 - Technical Writer
 - Rural Development Specialist
 - Social Media Specialist
 - Plant and Animal Inspector
 - Outdoor Recreation Manager
 - Agricultural Extension Educator
 - Environmental Science Teacher
 - Farm Services Agent
 - Food and Agricultural Science Editor
 - Natural Resources Conservation Specialist
 - Event and Meeting Planner
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Market Factors

Six primary factors will affect the market for graduates between 2015 and 2020.

- Macroeconomic conditions and retirements
 - Growing numbers of qualified graduates
 - Changing consumer preferences for foods and biomaterials
 - Public policy choices affecting food, agriculture, renewable natural resources, and the environment
 - Technological advancements in agriculture and biomaterials
 - Global market shifts in population, income, food, and energy
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Sources and Methodology

Available Graduates

Numbers of qualified graduates—bachelor's degree and higher—for food, agriculture, renewable natural resources, and environment positions in the United States were determined from using 2012–13 degrees conferred data from the Integrated Postsecondary Education Data System (IPEDS) surveys conducted by the National Center for Education Statistics (NCES) of the U.S. Department of Education. The NCES data include postsecondary degrees conferred by all accredited public and private non-profit higher education programs in the United States. Graduates are classified by degree level, degree specialization, and selected demographic characteristics.

Food, Agriculture, Renewable Natural Resources, and Environment Graduates

- From the NCES Classification of Instructional Programs (CIPS) 2010, project investigators and educator consultants to the project selected degree specializations that are offered by public and private non-profit higher education programs in food, agriculture, renewable natural resources, and the environment.
- Project investigators and educator consultants to the project used historical graduate employment information as well as personal observations and experiences to estimate the percentage of qualified graduates by degree specialization who are expected to enter occupations in the food, agriculture, renewable natural resources, and environment employment sectors. Next, the project investigators and educator consultants identified four occupational clusters for the purpose of categorizing graduates with degree specializations into four broad areas of expertise. The clusters are Management and Business; Science and Engineering; Food and Biomaterials Production; and Education, Communication, and Governmental Services.
- The following adjustments were made to total qualified food, agriculture, renewable natural resources, and environment higher education
 - Reduced qualified bachelor's degree graduates by 2%. Survey data indicate that this percentage of graduates do not enter the labor force.
 - Reduced qualified bachelor's degree graduates by 25%. This proportion was determined to enter graduate and professional schools.

- Reduced qualified master's degree graduates by 19% to account for those who enter doctor of philosophy degree programs.
- Included 70% of the nonresident alien doctor of philosophy degree recipients as qualified to enter the U.S. labor force. Surveys of earned doctorates conducted by the National Science Foundation indicate that only approximately 30% of these graduates return immediately to their country of origin upon receipt of their degrees.
- Increased the total number of qualified students by 3% in each instructional program to address expected growth in numbers of graduates in food, agriculture, renewable natural resources, and environment higher education programs due to increasing enrollments reported by the Food and Agricultural Education Information System.
- Project investigators assigned percentages of qualified graduates in each selected degree specialization to the four occupational clusters of Management and Business; Science and Engineering; Food and Biomaterials Production; and Education, Communication, and Governmental Services.
- For additional details, click on [Available Graduates—Food, Agriculture, Renewable Natural Resources, and Environment Higher Education Programs](#).

Other Graduates

- From the NCES Classification of Instructional Programs (CIPS) 2010, project investigators and educator consultants to the project selected degree specializations that are offered by public and private non-profit higher education programs in biological sciences, engineering, health sciences, business, communication, etc., who are expected to compete with food, agriculture, renewable natural resources, and environment higher education graduates for employment.
- Project investigators and educator consultants to the project used historical graduate employment information as well as personal observations and experiences to estimate the percentage of qualified graduates by degree specialization who are expected to enter occupations in the food, agriculture, renewable natural resources, and environment employment sectors. Next, the project investigators and educator consultants identified four occupational clusters for the purpose of categorizing graduates with degree specializations into four broad areas of expertise. The clusters are Management and Business; Science and Engineering; Food and Biomaterials Production; and Education, Communication, and Governmental Services.
- The following adjustments were made to total qualified other graduates.
 - Reduced qualified bachelor's degree graduates by 2%. Survey data indicate that this percentage of graduates do not enter the labor force.
 - Reduced qualified bachelor's degree graduates by 25%. This proportion was determined to enter graduate and professional schools.
 - Reduced qualified master's degree graduates by 19% to account for those who enter doctor of philosophy degree programs.
 - Included 70% of the nonresident alien doctor of philosophy degree recipients as qualified to enter the U.S. labor force. Surveys of earned doctorates conducted by the National

Science Foundation indicate that only approximately 30% of these graduates return immediately to their country of origin upon receipt of their degrees.

- Project investigators and educator consultants to the project assigned percentages of qualified graduates in each selected degree specialization to the four occupational clusters of Management and Business; Science and Engineering; Food and Biomaterials Production; and Education, Communication, and Governmental Services.
- For additional details, click on [Available Graduates—Other Programs](#).

Employment Opportunities

Estimated employment opportunities that require college graduates with expertise to enter occupations in the food, agriculture, renewable natural resources, and environment employment sectors were based upon data maintained by the Bureau of Labor Statistics (BLS) of the U.S. Department of Labor (DOL).

Occupational employment data for 2012 with projections to 2022 were published in the December 2013 *Monthly Labor Review*. Projected annual employment opportunities are reported for each occupation included in the BLS taxonomy.

- Project investigators worked with educator consultants to the project to select occupations that would be expected to require college graduates with expertise to work in the food, agriculture, renewable natural resources, and environment employment sectors.
- Project investigators worked with educator consultants to the project to calculate average annual job openings for each selected occupation, representing one-tenth of the 10-year BLS projections.

For each selected occupation, project investigators and educator consultants to the project determined a percentage of the average annual job openings that would require graduates having expertise in food, agriculture, renewable natural resources, and environment academic specialties. Average annual employment opportunities for each selected occupation were determined from these percentage estimates.

- Projected annual employment openings for high school and middle school Agricultural Education teachers were obtained from a January 2015 report entitled, *National Agricultural Education Supply & Demand Study*, authored by Daniel D. Foster, Rebecca G. Lawver, and Amy R. Smith.
- Project investigators and educator consultants to the project assigned percentages of the annual employment openings in each selected occupation to the four occupational clusters of Management and Business; Science and Engineering; Food and Biomaterials Production; and Education, Communication, and Governmental Services.
- For additional details, click on [Employment Opportunities](#).

Report Series

The report, *Employment Opportunities for College Graduates in Food, Agriculture, Renewable Natural Resources, and the Environment, United States, 2015–2020* is the eighth in a series of five-year projections initiated by the U.S. Department of Agriculture in 1980. While there have been some small refinements to

the methodology used in conducting these studies, the methodological structure outlined above was initially determined by Drs. Kyle Jane Coulter and Marge Stanton who conducted the study and authored the 1980 report entitled, *Employment Opportunities for College Graduates in the Food and Agricultural Sciences, 1980–85—Agriculture, Natural Resources, Veterinary Medicine*.

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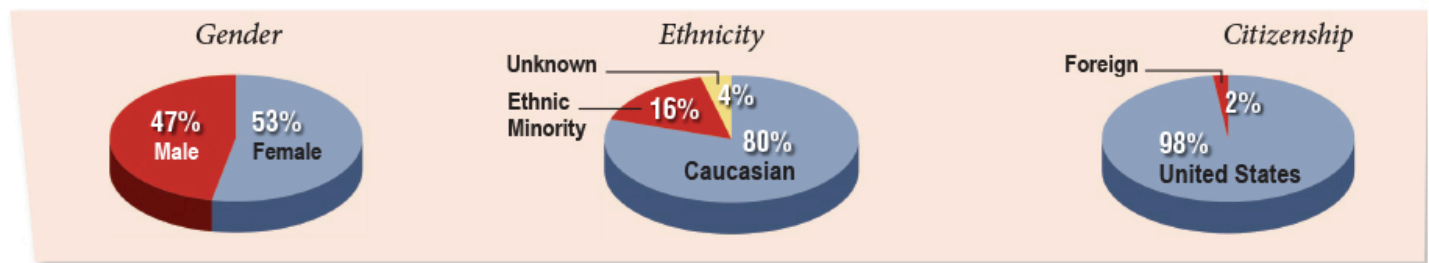
Characteristics of Graduates

Characteristics of Graduates *(Data in Percents)*

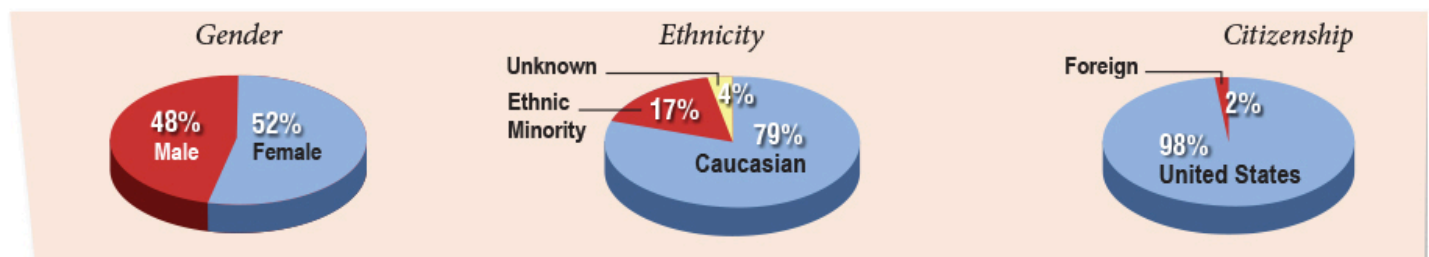
The data below compare characteristics of graduates of U.S. Colleges of Agriculture and Life Sciences, Forestry, and Veterinary Medicine from 2001–2002 to the same group of graduates from 2012–2013. Gender and ethnicity graphs include only U.S. citizens.

Bachelor's

2001 - 2002



2012 - 2013



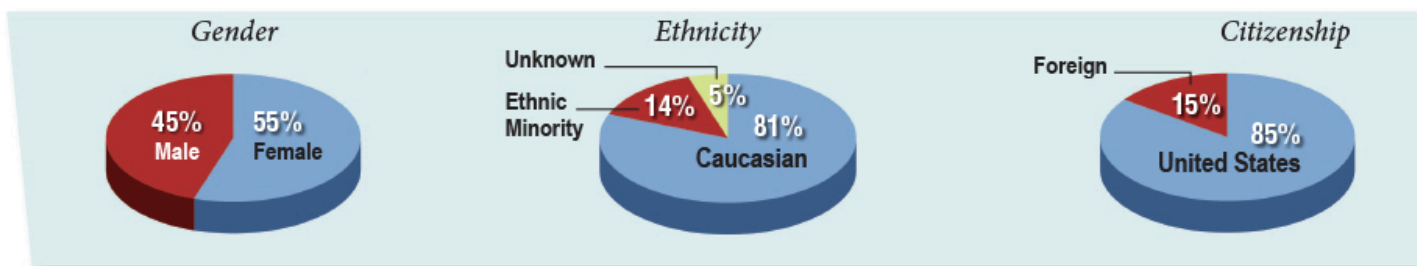
Source: National Center for Education Statistics

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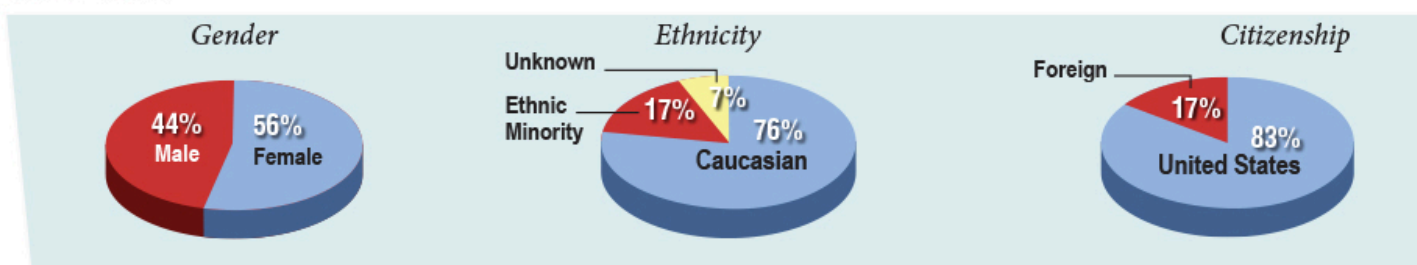
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Master's

2001 - 2002



2012 - 2013



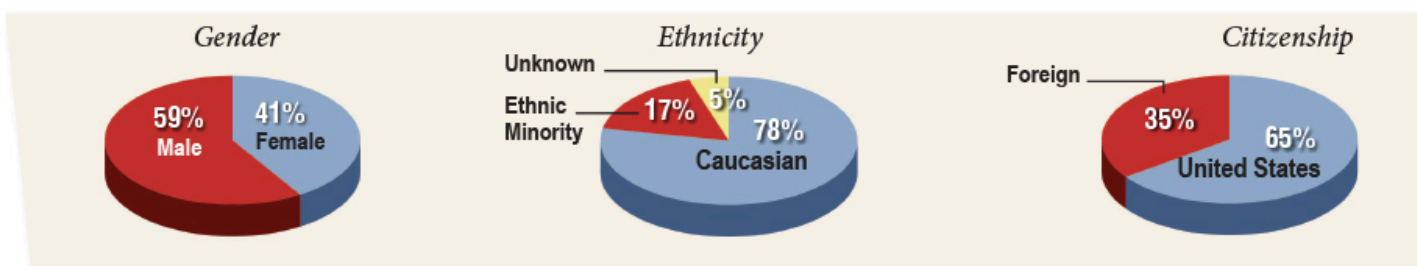
Source: National Center for Education Statistics

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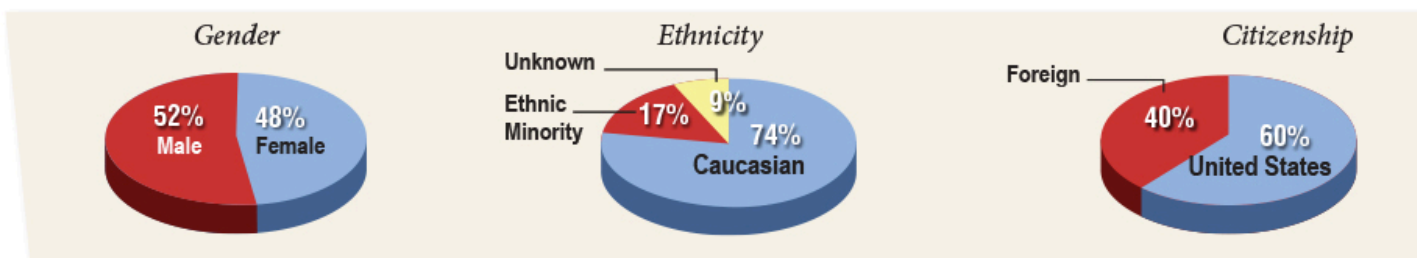
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Doctors of Philosophy

2001 - 2002



2012 - 2013



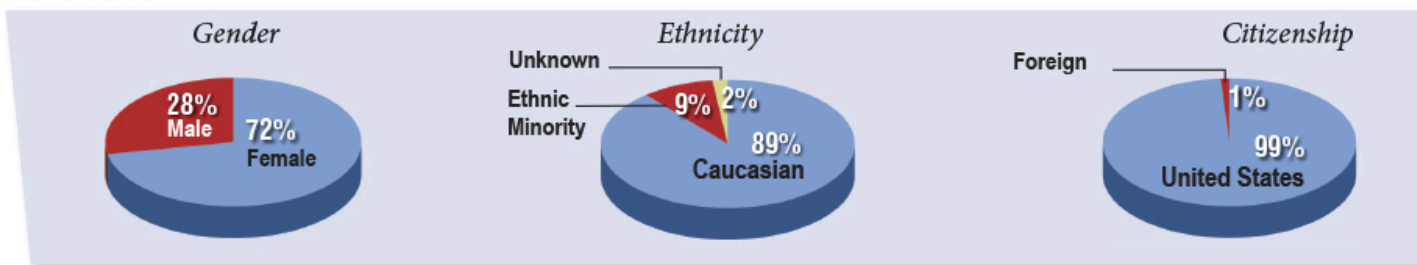
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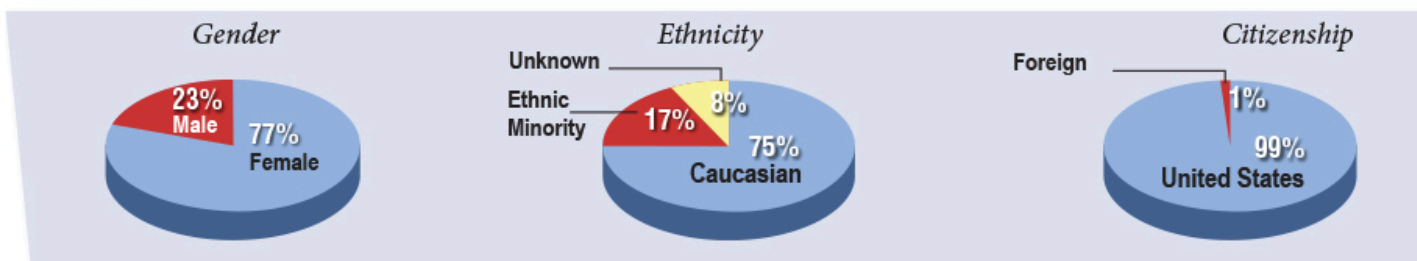
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Doctors of Veterinary Medicine

2001 - 2002



2012 - 2013



Source: National Center for Education Statistics

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Acknowledgements

This is the eighth in a series of five-year employment opportunities projections initiated by the United States Department of Agriculture (USDA). Former USDA employees, Drs. K. Jane Coulter and Marge F. Stanton, developed the basic methodology that has been used in conducting the series of studies. Some slight modifications of methodology in selecting national degrees conferred and occupations data were used in preparing the 2015-20 employment opportunities report.

We extend special thanks to Andrew Mary of the National Center for Education Statistics, U.S. Department of Education, for his assistance in obtaining degrees conferred data used in preparing this report.

We acknowledge the very important contributions of the following individuals who served on the advisory panel of experts for the 2015-2020 study.

Project Consultants

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We recognize the important review and recommendations of members of the Academic Programs Section of the Association of Public and Land-Grant Universities and the Non-land-grant Agricultural and Renewable Resources Universities, and those of employers of Food, Agriculture, Renewable Natural Resources, and Environment college graduates.

We acknowledge the excellent services of Russell J. Mersdorf (visual design) and Kenny Wilson (Web communication specialist) in preparing and disseminating this report. Both are with the Agricultural Communication Service, Purdue University.

Authors

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*in Food, Agriculture, Renewable Natural
Resources, and the Environment*

United States, 2015–2020

Employment Opportunities

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Graduates

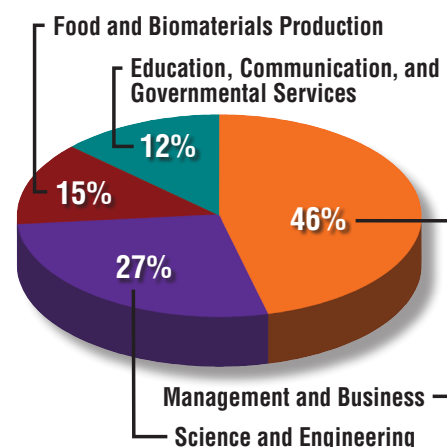
An average of 35,400 new U.S. graduates with expertise in food, agriculture, renewable natural resources, or the environment are expected to fill 61% of the expected 57,900 average annual openings. Most employers prefer to hire graduates with this expertise. However, because we anticipate more annual job openings than can be filled by these graduates, employers will need to look to other areas such as biology, business administration, engineering, education, communication, and consumer sciences to fill the remaining 39% of openings.

College graduates with expertise in food, agriculture, renewable natural resources, and the environment are essential to our ability to address the U.S. priorities of food security, sustainable energy, and environmental quality. Graduates in these professional specialties not only are expected to provide answers and leadership to meet these growing challenges in the United States, but they also must exert global leadership in providing sustainable food systems, adequate water resources, and renewable energy in a world of population growth and climate change.

Look to graduates of food, agriculture, renewable natural resources, and environment higher education programs if you are seeking to hire female graduates with STEM degrees. While other U.S. higher education programs have encountered challenges enrolling women in STEM specialties, women make up more than half of the food, agriculture, renewable natural resources, and environment higher education graduates.

Many food, agriculture, renewable natural resources, and environment graduates will have interests, skills, and experiences that lead them to employment in other industries. This will further widen the gap between numbers of graduates with expertise in these areas and the growing number of employment opportunities.

Employment Opportunities



MANAGEMENT AND BUSINESS

Between 2015 and 2020, expect an average of 26,700 annual job openings in management and business in the United States for new college graduates with expertise in food, agriculture, renewable natural resources, and the environment. This represents almost half of the annual job openings. Graduates with the best prospects have a strong background in life sciences and business, excellent communication skills, and work experience.

Selected Occupations

- Sales and Service Representative
- Forest Products Manager
- Land Use Manager
- Farm Labor Specialist
- Forest Ecosystem Manager
- E-commerce Specialist
- Financial Analyst
- Agricultural Economist
- Agricultural Loan Officer
- Landscape Contractor
- Marketing Specialist
- Grain Merchandiser

SCIENCE AND ENGINEERING

Food, agriculture, renewable natural resources, and environment higher education programs will continue to produce a growing number of graduates in science, technology, engineering, and mathematics (STEM) disciplines in the next five years. About half of these graduates will be women. Expect 15,500 annual job openings in these areas as demand for these graduates grows in many areas.

Selected Occupations

- Food Scientist
- Veterinarian
- Biological Engineer
- Environmental Scientist
- Insect Biologist
- Fisheries Biologist
- Plant Scientist
- Watershed Scientist
- Dietitian
- Irrigation Engineer
- Animal Scientist
- Soil Scientist

FOOD AND BIOMATERIALS PRODUCTION

Expect 8,500 annual job openings in food and biomaterials production between 2015 and 2020. More individuals filling these jobs will have bachelor's degrees, but production experiences will still be very important. Some growing job opportunities will be available in production of fresh and locally grown foods, poultry and swine production, crop production, forest management, and precision agriculture.

Selected Occupations

- Farmer
- Rancher
- Poultry Production Manager
- Range Manager
- Precision Agricultural Specialist
- Fruit and Vegetable Grower
- Forest Manager
- Crop Management Consultant
- Organic Crops Grower
- Viticulturist
- Swine Production Manager
- Aquaculturist

EDUCATION, COMMUNICATION, AND GOVERNMENTAL SERVICES

Anticipate 7,200 annual job openings in education, communication, and governmental services in the next five years for graduates with expertise in food, agriculture, renewable natural resources, and the environment. Graduates will find opportunities in agriscience education at all levels, government service, forest recreation, and agritourism. They will also find opportunities in marketing, event planning, and public relations.

Selected Occupations

- High School Agriscience Teacher
- Rural Development Specialist
- Plant and Animal Inspector
- Agricultural Extension Educator
- Farm Services Agent
- Natural Resources Conservation Specialist
- Technical Writer
- Social Media Specialist
- Outdoor Recreation Manager
- Environmental Science Teacher
- Food and Agricultural Science Editor
- Event and Meeting Planner

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For more details, log on to:

<https://www.purdue.edu/usda/employment>

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