Employment Opportunities for College Graduates in Food, Agriculture, Renewable Natural Resources and the Environment — United States, 2025-2030

USDA National Institute of Food and Agriculture
U.S. DEPARTMENT OF AGRICULTURE

PURDUE UNIVERSITY | College of Agriculture

PREFACE

This report continues a series of reports on employment opportunities for college graduates in food, agriculture, renewable natural resources and the environment (FARNRE) initiated in 1980. While maintaining consistency in data sources and procedures where possible, the 2025-2030 study differs from earlier studies in this series in several important ways. First, associate degree holders are included in the analysis. Second, the procedure used to develop the forecast of job openings is more rigorous than that used in earlier studies and draws on web-scrape data of position announcements for FARNRE jobs. Because employers are dropping degree requirements in position announcements, some jobs that will be filled by high school graduates are also included in the forecast of job openings (about 10% of the total FARNRE jobs available).

Third, the job openings data have been further disaggregated beyond the four general job clusters used in previous reports (Business and Management; Science and Engineering; Food and Biomaterials Production; and Education, Communication and Governmental Services) into 11 subclusters. In addition, the job openings projections have been disaggregated into five geographic regions. The expansion of the job openings data into 11 subclusters and the disaggregation of job openings into five geographic regions represent enhancements to the analysis. These enhancements are significant because: 1) moving from four broad clusters to 11 subclusters provides a more detailed understanding of workforce demand across specific career fields; and 2) regional projections reveal how job opportunities vary across the U.S., supporting more targeted educational programs and workforce development strategies.

While these changes represent improvements in study methodology with the goal of providing more robust demand and supply estimates for FARNRE jobs/graduates, they also mean trend analysis drawing on previous reports must explicitly consider these changes and should be conducted only where appropriate. Appendix 2 to this report provides detail on the data sources and procedures used to develop the estimates of job openings and available FARNRE graduates for the 2025-2030 report.

The report is intended to help both colleges and universities and employers anticipate shifts in the supply of and demand for FARNRE talent. For colleges and universities, such shifts can impact student recruitment, career office strategies and academic program investments. For employers, insights on supply of and demand for FARNRE talent can impact recruiting approaches, onboarding programs and broader human resource strategies.

EMPLOYMENT OPPORTUNITIES FOR COLLEGE GRADUATES BETWEEN 2025 AND 2030

We expect that in the United States between 2025 and 2030, employment opportunities will remain strong for new college graduates with interest and expertise in food, agriculture, renewable natural resources and the environment. Over that period, we forecast an average of 104,766 FARNRE job openings annually (Figure 1). This figure is much higher than the 59,400 FARNRE job openings reported in the 2020-2025 study for three reasons: 1) a more rigorous approach to determining FARNRE job openings; 2) the inclusion of associate degree holders in this study; and 3) the inclusion of some jobs open to those with a high school degree. We estimate that 90% of these 104,766 positions will require at least an associate degree, with the other 10% open to those without a degree. A list of factors that could impact this forecast is included later in the report.

The major employment areas for new FARNRE college graduates will be in Business and Management (42,855 annual openings) and in Science and Engineering (22,298 annual openings), making up 41% and 21%, respectively, of anticipated FARNRE job openings (Figure 2). Employment opportunities in Food and Biomaterials Production (19,725 annual openings) and the Education, Communication and Governmental Services category (19,888 annual openings) each account for 19% of jobs available to college graduates in food, agriculture, renewable natural resources and the environment.

While the actual job openings figures cannot be compared with previous studies, some insight into changes in openings by job cluster is provided by looking at the percentage breakdown across the four job categories. Compared with the previous five-year report, the proportion of job openings in Business and Management is relatively unchanged (42% in 2020 vs. 41% in 2025). There is a decline in the proportion of jobs available in the Science and Engineering category (31% vs. 21%), and corresponding increases in both Food and Biomaterials Production (13% vs. 19%) and Education, Communication and Governmental Services (14% vs. 19%). However, even with the shifts across clusters noted in the 2025-2030 study, these breakdowns have been relatively stable over time (Figure 3).

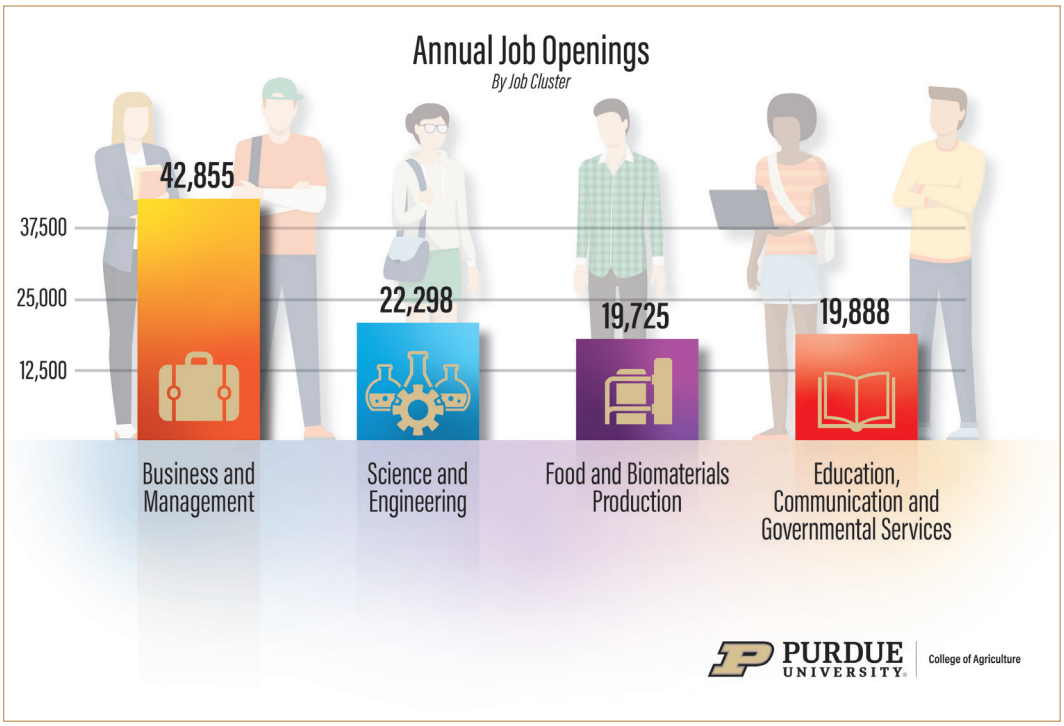


Figure 1. 2025-2030 Annual FARNRE Job Openings by Job Cluster.

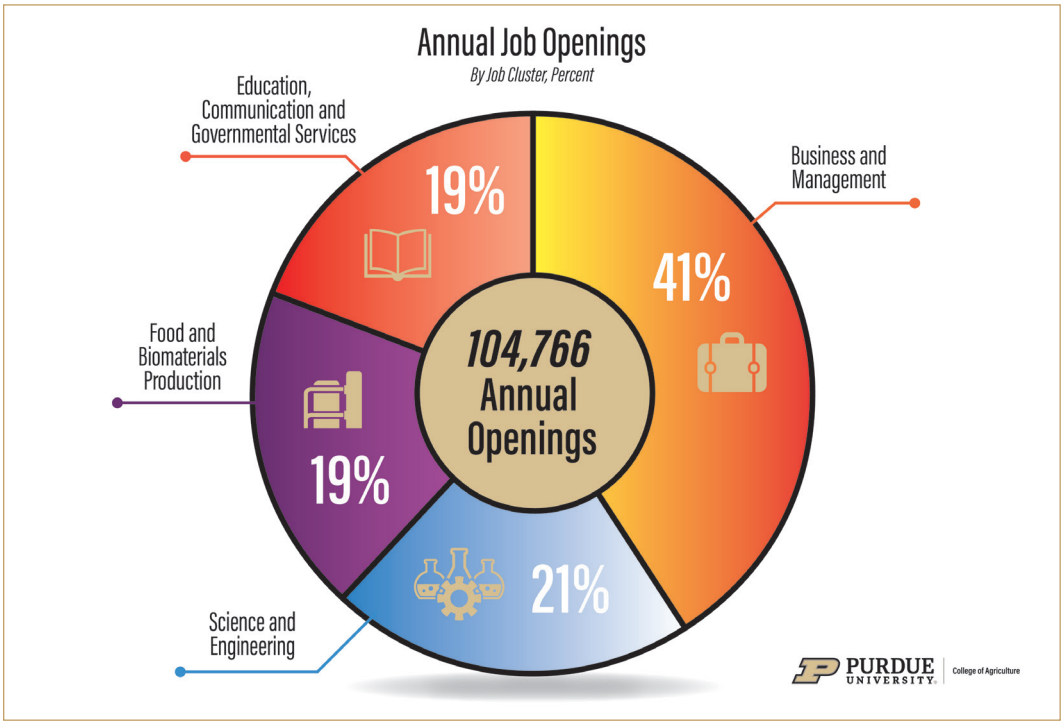


Figure 2. 2025-2030 Percentage Breakdown in Annual FARNRE Job Openings by Job Cluster.

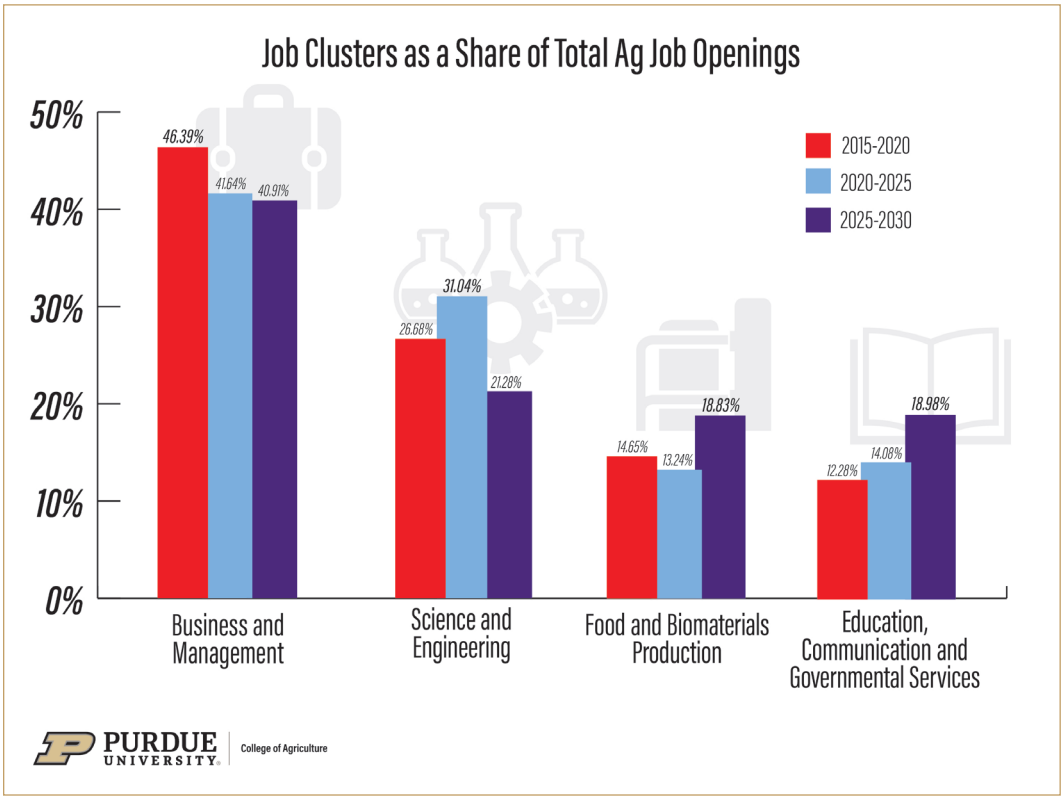


Figure 3. Total FARNRE Job Openings Across Job Clusters 2015-2030. *Bolded numbers indicate largest value.*

EMPLOYMENT OPPORTUNITIES IN JOB SUBCLUSTERS

New to the 2025-2030 study, the four primary job clusters were further segmented into 11 subclusters (Figure 4).

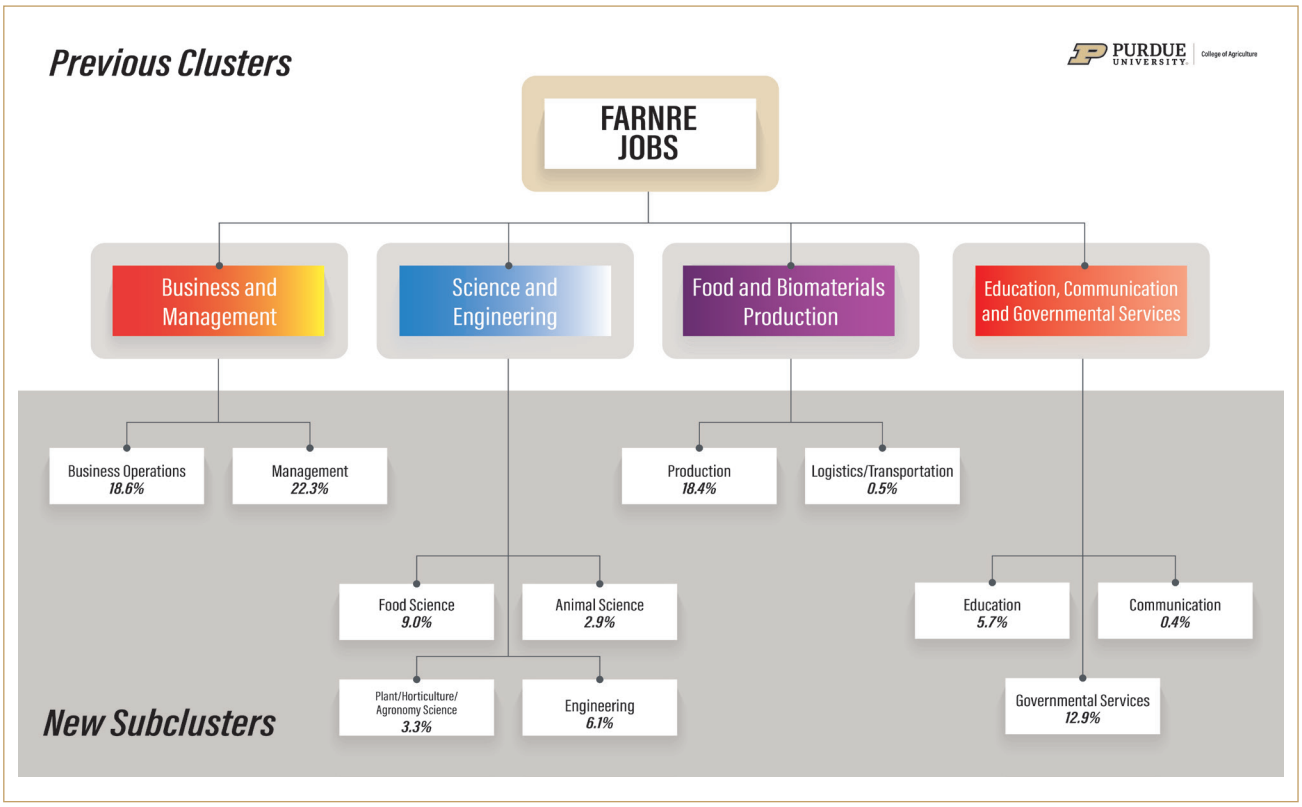


Figure 4. Job Cluster and Subcluster Breakdown as a Percentage of Total FARNRE Job Opportunities.

Business and Management jobs are equally divided between those categorized as Business Operations (18.6%) and those categorized as Management (22.3%) (Figure 4). Food Science (9.0%) and Engineering (6.1%) account for 70.9% of the jobs in the Science and Engineering category. In the Food and Biomaterials Production job cluster, virtually all jobs fall into the Production (18.4%) subcluster. Governmental Services (12.9%) jobs represent more than two-thirds of the jobs in the Education, Communication and Governmental Services job cluster. It should be noted that these 2025-2030 forecasts do not include any impacts of the federal workforce reduction initiatives such as the 2025 Deferred Resignation Programs, so the forecast of available jobs in the Governmental Services job subcluster may be overly optimistic.

EMPLOYMENT OPPORTUNITIES ACROSS GEOGRAPHIC REGIONS

Also new to this study is a disaggregation of total job opportunities into five geographic regions. These regions represent USDA ARMS III Farm Production Expenditure Regions. The ARMS III geographic breakdown was used based on the assumption that available FARNRE jobs will support and be aligned with agricultural production within geographic regions. Figure 5 shows that more than 30% of available jobs are in the Atlantic region, with about 25% of the FARNRE jobs in the West region. The Midwest region accounts for roughly 19% of available positions, with the Plains region at nearly 14%, and the South region at nearly 12%. The general trends in the four job clusters hold across the five geographic regions. Detail on job openings by cluster across geographic regions is presented in Appendix 1.

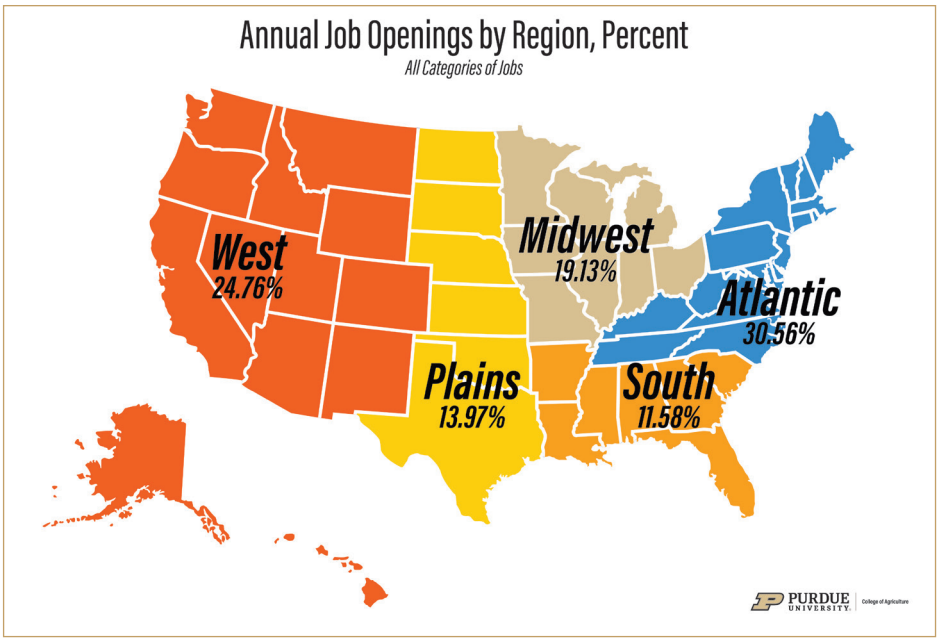


Figure 5. Regional Breakdown as a Percentage of Total FARNRE Job Opportunities.

COLLEGE GRADUATES BETWEEN 2025 AND 2030

In the United States between 2025 and 2030, the number of new college graduates (including those earning associate degrees) annually seeking employment opportunities in food, agriculture, renewable natural resources and the environment will remain strong. Graduates from degree programs (associate, baccalaureate, and postgraduate/professional) in food, agriculture, renewable natural resources and the environment will fill 47.8% (50,057) of the available FARNRE positions annually (Figure 6). Graduates with allied degrees – degree specializations offered by public and private nonprofit higher education programs in biological sciences, engineering, health sciences, business, communication, etc. – who are expected to compete for employment with FARNRE graduates will account for 24.6% (25,802) of the annual new graduate supply pool.

To fill the total 104,766 FARNRE jobs available, an additional 28,907 other graduates (Figure 6) will be needed annually (27.6%). About 10,477 (10%) of these 28,907 positions will be filled by individuals without a degree. The remaining 18,430 (17.6%) positions will need to be filled by additional allied majors or graduates from majors outside those in the allied category in order to meet total FARNRE demand.

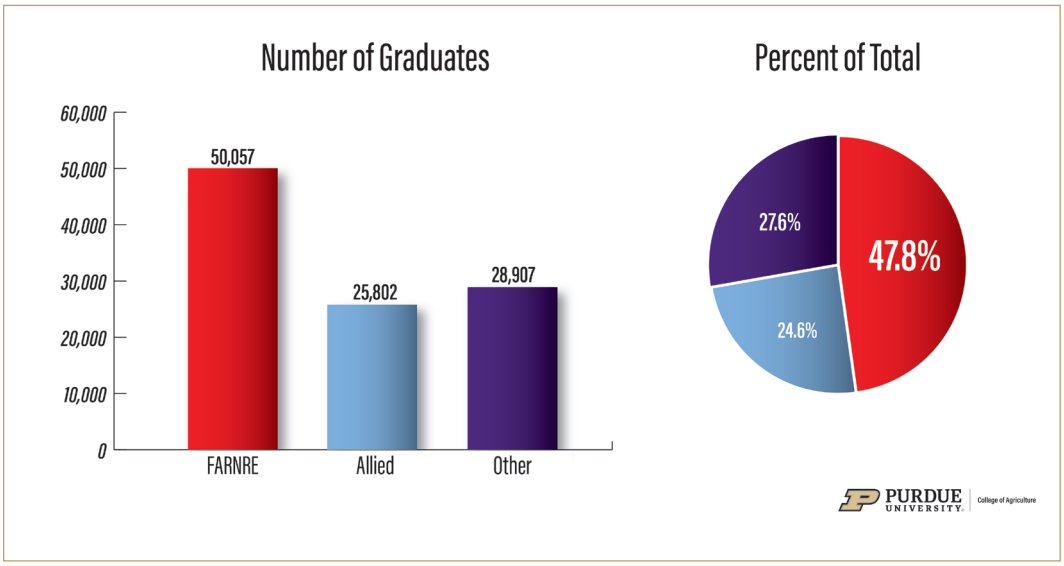


Figure 6. Annual Available Graduates by Category, 2025-2030.

Following the procedure used in prior reports, FARNRE graduates were assigned to one of the four job clusters based on their major (see Appendix 2). It is important to note that the major-job cluster relationship is quite fluid – especially given the increasing prevalence of second majors, minors, and certificates in areas other than the student's primary major. For example, a student majoring in agricultural engineering and classified in the Science and Engineering cluster may well take a job in the Business and Management cluster or the Food and Biomaterials Production cluster. In the end, it is quite possible that a student in any FARNRE major could take a position in any of the four job clusters.

With this point noted, of the 50,057 FARNRE graduates, 33% will be in the Business and Management job cluster, 27% in the Science and Engineering cluster, 23% in the Food and Biomaterials Production cluster, and 17% in the Education, Communication and Governmental Services cluster (Figure 7). The job cluster breakdown for bachelor's degree and above (44,871 graduates) is similar to the breakdown for all graduates (including associate degrees) with the bachelor's degree and above group showing a slightly higher proportion in the Science and Engineering cluster.

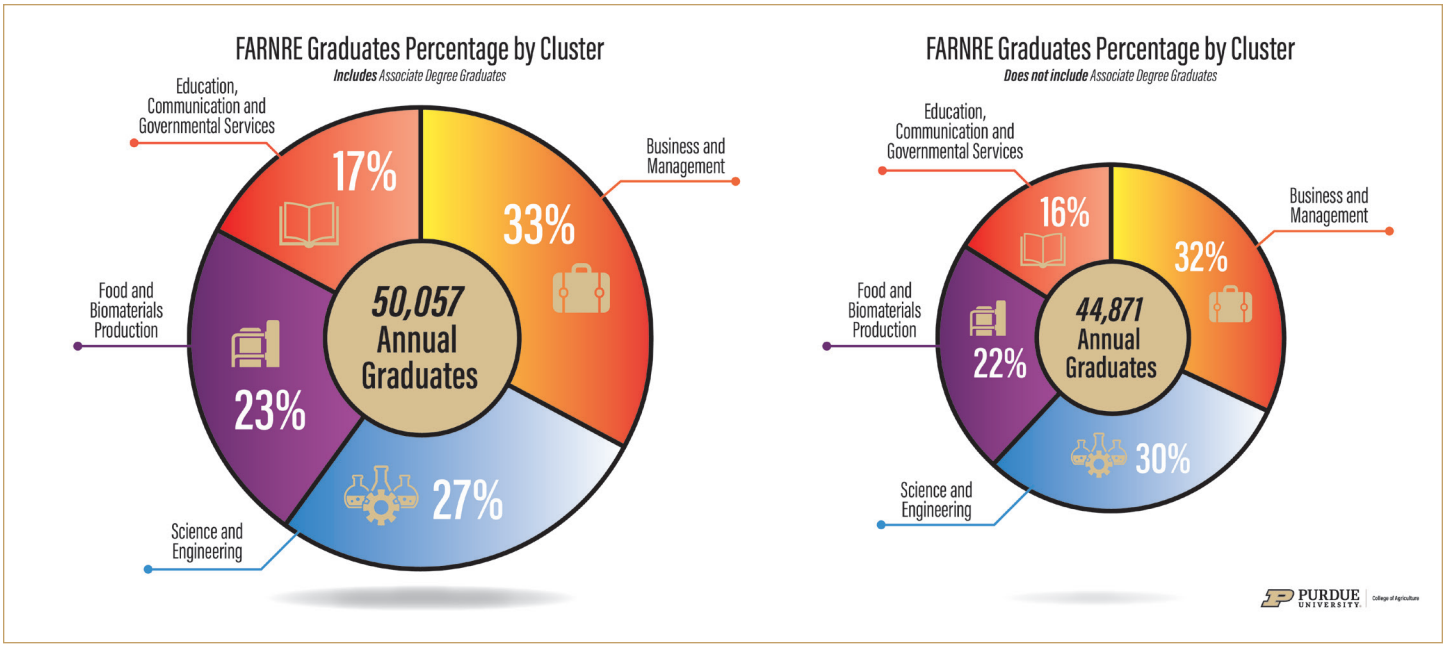


Figure 7. FARNRE Graduates by Job Cluster, With and Without Associate Degrees Included.

Compared to allied majors and the other category, new graduates with degrees in food, agriculture, renewable natural resources and the environment will comprise approximately 39.0% of Business and Management graduates; 60.6% of Science and Engineering graduates; 58.7% of Food and Biomaterials Production graduates; and 41.5% of Education, Communication and Governmental Services graduates (Figure 8 and Figure 9). Interestingly, FARNRE graduates and allied graduates are expected to fill all the available jobs in the Science and Engineering category (the most likely to require a degree), while the biggest gaps between FARNRE graduates and available jobs are in the Business and Management category (26,139 graduates) and Education, Communication and Governmental Services (11,633 graduates).

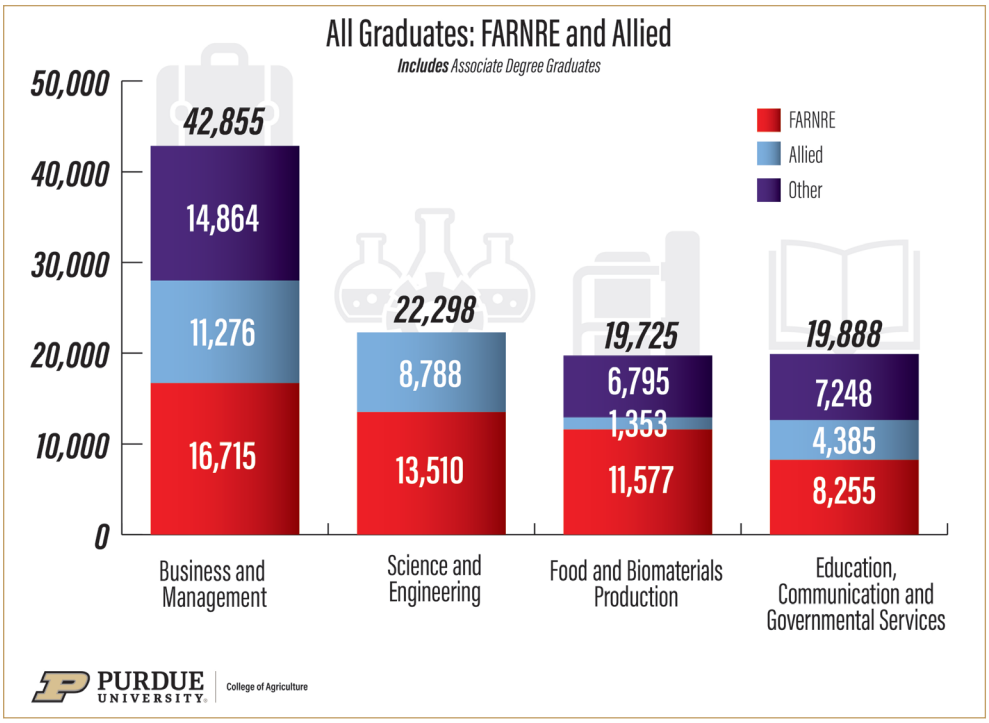


Figure 8. Number of Graduates Available Annually for FARNRE Jobs by Category, 2025-2030.

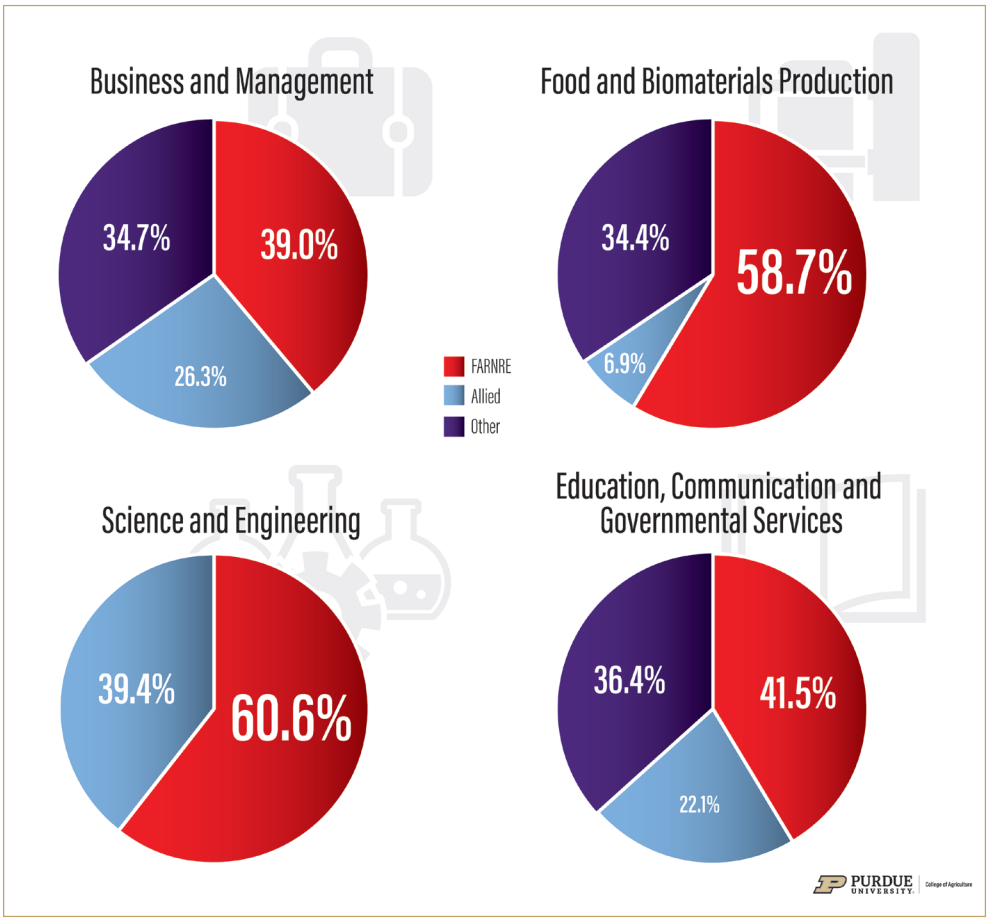


Figure 9. Percentage Breakdown of Graduates Available Annually for FARNRE Jobs by Category, 2025-2030.

BUSINESS AND MANAGEMENT

The **Business and Management** cluster includes business and management jobs throughout all stages of the food and agriculture value chain, from agricultural inputs and production to food wholesaling and distribution, including the management of renewable natural resources.

In the United States between 2025 and 2030, expect an average of 42,855 annual job openings in business and management with application in food, agriculture, renewable natural resources and the environment; and 16,715 graduates with FARNRE business and management degrees entering the food, agriculture, renewable natural resources and environment workforce. Approximately 41% of all FARNRE-related position openings are in Business and Management, making it the largest of the four employment clusters. On an annual basis, food, agriculture, renewable natural resources and the environment graduates will fill 39.0% of available positions in this cluster, with 26.3% (11,276) filled by graduates from allied fields of study, and the remaining 34.7% (14,864) filled by graduates in other fields, more allied graduates than have typically taken FARNRE jobs, and/or those without a degree (Figure 10).

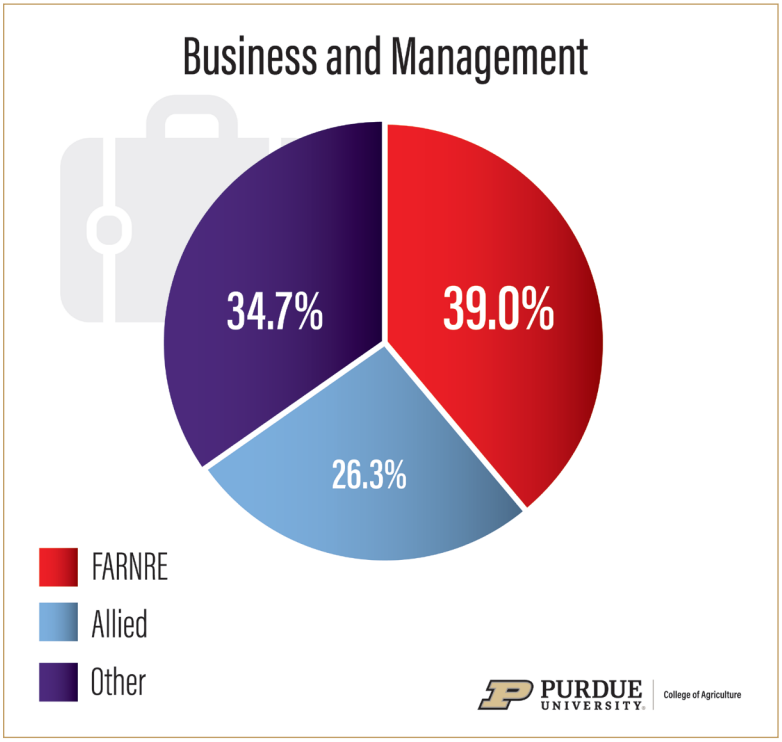


Figure 10. Breakdown of Source to Fill Approximately 42,855 Annual FARNRE Employment Opportunities in Business and Management.

Observations and Trends: Business and Management

Between 2025 and 2030, employment opportunities in business and management are projected to remain the largest share of FARNRE job openings, averaging 42,855 openings per year and accounting for roughly 41% of all FARNRE positions. Roughly 39% of business and management cluster openings are expected to be filled by FARNRE graduates, with the remaining 61% being filled by allied fields, other non-allied majors, or those without a degree.

Demand will remain particularly strong for general managers, operations leaders, financial analysts and risk managers as firms adapt to the ever-changing FARNRE economic environment. Technical sales and service specialists will continue to see favorable prospects, especially where solutions combine equipment, inputs and digital tools.

Employers also seek managers who have strong data management and analytics skills to improve decision-making. Nearly 44% (Table 1) of available job positions scraped for this report list data skills as needed (required or preferred) for the role. The theme of data carries over into the marketing and e-commerce roles as these roles are expected to utilize digital platforms, with performance marketing and Customer Relationship Management (CRM) systems driving hiring trends. New graduates will need to have strong data skills, even in sales roles, in order to make an immediate impact.

Table 1. Skills Mentioned in Job Postings

Skills Mentioned in Job Posting	Percent of Total Jobs Mentioning the Skill
Experience	95.8%
Leadership	89.3%
Communications	82.3%
Education	82.1%
Teamwork	64.0%
Travel	59.1%
Microsoft	53.4%
Quantitative skills	46.2%
Data	43.9%
Public speaking	41.7%
Critical thinking	28.5%
Remote work	18.5%
Programming skills	12.9%

Growth is also projected in project management and supply chain management positions, as companies continue to develop more robust supply chain strategies. Consulting and advisory services are likely to expand as food and agribusiness firms seek expertise in a variety of business topics such as transition planning, marketing, and financial management. Because a majority of these positions are filled by allied business graduates, agricultural graduates who complement their training with business analytics or industry certifications will be particularly competitive. Conversely, allied fields who are in competitive industries could benefit from getting experience in agriculture as 95.8% of the job postings in agriculture mention experience as a desired qualification.

Summary of Business and Management

- Expect continued strength in general management, operations and financial roles, with expansion in risk analytics, credit and insurance driven by a more volatile commodity, trade and interest-rate environment.
- Sales and key account roles remain numerous, especially where solutions integrate equipment, inputs, software and services into bundled value propositions. Data skills, including CRM systems, will be required for sales roles moving forward.
- Marketing and e-commerce hiring should keep shifting toward performance marketing, content strategy and CRM/marketing-automation — blending commercial savvy with light data analytics.
- Data skills (dashboarding, Key Performance Indicator [KPI] design, applied forecasting) will be prioritized as firms scale digital marketing and focus on supply chain logistics.
- Demand for project and product managers will increase as agricultural technology vendors and input manufacturers expand platform features and partnerships.
- Procurement and supply chain management roles will gain prominence with shifting geographical needs and logistics risk.
- Consulting and advisory service positions should grow as firms and farmers need services related to transition planning, financial management and marketing.

SCIENCE AND ENGINEERING

The **Science and Engineering** cluster includes the life, physical and social sciences and engineering occupations aligned with the production, transportation, processing, and distribution of food and fiber. Occupations focusing on the interface of food science, human nutrition and health are included. In the U.S. between 2025 and 2030, expect an average of 22,298 annual job openings with an emphasis on food, agriculture, renewable natural resources and the environment in Science and Engineering; and expect 13,510 FARNRE graduates with degrees and expertise in science and engineering entering the food, agriculture, renewable natural resources and environment workforce. Approximately 21% of all available FARNRE positions are in Science and Engineering. Graduates with degrees from institutions offering academic majors and degrees in food, agriculture, renewable natural resources and the environment will fill 60.6% (13,510) of the annual openings, with the other 39.4% (8,788) filled by graduates from allied fields of study (Figure 11).

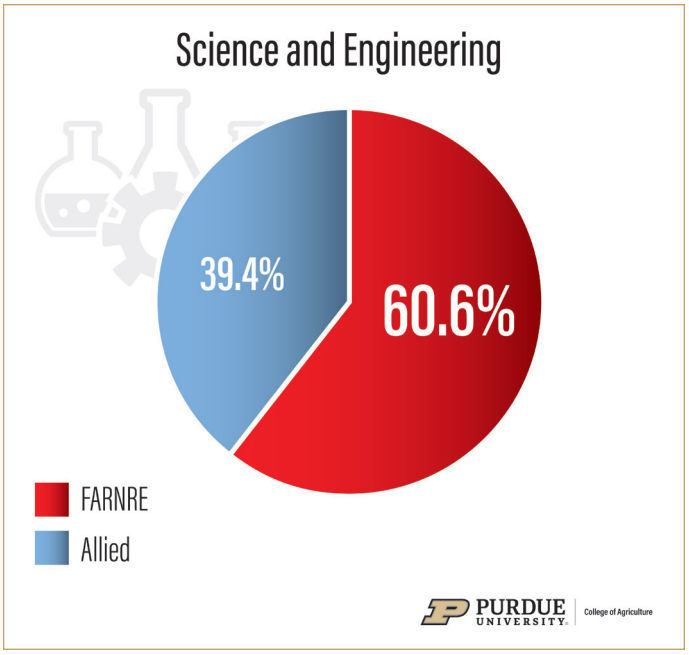


Figure 11. Breakdown of Source to Fill Approximately 22,298 Annual FARNRE Employment Opportunities in Science and Engineering.

Observations and Trends: Science and Engineering

The Science and Engineering job category will see 22,298 job openings annually from 2025 to 2030, making up about 21% of total FARNRE employment opportunities. Growth is projected across agronomy, plant breeding and plant health, where specialists remain essential for crop production innovation and pest/disease management. Approximately 60.6% of openings are expected to be filled by FARNRE graduates and 39.4% by allied fields.

Agricultural, biological and environmental engineers, along with technicians in computer-based systems, sensing and GIS, will continue to be in strong demand as precision agriculture expands. Food science and engineering graduates will find steady opportunities in food safety, processing and packaging, especially at the intersection of nutrition and human health.

Employers are also prioritizing expertise in automation, robotics and artificial intelligence (AI), reflecting the increasing integration of advanced technology into agricultural production systems and supply chain management. Water and soil specialists are expected to remain vital for conservation and compliance roles, particularly in geographic areas that see issues with certain resources (e.g., water). Large-animal veterinarians and rural veterinary practitioners will continue to be undersupplied relative to demand. Strong prospects also exist for biochemists, bioinformaticians and geneticists.

Summary of Science and Engineering

- Agronomy, plant science, breeding/genetics and diagnostics remain high-placement specialties across input suppliers, retailers and independent advisory firms.
- Biological/agricultural/environmental engineers and computer-based systems technicians (sensing, control, embedded/edge computing, GIS/remote sensing) will continue to see robust demand.
- Demand for food science and food process engineers will remain strong. In particular, jobs at the interface between food and human health, quality control, safety and package engineering will continue to grow.
- Hiring for automation, robotics, precision management, AI and geospatial analytics will keep expanding as producers and agricultural companies digitize operations and optimize input intensity.
- Water and soil specialists (e.g., hydrologist, irrigation efficiency, soil health) remain in demand amid changing weather patterns and regulatory compliance requirements.
- Large-animal veterinarians and rural veterinary practice positions will continue to be hard to fill.

FOOD AND BIOMATERIALS PRODUCTION

The **Food and Biomaterials Production** cluster includes occupations that focus on the production, operations, processing, and logistics of commodities used as food or biomaterials. This also includes occupations in forest production, renewable energy and environmental management.

In the United States between 2025 and 2030, expect an average of 19,725 annual job openings with a focus on Food and Biomaterials Production; and expect 11,577 graduates with FARNRE degrees in food and biomaterials production entering the food agriculture, renewable natural resources and environment workforce. Approximately 19% of all FARNRE job openings are in Food and Biomaterials Production. College graduates with degrees from institutions offering food, agriculture, renewable natural resources and the environment programs will fill 58.7% (11,577) of the annual openings, with 6.9% (1,353) filled by graduates from allied fields of study and the remaining 34.4% (6,795) filled by graduates in other fields, more allied graduates than have typically taken FARNRE jobs, and/or those without a degree (Figure 12).

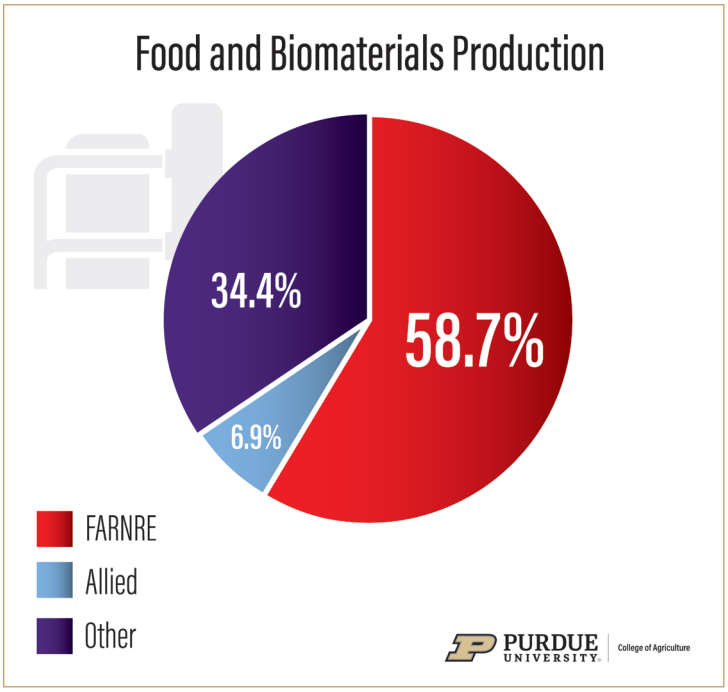


Figure 12. Breakdown of Source to Fill Approximately 19,725 Annual FARNRE Employment Opportunities in Food and Biomaterials Production.

Observations and Trends: Food and Biomaterials Production

Employment in food and biomaterials production is projected to increase significantly, averaging 19,725 annual openings from 2025 to 2030. These roles account for about 19% of the agricultural job market and are expected to be filled primarily by graduates with practical, applied training. Approximately 58.7% of the openings are expected to be filled by FARNRE graduates and 41.3% by allied fields, other non-allied majors, and/or those without a degree.

Agronomists, horticultural specialists and pest management professionals remain in demand, particularly for candidates with hands-on experience. Opportunities are also expected to grow in commercial livestock and poultry management, where animal health, nutrition and welfare expertise are increasingly valued. This sector will continue to see efficiency gains driven by better production practices and management strategies. As such, the theme of data analytics continues in this cluster of jobs as agriculture adopts even more data-intensive production practices.

Biomaterials and bioenergy employers will continue to seek graduates with knowledge of feedstock logistics and sustainability practices. Across this cluster, the ability to collect, interpret and apply data remains a clear differentiator, while routine and seasonal positions that do not require a degree are expected to show slower growth.

Summary of Food and Biomaterials Production

- Strong demand persists for agronomists, horticultural specialists, consultants and pest management professionals — especially candidates with substantial practical experience.
- Commercial livestock and poultry operations (swine, dairy, feedlot, layer/broiler) continue to offer managerial and technical roles tied to animal health, nutrition and welfare.
- Entrepreneurial opportunities will continue to expand in local, niche and value-added products.
- Biomaterials and bioenergy will seek graduates familiar with feedstock logistics, conversion processes and sustainability practices.
- Candidates who can manage and interpret data have a clear edge in both production and service roles.
- Roles that are primarily routine or seasonal (e.g., nonmanagerial caretaking, basic landscape maintenance) are less likely to require bachelor's-level preparation.

EDUCATION, COMMUNICATION AND GOVERNMENTAL SERVICES

The Education, Communication and Governmental Services cluster includes educators, communicators and public relations specialists in the public and private sectors. A wide range of positions are offered by local, state, national and international agencies.

In the United States between 2025 and 2030, expect an average of 19,888 annual job openings for college graduates in the Education, Communication and Governmental Services cluster; and expect 8,255 FARNRE graduates with degrees in education, communication and government services to enter the food agriculture, renewable natural resources and environment workforce. Approximately 19% of all FARNRE position openings are expected to be in Education, Communication and Governmental Services. Graduates with degrees in food, agriculture, renewable natural resources and the environment will fill 41.5% (8,255) of the annual openings, with 22.1% (4,385) filled by graduates from allied fields of study and the remaining 36.4% (7,248) filled by graduates in other fields, more allied graduates than have typically taken FARNRE jobs, and/or those without a degree (Figure 13).

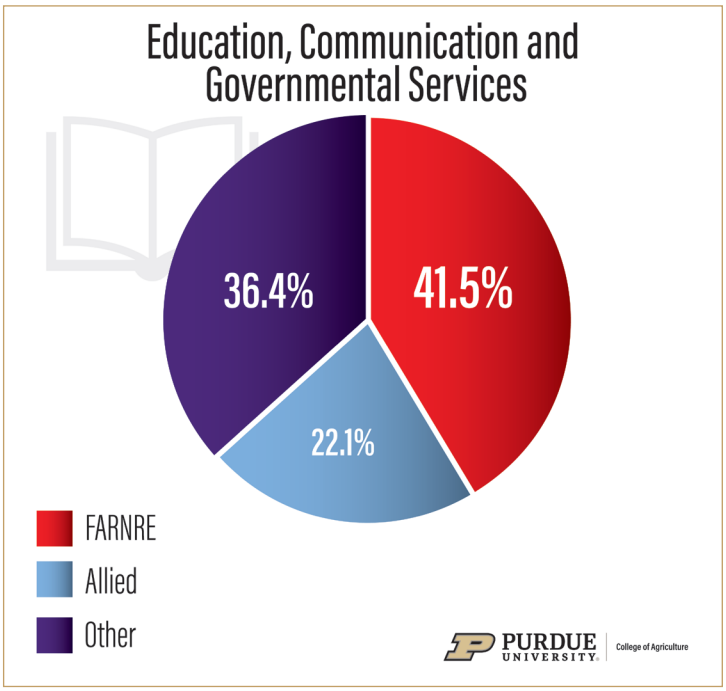


Figure 13. Breakdown of Source to Fill Approximately 19,888 Annual FARNRE Employment Opportunities in Education, Communication and Governmental Services.

Observations and Trends: Education, Communication and Governmental Services

Education, communication and governmental services occupations are forecast to generate 19,888 annual openings between 2025 and 2030, or about 19% of the total FARNRE openings. Roughly 41.5% of the openings are expected to be filled by FARNRE graduates, 22.1% by graduates in allied fields, and 36.4% by graduates in non-allied majors and/or those without a degree. For those with a degree, opportunities remain strong for teachers in agriscience and natural resources at the middle and high school levels, and community colleges show a favorable outlook for agriculture faculty. At universities, hiring is expected to continue shifting toward fixed-term and specialized appointments, reflecting growing demand for workforce-aligned, externally funded programs rather than traditional tenure-track roles.

Communication graduates will find a competitive market overall, but those with agriculture and science backgrounds, coupled with digital media skills, should see favorable prospects. Government agencies and nonprofits are increasingly seeking data scientists and analysts in compliance, evaluation and reporting roles. Because this cluster draws heavily on allied graduates, those who combine communications or policy expertise with technical agricultural background/knowledge will have an advantage in securing these roles.

Summary of Education, Communication and Governmental Services

- Agriscience and natural resources teachers at middle/high schools remain in strong demand; community colleges show a favorable outlook for applied agriculture faculty.
- At universities, expect growth in specialized, fixed-term faculty with emphasis on externally funded, workforce-aligned programs.
- Demand for agricultural and science communication roles remains healthy, with employers seeking digital fluency (social, multimedia, analytics) and science-translation skills.
- Data science and analytics skillsets are increasingly valued in agencies and NGOs for program evaluation, transparency and reporting.
- Because this cluster draws heavily from allied fields, FARNRE candidates who pair communication/policy with technical agriculture expertise/experience will be especially competitive.

CHARACTERISTICS OF COLLEGE GRADUATES

Perhaps more than any other sector, the food, agriculture, renewable natural resources and the environment sector crosses economic, political, social and geographic lines. The work of this sector undergirds the very existence of all of humankind. Technological innovation and evolution — the product of an impact-driven and curiosity-fueled FARNRE workforce — will need to support a global population projected to reach 9.8 billion by 2050. Given the complex environmental, social and economic issues directly impacting agriculture, food, renewable natural resources and the environment, the U.S. needs a cadre of FARNRE professionals from across the country, drawing on rural, urban and suburban backgrounds, who are technically sound, globally competent and prepared for the work world.

The changing demographics of the FARNRE workforce will reflect the changing demographics of the U.S. population. This section reports trends in select demographics of FARNRE graduates over time. All FARNRE graduates (for each degree and time period) are included in the figures. The race and ethnicity of FARNRE graduates by degree for 2022-2023 are reported in Figure 14.

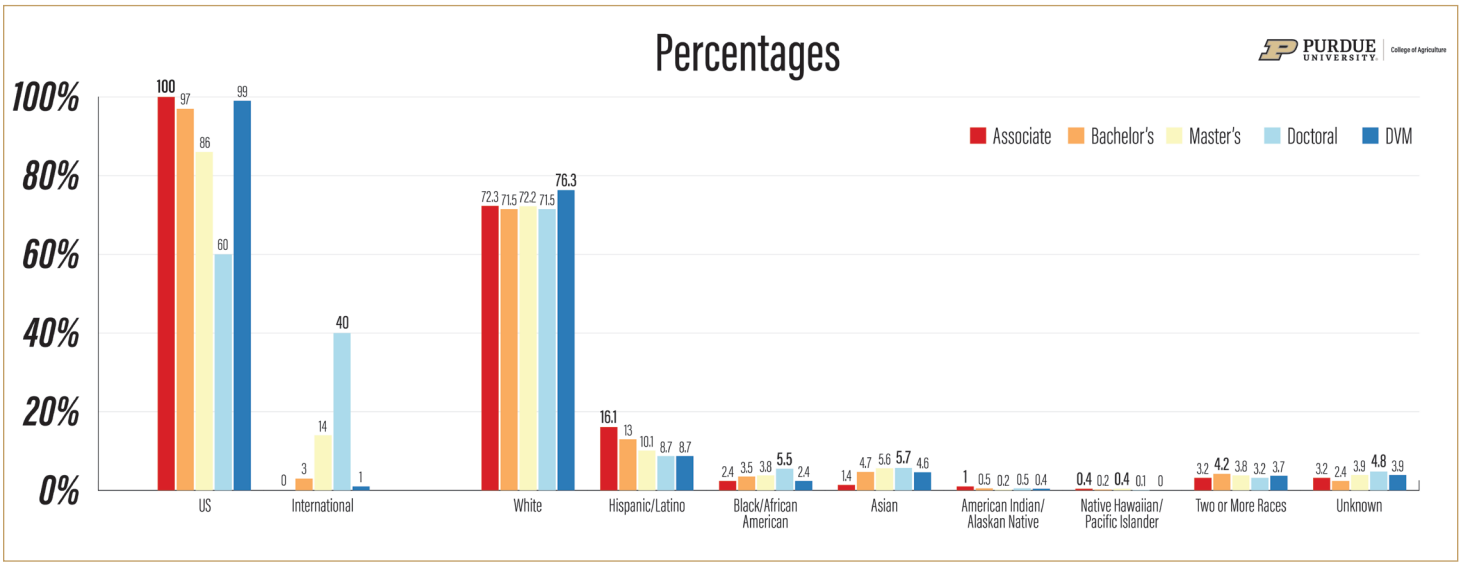


Figure 14. Self-Reported Racial and Ethnicity Distribution of College Graduates in Food, Agriculture, Renewable Natural Resources and the Environment, 2022-2023. *Bolded numbers indicate largest value.*

Demographics of Associate Degree Recipients

Associate degree recipients are about 2/3 female and 1/3 male (Figure 15). They are roughly 75% white and virtually all are U.S. citizens. Degree attainment by students from racial and ethnic minorities has grown steadily, while the percentage of white students earning associate degrees has declined over this same time frame.

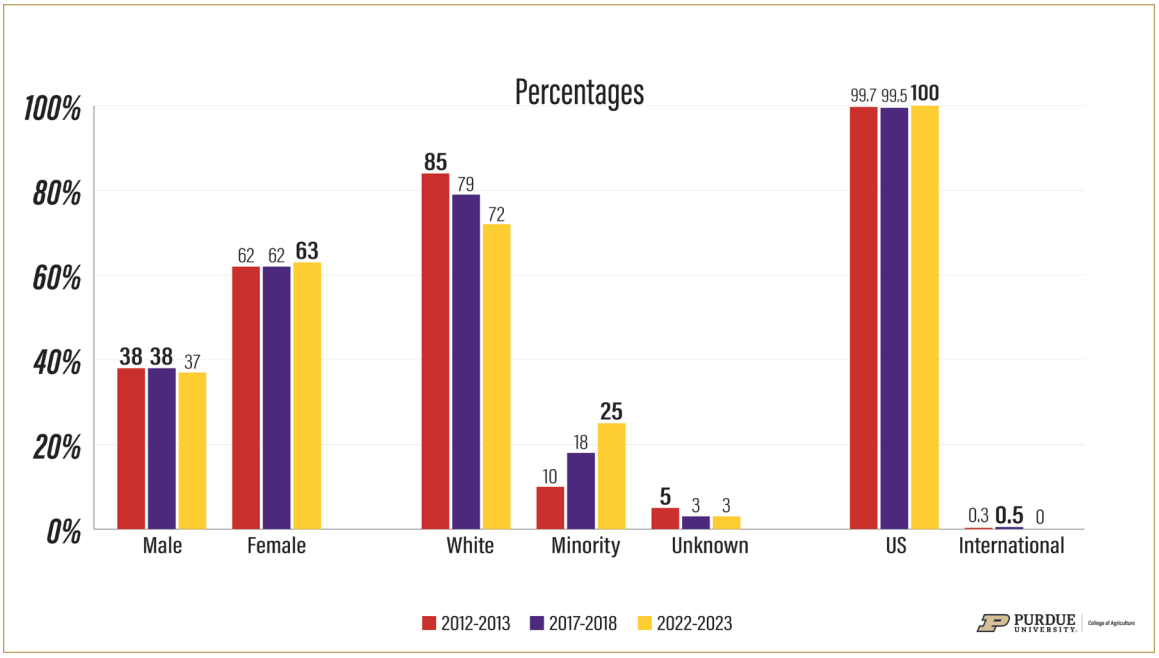


Figure 15. Changes in Demographics of FARNRE College Graduates, 2012-2013, 2017-2018, and 2022-2023: Associate Degrees. *Bolded numbers indicate largest value.*

Demographics of Baccalaureate Degree Recipients

At the baccalaureate level, female graduates have comprised the majority of graduates over the past two decades, and the proportion of female graduates has grown steadily over the period (Figure 16). Some undergraduate majors — including animal sciences, agricultural education, agricultural communication and veterinary medicine — tend to attract a greater proportion of female students. While other majors tend to be chosen predominantly by male students, such as agricultural engineering, forestry, agronomy and crop science, etc., females are increasingly enrolling in these programs as well. Degree attainment by students from racial and ethnic minorities has steadily increased, while white students have seen a slight proportional decline over this same time frame. Like associate degree recipients, virtually all bachelor's degrees in FARNRE are awarded to U.S. citizens.

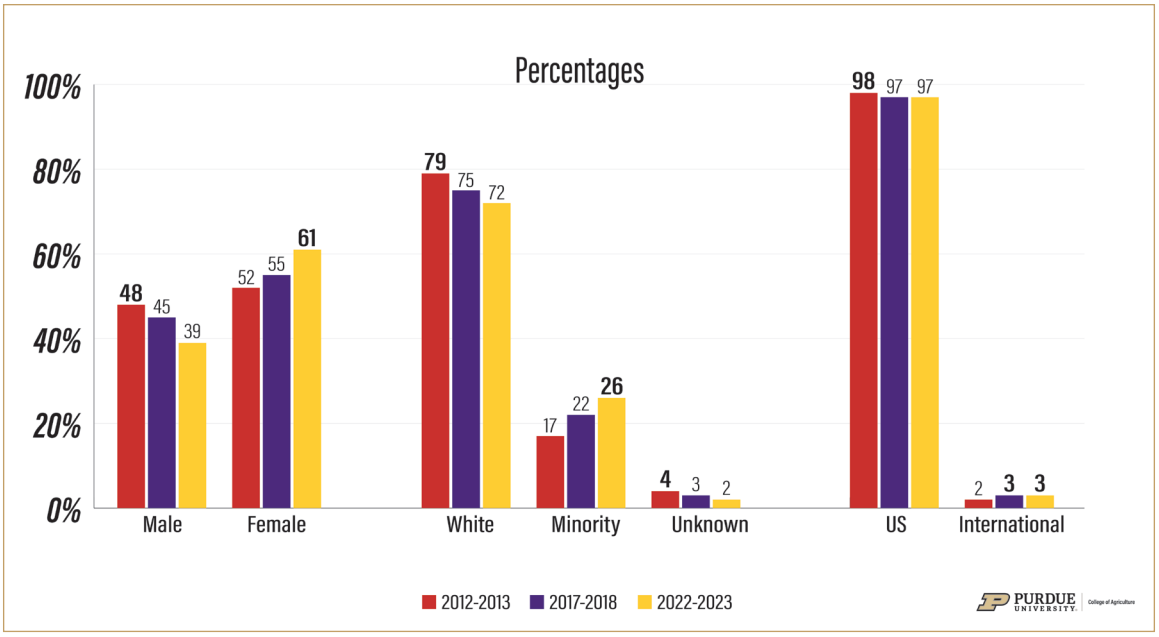


Figure 16. Changes in Demographics of FARNRE College Graduates, 2012-2013, 2017-2018, and 2022-2023: Bachelor's Degrees. *Bolded numbers indicate largest value.*

Demographics of Master's Degree Recipients

At the master's degree level, following the trend in bachelor's graduates, female graduates have continued to increase relative to male graduates over the past two decades (Figure 17). Degree attainment by students from racial and ethnic minorities has grown steadily, while the percentage of white students earning master's degrees has slightly declined over this same time frame. While the majority of FARNRE master's graduates are U.S. citizens, the proportion of international graduates is substantially higher than for associate and bachelor's degree holders.

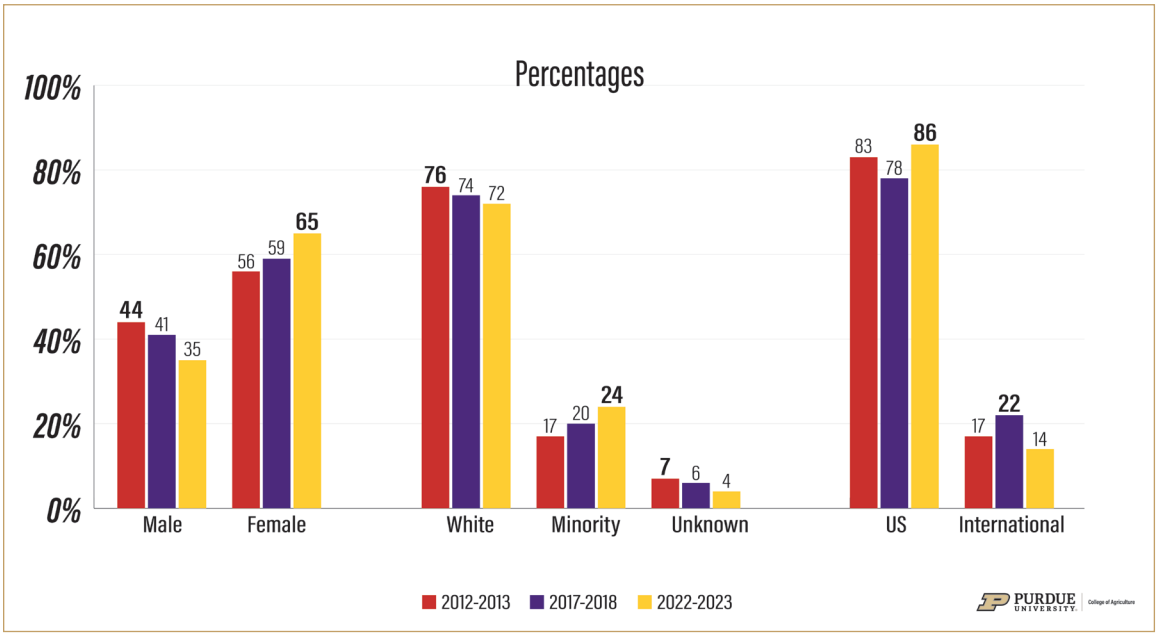


Figure 17. Changes in Demographics of FARNRE College Graduates, 2012-2013, 2017-2018, and 2022-2023: Master's Degrees. *Bolded numbers indicate largest value.*

Demographics of Doctoral Degree Recipients

At the doctoral level, female graduates continue to increase relative to male graduates and represented the majority of doctoral graduates for the last year of record (Figure 18). Degree attainment by doctoral students from racial and ethnic minorities has increased over the past 10 years. Minority students now represent about a quarter of the total FARNRE doctoral graduates, while white doctoral graduates have seen a slight but steady decline as a percentage of the total over the same time frame. In contrast to associate, bachelor's and master's graduates, international students — who make up 40% of the total — represent a large proportion of FARNRE doctoral degrees awarded.

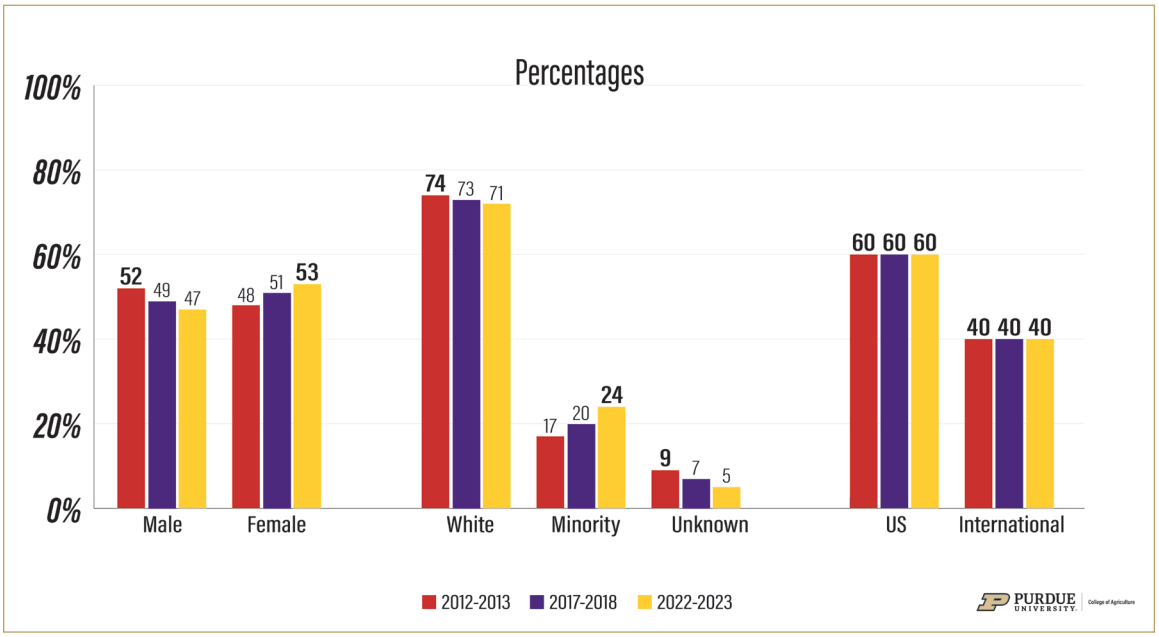


Figure 18. Changes in Demographics of FARNRE College Graduates, 2012-2013, 2017-2018, 2022-2023: Doctoral Degrees.
Bolded numbers indicate largest value.

Demographics of Veterinary Medicine Degree Recipients

The percentage of female graduates attaining degrees in veterinary medicine has continued to increase, and females now account for 82% of the total DVM degrees awarded (Figure 19). The proportion of white DVM graduates has remained relatively steady at about 75%. Virtually all DVM degrees are earned by U.S. citizens.

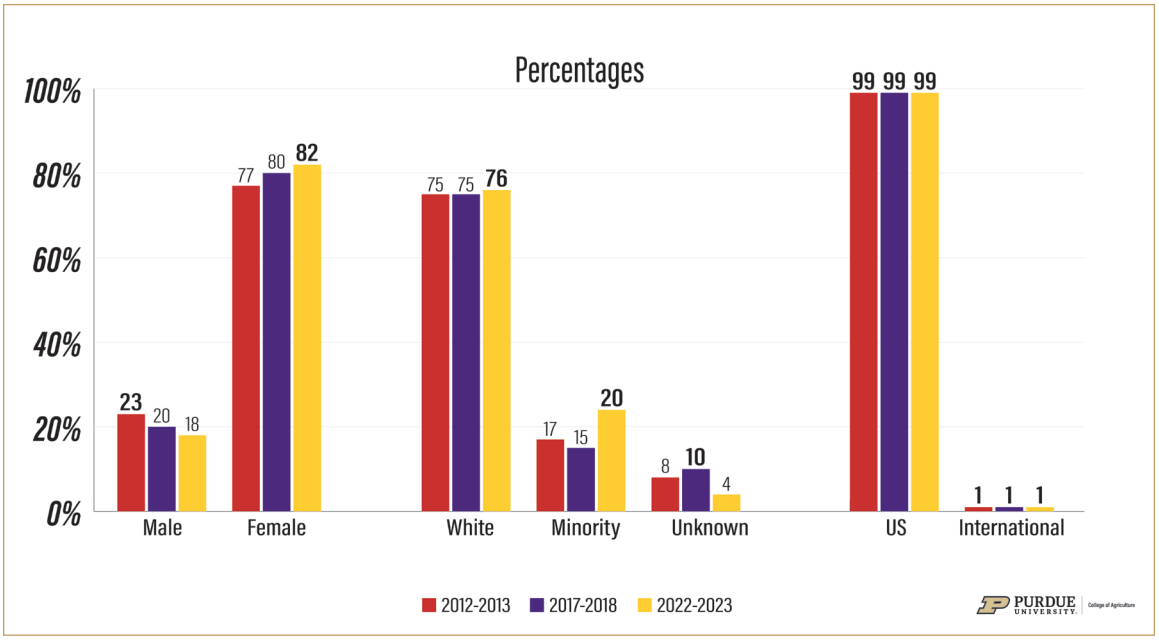


Figure 19. Changes in Demographics of FARNRE College Graduates, 2012-2013, 2017-2018, and 2022-2023: Veterinary Medicine Professional Degrees. *Bolded numbers indicate largest value.*

MARKET AND OTHER FACTORS FOR GRADUATES 2025 THROUGH 2030

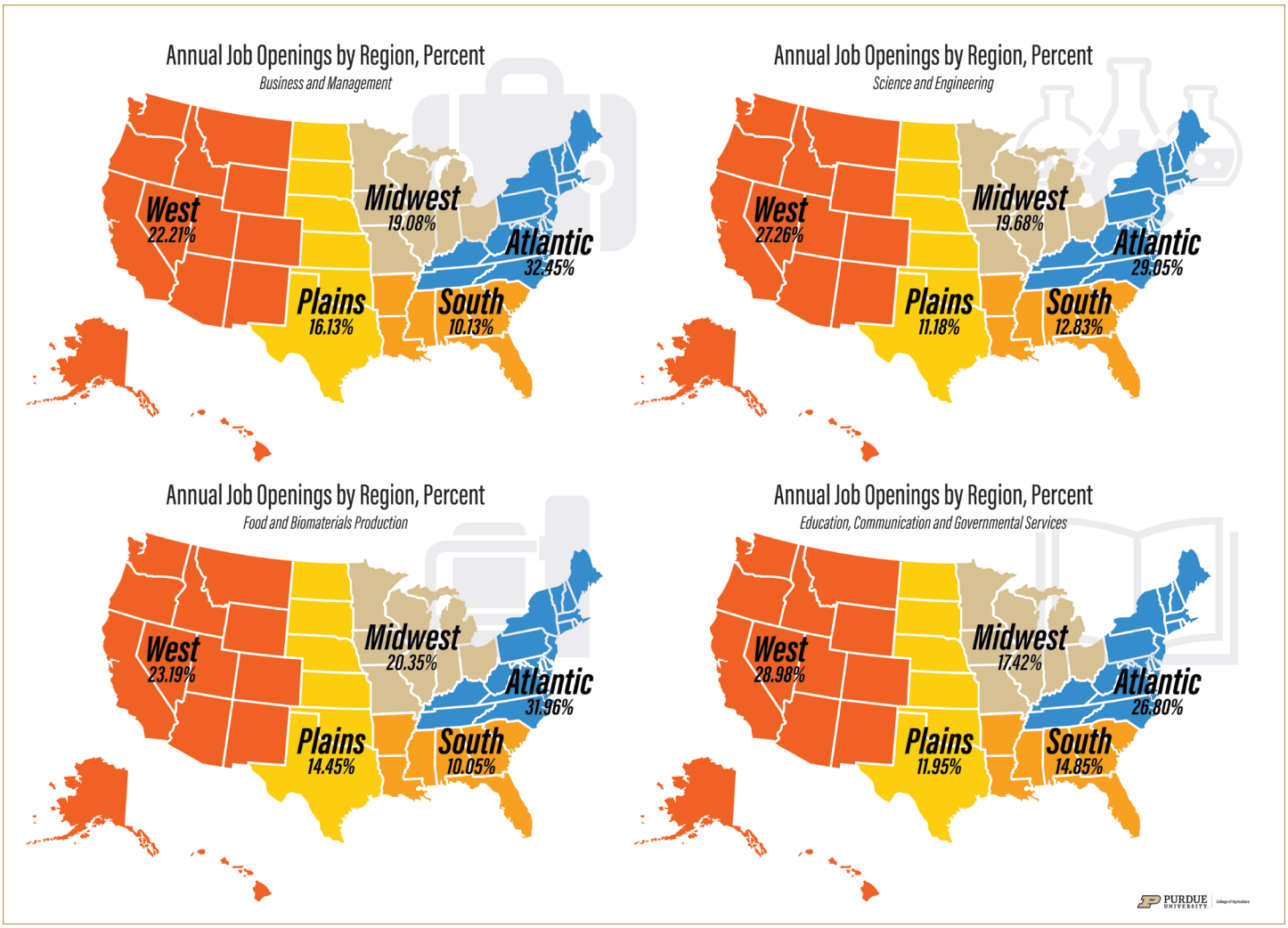
The job openings forecasts in this report are based on market conditions at the time the forecasts were developed — 2024 and early 2025. Some of the market and other factors that might affect the employment of college graduates between 2025 and 2030 include:

- Delayed or enhanced openings due to anticipated retirements;
- Initiatives to reduce the size of the federal government workforce;
- Expected decline in high school graduates across many regions of the United States, resulting in an overall reduction in the number of students pursuing college degrees;
- Continued growth and acceptance of non-degree credentials such as certificates, certifications, micro-credentials, apprenticeships and boot camps as qualifying graduates for entry-level roles;
- Changes in production and availability of food, feed, renewable natural resources and other biomaterials due to shifting weather patterns and events;
- Global market shifts in population, income, food and energy;
- Continued changes and evolution of consumer preferences for foods and biomaterials;
- Personal lifestyle and community demand on outdoor and recreational spaces;
- Public and trade policy choices affecting food, agriculture, renewable natural resources and the environment;
- Technological advancements in agriculture and biomaterials, particularly the role of robotics, automation and data science;
- Adoption of artificial intelligence throughout the food, agriculture, renewable natural resources and the environment industries; and
- The net effect of all of the above on the broader FARNRE sector and firms within the sector.

Report Series

The report, *Employment Opportunities for College Graduates in Food, Agriculture, Renewable Natural Resources and the Environment, United States, 2025-2030* is the tenth in a series of five-year projections initiated by the U.S. Department of Agriculture in 1980. The original methodological structure for these studies was developed by Kyle Jane Coulter, PhD, and Marge Stanton, PhD, who conducted the first study and authored the 1980 report, *Employment Opportunities for College Graduates in the Food and Agricultural Sciences*, *1980-1985 — Agriculture, Natural Resources, Veterinary Medicine*. The current study modifies the original approach to enhance the quality of the projections but utilizes the original data sources and methods wherever possible.

APPENDIX 1 – Job Clusters by Geographic Region.



Methodology – Demand Data: Available FARNRE Jobs

To estimate demand for graduates in agriculture-related fields from 2025 to 2030 and be consistent with prior reports, we began by anchoring our analysis in the Bureau of Labor Statistics (BLS) job projections using data from their Employment Projections Report. These projections provide a foundational, nationally representative estimate of occupational trends, which we used as a baseline for identifying relevant job categories.

The BLS relies on the U.S. Census Bureau and its American Community Survey (ACS) that projects population into the future. Because the BLS uses the ACS to project population, the BLS employment projections do not include Puerto Rico and the other U.S. territories. Additionally, they exclude U.S. armed forces overseas and civilian U.S. citizens whose usual place of residence is outside the United States. The U.S. resident population then utilized here includes all persons who usually reside in the 50 states and the District of Columbia.

Because BLS job titles are broad and do not always capture the agricultural relevance of a position, we enhanced this dataset using web-scraping and data mining techniques, specifically by extracting job postings from Google Jobs. Google Jobs aggregates listings from multiple major job boards, giving us wide coverage of the employment landscape.

We used generic job titles from the BLS to initiate these searches, then filtered the postings by searching within job descriptions for agricultural-related terms and keywords. This allowed us to identify which job postings had a meaningful agricultural component, even if the job title itself was generic or ambiguous.

As employer search strategies have evolved, most employers no longer "require" a degree for new positions (some research/technical positions would be exceptions.) Employers may "prefer" or "desire" a degree in the position announcement but be open to hiring a person with experience but no degree. In addition, many employers say nothing about degree preferences in their position announcement in order to maximize their applicant pool. Hence, most position announcements no longer specify a degree requirement, though some will mention degree preferences.

To assess demand for FARNRE graduates with an associate degree or higher as accurately as possible, the web scrape of position announcements was focused on job titles aligned with the four job cluster categories. This eliminated most positions that would be open to non-college graduates, such as seasonal farm labor.

About half of the job postings scraped did not specify any degree requirement/preference. For the other half, 20% mentioned a high school degree; the other 80% mentioned an associate degree or higher. Based on these mentions, we assume at least 80% of the total annual job openings will prefer at least an associate degree, and that some portion of the remaining 20% will as well. Overall, it is prudent to assume that 90% of the total annual job openings prefer at least an associate degree.

Each job was then classified into one of four major cluster categories — Business and Management, Science and Engineering, Food and Biomaterials Production, and Education, Communication and Governmental Services — based on the frequency of keywords tied to each area. A predefined list of terms guided this classification process, and each posting was assigned to the category with which it shared the most key identifying words. While one can argue that some jobs might span more than one job cluster, a research manager, for example, each job was classified into one of the four clusters.

These classified results provided the percentage distribution of agricultural job demand across the four cluster categories. These percentages are used later to align the supply side (graduate data) to demand projections.

This approach allows us to preserve consistency with prior editions of the report while taking advantage of more modern techniques — namely, web scraping and keyword-based classification — to provide a more accurate and nuanced understanding of current job market dynamics in the agricultural sector.

In addition to classifying agricultural job postings into broad occupational categories, we also used the web-scraped data to conduct a regional analysis of job demand. By capturing the geographic information included in the job postings, we were able to determine the percentage of each generic job category (as defined by BLS titles) that appeared in specific U.S. regions. This allowed us to break down national trends into more localized snapshots of employment demand.

Within each region, we further analyzed the distribution of jobs across the four major cluster categories — Business and Management, Science and Engineering, Food and Biomaterials Production, and Education, Communication and Governmental Services. This regional layer adds significant value for stakeholders seeking to understand where agricultural employment opportunities are emerging and how those opportunities vary in terms of job function and industry focus.

Methodology – Supply Data: Available College Graduates

The number of U.S. graduates — associate degree and higher — in food, agriculture, renewable natural resources and the environment majors was determined using preliminary 2022-2023 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 nonprofit higher education programs in the United States. Graduates are classified by degree level, degree specialization and selected demographic characteristics. These data are located on the FAEIS website.

The methodology for determining the number of college graduates in the FARNRE and allied categories essentially mirrors the 2020-2025 report with certain exceptions:

- The Classification of Instructional Programs (CIP) codes used by the National Center for Education Statistics is updated every 10 years. For this study, the categorization of CIP codes into either FARNRE or allied categories was updated with new coding where appropriate. An audit of the codes used was completed and changes/additions were approved by the project's Advisory Panel.

- Data on associate degrees are collected and reported in this study.

- New to the 2025-2030 study, an "Other" category was included that shows the difference between the graduates in the FARNRE and allied categories and the total jobs available in the job cluster. These "Other" graduates are expected to include majors not listed in the allied category, a greater number of allied graduates than have traditionally taken FARNRE jobs, or those without a degree.

The job clusters/areas of expertise remained the same as the 2020-2025 report: Business and Management; Science and Engineering; Food and Biomaterials Production; and Education, Communication and Governmental Services. The following adjustments were made to calculate the total number of available graduates in food, agriculture, renewable natural resources and the environment as well as allied graduate programs.

- Reduced total associate degree graduates by 2%. This proportion was determined to not enter the workforce and therefore would not be filling jobs upon graduation.

- Reduced total bachelor's degree graduates by 2%. This proportion was determined to not enter the workforce and therefore would not be filling jobs upon graduation.

- Reduced the adjusted bachelor's degree graduates by 25%. This proportion was determined to enter graduate and professional schools and therefore would not be filling jobs upon graduation.

- Reduced total master's degree graduates by 19% to account for those who enter doctoral or professional degree programs and do not take jobs upon graduation.

- Included 85% of the doctoral degree recipients as qualified to enter the U.S. labor force. Prior surveys of earned doctorates conducted by the National Science Foundation indicate that approximately 15% of these graduates return immediately to their foreign country of origin after receiving their degrees. We acknowledge this figure may change as U.S. policy on visa eligibility/immigration evolves.

- Graduates in each selected degree specialization/CIP codes in both the FARNRE and allied categories were assigned to one of the four occupational clusters of Business and Management; Science and Engineering; Food and Biomaterials Production; and Education, Communication and Governmental Services. Assignments were based on CIP codes consistent with the previous report.

As mentioned earlier in the report, it is important to note that the major-job cluster relationship is quite fluid — especially given the increasing prevalence of second majors, minors and certificates in areas other than the student's major. It is quite possible that a student in any FARNRE major could take a position in any of the four job clusters — or in a job that spans multiple clusters.

When demographics of the FARNRE graduates are discussed, data are for the total number of FARNRE graduates as it is not possible to report demographics for the subset of total graduates entering the workforce.

SELECTED REFERENCES

Alston, A.J., R. Roberts, and C.W. English (2020). Toward a Holistic Agricultural Student Recruitment Model: A National Analysis of the Factors Affecting Students' Decision to Pursue an Agricultural Related Degree. *Journal of Research in Technical Careers* 4 (1) https://doi.org/10.9741/2578-2118.1071.

ARMS III Farm Production Expenditure Regions, National Agricultural Statistics Service, United States Department of Agriculture. *Retrieved from*: https://www.nass.usda.gov/Charts_and_Maps/Farm_Production_Expenditures/reg_map_c.php.

Association of Public and Land-Grant Universities (2017). Ready for Jobs, Careers, and a Lifetime – Public Research Universities and Credentials that Count. *Retrieved from*: https://www.aplu.org/library/ready-for-jobs-careers-and-a-lifetime/file.

Crawford, P., and W. Fink (2020). Employability Skills and Students Critical Growth Areas. *NACTA Journal* 64, p 132-141.

Crawford, P., and W. Fink (2020). From Academia to the Workforce: Critical Growth Areas for Students Today. Washington, DC: APLU. *Retrieved from*: https://www.aplu.org/library/from-academia-to-the-workforce-critical-growth-areas-for-students-today/file.

Crawford, P., and W. Fink (2020). From Academia to the Workforce: Executive Summary. Washington, DC: APLU. *Retrieved from*: https://www.aplu.org/library/from-academia-to-the-workforce-executive-summary/file.

Crawford, P., and W. Fink (2020). From Academia to the Workforce: Navigating Persistence, Ambiguity, Change and Conflict in the Workplace. Washington, DC: APLU. *Retrieved from*: https://www.aplu.org/library/from-academia-to-the-workforce-navigating-persistence-ambiguity-change-and-conflict-in-the-workplace/File.

Fernandez, J.M., A.D. Goecker, E. Smith, E.R. Moran, and C.A. Wilson (2020). Employment Opportunities for College Graduates in Food, Agriculture, Renewable Natural Resources, and the Environment, United States, 2020-2025. *Retrieved from*: https://www.purdue.edu/usda/employment/.

Food and Agricultural Education Information System (FAEIS). *Retrieved from:* https://faeis.cals.vt.edu/.

Fuller, J.B., C. Langer, J. Nitschke, L. O'Kane, M. Sigelman, and B. Taska. *The Emerging Degree Reset: How the Shift to Skills-Based Hiring Holds the Keys to Growing the U.S. Workforce at a Time of Talent Shortage*. The Burning Glass Institute. 2022. *Retrieved from:* https://www.hbs.edu/managing-the-future-of-work/Documents/research/emerging_degree_reset_020922.pdf.

Goecker, A.D., E. Smith, J.M. Fernandez, R. Ali, and R. Goetz Theller (2015). Employment Opportunities for College Graduates in Food, Agriculture, Renewable Natural Resources, and the Environment, United States, 2015-2020. *Retrieved from*: https://www.purdue.edu/usda/employment/.

Integrated Postsecondary Education Data System (IPEDS). *Retrieved from:* https://nces.ed.gov/ipeds.

Next Steps: An Analysis of Teens' Post-High School Plans. American Student Assistance. 2024. *Retrieved from*: https://www.asa.org/wp-content/uploads/2025/05/Teens-Next-Steps-Research-Paper.pdf.

World Population. Department of Economic and Social Affairs, United Nations. *Retrieved from*: https://www.un.org/en/desa/world-population-projected-reach-98-billion-2050-and-112-billion-2100.

ACKNOWLEDGMENTS

We acknowledge the important contributions of the following individuals who served on the advisory panel for the 2025-2030 study.

Advisory Panel

Antoine Alston, North Carolina A&T University

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Ryan Wildman, Lake Land College

Allen Wysocki, University of Florida

In addition, Tiffany Heng-Moss, University of Nebraska-Lincoln, and Wendy Fink, APLU, provided important comments and suggestions on the final report.

We also acknowledge the expertise and services from the Department of Agricultural Communications at Purdue University in the preparation and dissemination of the report, and more specifically Nyssa C. Lilovich (project management), Charles Wineland (editorial assistance), Tom Kronewitter (illustrator) and Tim Thompson (designer).

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This is the 10th in a series of five-year employment opportunities projections initiated by the United States Department of Agriculture (USDA).

This material is based on work supported by the U.S. Department of Agriculture's National Institute of Food and Agriculture under Project Award No. 2024-38817-42354. Any opinions, findings, conclusions, or recommendations expressed in this presentation/publication are those of the author(s) and should not be construed to represent any official USDA or U.S. government determination or policy.

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