

Pennsylvania **AGRICULTURE EDUCATION**

*2017 Report of the
PA Agriculture Education Advisory Committee*

Released June 2018





Commonwealth of Pennsylvania
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Department of Education
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Contents

Introduction	4
Legislative Mandate and Purpose.....	5
Process and Activities	5
The Agriculture and Food Industry in Pennsylvania	5
The Broader Agriculture and Food Industry	6
Changing Attitudes about Food and Farming	7
Agriculture and Food Workforce Career Pathways	7
Agriculture Education in Pennsylvania	10
Funding for Agriculture Education Programs	10
Supporting Career Pathways.....	11
K-12 Agriculture Education in Pennsylvania	11
Postsecondary Agriculture Education in Pennsylvania.....	12
Staying Ahead of Change in the Industry.....	13
Technology’s Impact on the Agriculture and Food Industry.....	13
Skill-Based Training Needs	14
Work-Based Learning and Apprenticeship	14
Bilingual Skill Training	15
Challenges for Agricultural Education.....	15
Recommendations	17
Appendix A.....	20
High-Demand Occupations in the Agriculture and Food Industry.....	20

Introduction

The Pennsylvania Agriculture Education Advisory Committee – a cross-sector group of educators, administrators, business and industry representatives, and community leaders – provides this report to help guide agriculture education in the Commonwealth of Pennsylvania. At the core of the committee’s work is a shared commitment to ensuring that Pennsylvania’s students have access to high-quality agriculture education programs that foster the skills necessary for success and laying the groundwork for a talented, well-prepared labor force for business and industry.

While the committee’s work and this resulting report of findings and recommendations focuses on existing agriculture education programs at the secondary and postsecondary levels, there are also broader societal and educational benefits to raising the awareness of food and agriculture industry career pathways in the elementary and middle school years.

The convergence of several key industry-related factors makes this report timely and critical:

- The current and anticipated growth of the food and agriculture sectors to meet demand for products and services;
- Increased interest from the public in knowing where their food comes from and who is producing it;
- Rapid change in the industry catalyzed by enhancements in technology creates new opportunities for the commonwealth to respond to these trends and compete in the global marketplace, necessitating more employees with the necessary technical skills and competencies; and
- The recent development of strategic recommendations to guide the food and agriculture industries over the next 10 years.

The report also comes at an important moment for public education in Pennsylvania. Since Governor Tom Wolf took office in January 2015, Pennsylvania has enacted historic increases in state investments in public pre-K to postsecondary education, with additional investments driven by a newly adopted funding formula that considers both student- and district-based factors.

In addition to a focus on additional resources and a fair funding system, the Pennsylvania Department of Education (PDE) has engaged thousands of students, educators, parents and families, advocates, community leaders, and policymakers to develop more comprehensive, holistic measures of student and school performance in preparing students for postsecondary success. These efforts will culminate in the launch of the [Future Ready PA Index](#) in fall 2018, a new public-facing school report card that includes measures of K-12 career readiness, industry-recognized credentials, access to advanced coursework, chronic absenteeism, and postsecondary outcomes after high school graduation, among others.

The 2017-18 school year also marks a significant transition point as Pennsylvania and other states move to new systems of support and accountability under the federal [Every Student Succeeds Act \(ESSA\)](#), which replaced No Child Left Behind as the nation’s main K-12 education law. Pennsylvania’s ESSA Consolidated State Plan, approved by the U.S. Department of Education in January 2018, outlines the commonwealth’s commitment to creating conditions that ensure all Pennsylvania learners are ready for success in school, work, and life.

Legislative Mandate and Purpose

Act 91 of 2000 required that the Secretary of Education “shall consult, at least annually, with the Secretary of Agriculture and a cross section of the agriculture and education communities to:

- Assess the trends and needs in agriculture education;
- Consider the way any funds are used to support agricultural education; and
- Make recommendations to the Governor and the General Assembly regarding legislative or regulatory changes to improve agricultural education pursuant to the preparation and submittal of the report required by subsection (c).”

Based on this review, the law required the Secretary of Education “to prepare and submit, in conjunction with the Department of Agriculture, an annual report to the Governor and the General Assembly on the status of agricultural education in the Commonwealth. The report shall outline agricultural education programs and achievements, highlight new initiatives, and recommend future program needs.”

Process and Activities

To fulfill the intent of Act 91, Secretary of Education Pedro A. Rivera and Secretary of Agriculture Russell Redding empaneled an Agriculture Education Advisory Committee in 2016. The composition of the committee was designed to meet the specifications of the legislation for members in certain roles (e.g., farmers, representatives of other agriculture businesses, school superintendents, agriculture teachers, and members of the public knowledgeable about agriculture education). The secretaries agreed that committee members should represent the commonwealth geographically, and members serve a two-year term (except for the first class of members where half will serve for one year and half for two years).

Committee meetings were held twice per year in April and October (in anticipation of the end of the fiscal year and the calendar year, respectively). Staff support came from both departments and the FFA Association.

The Agriculture and Food Industry in Pennsylvania

Agriculture production¹ is a vital part of Pennsylvania’s economic and cultural landscape, accounting for more than \$135 billion in total economic activity and nearly 580,000 jobs across the commonwealth,² and utilizing more than 7.7 million acres of the state’s total land area.³ The infrastructure of the cluster provides fresh and processed food products to the more than 52.3 million people who live on the northeastern seaboard of the United States (Boston to Richmond).⁴ Just as importantly, the production

¹ According to Agriculture Security Area definition section in Chapter 1381 of the Agricultural Area Security Law, “agricultural production” is defined as “the production for commercial purposes of crops, livestock and livestock products, including the processing or retail marketing of such crops, livestock or livestock products.”

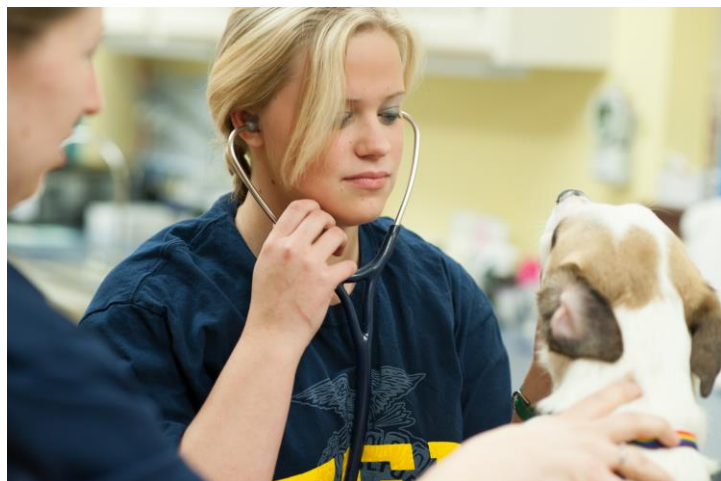
² Economic Modeling Specialists International, Analyst, Moscow, ID, 2017

³ U.S. Department of Agriculture, *Farms and Land in Farms*, 2015 Summary, February 2016

⁴ *America 2050, Northeast*, www.america2050.org/northeast.html

infrastructure provides substantial support including seed, feed, equipment, lending, and technical and support services for agriculture enterprises in the mid-Atlantic states.

While Pennsylvania's agriculture economy is primarily animal-based (dairy, poultry, and swine), the commonwealth also leads the nation in the production of agaricus mushrooms and is in the national top 10 for fruit products, particularly apples, Christmas trees, butter and certain cheeses, and maple syrup. Both dairy products and eggs topped \$1 billion of cash receipts in 2015.⁵ Cash receipts from agriculture



commodities tallied \$7.5 billion in 2015 with more than \$2.04 billion in international exports of agricultural products.⁶

In Pennsylvania, one in 15 jobs are related to the agriculture and food industry. There are just over 59,000 farm operators with farming as their primary occupation, but there are nearly 580,000 jobs in the agriculture and food industry that are as diverse as farmers to foresters and from mechanics to agronomists and veterinarians.⁷ The agriculture and food

workforce is very diverse with foreign-born workers comprising more than 70 percent of the production jobs in the industry.⁸ The Pennsylvania Department of Agriculture has identified 28 occupations that will be key growth positions for the next 10 years based on anticipated changes in the industry. Those careers alone will require more than 75,000 new and replacement workers moving forward.⁹

The Broader Agriculture and Food Industry

Pennsylvania agriculture extends well beyond traditional boundaries into areas that make its product inventory much more diverse and robust.

- Pennsylvania is a national leader in the production of hardwoods that are exported abroad and processed in-state for lumber and finished wood products.¹⁰ In 2015, lumber and wood products accounted for \$16.1 billion of direct sales and an estimated \$33.4 billion in sales through related supply and distribution chains.¹¹
- The state's Christmas tree industry ranks fourth in the United States¹² with 32,000 acres under cultivation.

⁵ Economic Research Service, USDA, *State Fact Sheets*, Pennsylvania, 2016

⁶ Ibid.

⁷ Ibid.

⁸ PA Department of Agriculture, *Fast Facts on the Role of Foreign-Born Workers in the Hired Farmworker Labor Force*, January 2017.

⁹ Economic Modeling Specialists International, Analyst, Moscow, ID, 2017

¹⁰ U.S. Department of Agriculture, *Forest Service Forest Inventory Analysis*, FIADB version 6, Population Estimates, January 2017

¹¹ Economic Modeling Specialists International, Analyst, Moscow, ID, 2017

¹² U.S. Department of Agriculture, *2014-2015 Agricultural Statistics Annual Bulletin*, Pennsylvania

- Finally, Pennsylvania is a food processing giant, not only because of the abundant agricultural product in the area, but also because of the location of Pennsylvania relative to East Coast markets. Manufactured food product sales totaled \$43.7 billion in 2015, or more than \$119 billion when including sales related to extended supply and distribution chains. Pennsylvania processes and packages mushrooms; snack foods; milk, ice cream, butter, and cheese; ham, hot dogs, and meat products of all kinds; eggs; and cereal. It rivals the Chicago area in the sale of confectionary goods.

Changing Attitudes about Food and Farming

While the traditional agriculture and food industry in Pennsylvania is large and well established, it is being reinvented gradually by new attitudes among consumers. Specifically, consumers are increasingly looking for food perceived as being “pure” or “clean” (i.e. processed with minimal additives, locally grown or processed, and produced equitably). The trends related to these changing attitudes about food are far-reaching and include new thinking about what is being grown, how it is being grown, how it is being processed, and how it is transported to market.

Consumers are also buying through newly-expanded food distribution channels (e.g., direct from producer, consumer-supported agriculture, farmers markets) and, in many cases, participating to one degree or another in production themselves. Organic products are some of the fastest-growing segments of the agriculture and food industry as are direct-to-consumer marketing channels. Pennsylvania is a leader in both categories.¹³

Amid responding to these changes in consumer attitudes, production agriculture is also undergoing a revolution in the way it uses new technology. No-till farming has changed the way crops are grown, and farmers are increasingly cognizant of the volume of water they use in production and the way in which that water is managed. Best practices in manure management have not only addressed the amount of runoff in local watersheds but, in many cases, are generating electricity for farm operations. New equipment is being guided by global positioning systems. Crops are being surveyed and planned using drones. Vertical farms using hydroponic and aquaponic systems are springing up in urban communities, offering new methods for crop production in confined spaces using year-round growing options.

Agriculture and Food Workforce Career Pathways

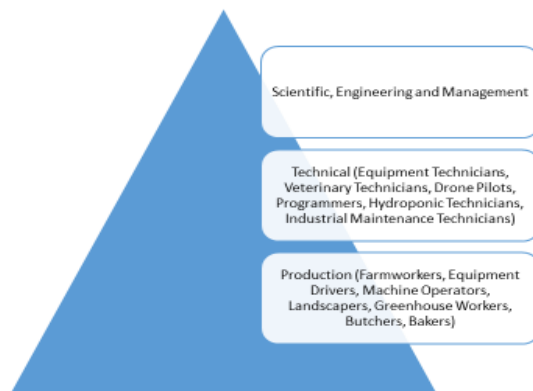
As the needs and practices of the agriculture industry have grown and evolved, so too has the workforce that supports those vital efforts. Members of the Pennsylvania Agriculture Education Advisory Committee noted – and data and research have affirmed – the continued need for education and training that allows current and future workers to meet the demands of the agriculture and food industry.

The workforce of any industry is like a pyramid with a small number of management, engineering, and scientific professionals at the top; a significant number of supervisory and technical people in the middle; and many production people at its foundation. In agriculture, professionals at the top rely on a base of knowledge and skills that are usually taught in agriculture and management institutions of higher education. The middle layer of supervisory and technicians usually acquire the knowledge and skills that they need through technical education that is provided at the high school, community college,

¹³ U.S. Department of Agriculture, National Agricultural Statistics Service, *Pennsylvania Organic Growers Second in Nation in Sales*, news release, September 22, 2017.

and technical school levels, while production workers normally receive on-the-job training from their employers rather than through any formal education system.

The Agriculture and Food Industry Workforce



Expanding opportunities for current and future workers is essential for ensuring the success of the industry. There are significant disparities in economic security and education levels between production workers and those at higher levels of the agriculture pyramid. Nearly one in five agriculture workers in Pennsylvania are undocumented immigrants,¹⁴ and many face significant challenges related to economic security and working conditions. According to data from the National Agricultural Workers Survey (2013-14), mean and median incomes from agricultural employment ranges from \$15,000 to \$17,499; only 8 percent earned more than \$30,000.¹⁵ Only one in three workers are fluent in English, and the majority have not completed schooling beyond high school.¹⁶ Nearly half of farmworkers rely on some form of public assistance through programs such as Medicaid; the Women, Infant and Children program; Supplemental Nutrition Assistance Program; and public health clinics.¹⁷ While this report focuses primarily on improving formal education opportunities for K-12 and postsecondary students in Pennsylvania who are preparing for careers in the industry, it is important to also consider the education and training needs of the sector's current workforce, including production and farmworkers.

¹⁴ Jeffrey S. Passel and D'Vera Cohn, "Size of U.S. Unauthorized Immigrant Workforce Stable After the Great Recession," Pew Research Center, *Hispanic Trends*, November 3, 2016.

<http://www.pewhispanic.org/2016/11/03/occupations-of-unauthorized-immigrant-workers/>.

¹⁵ U.S. Department of Labor, Employment and Training Administration, Office of Policy Development and Research, *Findings from the National Agricultural Workers Survey (NAWS) 2013-2014: A Demographic and Employment Profile of United States Farmworkers*, December 2016.

https://www.doleta.gov/agworker/pdf/NAWS_Research_Report_12_Final_508_Compliant.pdf.

¹⁶ U.S. Department of Labor, *Findings from the National Agricultural Workers Survey (NAWS) 2013-2014*, December 2016.

¹⁷ U.S. Department of Labor, *Findings from the National Agricultural Workers Survey (NAWS) 2013-2014*, December 2016.

Career pathways have become increasingly popular frameworks for talking about the variety of career options available to individuals preparing to enter the job market or looking for work after an employment dislocation. Career pathways are descriptions of the knowledge, skills, and abilities that workers need as they move through the occupations that exist in an industry. These pathways typically have a parallel system of skill acquisition that describes the way the worker can learn what is required, and they use occupations as a roadmap for jobseekers. Many career pathways have been organized in “ladders” or “lattices” showing occupational progression.¹⁸

The Pennsylvania Department of Agriculture has identified 11 career pathways in the agriculture and food industry, including:

- 1. Farming and Agricultural Operations;**
- 2. Agriculture Equipment Operation and Maintenance;**
- 3. Food Production;**
- 4. Industrial Maintenance;**
- 5. Trucking and Material Handling;**
- 6. Forest Management;**
- 7. Lumber and Wood Products Production;**
- 8. Landscaping;**
- 9. Greenhouse Management and Horticulture;**
- 10. Conservation and Natural Resources; and**
- 11. Animal Health.**

These pathways support the roughly 28 high-demand occupations that have been identified, prioritized, and documented.¹⁹ See Appendix A for more information.



¹⁸ WIOA defines a career pathway as “a combination of rigorous and high-quality education, training, and other services that:

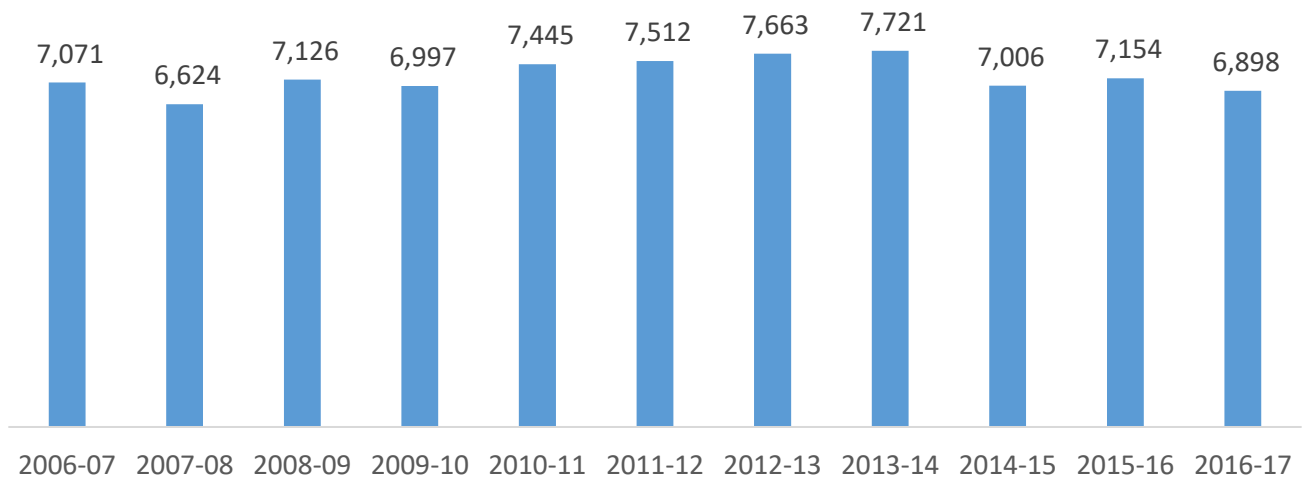
- (A) aligns with the skill needs of industries in the economy of the State or regional economy involved;
- (B) prepares an individual to be successful in any of a full range of secondary or postsecondary education options, including registered apprenticeships;
- (C) includes counseling to support an individual in achieving the individual’s education and career goals;
- (D) includes, as appropriate, education offered concurrently with and in the same context as workforce preparation activities and training for a specific occupation or occupational cluster;
- (E) organizes education, training, and other services to meet the particular needs of an individual in a manner that accelerates the educational and career advancement of the individual to the extent practicable;
- (F) enables an individual to attain a secondary school diploma or its recognized equivalent, and at least one recognized postsecondary credential; and
- (G) helps an individual enter or advance within a specific occupation or occupational cluster.” [Section 3(7) of WIOA]

¹⁹ The principal difference between the High-Priority Occupation (HPO) definition used by the PA Department of Labor and Industry and the High-Demand Occupations (HDO) definition used by the PA Department of Agriculture is that the HPO definition requires a base wage whereas the HDO definition does not.

Agriculture Education in Pennsylvania

The commonwealth has a strong tradition of agriculture education that weaves together local and regional industry needs with high-quality, rigorous academic instruction and experiential learning for students in secondary and postsecondary education. The number of students enrolled in approved agriculture education programs in Pennsylvania has decreased 2.5 percent over the past decade, with 6,898 students participating in 2016-17.

Enrollment in PDE-Approved Agriculture Education Programs, 2006-2017



Students in these programs develop the skills and experiences necessary to succeed in the agriculture and food industry, including:

- Safety, health and environmental;
- Technical skills, tools, equipment, machinery, and technology; and
- Employability, career development.

As members of the committee noted, the agriculture and food industry is facing major shortages of skilled workers in the next several decades due to growth and the retirement of the Baby Boomer generation. Continuing to provide a well-prepared, adequate supply of young people graduating from agriculture education programs and moving into the workforce is one important way to address this shortage. Identifying ways to ensure that Pennsylvania’s agriculture education programs are preparing students for jobs in agriculture available today – and in the future – is the central focus of the committee and this report.

Funding for Agriculture Education Programs

Both state and federal funding supports PDE-approved agriculture education programs. Like other PDE-approved Career and Technical Education (CTE) programs, these funds are distributed through a formula that considers a number of factors, including school and community characteristics, as well as overall student enrollment. The specific way in which these federal and state funds are ultimately distributed to each program is determined at the local level, through input from an Occupational Advisory Committee

(OAC) comprised of local cross-sector leaders who help ensure that CTE programs are aligned with local, regional, and state workforce and community needs.

Supporting Career Pathways

People enter agricultural career pathways in many ways. While data is not available to show how many individuals raised on farms pursue careers in agriculture, anecdotal information suggests that people who have exposure to agriculture by being part of a farm family represent a large portion of the agriculture production and supporting infrastructure workforce. These individuals bring valuable skills and knowledge gained through direct experience. While not often recognized in the same way as formal education or training programs, the tacit skills and knowledge that people with roots in agriculture provide to the sector should be recognized and valued.



K-12 Agriculture Education in Pennsylvania

While Pennsylvania has adopted rigorous state academic standards establishing expectations for what students should know and be able to do at key points in their education, the commonwealth also has a strong tradition of local control guiding K-12 public education, including agriculture education programs.

This means that each local education agency (LEA) has the authority to

tailor program offerings, aligned to standards and regulations, to the unique needs of their students and communities.

In 2016-17, there were 156 PDE-approved agriculture education programs offered in nine categories (Ag General, Ag Mechanics, Ag Production, Ag Food Products, Applied Horticulture, Animal Sciences, Ag Operations, Natural Resources, and Forest Technology) by 125 high schools and career and technology centers (CTCs) across the commonwealth. Approximately 30 additional programs are offered by public schools, but not approved by PDE. There are five middle school agriculture programs and four that are offered in private secondary schools.

There were 236 secondary agriculture teachers in the commonwealth with two agriculture education certification programs: Penn State University and Delaware Valley University. A total of 922 people hold an Instructional I certificate and 919 have an Instructional II certificate in agriculture. In the 2014-2015 school year, 24 individuals applied for agriculture education instructional certification.

Agriculture education at the secondary level is a three-part process that includes classroom instruction (focus on knowledge and skill attainment), involvement in Future Farmers of America (FFA) that emphasizes soft skills and leadership development, and completion of supervised agriculture experiences (with a focus on independent learning through a project-centered approach). Completion of components of this process can lead to recognition through four state degrees (Keystone, Area, Chapter, and Greenhand) and one national degree. In 2014-2015, 70 Pennsylvania students completed the

national degree, while 387 earned the Keystone degree. These awards qualify the student for scholarships and recognition that can advance their progression through career pathways that include higher education and training.



There are 145 FFA chapters in Pennsylvania with 12,753 members. The number of chapters has remained relatively stable (slight growth from 142 in 2007-2008), while the number of participating students has grown considerably (from more than 7,500 in 2007-2008). W.B. Saul High School of Agriculture Sciences in Philadelphia is the largest FFA chapter under one roof in the country with more than 500 members. There continues to be minor adjustments in the number of chapters,

but the trend is generally toward the formation of new chapters.

A critical and unique component of formal agriculture education is the supervised agriculture experience (SAE). It is a pedagogical methodology that works for many students because it is an opportunity to apply what they learn in the classroom to a real-world environment. An SAE can be built around an experiment or set of observations in a laboratory, the business of raising an animal, a part-time job, or some endeavor related to a career path. The goal of the SAE is to allow the student to learn independently (but still under the supervision of a teacher) and to take responsibility for documenting a project through a hard-copy or digital recordkeeping process. The investments that students make in SAEs also have economic value. A recent study by Texas A&M University found that SAEs in Pennsylvania in 2014-2015 generated \$1.5 million in economic value.²⁰

Agriculture education is closely connected with CTE and shares federal Perkins Act funding with other CTE training that ranges from auto repair and machine operation and repair to information technology and health care occupations of all kind. Administration of agriculture education at PDE resides in the Bureau of Career and Technical Education. Agriculture education and other PDE-approved CTE programs can be provided at high schools or at regionally-based CTCs; approximately 74 percent are offered in comprehensive high schools.

Postsecondary Agriculture Education in Pennsylvania

At the postsecondary level, there are numerous opportunities for educating and training the management, engineering, and scientific professionals at the top of the agriculture workforce pyramid. The Pennsylvania State University is the state land grant school, and its College of Agricultural Sciences supports nine academic departments, 17 undergraduate majors and 23 minors, three two-year programs, and two certificate programs. Majors include agribusiness, animal science, food science, toxicology, environmental resources management, plant sciences, and biological engineering among others. Annually, there are approximately 3,000 undergraduates in the college overall, with 2,100 at University Park. There are 580 graduate students in the college.

²⁰ Roger D. Hanagriff, *2015 Pennsylvania Agricultural Education Engagement Summary Report*, Texas A&M University, February 2016

Also, the School of Agriculture and Environmental Sciences at Delaware Valley University offer majors in agribusiness, animal sciences, equine science, food science, landscape architecture and environmental sciences, and plant sciences, with roughly 900 students enrolled in the school's programs.

While there are other postsecondary programs that teach skills related to the agriculture and food industry, particularly around manufacturing and transportation, most postsecondary institutions in the commonwealth do not have formal programs or offerings related to agriculture, environmental, and food sciences.

There are a number of options available for individuals who are interested in continuing their education beyond high school, but who do not wish to pursue a formal degree or certificate.

- Penn State Extension operates in every county of Pennsylvania, delivering expertise through training and technical assistance directly to agriculture producers and processors in the areas of livestock, field and forage crops, tree fruit production, forest resources, vegetables, food safety, and the business of agriculture.
- Industry associations such as the Farm Bureau, the Professional Dairy Managers of Pennsylvania, PennAg Industries, and many others offer their members the latest technical and market information through meetings, training sessions, and other outreach. The Pennsylvania Young Farmers' Association assists those in production, agriculture, and agribusiness to become successfully established or to improve their current agricultural status.

Production workers, meanwhile, have far more limited educational opportunities. Federal data suggests that a significant majority of field and production workers in agriculture have not completed a high school education and have low literacy and English proficiency levels.²¹ The lack of short-term, skill-based training offered bilingually for migrant and seasonal farmworkers was identified as a significant barrier for promoting the economic success and well-being of workers and the agriculture and food industry in Pennsylvania.²² As such, one of the committee's recommendations includes concentrating more efforts on bilingual skill training for the agricultural workforce with assistance from the Pennsylvania Department of Labor and Industry (L&I).

Staying Ahead of Change in the Industry

Technology's Impact on the Agriculture and Food Industry

Technology is changing the agriculture and food industry, from seed to shelf. Every aspect of the food system is impacted—from animal and plant genetics, the way in which consumers access information on food and the environment, and how products flow through distribution channels. These impacts are seen in self-driving tractors and equipment, machines that package items faster than the human eye can process, sensors in the field that control the application of fertilizer to crops, anaerobic digesters that generate electricity on the farm, and drones that map land contours providing new resources for crop and water management. These advances have significant impacts on the food system in Pennsylvania and around the globe. This rapid evolution creates important opportunities and daunting challenges for

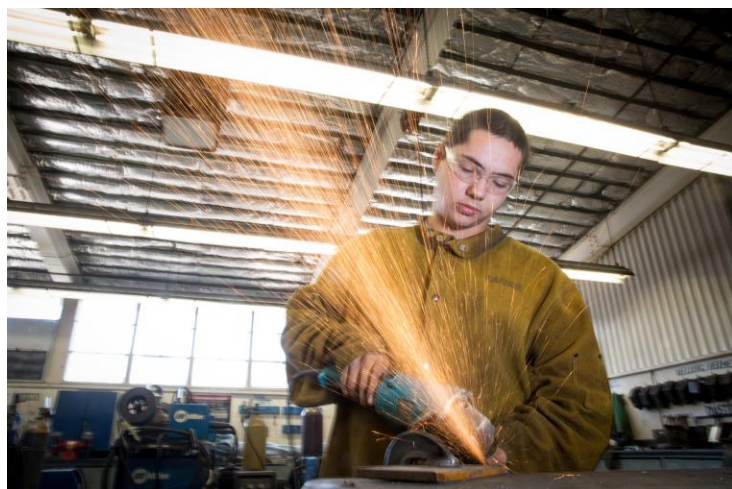
²¹ U.S. Department of Labor, *Findings from the National Agricultural Workers Survey (NAWS) 2013-2014*, December 2016.

²² PA Department of Labor and Industry, [Pennsylvania Workforce Innovation and Opportunity Act \(WIOA\) Combined State Plan](#), March 2016.

industry and education leaders. Committee members considered these tensions, including how to integrate effectively the knowledge and skills new technologies require within traditional agricultural education, as well as the informal education networks that practitioners need to innovate.

Skill-Based Training Needs

Employers in the agriculture and food industry are asking what essential skills are needed for current and new jobs. Many committee members noted that employers are beginning to understand that possessing a degree is not a guarantee of the ability to do a job and that, indeed, a formal one may not be necessary at all. Skills are the currency of labor force competency today, and those skills are more often learned on the job, not in a classroom.



Work-Based Learning and Apprenticeship

Research suggests that providing students with opportunities to link what they are learning to real-world problems through work-based learning, cooperative education, clinical experiences, and apprenticeships can improve engagement and academic outcomes.²³ Over the past decade, Pennsylvania’s secondary and postsecondary institutions have partnered with local and regional employers to create authentic, relevant

learning experiences for students that are connected to career pathways. These experiences include work-based learning, apprenticeships, job shadowing, internships, and other career exploration and preparation programs.

Over the last several years, there has been a renewed interest in registered apprenticeships in which people are hired into a job and then earn wage increases as their skills develop. In addition, pre-apprenticeships, where young people begin their skill development before they begin the work experience part of apprenticeships, have become more common. Bringing industry-recognized credentials into high school programs, as well as developing “badges” outside of formal education programs that recognize skill attainment, are two new approaches to work-based learning.

PDE is also expanding its school performance measures to report these types of programs and initiatives at schools and CTCs in the commonwealth. The Future Ready PA Index will include K-12 career readiness metrics and the number of students earning industry-recognized credentials, among other indicators.

²³ M. Felicity Rogers-Chapman and Linda Darling-Hammond, “Preparing 21st Century Citizens: The Role of Work-Based Learning in Linked Learning,” *Stanford Center for Opportunity Policy in Education – Knowledge Brief*, Stanford University, August 2013.

Bilingual Skill Training

The overwhelming majority of farm workers in the United States, and in Pennsylvania²⁴ were born outside the U.S., and many are non-English speakers.²⁵ A significant portion of Pennsylvania's agriculture workforce is comprised of immigrants, most of whom are Latino/Hispanic and have limited English language proficiency. Language barriers and limited opportunities for education and training create significant barriers for advancement and progression through career pathways.

There is very little bilingual skill training available for agriculture workers. In limited cases where such training is available, it is typically offered by companies in-house through on-the-job training provided by bilingual supervisors. Penn State University has some training for non-English speakers that is done through Cooperative Extension. More robust training and education supports are needed, however, to promote career pathways for production and farmworkers to advance to entry-level jobs and become mid- and upper-management and technical workers, as well as to invest in the future workforce of the agriculture and food industry.

Challenges for Agricultural Education

Agricultural education for people of all ages and backgrounds in the commonwealth faces many challenges as the Pennsylvania Agricultural Education Advisory Committee enumerated during its deliberations. These include:

- **Maintaining the integrity of the three parts of agriculture education: Classroom instruction, FFA, and Supervised Agriculture Experiences.** Agriculture education combines three key components: formal classroom instruction for knowledge transfer, a student organization that encourages leadership and soft-skill development, and experiential learning that is built into the learning process and focused on the development of hard skills. One challenge committee members identified through a survey of Pennsylvania's formal agriculture education is a reported inconsistency in ways that these three key parts are offered to students. Given that the success of the model requires all three components, committee members expressed concern regarding the impact of possible deviations to student outcomes.
- **Developing career-ready indicators and communicating to jobseekers.** Internally, companies in the agriculture and food industry have articulated the hiring and promotion requirements for their positions in a number of ways. The government occupational classification system (O*Net) has summarized information into documentation that includes duties, knowledge, skills, and abilities, however, even though substantial effort has been made to provide training, the education and workforce systems generally lack awareness of this resource and do not use it in their work in counseling students, jobseekers, and prospective employees.
- **Developing consistent curricula.** Because curricula are developed locally, considerable inconsistencies exist. States have adopted and used nationally-developed and -vetted curricula, but many local areas complain about the cost of these offerings, particularly for smaller school districts. There are efforts to provide standardization by evaluating the results of local decisions

²⁴ PA Department of Agriculture, *Fast Facts on the Role of Foreign-Born Workers in the Hired Farmworker Labor Force*, October 2017.

²⁵ U.S. Department of Labor, *Findings from the National Agricultural Workers Survey (NAWS) 2013-2014*, December 2016.

and programming through NOCTI testing as with other career and technology programming, however such measures may be insufficient to address the problem.

- **Connecting agriculture science with STEM and other sciences.** Increasingly, schools are using agriculture to teach students science, technology, engineering, and mathematics (STEM) skills and knowledge. In addition to facilitating the launch of the Pennsylvania STEM Coalition in November 2016, PDE has been involved in the Lancaster-Lebanon Intermediate Unit 13's work to teach STEM educators to use agriculture as a medium for STEM instruction. A new partnership between Delaware Valley University and INTAG is developing a curriculum for hydroponic and aquaponics instruction in schools around the commonwealth, and a new consortium of schools in southwest Pennsylvania is bringing this curriculum to high school students in the region.
- **Ensuring that agriculture program funding is dedicated to agriculture programs.** Committee members expressed concern about the way some local school districts use federal and state funds allocated for agriculture education, questioning whether agriculture and CTE funding streams are being used exclusively for agriculture education programming. This issue surfaces when program budgets are limited, or when programs are threatened, restricted, or closed.
- **Consistent financial resources.** Committee members noted that despite significant increased investments in public education since 2015, current funding for agriculture education is not sufficient to meet the current and future needs of the agriculture and food industry, which are increasingly technology-driven. Agriculture education programs demand more significant investments in teachers, equipment, and instructional materials that are innovative and technologically up-to-date.
- **Developing a pipeline of qualified teachers.** Agriculture education teachers are in scarce supply around the country. While Penn State and Delaware Valley University have nationally-recognized agriculture education preparation and development programs, many teachers trained through these Pennsylvania-based programs are recruited to work in other states.²⁶ Many agriculture education programs rely on teachers that come to the profession in other ways than having degrees in agriculture education. While traditional recruitment and preparation models are important, committee members noted the need to look more intentionally for practitioners who may be good potential teachers, but who come from other paths to the profession.
- **Extending agriculture education to K-6.** Agriculture and food are good ways to teach younger students about diverse subjects, including science, food, nutrition, botany, environment, and techniques of growing food themselves. Farm-to-school projects abound in elementary and middle schools with more students learning to plan for food, grow it, and prepare it and, more importantly, what this means for themselves, their families, and their communities.
- **Keeping education relevant to industry.** In order to meet the needs of Pennsylvania's agriculture and food industry, agriculture education must prepare and connect individuals who are interested in working in the industry with the right knowledge and skills. Currently, public

²⁶ Daniel D. Foster, Rebecca G. Lawver, and Amy R. Smith, 2015 Executive Summary, *National Agricultural Education Supply and Demand Study*, aaaeonling.org/Teacher-Supply-and-Demand.

training funds are aligned with high priority occupations; only two agriculture production-related jobs (First-Line Supervisors of Agricultural Workers and Agriculture Equipment Mechanics) are recognized by L&I the High-Priority Occupations (HPOs) list maintained. See Appendix A for jobs identified as high-demand by the Pennsylvania Department of Agriculture.

In response to the high priority occupation petition process having defined criteria for inclusion and often supporting established occupations, L&I developed an In-Demand Occupation List (IDOL) that identifies careers with the greatest demand across Pennsylvania, but without an over-supply of workers. Occupations offer a qualified jobseeker a reasonable expectation of obtaining employment in the field categorized as “Today,” “Tomorrow,” and “Future.” **Ten additional agriculture and food occupations are included on the 2017 PA In-Demand Occupation List. Public training funding is not available for occupations on the IDOL list.**

Contributing to this challenge, representatives of the industry do not petition for inclusion on the priority listings that guide training funds and are inconsistently represented on the Occupational Advisory Committees of the 150+ agriculture education programs around the commonwealth. It is important for industry to be engaged directly in helping to guide education and training programs that will develop Pennsylvania’s current and future agriculture workforce.

- **Articulating broad career pathways for the larger industry.** While Pennsylvania students’ exposure to career exploration, awareness, and preparation programs has increased, the committee noted that additional agriculture-specific opportunities are needed to promote agriculture education. To help improve students’ awareness of career pathways and opportunities, the national FFA organization has launched [Ag Explorer](#), an agriculture careers website that lists more than 200 careers in the agriculture and food industry. As mentioned earlier, O*Net has occupational profiles for many of these jobs, however, not many people understand how knowledge and skill acquisition tie occupations together for people as they move through their careers in the agriculture and food industry. To help address that challenge, PDA has charted nearly 20 clearly defined career pathways for the industry, but information needs to be vetted and distributed further to improve awareness and scale preparation efforts.
- **Adequate resources for individuals without postsecondary education or training.** Not everyone needs or desires to attend two- or four-year colleges to enter the agriculture or food industry. The committee recommended further exploring ways to equip individuals making the transition to the agriculture production or food processing workforce with more robust connections to technology transfer activities that they can use within the industry.
- **Adequate resources for continuing education and training.** Cooperative Extension, trade and professional organizations, and groups such as Young Farmers provide a variety of continuing education activities for practitioners regardless of their education levels.

Recommendations

The following recommendations flow out of the aforementioned challenges. Some recommendations are school-based, while others require industry engagement, but all are made to fulfill requirements set forth under Act 91 and to improve the quality of agriculture education programs across the commonwealth. Both departments intend to utilize stakeholders to continue identifying challenges and finding solutions.

- **Articulate and stress the value of the three-circle model of agriculture education – classroom instruction, FFA, and Supervised Agricultural Experiences – and their necessity for quality agricultural education programs.** Work with the Pennsylvania Association of Agriculture Educators (PAAE) to communicate this to agriculture teachers. Connect SAEs and other forms of work-based learning, including apprenticeships and pre-apprenticeships.



- **Increase the number of agriculture production occupations on the High Priority Occupations List maintained by the Pennsylvania Department of Labor and Industry.** Two agriculture production occupations – First-Line Supervisors of Agricultural Workers and Agriculture Equipment Mechanics – have been added to the statewide list by petition from PDA. The list is intended to align workforce training and education investments in positions employers demand, have higher skill needs, and are most likely to provide family sustaining wages. Inclusion on the list requires meeting criteria such as unmet employer demand and entry into career pathways leading to other high priority occupations, among others. Other occupations may be placed on regional lists by petition from industry and/or local agriculture organizations.
- **Continue and expand the effort of PDE to incorporate more industry credentials into K-12 curriculum.** Explore “badging” as a way to offer skill-related credentials that people can earn toward or in lieu of degrees.
- **PDE and PAAE to identify career-ready indicators and PDA to identify career pathways for the Agriculture and Food Industry, assess it with the help of the industry, and distribute widely to young people and adults.** Develop a long-term and sustainable strategy for providing information around agriculture and food careers to students and jobseekers. Endorse Ag Explorer as the official agriculture and food careers site of the commonwealth.
- **PDA to offer technical assistance at the recommendation of PDE to local agriculture education programs in developing more robust Occupational Advisory Committees (OACs).** As indicated previously, OACs are developed locally and better understand the workforce needs of a local area or region. Technical assistance that aligns with the OAC priorities can ensure agriculture education is appropriately represented.
- **Promote local connections with community science fairs, schools, and the agriculture and food industry as a recognized area of STEM to be promoted and included in local science fairs.** The Lancaster County Agriculture Council has piloted this process, offering a good model for other areas that have science fairs.

- **Identify and encourage best-practice examples of K-6 elementary programs that use agriculture as a vehicle for instruction.** Feature these examples in media stories and in professional development venues. Provide technical assistance opportunities from programs that have been thought and action leaders in this arena.
- **In conjunction with the PAAE, establish best practices for agriculture education programs and a strategy for consistent application.** PDE and PDA can collaboratively identify strategies to improve cross-sector and cross-agency coordination to enhance student outcomes.
- **Explore recognizing life experience for people with agricultural hands-on experience toward education or industry credentials or degrees.**
- **Concentrate more training efforts on bilingual skill training for the agricultural workforce with the assistance from the Pennsylvania Department of Labor and Industry.**
- **Identify ways in which funding for agriculture education can be targeted more directly to agriculture-specific initiatives.** Federal and state funds are distributed locally via a formula that applies a number of factors and investment decisions, which are determined at the local level through input from OACs and other stakeholders.
- **Quantify the investments being made in agriculture education at the state and local levels and then establish a baseline for investment.** As indicated previously, funding is distributed via formula at the state level and decision-making around investments occurs at the local level. Where feasible, state and local investments in agriculture education should be quantified and monitored to be sure that there is continued commitment to agriculture education.
- **Work with Penn State and Delaware Valley University and other postsecondary agriculture education partners around the recruitment and education of agriculture education teachers.**

Appendix A

High-Demand Occupations in the Agriculture and Food Industry

Farming and Agricultural Operations

- Farm Manager
- Dairy Herdsman
- Farm Equipment Mechanics and Service Technicians
- Farmworkers-Farm, Ranch, and Aquacultural Animals
- Farmworkers and Laborers-Crop, Nursery, and Greenhouse

Landscaping

- Landscaping and Groundskeeping Worker

Food Manufacturing

- Food Batchmakers
- Packaging Machine Operators
- Bakers
- Butchers
- Slaughterers and Meat Packers
- Meat Trimmers
- Inspectors, Testers, Samplers, and Weighers
- Industrial Machinery Mechanics
- General Maintenance and Repair Workers
- Heavy and Tractor Trailer Truck Driver

Forestry, Lumber, and Wood Products

- Fallers
- Logging Equipment Operator
- Sawing Machine Operator
- Team Assemblers
- Paper Goods Machine Operators
- Sales Representatives, not medical or scientific products

Conservation and Natural Resources

- Soil and Water Conservationists
- Agriculture Technician

Animal Health and Veterinary Services

- Veterinarians
- Veterinary Technologists and Technicians
- Veterinary Assistants