

Penn State University Combined Research and Extension Plan of Work 2022-2026

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I. Plan Overview

1. Executive Summary

The College of Agricultural Sciences at Penn State will provide comprehensive support to the residents of Pennsylvania through the activities of the Pennsylvania Agricultural Experiment Station (AES) and Penn State Extension (PSE). We will be responsive to stakeholder needs through translational research and delivery of science-based programs to clientele, but we will also conduct internationally relevant fundamental research that generates baseline data to solve future problems and actively seek new and better ways to communicate our programs to new audiences. Our faculty and staff, supported by federal base funding, will effectively leverage this investment against many other funding sources to conduct programs of the highest caliber. We are committed to excellence in research, educating the next generation of agricultural professionals and citizens, and promoting life-long learning among the citizens of Pennsylvania.

Our College's mission is clear: "The mission of the College of Agricultural Sciences is to discover, integrate, translate, and disseminate knowledge to enhance the food and agricultural system, natural resources and environmental stewardship, and economic and social well-being, thereby improving the lives of people in Pennsylvania, the nation, and the world."

Evolving outlook on the future of agriculture

Agriculture faces challenges of rising energy costs, weather extremes, an expanding human population, environmental degradation, loss of biodiversity, and labor shortages. In 2020, the COVID-19 pandemic added to the challenges: disruptions to food chains, workforce challenges, impacts on youth education, and business interruptions. We expect these challenges to continue in changing ways until the pandemic is over and beyond. We must address these issues to mitigate future widespread disruptions that impact all of society.

To help meet these challenges, we are developing a conceptual framework based on the science of agricultural sustainability--defined as the integration of natural and social sciences to inform practice and policy for productive, working landscapes, healthy watersheds, and resilient economies. This innovative approach to agricultural research, engagement, and education centers on the impacts and synergies of contiguous rural and urban landscapes. This mosaic of densely populated areas next to forests and agricultural landscapes is unique to Pennsylvania and the Mid-Atlantic Region and requires an integrated strategy to achieve healthy and thriving agriculture, natural systems, economies, and communities.

A primary component of AES and PSE work in our College will be built on the three integrated pillars of intensification, resilience, and regeneration of agricultural landscapes as solutions to some of the most vexing problems confronting Pennsylvania and similar mosaic landscapes worldwide. We will holistically and comprehensively address these critical issues:

- increasing the efficiency and profitability of agricultural production while minimizing environmental impacts
- equipping farmers to absorb and recover from short-term or long-term shocks and stresses to their agricultural production and livelihoods
- optimizing plants, animals, and ecosystems for resistance to and/or faster recovery from environmentally related stresses
- developing strategies for better management of nutrient inputs and outputs across complex agricultural and natural resource systems, from field and farm to large watersheds
- harnessing spatial data and remote sensing technologies to map and model predictive simulations of environmental

change

This framework represents the College's new organizing outlook and leads to our newly endorsed critical issues.

Our critical issues

Our faculty's proficiencies span the gamut from the molecular to plant and livestock breeding, from farm sustainability to ecosystem modeling, and help ensure that solutions to problems are economically viable, socially acceptable, and equitable.

In 2021, the College of Agricultural Sciences will roll out its College Strategic Plan, which builds on the accomplishments of the previous strategic plan. This Plan of Work addresses critical issues aligned with the strategic plan. We expect that emerging initiatives within the College will reflect those outlined in the College's strategic plan and the plan presented here.

This plan and the critical issues addressed will evolve with time as new challenges arise, issues evolve, and needs change.

Advancing Agricultural and Food Systems through the use of state-of-the-art technology and interdisciplinary collaboration to increase agricultural resiliency and efficiency.

Developing Biologically Based Materials and Products to meet the promise of sustainable clean energy, beneficial reuse of agricultural waste, and income generation through new, value-added bioproducts to support struggling rural economies.

Building Community Resilience and Capacity through integrated research and extension programming that promotes economic and social well-being by encouraging agritourism and entrepreneurship, community health, and sustainability in infrastructure, food, and energy systems.

Promoting Environmental Resilience by assessing and protecting ecosystems and ecosystem services, helping agriculture meet its environmental challenges, promoting ecosystem resilience and health, and mitigation and adaptation to climate change.

Supporting Integrated Health Solutions by developing functional foods for positive health outcomes, overcoming food safety concerns, fostering human and livestock health, and fighting insect-borne diseases and parasites.

Fostering a Positive Future for Youth, Families, and Communities by providing a wide range of evidence-based programming to support healthy families, build positive youth skills, strengthen intergenerational relationships within communities, and promote farm safety.

How we arrived at the critical issues

As with previous plans of work, this plan is built on the framework of the College's new strategic plan and incorporates broad internal and external feedback. We developed these critical issues by analysis of cross-cutting emerging themes across the College. We solicited and received input from College leadership advisory groups, topical faculty focus groups, College employees, and the Penn State Ag Council.

The College considers both the strategic plan and the Plan of Work to be dynamic documents that allow new scientific approaches to be developed and integrated into the thematic areas. The College's strategic plan discusses future initiatives to ensure the stability of the food system in the Commonwealth, and our efforts to provide a broad-based online learning platform for noncredit programming and digital education. Departmental annual reviews and strategic plans, as well as their signature research areas, also inform the Plan of Work and critical issues.

Our critical issues capture the systems approach that we have identified as a key element for generating impact. They cut across disciplines, uniting our research efforts with our extension education capacity. Penn State has the good fortune of providing an environment that encourages interdisciplinary work and values outreach to stakeholders. The University has built a framework of university-wide consortia and institutes (e.g., Life Sciences; Energy and Environment; Children, Youth, and Families Consortium; Materials Research; Ethics; Sustainability; Consortium to Combat Substance Abuse), and the College of Agricultural Sciences plays an integral role in these organizations. This interdisciplinary philosophy has reinforced the natural tendency of our faculty and extension educators to work cooperatively to solve problems. Coupled with the joint research-extension appointments of many of our College faculty, our work, as represented in this Plan of Work, will effectively unite fundamental knowledge with practical solutions delivered to stakeholders. The net result will be a tangible benefit in economic prosperity and quality of life for Pennsylvania citizens.

2. FTE Estimates

Year	1862 Extension	1862 Research
2022	475.3	443.3
2023	475.3	443.3
2024	475.3	443.3
2025	475.3	443.3
2026	475.3	443.3

II. Merit / Peer Review Process

Both PSE and AES programs undergo comprehensive review utilizing a number of merit review processes.

Internal university panels will be used to review AES projects. The Hatch, McIntire-Stennis, Animal Health, and State projects will be internally reviewed at initiation by at least two qualified faculty. In addition, external university panels are used for Multistate Research Project (MRP) activities. Both extension and academic faculty are encouraged to participate to meet the jointly agreed objectives. These projects are reviewed multiple times through the five-year duration.

External non-university panels are used as new Penn State extension programmatic issues or AES projects are implemented. Stakeholder and/or program advisory groups provide ongoing review of programs to ensure a focus on priority needs as identified by advisory groups. Reviewers' comments provide mechanisms for improving our educational and research programs.

Combined internal and external university panels are assigned to each of the programmatic issues. These panels are integrated, multidisciplinary State Extension Teams (SETs) made up of field-based extension educators and faculty with split appointments in both extension and research. Team members broadly represent all parts of the Commonwealth, and faculty members are chosen to represent relevant research and extension perspectives. Extension Program Leaders provide overall leadership to the SETs, and programs are reviewed by extension administrators. State administrators and academic unit leaders serve as liaisons to each team. Each SET developed a program plan, based on logic model components, that will guide extension programming and applied research efforts.

III. Stakeholder Input

1. Actions to Seek

College administration and faculty advisory groups will confer regularly with key stakeholder groups, state and federal partners, and relevant industry representatives across the breadth of interests in the College. Listening sessions, targeted invitations, surveys, focus group meetings, and engagement on social media will all seek input from traditional and nontraditional stakeholder groups and/or individuals. A primary avenue for stakeholder input is via the various forms of feedback obtained in connection with extension offerings, from volunteered comments and formally sought assessments of learning and effectiveness to retrospective evaluations that seek to measure outcomes such as costs averted or profit increased from implementing extension program suggestions. All of these forms of feedback will be taken together to help

set the course for PSE and AES programs. The results of these assessments will be incorporated into our Extension Beyond Civil Rights One Drive folder. We will continue to use Cvent and Salesforce to track program offerings and conduct evaluations.

2. Methods to Identify

The Penn State Ag Council (Ag Council) will assist our programs with identification and selection of stakeholder individuals and groups. Ag Council members will be selected to represent diverse program areas, emerging issues, geographic areas, and populations (diverse in, for example, race/ethnicity, age, longevity in the ag field, rural/urban, and those historically underserved by extension). Ag Council meetings will be publicly announced, and broad representation will be constantly reassessed to ensure the inclusion of new and traditionally underserved audiences. Our new Latinx Agricultural Network consists of producers, processors, and Latinx agricultural leaders in Pennsylvania. The network regularly engages with College leadership to provide feedback and identify opportunities to serve the Latinx community. Maintaining contact with College alumni builds direct links to our stakeholder groups and industries. Alumni and friends' banquets and football tailgates are common and well received throughout the College.

3. Methods to Collect

To collect stakeholder input, educators or faculty will hold regularly scheduled meetings, such as advisory groups and Penn State Ag Council. Ag Council members will work with program teams to develop relevant science- and industry-based programs to meet the educational needs of the residents of the Commonwealth. This effort is part of the Program Development Process. Meetings will occur with traditional and non-traditional individuals and groups. During and after extension programs, participants may verbally or through surveys request additional programs or updates or provide input about effectiveness, both immediate and long term. To collect more detailed information from traditional and nontraditional stakeholders, sophisticated survey instruments or focus group meetings will be implemented and the data analyzed. All departments and extension programs will maintain websites and distribute regular electronic and/or hardcopy communications and/or social media messages to inform stakeholders and to invite feedback. Many programs will hold field tours or site tours (as COVID-19 safety precautions allow), which allow them to hear from stakeholders directly. The dean's industry tour series will bring some of the College's leaders into some of the state's leading agricultural industry facilities to learn about their challenges and about how Penn State researchers might help.

4. How Considered

Budget Process: Availability of funding from certain extramural funding sources will influence resource allocations.

To Identify Emerging Issues: Stakeholder feedback will help to identify emerging issues, such as the effects of COVID-19 on agricultural operations and food safety, that would benefit from extension programming and/or research.

Redirect Extension Programs: Information collected from stakeholders will continue to be used to adjust issue areas for extension programming.

Redirect Research Programs: Information collected from stakeholder groups, such as industry associations, will continue to be used to directly influence applied research activity through local decisions about priorities.

In the Staff Hiring Process: Information collected from stakeholders will continue to influence hiring decisions for faculty and extension educators to address unmet needs. Stakeholder feedback also indicates where volunteers and donors would be interested in assisting with programs and initiatives.

In the Action Plans: Our mission is to serve our stakeholders, so we will analyze the information gathered from stakeholders and adjust our action plans as needed to meet their needs.

To Set Priorities: Our stakeholders' priorities must be our priorities, and we will adjust our programs as needed.

To Determine How and Where Programs are Offered: Stakeholder input will continue to directly impact how, where, and when we offer our extension programs. We have been developing and implementing many different platforms for information transmittal in response to previous feedback from stakeholders that additional methods of program delivery were needed as demands for resources and/or time increase. We now offer podcasts, online webinars, videos, field tours, etc., by synchronous and asynchronous means, and continue to migrate away from the traditional classroom setting. We want to maximize the utility of extension educators' time in the field by increasing the depth and breadth of routine educational materials available online. As noted earlier, Extension will use rigorous evaluation strategies to determine the best practices and lessons learned from the pandemic to influence future face-to-face and online engagement with stakeholders.

IV. Critical Issues

1 Advancing Agricultural and Food Systems

Description:

To meet coming challenges of climate change and increasing human population, agriculture must reduce its required inputs of energy, water, and chemicals while simultaneously increasing crop productivity and producer profitability and improving soil health. Topics will include:

resiliency in food systems, food supply chains, and business operations
agricultural labor shortage
efficiency of energy and inputs to agriculture
value-added aspects of commodities
plant production and protection
livestock production and reproduction
pollinator health
microbiome advances
agricultural, natural resource, and biological engineering

Term: Long

Science Emphasis Areas

Agroclimate Science
Environmental Systems
Sustainable Agricultural Production Systems

2 Developing Biologically Based Materials & Products

Description:

Our researchers will help to meet the promise of sustainable clean energy, beneficial reuse of agricultural waste, and income generation through new, value-added bioproducts to support struggling rural economies. Research commercialization and industry engagement are increasingly important as we seek real-world solutions that work. Topics will include:

value-added products from biomaterials
sustainable energy sources
new biomaterials exploration and development
beneficial reuse of agricultural wastes
eco- and human health-friendly products
new and improved food sources and products, and processing and packaging technologies

Term: Long

Science Emphasis Areas

Bioeconomy, Bioenergy, and Bioproducts
Environmental Systems

3 Building Community Resilience and Capacity

Description:

Communities need to build greater resiliency to natural and economic disasters; diversify their economies; restore and sustain robust infrastructure; increase the efficiency of community support systems; and identify and

implement cost-effective policies. Our specialists will address topics including:

- sustainable infrastructures and food systems
- economic promotion and resilience
- implications of shale gas energy
- agritourism
- entrepreneurship
- changing and declining rural areas
- trend analysis to meet communities' needs
- economic, market, and policy analysis
- identifying and helping to meet the needs of underserved populations
- access to broadband internet service
- educational delivery

Term: Long

Science Emphasis Areas

- Environmental Systems
- Family & Consumer Sciences
- Youth Development

4 Promoting Environmental Resilience

Description:

Society faces increasingly challenging environmental issues as the effects of climate change intensify; the human population grows; water, food, and energy supplies tighten; and land use change and urbanization limit our options. To tackle these issues, our faculty and programs will address:

- air quality
- water quality and quantity
- adaptation to climate change
- land use change
- invasive species
- integrated pest management
- assessment of and protection of ecosystem services
- forest health and fragmentation
- ecosystem resilience
- soil health
- fish and wildlife ecology
- effects of agricultural production on the environment

Term: Long

Science Emphasis Areas

- Agroclimate Science
- Environmental Systems
- Sustainable Agricultural Production Systems

5 Supporting Integrated Health Solutions

Description:

Climate change is already affecting the areal extent of some human and livestock diseases and parasites and how they spread, and this is expected to intensify. Decreased access to clean water and healthy food poses health risks. We are making gains in food safety and learning more about the microbiome that we can use to promote health. Topics will include:

- functional foods for positive health outcomes
- human nutrition
- food safety concerns
- livestock health and reproduction
- interplay between human and animal health
- insect-borne and zoonotic diseases and parasites
- hazards to human health and safety
- new and improved food products and food processing technologies
- the effects of foods or nutrients on the microbiome in maintaining health
- access to medical and mental health services

Term: Long

Science Emphasis Areas

- Environmental Systems
- Food Safety
- Human Nutrition

6 Fostering a Positive Future for Youth, Families, & Communities

Description:

The urban/rural divide continues to grow. The lack of employment options and the opioid crisis take a heavy toll on rural areas. Efforts to foster healthy individuals, families, and communities will cut across local, state, and national boundaries; build sustainable community institutions and strong new leaders; and strengthen intergenerational relationships. The focus will be on:

- engaging youth, women, and minorities in social action and leadership
- individual and family resource management
- human development and family well-being
- community institutions, health, and social services
- farm safety

Term: Long

Science Emphasis Areas

- Education and Multicultural Alliances
- Family & Consumer Sciences
- Youth Development