# Indiana (Purdue University Main Campus)

## Plan of Work for 2023-2027

Status: Final (Approved 9/24/2022)

## Executive Summary Overview

Purdue's College of Agriculture's 2021-2026 Strategic Plan outlines the vision and mission: to embody the ideal of a contemporary land-grant mission to prepare tomorrow's leaders for meeting society's needs, and to achieve worldwide leadership in growing a sustainable future by addressing challenges in food, life and natural resource sciences, working across disciplines.

Our research goal is to achieve preeminence in discovery and innovation in food and natural resources. We conduct basic research and achieve global recognition for driving discovery toward solutions in food and agriculture. We aim to lead interdisciplinary research towards advancing quality of life, livelihood and the environment.

Extension's mission is to deliver practical, research-based information by providing high-impact educational programs that transform lives and livelihoods of individuals and communities. We strive to be an educational partner for life-long learning from youth to adults. Indiana 4-H enhances youth and leadership development.

Two strategic priorities, diversity, equity and inclusion (DEI), and commercialization, guide research and Extension activities. We aim to advance new DEI models of best practices, core values and culture, and integrate DEI in our living culture. All faculty and staff will complete the Intercultural Development Inventory (IDI) to assess intercultural competence. A seminar series is also planned, starting with a DEI leader from Cargill North America. Extension will cultivate stakeholder engagement to promote a culture of DEI; foster a climate of belonging where individuals fully participate, contribute, and thrive; and enhance innovations, collaborations, and synergies across all stakeholders. Navigating Difference is a cultural competency program providing a half-day awareness workshop and a three-day training for connecting across diverse cultures with clientele, co-workers and community members.

For commercialization, research addresses: supporting new businesses, training and providing resources for aspiring entrepreneurs, moving discoveries into the market or startup companies, supporting accelerator activities and identifying unconventional partners while remaining connected to current stakeholders. The College named 12 faculty and a fellow as Innovation and Entrepreneurship Ambassadors to encourage students, staff, faculty and alumni to make real-world impacts by moving discoveries from laboratory to markets. Extension will promote entrepreneurship and new business by strengthening knowledge, practices, products and markets, and engaging partnerships and collaborations. An Agribusiness Initiative was launched with the Indiana Small Business Development Center, Purdue Center for Regional Development, and the Indiana State Department of Agriculture (ISDA) to provide business advising, training, referrals, tools and resources to help businesses succeed from startup to sale or retirement.

New critical issues were created incorporating College initiatives, and to align with priorities of NIFA, Research, Education & Economic Goals of USDA, Agriculture & Food Research Initiative, Foundation for Food & Agriculture Research, and Extension Committee on Organization & Policy. In a statewide survey, over 4,000 stakeholders shared input on the importance of the critical issues for their communities.

Critical issues are described on NRS. All critical issues are considered long-term. Within each, here we have listed short-, intermediate, and long-term agriculture issues with research and Extension examples.

Climate Change, Natural Resources & the Environment, & Sustainable Energy

Short-term – develop adaptation and mitigation for erratic and extreme weather

Intermediate – determine crop varieties, climate-smart practices and animal systems to conserve natural resources and reduce greenhouse gas emissions

Long-term – increase bioenergy and biofuels research and adoption, and conservation practices for soil, water, and natural resources

Research to understand and predict pollutants in critical landscapes in watersheds assesses mitigation approaches through site-to-watershed-scale restoration, including restoration of wetlands and conservation practice implementation in agricultural landscapes. Extension is collaborating with the Conservation Cropping Systems Initiative and Indiana Soybean Alliance to support three joint agronomist positions to help farmers adopt practical applications to improve conservation and sustainable agriculture production. Extension's Conservation through Community Leadership (CCL) trains local leaders, government officials and staff, representatives of NGOs, and residents about decision-making for natural resource conservation.

Workforce Development

Short-term – support workers to obtain certifications for agriculture jobs

Intermediate – develop STEM skills and agricultural technologies

Long-term – train aspiring or beginning farmers/ranchers to ensure viability of developing operations, and raise interest in STEM careers

Research on professional development curriculum for natural resource science undergraduate students explores opportunities for students to experience scientific processes, learn technical skills and evaluate future career decisions. Purdue is partnering with IN-MAC (Indiana Manufacturing Competitiveness Center) for resources, expertise and networking to strengthen workforce education, technology adoption and manufacturing research. Extension's Work Ready trains youth and adults about goal setting, responsibility, accountability, resumés, interviewing skills, money management, marketable skills, career opportunities and responsible social media usage to prepare them for work.

Positive Youth Development & 4-H Opportunities

Research on mental health and well-being in Midwestern Latino youth is identifying key factors that moderate/mediate the association between stressors and poor mental health. It focuses on Latinx children in migrant farmworker families, one of the most economically disadvantaged and underserved Latinx populations, and rural Latinx youth. Extension's Spark and 4-H Club programs, trainings, and

camps provide opportunities for youth, reaching new audiences and communities for expanded participation in positive youth development activities.

Big Data, Internet of Things, Broadband Access, Digital Literacy, Inclusion, & Innovation

Short-term – develop digital agriculture data science tools for more efficient operations

Intermediate – advance agricultural technologies (e.g., UAVs, modeling, sensors, robotics, automation, autonomous)

Long-term – develop and ensure digital parity, inclusion, and equity of all Indiana families, farms, rural households, businesses and communities

Research on field crop diseases seeks to provide detection and management of emerging and annual diseases via sentinel disease monitoring plots, replicated field experiments, and greenhouse and laboratory experiments. Extension's Digital Ready Business advances small business capacity to strengthen knowledge and application of broadband strategies, and Digital Ready Community empowers communities to increase civic engagement, trust and local government responsiveness by leveraging digital platforms.

Human, Family, & Community Health

Short-term - support farmers dealing with stress

Research on child-parent relationships, parenting stress, and marital conflict investigates development of positive child-parent relationships and attachment security during the preschool years. In collaboration with ISDA and the North Central Region, Extension's Farm Stress Team offers resources/programs, develops training for mental health providers and suicide prevention call centers, and supports women in agriculture. Extension's Creating Healthy Communities is a multidisciplinary program for decision-makers and local leaders with oversight and management of community public spaces (e.g., parks board, planning commissioners, public officials) and includes public deliberation to design action plans toward sustainable improvements.

Food Production, Security, & Safety

Short-term - address invasive species and integrated pest, weed, and disease management

Intermediate - support agricultural management, multidisciplinary farm decision-making, sustainable pre-harvest and post-harvest practices, and efficient on-farm production and off-farm post-production

Long-term - strengthen whole value chain, markets

Research on dietary factors and exogenous enzymes in regulation of efficiency of nutrient utilization and tissue composition in pigs explores exogenous enzymes and other natural feed additives to improve pig development and health while lowering input costs. Integrated research and Extension activities on tar spot in corn help identify, monitor and contain the emerging disease. To combat a salmonella outbreak, Extension is promoting food safety practices in vegetable production. Extension programs address risk assessments, commodity marketing strategies, land leases, effective business ventures, marketing strategies, and business and succession plans.

Urban Agriculture & Urban Extension

Short-term - build skills for crop/produce and animal production and for preparation of urban sites

Intermediate - strengthen communities through urban gardens and farmers markets

Long-term - encourage policy, systems, and environmental changes to support collective impact

Research on saving, reducing, and offsetting energy requirements for indoor specialty-crop produce aims to reduce costs of sole-source lighting of leafy vegetables by leveraging physical properties of LEDs to reduce energy expenditure. Over 200 individuals in urban agriculture across Indiana shared challenges and successes and Extension is using their input to build programs and resources. Extension's Grass to Garden brings residents, volunteers, non-profits, local officials, and garden enthusiasts together to learn how to start a community-based garden to improve access to local food.

## Merit and Scientific Peer Review Processes

Processes are the same but have been updated with changes in staffing. Purdue receives federal formula funding for Hatch, Animal Health research and McIntire-Stennis for forestry research. Hatch, Animal Health, and McIntire-Stennis research projects offer a broad spectrum of individual, departmental, and team research at Purdue. The projects document the University's commitment to partnership with other land-grant universities, the USDA, and the state of Indiana. Purdue faculty in the College of Agriculture, College of Veterinary Medicine, and selected departments in the College of Health and Human Sciences who have research appointments funded at 20% or more by formula funds are required to submit a five-year plan of research. These five-year plans are peer reviewed under the direction of the office of Agricultural Research and Graduate Education (ARGE) at Purdue and submitted to USDA-NIFA for final review and approval. The review panel, consisting of three reviewers, provides feedback that is shared and used by the Senior Associate Dean of Research and Director of Agriculture Research and Graduate Education when meeting with faculty members to provide feedback on projects. Once faculty submit any revisions to the project based on the feedback, ARGE will then submit the project electronically through the NIFA Reporting System (NRS). Faculty prepare and submit annual Progress Reports plus a Final Report at the end of the 5-year period. The office of ARGE is responsible for ensuring that Purdue faculty comply with the peer-review procedures and for the quality of reporting submitted to NRS.

## Stakeholder input: Action Taken to Seek Stakeholder Input

The four segments on stakeholder input have been updated to better align with the College of Agriculture's 2021-2026 Strategic Plan.

The College of Agriculture, the Office of Agriculture Research and Graduate Education, and Extension work closely with many groups via ongoing and periodic meetings to understand the current and long-term direction desired by these stakeholders for Research and Extension programs: Indiana Soybean Alliance, Indiana Corn Marketing Council, Indiana Pork Board, Indiana Crop Improvement Association, Indiana Farm Bureau (e.g., Supper Series and annual meeting), Dean's Advisory Council, Indiana Wine Grape Council, Corn and Soybean Showcase, Phenomics Advisory Board, and Purdue Council for Agricultural Research, Extension and Teaching (PCARET).

Stakeholders attending Field Days, special events, trainings, workforce development, meetings, and activities held at the eight Purdue Agricultural Centers (PACs) located across Indiana interact with

researchers and Extension personnel. These on-farm demonstrations and opportunities encourage stakeholder involvement, input, and feedback related to applied field crop and animal research, and production practices and agricultural technology.

Under the direction of the Dean, the College of Agriculture gathers input from stakeholders across Indiana in order to develop the 5-year strategic plans – The most recent strategic plan has been released. Meetings with groups of stakeholders, and community forums with residents across Indiana, provide opportunities for input and feedback.

Under the leadership of the Senior Associate Dean for Research and Director of Agricultural Research and Graduate Education, Purdue has facilitated tremendous growth in the innovation sector, resulting in record-setting investments in faculty intellectual property, licenses and start-up companies. Much of the commercialization successes are the result of increased collaboration and communication with corporate stakeholder to address their current and future needs. The College of Agriculture maintains a robust set of industrial partners to fuel the innovation pipeline.

Under the leadership of the Senior Associate Dean and Director of Extension, surveys are distributed to residents across Indiana, and focus groups of county stakeholders, board and council members, and residents provide input on goals, priorities, and activities for Extension. In Extension statewide program evaluations, the Net Promoter Score® is included to measure customer loyalty via a quantitative rating and verbal responses about the likelihood to recommend Purdue Extension to others.

## Stakeholder input: Methods to Identify Individuals and Groups

For the College of Agriculture's strategic planning activities, a 28-member task force made up of faculty and staff members representing the College held discussions with the College administrative leaders, alumni, advisory board members, undergraduate and graduate students, and other stakeholders to define the College's strengths, weaknesses, opportunities and challenges. Work with these groups also involved defining the visionary grand challenges facing the College now and in the future.

For the stakeholder groups across Indiana that meet regularly with the College of Agriculture's Dean, Senior Associate Dean of Research, and the Senior Associate Dean and Director of Extension, ongoing conversations, interactions, and meetings help to identify and address research and Extension interests and priorities of groups and individuals across Indiana.

For Research, Purdue's College of Agriculture continues to adapt to changes in the research landscape and technological innovations through the creation of new advisory boards or committees that are tasked with providing valuable insight on the pressing needs of agricultural producers. For example, the growth of digital agriculture and high-throughput phenomics resulted in the formation of a new stakeholder group, the Phenomics Advisory Board. Core members on the advisory board are from the Indiana Corn Growers Association and Indiana Soybean Alliance and key industrial partners. The board meets twice annually to keep pace with the progress Purdue's scientists have made in phenotyping/phenomics-related research, and also to provide advice and suggestions for identifying opportunities in phenomics research and promoting strategic collaborations.

For Purdue Extension, the 92 County Extension Directors provide direction on, and connection with, local stakeholders among their community residents, groups, agencies/organizations, and businesses.

Purdue Extension Educators collect and manage needs assessments to identify stakeholders and County data for tracking resources, strengths, assets, gaps, and needs across communities.

## Stakeholder input: Methods for Collecting Stakeholder Input

For Research, a variety of approaches are used to gather input from stakeholders ranging from communications at Field Days, meetings with commodity groups and other stakeholder boards and committees and listening tours that focus on priorities and initiatives (e.g., strengthening our innovation ecosystem).

For Extension, methods for collecting input include community forums, listening sessions, stakeholder meeting discussions, statewide surveys, County Extension Boards and Advisory Councils, program evaluation post- and follow-up surveys, focus groups, interviews, consultations with producers, community leaders, and businesses.

## Stakeholder input: A Statement of How the Input Will Be Considered

Input collected for research is considered during departmental- and college-level reviews as it directly impacts the unit's strategic planning. Internal funding has been used to seed novel research concepts that have been communicated by stakeholder groups and aligned faculty. Position development and hiring is also influenced by stakeholder discussions as we attempt to strengthen areas where we envision future growth and to fill gaps in expertise as necessary.

Input collected for Extension from stakeholders will be used to inform the mission, vision, and goals, to compare against actions and offerings delivered, and to inform improvement, adjustment, and addition of programs implemented across Indiana. For example, in 2022, over 4,000 stakeholders completed a statewide Extension survey which was distributed by County Extension Directors. Survey responses about the importance of issues for their communities are being used to assess and prioritize our Extension offerings and communication. Also, focus groups were conducted during County Board meetings in 12 counties. Input from stakeholders on the value and impact of Extension in their communities is being used to assess and revise our practices, programs, and communication.

## Critical Issues

### Big Data, Internet of Things, Broadband Access, Digital Literacy, Inclusion, and Innovation

Initiated on: Oct 01, 2022
State: Indiana

Term Length: Long-term (>5 years)

(a) Working with big data, developing digital agriculture data science tools (e.g., user-friendly platforms) to make operations more efficient, productive and sustainable. (b) Advancing use and understanding of agricultural technology, Unmanned Aerial Vehicles, modeling, sensors, robotics, automation, autonomous, and the Internet of Things (IoT) for agricultural production. (c) Supporting operations that are "digital ready" for expanding agricultural production resources and potentials. (d) Reaching and creating digital parity, inclusion, and equity of all Indiana families, farms, rural households, businesses, and communities. (e) Expanding broadband, building digital literacy and skills, and increasing digital

connectivity and devices in rural communities, urban neighborhoods, and metropolitan cities. (f) Building well-connected communities by providing critical information and technical support.

Science Emphasis Area

Agroclimate Science, Environmental Systems, Sustainable Agricultural Production Systems

## Climate Change, Natural Resources and the Environment, and Sustainable Energy

Initiated on: Oct 01, 2022
State: Indiana

Term Length: Long-term (>5 years)

(a) Taking a global view of sustainability of the environment by addressing climate change, protecting water, soil and natural resources, and incorporating sustainable energy use. Building water and soil management practices, structures and systems. (b) Responding to climate and energy needs, focusing on adaptation, mitigation, and resilience. Influencing massive reforestation. Controlling invasive species and diseases, and supporting pollinator health. (c) Developing and adopting climate-smart agriculture, practices, and resilient crops, and sequestering carbon through agriculture. (d) Advancing animal systems, reducing/reusing methane in livestock production, and finding solutions for different scales of operation. (e) Researching and adopting bioenergy, biofuels (corn and cellulose), other sustainable energy sources, efficient and alternative energy sources, energy-efficient processes, products, and agricultural machines.

Science Emphasis Area

Agroclimate Science, Environmental Systems

## Food Production, Security, and Safety

Initiated on: Oct 01, 2022
State: Indiana

Term Length: Long-term (>5 years)

(a) Advancing plant and animal sciences and production and supporting sustainable agricultural production. (b) Addressing nutrient management and crop- and livestock-related soil and water management. (c) Developing agricultural management, multidisciplinary farm decision making, sustainable pre-harvest and post-harvest practices, and efficient on-farm production and off-farm post-production. (d) Building and supporting the whole value chain, strengthening markets, making sure food reaches all consumers including foods they like and prefer. (e) Targeting invasive species and disease, and working with integrated pest management (IPM), weed and disease management strategies. (f) Ensuring the safety and security of food produced. Generating rapid detection of pathogenic organisms and/or toxins, proper handling and storage/shipping/preparation, and post-harvest monitoring and traceability. (g) Engaging with partnerships that advance societal development, fulfilling agricultural needs and aspirations around the world supporting global sustainability of agriculture.

Science Emphasis Area

Food Safety, Sustainable Agricultural Production Systems

## Human, Family, and Community Health

Initiated on: Oct 01, 2022
State: Indiana

Term Length: Long-term (>5 years)

(a) Enhancing positive human development and strengthening financial resource management. (b) Increasing physical and mental health understanding and practices, by tackling opioid addiction, obesity, depression, and other health challenges, and by cultivating healthy nutrition, physical activity, and stress management behaviors. (c) Operating at levels of policy, systems, and environments via active health coalitions representing all voices of the community. (d) Enhancing success in communities by informing decision making to improve economic and social well-being for communities of all sizes, developing businesses, and increasing community vitality, building leadership capacity, improving public decision making, resolving public issues, and creating quality places.

Science Emphasis Area

Education and Multicultural Alliances, Family & Consumer Sciences, Human Nutrition, Youth Development

## Positive Youth Development and 4-H Opportunities

Initiated on: Oct 01, 2022
State: Indiana

Term Length: Long-term (>5 years)

(a) Preparing youth for economic and social well-being. Opportunities, relationships, and support for youth help them acquire life skills to meet the challenges of adolescence and adulthood. Activities align with the mission areas of science, engineering and technology, healthy lifestyles, civic engagement, teen leadership, and college and career readiness. (b) With 13,000 adult volunteers involved, volunteer development opportunities are essential, and a vital component to positive youth development.

Science Emphasis Area

Youth Development

## Urban Agriculture and Urban Extension

Initiated on: Oct 01, 2022
State: Indiana

Term Length: Long-term (>5 years)

(a) Growing urban gardens and farms, urban agriculture, diversified farming and food systems, and small-scale farming including specialty crops. (b) Advancing practices for efficient production including controlled environments, season extensions, aquaponics, and hydroponics. (c) Sharing ways to grow food, and strengthening local communities through urban gardens and farmers markets. Building whole value chains, market systems and farmers markets. (d) Using comprehensive community development strategies, targeted to address key community needs and issues. (e) Programming that encompasses policy, systems and environmental change focused on issue-based programming with a strong outcome focus and capability for shared measurement that illustrates collective impact. (f) Developing

partnerships, collaborating with community and public agencies and the private sector for shared priorities and new opportunities.

Science Emphasis Area

Education and Multicultural Alliances, Sustainable Agricultural Production Systems

## Workforce Development

Initiated on: Oct 01, 2022
State: Indiana

Term Length: Long-term (>5 years)

(a) Improving economic well-being, and workforce development for youth, families, individuals, businesses, organizations, agencies and communities. (b) Focusing on technical, professional and life skills training to help individuals for their first job, to prepare for or achieve their work-related certifications, licenses, continuing education units (CEUs), and other credentials, to develop positive life skills in families, and to provide youth and adults with opportunities to learn new science, technology, engineering, and mathematics (STEM) skills. (c) Raising interest in STEM education for agricultural and environmental careers among young generations by engaging with PK-12 populations, and for adults seeking training for future opportunities, and for building STEM education throughout life.

Science Emphasis Area

Education and Multicultural Alliances, Food Safety, Sustainable Agricultural Production Systems, Youth Development