

2025

# CHALLENGE RESOURCE GUIDE



AGRINOVUS  
**Velocity**

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## FOREWORD

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Research identifies three forces of change expected to shape the future of the agbioscience economy over the next 25 years: bioinnovation, farmer-focused innovation and food is health. These forces will create new challenges for companies, startups, students and innovators as the global agbioscience economy evolves across food, animal health, plant science, agtech and agriculture.

Creating the conditions and connections to transform challenges into opportunities is what we do at AgriNovus, and it is why we created Velocity – a six-month accelerator program to inspire the creation of tech-enabled solutions that will transform the three forces of change into three forces of opportunity. In partnership with the Indiana Corn Marketing Council, Indiana Soybean Alliance, Elevance Health, Beck’s Hybrids and Ag Alumni Seed, Velocity challenges students, startups and existing companies to accelerate innovation and awards the top solution that addresses the forces of change with a \$25,000 award.

The following pages provide a compendium of research, insights and data to inspire the creation of the solutions this economy needs. Innovation is the catalyst to creating this future faster – a reality needed as this economy is the only economy in the world that touches every person on the planet given that it centers on food.

Review the research and join us to increase the velocity of agbioscience innovation. Together, we can make this world and this economy even stronger.

Let’s make it happen!



**Mitch Frazier**  
President + CEO  
*AgriNovus Indiana*

## AGRINOVUS RESOURCES

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*Accelerate 2050: A Vision for Indiana Agbioscience* identifies Indiana’s economic performance across food, animal health, plant science, agtech and production agriculture and defines priority opportunities to position Indiana’s agbioscience economy for differentiated growth amid future uncertainty. According to the study, Indiana’s three key opportunities include: farmer-focused innovation, food is health and bioinnovation.

[Download the full report here.](#)

## Indiana Agbioscience Ecosystem: 2050 Vision

Through Accelerate 2050, AgriNovus and its Board articulated a shared vision for the Indiana agbioscience ecosystem to drive collective action and progress through 2050:

**Indiana is the world-leading destination for developing and scaling agbioscience companies that fuel long-term, differentiated economic growth for the state, the nation, and the global agbioscience ecosystem.**

Specific elements of this shared vision include:

- Interdisciplinary, cross-sector collaboration between the agbioscience platforms
- Strong connections between research and commercialization to invent and scale technologies in collaboration with farmers
- Differentiated and durable growth informed by ambitious strategies and competitive advantages
- Thriving farmers and communities, both rural and urban, that generate value and catalyze impact in the global agbioscience economy
- Leveraging assets to advance commercialization of new technologies to generate increased productivity

## Indiana Agbioscience Growth Opportunities

AgriNovus and its Board identified three high-priority opportunities for achieving durable, differentiated economic growth for Indiana agbioscience:

### Farmer-Focused Innovation

*(pg. 26–27)*

Indiana cultivates a thriving community of early-adopter farmers partnering with agbioscience companies, especially start-ups and growth-stage ventures, to create the agbioscience solutions of the future.

### Food is Health

*(pg. 28–29)*

Indiana drives innovation at the intersection of plant, animal, human, and environmental health, recognizing food as the nexus of these domains, to create both economic growth and improved health outcomes.

### Bioinnovation

*(pg. 30–31)*

Indiana serves as the premier destination for bioinnovators and biomanufacturers to research, commercialize, and scale biotechnology processes, platforms, and products.

# The Current State of Indiana Agbioscience

## Indiana's Five Agbioscience Platforms

The Indiana agbioscience economy is defined by five platforms that drive economic activity and growth across rural and urban parts of the state:

- **Agricultural Production** spans all types of crop and livestock production and includes primary agricultural processing for animal and human consumption and industrial applications, such as biofuel manufacturing.
- **Value-Added Food and Nutrition** spans a variety of manufactured foods: dairy products, processed meat, processed fruits and vegetables, bakery products, functional foods, confectionery, edible oil, condiments, sweeteners, and beverages.
- **Plant Science and Crop Protection** includes seeds and crop protection, such as chemical and biological herbicides, insecticides, and fungicides; biostimulants; and plant nutrient solutions.
- **Animal Health and Nutrition** includes preventatives and pharmaceuticals, biologics, diagnostics, and medicinal and nutritional feed additives for livestock and companion animals.
- **Agricultural Technology and Equipment (AgTech)** includes tractors, harvesting machinery, other farm machinery, and agricultural technology aimed at increasing farm efficiency and productivity.

## The Size of Each Platform

In 2022, the Indiana agbioscience economy totaled \$69.6 billion,<sup>1</sup> measured by economic contribution, as shown in **Table 1** below. Indiana agbioscience employed 147,075 people and generated \$22.7 billion in GDP, or economic contribution minus the cost of its intermediate inputs.<sup>2</sup> Indiana agbioscience contributed more to the state GDP than other key Indiana industries, such as auto manufacturing and construction, each of which contributed just under \$22 billion to state GDP.<sup>3</sup>

Table 1: Size of Each Indiana Agbioscience Platform by Employment, Output, and GDP, 2022

Platforms	Employment	GDP (\$BN)	Economic Contribution (\$BN)
Agricultural Production	67,908	\$10.7	\$30.1
Value-Added Food and Nutrition	63,693	\$8.4	\$29.8
Plant Science and Crop Protection	6,594	\$1.8	\$3.9
Animal Health and Nutrition*	3,149	\$0.8	\$3.5
AgTech	5,731	\$0.9	\$2.3
<b>Agbioscience Total</b>	<b>147,075<sup>+</sup></b>	<b>\$22.7<sup>+</sup></b>	<b>\$69.6<sup>^</sup></b>

\* Note: Animal Health and Nutrition GDP is likely understated due to data limitations with NAICS codes not distinguishing between veterinary and human health pharmaceuticals. The Animal Health and Nutrition GDP estimate assumes that veterinary pharmaceutical manufacturing accounts for 2% of total pharmaceutical manufacturing GDP based on a 2022 Animal Health Institute study.

Source: <sup>+</sup>RTI analysis of U.S. Bureau of Labor Statistics, U.S. Bureau of Economic Analysis, and Lightcast data. <sup>^</sup>Indiana Business Research Center analysis using IMPLAN

# Exploring Possible Futures for Indiana Agbioscience

## Forces of Change Impacting Global Agbioscience

Over the next 25 years, the agbioscience economy will continue to be shaped by global, national, and regional forces of change. Understanding these forces of change is a critical first step in understanding possible agbioscience futures and prioritizing opportunities poised to enable long-term, differentiated growth.

*The future is here, it's just not evenly distributed yet.*  
 –William Gibson, Futurist

To inform Accelerate 2050, the RTI team conducted divergent secondary and primary research to identify more than 150 forces of change impacting the future of Indiana agbioscience. RTI aggregated and analyzed trends and drivers of change from our own proprietary trends database and data from dozens of organizations such as the Food and Agriculture Organization of the United Nations (FAO), European Commission, the World Economic Forum, and the Global Panel on Agriculture and Food Systems for Nutrition. In addition, RTI conducted 15 expert interviews (e.g., AgriNovus Board members, global food security experts, multinational food and beverages company leaders) and reviewed dozens of interviews conducted for the agbioscience podcast.

AgriNovus and RTI collaboratively analyzed these forces through a series of sense-making workshops and prioritized 24 high-impact driving forces and 12 high-impact stabilizing forces with significant bearing on the future of agbioscience for Indiana, listed in **Table 4**. The forces shaping the agbioscience economy are inherently related and connected. Table 4 presents one way to organize these forces of change, but each force contains dotted lines to nearly every other category. Additional details on each force of change were provided to AgriNovus and are available upon request to RTI.

RTI, together with AgriNovus and its Board, analyzed combinations of forces of change and explored the implications and the uncertainties they create for Indiana's agbioscience industry. The following is a selection of insights from those working sessions and RTI analysis:

### Technology and Innovation Insights

- Advances in biotechnology and gene editing will likely drive a surge in biomanufacturing and will revolutionize production processes across various industries.
- Platform innovations (e.g., gene therapy, de novo protein synthesis, microbiome engineering) that work across the plant-animal-human health continuum hold potential but require strategic investment to drive adoption and maximize benefits.
- Biotransformation technologies are poised to transform production processes (e.g., waste valorization, fermentation) and enable new product creation (e.g., food ingredients, bioinputs).
- The combination of biotechnology and AI could significantly enhance farm productivity if potential barriers to adoption (e.g., cost, return on investment) can be overcome.
- The adoption of AI and AgTech in the agbioscience sector, in combination with farm consolidation, has the potential to reshape labor dynamics and the distribution of economic benefits.

Table 4: Forces of Change Impacting the Future of Indiana Agbioscience

High-Impact Driving Forces			
<p><b>Driving forces</b> propel change and push a system, organization, or environment toward a new state or direction.</p>	<p><b>Science and Technology</b></p> <ul style="list-style-type: none"> <li>• Computing, Data, and Industrial Automation</li> <li>• Agricultural Biotechnology</li> <li>• The Energy Transition</li> <li>• Precision, Smart, and Data-Driven Agriculture</li> <li>• Health Science Research and Discovery</li> <li>• Artificial Intelligence</li> <li>• Human–Machine Collaborations/Interfaces</li> </ul>	<p><b>Environmental</b></p> <ul style="list-style-type: none"> <li>• Water and Other Natural Resources</li> <li>• Climate</li> </ul>	<p><b>Societal</b></p> <ul style="list-style-type: none"> <li>• Social Movements</li> <li>• Public Trust</li> <li>• Population Dynamics</li> <li>• Food Consumption Patterns and Preferences</li> <li>• Integration of Planetary, Plant, Animal, and Human Health Systems</li> </ul>
	<p><b>Economic</b></p> <ul style="list-style-type: none"> <li>• Finance, Insurance, and Investments Models</li> <li>• Commodity Production and Prices</li> <li>• Capital Intensity and Consolidation</li> <li>• Entrepreneurship and Corporate Innovation</li> <li>• The Labor Market</li> </ul>	<p><b>Political and Regulatory</b></p> <ul style="list-style-type: none"> <li>• State and Federal Ag Policy</li> <li>• Geopolitics and Trade</li> <li>• Domestic Food Security</li> <li>• AI Governance and Regulation</li> <li>• Food-Labeling Guidelines</li> </ul>	
High-Impact Stabilizing Forces			
<p><b>Stabilizing forces</b> maintain or restore equilibrium in a system. They resist change and tend to preserve the status quo.</p>	<ul style="list-style-type: none"> <li>• Fundamental Human Dietary Needs</li> <li>• Available Natural Resources</li> <li>• Food Is More Than Calories</li> <li>• Population Demographics</li> <li>• Persistent Efforts and Achievements in Enhancing Productivity</li> </ul>	<ul style="list-style-type: none"> <li>• Importance of Food Safety</li> <li>• Regulatory Pathways</li> <li>• Economic Motive and Following Incentives</li> <li>• Prevailing Economic Systems (e.g., U.S. Capitalism)</li> </ul>	<ul style="list-style-type: none"> <li>• Fundamentals of Farming Inputs</li> <li>• Link Between Food Security and National Security</li> <li>• Existing Food Infrastructure and Systems Inertia</li> </ul>

### Energy and Climate Insights

- Increased weather variability and extreme weather events, coupled with long-term climate shifts and natural resource constraints, may shift traditional growing regions and further amplify the focus on sustainable and resilient agriculture.
- As the impacts of a changing climate unfold, the need for climate-adaptative solutions will likely increase, augmenting the importance of innovation in climate-resilient crops, complementary technologies, and regenerative agricultural practices.
- Changes in climate patterns could lead to significant changes in global migration patterns as people seek stability and economic prosperity in less-climate-vulnerable regions.
- The evolution of infectious diseases and future global pandemics could create new challenges and opportunities for public health, food safety, and food security.
- The ongoing energy transition presents near-term opportunities for biofuels and potential long-term challenges, depending on how technology and the energy landscape evolves.

### Consumer Preferences and Nutrition Insights

- The evolution of attitudes toward biotechnology in the U.S. and global markets will influence product development, market access, and regulatory frameworks.
- Global demand for protein is shaping export markets and is linked to several other forces, including geopolitics and trade dynamics, global development and nutrition, and food prices.
- The introduction of gene-edited foods, lab-grown meats, or other biotechnology innovations could cause political or consumer divisions with implications for monitoring, labeling, and regulation.
- The rise of precision and personalized nutrition may drive changes in consumer preferences, product development, and agricultural production practices.
- Increasing consumer focus on health, wellness, and environmental sustainability could dramatically shift consumer preferences for healthier, sustainably sourced, and traceable food.



### **Rural-Urban Dynamics and Regional Development Insights**

- Growing focus on regional or city-specific agbioscience or AgTech hubs (e.g., St. Louis, Research Triangle Park, Boulder) may influence corporate location decisions, investment patterns, and more.
- Uneven availability of digital infrastructure, job opportunities, hybrid work options, and more could widen the rural-urban divide, leading to significant place-based disparities.

### **Supply Chain and Geopolitics**

- Increasing intertwinement of food security and national security with the agbioscience sector is playing a crucial role in ensuring the resilience and stability of both.
- Deepening relationships between farmers and manufacturers, along with increasing verticalization in the agrifood sector, could shift supply chain dynamics, innovation processes, and market structures.
- Geopolitical tensions and global trade dynamics could evolve in multiple ways, potentially leading to reshoring and nearshoring of food supply chains if countries prioritize domestic food security.

### **Farm Revenue and Risk Management**

- Effective risk management strategies become increasingly important to ensure resilient and sustainable agricultural operations amid market uncertainties and environmental challenges.
- Continued market uncertainty pushes farmers to diversify revenue streams and pursue new on- and near-farm opportunities in energy technologies, carbon markets, and vertical integration.

## **Key Uncertainties**

Analyzing forces of change led AgriNovus and its Board to highlight key uncertainties for Indiana agbioscience over the next 25 years:

- How will global instability and natural resource pressures impact domestic agricultural production?
- How will AI catalyze new biological insights and fundamental discoveries, especially at the intersection of human, plant, and animal health?
- How will changes in consumer perception and trust impact food purchasing?
- How will climate volatility impact farming business models?
- How will future mergers, acquisitions, and strategic partnerships shape the agbioscience industry?
- How will AI impact the labor market over the long term? How will future generations view work, including workplace values and desired experiences?
- How will trends in farm consolidation and farmland loss play out, and what will be the implications for the agricultural sector?

# Indiana Agbioscience Vision and Opportunities

## Indiana Agbioscience: 2050 Vision

AgriNovus and its Board articulated a shared vision for the Indiana agbioscience ecosystem to drive collective action and progress through 2050 (see **Figure 13**):

**Indiana is the world-leading destination for developing and scaling agbioscience companies that fuel long-term, differentiated economic growth for the state, the nation, and the global agbioscience ecosystem.**

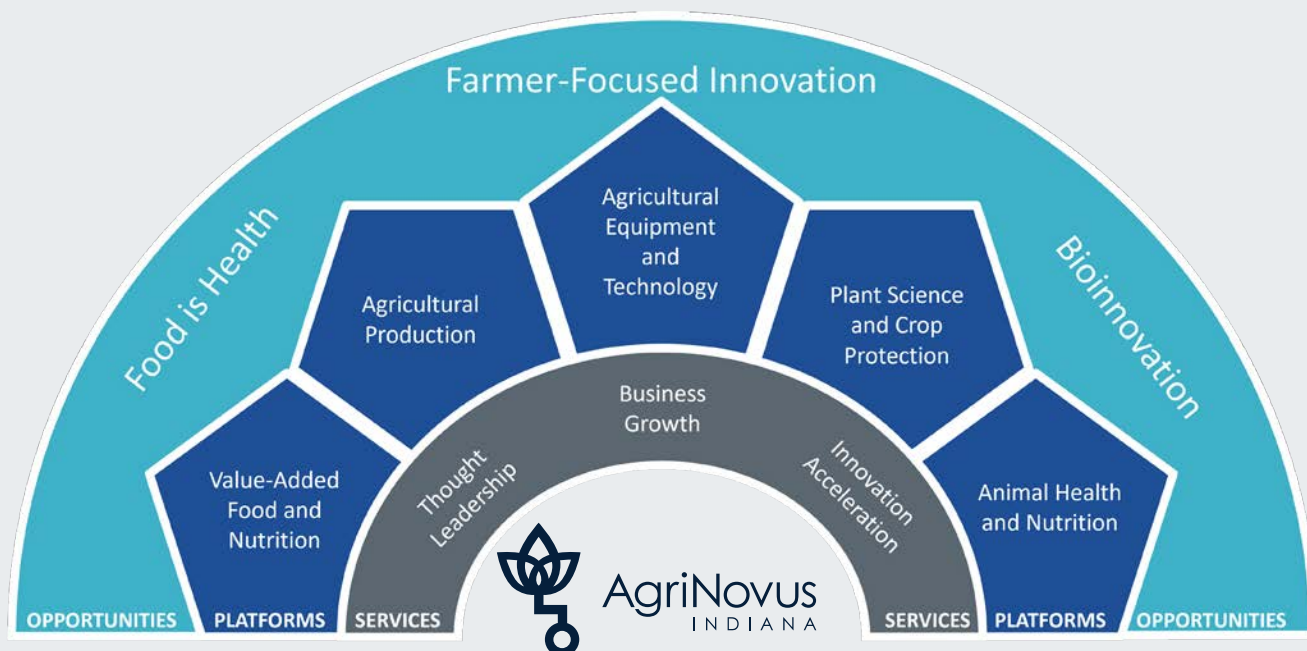
Specific elements of this shared vision include the following:

- **Interdisciplinary, cross-sector collaboration** between the agbioscience platforms.
- **Strong connections between research and commercialization** to invent and scale technologies in collaboration with farmers.
- **Differentiated and durable growth** informed by ambitious strategies and competitive advantages.
- **Thriving farmers and communities, both rural and urban**, that generate value and catalyze impact in the global agbioscience economy.
- **Leveraging assets** to advance commercialization of new technologies to generate increased productivity.

Figure 13: Bringing together agbioscience services, platforms, and ecosystem-wide opportunities in pursuit of a shared 2050 vision

### Vision

Indiana is the world-leading destination for developing and scaling agbioscience companies that fuel long-term, differentiated economic growth for the state, the nation, and the global agbioscience ecosystem.



As the convening body of the agbioscience ecosystem, **AgriNovus's mission is to fuel growth in the Indiana agbioscience economy.**

## Indiana Agbioscience: 2050 Opportunities

### Farmer-Focused Innovation

Indiana cultivates a thriving community of early-adopter farmers partnering with agbioscience companies, especially start-ups and growth-stage ventures, to create the agbioscience solutions of the future.

### Food is Health

Indiana drives innovation at the intersection of plant, animal, human, and environmental health, recognizing food as the nexus of these domains, to create both economic growth and improved health outcomes.

### Bioinnovation

Indiana serves as the premier destination for bioinnovators and biomanufacturers to research, commercialize, and scale biotechnology processes, platforms, and products.

Through Accelerate 2050, Indiana agbioscience leaders identified three high-potential opportunities for durable, differentiated growth for the Indiana agbioscience economy. The opportunities offer complementary innovation pathways by addressing a known need (Farmer-Focused Innovation), demonstrating expertise in an enduring technology domain (Bioinnovation) and setting clear expectations for desired future industry leadership (Food is Health). The following pages include additional information about each opportunity.

Table 5: The Criteria Used to Identify These Opportunities

Characteristic	Questions to Ask
<b>Essential to the vision</b>	Will achieving this opportunity progress the agbioscience economy toward the vision in a meaningful way?
<b>Stands the test of time</b>	Is the opportunity rooted in problems that are likely to persist or grow in importance over time? Is it aligned with long-term trends or drivers of change?
<b>Balances future ambition with current realities</b>	Does this opportunity push the boundaries of the status quo while capitalizing on Indiana’s current assets, strengths, and competitive advantages?
<b>Requires collective, system-level action</b>	Does the opportunity require action from many AgriNovus stakeholders? Does it involve multiple agbioscience platforms/sectors?
<b>Builds on Indiana strengths</b>	What is Indiana uniquely positioned to impact? Which opportunities build on Indiana strengths?

## Farmer-Focused Innovation

Farmer-Focused Innovation centers Indiana farmers as advisors, co-creators, and early adopters working collaboratively with early- and growth-stage agbioscience companies in the development of new agbioscience solutions. This opportunity formalizes collaboration between early-adopter farmers and agbioscience early- and growth-stage companies to inform and trial new products, services, and business model innovations that benefit Indiana and beyond.

**Indiana has the opportunity to cultivate a thriving community of early-adopter farmers partnering with agbioscience companies, especially start-ups and growth-stage ventures, to create the agbioscience solutions of the future.**

### Opportunity in Context

A thriving Indiana agbioscience economy requires thriving farmers. However, farmers face compounding risks—increased weather variability, commodity market dynamics, changing regulatory environments and consumer preferences—that add uncertainty to an already challenging business. This is especially true in a place like Indiana, where a high concentration of corn and soybean production creates vulnerability to external shocks and demand changes. Agbioscience innovations hold potential to improve the efficiency and sustainability of farming operations and could offer ways to diversify farm-based revenue (e.g., via tech-enabled value addition or waste valorization). However, a lack of direct farmer input into agbioscience research and development (R&D) efforts means that the products and services available to farmers often fail to deliver clear return on investment or personalized results.<sup>9</sup> The Farmer-Focused Innovation opportunity brings farmers directly into the agbioscience innovation process so that their interests and opportunities feature centrally in the development of emerging products and services.

This opportunity holds potential to set off a virtuous cycle of value creation for Indiana: early-adopter farmers partner with agbioscience innovators to co-create and shape future offerings; direct access to early adopters attracts new companies to Indiana; those companies create more-informed and demand-driven innovations. Farmer needs are better met and uptake improves, leading to improved farm outcomes. The demonstrated benefits of this approach draw additional capital and companies to Indiana and additional farmers to engage in the process. Indiana strengthens its position as a conducive, enabling environment for innovators and innovative agbioscience companies to thrive.

### Critical Components to Capture the Opportunity

- **Mutually beneficial, two-way engagement** between early-adopter farmers and agbioscience companies early in the innovation process
- **A neutral broker** that facilitates farmer-company interactions, including enabling a shared language and equitable risk-reward arrangements
- **Low transaction costs** for both farmers and companies (e.g., streamlined access to early-adopter farmers for companies; pre-vetted innovation opportunities for farmers)
- **Financial incentives** (e.g., equity stakes in agbioscience companies, government grants, profit-sharing agreements) and other risk mitigation resources to pull farmers into the innovation process, especially for small and mid-sized farms that may be less able to take on increased risk (e.g., see the Manufacturing Readiness Grants in Indiana for an adjacent industry example)
- **Risk capital** to support the innovation pursuits of early and growth-stage companies
- **Networking and knowledge-sharing opportunities** for early-adopter farmers to build relationships and deepen the community's innovation and entrepreneurial expertise
- **Mechanisms to identify on-farm innovations** with commercial potential and create pathways for farmers to profit from their inventions

## Food is Health

The Food is Health opportunity encompasses three complementary aspects aligned to the ecosystem's desire to nurture an agrifood system that creates healthier lives, communities, and environment: (1) accelerating food-focused research and commercialization at the intersection of plant, animal, human, and environment health; (2) enabling farmers to diversify production into horticulture crops and supply regional food economies; and (3) growing the value-added food-manufacturing base to address emerging consumer food interests (e.g., personalized nutrition, nutrient density, macronutrient profiles, functional foods) and improve human health outcomes. Together, the components of this opportunity unlock the power of food at the molecular, raw-product, and processed-goods levels.

**Indiana has the opportunity to drive innovation at the intersection of plant, animal, human, and environmental health, recognizing food as the nexus of these domains, to create both economic growth and improved health outcomes.**

## Opportunity in Context

Food is emerging as a central focus in the Indiana agbioscience ecosystem, with consumers increasingly recognizing the impact of their food choices on personal, community, and environmental health. At the same time, scientific advances and emerging technology platforms (e.g., microbiome engineering) create a high potential for intersectional innovation that capitalizes on the similarities in underlying biology and sector challenges.

Also, Indiana agbioscience GDP is poised for further growth if the state can more concertedly translate the outputs of its sizable agricultural production platform into inputs for an expanded value-added food and nutrition platform. Many food companies are shifting toward natural ingredients and exploring new product-development approaches. Others are deepening relationships with farmers and investing in their transition to regenerative agricultural practices to reduce supply chain risks and meet sustainability commitments. Indiana is well-positioned to emerge as a Food is Health leader, with efforts spanning upstream intersectional research to strengthened regional food economies bolstered by diversified agricultural production and an expanded based of value-added food companies.

## Critical Components to Capture the Opportunity

- **Dedicated leadership** to prioritize cross-sector collaboration and to mobilize their respective organizations to maintain support for shared ecosystem goals
- **Common discovery platforms with corresponding data-sharing agreements** that pool resources and enable discoveries relevant to plant, animal, human, and environmental health
- **Shared spaces and convening organizations** (e.g., networks, shared projects, QUADRANT events) that create collision opportunities by bringing people together on broad and focused cross-sector topics
- **Multidisciplinary research teams** that can identify opportunities and discover novel solutions at the intersection of traditionally siloed scientific domains and industries
- **Enabling incentives and structures that promote collaboration** across the food value chain and with adjacent industries such as pharmaceuticals; nutraceuticals; health care; and medical technology, which may include joint initiatives or co-funded activities
- **Focused efforts to build homegrown or recruit value-added food companies** that align with the Food is Health opportunity
- **Deepened understanding of local food demand and regional agrifood systems**, including ways to shorten food supply chains by better connecting local agricultural production and value addition with communities' food needs
- **High-level support and incentives for crop diversification** among state agencies, commodity groups, and other key agricultural sector leaders who can influence policies, resourcing, and other support for regional and local food systems

## Bioinnovation

Bioinnovation creates the enabling infrastructure, financing, and partnerships needed to advance all scales of biotechnology product, platform and process development—from early-stage R&D to pilot-scale trials to commercial-scale operations. Importantly for Indiana, this opportunity leverages the agricultural sector as primary market for biotechnology products (i.e., bioinputs) and a supplier of the raw materials needed for the industrial biomanufacturing industry.

**Indiana has the opportunity to become the premier destination for bioinnovators and biomanufacturers to research, commercialize, and scale biotechnology processes, platforms, and products.**

## Opportunity in Context

Biotechnology and AI are powerful platform technologies that hold wide possibilities for the agbioscience economy, especially in terms of accelerating the discovery and development of novel microorganisms, biological transformations, and biomolecules. This potential boon in early-stage innovations is converging with an unprecedented demand for bio-based products in the United States and globally. Governments increasingly look to alternative fuel options such as biofuel to enable transportation and energy sector transitions. Growing consumer demand for more sustainable and bio-based products ranges from packaging to cosmetics. In the agriculture sector, expanding use of regenerative agriculture practices opens opportunity for complementary bioinputs (e.g., biopesticides and biofertilizers) to reduce synthetic input use.

This convergence of accelerated scientific discovery and growing demand for bio-based products presents a sizable opportunity to more readily advance early-stage discoveries into commercial pipelines, but only if the requisite infrastructure, capital, and partnerships are in place to support this translation to commercially viable bioproducts. Current U.S. shortages of mid-scale bioreactors have forced some biomanufacturing companies to look internationally to scale their operations.<sup>20,21</sup>

## Critical Components to Capture the Opportunity

- **Biological technology platforms** leveraging tools like AI, advanced omics, high-throughput screening, and gene editing
- **Optimized bioconversion processes (e.g., feedstocks, microorganism strains, bioreactors)** that can serve commercial interests at different scales and for different products
- **Strong linkages** between academic institutions and early-stage start-ups at the forefront of Bioinnovation and the industrial biomanufacturing sector to bring the innovations to commercial scale
- **Different scales of retrofitted or new biomanufacturing infrastructure** and modular, flexible equipment
- **Shared infrastructure and collaborative mechanisms to translate foundational assets** (e.g., data sets, computation tools) across the agbioscience ecosystem
- **Available capital to support mid-stage companies** operating at demonstration and first commercial scale
- **Formalized co-locations or circular systems** that valorize agricultural waste streams into high-value (e.g., specialty ingredients) or commodity outputs (e.g., chemical feedstocks)



# FARMER-FOCUSED INNOVATION

## PROBLEM STATEMENT

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Leverage technology to help farmers face compounding risks – increased weather variability, commodity market dynamics, challenging regulatory environments and labor/administrative burden – to create innovation that helps mitigate risk and uncertainty while driving a net return on investment back to the farmer.

## AGRINOVUS RESOURCES

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## Farmer-Focused Innovation

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**Indiana has the opportunity to cultivate a thriving community of early-adopter farmers partnering with agbioscience companies, especially start-ups and growth-stage ventures, to create the agbioscience solutions of the future.**

### Opportunity in Context

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This opportunity holds potential to set off a virtuous cycle of value creation for Indiana: early-adopter farmers partner with agbioscience innovators to co-create and shape future offerings; direct access to early adopters attracts new companies to Indiana; those companies create more-informed and demand-driven innovations. Farmer needs are better met and uptake improves, leading to improved farm outcomes. The demonstrated benefits of this approach draw additional capital and companies to Indiana and additional farmers to engage in the process. Indiana strengthens its position as a conducive, enabling environment for innovators and innovative agbioscience companies to thrive.

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- **Mechanisms to identify on-farm innovations** with commercial potential and create pathways for farmers to profit from their inventions

## Indiana Strengths to Build Upon

In addition to the strengths identified in the Current State section (pages 11–19), the following are opportunity-specific strengths from which Indiana is well-positioned to build:

- An existing model for farmer-engaged innovation.** AgriNovus convenes Indiana farmers, companies, entrepreneurs, and students in a Producer-Led Innovation Challenge competition with a \$25,000 commercialization prize. Since its launch in 2020, every company that has won the challenge has received follow-on funding or has been acquired. This challenge—founded by farmers—continues to be farmer-funded, with challenge winners selected by farmers.
- Co-location of large-scale agricultural production alongside agbioscience leaders, new entrants, and enabling organizations.** The co-location of producers, distributors, large corporates, research universities, early- and growth-stage companies, and enabling entities such as Elevate Ventures provides a good test bed for agbioscience innovation.
- Strong farmer cooperatives and commodity groups.** Organizations like the Indiana Soybean Alliance and Indiana Farm Bureau (both AgriNovus Board members) provide working knowledge of and access to large farming communities. These organizations can provide starting points for gauging farmer interest and identifying early-adopter farmers.
- Sizable population of new and beginning farmers.** New and beginning farmers (those with less than 10 years of experience) account for nearly 30% of Indiana’s farmer population. With an average age of 43.2 years old, this new generation of farmers stand out as digital natives with potential to integrate new ways of working into their farming operations.
- Indiana’s strategic focus on entrepreneurship.** Indiana Economic Development Corporation’s (IEDC’s) economic development strategy<sup>11</sup> highlights entrepreneurship as one of its core components. Conferences like the annual Rally Innovation Conference<sup>12</sup> and the 2025 Global Entrepreneurship Congress hosted in Indianapolis<sup>13</sup> create strong momentum for the Farmer-Focused Innovation opportunity.

**“Being close and being able to get in a pickup truck and talk to your customers—that’s a big deal for us.”**

—Chuck Margo<sup>10</sup>  
CEO of Corteva  
About deciding to move  
Corteva HQ to Indianapolis

## What might success look like?



**AgriTech Indiana** initiative leads to mutually beneficial partnerships and economic prosperity.

In 2050, through the AgriTech Indiana initiative, Eli, a fourth-generation Indiana corn farmer, and Maya, an innovative tech entrepreneur, forged a partnership. Together, they introduced a fleet of AI-enabled micro-drones that can perform high-precision agriculture—from real-time crop analysis to microdosing of nutrients and organic pest control. Their alliance was facilitated by the program’s grants and collaborative network, which nurtured their venture from a concept to a sustainable, high-yield farming model. This, and hundreds of other similar examples, became the cornerstone of Indiana’s agricultural transformation, highlighting how harmonizing farming expertise with groundbreaking technology can lead to economic prosperity and environmental stewardship.

*This is a hypothetical, fictional company.*

## Recommended Ecosystem Actions for Farmer-Focused Innovation

Farmer-focused innovation opportunity involves developing a user-centered innovation program that recognizes farmers' central role in the agbioscience economy. RTI recommends the following next steps for the ecosystem as it advances this opportunity.

**Differentiate Indiana through a thriving community of early-adopter farmers.** A thriving community of farmers with the right incentives to become early adopters and innovation partners could differentiate Indiana to early- and growth-stage agbioscience companies. To build this community, conduct research to understand Indiana farmer, advisor, and start-up segmentation, as farms and start-ups vary drastically in their innovation ambitions, needs, and challenges. Collaborate with farmer cooperatives, intermediaries, and other stakeholders to conduct listening tours that pinpoint shared innovation ambitions, opportunities to strengthen farmer entrepreneurship, and incentives for collaboration.

**Design user-centered innovation program.** Engage potential farmers and agbioscience companies that may participate in the program through listening sessions and user-centered design research methods. Design the innovation program and its offerings tailored to Indiana farmers and entrepreneurs' needs.

**Support farmers in navigating key innovation and adoption challenges.** Provide targeted services and incentives to help early-adopter farmers manage risks associated with adopting new technologies and practices and diversifying their revenue stream. Recognize that farmers are constantly approached with new solutions that promise efficiency and financial returns. Ensure farmers' time is well spent while still preserving the opportunity for farmers to shape agbioscience innovation in its earliest stages of development.

**Develop creative mechanisms that reward farmer contributions to innovation.** Pilot innovative investment mechanisms or profit-sharing arrangements that enable farmers to share in the financial success of the innovations they help develop as early-adopter partners. Examples to learn from include AgLaunch and Fulcrum Capital.<sup>26,27</sup>



**Nurture and showcase the Farmer-Focused Innovation program.** Convene and nurture connections between early-adopter farmers and agbioscience companies. When possible, showcase innovative Indiana farmers, their inventions, and the innovation program through channels like the Agbioscience podcast. Ensure parallel initiatives and programmatic elements are well-connected to this innovation program to avoid presenting a fractured landscape of entrepreneurial support to farmers.

**Measure and adapt for economic, social, and environmental impact.** Implement effective learning systems to understand the impact of the Farmer-Focused Innovation program on the Indiana economy and the broader agbioscience economy. Over time, evaluate the net positive social and environmental impacts of technology adoption, alongside economic indicators of growth, to ensure the program contributes to a more sustainable and equitable future for Indiana agriculture. Develop mechanisms to adapt the program and its services based on lessons learned and delivered benefits to continuously improve its impact and effectiveness.

Figure 14: Recommended Ecosystem Actions for Farmer-Focused Innovation

Now (0-1 year)	Next (2-3 years)	Future (4-5 years)
Differentiate Indiana through a thriving community of early-adopter farmers.		
<div data-bbox="243 758 552 852">Design a user-centered innovation program.</div>		
Support farmers in navigating key innovation and adoption challenges.		
<div data-bbox="318 947 803 1041">Develop creative mechanisms that reward farmer contributions to innovation.</div>		
	<div data-bbox="712 1052 1481 1125">Nurture and showcase the farmer-focused innovation program.</div>	
		<div data-bbox="963 1136 1481 1209">Measure and adapt for economic, social, and environmental impact.</div>

## AGRINOVUS RESOURCES

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# PRODUCER-LED INNOVATION CHALLENGE OPPORTUNITY IDENTIFICATION

AUGUST 2024



A study completed by Aimpoint Research informed the scope of AgriNovus Indiana's 2024 Producer-Led Innovation Challenge and outlined three areas of opportunity to innovate for farmers, including labor shortages and management, administrative burden and technological adoption.

[Download the full report here.](#)



In order to inform the Producer Led Innovation Challenge, AgriNovus sought to understand key inefficiencies that hinder the profitability of Indiana producers. Using both quantitative and qualitative methodologies, Aimpoint Research worked to identify those inefficiencies that are most acutely felt among producers and crystalize specific measures to address them.

Aimpoint conducted a series of in-depth interviews among five Indiana producers with Gross Farm Income (GFI) above \$100K. At the same time, an online survey was conducted among an additional 150 producers who fit the same criteria. While the in-depth interviews conversationally explored producer sentiment towards operational inefficiency, the survey sought to validate that those inefficiencies are indeed felt by the larger population of Indiana producers.

A key pattern from conversations with producers is that the idea of 'inefficiency' is difficult to perceive much less isolate operationally. A common theme is farmers' ways of working are assumed as necessity rather than examined for potential improvement. However, three primary themes emerged in both the qualitative interviews as well as the producer survey.

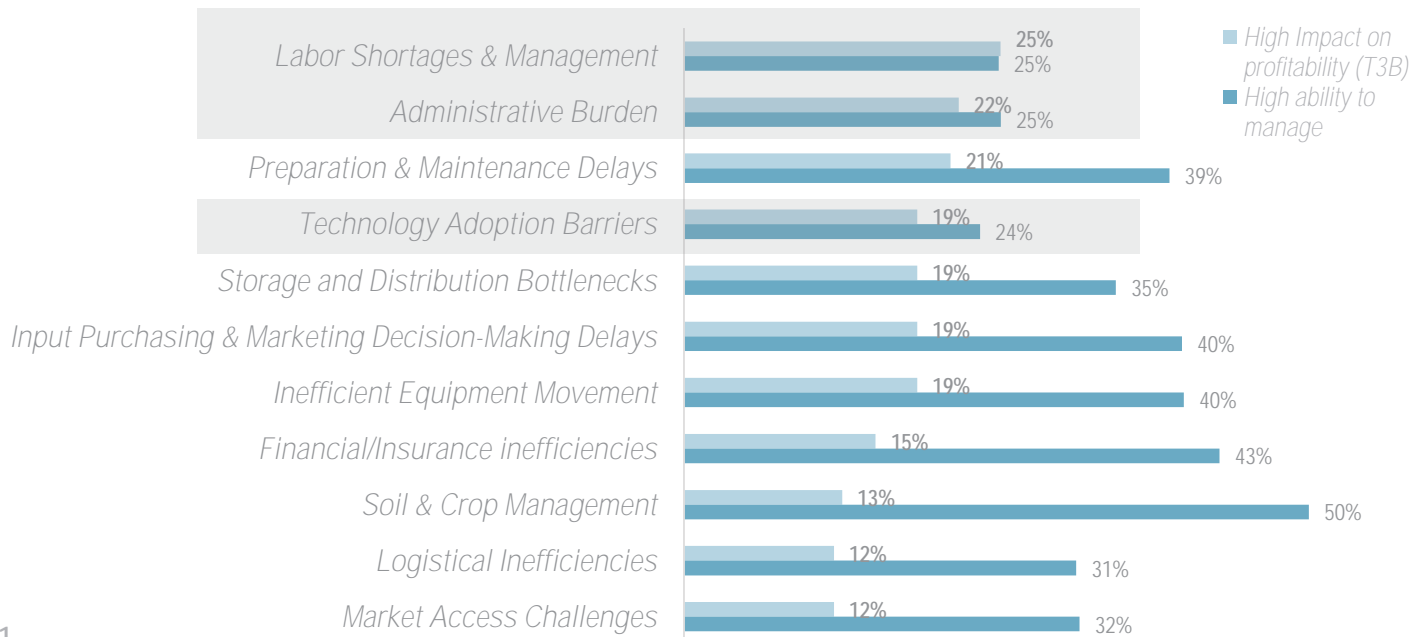
1. Labor Shortages & Management

2. Administrative Burden

3. Technology Adoption Barriers

## IMPACT VS. ABILITY

When impact and ability are both considered, the three inefficiencies of labor management, administrative burden, and technological adoption barriers stand out in terms of the disparity between producer ability to manage and the impact to profitability. They are impactful factors that are difficult to manage.





# LABOR SHORTAGE AND MANAGEMENT

A major issue that emerged from in-depth discussions with Indiana producers was the issue of labor and its relationship to technological innovation. This sentiment is echoed in the producer study with *'Labor Shortages and Management: Issues managing workers, especially during busy times'* cited as the most impactful inefficiency limiting operational profitability with nearly a third of producers claiming to have *'low ability'* to manage this obstacle.

The agriculture industry has long relied on an immigrant workforce, but fewer young immigrants are entering the workforce, and this trend is not expected to change. As this labor pool dissipates, wages are driven upward making workers both scarce and expensive. While programs like H-2A are helpful, they are cumbersome to navigate. The eventual adoption of new technologies is a solution, but adoption comes at a sizable opportunity cost, and the requirement for more skilled labor, which is even more of a challenge to find.



*"There's a lot of technical expertise that farmers rely on in order to do some of the more sophisticated types of jobs. As farming becomes more and more digitized and equipment becomes more sophisticated, they want folks that have some technical experience. And that can be a bit challenging."*

# ADMINISTRATIVE BURDEN

ANOTHER INEFFICIENCY IMPEDING OPERATIONAL PROFITABILITY IS **'ADMINISTRATIVE BURDEN'** DEFINED IN THE PRODUCER SURVEY AS:

*Time-consuming paperwork for government incentive and risk management programs*

*Complicated admin due to inefficient land data*

*Time-consuming data entry and transferring processes for carbon programs*

*Regulatory cost and inefficiency*

During in-depth interviews, this administrative burden was more clearly expressed in terms of the **lack of consolidated access to operational data**. According to the IDC, the average farm generates 500,000 data points daily, a number that is expected to increase 800% by 2036. Whether it be financial, agronomic, or tied to some sort of credit program, modern farming operations produce a plethora of relevant data that is most actionable when multiple data streams are combined. To this point, no informational solutions have answered the call for simplified consolidation.

Frustrated by flawed or incomplete options, many producers have regressed to simple (and time consuming) alternatives such as spreadsheets. One type of data that creates a stumbling block is that related to market opportunity and pricing. Producers lack real-time pricing information which could better inform their selling decisions. Separate research also suggests administrative burden is keeping producers from leveraging value-added opportunities; a University of Vermont study showed nearly a third of farmers forego conservation incentive programs for this reason.



*"I use Farmworks, which is so ancient they are out of business, and it hasn't had an update in 8 years. But I still can't find anything to transition all those books, all of that data over to. I'll go back 10 years and say 'What was my biggest expense? What percent was interest in 2013 versus today?' I want the ability to take my 25 years of log data, of log accounting and push it into something new so that I can go forward and continue with that."*



# TECHNOLOGICAL ADOPTION

THE ISSUE OF TECHNOLOGICAL ADOPTION IS RELATED TO BOTH LABOR ISSUES AND ADMINISTRATIVE BURDEN. THE PRODUCER SURVEY DEFINED 'TECHNOLOGY ADOPTION BARRIERS' AS:

*Delays and inconsistencies in financing and adopting new farming tech*

*Uncertainty about getting a good return on money spent on innovative equipment*

Notable barriers to technology are cost and unclear value propositions. There is also a gross lack of industry standardization. For example, the USDA reported that only 42% of Indiana farmers have access to broadband internet - a condition that makes further informational integration nearly impossible.

Unknown or unclear ROI is another factor that impedes adoption. According to McKinsey, producers ultimately expect a 3:1 ROI to adopt a new technology but uncertainty surrounding new offerings make this difficult to estimate. Furthermore, informational limitations within their own operations impede accurate risk assessment. The factors of high cost and uncertainty have led to a situation where only 28% of North American farmers have adopted or plan to adopt precision agriculture technology over the next two years.




*"Whatever (new technology) is out there I'm probably going to hear about it and then I'm going to go back to (my business partner) to say, 'This is kind of where this is going.' and then we talk about it. 'Is this something we want to try? Does it make sense?' You know, that sort of thing. It would need to show us a return on dollars and that's how we proceed."*

## SUMMARY

Indiana producers who participated in both in-depth interviews and an online survey echo similar sentiments regarding the inefficiencies they face in their operations. The primary inefficiency is that of **labor management** and its relationship to the **adoption** of various labor-saving **technologies**. Simply put, finding adequate labor is difficult. While the market has responded to this with a variety of costly technological solutions that reduce labor needs, producers are constantly faced with the strategic decision between investment risk and labor uncertainty. Access to a willing and flexible labor pool is needed in the short term. Looking forward, producers would benefit from a way to accurately assess the costs and benefits of technological adoption.

The ability to **consolidate** a variety of **disparate data** into an organized and easily **accessible interface** would save time while providing producers **clear operational assessment**. Operations' data output has outpaced the management of that data. This causes a considerable burden when coupled with **paperwork** and **regulatory** hoops that must be executed in the name of compliance and/or to receive deserved benefits (credits, etc.). An **integrated information resource** that accurately consolidates and organizes a variety of operational data would help alleviate this pain point. The usefulness of such a tool would be amplified if this informational output were to become universally accepted by a variety of organizations (regulatory, financial, agronomic, etc.). Such a tool could not only save valuable time but could empower producers to make informed and accurate decisions as they consider operational issues of labor and technology.





AGRINOVUS

Velocity

**FOOD IS HEALTH**

## **PROBLEM STATEMENT**

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Accelerate innovation focused on driving increased access to food, improving middle-mile logistics to gain efficiencies, or unlock the power of food at the production and/or molecular level to positively impact healthier lives, communities and environment.

## AGRINOVUS RESOURCES

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*Accelerate 2050: A Vision for Indiana Agbioscience* identifies Indiana’s economic performance across food, animal health, plant science, agtech and production agriculture and defines priority opportunities to position Indiana’s agbioscience economy for differentiated growth amid future uncertainty. According to the study, Indiana’s three key opportunities include: farmer-focused innovation, food is health and bioinnovation.

[Download the full report here.](#)

## Food is Health

The Food is Health opportunity encompasses three complementary aspects aligned to the ecosystem's desire to nurture an agrifood system that creates healthier lives, communities, and environment: (1) accelerating food-focused research and commercialization at the intersection of plant, animal, human, and environment health; (2) enabling farmers to diversify production into horticulture crops and supply regional food economies; and (3) growing the value-added food-manufacturing base to address emerging consumer food interests (e.g., personalized nutrition, nutrient density, macronutrient profiles, functional foods) and improve human health outcomes. Together, the components of this opportunity unlock the power of food at the molecular, raw-product, and processed-goods levels.

**Indiana has the opportunity to drive innovation at the intersection of plant, animal, human, and environmental health, recognizing food as the nexus of these domains, to create both economic growth and improved health outcomes.**

## Opportunity in Context

Food is emerging as a central focus in the Indiana agbioscience ecosystem, with consumers increasingly recognizing the impact of their food choices on personal, community, and environmental health. At the same time, scientific advances and emerging technology platforms (e.g., microbiome engineering) create a high potential for intersectional innovation that capitalizes on the similarities in underlying biology and sector challenges.

Also, Indiana agbioscience GDP is poised for further growth if the state can more concertedly translate the outputs of its sizable agricultural production platform into inputs for an expanded value-added food and nutrition platform. Many food companies are shifting toward natural ingredients and exploring new product-development approaches. Others are deepening relationships with farmers and investing in their transition to regenerative agricultural practices to reduce supply chain risks and meet sustainability commitments. Indiana is well-positioned to emerge as a Food is Health leader, with efforts spanning upstream intersectional research to strengthened regional food economies bolstered by diversified agricultural production and an expanded based of value-added food companies.

## Critical Components to Capture the Opportunity

- **Dedicated leadership** to prioritize cross-sector collaboration and to mobilize their respective organizations to maintain support for shared ecosystem goals
- **Common discovery platforms with corresponding data-sharing agreements** that pool resources and enable discoveries relevant to plant, animal, human, and environmental health
- **Shared spaces and convening organizations** (e.g., networks, shared projects, QUADRANT events) that create collision opportunities by bringing people together on broad and focused cross-sector topics
- **Multidisciplinary research teams** that can identify opportunities and discover novel solutions at the intersection of traditionally siloed scientific domains and industries
- **Enabling incentives and structures that promote collaboration** across the food value chain and with adjacent industries such as pharmaceuticals; nutraceuticals; health care; and medical technology, which may include joint initiatives or co-funded activities
- **Focused efforts to build homegrown or recruit value-added food companies** that align with the Food is Health opportunity
- **Deepened understanding of local food demand and regional agrifood systems**, including ways to shorten food supply chains by better connecting local agricultural production and value addition with communities' food needs
- **High-level support and incentives for crop diversification** among state agencies, commodity groups, and other key agricultural sector leaders who can influence policies, resourcing, and other support for regional and local food systems

## Indiana Strengths to Build Upon

In addition to the strengths identified in the Current State section (pages 11–19), the following are opportunity-specific strengths from which Indiana is well-positioned to build:

- **Presence of industry leaders in plant, animal, and human health.** Indiana is home to major companies across the full spectrum of plant, animal, and human health (e.g., Eli Lilly and Company, Elanco, Corteva, Elevance Health).
- **Indiana’s new One Health Innovation District.** The recently announced One Health Innovation District aims to be a “globally recognized research innovation district dedicated to optimizing the health of people, animals, plants and the planet.”<sup>14</sup>
- **Strong research universities.** Indiana is home to three R1 research universities: Purdue University, Indiana University Bloomington (IU), and University of Notre Dame. Purdue University ranks 11th nationally for animal science majors and IU School of Medicine ranks 13th among all U.S. public medical schools in funding from the National Institutes of Health.<sup>15,16</sup>
- **Growing food science and food-manufacturing base.** Leveraging the availability of local source materials and its proximity to other regional agricultural producers, Indiana continues to support the recruitment and expansion of a variety of food manufacturers such as Clif Bar, Kraft Heinz, and Mission Foods.
- **Foundations for growth in food innovation.** Purdue’s Food Science Technology program ranks fourth nationally, and the Food Science Extension program aids Indiana food entrepreneurs and food and beverage companies with everything from food safety to preservation and packaging.<sup>17</sup>
- **Financial support for specialty crop expansion and food systems infrastructure.** Indiana state government offers block grants for specialty crop expansion that could be expanded and embedded in a broader crop diversification strategy.<sup>18</sup> It also offers grants to improve food supply resilience in the middle of the food chain.<sup>19</sup>

**The Indianapolis One Health Innovation District will serve as a place where “innovators will find a vast ecosystem of support—including one of the world’s leading universities, funding, lab space, collaboration with many other innovators and companies—and most significantly, shared technical development and pilot plant facilities to manufacture and scale innovations.”**

—Jeff Simmons, CEO Elanco

## What might success look like?



**Ecobiome** spins out of Indiana’s plant-animal-human health joint venture in 2038.

Ecobiome’s multidisciplinary R&D team used AI advances to map genetic pathways in soil, plant, livestock, and humans when they discovered commonalities across digestion, immunity, hormonal signaling, and more. These cellular- and molecular-level insights gave way to their flagship platform, SymbioSync, which optimizes soil microbial solutions for health outcomes across the entire food value chain. SymbioSync’s proprietary platform mapped vitamin absorption pathways in the human body and subsequently designed soil strains that upregulate the expression of plant’s endogenous genes to create more nutrient-dense fruits and vegetables with enhanced absorption.

*This is a hypothetical, fictional company.*

## Recommended Ecosystem Actions for Food is Health

Indiana is uniquely positioned to become a global leader in innovation at the intersection of plant, animal, human, and planetary health. Successfully advancing the Food is Health opportunity will depend on the combined efforts of multiple partners, as the scope of this opportunity extends beyond what any single organization can accomplish independently. For Indiana agbioscience to advance this opportunity area and drive economic growth through Food is Health, RTI recommends the following next steps for the ecosystem:

**Define and prioritize more-specific focus areas within Food is Health.** Differentiating Indiana within the broader Food is Health opportunity will require clarifying and establishing traction in specific focus areas. Finding and prioritizing these focus areas should involve diverse ecosystem stakeholders and involves four steps:

**Explore potential focus areas within Food is Health.**

Food is Health touches many industry sectors and cross-cutting research and commercialization areas. Mapping the landscape of intersection between food and the agbioscience innovation platforms will clarify potential focus areas within Food is Health. Monitor other ecosystems pursuing intersectional Food is Health type strategies to ensure differentiation.

**Identify Indiana-specific resources and assets aligned with potential focus areas.** Innovating at intersections requires connecting and convening existing assets and building new ones. Build a fresh and data-driven understanding of the breadth of Indiana's food-related assets within each potential focus area.

**Align ecosystem stakeholders on Indiana's differentiated research and commercialization priorities within Food is Health.** Prioritization will drive intentionality and focus to prevent Food is Health from becoming all-encompassing and difficult to communicate or execute.

**Coordinate resources, action plans, and messaging around focus areas.** Chosen focus areas may overlap with other Indiana initiatives or ecosystem actors. A critical role of an ecosystem convener like AgriNovus will be to ensure that related initiatives collaborate rather than duplicate efforts in pursuit of the goal.

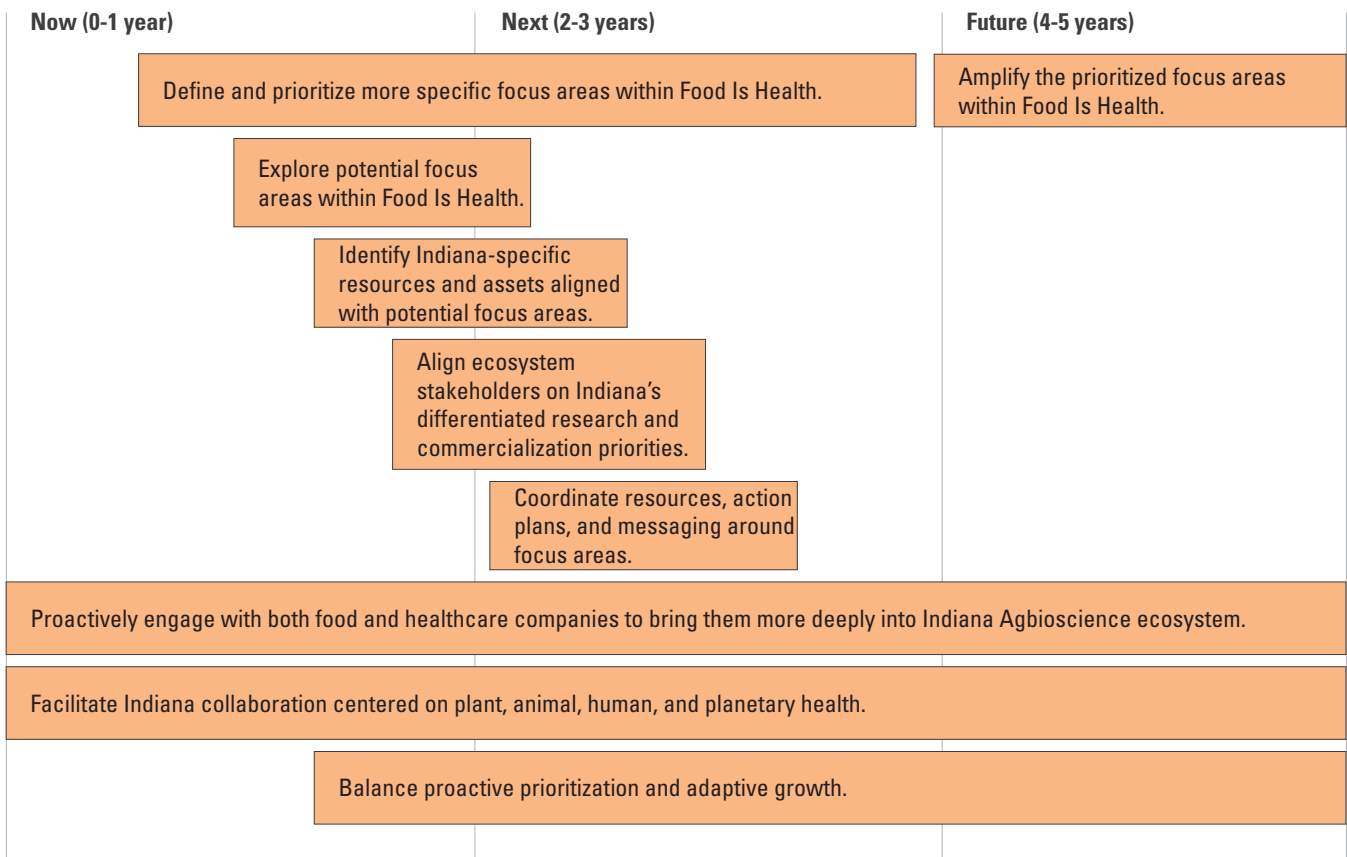
**Proactively engage with food and health care companies to bring them more deeply into Indiana agbioscience ecosystem conversations.** Monitor the landscape of relevant start-ups and establish relationships with related larger entities. Nurture formal (i.e., joint venture agreements) and informal collaborative relationships within the priority focus areas.



**Facilitate Indiana collaboration centered on plant, animal, human, and environmental health.** To succeed, the ecosystem must go all-in on collaboration and build both the physical and social infrastructure needed to make collaboration more than just a buzzword. Indiana agbioscience must continue to foster an environment where various industries collide that are working toward similar goals and are striving to solve similar problems. In addition to broad convenings, topically focused convenings can accelerate specific opportunity identification, drive collaboration, and strengthen the brand of the Indiana agbioscience ecosystem.

**Balance proactive prioritization and adaptive growth.** Food is Health is likely to be a very dynamic opportunity area over the next decade, as advances in AI accelerate scientific discovery, consumer health and wellness trends shape behavior, scientific understanding of precision and personalized nutrition advance, and the health care system evolves. A deeper understanding of differentiated focus areas is necessary, but the agbioscience ecosystem should be adaptive and responsive and should seek to accelerate growth in focus areas that gain early traction. Network effects make attracting the next company within a focus area easier with each successive win.

Figure 15: Recommended Ecosystem Actions for Food is Health



# INDUSTRY RESOURCES

## Elevance Health

- 19% of Commercially Insured patients over 18 list access to healthy food as a Health-Related Social Need

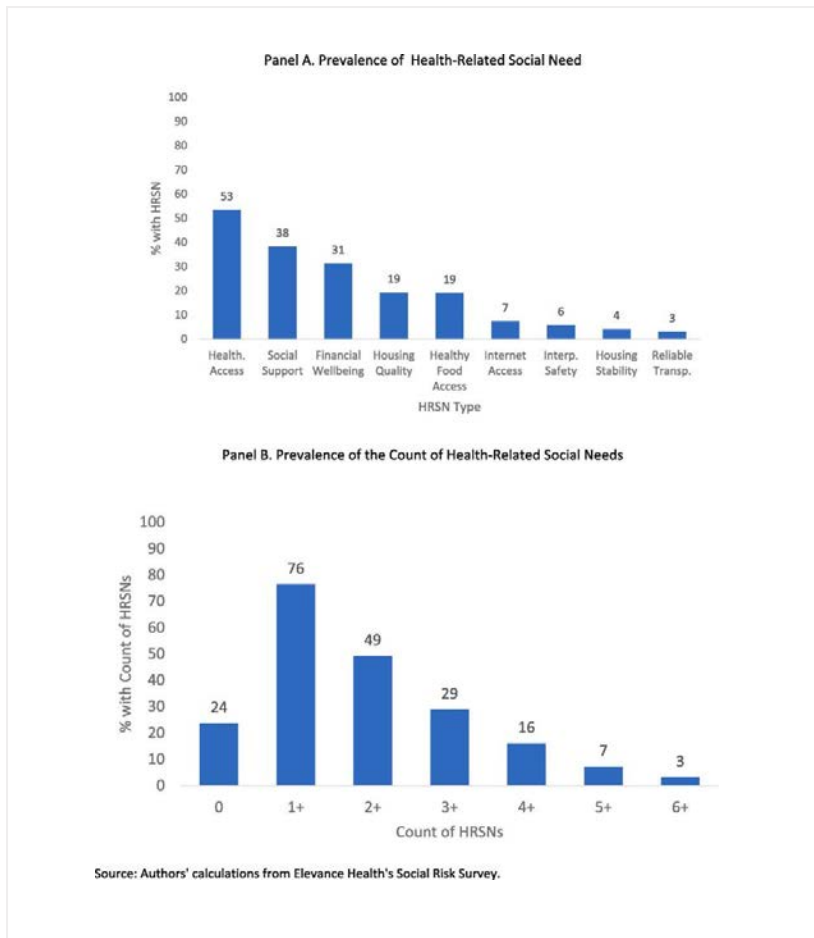


FIG 1. Prevalence and Number of Health-Related Social Needs among a Sample of Commercially-Insured Adults (≥18 years) from Georgia and Indiana, Dec 2021-Mar 2022 Survey (n = 1,160) Source: Authors' calculations from Elevance Health's Social Risk Survey.

**Source:** Falconi AM, Johnson M, Chi W, Stephenson JJ, Marc Overhage J, Agrawal S. Health related social needs and whole person health: Relationship between unmet social needs, health outcomes, and healthcare spending among commercially insured adults. *Prev Med Rep.* 2023 Nov 8;36:102491. doi: [10.1016/j.pmedr.2023.102491](https://doi.org/10.1016/j.pmedr.2023.102491). PMID: 38116266; PMCID: PMC10728312.

- 14% of all households experience food insecurity

**Source:** [Elevance Health](#)

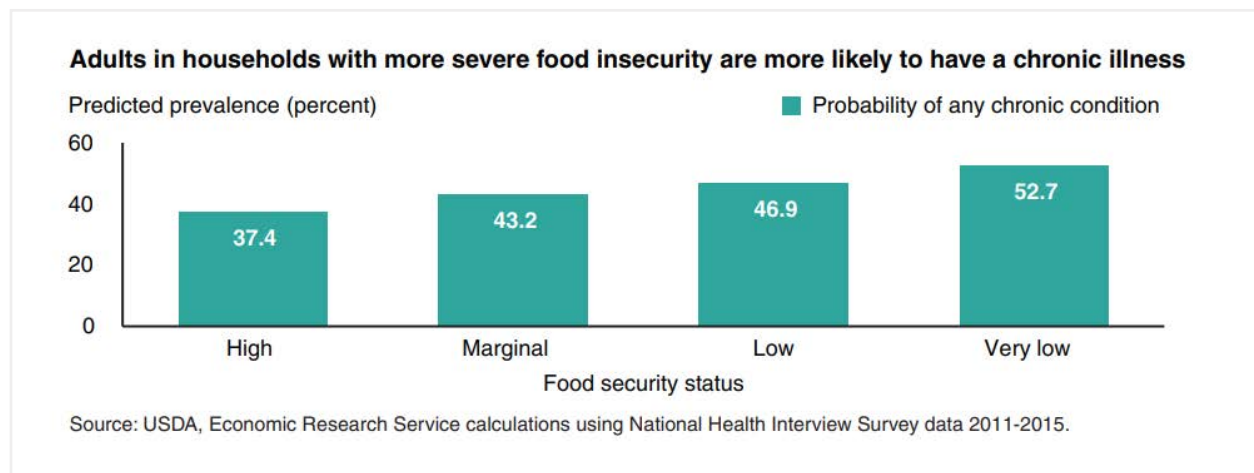
- Many Americans face unmet social, economic and health needs.

Source: [Elevance Health](#)



## U.S. Department of Agriculture (USDA)

- Adults in households with very low food security were 15.3 percentage points more likely to have any chronic illness than adults in households with high food security, as is shown in the figure below. This is a 40-percent increase in overall prevalence.



- “The magnitude of the higher probabilities of chronic illness associated with food insecurity is striking. Even for adults in marginally food-secure households—which are normally classified as food secure and typically endure relatively mild food hardships—the associated increases in the probability of hypertension, diabetes, and COPD are 20, 59, and 158 percent, respectively, compared to the (baseline) prevalence of those diseases in low-income, high food-secure households. The gaps in relative health risks associated with low versus very low food security are even larger.”

Source: Christian A. Gregory, Alisha Coleman-Jensen. [Food Insecurity, Chronic Disease, and Health Among Working-Age Adults](#), ERR-235, U.S. Department of Agriculture, Economic Research Service, July 2017



# BIOINNOVATION

## PROBLEM STATEMENT

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Develop technology focused on the use of novel microorganisms, biological transformations, and biomolecules that unlock powerful markets that are bio-based products, sustainable bio inputs, as well as biofuels and alternative energy which impact both the agriculture industry and the broader economy as a whole.

## AGRINOVUS RESOURCES

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*Accelerate 2050: A Vision for Indiana Agbioscience* identifies Indiana’s economic performance across food, animal health, plant science, agtech and production agriculture and defines priority opportunities to position Indiana’s agbioscience economy for differentiated growth amid future uncertainty. According to the study, Indiana’s three key opportunities include: farmer-focused innovation, food is health and bioinnovation.

[Download the full report here.](#)

## Bioinnovation

Bioinnovation creates the enabling infrastructure, financing, and partnerships needed to advance all scales of biotechnology product, platform and process development—from early-stage R&D to pilot-scale trials to commercial-scale operations. Importantly for Indiana, this opportunity leverages the agricultural sector as primary market for biotechnology products (i.e., bioinputs) and a supplier of the raw materials needed for the industrial biomanufacturing industry.

**Indiana has the opportunity to become the premier destination for bioinnovators and biomanufacturers to research, commercialize, and scale biotechnology processes, platforms, and products.**

## Opportunity in Context

Biotechnology and AI are powerful platform technologies that hold wide possibilities for the agbioscience economy, especially in terms of accelerating the discovery and development of novel microorganisms, biological transformations, and biomolecules. This potential boon in early-stage innovations is converging with an unprecedented demand for bio-based products in the United States and globally. Governments increasingly look to alternative fuel options such as biofuel to enable transportation and energy sector transitions. Growing consumer demand for more sustainable and bio-based products ranges from packaging to cosmetics. In the agriculture sector, expanding use of regenerative agriculture practices opens opportunity for complementary bioinputs (e.g., biopesticides and biofertilizers) to reduce synthetic input use.

This convergence of accelerated scientific discovery and growing demand for bio-based products presents a sizable opportunity to more readily advance early-stage discoveries into commercial pipelines, but only if the requisite infrastructure, capital, and partnerships are in place to support this translation to commercially viable bioproducts. Current U.S. shortages of mid-scale bioreactors have forced some biomanufacturing companies to look internationally to scale their operations.<sup>20,21</sup>

## Critical Components to Capture the Opportunity

- **Biological technology platforms** leveraging tools like AI, advanced omics, high-throughput screening, and gene editing
- **Optimized bioconversion processes (e.g., feedstocks, microorganism strains, bioreactors)** that can serve commercial interests at different scales and for different products
- **Strong linkages** between academic institutions and early-stage start-ups at the forefront of Bioinnovation and the industrial biomanufacturing sector to bring the innovations to commercial scale
- **Different scales of retrofitted or new biomanufacturing infrastructure** and modular, flexible equipment
- **Shared infrastructure and collaborative mechanisms to translate foundational assets** (e.g., data sets, computation tools) across the agbioscience ecosystem
- **Available capital to support mid-stage companies** operating at demonstration and first commercial scale
- **Formalized co-locations or circular systems** that valorize agricultural waste streams into high-value (e.g., specialty ingredients) or commodity outputs (e.g., chemical feedstocks)

## Indiana Strengths to Build Upon

In addition to the strengths identified in the Current State section (pages 11–19), the following are opportunity-specific strengths from which Indiana is well-positioned to build:

- **Abundant feedstock.** Indiana is the fourth largest producer of soybeans and fifth largest producer of corn in the United States.<sup>22</sup> Corn and soybeans are important biomanufacturing feedstocks, providing companies a strong pull to the state.
- **Existing bioprocessing industry.** Major agriculture processors, such as Cargill, ADM, Bunge, and Primient, have invested in wet and dry mills and soybean processing facilities across the state. Available feedstocks and bioprocessing infrastructure can be leveraged for higher value-added products, such as biofuels, and bio-based replacements for other petroleum products.
- **Mix of established leaders and new entrants.** Indiana’s agbioscience economy boasts global industry leaders like Corteva Agriscience, which develops bio-based crop protection products among other products, and new ventures like AgroRenew, a start-up that aims to repurpose watermelon, cantaloupe, and pumpkin waste into bioplastics.
- **Established and growing green energy production.** Indiana is home to ethanol companies, such as POET, Central Indiana Ethanol, and Verbio/South Bend Ethanol, which have corn-based ethanol plants across the state. Louis Dreyfus Company manufactures biodiesel in Claypool, Indiana.
- **Regional Technology and Innovation Tech Hub designation focused on U.S.-based bioproduction.** In 2023, the U.S. Economic Development Administration recognized Indiana as a region poised to ensure U.S. global competitiveness in domestic bioproduction. Led by Heartland BioWorks, the effort brings together partners such as Purdue University, IU, and BioCrossroads (a complementary CICP initiative) to grow Indiana’s biotechnology manufacturing ecosystem.<sup>23,7</sup>
- **New investment in precision fermentation infrastructure.** Biomanufacturing start-up Liberation Labs broke ground on a precision fermentation facility in Richmond, Indiana, in 2023. The facility aims to “fill a pressing need among food companies for animal-alternative ingredients.”<sup>24</sup>

**“The opportunities ahead are bigger now than Indiana has seen in many many years.”**

—AgriNovus Board Member

## What might success look like?



*This is a hypothetical, fictional company.*

**NanoSynth Solutions**, established from the acquisition of a pharmaceutical company’s R&D facility in Indianapolis in 2025, revolutionizes biomanufacturing with its rapid microbial evolution platform. The platform speeds up the microbial engineering process from months to minutes. NanoSynth can screen billions of genetic variations in the matter of minutes, unleashing the potential for near-instantaneous development of custom solutions for an unlimited number of possible food and agriculture applications. NanoSynth chose Indiana due to its rich agricultural resources that feed its fermentation platform and for Indiana’s unparalleled biomanufacturing workforce that brings the complimentary skillsets needed to operate and maintain its platform, from strain optimization and engineering to fermentation process design and scale-up to downstream processing.

## Recommended Ecosystem Actions for Bioinnovation

From early-stage research and product development to scale-up to commercial operations, biotechnology is ripe with potential for innovation and scaled impact. Pathways to economic growth through the Bioinnovation economy could take several forms. RTI recommends that the next steps for the Bioinnovation opportunity involve identifying focus areas to drive targeted growth activities.

### **Clarify industry-specific needs and challenges related to the development and scaling of Bioinnovation solutions.**

Whereas the long-term potential of Bioinnovation is clear, the near-term needs and specific opportunities vary by industry segment (e.g., the needs and near-term opportunities for sustainable aviation fuels are different from precision fermentation for food ingredients). Specific actions include the following:

**Segment the Bioinnovation ecosystem** into its component biotechnology processes and platforms, from early-stage to commercial, to further describe discrete subopportunities (e.g., traditional fermentation, precision fermentation, microbial strain engineering, bioproduct discovery and characterization).

**Identify industry needs across the Bioinnovation segments.** Consider the full breadth of bioproduct industries, including pharmaceuticals, enzymes, ingredients, oils, fats, textiles, plastics/polymers, fuel, pigments, and other specialty chemicals to understand the latent or underserved technology or innovation needs that could be addressed.

**Identify priority focus areas of Bioinnovation R&D** where Indiana can leverage its existing university and corporate R&D assets to become the global leader in accelerating discovery and development. This step will include clarifying Indiana's unique advantage in commercialization and scaling industrial biomanufacturing vis-à-vis other Midwest states. Gather intelligence to compare Indiana's commercialization infrastructure, crops, land or water assets, and other advantages (energy, waste treatment, business incentives) with those of other Midwest states (Iowa, Illinois, Nebraska). Research the return on investment for building out biotechnology infrastructure to understand which investments will generate the highest impact.

**Explore building additional biomanufacturing infrastructure.** Europe is leading the world in fermentation capacity. The U.S. government is investing in expanding domestic biomanufacturing infrastructure. Conduct additional research to evaluate the economic development potential of building out biomanufacturing infrastructure.



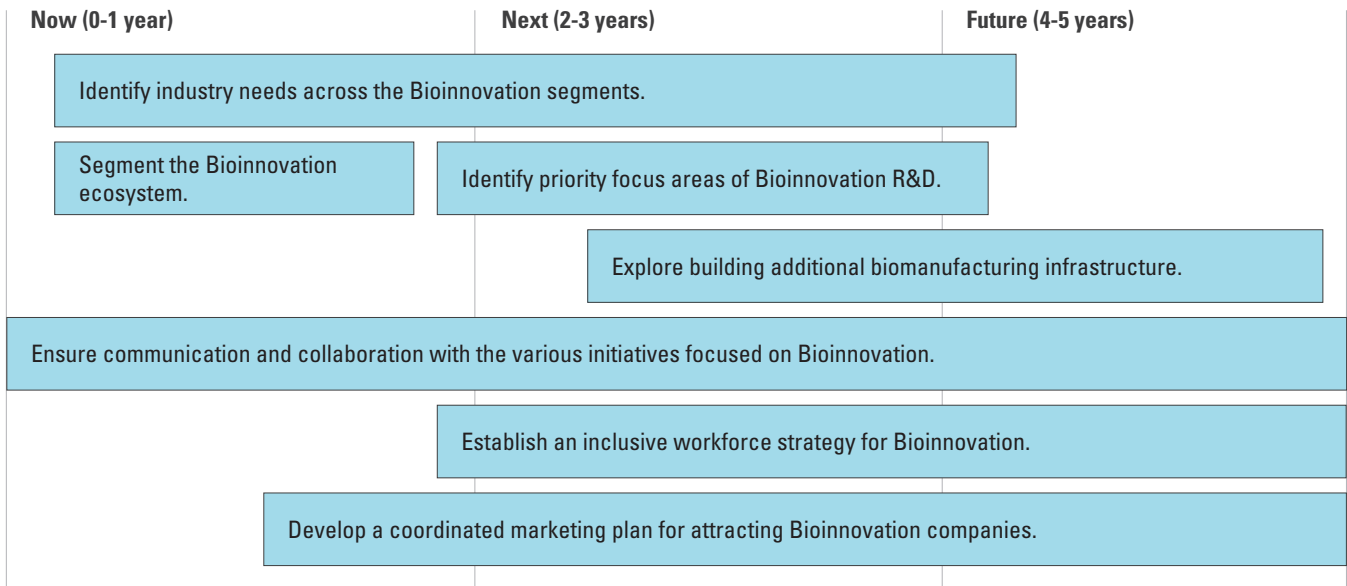
**Ensure communication and collaboration with the various initiatives focused on Bioinnovation**, including those in Indiana like Heartland BioWorks and BioCrossroads, and other regional or national groups like BioMADE. For example, BioLaunch, a strategic initiative of Heartland BioWorks, is targeting small and medium biotech innovators in the drug substances and drug products space, moving innovations from late-stage clinical development to manufacturing and distribution. Both the BioWorks consortium and the agbioscience biotechnology opportunity aim to accelerate the Bioinnovation lab-to-market pipeline by connecting stakeholders within advanced manufacturing and biotechnology.

**Establish an inclusive workforce strategy for Bioinnovation.** Today, industrial biomanufacturing lacks a trained workforce—one that blends high-science skills with advanced manufacturing and trade labor. Creating a workforce strategy can signal to prospective companies that Indiana is committed to building the skilled talent pipeline required to grow its footprint. Anchoring the strategy in the principles of inclusive workforce development can ensure that economic growth benefits both rural and urban communities and promotes diversity of talent within the biomanufacturing field.

**Develop a coordinated marketing plan for attracting Bioinnovation companies.** As place-based Bioinnovation hubs in Indiana like Heartland BioWorks and the LEAP Lebanon Innovation District mature, the ecosystem should create a coordinated plan to monitor the landscape of relevant start-ups, and build the pipeline of prospective companies. Example activities within this plan could include the following:

- Promote the existing industrial biotechnology industry in Indiana as anchor facilities to attract new companies.
- Expand relationships with Indiana bioprocessors who have relationships with emerging companies that are nearing commercial production.
- Monitor domestic commercialization pipeline of de-risked companies to identify and connect with prospects.
- Work with biomanufacturing Initiatives to identify funding sources.
- Assemble consortium partners that act as market uptake actors creating agreements with new companies.

Figure 16: Recommended Ecosystem Actions for Bioinnovation



# INDUSTRY RESOURCES

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## BioMADE

- **Key Areas:** Accelerates the commercialization of modern biotechnology products and identifies domestic supplies of important materials by focusing on the pilot-scale Manufacturing Readiness Levels
  - Data and design
  - Scale-up
  - Downstream processing
  - Testing and evaluation
  - Resilient bioindustrial manufacturing ecosystem
  - Commercial readiness

Source: [BioMADE](#)

- Mid-level pilot scale biological innovation that brings novel tech to our ecosystem/country – fermentation, genomics, synthetic biology, probiotic, etc

Source: [BioMADE](#)

- Project Call 5.0

Source: [BioMADE](#)



[Download the full report here.](#)

## 2. Project Call Overview and Focus Areas

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BioMADE is pleased to issue Project Call 5 [which includes the opportunity for NSF researchers to participate as part of an integrated project team](#).

Proposers will choose whether they are applying for BioMADE funding or for joint BioMADE and NSF funding as an integrated proposal. This packet describes the purpose, process, and eligibility criteria for this funding opportunity.

Project Call 5.0 focus areas are topic-specific and focus on advancing bioindustrial manufacturing by developing underlying tools and technologies to support diverse applications.

**The focus areas are:**

- **Data Acquisition for AI/ML Predictive Modeling**
- **Reducing Drivers of Cost**
- **Standardization of TEA Guidelines**

Successful proposals will describe in detail how the project aligns with the focus area(s) and the BioMADE Technical Roadmap. Version 3.0 of the Technical Roadmap will be available when the white paper submission portal opens. Proposals must also fall within BioMRLs 4–7, described in [Appendix E](#), with justification included that details the current BioMRL state and plan to advance BioMRL status for each bioproduct or process.

Integrated projects should include both NSF fundable basic research and BioMADE fundable MRL 4-7 research. Proposals should align with participating NSF programs and with the BioMADE project call focus areas. While BioMADE portions of the project must comply with relevant BioMADE membership and cost share requirements, the NSF funded portion of the project, designated as the MRL 1-3 level work, has no requirements for cost share or BioMADE membership. PIs are encouraged to reach out to a BioMADE Program Manager to discuss project viability and alignment to the Project Call. It is strongly recommended that PIs contact the director of the targeted NSF program prior to submission to determine relevance.

Details on the project call focus areas and instructions on how to submit a proposal can be found in [Guidelines for Successful Proposals](#).