IOWA STATE UNIVERSITY

Economic Development and Industry Relations

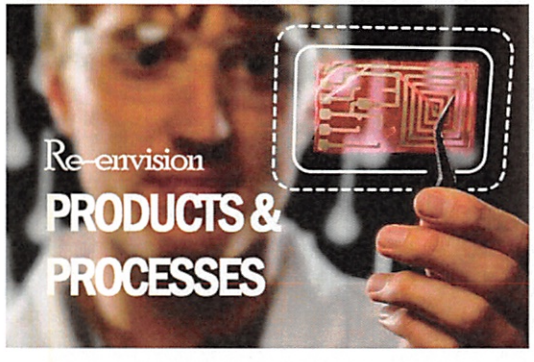
Building Our Innovation Ecosystem in Iowa

Senate Appropriations, Economic Development Subcommittee

February 21, 2023

PETER K. DORHOUT

Vice President for Research Iowa State University



STATE

Innovation Ecosystem

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Research Park
Rick Sanders
Pappajohn Center
Judi Eyles
America's SBDC, Iowa
Lisa Shimkat
CIRAS
Leah Barton, Interim Director
OIC ISURF/OIPTT
Patrick Klepcyk
EDIR
David Spalding

APLU Innovation & Economic Prosperity University Designee

Innovation & Economic Prosperity University awards go to APLU member universities that demonstrate excellence and leadership in planning, implementing, and evaluating programs and initiatives that support regional economic development and engagement. Institutions are only eligible to apply for IEP Awards once they have earned the IEP University designation.

Iowa State has had an IEP University designation since 2016.

IEP Awards:

2022 - Innovation Award Winner
2021 - Place Award Winner
2020 - Innovation Award Winner
2018 - Innovation Award Finalist
2017 - Talent Award Winner

America's Small Business Development Center Iowa

AMERICA'S SBDC IOWA

15 regional centers across the state and serves all 99 Iowa counties

Rural Business Innovators brings tech expertise to rural communities

Helps to start new companies

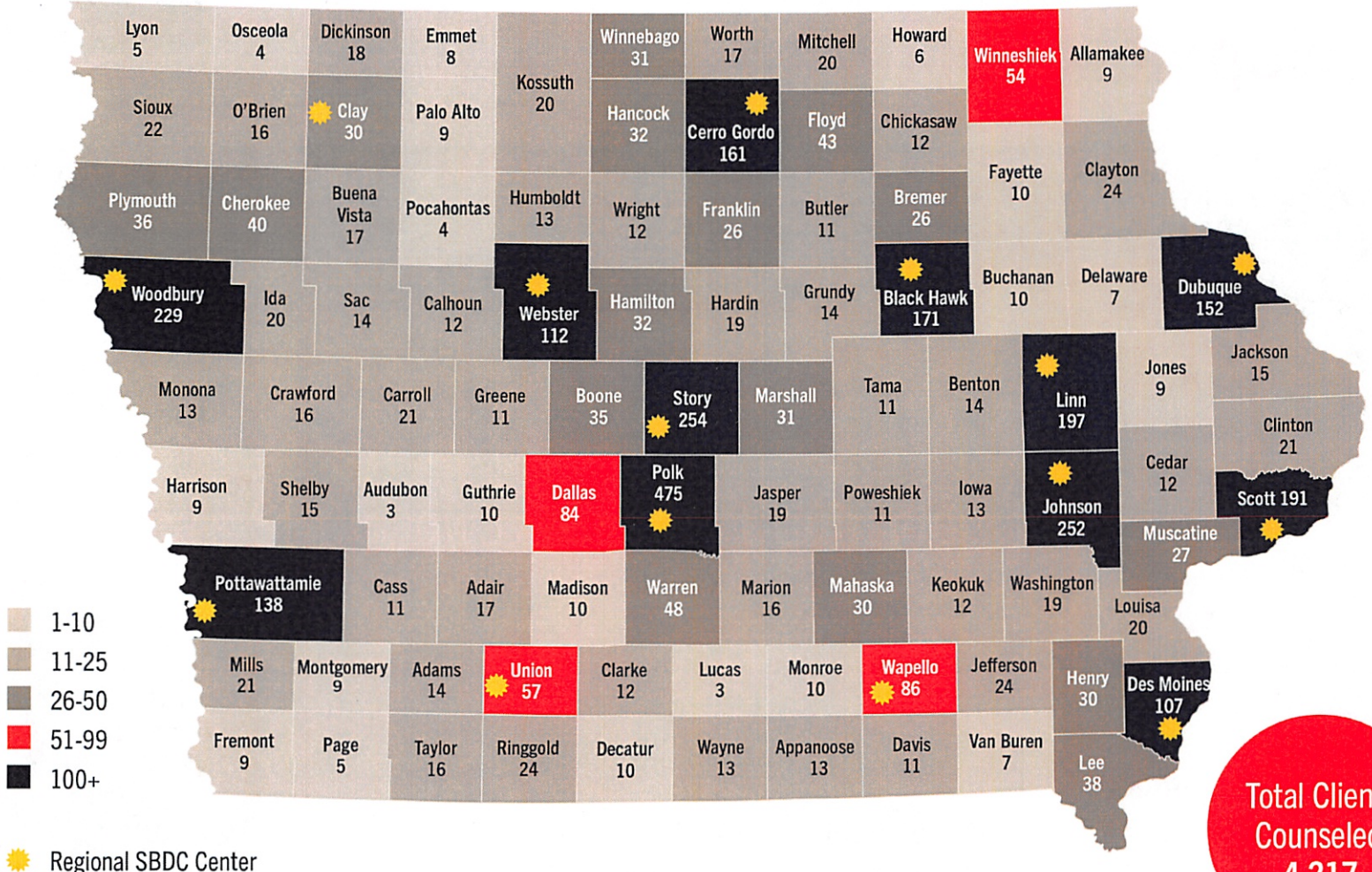
Provides business services/counsel to existing companies to:

- Solve management problems
- Improve operations
- Seek financing
- Pursue new opportunities

Impact of State Funding

State funding accounts for nearly 50% of program dollars.
Federal funding requires a 1:1 match, half of which must be in cash.

America's SBDC Iowa – Clients Counseled FY22



*An additional 80 clients were also seen from other states.

Total Clients Counseled 4,217

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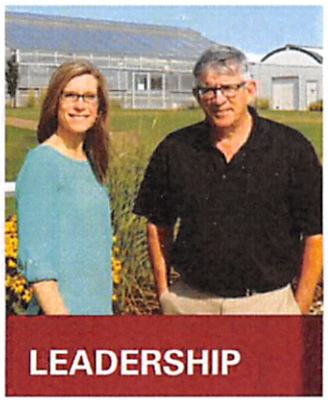
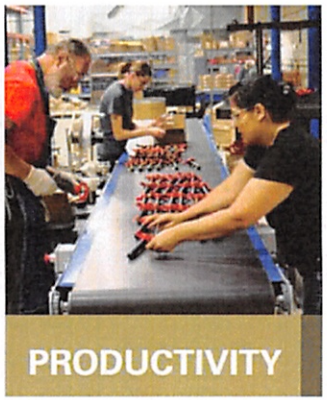
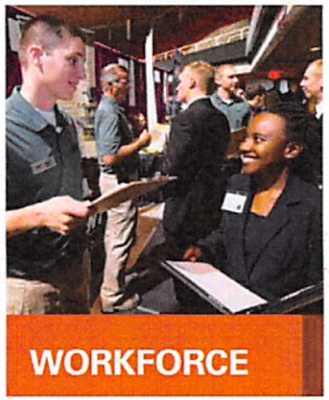
Center for Industrial Research and Service (CIRAS)

Helping Business Thrive

ciras



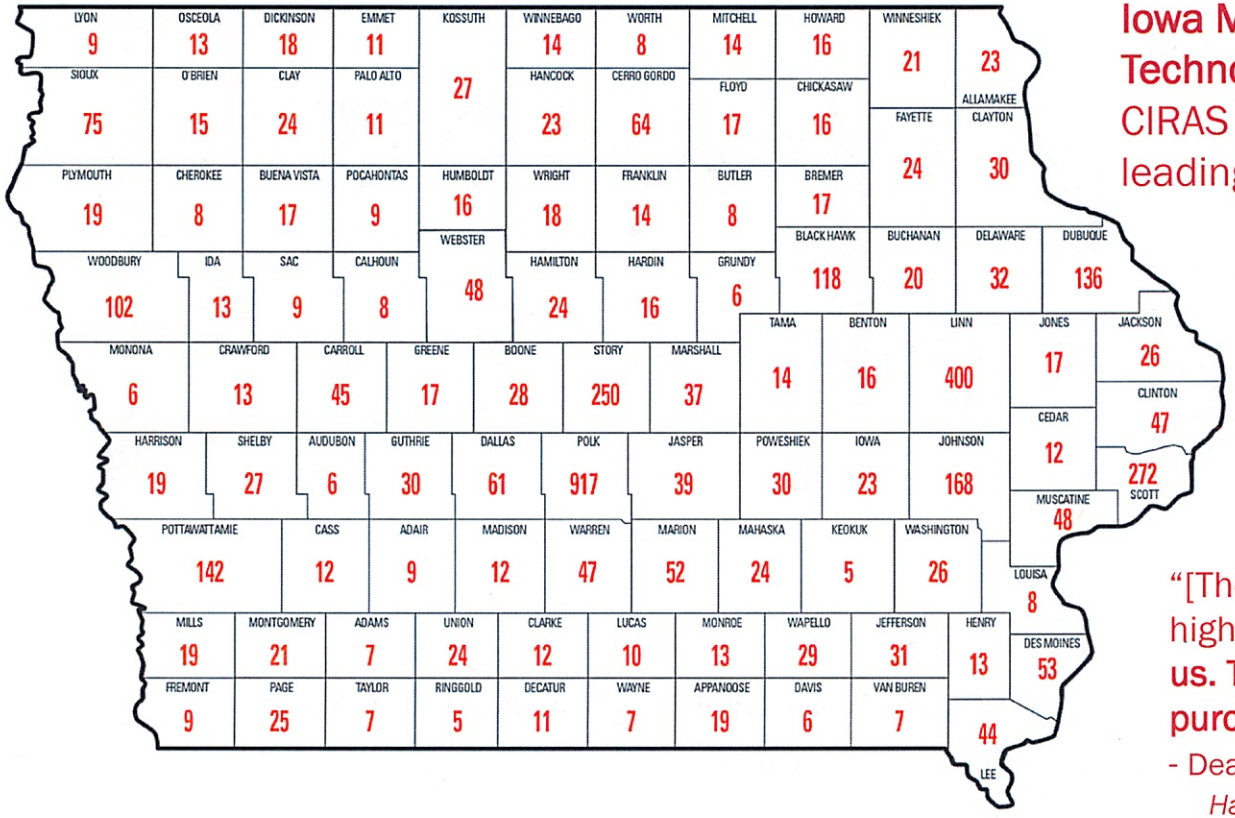




- Services, counseling, and training for Iowa businesses
- Focus on small- to medium-sized enterprises (SMEs)
- Manages Technology Assistance Program - Iowa Legislature Economic Development Committee
- Typical client achieves a 200% ROI – $2 return for every $1 invested

CIRAS: Impacting Iowans in 99 counties

Distinct Clients Served Last 5 Years



Iowa Manufacturing 4.0 Technology Investment Grants

CIRAS conducted 230 on-site assessments leading to:

$7M total funding to manufacturers

$70M manufacturer-reported results to date

"[The Cobot] freed up workers to do other, higher-level tasks. **It's been a real win-win for us. To be honest, we would have never purchased it at this point without the grant**"

- Dean Sonquist, Plas-TechTooling, *Hancock County*

CIRAS: Generating Results Across Iowa

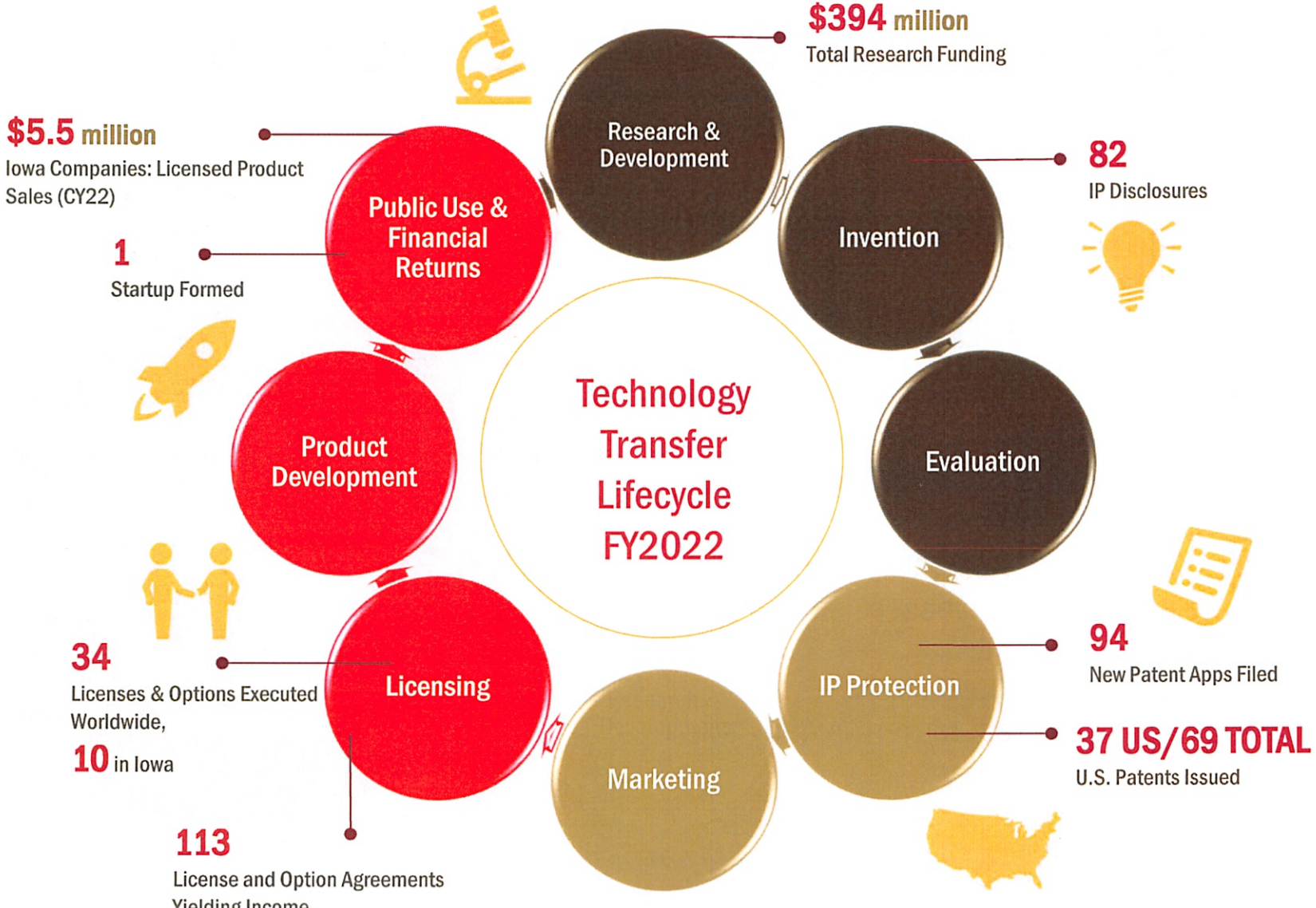
Connecting ISU with Iowa Industry

- 60 Engineering student capstone projects with Iowa businesses
- Digital Manufacturing Lab powered by Alliant Energy provides access to new technologies
- Hosted over 225 events across the state

CIRAS Results over the past five years:

- 4,408 distinct Iowa businesses served by CIRAS and its partners
- Economic impact of $2.8 billion
- Over 30,000 jobs created or retained

Life Line Emergency Vehicles
Bremer County



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Iowa State University Research Park

99 companies

call the ISU Research Park home (+20 paid affiliates)

2,328 people

are employed at ISU Research Park (tenants and coworking/affiliates)

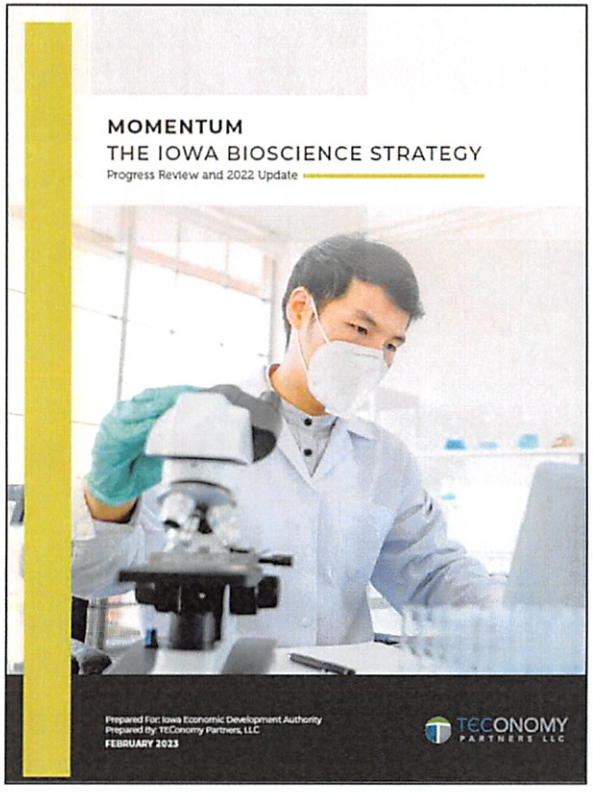
550 acres

approximately 850,000 square feet of building space

IOWA STATE UNIVERSITY

ISU Bioscience Platforms – Return on Investment

- Three years of investments have:
  - Hire Chief Technology Officers (CTOs)
  - Launched/helped over **27** startup companies
  - Involved over **153** researchers/students
  - Created new partnerships with over **29** companies though the seed grant mechanisms
  - Garnered over **$80.2 M** in federal/industrial funding that has been added to the innovation ecosystem in these platform areas



TEConomy Partners, 2023
For IEDA

Strengths of the Platforms

- CTOs are viewed by stakeholders as being a very successful addition to the platforms. The CTOs are instrumental in driving innovation commercialization across platforms through their individual commercial experience and because they come with significant relationships and contacts.
- State funds for the bioscience platforms are designed as highly flexible in their use by universities. Because the use of funds has not been overly prescriptive, the universities have been able to direct resources to where they feel they will be most effective.
- Platforms have helped organize people around common goals in a way that has resulted in real progress, including moving forward infrastructure projects and pursuing new opportunities

The Focus in the Biosciences

- Iowa State continues to support and grow innovation ecosystems and foster tech transfer from the three ISU-advantaged Bioscience Platforms

BioBased Products (BBP)

Vaccines, Immunotherapeutics, and Diagnostics (VID)

Digital and Precision Agriculture (D&PA)

- Experts working with ISU research teams to ID innovations with strong commercial potential; growing commercial partnerships with industry

BBP: The Future of Chemical Manufacturing

USDA CERTIFIED BIOBASED PRODUCT
PRODUCT 87%

BIOBASED CHEMICALS

Fermentation will grow as a way to make chemicals

by ***Craig Bettenhausen***

Most consumer-facing markets are seeing increased demand for low-carbon, plant-based products. In 2023, the volume and diversity of biobased chemicals made via fermentation will grow as microbe engineering gets better and synthetic biology unlocks a wider range of molecular targets.

One example of this trend is the growth of the industrial biotechnology firm **Genomatica**, which is rapidly commercializing fermentation routes to large-volume

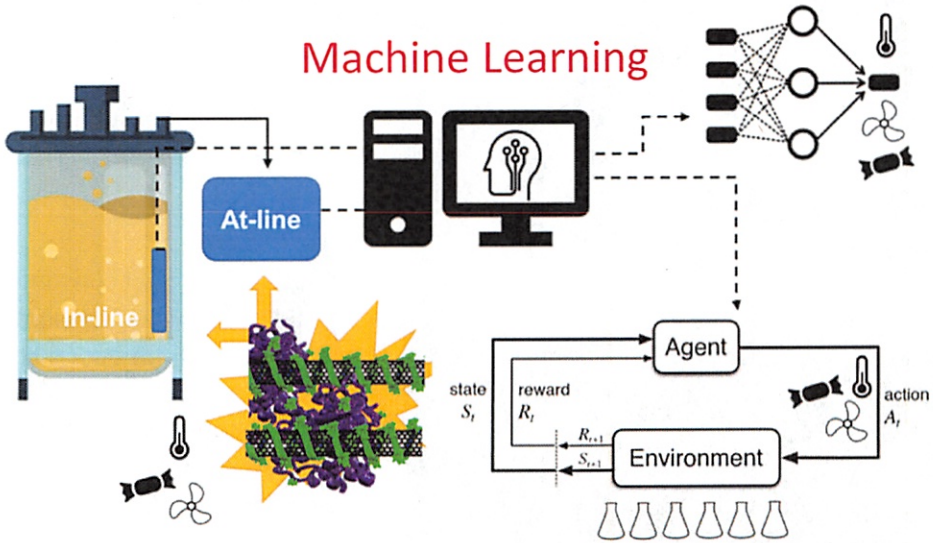
TAKEAWAYS

- Improved process engineering is enabling larger-volume chemical fermentation.
- Genetic engineering is opening up more molecular targets to microbial manufacturing.

BBP Corporate Engagement - BioMADE

The Bioindustrial Manufacturing and Design Ecosystem (BioMADE) Institute was established to improve production efficiency and scale-up of biobased products

- Within the *past year*, ISU awarded **>$2.6 million** in grants with key industrial partners
  - Cargill
  - Genomatica
  - Novozymes



Optimization project funded by BioMADE

BBP Startup – Pyrone Systems

PYRONE
SYSTEMS INC.

- Commercializing ISU-developed biopesticide technology
- Naturally occurring molecule delivers positive environmental impact. Novel mode of action combats pest resistance
- Closed initial funding round

Repellency

Performance equivalent to DEET

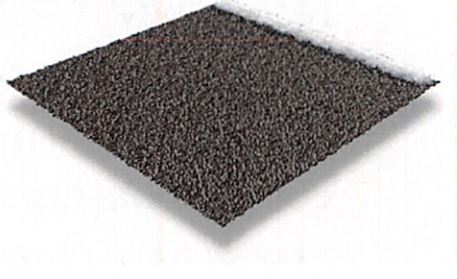
Insecticide

Efficacy for corn rootworm and soybean aphid

BBP Startup – Soylei Innovations

Soylei Innovations is and Iowa-based startup commercializing ISU technology for soybean oil derivatives used as asphalt modifiers

- More than 30 patents issued
- Current portfolio of 5 products marketed with Ames-based channel partner Colorbiotics
- Won $5 M USDA/NIFA grant for 2023



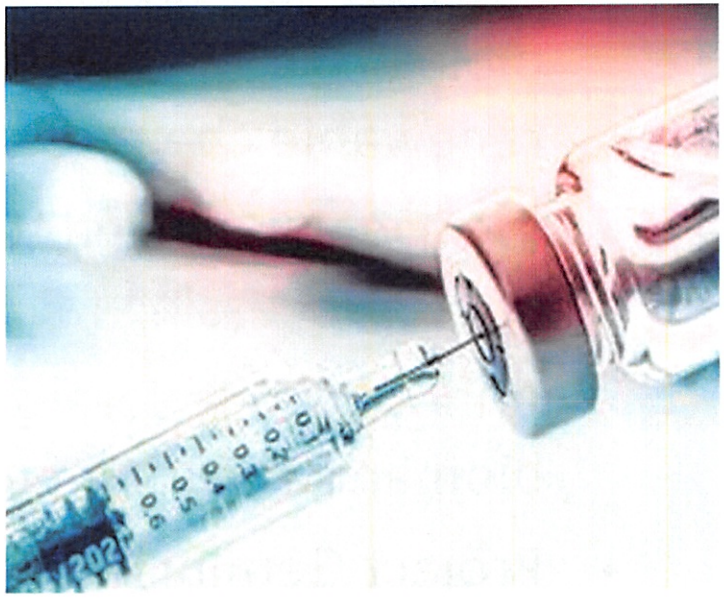
Longer life / higher-performance asphalt products

BBP Infrastructure – Project Gemini

- Addresses critical need for scaleup biomanufacturing capacity to support the pipeline of products in ag biologicals, animal and human nutrition, bio-materials and renewable chemicals
- Iowa ideally suited to host – feedstock, existing critical mass of bioprocessing facilities, renewable power, and talent
- Announced federal government support for funding of biomanufacturing facilities
- Project Gemini initiated to gather Iowa stakeholders to capture this opportunity – preliminary engineering, siting, budgeting in process

VID: CYVAX – Concept and Objectives

- Dedicated licensed space (1500 GSF) for vaccine pilot scale production
- Increase the value of ISU faculty-based research and associated IP for license with focus on regulatory compliance
- Increase the speed/efficiency of commercial development by Iowa based startup companies
- ISU-Industry Training of USDA and regulatory requirements



VID: CYVAX Results

Startup Support

- 3D Health Solutions (ISU Faculty Startup)
- Initiated commercial activity at CYVAX
- Graduate student > Full Time Employee

Existing Industry

- ELANCO needed a laboratory to evaluate new technology; CYVAX provided easy access to new Iowa location
- New Scientists hired for Iowa site, with expansion possible

3D HEALTH SOLUTIONS

Elanco™

VID: CYVAX Results

Advanced regulatory & commercial manufacturing training

- Regulatory product release (Potency Training) with JESS partnership
- 35 participants including students, faculty, startups and existing industry
- Additional sessions planned for 2023

VID: MERCK Strategic Partnership

- 4 - year agreement with $300K/yr in committed funding
  - Options to expand for specific projects
- Managed by a joint ISU-MERCK Steering Committee
- First year – actual funding was nearly $900K
  - 15 Active projects funded by MERCK AH
  - 3 projects funded by MERCK Human
  - 11 projects under discussion
  - Vet Med, Nanovaccine, Engineering, Library, Internships

VID: Commercial Fellowship

Challenge – Graduate students are top talent associated with new technology. New startups often have funding gaps that prevent talent retention.

Solution – A portion of BioScience platform funds was invested to establish a fellowship program to support talent retention, industry training, and job creation/retention in strategic areas

VID: Fellowship Results

Halide Biologics

- University of Iowa based startup
- Technology focused on Biotherapeutic protein stabilization
- Billion-dollar market
- Post-Doc essential for company development

Halide Biologics

VID Commercial Fellowship Awarded

- 6-month runway of funding while SBIR and other funding in progress
- Commercial milestones and progress defined and monitored
- 4-person commercial advisory team monitors and supports efforts
- Two other applications under consideration

D&PA: Startup Success: Dryland Genetics

Dryland Genetics

Sustainable food for a world with less water

Challenge – the world needs more grain but is running out of water

Solution – Prosso Millet: "The Greener Grain"

"It is an amazing crop . . . It will grow in adverse conditions . . ."

Harry Stine

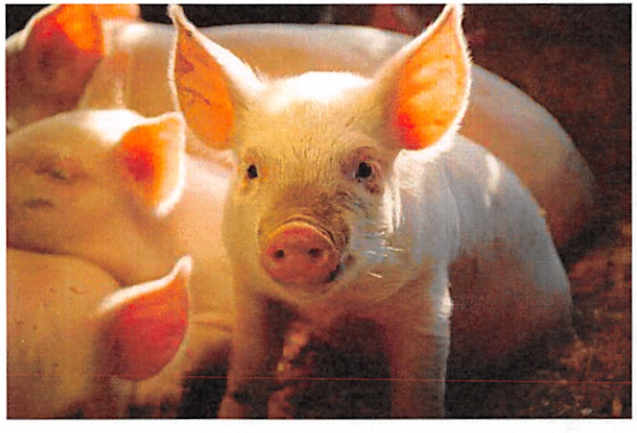
Stine Seed Co. & DLG Investor

Startup Success: Dryland Genetics

- Under water-limiting conditions millet produces 2x more grain per gallon of water than corn. Currently grown on ~700,000 acres in arid western Great Plains.
- Drivers for 10x to 20x expansion of domestic acreage
  - Drop-in substitute for corn in livestock feed
  - Water and carbon efficiency
  - 20% yield increases double farmer profits
  - DLG improved varieties exhibit 10 to 40% yield advantage over best alternative varieties
- DLG recorded 11x growth in seed sales in 2022 compared to 2021
- **Viable third crop for Iowa** – in 2022 Iowa growers realized $800/A revenue wo/use of N fertilizer; no new equipment needed to grow the crop

Dryland Genetics

D&PA: Startup Success - Vet Med Telehealth



Challenge – Foreign animal diseases (FAD) not found in the U.S. can spread quickly and make animals sick, causing production losses and death

Solution – Vet Med Telehealth, rapid and scalable response to foreign animal diseases

"Any set of eyes, on any set of pigs, anywhere in Iowa, within one hour."

D&PA: Startup Success - Vet Med Telehealth

If a FAD was detected by our VDL, responding quickly to protect Iowa's farmers, stop disease spread, and eliminate the disease requires disease detection, containment and elimination

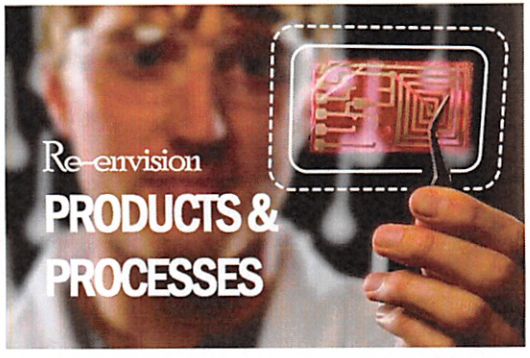
- **Challenges:**
  - Limited data connection to farm sites (network reliability, physical barriers)
  - On-farm hardware requires specialized engineering (e.g., dust, low light, antimicrobial properties)
- **Opportunities:**
  - Validated clinical skill transfer and site evaluation via telehealth
  - Wearable hands-free devices connected to automated data collection and analysis platform

ISU Bioscience Platforms Request



The BOR request: an additional **$377,000** to continue to grow partnerships with BioConnect Iowa and Iowa industry, to accelerate technology transfer, and to grow the innovation ecosystem for all three platforms. At the full $1 million per platform, we will:

- Identify and accelerate development of commercial opportunities that provide benefit to Iowa-based companies and startups.
- Attract external funding and provide innovation ecosystem services.
- Incubate start-ups and accelerate technology transfer.
- Develop a skilled workforce with an innovation mindset.



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