

IOWA STATE UNIVERSITY

OF SCIENCE AND TECHNOLOGY

FY23 ANNUAL ECONOMIC DEVELOPMENT AND TECHNOLOGY TRANSFER REPORT TO BOARD OF REGENTS, STATE OF IOWA

PRESENTED BY:

David Spalding
Raisbeck Endowed Dean, Debbie and Jerry Ivy College of Business
Vice President, Office of Economic Development and Industry Relations

October 1, 2023

Annual Economic Development and Technology Transfer Report – FY2023

As the land-grant institution in the very first state to adopt the Morrill Act, Iowa State University supports the land-grant ideals of putting science, technology, and human creativity to work. Iowa State's Economic Development and Industry Relations (EDIR) team in partnership with Iowa State Extension is focused on innovation and economic prosperity in all 99 Iowa counties.

Economic development is a top priority at Iowa State, and the university is very proud of the impact it has on both the lives of its students and our state economy. Iowa State's **economic development programs, services and initiatives** contribute to the overall positive net impact the university creates on Iowa's business community and the return on investment it generates for students, taxpayers, and society. Through President Wendy Wintersteen's **Innovation and Entrepreneurship Initiative**, we are embedding innovation and entrepreneurship more deeply into our culture and curriculum. By doing so, we are cultivating the next generation of innovators and entrepreneurs while responding to the needs of our communities and state.

Iowans can count on Iowa State to serve as a trusted resource, using our core strengths—innovation, science-based extension and outreach, and education. Our economic development and innovation efforts have also been recognized nationally and globally. EDIR consists of the following key university economic development units that provide integrated and comprehensive business, technical, entrepreneurial support, and educational services to Iowa State's clients and partners:

- Center for Industrial Research and Service (CIRAS)
- Iowa State University Research Park (ISURP)
- Office of Innovation Commercialization
- Iowa's Small Business Development Centers
- Pappajohn Center for Entrepreneurship

Iowa State's Economic Development and Industry Relations (EDIR) department is focused on innovation and economic prosperity for all 99 counties in Iowa. It was designed as a one-stop shop for businesses and entrepreneurs who want to work with Iowa State. There are countless ways for businesses, founders, and innovators to engage with Iowa State and the entities in EDIR, and our Iowa State Extension partners are many times the starting point. Our focus in EDIR is on initiating, broadening, and strengthening these interactions into meaningful engagement opportunities across campus for the betterment of the state economy.

We have been recognized both nationally and globally for our work in Economic Development and innovation. Iowa State won the 2022 Innovation and Economic Prosperity Award from the Association of Public and Land-grant Universities. The award was in the "Innovation" category – recognizing our initiatives to spur innovation, entrepreneurship, and technology-based economic development. It's our fourth award in seven years and we have been a finalist in two other years, including this year.

Financially, Iowa State has a major impact on the economy of the state of Iowa. This is backed up by an analysis recently completed of Iowa State University's economic impact on the state of [Iowa for the fiscal year ending June 30, 2022](#).

- Iowa State produced a \$5 billion impact last year.
- Iowa State supports 57,142 jobs – or 1 out of every 36 jobs in Iowa.
- ISU research spending and activities created a net total of \$235.3 million in added income for the state economy.

We are one of the leading research universities in the United States. Last year Iowa State ranked 17th in research funding among all universities that don't have a medical school. Our students benefit from studying at a major research university because the faculty who teach them need to be at the leading edge of their fields and they bring that knowledge back into the classroom. Many of those researchers also get engaged in research projects for industry. Areas where we engage with companies include:

WORKFORCE Iowa State graduated almost 6,800 students this past academic year, and we provide more graduates who stay in Iowa than any other university in the United States. We work closely with industry to meet their hiring needs and achieve successful placement outcomes for our graduates. Our Career Services and corporate engagement teams partner with businesses to meet their needs by developing internship programs, offering speaking opportunities on campus, engaging with student organizations, and positioning them at our career fairs. Many companies utilize our research park as a training hub and beachhead location to help them retain interns and to serve as a continuing pipeline into recruitment.

RESEARCH is the driving force behind economic development at Iowa State. The resources available through the EDIR office allow businesses to access a wide range of researchers and connect with services to help businesses grow and thrive. Multiple businesses have set up innovation and technical scouting offices at our research park for a closer view into the intellectual property being generated both at the university and by our startup community.

Groups like the Translational Artificial Intelligence Consortium at Iowa State are another example of corporate engagement. In addition to hosting events on next generation technologies, businesses can access faculty expertise across the university by engaging directly with our scientific and research community through sponsored research, hiring graduate students, or a variety of other means.

UPSKILL, RESKILL, CONTINUING EDUCATION. Iowa State offers tailored curriculum and programs to upskill, reskill and support leaders with continuing education, such as the Executive MBA program. We also offer a variety of fully online programs for working professionals including masters of Seed Technology and Business; masters of Business Analytics; masters of Engineering Management; and MBA. Iowa State also recently launched fully customized education programs for individual companies to meet their needs. These include both upskill classroom and bootcamp type engagements; content is driven by corporate partners and paired with university expertise.

FACILITIES AND EQUIPMENT are also available for industry partners to access via a fee for service model. Oftentimes, there are pieces of equipment that are costly to purchase that a company might only need to use periodically, and those can be accessed for public use. This could include anything from scale up facilities, to field access, to milling and grinding equipment, gene sequencers and more. An example is an Off-Highway Vehicle Chassis Dynamometer for testing of complete highway vehicles.

A closer look at our EDIR organizations and partners follows:

The **Center for Industrial Research and Service (CIRAS)** works with business and industry across all 99 counties to enhance their performance through service offerings in five general areas: technology, growth, productivity, leadership, and workforce. CIRAS leads three federal business outreach programs and three state-based programs, with staff and partners located across campus and across the state. Since 1963, CIRAS has partnered with Iowa companies and communities to help them prosper and grow. A vast network of university and industry experts brings years of professional experience to CIRAS, making us a leading integrator of solutions in Iowa. Over the past five years, CIRAS and its partners have reported impact from companies totaling more than \$3 billion and more than 36,000 jobs created or retained because of the assistance they received.

CIRAS FY23 HIGHLIGHTS: Last year, 1,721 businesses from 98 counties in the state received assistance on projects or attended educational workshops from CIRAS staff or partners.

To meet changing expectations from companies, CIRAS launched ExporTech 2.0 in partnership with the Iowa Economic Development Authority (IEDA). ExporTech is a national export assistance program that helps companies develop customized plans for growing their level of exports. It is a joint effort of CIRAS, the Manufacturing Extension Partnership, the Iowa Economic Development Authority (IEDA), and the U.S. Department of Commerce. When ExporTech was first introduced by CIRAS in 2014, participants attended three full-day events scheduled about a month apart. Content experts covered topics like sales and distribution strategies, pricing and payment practices, logistics, regulations and certifications, and marketing messages. The same topics are covered in the new hybrid model.

This new approach helps businesses develop and deploy an exporting strategy provides them with more flexibility. “We learned a great deal about building our global presence and making contacts, as well as the details of exporting and registrations in each country,” said Dr. Rebecca Quesnell, vice president of operations and research/product development director at TransAgra International, who expects to double their international sales because of the effort.

Lily Okech, a Uganda refugee, overcame language barriers and adversity to establish Cleaning for Hope, a thriving commercial cleaning service in Des Moines. With determination and support from the CIRAS APEX Accelerator, Okech secured her first contract of \$49,500 from the Iowa Department of Transportation. Okech credits CIRAS with positioning her to successfully compete for the award as well as future government work.

Cedar Ridge Winery and Distillery, located in Swisher, faced challenges with their packaging equipment. Recognizing the potential for assistance, Murphy Quint, head distiller and chief of operations at Cedar Ridge, reached out to CIRAS after learning about the Iowa Economic Development Authority’s program to help manufacturers with technology equipment purchases. With help from CIRAS, Cedar Ridge received a \$50,000 Manufacturing 4.0 Grant, enabling them to invest in new automated equipment that streamlined their bottling process.

Fairy Tale Cotton Candy, a food manufacturer based in Des Moines, sought guidance from CIRAS to propel their business growth. Owner Steve Shearer expressed, “Working with CIRAS makes it easy to manage everything.” CIRAS aided with plant layout, federal food safety requirements, and marketing support. As a result, the company has experienced remarkable results, including over \$1.5 million in sales, cost savings, and investments over the past three years.

CIRAS completed support of the Iowa Economic Development Authority (IEDA) Manufacturing 4.0 Technology Investment Grant program. Starting in 2021, CIRAS conducted more than 330 on-site technology assessments for small manufacturers across Iowa. Third-party surveys with assessment participants through June 2023 have identified \$94M in financial impact and more than 400 jobs added or retained because of this program.

Iowa State University Research Park (ISURP) provides a resource-rich environment *where innovators flourish*. ISURP is a bricks and mortar real estate development, but its value to its tenants, Iowa State, and the Iowa economy lies in its engagement with the university and the seamless coordination and engagement opportunities it offers tenant partners. This includes proximity and easy access to Iowa State for both start-ups and established companies that range from growing entrepreneurial ventures to global corporations. Tenants can seamlessly access Iowa State’s vast array of workforce with customized solutions, the research enterprise, equipment and

more, and the proximity to the university is a differentiator for retention and conversion of talent and innovation. ISURP offers high quality labs and office space, as well as numerous community events, services and amenities that support the efforts of science- and technology-based organizations.

ISURP FY23 HIGHLIGHTS: After experiencing some of its highest vacancy rates in ISURP history during the height of the COVID19 pandemic, ISURP had its best year by numerous measures in FY23. The organization shifted its focus to finding mutually beneficial ways to say ‘**yes**’ to community and university partners, tenants, and prospects, and it paid off. ISURP is now almost completely full, with over 98% occupancy. Fifteen tenants took or added space this year, resulting in a net increase of 39,842 square feet leased, and numerous partnerships have paid dividends.

ISURP expanded its footprint in corporate engagement and added an employee focused on creating customized workforce solutions for tenant partners. Beachhead offices for many ISURP companies offer corporate partners a leg up on both innovation and workforce and an engagement team works with others across the institution to provide a concierge service to demystify and differentiate the process of accessing important university resources.

ISURP also started construction on a \$14M building for a booming biologics company, Pivot Bio, a 36,000 square foot customer success center that will open in November. ISURP expanded its partnership with Iowa State’s Digital and Precision Ag team, a renowned research group currently housed at Iowa State’s BioCentury Research Farm, led by professor Dr. Matt Darr, that works with corporate partners on ag innovation in the autonomy and sensing space. This is the most productive research team in Iowa State history, holding more than 70 patents and tech transfer outcomes, with 32 products sold globally, and accounting for more than 300 jobs in ag tech. ISURP brought additional corporate partners to this esteemed research group and provides resources to enable them to continue to scale their footprint to help additional Iowa companies. To that end, ISURP partnered with ISU Digital Ag, and Alliant Energy to begin construction on an \$18 million, 87,000 square foot facility that will open next December. The facility will allow Digital Ag Innovation to continue to work alongside test ground and partners at ISURP and also to scale and bring together multiple players in the agriculture space in shared communal and high bay spaces, all with the goal of bringing the next generation of technology solutions to farmers. Alliant Energy provided \$3M to enable construction, the first naming gift in ISURP history.

An important aspect of continued research park expansion is also expansion of the amenities offered to those that choose to work at ISURP. To that end, ISURP is also partnered with Iowa State Athletics on the CYTown redevelopment project, an effort to bring additional entertainment options, hotel, and flat floor space to Ames, while also funneling revenues back into the functional obsolescence of our performing arts facilities. Phase I parking lots and infrastructure are underway, and an announcement was made for the first anchor tenant, McFarland Clinic, to start construction in 2024. ISURP also leaned into its live, work, play environment and created a second unique partnership with ISU Athletics and will provide a home for Iowa State’s rising tennis program by expanding an existing facility previously owned by Ames Fitness, and adding outdoor clay courts and a locker room and team area.

ISURP also has several projects in the works that will come to fruition in FY23-24 to bring housing to the research park community—a critical need in our community to serve the base of 2500 employees working and commuting ISURP daily.

The Office of Innovation Commercialization (OIC) serves the Iowa State University community and the state of Iowa by commercializing intellectual property resulting from the research enterprise at ISU. Consisting of the Iowa State University Research Foundation (ISURF) and the Office of

Intellectual Property and Technology Transfer (OIPTT), OIC develops and executes appropriate protection and licensing strategies for both pre-partnered innovations (funded by industry-sponsored research agreements) and un-partnered technologies (primarily funded through federally sponsored research programs). Established and startup companies benefit from licensing intellectual property rights by creating new products, decreasing manufacturing costs, improving revenue streams, and increasing market share.

OIC FY23 HIGHLIGHTS: Iowa State researchers submitted 130 intellectual property disclosures (not including datasets) and ISURF filed 112 patent applications. In calendar year 2022, Iowa State was recognized for having 39 U.S. utility patents issued, ranking 87th of the top 100 worldwide and 54th of the top 100 U.S. universities granted U.S utility patents by the National Academy of Inventors.

In FY23, Iowa State was awarded 42 U.S. utility patents and an additional 13 patents from foreign countries for an overall total of 55. ISURF executed 87 license and option agreements for ISU technologies in FY23, 14 of which were with Iowa companies. ISURF currently has 113 license and option agreements which are yielding income. Iowa companies reported \$3.0 million of revenue from sales of ISU-licensed technologies in calendar year 2022, and one startup company was formed during that time period to commercialize ISU technologies. Global sales of licensed technologies was \$95 million. ISURF has been self-supported since 1992 through returns on its licensed technology portfolio; in addition, ISURF has returned over \$9.4 million over the last ten years to Iowa State and the Ames National Laboratory to support further investments in the research enterprise. ISURF distributes royalty revenue in accordance with the royalty sharing policy to technology inventors and retained earnings more than what is needed to support ISURF's operations are utilized to support research initiatives as recommended and approved by the ISURF Board of Directors.

The Office of Intellectual Property and Technology Transfer negotiates and executes sponsored research agreements for ISU with industry partners and commodity groups as well as nondisclosure agreements and material transfer agreements for Iowa State University. In FY22, OIPTT handled more than 1200 agreements.

Ames Laboratory researchers have developed new alloys for applications that require high strength, creep resistance and high tensile ductility at high temperatures. Applications include next-generation gas turbine engines, improved wind energy generators, and manufacturing dies. ISURF and the Ames National Laboratory are working with one of the big three U.S. automotive manufacturers to investigate opportunities for the alloy to improve current manufacturing techniques in a two million dollar, federally funded project.

Iowa State University researchers have developed new thermoplastic elastomers from soybean oils with initial markets in asphalt paving. As a replacement for conventional SBS polymers in asphalt, these renewably-sourced polymers allow for reduction of greater than 40% of virgin petrochemical materials in new roads through reincorporation of recycled asphalt. ISURF has licensed an extensive portfolio of patents to an Iowa-based startup company for commercialization of the technologies.

Iowa State University researchers discovered an enhanced method of producing antibodies for in the lab for diagnostic purposes. ISURF is working with a California-based company with an Iowa manufacturing presence to explore the commercial opportunities for this technology.

The **Small Business Development Center (SBDC)**, administered by Iowa State, consists of 15 regional centers serving all 99 counties in Iowa. SBDC assists individuals interested in starting new companies and provides business services and counsel to existing small companies across Iowa to solve management problems, to improve operations, to seek financing, and to pursue new

opportunities. Iowa State also operates two of the regional centers.

SBDC FY23 HIGHLIGHTS: Iowa's Small Business Development Center support thousands of businesses every year across many different industries. In State fiscal year 2023, the Small Business Development Center (SBDC) supported 4,569 companies across Iowa-- a minimum of five distinct clients in every Iowa county.

SBDC helps businesses in a variety of ways, including business planning, customer discovery, cash flow projections, financial analysis, loan proposal/capital request assistance, business growth strategies, marketing strategies, startup assistance, export assistance, and market research. The 4,569 businesses supported by SBDC accounted for \$111.1 million in new capital totaling 689 capital events and an increase of \$153.8 million in sales, including the creation of 1,661 jobs and 211 business starts.

SBDC also awards two Entrepreneur of the Year prizes. The 2023 Deb Dalziel Woman Entrepreneur of the Year was Nannette Griffin of Griffin Muffler and Brake. In 1997, after realizing she wanted to change the automotive repair customer experience, she opened Griffin Muffler and Brake. Nannette performed brake jobs and her husband did custom exhaust work. When an opportunity came to purchase a building in Ft. Madison, Nannette contacted the SBDC to help with loan options, and the business expanded. In 2007, tragedy struck when the building burned down. Nannette and her husband took the opportunity to rebuild to become more efficient. In 2019, Nannette founded the Southeast Iowa Chapter of Midwest Auto Care Alliance because it was a three-hour drive to the closest chapter in Des Moines. She is leading change by uniting fellow automotive repair shops to work together.

2023 Neal Smith Entrepreneur of the Year was Jorge Villeda, owner of Villeda Construction. Villeda Construction opened in 2014 at the Indian Hills Regional Entrepreneurship Center Incubator. Due to steady growth, Villeda purchased a vacant building in downtown Ottumwa and renovated it into commercial space to serve as headquarters. The growth of the business required Villeda Construction to change their business model and adapt to new challenges. With assistance from the SBDC, Villeda Construction gained knowledge in the areas of construction bonding, financial projections, QuickBooks bookkeeping and job closings. SBDC has also helped Jorge start a second business.

The **Pappajohn Center for Entrepreneurship** serves entrepreneurs on campus and in the community, providing entrepreneurial opportunities for students including a statewide tech startup incubator, student accelerator, hosting statewide and local business plan and pitch competitions, and participating in university-wide academic programs in entrepreneurship ranging from a cross-campus minor to a PhD program. The Pappajohn Center for Entrepreneurship has a presence in the Research Park Core Facility and on campus in the Student Innovation Center. Flagship programs include Iowa State Startup Factory, CYstarters, and CyBIZ Lab.

PAPPAJOHN CENTER FOR ENTREPRENEURSHIP FY23 HIGHLIGHTS: In November, the Global Consortium of Entrepreneurship Centers (GCEC) announced Iowa State University Pappajohn Center for Entrepreneurship as the winner of the 2022 Nasdaq Center for Entrepreneurial Excellence Award, the highest honor presented during the 2022 GCEC Awards, for universities and colleges with more than 5,000 students.

In 2022-23, the Iowa State Pappajohn Center and local Small Business Development Center served 1,423 clients, delivering 3,978 hours of mentoring, which was responsible for 63 new

ventures, 362 jobs, and resulted in \$41.4M in capital raised.

The ISU Pappajohn Center touched more than 9,600 individuals through its programs, advocacy events, training, and student programs and more than \$280,000 was awarded to young entrepreneurs, including \$71,000 in national prize awards that helped seed new startups.

CyBIZ Lab, our interdisciplinary student consulting agency served 39 companies, and employed 52 students. CyBIZ Lab provides the opportunity for cross functional teams of undergraduate and graduate students to work on fee based business and organizational projects. It also gives founders, entrepreneurs, and businesses a chance to solve a business problem, while working alongside student consultants. Live cases are also conducted as part of a for-credit classroom experience.

The Reiman Entrepreneur Internship Program is an endowed internship program that encourages students to explore working in startup companies. The endowment matches 50% of student wages for any approved Iowa State Research Park companies. In FY23, the program supported 33 students.

The Iowa State Startup Factory is a startup incubator helping researchers and inventors develop a roadmap to realize the societal and economic impact of their high-tech innovations. In FY23, the Iowa State Startup Factory served 14 companies (18 participants) that attracted \$5.4M in capital. Since its inception in 2016, 125 companies have completed the program, 147 jobs have been created by those companies and those companies have self reported \$63.8M in dilutive and non dilutive funding raised. Program staff and Entrepreneurs in Residence contributed just shy of 1,000 hours of individual mentoring support to companies as part of the Venture Mentor Service, an MIT modeled program focused on team-based mentorship for startup founders and entrepreneurs. Iowa State Startup Factory's footprint extends beyond Iowa, with collaborations in Kenya East Africa, and California.

When Iowa State Startup Factory companies complete the program, they oftentimes are still not mature enough to seek external investment. Iowa Go-To-Market (G2M), a partnership between BioConnect Iowa, the Iowa State University Startup Factory, and VentureNet Iowa, provides follow-on support for Iowa entrepreneurs who are developing technology driven innovative products or services and need additional support to increase their livelihood of commercial success. G2M served 13 companies (20 participants) that received \$11.6M in new funding. Program staff and the G2M entrepreneurs in residence contributed more than 350 hours of individual mentoring to participating companies.

CYstarters is an 11-week summer accelerator for Iowa State students or recent graduates to focus on their startup or business idea. The summer accelerator completed its annual 11-week immersive training program for 15 student ventures (19 participants). Staff and professional service providers in the community contributed more than 220 hours of individual mentoring to program participants. An additional 35 professional alumni and peer mentors volunteered time supporting student ventures.

Although students from across campus may take one of the nearly 100 courses that offer entrepreneurship content, a growing number of students are pursuing entrepreneurship as their primary educational focus. Fall 2023 data shows a total of 153 students with Entrepreneurship as a first major, 34 with second majors and an additional 114 students declaring an entrepreneurship minor. Many more participate in co-curricular programming opportunities.

RESEARCH

The [Iowa State Research](#) enterprise received **\$301.3M** in **external sponsored research funding** for fiscal year 2023. This marked the first time the university exceeded \$300M in external research funding, and represented an increase of \$17.1 million, or 6%, compared to the previous record of \$284.2M set in FY22. **Total external funding**, though, was down from the FY22 record of \$601.7M to **\$530.5M** in FY23. New records for both federal and non-federal research funding contributed to the new benchmark for total research funding. The \$206.9M in federal research funding received in FY23 was up from the previous record of \$198.2M set in FY22, and the \$94.4 million in non-federal research funding topped the previous record of \$86M, also established in FY22.

Here are a few examples of new projects receiving initial funding in FY23:

- In May 2023, a multi-institution initiative, led by Laura Jarboe, Iowa State Cargill Professor in Chemical Engineering, was announced by the National Science Foundation (NSF) as one of [six new EPSCoR projects](#) that would receive an award of \$20M over five years. The Iowa initiative – known as [Chemurgy 2.0](#) – brings Iowa State together partner institutions the [University of Iowa](#), the [University of Northern Iowa](#), [Central College](#) and [Dordt University](#) in an effort the team believes will position Iowa as a national leader in advanced biomanufacturing.
- In August 2022, Kaoru Ikuma, associate professor in Civil, Construction and Environmental Engineering, received over \$3.2M from the U.S. Environmental Protection Agency (EPA) to support a four-year research effort. Ikuma and her team will [explore water reuse](#) as a means of improving water security in small rural communities.
- The National Pork Board awarded Iowa State and four other partner institutions – the University of Georgia, University of Minnesota, North Carolina A&T, and North Carolina State University -- \$5.1M of an estimated total of \$8.5 million over five years to spearhead the [Real Pork Trust Consortium](#). The diverse multidisciplinary team will use the [We Care Ethical Principles](#) of pork production as a framework for improving communication and education through each step of the pork supply chain with the goal of increasing the resilience and adaptability of the pork industry.

BIOSCIENCES-BASED INITIATIVES. Iowa State continues to expand the impact of the university's Biosciences-focused Innovation Ecosystems with Iowa Legislature support, and in partnership with [BioConnect Iowa](#). The legislature allocated \$2.6M for FY23 to support Iowa State's research and development efforts across three Biosciences platforms: Biobased Products, Digital and Precision Agriculture and Vaccines and Immunotherapeutics.

The state's investment has resulted in platform dollars being invested in a variety of ways to create additional opportunities in each targeted area including leveraging funds to win federal research and development awards, providing seed funds to university startups for scale up opportunities, and the purchase of shared equipment to support research and entrepreneurial scale up. Some outcomes include:

- The Department of Defense (DOD) provided \$2.1M in funding to BioIndustrial Manufacturing and Design Ecosystem ([BioMADE](#))– its largest award to date – to enable Iowa State and industry partners, Cargill and Genomatica to begin fermentation scale-up predictive modeling.
- Researchers began work on a \$2.7 million Department of Energy (DOE) project including Iowa State, [ADM](#), [3M](#), and [Diageo](#) that grew from a seed grant exploring biodegradable polymers.
- Iowa State-related startup companies [Soylei Innovations](#) expanded product sales in 2022, negotiated an additional technology license with the ISU Research Foundation, and created strategic alliances with outside industry partners. [Pyrone Systems](#) received initial funding; and [Janas Materials](#), a prior seed grant recipient, was awarded a \$25,000 Proof of Commercial

Relevance (POCR) loan by the [Iowa Economic Development Authority](#) (IEDA).

- [CYVAX](#) – a vaccine development laboratory focused on USDA-compliant master seeds, manufacturing scale-up, and commercial development of materials used for clinical trials – opened in the ISU Research Park. By the end of the 2022, CYVAX had two tenants. In October, 25 participants attended the facility’s inaugural Iowa State-industry training session focused on commercial development. CYVAX co-hosted the program with [Bio-Techne](#).
- Iowa State kicked off a strategic partnership with Merck, guaranteeing funding of at least \$250,000 per year. By the end of 2022, more than 15 animal health projects were in place, exceeding \$900,000 in funding, and [ELANCO](#) Animal Health established a presence at ISURP.

IOWA STATE EXTENSION AND OUTREACH, in collaboration with Iowa State colleges, impacts economic development in the state through all of its programs—Agriculture and Natural Resources, Community and Economic Development, Human Sciences, and 4-H Youth Development.

Since approximately 30-40% of crop revenue goes toward farmland rental expenses, land leasing arrangements are a top concern for Iowa producers and farmland owners. Agriculture and Natural Resources extension specialists provided unbiased, research-based **farmland leasing education**, reaching 1,235 participants in the past year; 297 completed a post program evaluation. Approximately 91% reported an increase in knowledge of leasing, 93% in legal issues, and 86% in cash rental rates; 98% reported increased confidence to change their lease agreements.

Midwest beef producers expressed a desire for more research on incorporating winter and summer **forage crop rotation** into their cattle production enterprise. The practice is used to reduce cattle feed cost, improve soil health, and manage production risk, and drives improved water quality and resiliency to extreme weather events. ISU Extension and Outreach beef specialists and field agronomists developed **programming for cow-calf producers**, delivered via on-farm demonstration field days at 15 locations across the state to 732 producers. An additional, 8,800 indirect contacts were made through social media and podcasts. The field program impacted 378,917 acres in Iowa, with a return of almost \$1.5M in increased grazing days for those who adopted annual forages.

One of the most significant threats to sustainable and profitable corn production in Iowa is the western corn rootworm, and a needs assessment indicated a lack of knowledge on identification, scouting, and effective management options for this pest. Twelve ISU Extension and Outreach agronomists and entomologists organized seven **hands-on corn rootworm demonstrations** at Iowa State research and demonstration farms across the state in summer 2022 for farmers and agricultural professionals. Most of the farmers who attended plan to change their management of corn rootworm, and nearly 80% of farmers responding to the survey expect to increase profits by at least \$5/acre on their combined 6,118 acres.

Iowa’s Food Code requires at least one supervisory employee in licensed foodservices to be certified in food safety through an approved program. In Federal FY22, 2,018 Iowans participated in **ServSafe** classes taught by Human Sciences extension specialists, with 70% successfully earning the Certified Food Protection Manager credential. ServSafe is the National Restaurant Association Educational Foundation’s internationally recognized food safety certification program, providing food service workers with the knowledge they need to protect the public from foodborne illnesses.

The **Volunteer Income Tax Assistance program** trains community volunteers to provide free tax preparation to qualified individuals with low or moderate income. In Federal FY22, Human Sciences extension specialists trained and supported 128 volunteers who completed IRS certification and then provided 8,955 hours of their time. With outreach and administrative support from 17 county extension offices, the volunteers provided 2,450 Iowans with free, accurate tax preparation, allowing them to save approximately \$666,400 on tax preparation fees. The volunteers also helped 810 of

these lowans claim \$1.1M in Earned Income Tax Credit refunds, boosting family income.

Summary of ISU Economic Development and Innovation Data	
a. Number of disclosures of intellectual property (excluding data sets)	130
b. Number of patent applications filed	112
c. Number of patents awarded: U.S. issued patents	42
total issued patents (world-wide)	55
d. Number of license and option agreements executed on institutional technologies:	
in total	87
in Iowa	14
e. Number of license and option agreements yielding income	113
f. Revenue to Iowa companies as a result of licensed technology (CY22)	\$3.0M
g. Number of startup companies formed (through licensing activities) in total	
in Iowa	1
in Iowa	1
h. Number of companies in research park and incubators	
pre-incubator companies	28
private	109
university related	22
i. Number of new companies in research park and incubators pre-incubator companies	28
private	19
university related	1
j. Number of employees in companies in research park and incubators	2491
k. Royalties and license fee income	\$3.1 million
l. Total sponsored funding received	\$530.5 million
How much of this is for research	\$301.3 million
m. Corporate sponsored funding received for research and economic development:	
in total	\$67.6 million
in Iowa	\$22.8 million
n. Iowa special appropriations for economic development, in total SBDC	\$3.474 million
CIRAS Technology Assistance Program ISU	\$0.936M
Research Park	\$1.365M
Regents Innovation Fund	\$0.122M
	\$1.050M
o. Research expenditures (federal, state and local; business; nonprofit; institution funds; all other sources, FY23):	\$289.1 million
p. Licenses and options executed per \$10 million research expenditures (FY19 AUTM Survey)	3.0
q. Sales of licensed products by Iowa-based companies (CY22)	\$3.0 million
r. Number of employees for current Research Park tenants and incubators, as well as former tenants that are still in existence in basic form world-wide	43,703

Summary of FY23 RIF Commercialization Program Projects

Principal Investigator	FY23 RIF Commercialization Program Projects (\$448,000 of \$1,050,000 RIF Allocation)	Award Amount
Dr. Cheng Huang (Electrical and Computer Engineering)	Efficient, Small-Form-Factor and Low-Cost Power Management Integrated Circuits for Portable Solar-Powered Applications Design of new solar-charger chip.	\$50,000
Dr. Shan Jiang (Materials Science Engineering)	Additive to improve waterborne wood stains Scaled up the reaction 300X, shortened reaction time 4X, improved stability, provided 2-gallon samples to industry partner, and samples showed excellent performance.	\$50,000
Dr. Ratnesh Kumar (Electrical and Computer Engineering)	Designing and Ultra-low-powered IoT System for Energy Harvester Integrated Battery-free Operation Demonstrated a breakthrough by writing a custom program to reduce power consumption; preparing for patent submission.	\$50,000
Dr. Young-Jin Lee (Chemistry)	Rapid Antibiotic Susceptibility Testing by Deuterium Labeling of Bacterial Lipids in On-Target Microdroplet Cultures Technical progress led to patent filing April 2023, NIH R21 proposal pending to continue research.	\$33,000
Dr. Wenzhen Li (Chemical and Biological Engineering)	A Multi-Purpose Waste Upcycling Process Enabled by the Scalable Production and Conversion of Ammonium Bicarbonate	\$50,000
Denis Prodius (Ames National Lab)	Separation of Critical Materials Using Microwave Technology Focus on Rare Earth Elements (RREs)	\$50,000
Dr. Guowen Song (Apparel, Events & Hospitality Management)	Development of hand-specific thermoregulation model and systematic tool for PPE design and evaluation Established a thermoregulation model together with preliminary human trial validation, as well as initiated design innovation for protective gloves as guided by model prediction (use by firefighters).	\$50,000
Dr. Sri Sritharan (Civil, Construction and Environmental Engineering)	Enabling Hexcrete Technology for Tall Wind Towers Nationwide Established design loads for tall towers, completed dimensioning of 40-m pedestal, and completed analysis under design loads.	\$50,000
Dr. Ling Zhang (Apparel, Events & Hospitality Management)	Fit Adjustable Nursing Undergarments Established new company, finalized bra design, products currently in mass production set for U.S. delivery November 23, online store designed and running.	\$50,000