

# IOWA STATE UNIVERSITY

## OF SCIENCE AND TECHNOLOGY

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### FY21 ANNUAL ECONOMIC DEVELOPMENT AND TECHNOLOGY TRANSFER REPORT TO BOARD OF REGENTS, STATE OF IOWA

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## Iowa State University Annual Economic Development and Technology Transfer Report – FY2021

As the land-grant institution in the very first state to adopt the Morrill Act, Iowa State University wholeheartedly supports the land-grant ideals of putting science, technology and human creativity to work. Economic development is a top priority for Iowa State, and the university is very proud of the impact it has on both the lives of its students and the 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 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. In response to the ongoing COVID-19 crisis, units within the **Office of Economic Development and Industry Relations (EDIR)** have adapted their normal business operations to better meet Iowans' needs. The units continue to remain very engaged across the entire state, providing outreach and assistance in support of Iowa businesses.

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:



- 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.



- 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.

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### Pappajohn Center for Entrepreneurship

- The **Pappajohn Center for Entrepreneurship** serves entrepreneurs on campus and in our community, provides entrepreneurial opportunities for students including a student accelerator, hosts statewide and local business plan and pitch competitions, and participates 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 new this year, on campus in the Student Innovation Center. Flagship programs include ISU Startup Factory, CYstarters, and CyBIZ Lab.

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### Research Foundation, Inc.

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### Office of Intellectual Property and Technology Transfer

- **The Office of Innovation Commercialization, which encompasses the ISU Research Foundation (ISURF) and Office of Intellectual Property and Technology Transfer (OIPTT)**, protects, manages, markets, and licenses intellectual property resulting from the research enterprise at Iowa State University. Both established and startup companies license intellectual property rights from ISURF in order to introduce new products, decrease their manufacturing costs, improve revenue streams, and increase their market share. OIPTT negotiates and executes nondisclosure agreements, material transfer agreements, and research agreements between ISU and industry partners and commodity groups.



- **ISU Research Park (ISURP)** provides a resource-rich environment *WHERE INNOVATORS FLOURISH*. It includes close proximity and easy access to Iowa State University for our tenant partners, which include start-ups and established companies that range from growing entrepreneurial ventures to global corporations. The Research Park 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.

### Highlights of FY2021

#### EDIR

- Named winner of the Innovation Award given by the Innovation of Economic Prosperity Universities program of the Association of Public & Land Grant Universities

## **CIRAS**

- Worked with a Mason City company to help them pivot to making face shields when the pandemic hurt their operations. Ultimately the company produced over 2 million face shields with the majority going to organizations in Iowa.
- **Achieved a milestone by reporting \$3B in impact** and over 31,000 jobs created or retained from companies over the past five years as a result of CIRAS and partner assistance.
- **Launched a new partnership with the Iowa Department of Transportation (DOT)** to help economically and socially disadvantaged businesses develop so they are better able to compete for highway construction projects and other DOT-funded projects. CIRAS will provide one-on-one assistance to companies who qualify as Disadvantaged Business Enterprises (DBE) about the best ways to position themselves for bidding opportunities.

## **America's SBDC Iowa**

- Due to the assistance of the SBDC during the reporting period, the following statewide economic impact was attributed by clients served in all 99 counties:
  - 207 new businesses started – 17 new business/month
  - 2,245 job created – 187 jobs/month
  - \$182 million in capital infusion into businesses served
  - Sales increased by \$415 million - \$34 million in sales increases/month
- Launched the Rural Business Innovators program with 8 companies in the first cohort.
- #IASBDCMobile initiative began in the fall of 2020, with dedicated team members going to more than 20 communities across the state to bring needed assistance and resources in the areas of accounting, operations digital marketing and e-commerce.

## **Pappajohn Center for Entrepreneurship**

- ISU Startup Factory, in partnership with BioConnect Iowa and Venture Net Iowa, was awarded a \$525,472 EDA grant to launch Iowa's first Go-To-Market Accelerator program. The program launched in February 2021 with five companies representing education technology, animal health, biotechnology, advanced manufacturing and medical technology.
- Iowa State University was awarded the U.S. Association for Small Business and Entrepreneurship (USASBE) National Model Program award for its robust entrepreneurship programs that span from the classroom to startups.
- The Princeton Review ranked Iowa State #11 in the country for its undergraduate entrepreneurship programs.
- Dr. Shan Jiang, Materials Science professor and member of Cohort X of ISU Startup Factory, was awarded a 2021 Regents Innovation Fund grant for his self-stratifying amphiphilic Janus particles, which has the potential through his startup company to significantly change the coatings industry. Dr. Jian and his team were selected to attend the National I-Corps program in early 2021.

## **Office of Innovation Commercialization**

- Renewable Waxes. Iowa State University researchers discovered a method to make a new wax from soybean oil that appears to meet the temperature and performance requirements of manufacturers from various industries. ISURF has entered into an option

agreement with a Fortune 100 company to evaluate the patented formulations and methods for commercialization.

### **ISU Extension and Outreach**

- Outreach Agriculture and Natural Resources programs made more than 98,200 contacts with farmers and agribusinesses, providing research-based information to help Iowans grow the economic base of Iowa agriculture.
- Human Sciences Extension online educational offerings are now widely available to support recruitment and retention of the child care workforce and to improve quality of care. During FY 2021, a total of 22,344 early care and education professionals participated in 90,285 hours of online education.
- 4-H Youth Development programs reached more than 100,000 Iowa youth in 2019-2020, preparing these young people to actively pursue careers and education beyond high school and build skills. Annually about 91 percent of 4-H seniors report they intend to pursue trades or post-secondary education within 12 months of graduation.

### **ISU Research Park**

- At the beginning of the pandemic (March 2020), ISURP had 140,000 square feet of vacant space in our multi tenant buildings. We currently (Nov 2021) have less than 4,000 rentable square feet available.
- Last year, ISURP intentionally switched our engagement model to be more collaborative with campus partners. This has netted increased spend on research and revenue generating projects across the institution and underscored our value proposition with key tenant partners.
- ISURP is in partnership with Iowa State University, the athletic department, the BioCentury Research Farm, and multiple university groups on building out multiple private partnership deals that will likely impact our tenant roster and current geographic model moving forward.

### **Vice President for Research**

- In June, Iowa State University became home to a new NSF-funded initiative focused on enhancing rural broadband connectivity and bridging the divide between urban and rural areas both in the state, and the nation as a whole. [ARA Wireless Living Lab for Smart and Connected Rural Communities](#) is led by Iowa State Electrical and Computer Engineering professor, Hongwei Zhang. ARA is receiving **\$8 million in federal funding** from the [Platforms for Advanced Wireless Research](#) (PAWR) **as well as a matching investment** in cash and in-kind contributions from PAWR industry consortium partners. ARA's ultimate goal of enhancing rural broadband connectivity can have a profoundly positive impact on improving the economic sustainability of rural communities by:
  - Supporting the state's growth in the Biosciences, in digital and precision agriculture, in particular;
  - Making industry and manufacturing in rural areas more vital and competitive; and
  - Fueling greater innovation and entrepreneurship across the rural landscape.
- Iowa State University and U.S. Department of Energy (DOE) National Laboratory, Ames Laboratory, have become a national research epicenter for the rapidly emerging field of plastics upcycling. An award of **\$2.7 million** from the Defense Advanced Research Projects Agency (DARPA) is just one multiple grants received by researchers Aaron

Sadow, Chemistry professor, Erich Cochran, Chemical and Biological Engineering professor, and Robert Brown, director of the Bioeconomy Institute. This innovative work in plastics upcycling opens economic opportunities but also offers creative solutions for resolving the world's mounting issues with waste and is an important step toward a more sustainable future.

- Soumik Sarkar, associate professor of Mechanical Engineering and a Walter W. Wilson Fellow in Engineering, received an initial FY21 award of \$1.9 million from NSF and USDA-NIFA on a **five-year \$7 million** Cyber-Physical Systems (CPS) Frontier grant. Sarkar is leading a multi-institution, interdisciplinary research initiative that could bring unprecedented levels of efficiency and sustainability to production agriculture. The team is focused on transforming current cyber-physical systems and capabilities in agriculture by developing a novel, context-aware cyber-agricultural system that encompasses sensing, modeling, and actuation activities to enable farmers to respond to crop stressors more cost-effectively, with greater agility and with less impact on the environment than current practices.

In June 2016, EDIR moved into the new **Economic Development Core Facility**, which houses these units under one roof. EDIR serves as the gateway to the university's expertise, capabilities, resources, and facilities that support and enhance economic development throughout the state. EDIR works very closely with other university units that contribute to the university's economic development efforts and impact, including the Office of the Vice President for Extension and Outreach, the Office of the Vice President for Research, and the academic colleges.

Iowa State **pioneered the first statewide Extension Service** in 1906. The extension experiment—universities actively transferring their research and expertise to every corner of every state—was immensely successful across America and remains so today. **Iowa State University Extension and Outreach**, in collaboration with ISU colleges, impacts economic development in the state through all of its programs—Community and Economic Development (CED), as well as Agriculture and Natural Resources, Human Sciences, and 4-H Youth Development.

ISU promotes economic growth in Iowa in a number of ways. We provide business and technical assistance to existing companies, we support the creation of new companies, we help attract new companies and entrepreneurs to Iowa, we create intellectual property and help move research ideas to the market, and we contribute to workforce and entrepreneurial development.

### **Business and Technical Assistance**

**SBDC** - The SBDC, through its Lead Center based at Iowa State University, and its 15 regional centers, continues to work tirelessly to assist small businesses in every corner of the state with pandemic recovery. In a typical year, the SBDC assists approximately 4,000 clients. Throughout the pandemic, SBDC has assisted more than 70,000 businesses. Business Counselors provided direct client counseling on small business relief programs and advice on how to pivot their businesses to keep the doors open and the lights on. The SBDC also engaged in several additional initiatives that directly impacted Iowa's businesses, including significant rural outreach:

- #Back2Biz – Be Smart with the Restart campaign – developed resources including a recovery guidebook, customizable and printable posters for workplace safety, as well as operations and employee well-being tips. <http://iowasbdc.org/back2biz/>
- Business Recovery Kits – delivered 300 kits to 25 communities across the state. The focus of the kits is a Small Business Recovery Guide which has e-commerce, digital marketing, restaurant guidance, and other resources. The kits also contained a cybersecurity guide, resource magnet with contact information, and masks required window clings. The kits were developed in both English and Spanish. <https://iowasbdc.org/wp-content/uploads/2021/02/Small-Business-Recovery-Guide.pdf>
- #IASBDCMobile initiative began in the fall of 2020, with dedicated team members going to more than 20 communities across the state to bring needed assistance and resources in the areas of accounting, operations digital marketing and e-commerce. Through this initiative, the e-commerce platform, Shop Iowa ([www.shopiowa.com](http://www.shopiowa.com)) was heavily promoted. Funded in part by IEDA, the platform is available for no-cost for small businesses. The pandemic brought forth the need for businesses to get online to make sales, and the platform was a no-risk opportunity to engage in e-commerce. During the tour, the SBDC team had a lighted portable photo studio they demonstrated and let businesses use during their visits. They were very popular and SBDC used funds to purchase a portable photo studio for all 942 communities in Iowa. Throughout the spring of 2021, SBDC staff, state advisory board members, Main Street Iowa staff, ISU Extension and Outreach – FFED staff, and others delivered the photo studios. <https://iowasbdc.org/photo-box/>
- The pandemic also showed the need to increase outreach to minority-owned businesses and entrepreneurs, as they have been among the hardest hit. SBDC has launched the Inclusivity Challenge. The purpose is to hold conversations all across the state and work with our partners to discuss how we can work together to support minority entrepreneurs. A kick-off event was held in July, and many conversations are starting with action plans to show results of the efforts. <https://iowasbdc.org/wp-content/uploads/2021/07/inclusivity.pdf>

The efforts by the entire SBDC staff have produced significant results, especially for the rural areas of the state:

## RURAL MILESTONES



CAPITAL INFUSION

SFY20 **\$43,938,098** → SFY21 **\$126,247,149** **+187%**  
INCREASE

SFY 20 - 21  CLIENTS COUNSELED → **8,709**



SALES INCREASE

SFY20 **\$159,912,951** → SFY21 **\$199,994,227** **+25%**  
INCREASE



In response to the tremendous need for services in our rural areas, the SBDC responded with additional counselors and starting the Rural Business Innovators (RBI) program. There are a lot of strong business ideas in our rural areas that needed additional support to take their business product or idea to the next level toward commercialization. RBI is an entrepreneurial training program that focuses on finding commercialization opportunities in Iowa's rural areas in an effort to increase wealth and create jobs in rural Iowa. The first cohort of eight tech companies have been meeting and developing their business models.

<https://sites.google.com/iastate.edu/ruralbusinessinnovators/home>

## STATEWIDE MILESTONES



CAPITAL INFUSION

SFY20 **\$75,907,697** → SFY21 **\$212,305,314 +179%**  
INCREASE

SFY 21  CLIENTS COUNSELED → **7,332**



SALES INCREASE

SFY20 **\$182,549,994** → SFY21 **\$422,691,097 +131%**  
INCREASE



During the most recent State Fiscal year of July 1, 2020 through June 30<sup>th</sup>, 2021, **America's SBDC Iowa** provided business assistance to individuals and companies **in all 99 counties totaling 7,332 clients and 14,493 counseling hours**. Of the over 70,000 small businesses that were touched by the SBDC, 7332 were registered in our system for continued follow up. As a result of this counseling, 207 new businesses were started and 2,245 jobs were created. Additionally, SBDC assistance was **credited by clients with increasing their capital infusion by more than \$182 million and increasing their sales by more than \$415 million**. This translates into 187 new jobs every month, 17 new business every month and sales increases of \$34.0 million every month.

The **ISU SBDC regional center and the Mid Iowa SBDC regional center**, hosted by Iowa State University provided 2,497 hours of counseling assistance to startup and existing companies; served 842 clients with one-on-one counseling; provided advice to several hundred clients via telephone and e-mail; and advised a number of technology companies in the areas of licensing, equity-based financing, market entry, and numerous operational areas. The centers documented **45 new business starts with 203 new jobs created that have generated \$41.27 million in capital infusion and \$39.76 million in sales increases**.

**CIRAS** - CIRAS was created in 1963 to improve the quality of life in Iowa by helping businesses and their communities prosper and grow. **CIRAS' individually tailored strategy, Engage. Educate. Embed. means we work with companies to fashion solutions specific to their individual needs**. CIRAS offers services in five main areas: growth, productivity, technology, leadership, and workforce.



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 (sales gained or retained \$2.5 billion, new investments \$0.3 billion, costs saved or avoided \$0.2 billion) and over 31,000 jobs created or retained** as a result of the assistance they received.

In 2020 alone, **1631 businesses from 93 counties in the state received assistance on projects or attended educational workshops from CIRAS staff or partners.** Companies responding to surveys reported \$614 million in total economic impact (\$560 million in sales gained or retained, \$29 million of new investment, and \$25 million in costs saved or avoided) and over 7,400 jobs created or retained as a result of the assistance they received from CIRAS and its partners.

- The **CIRAS Manufacturing Extension Partnership (MEP)** program helps small to mid-sized manufacturers grow by implementing new technical and management practices.
- The **CIRAS Procurement Technical Assistance Center (PTAC)** assists companies from all industries and skill levels in navigating the contracting processes for federal, state, and local governments.
- The **CIRAS Economic Development Administration University Center Program (EDAUCP)** develops workforce management plans for rural communities clustered near metropolitan areas.
- The **CIRAS Technology Assistance Program (TAP)** provides expertise to Iowa businesses to reduce their risk of deploying technologies.
- The **Iowa Lean Consortium (ILC)** is a member-driven program dedicated to advancing Lean in all sectors of the economy.
- The **Disadvantaged Business Enterprise (DBE)** Program helps economically and socially disadvantaged businesses better compete for Iowa DOT-funded projects.

**Appendix 1** provides some illustrative examples of CIRAS, SBDC, and ISURF projects with Iowa companies and entrepreneurs during the past year.

## IOWA STATE UNIVERSITY

### Extension and Outreach

#### Community and Economic Development

**ISU Extension and Outreach** - The Community and Economic Development program within ISU Extension and Outreach has multiple community development specialists in place with expertise and/or experience working with minority-owned businesses and community business leaders. Through a partnership with SBDC, CED specialists reached 54 business owners in under-represented markets, equating close to 250 hours of one-on-one business counseling in addition to invaluable time spent in advocacy to these markets. The Financial Empowerment Center is working closely with SBDC and CED to provide financial literacy training for minority business owners, to prepare them to acquire capital to start or grow their business. Through the training in the past two years, 76 entrepreneurs were trained, resulting in 50 minority-owned businesses starting or improved.

This past year the **Agriculture and Natural Resources (ANR) program made more than 98,200 contacts with farmers and agribusinesses through 1,836 meetings, 3,943 face-to-face consultations, and 33,777 phone and email discussions.** Specialists made 959 digital presentations and online courses, reaching more than 126,000 participants in real-time and an additional 70,581 in on-demand viewing of virtual program archives. ANR specialists present research-based information and answer technical questions to help lowans **grow the economic base of Iowa agriculture.** ANR provides farmers, policy makers, regulators, and agribusiness professionals the opportunity to learn from research-based education to inform their decisions, which leads to sustainable environments, profitable farms, thriving communities, and a more secure food system.

**Appendix 2** provides some illustrative examples of this work.

**ISU Research Park - ISURP, WHERE INNOVATORS FLOURISH,** is a growing technology community and incubator for innovators at new and expanding businesses, providing access to the vast array of resources available at Iowa State University. ISURP has a history of success because companies find value in a close physical presence and connection to the university as it facilitates working with faculty and graduate students on research, tapping into and recruiting the graduate and undergraduate student talent pool, and accessing university facilities. ISURP tenants include companies of all sizes and industry focus, though engineering and technology, and bioscience/ag tech comprise the largest proportion, reflecting Iowa State's strength in STEM. Tenants include companies incubated at ISURP as well as established global brands. **Five Iowa companies that had an IPO started at ISURP; today two remain at ISURP and one additional is located elsewhere in Ames.** In addition, multiple ISURP companies have enjoyed significant liquidity events, with multiple startups acquired by global brands.

Today, ISURP is a 400-acre development just south of campus with approximately 800,000 square feet of building space. **Fifteen new companies and affiliates, and 26 pre-incubator cohorts joined ISURP in FY21,** bringing the **cumulative total to 508 companies and research centers and 8,066 employees for current and former tenants that are still in existence world-wide.** Currently, there are **101 companies and research centers and 18 affiliates and coworking members located at ISURP, employing 1,913 and 520 people, respectively.**

In choosing to locate at ISURP, businesses are doing more than simply occupying a building. They are joining a thriving community focused on driving innovation, researching and developing solutions to complex challenges, creating a pipeline that offers easy access to world class talent, and supercharging the state economy.

- In the past seven years, **ISURP has increased its tenant base by more than 100%, has increased square footage by 75% and significantly increased the number of employees.** In addition, commercial amenity and infrastructure projects have brought ISURP an additional 38 build ready acres for portfolio company growth so we are well positioned for the next generation of workforce solutions.
- ISURP contributes more to local property taxes than any other entity in Story County (\$1.5 million annually).
- In 2019 ISURP opened a standalone sprayer technology facility for John Deere, in addition to already housing one of its Global Technology and Innovation Centers.

- Added Silicon Valley startup PivotBio, and locally grown startup Summit Capture Solutions to the tenant mix, both precision/sustainable agriculture companies with multiple relationships in place with other ISURP tenants.
- Headquarters for the AgStartup Engine, a private systematic program to fund AgTech entrepreneurs and help them towards success through mentorship and financial support.
- 200+ student interns work at ISURP at any given time
- 53 corporate locations throughout the state, in addition to ISURP presence
- \$68,000 average salary for ISURP company employees
- An additional 2,500+ are employed throughout Iowa from ISURP graduate companies

**COVID-19 brought our tenant base and programs unprecedented change and challenge, but it also represents an opportunity for thoughtful growth.** While ISURP never missed a day of in person business operations, nearly all of our tenants have been forced into remote working situations, and many of those tenants, in particular the larger, international companies have not yet returned. The absence of workforce created strain on ISURP based amenities as childcare censuses shift for our child care provider, our restaurant provider could no longer provide catering services for events, and our gym has many members that are unable to utilize its services. Our events, community-based programming and the ISU Startup Factory and I-Corps programs all shifted to an online environment. **Tenant acquisition slowed but activity remained high and on the contrary, tenant retention has remained steady and vacancy rates are within traditional industry averages pre-COVID.** Despite the broad challenges we emerged from the first year of the COVID-19 pandemic with a level of activity that filled our multi-tenant buildings, created many internal construction projects to accommodate changing work environments, added new tenants and left us with a vacancy rate so low we are considering multiple new construction projects headed into 2022.

**The physical absence of our tenant base throughout much of 2020 and the first part of 2021 also allowed ISURP to upgrade and enhance shared spaces in several of our multi-tenant buildings to bring them to a higher standard.** We enhanced exterior spaces and have held outdoor events. We launched a new co-working and affiliate program to address the needs of those workers that are still remote, but that might need temporary or drop in space outside of their homes. We also have engaged multiple companies with opportunities across colleges at Iowa State University utilizing Zoom and online services that have positively scaled the decision-making processes and are realizing collaboration and research agreements at a faster velocity than ever before. We also developed a much closer relationship with the BioCentury Research Farm, have streamlined project management and corporate facing functions, have partnered with the Iowa State Foundation and the Iowa State Vice President of Research offices under the leadership of Iowa State Economic Development and Industry Relations to create a team based approach to corporate partners.

**Looking forward, we believe ISURP will continue to represent a world class location for companies and corporations as they look to re-think their strategy around workforce.** We hope to target our services to our traditional markets, but also to cultivate relationships with a new cross section of companies looking to train large groups of employees, such that they could either stay at ISURP, or work in remote environments indefinitely. Our experience in the creation of beachhead offices for our large, Iowa based manufacturing companies will uniquely position us to help these companies rethink their workforce strategy. Our proximity to Iowa State and a

ready-made talent base of graduating students will allow us to offer them a talented, ready-made workforce.

### **Workforce Development**

A key component of the university's value proposition related to economic development, and its primary mission, is **providing a world class education that provides students with the technical, analytical, problem-solving, communications, and social responsibility skills required in today's workplace**. Iowa State is the largest university in Iowa with 30,708 students, and despite our Midwest location, our student body is quite diverse. Even in the pandemic year of 2019-2020, our graduates were in high demand, and we had a **campus-wide placement rate of 91%** (i.e., 91% of undergraduate students are employed in their field or are pursuing graduate education within six months of finishing their undergraduate studies).

**Iowa State is well known for providing students with professional development activities on campus that give great opportunities for companies to utilize our students' talents.** Iowa State's 2020 Association of Public & Land-Grant Universities (APLU)'s Innovation and Economic Prosperity Innovation award recognized the opportunities for innovation and collaboration through the new Student Innovation Center and the Pappajohn Center for Entrepreneurship, as well as support for startups from the Office of Economic Development and Industry Relations (EDIR). ISU has placed cultivating entrepreneurship and innovation at the heart of its economic engagement and development efforts. ISU has a host of programs centered on entrepreneurship, including an undergraduate major and minor, graduate certificate and Ph.D. program in the discipline, as well as experiential learning opportunities outside of the classroom and venture creation and small business support.

We have excellent entrepreneurship programs in every college as well as "experiential learning" centers that provide opportunities for cross functional teams of students to work on business projects. **Each year more than 500 Iowa State students intern at ISU Research Park companies (200+ in the Park at any given time) and at university centers.** Additionally, engineering students complete a senior capstone project, and several faculty across campus integrate company projects into their courses.

We are very proud that Iowa State's undergraduate Entrepreneurship programs **ranked #11 in the 2020-21 Princeton Review ranking of over 300 undergraduate Entrepreneurship programs**. Additionally, the U.S. Association for Small Business and Entrepreneurship named Iowa State University as a "Model Program", the association's highest honor. President Wintersteen's leadership in entrepreneurship and innovation has raised awareness and support for entrepreneurial students, faculty, alumni and the community. In only its fourth year, the Ivy College of Business undergraduate major in Entrepreneurship ranked #32 in the US News & World Report rankings.

During the summer of 2021, the Pappajohn Center for Entrepreneurship sponsored its sixth cohort of **CYstarters**, an 11-week summer accelerator program for students and recent graduates from across campus. Eighteen students on 14 business teams were selected to spend the summer in a hands-on mentoring environment to launch and grow their companies. The program took place at the CORE Facility of the Research Park, offering students space to work, funding, educational sessions, and mentoring from close to 60 professionals, entrepreneurs and

educators. The young entrepreneurs worked with Pappajohn Center staff on a daily basis in accountability sessions over the course of the summer. **All 14 teams successfully launched their business or are continuing to make progress. Fifty-two of the 78 total businesses over the past six years are still active and have gone on to be successful in state and national competitions.** Three CYstarters companies placed in national virtual competitions in 2020.

**Over 270 students competed in the Pappajohn Center's campus-wide pitch and business plan competitions.** Top performers in those events received financial support totaling more than \$80,000 for their fledgling concepts.

**The Pappajohn Center partnered with the Ivy MBA Program to host the Ivy Mind to Market Technology Entrepreneurship MBA case competition, featuring an ISU startup as the live case.** Six universities competed virtually in the 2021 Mind to Market case competition. The schools represented include the University of Illinois at Urbana-Champaign, Texas Christian University, the University of Kansas, Purdue University, University of Warwick, and Iowa State University. The MBA students enjoyed meeting the company founders, learning about the company's technology, and then competing to provide the best market strategies for the company.

**The Iowa State Pappajohn Center works collaboratively with the other four JPEC programs** to host a statewide student competition, a statewide Iowa entrepreneur competition, a weeklong entrepreneur summer boot camp in Okoboji at the Lakeside Lab, and a fellowship with Entrepreneurs Organization Iowa. **Through these programs and continued matching support from IEDA, the JPECs awarded \$120,000 in incentives for entrepreneurial ventures.** The 2021 finalists presented to a panel of judges at the CORE Facility in August; the winners will be announced at the 25<sup>th</sup> anniversary celebration of the five John Pappajohn Entrepreneurial Centers in September.

The Pappajohn Center for Entrepreneurship **placed 42 student interns in startup companies located at the ISU Research Park, provided more than \$64,000 in match funding to startups, and reported over 16,600 students taking at least one course with an entrepreneurship component at the university.** Over 18,000 individuals participated in programs and classes focused on entrepreneurship, startups and small business.

The COVID pandemic forced the cancellation of programs including the Women Who Create Conference and SheTalks events, as well as the Reiman Entrepreneur Speaker Series. However, the Pappajohn Center launched a series of "Side Hustle" virtual trainings that drew over 400 people. Many people were spinning off small home-based businesses during the pandemic, so the workshops were popular.

The **CyBIZ Lab** interdisciplinary student consulting program offers business solutions to companies of all sizes as well as supports faculty commercialization efforts through the Regents Innovation Fund (RIF) program. The improved performance resulting from these interactions allow businesses to retain and often expand their workforce. **Forty-five CyBIZ Lab students working part-time completed 20 consulting projects that gave students the opportunity to**

**work with actual businesses to solve business problems. Not surprisingly, a number of the projects focused on the COVID impact to companies and organizations.**

CyBIZ Lab works with clients that include startups, non-profit organizations, government agencies, communities (partnership with ISU Extension), college administrators, national professional organizations, small and medium sized businesses, and large global companies. CyBIZ Lab is unique in that teams are interdisciplinary and include both undergraduate and graduate students working together; projects also have a flexible timeline outside the classroom schedule, which allows teams to be highly responsive to company needs.

CIRAS helps connect students to real-life experiences that provide benefits to businesses across Iowa through the engineering capstone program. **Last year, engineering students worked on 111 projects, 96 of them with Iowa companies. This included 77 different Iowa companies across 32 Iowa counties.** Companies responding to surveys reported **impacts of over \$18 million** for these projects.

CIRAS partnered with public and private leadership in Delaware County to pilot the Iowa Workforce Innovation Network (iWIN). This approach uses data to build workforce strategies for individuals that are not employed or under-employed, retention of current employees, increased productivity of your workforce, increased output through automated systems, and the future workforce. In 2021, CIRAS is expanding this program to several communities and businesses throughout Iowa.

**Iowa State University Engineering Community Outreach** works to create a future talented workforce to positively impact economic development in Iowa and the nation through ongoing innovation of STEM programming to K-12 youth, educators and the public since its inception in 2002. Trainings, events and awareness initiatives impact communities and industry talent expansion through partnerships and engagement to increase the diversity of STEM students and their exposure to career pathways. **Programs directed include FIRST® LEGO® League and FIRST® LEGO® League Jr. where over 700 teams across the state participated in 60 events throughout the academic year supported by over 1,000 volunteers.** Virtual summer kids camp activities and family-centric STEM programming were delivered throughout the spring and summer in order to provide innovative approaches to outreach to Iowa families during the pandemic. Leadership of Manufacturing Day resulted in over 100 events with communications out to over 5,000 education and industry stakeholders to promote Iowa manufacturing and the many state organizations working in partnership to share best practice. Programming continues to expand to meet the needs of educating and inspiring Iowans into high-skill, high-demand STEM careers.

In addition to professional development opportunities on campus, **ISU's career services offices work closely with companies to assist them in establishing internships for our students.** Internships provide students the opportunity to apply what they are learning on campus as well as the opportunity to experience firsthand the type of work environment they will be entering after completing their studies. Companies and other organizations benefit from the interns' work output (many companies calculate a return on investment for their internship programs, and the returns are impressive), and they use the internship as a testing ground for prospective new employees.

In the most recent year for which we have data, our career services offices were able to document **nearly 2,500 ISU interns who were employed by more than 960 different Iowa employers located in 260 communities in 91 counties.** These numbers do not include students who did not register their internship nor do they include students who had non-internship jobs related to their field of study.

The **Rising Star Internship Program** gives Iowa State students a unique, multi-disciplinary opportunity to learn while living and working in rural Iowa communities. **The experiential work opportunities aim to increase students' potential for employability and promote awareness of ISU Extension and Outreach.** It is a cooperative effort between Iowa State University academic units and ISU Extension and Outreach at both the campus and county levels. Students apply their academic knowledge in work settings, examine their personal career interests, assess their professional attributes, and gain knowledge of extension career opportunities. Requirements for the program include status as an undergraduate student at or above the sophomore level, with a minimum grade point average of 2.5. The summer 2021 program resumed on a limited basis, with 8 students in 16 counties, following a 2020 lapse in response to the COVID-19 pandemic. ISU Extension and Outreach is committed to fully resuming the Rising Star program to provide this opportunity, and the rich interdisciplinary collaboration it brings, to ISU students in 2022 and beyond.

- This program is not a conventional internship. The Colleges of Design, Human Sciences, and Agriculture and Life Sciences have helped recruit their students to live and work in interdisciplinary teams of two or three. Students are placed in rural Iowa communities. Since the program's inception, interns have been placed to work in 24 Iowa counties.
- The Rising Star Internship Program gives Iowa State students a greater understanding of the land-grant mission through extension and outreach work and provides a quality experience that improves their career opportunities upon graduation. Some interns use the Rising Star Internship to complete a requirement for their field of study. Interns also are gaining an understanding of rural Iowa's strengths and challenges.
- **Since 2014, when the program was developed, 66 students have completed the internship.** The work of the students in each region will always be focused on a locally identified need with supervision from the regional director and supported by extension professionals and other identified community members. Interns have raised the awareness of local foods and healthy living as they have assisted communities, schools, underserved audiences, producers, farmers markets, and community and economic development entities. Students tailor projects using knowledge gained in the classroom with real world work experiences that match their skills and interests.
- Following the conclusion of the experience, interns are invited to become members of the Rising Star Galaxy Club, which helps them stay connected to ISU Extension and Outreach and provides links to job opportunities. Past interns often volunteer to assist with recruitment and orientation of new applicants.

**Iowa State also supports students' learning and skill development in the STEM fields even before they get to the university.** Through the STEM Scale-Up Program the North Central STEM Hub provided STEM programs and resources to more than 287 educators, impacting over 9,700 PK-12 students and 80% of the region's community school districts. These programs range from building robots and coding programs to conducting agricultural field experiences and

learning about STEM careers. The Hub also provided free, hands-on education experiences for PK-12 youth and families during the pandemic in the form of STEM kits and virtual experiences to over 1,500 PK-12 students. ISU Extension and Outreach professionals also played a significant role in each region through representation on each of the six Regional Advisory Boards.

**4-H Youth Development prepares Iowa's young people for careers.** By participating in 4-H educational experiences, youth develop STEM, communication, leadership, civic engagement, healthy living, and general life skills. Youth are challenged to actively pursue careers and education beyond high school and build skills. In fact, annually about 91 percent of 4-H seniors report they intend to pursue trades or post-secondary education within 12 months of graduation. **4-H programs reached more than 100,000 Iowa youth in 2019-2020.**

- Over the past four years, 4-H has added **FLEx2Go** (part of the Forward Learning Experience) field-based kits containing Oculus Rift Virtual Reality sets, a 3-D printer, and a 360-degree camera. The camera captures video in 360 degrees, which when combined with Virtual Reality, allows the viewer to be right in the environment. The first 4-H 360 videos immersed youth in agriculture production experiences to better understand practices in modern agriculture.
- **4-H and FLEx won a grant through the Iowa Space Grant Consortium** for a new FLEx program. It is called FLEx Space Artemis to introduce and expand youth knowledge of core space concepts and celebrate the NASA ARTEMIS program and upcoming plans for the Moon, Mars, and even Earth. Activities include Seeing and Making with the FLEx2GO Space Artemis (FSA) Mobile KIT and new flight/design VR motion-base simulator.
- **FLEx** continues to partner with the Iowa State University Women in Science and Engineering (WiSE) Program to expand the reach of FLEx programming to youth across Iowa. WiSE recruits, trains, and deploys collegiate student role models majoring in STEM fields to lead experiential STEM programming in K-8 classrooms and educational events, including delivering FLEx across Iowa.
- **STEAM'n through the Seasons** is a curriculum designed to teach K-3 children fundamental STEM and art concepts through integrated STEAM-literacy activities that focus on a seasonal topic. Each lesson includes high quality children's books and opportunities for hands-on STEM play. STEM play is needed to help young children become strong STEM thinkers by allowing children to pursue questions, investigate ideas, and begin to form and test theories about the world around them.
- **AgOvation** is a newer and expanding program at Iowa 4-H that helps youth develop 21st century skills through a year-long competition. In 2021, teams across Iowa completed experiential learning projects in the summer with finals at the Iowa State Fair. Currently teams from Sac, Cherokee, Hamilton, Story, and Linn counties are participating. Each team identifies a problem in modern agriculture, researches it, develops a solution, tests their solution, and presents their work in a "Shark Tank" type experience to industry professionals. Each team has a mentor and industry advisers to help them as they prepare for the final competition.
- **Iowa 4-H and NASA Iowa Space Grant Consortium** collaborated to implement Astro Camps in Iowa. Sixty kits were sent to counties across the state. Other



partners included the Science Center of Iowa, Putnam Museum, University of Northern Iowa STEM, and the Governor's STEM Council. Goals of the program include strengthening the nation's STEM future workforce, attracting and retaining youth in STEM, and engaging youth in NASA's mission.

- **Animal U** is a new online youth curriculum in animal science developed by Iowa State University Extension and Outreach. Currently, Animal U has over 200 modules for beef, swine, and careers with plans to expand to sheep, goats, dairy, poultry, and rabbits. Each specie has three levels: beginner, intermediate, and advanced. Each specie module covers twelve different topic areas including animal husbandry, advocacy, welfare, and more. The career module takes the learner through a variety of animal related careers from conception of the animal to consumption of the product. Users can create an avatar based on their interests and will investigate careers and learn life skills necessary to prepare them for a career. Modules are interactive and include an assessment. The curriculum is designed for 4th-12th grade audiences and can be self-directed, but also has a facilitator's guide and can be used in a classroom setting. The outcomes of Animal U are to use a livestock project to demonstrate stronger STEM proficiency; create an understanding of the science involved in producing an abundant and safe food supply; create advocates and future scientists for the livestock industry; and introduce youth to the commercial livestock industry and the abundance of careers associated with food animal production. Since launching in April 2020, we have had over 14,000 users from 49 states and 10 countries.

Finally, several ISU units provide training and related educational activities to a wide variety of individuals, occupations, and industries across the state. **Appendix 2** provides several such examples.

### **Technology Transfer**

In FY21 ISU researchers submitted 144 intellectual property disclosures (not including datasets) and ISURF filed 114 patent applications. In calendar year 2020, ISU was recognized for having 44 U.S. utility patents issued, tied for 65<sup>th</sup> on the list of the top 100 institutions for issued U.S. patents. In FY21, ISU had 50 U.S. patents issued and a total of 71 patents issued when foreign patents are included. Additionally, ISU technologies resulted in 47 license and option agreements in the last fiscal year, 22 of which were with Iowa companies. ISU currently has 118 license and option agreements that are yielding income. Iowa companies reported \$1.7 million of revenue from sales of ISU licensed technologies in calendar year 2020, and eight startup companies were formed to commercialize ISU technologies. Globally, total sales revenues of ISU licensed technologies were \$62 million. Additionally, 123,000 bushels of ISU-developed soybean varieties were planted across the Midwest.

The **Regents Innovation Fund** program at Iowa State has a competitive research component that pairs ISU faculty members with Iowa companies (mostly new to young startups) to commercialize their research discoveries. Please see **Appendix 3** for a complete report on Regents Innovation Fund uses and results.

## Research

Iowa State received \$559.1 million in **total external funding** in FY21, a new record, and the third time in the past five fiscal years that total external funding eclipsed \$500 million. The FY21 total was bolstered by \$90.2 million in federal COVID-19 Higher Education Emergency Relief Funding (HEERF). The university received \$231.1 million in **external sponsored research funding** in FY21, down 8.6% from the \$253 million received in FY20. Funding from federal agencies in FY21 was down \$31.2 million, or 16.8%, from FY20's federal research funding record of \$186 million. The university also received a total of \$255.7 million in **non-federal external economic development and research funding** from a variety of sources including – but not limited to – commodity groups, corporate and industry sponsors, non-profit organizations and individual donors. A total of \$51.5 million in research and economic development funds for FY20 came from commodity groups and corporate and industry sources. **Non-federal sponsored research** funding for FY21 totaled \$76.3 million, the second-highest amount in the past five fiscal years. Of this total, \$12.2 million came from companies headquartered in Iowa or that have a significant footprint in the state.

In Iowa, research plays a vital role in keeping us healthy, in growing our economy, in maintaining our competitiveness in today's global market, and in keeping our world sustainable for generations to come. From work that supports Biosciences and Manufacturing 4.0 initiatives, to research that improves the health and wellness of our people and planet, here are just a few examples of new projects funded in FY21 that are helping the state become its best possible version of itself:

- Iowa State is home to a new NSF-funded initiative focused on enhancing rural broadband connectivity and bridging the divide between urban and rural areas both in the state and the nation as a whole. [ARA Wireless Living Lab for Smart and Connected Rural Communities](#) is led by Iowa State Electrical and Computer Engineering professor, Hongwei Zhang. ARA is receiving \$8 million in federal funding from the [Platforms for Advanced Wireless Research](#) (PAWR) as well as a matching investment in cash and in-kind contributions from PAWR industry consortium partners. ARA's ultimate goal of enhancing rural broadband connectivity can have a profoundly positive impact on improving the economic sustainability of rural communities by:
  - Supporting the state's growth in the Biosciences, in digital and precision agriculture, in particular;
  - Making industry and manufacturing in rural areas more vital and competitive; and
  - Fueling greater innovation and entrepreneurship across the rural landscape.
- Iowa State and U.S. Department of Energy (DOE) National Laboratory, Ames Laboratory, have become a national research epicenter for the rapidly emerging field of plastics upcycling. An award of \$2.7 million from the Defense Advanced Research Projects Agency (DARPA) is just one of multiple grants received by researchers Aaron Sadow, Chemistry professor, Erich Cochran, Chemical and Biological Engineering professor, and Robert Brown, director of the Bioeconomy Institute. This innovative work in plastics upcycling opens economic opportunities but also offers creative solutions for resolving the world's mounting issues with waste and is an important step toward a more sustainable future.
- Rizia Bardhan, associate professor of Chemical and Biological Engineering, [received an award of \\$586,553](#) from the Department of Defense (DOD) Army Medical Research

Acquisition Activity (USAMRAA) to explore the use of 3D culture systems and high-throughput Raman spectroscopy screening to enhance individualized treatment for colorectal cancer (CRC) patients. Bardhan is collaborating on this project with: [Jonathan Mochel](#), associate professor of Biomedical Sciences in Iowa State's College of Veterinary Medicine; Soumik Sarkar, ISU associate professor of Mechanical Engineering; and Bhuminder Singh at Vanderbilt University School of Medicine.

A sampling of additional noteworthy new projects that received federal research funding during the 2021 fiscal year include the following:

- Gregory Phillips, professor of Veterinary Microbiology and Preventive Medicine, is leading a team that is using innovative artificial intelligence to study how to improve the effectiveness of vaccines by gaining a better understanding of how the microbiome interacts with the human immune system. [Phillips received an initial award of \\$551,032](#) from the Defense Threat Reduction Agency (DTRA) in FY21. The overall project includes two additional option years with an estimated total award of just over \$1.6 million.
- Andy King, assistant professor in Iowa State's Greenlee School of Journalism, received an [initial grant of \\$396,908](#) from the NIH National Cancer Institute (NCI) for a four-year project that is estimated to receive more than \$1.5 million in total funding. Both incidence and death rates due to colorectal cancer (CRC) are disproportionately higher among Black Americans, compared to non-Hispanic White Americans. King is leading a multi-institution team that is studying communication related to colorectal cancer screening (CRCS). The ultimate goal is to identify messages and information that are most effective in supporting adherence to CRCS recommendations and ultimately improve screening acceptance and behaviors in at-risk communities.
- [Jonathan Claussen and Carmen Gomes](#), both associate professors of Mechanical Engineering, received a one-year grant of \$664,521 from HHS and the Centers for Disease Control and Prevention (CDC) to develop better, cheaper, quicker, more accessible testing for the coronavirus that causes COVID-19. The project, which started with a \$15,000 seed grant from the Iowa State Office of the Vice President for Research, focuses on developing a saliva test similar to test strips used to monitor glucose levels in people with diabetes. The tests could be easily done at home, workplaces or a doctor's office with no expensive lab equipment. Results would be available in about 20 minutes, and the cost of the test is expected to be less than \$6.
- Soumik Sarkar, associate professor of Mechanical Engineering and a Walter W. Wilson Fellow in Engineering, received an initial FY21 award of \$1.9 million from NSF and USDA-NIFA on a five-year \$7 million Cyber-Physical Systems (CPS) Frontier grant. Sarkar is leading a multi-institution, interdisciplinary research initiative that could bring unprecedented levels of efficiency and sustainability to production agriculture. The team is focused on transforming current cyber-physical systems and capabilities in agriculture by developing a novel, context-aware cyber-agricultural system that encompasses sensing, modeling, and actuation activities to enable farmers to respond to crop stressors more cost-effectively, with greater agility and with less impact on the environment than current practices.
- Many small and rural communities across Iowa and throughout the U.S. are shrinking, and evidence shows this a trend that is unlikely to be reversed in most instances. Kimberly Zarecor, professor of Architecture in the College of Design, received an NSF award of \$1.5 million to spearhead a project that encourages communities to adapt

to shrinkage rather than fight against it, with the goal of helping them mitigate the negative effects of population loss on quality of life and community services. Zarecor's multidisciplinary team will develop and test new educational resources and data-driven tools to help rural Iowa communities implement effective strategies for smart shrinkage.

- Adina Howe, assistant professor in Agricultural and Biosystems Engineering, [received a \\$1 million award from USDA-NIFA](#) to explore the connection between livestock manure management and antimicrobial resistance (AMR). The majority of antibiotics in use today are used in animal production. Antibiotic-resistant bacteria can end up in manure and can make their way into the environment when manure is applied to fields as fertilizer. Howe and her fellow researchers aim to figure out what resistant genes proliferate in bacteria and how widely those bacteria spread and persist in the soil.

Iowa State continues to help lead innovation and discovery in three priority [Bioscience platforms](#) – Biobased Products, Digital and Precision Agriculture and Vaccines and Immunotherapeutics – that are critical for continued economic growth and development in the state of Iowa.

The university strategically invested the \$813,000 the Iowa Legislature allocated in FY21, along with a one-time supplement of \$750,000 from [BioConnect Iowa](#), in key initiatives designed to foster greater university-industry collaboration and economic development. Here are just a few of Iowa State's Biosciences-focused accomplishments for FY21:

- [Nadilia Gomez](#) joined the university in the spring of 2021 and [Michael Roof](#) in the fall of 2020, as Chief Technology Officers (CTOs) for the Digital and Precision Agriculture and Vaccines and Immunotherapeutics platforms, respectively. With the fall 2019 hire of [Sundeep Vani](#) as CTO for Biobased Products, the university now has the three platform CTOs in place. The CTOs are working with platform leads and research teams to identify technologies with commercial potential and prioritize those opportunities for commercial development.
- Having all CTOs on board has accelerated industry outreach, resulting in more than 30 substantive engagements with startups and established companies within key industry segments.
- DOD has provided \$87.5M of funding over six years to [BioMADE](#), a university-industry consortium focused on advanced manufacturing of biobased products. Sundeep Vani was heavily involved in the development of the winning proposal, and holds a seat on the consortium's governing board, which positions Iowa State well for receiving funding for projects relevant to the BioMADE initiative.
- A seed grant program to support public-private research projects in the platforms started in FY20 and continued in FY21. Since the program's inception, grants have been awarded to support ISU/industry research projects with: Kemin Industries, Kent Corporation, Siegwark USA, Archer Daniels Midland (ADM), Medgene Labs, Arko Labs, Nittobo America, Elanco Animal Health, Genvax Technologies, LEAH Labs, Boehringer Ingelheim, Iowa Select Farms, and Corteva Agriscience.
- CTO Michael Roof, working with ISU Research Park, organized a successful virtual [Vaccines and Immunotherapeutics conference](#). The event drew 124 attendees – business development and senior R&D leaders in strategic decision-making roles – from numerous companies.
- Iowa State received a National Science Foundation (NSF) award of \$99,948 to host a [Digital and Precision Agriculture convergence accelerator workshop](#), in tandem with university

collaborators, North Carolina A&T and Penn State. Nearly 100 scientists, engineers and stakeholders participated in the May 2021 workshop that served as a brainstorming and ideation platform to identify critical needs and map out future strategic priorities.

- Nearly 20 faculty-initiated startup companies have licensed Iowa State-discovered technologies – [Skroot Laboratory Inc.](#), [SoyLei Technologies](#) and [3D Health Solutions](#), just to name a few.

### **Assistance to Communities**

Through a partnership with ISU Extension, the **CyBIZ Lab student teams supported three community projects** performing market research and economic analysis efforts for small, rural communities in Iowa.

Pappajohn Center staff **spent 2,500 hours** visiting classrooms, community groups, and conducting training programs to share entrepreneurial and small business resources.

Assistance to Iowa communities is the focus of many of the programs managed by ISU Extension and Outreach. Some examples of direct economic development assistance to Iowa communities are provided below.

### **Extension Community and Economic Development**

#### ***Local Government and Nonprofit Programming***

In FY21, CED specialists conducted Introduction to Planning and Zoning workshops to 130 local government officials. The CED Office of State and Local Government Programs (in tandem with the Iowa League of Cities) trained 391 municipal professionals at the Municipal Professionals Institute and Academy. Township Trustee and Clerk training was provided to 118 local municipal professionals. Grant Writing 101 training was provided to 444 nonprofit and local government individuals. CED's local government and housing team presented at affiliated local government programs and trained 207 individuals.

#### ***Strategic Planning and Goal Setting***

CED provides goal setting and strategic planning services to help local governments and nonprofits address critical issues, identify priorities, and develop action plans to accomplish those priorities. In FY21, CED facilitated strategic planning and goal setting to 18 organizations, including those on the national, state, county, and local levels.

#### ***Iowa Retail Initiative***

Iowa Retail Initiative (IRI), a part of ISU Extension and Outreach, is a three-part program designed to strengthen independent retail in Iowa communities. Community and Economic Development extension specialists provide the training and coaching. In FY21, 29 community and business leaders from 4 communities participated in IRI workshops or consultations.

#### ***Student Involvement in Community Development***

In spring 2021, 18 Community and Regional Planning students developed alternative housing options for a former school site in Grand Junction and 6 Landscape Architecture students

developed site plan concepts for outdoor space for a Cedar Rapids homeless shelter through CED's PLACE program. The Office of State and Local Governments employed a student intern to assist in organizing and carrying out the 2020 Municipal Professionals Institute and Academy in July 2020. From June 1 to August 1, 2021, Iowa State University **Data Science for the Public Good (DSPG) Young Scholars Program** taught **9 student interns and 3 graduate fellows** to apply data science skills to solve local community problems through the identification and discovery of datasets that can be used to better analyze, visualize, and understand the problems and their potential solutions. The program is led by a coalition of land-grant universities in three states—Iowa State University; Oregon State University; Virginia Tech; Virginia State University—and the University of Virginia.

### ***Iowa's Living Roadways Community Visioning Program***

For the past 25 years, the Community Visioning Program has helped rural communities plan transportation enhancements using state funds from the Iowa DOT. To date, more than 250 Iowa towns have completed the process and collaborated with design teams to create conceptual transportation enhancement plans. More than two dozen towns have repeated the program. In spring 2021, Iowa's Living Roadways Community Visioning Program employed **12 student interns to assist in assessments and analysis in 10 communities**. In addition, private-sector firms contracted through the program employed 6 student interns as part of their design teams to assist with developing conceptual designs for client communities.

### ***New Programming Initiatives***

- The CED program is partnering with the Iowa Economic Development Authority through the Empower Rural Iowa grant and CDBG technical assistance program to conduct **Rural Housing Readiness Assessments (RHRA)** for Iowa communities. CED created the RHRA to help communities self-assess their housing needs, educate community members about housing decision points, guide them in creating a common vision for housing in their community, and create a 3- to 5-year action plan to accomplish that vision. In spring 2020, 11 rural Iowa communities were set to begin their housing workshops. Gathering in-person for the workshops was not always possible due to COVID-19 so the CED staff converted the RHRA program from a face-to-face series into an interactive, virtual workshop experience. Each town completed an action plan, and CED specialists provided follow-up assistance for next steps. CED's work in converting to the online format was recognized by the ISU Vice President for Extension and Outreach with an award for Innovative Program Delivery in February 2021. All 11 towns completed the RHRA process, accessing a total of \$100,000 in state assistance and raising a total of \$51,500 in local match dollars. More than 100 local leaders were trained to make better decisions about housing in their local communities; they provide new knowledge and expertise at the local level. Increased leadership has been another result; in each community, several volunteers are leading work teams and moving tasks forward.
- In 2020, **the Municipal Professionals Institute and Academy (MPI/MPA) were moved to a completely virtual format** because of the COVID-19 pandemic. While the educational component of MPI/MPA was mostly effective, participants missed out on the networking experience available only in an in-person setting. At the same time, participants enjoyed the convenience of not having to spend time and money to travel. As a result, CED local government launched a "blended" format for MPI, which consists

of winter and fall virtual sessions and a four-day in-person event in July. The combination of online and in-person learning will take the best of both worlds, while acknowledging that while it's not always best to learn online, it does save attendees the time and expense of travel.

- **The Great Iowa Road Trip** was a weekend event planned to help revive Iowa's small businesses and small towns. The event, which was held April 30 and May 1, 2021, was a coordinated, mapped tour of open doors at businesses and attractions in southern Iowa. CED partnered with several community development organizations to organize the event, training 84 businesses and managers. Of those 84 people, 44 business owners applied and 42 participated. A total of 5,320 people (general public and marketing interaction for the event) attended, and 140 youth participated in activities and attractions put on by the businesses and museums.

### ***Community Food Systems Team***

#### **Local Food Leader and Community Food Systems Certification Programs**

The Local Food Leader and Community Food Systems certification programs have been offered since 2015 as a joint effort of the Farm, Food and Enterprise Development (FFED) and Community and Economic Development (CED) units of Iowa State University Extension and Outreach. Due to COVID-19, the program team transitioned these courses to an entirely virtual format. Both virtual courses sold out for fall 2020, with 16 participants in the Local Food Leader cohort and 21 in Community Food Systems cohort. Participants attended from 36 states and included extension employees, farmers, community planners, and nonprofit staff. Participants consistently comment in trainings and homework assignments on the high value they place on these trainings. Their knowledge gained will make them more effective practitioners and will benefit their communities by improving healthy food access and food security.

#### **Online Farmers Market**

The COVID-19 pandemic abruptly closed restaurants and schools in March 2020. For farmers selling food to those outlets and with farmers markets at risk as well, it immediately created uncertainty about the upcoming growing season. Northeast Iowa ISU Extension and Outreach program specialists collaborated with Decorah area farmers and the Iowa Food Hub (IFH) to create an online farmers market to bridge the gap until markets opened later in the summer. One farmer noted "The online market helped offset that revenue loss for our farm. It also provided an opportunity to connect with consumers that may not have otherwise been aware of our farm or the things that we sell. The online market has impacted our farm very positively. It has provided a way to supply our local communities in a collaborative effort with many other producers in a way that did not previously exist here."

Twenty-four farms participated in the online market in 2020. Customers placed 3,100 orders and purchased \$85,800 of products. Farm sales ranged from \$64 to \$23,580 for the year including individuals, small retailers, and child care centers. The online market continued to operate during the winter months and added product from its wholesale suppliers to maintain a diverse product offering. Customer feedback has been overwhelmingly positive. One customer shared that "this is one of the best responses to the pandemic. All my family and friends throughout the USA have commented they wish they had this program." A producer noted, "Without the hard work and dedication of people from ISU Extension, Iowa Food Hub and countless others, our farm and others would have been much worse off."

### **ISU Community Food Systems 2021 Annual Event**

Supply chain breakdowns during the COVID-19 pandemic of 2020 highlighted the critical need for secure, effective local food systems focused on equity. Iowa State University Extension and Outreach has hosted a national annual event for food system practitioners since 2015. The 2020 conference was held virtually and provided a space to promote, engage, and learn with other food systems practitioners while providing insight for community-based food systems actions and strategies. The conference featured a total of 19 presenters and 87 registered attendees. A satisfaction survey distributed digitally showed >75 percent of respondents felt welcomed during the event, felt their voice was heard, and felt included in the interactive breakout sessions. Most respondents claimed they learned helpful information and resources that were beneficial and relevant to their work. Attendees indicated an overall satisfaction rating of 4.4/5 (88 percent) for the event presentations. All respondents stated the event gave them a better understanding of potential projects that may be beneficial to their community.

### **Major Economic Development Collaborations**

Iowa State University takes great pride and pleasure in its collaborations with both private and public sector partners. These collaborations are essential to achieving the university's and the state's economic development goals. The first five sections below identify new collaborations begun or formalized this past year. The remaining sections describe on-going significant state and regional collaborations:-

#### ***Iowa State, University of Iowa John Pappajohn Entrepreneurial Centers partner on Kauffman Challenge Grant***

The Iowa State University and University of Iowa John Pappajohn Entrepreneurial Centers collaborated to submit and were awarded a Kauffman Foundation Challenge Grant providing \$100,000 to focus on increasing the number of SBIR and STTR grants awarded to faculty in Midwest institutions. The Challenge Grant planning team includes Iowa State University and economic development staff at U of I as well as BioConnect Iowa, to reach out to institutions in Iowa, Nebraska, Kansas and Missouri to research and share best practices. The efforts will continue into 2022.

MIT VMS – A second Kauffman Foundation-funded grant has brought together all five John Pappajohn Entrepreneurial Centers (Iowa State, Iowa, Drake, UNI, and NIACC) to be trained in and implement MIT's Venture Mentoring Service program, established to build a strong network of mentors for Iowa's startup companies. Staff from each of the JPECs participated in virtual training and will launch the Iowa VMS pilot in the fall of 2021.

Techstars Iowa – Iowa State University, the University of Iowa, and Grinnell College partnered with Techstars Global to establish the first ever Techstars Iowa program in Des Moines in 2020. University partners are involved in applicant pitches, mentoring, and serve as advisors to the Techstars Iowa program. Techstars Iowa launched its second cohort in the summer of 2021. To date, four Iowa startups have participated in Techstars Iowa.

#### ***Iowa Department of Transportation Partners with CIRAS on Disadvantaged Businesses***

CIRAS has received a \$133,000 grant from the Iowa Department of Transportation (DOT) to help economically and socially disadvantaged businesses develop so they are better able to compete for highway construction projects and other DOT-funded projects.



CIRAS will provide one-on-one assistance to companies who qualify as Disadvantaged Business Enterprises (DBE), small business that are at least 51 percent owned by women or minorities, about the best ways to position themselves for government bidding opportunities and market themselves to prime contractors and government agencies.

The grant includes promoting the DBE program to companies that aren't yet part of it and to host quarterly networking or matchmaking events to connect DBEs with prime contractors and government agencies. In addition, CIRAS will engage a Technical Advisory Committee to act as a sounding board for the kinds of services needed to support DBEs.

### ***CIRAS Partners with State on Manufacturing 4.0 Initiative***

CIRAS collaborated with the Iowa Economic Development Authority (IEDA) and a variety of additional public and private entities to drive the Manufacturing 4.0 initiative. The first phase of the initiative focused on defining the key strategies needed to ensure Iowa's manufacturing sector remains competitive as the world transitions to Industry 4.0.

CIRAS continues to partner with IEDA on this initiative through supporting the new Technology Investment Grant Program. As part of this program, CIRAS will provide manufacturers with 3-75 employees a no-cost Industry 4.0 assessment prior to applying for the grant. This approach allows manufacturers to be informed about the key opportunities and risks surrounding an Industry 4.0 implementation prior to applying for state funds.

### ***Iowa's Community Colleges, CIRAS, and others form Industry 4.0 Training Consortium***

Iowa's 15 Community Colleges and the Iowa Association of Community College Trustees formed a new consortium with CIRAS, the Association of Business and Industry (ABI), the Iowa Department of Education (DE), the Iowa Economic Development Authority (IEDA), Iowa Workforce Development (IWD), Professional Developers of Iowa (PDI), and the University of Northern Iowa (UNI) focused on developing and deploying awareness and training on Industry 4.0.

This effort, based on recommendations from the IEDA Manufacturing 4.0 initiative, brings together the manufacturing ecosystem to implement an education and awareness strategy statewide. The consortium will develop curriculum to meet training needs of all sizes of manufacturing businesses throughout Iowa. In addition to customized training for the existing workforce, the group will develop and enhance certificate, diploma, and degree programs to ensure employers have access to advanced skills training and career pathways now and in the future.

### ***Iowa State University Collaborates on Technology Transfer Services***

Iowa State University and the University of Northern Iowa (UNI) continue in their partnership in technology transfer. The partnership allows UNI to leverage Iowa State University resources for technology transfer. UNI has the option to manage the protection and commercialization of their innovations or can choose to have the Iowa State University Research Foundation provide those services. ISURF has also entered into an agreement with Drake University to provide technology transfer service as well. ISURF first licensed UNI technology in FY20 which has already resulted in licensing revenue; ISURF began negotiations to license a Drake technology in FY21.

### ***ISU Partnership with Cultivation Corridor***

Iowa State University has representatives on the Board of Directors of the Cultivation Corridor, a regional economic development initiative to attract ag-bioscience firms to Iowa that was launched in April 2014. Other board members include Iowa Economic Development Authority, leading Iowa companies in the ag-bioscience industry, and Iowa commodity groups. ISU also serves on the Advisory Cabinet of the Executive Director of the Cultivation Corridor. ISU's Office of Economic Development and Industry Relations works closely with the Cultivation Corridor, providing university expertise and services to support the Corridor's efforts.

### ***Statewide Committees, Councils, and Task Forces***

Many representatives from ISU serve on committees that promote economic development programs. Those committees include the following: the Iowa Business Council's Business-Education Alliance, the Iowa Innovation Corporation, the Biosciences Alliance of Iowa, Association of Business and Industry Advisory Council, the Iowa Lean Consortium, Professional Developers of Iowa, the Iowa Business Council, Innovate Iowa, Technology Association of Iowa, the IEDA Advanced Manufacturing Working Group, Capital Crossroads, the Cultivation Corridor, and the Iowa Chamber of Commerce Executives. SBDC additions: Iowa Economic Development Authority Board, Future Ready Iowa, Renew Rural Iowa Entrepreneurial Roundtable, Iowa Rural Development Council, Brownfield Advisory Committee, Iowa Waste Reduction Center, Value Added Agricultural Sustainability Team.

### ***Midwest Grape and Wine Industry Institute***

The Midwest Grape and Wine Industry Institute, supported by the College of Agriculture and Life Sciences and ISU Extension and Outreach, was formed in 2006 by the Iowa Board of Regents as a result of the state's evolving grape and wine industry.

The goals of the Institute are to:

- conduct research to evaluate cold-hardy grape varieties that can thrive in the Midwest;
- conduct enology research and develop vinification techniques;
- assist with implementation of the Iowa Quality Wine Consortium program, a quality assurance stamp of approval;
- establish an outreach program to the industry by offering training opportunities to cellar workers and winemakers;
- form partnerships to develop job training programs specific to growing grapes and wine making

Iowa has 99 licensed wineries and 245 commercial vineyards. At the end of 2020, total wine, cider, and mead production totaled 307,267 gallons, down slightly from 2019. Sales were reported at 276,274 gallons. Wine sold at wineries represented 42 percent of sales, while the remaining 58 percent was sold at wholesale. The grape and wine industry in Iowa is maturing but continues to grow. According to a 2012 study by Frank, Rimerman + CO. LLP, the economic impact of the Iowa wine and grape industry on the state's economy is \$420 million.

### **Future Plans**

Iowa State University greatly appreciates the resources and support that it receives from the Board of Regents and the legislature to carry out its economic development initiatives and activities. The primary purpose of this report is to show the huge economic and quality of life

impacts we have been able to achieve for the state with the resources entrusted to us. The following sections identify how we plan to use additional resources to enhance the impact of university technology transfer and service on the creation of jobs and wealth in Iowa.

### ***Small Business Development Centers***

By helping its clients improve and grow their businesses, the SBDC generates new tax dollars for the Iowa treasury in the form of sales tax revenue from increased client sales and income tax revenue from new jobs created by clients. In state fiscal year 2020, SBDC clients generated an increase of \$415 million in sales, \$182 million in capital invested in Iowa businesses, and created 2,245 jobs. These rather large numbers were driven by the SBDCs COVID-19 response, as mentioned earlier in this report. All information reported by the SBDC is verified and attributed to the assistance of the SBDC by the client through the client milestone collection process. SBDC is a good investment for the State of Iowa!

SBDCs across the state helped their clients achieve the following success for the state.

- **Over \$34,000,000 in sales EVERY MONTH**
- **Over \$498,000 in capital investment in Iowa Companies EVERY DAY**

The SBDC also has a technology center designation allowing us to provide more in-depth counseling to entrepreneurs who have ideas or innovations that have potential for commercialization. In February 2021, SBDC launched the Rural Business Innovators (RBI) program. RBI is an entrepreneurial training program that focuses on finding commercialization opportunities in Iowa's rural areas in an effort to increase wealth and create jobs in rural Iowa. The first co-hort of nine tech companies have been meeting and developing their business models. <https://sites.google.com/iastate.edu/ruralbusinessinnovators/home>

Cybersecurity awareness has been a priority for SBDC. We have developed a dedicated webpage that has a comprehensive cybersecurity assessment guide, as well as hosted a series of cybersecurity webinars that are also available on the site. We are working closely with the Secretary of State Office to promote cybersecurity awareness and have provided blog posts for their newsletters as well as a cybersecurity booklet they will be distributing at the Iowa State Fair. <http://iowasbdc.org/cybersecurity/>

The SBDC is also providing training to our rural areas across the state to help build and create wealth for Iowa businesses that may not typically have access to additional resources. The training program consists of both in-person and virtual trainings and assistance to develop stronger brands and assist businesses in commercializing their products. SBDC has also produced on-demand training videos for entrepreneurs interested in starting a business. They are called Smart Start and are available in both English and Spanish. <https://iowasbdc.org/on-demand-training/>

It should be noted that SBDC is working diligently to collaborate and partner with other organizations throughout the state, both public and private, to ensure that we are not duplicating efforts and to leverage each other's resources and efforts.

### ***ISU Pappajohn Center for Entrepreneurship***

The Center for Entrepreneurship, which is celebrating 25 years in 2021, is working diligently to expand opportunities for entrepreneurial learning and business support as part of President Wintersteen's campus-wide initiative in entrepreneurship. The center has worked with faculty and staff in all of the colleges to support the development of programming and experiential learning opportunities for the growing number of students interested in pursuing entrepreneurship as an academic area of study or because they want to pursue their ideas, inventions, or product creations as a business venture. The center has partnered with the director of the Student Innovation Center to bring Pappajohn Center programs and services to campus for more convenient delivery and the opportunity for students to collaborate across disciplines in this new collaborative space that opened fall 2020 but will be dedicated formally in fall 2021.

In August 2020, **ISU Startup Factory** moved under the Pappajohn Center for Entrepreneurship. The program provides opportunities for undergraduate students, graduate students, faculty and staff to create scalable businesses that address technical, societal or other challenges. Entrepreneurs in the Startup Factory receive formal training, resources, and access to a network of business mentors, advisors, counselors and investors. To date, **nine cohorts have completed the program. Cohort 10, with 8 new startups, launched in 2021 under the leadership of a new program director. A total of 78 startups have completed the program.**

The Pappajohn Center for Entrepreneurship and ISU Startup Factory have been aligned together organizationally to better integrate educational training and support for entrepreneurs of all types and to provide business support and resources for entrepreneurs across campus.

In the fall of 2020, ISU Startup Factory and its partners, BioConnect Iowa and Venture Net Iowa, received a \$525,000 Economic Development Administration grant to launch a new statewide Go-To-Market Accelerator, which is currently running with five cohort companies representing the med-tech, biotech, animal vaccines, manufacturing, and education industries.

ISU Startup Factory is playing a key role in launching a new mentoring program in partnership with MIT's Venture Mentoring Service and the four other Pappajohn Centers. This collaborative initiative, funded by the Kauffman Foundation, will provide industry-specific resources and potential funding support for startups all across Iowa.

The Pappajohn Center facilitated review panels to select the faculty who received the 2021 Regents Innovation Fund technology commercialization grants. Ten (10) faculty P.I.'s will receive \$448,000 in support to further commercialize their technologies in collaboration with industry partners.

CyBIZ Lab teams will continue to partner with faculty grant recipients in the Regents Innovation Fund program to help validate business opportunities stemming from university research discoveries with the goal of increasing the number of startups at the ISU Research Park, providing potential employment opportunities in Iowa for students and graduates from across disciplines.

The Techstars Iowa partnership with partners at Iowa State University, the University of Iowa, and Grinnell College, will celebrate the close of its second cohort in September 2021.

The Pappajohn Center, in partnership with the Ivy College of Business, SBDC, and Home Base Iowa, is planning a 2022 summer program for Veterans interested in pursuing a startup or small business venture.

Working collaboratively with the CTO's, I-Corps leadership, OIC, and VPR, the collective focus is on increasing the number of technologies and startups moving through the university. Concurrently, educating students in entrepreneurship and innovation will produce more entrepreneurial thinkers and innovators to solve small and large problems, ideally producing greater employment opportunities in Iowa for graduates.

### ***Iowa State University Research Park***

ISURP underwent a significant expansion in recent years which doubled the developable acreage and included commercial amenities such as a restaurant, fitness center, child care facility, walking and biking paths and a 38-acre park that are expected by young professionals today. Projects completed in the last year have largely focused on expansion of current tenant facilities and infrastructure. The third phase of the demonstration park (Tedesco Environmental Learning Corridor) developed in partnership with Story County Conservation, was completed in August of 2020. This connects the trail infrastructure at ISURP and Ames to the High Trestle network near Kelley/R38. In addition, John Deere's 2019 investment in a sprayer facility, which added 33,000 square feet and a development location for Deere was leveraged with a \$1.8 million infrastructure grant from EDA that expanded roadways and brought utilities to the surrounding 38 acres. That work was also completed last year. Deere has continued to expand their research investments across campus and through ISURP and BCRF. They also are in the process of expanding their second location at RP, where most of their recruitment initiatives are housed.

ISURP's recent growth and the shift in our tenant base from largely startups to a mix of both startups and well established international companies has assisted the financial viability of the research park and positioned the organization to weather the challenges associated with the pandemic. Long term leases with well-established companies allows ISURP to assist startups with a greater operational risk tolerance. We have dedicated staff full time to connecting research park innovators and prospects to Iowa State University, and largely, aside from non-pandemic associated churn, our tenant base remains stable.

Like much of the campus and surrounding community, it is imperative to our long term success to keep students on campus, as increasingly our tenant base relies on student workers to fuel recruitment strategies and long term growth initiatives. Positioning ISURP staff full time working towards connecting tenants to the resources available at Iowa State (aside from talent acquisition) is an intentional strategic effort to broaden the engagement strategies of our largest tenants into research and infrastructure investments to maintain a tenant-base with interests that include research/infrastructure in addition to talent acquisition.

Iowa State is renowned as a research institution. From veterinary science to agricultural related pursuits, to a robust engineering program, there are new developments coming out of the University on a daily basis. And companies large and small are paying attention and the opportunity for the ISURP to initiate connections between the two offers robust opportunities. Travel restrictions, work from home orders and all of the havoc caused by COVID-19 have represented a unique opportunity for Iowa State researchers to share their work with corporate interests with speed and efficiency not previously recognized. We feel optimistic that while most of our tenant companies are not yet fully back at work, most are doubling down their efforts to explore new research and development opportunities with Iowa State and that we are able to deliver these engagement meetings with unparalleled efficiency. In fact, despite not being fully out the other side of the COVID-19 pandemic, the research park has the lowest vacancy rate in recent years and needs to expand spaces to meet current demand.

In recent years, a number of companies with an international reach have opened innovation hub/offices at ISURP, each of them sharing a common interest in the benefits of having a physical presence in close proximity to the university.

Also, this past year several more Iowa-based companies established operations in the Research Park to get better connected with the research expertise and infrastructure at the university as well as the workforce talent being developed on campus. We believe innovation “hubs” will continue to be an emerging opportunity for tenant attraction. As we look to the future and the new order that will inevitably become new workforce solutions, partnerships with companies as they retool and rethink work strategies in the wake of the pandemic will include remote training facilities and operations as an emerging area of interest, in particular as they align with Iowa State’s strengths. To that end, we recently retooled our affiliate program to include a co-working option.

Pre-pandemic, ISURP was finding great enthusiasm from corporate partners on the shared vision of an agricultural technology hub facility where companies with aligned interests in agriculture/technology could locate with shared communal space and high bays. COVID-19 initially put most of those discussions on hold, but our partners tell us they remain interested in pursuing such a facility and we lack space to backfill new tenant partners into current multi-tenant facilities. Any new funds to the ISU Research Park would be utilized to support costs associated with the expansion of ISURP and the region in the area of agriculture/technology to establish Iowa as the center of gravity for all things ag tech, as well as to increase our efforts to attract and retain tenant companies and the highly skilled workforce necessary to fill those jobs.

### ***The Center for Industrial Research and Service***

CIRAS has been supporting the growth of Iowa industry since 1963. As Iowa recovers from the COVID-19 pandemic, the need for people statewide continues to be the top issue across industry. As businesses formulate strategies to maintain growth, CIRAS continues to build our focus on proven and emerging strategies to respond to workforce needs. In addition to new strategies focused on finding, training, and retaining people, we will continue to grow our ability to help manufacturers implement new technologies to increase output, cybersecurity controls to protect the business, and new ways of finding local suppliers for a more resilient supply chain.

New funding of \$1 million per year for expanded services can be leveraged to bring in an additional \$1 million of federal grants and fees to help Iowa businesses implement real solutions to solve their workforce problems. Historically, funding at this level has led to companies reporting \$100 million of new sales and investments and 1,000 jobs created or retained.

### ***ISU Research Foundation (ISURF)***

The Iowa State University Research Foundation has been self-supporting since 1992 and over the last ten years has returned more than \$12.9 million to Iowa State University and the Ames Laboratory to support the research enterprise. ISURF continues to distribute royalty revenue in accordance with the royalty sharing policy, and funds in excess of those needed to support ISURF's operations will be utilized to support research initiatives as recommended and approved by the ISURF Board of Directors.

### ***ISU Extension and Outreach***

Extension and Outreach works across ISU colleges and with external partners to provide technical assistance, research-based education, and access to the resources of ISU to improve the competitiveness of farmers and businesses and quality of life in the state. Iowans want an economy that can form new businesses, grow existing industry, enhance communities, and recruit companies to the state. Iowa's STEM jobs are expected to grow 10% by 2027, with median earnings in Iowa STEM jobs at \$32.98/hour. Iowans see the need to stop the "brain drain" and take steps to develop the state's future workforce, connecting youth with opportunities here in Iowa.

With additional funding, ISU Extension and Outreach will expand economic opportunities and development projects to broaden Iowans' entrepreneurial aspirations with education and technical assistance. Extension and Outreach also will address the distinct needs of minority populations, as well as a burgeoning local foods industry and many struggling rural downtowns. These are only a few of the basic needs and urgent trends facing this state.

<b>Summary of ISU Economic Development and Innovation Data</b>	
a. Number of disclosures of intellectual property (excluding data sets)	144
b. Number of patent applications filed	114
c. Number of patents awarded: U.S. issued patents	50
total issued patents (world-wide)	71
d. Number of license and option agreements executed on institutional technologies: in total	47
in Iowa	22
e. Number of license and option agreements yielding income	118
f. Revenue to Iowa companies as a result of licensed technology (CY19)	\$1.7 million
g. Number of startup companies formed (through licensing activities) in total	8
in Iowa	8
h. Number of companies in research park and incubators pre-incubator companies	33
private	82
university related	19
i. Number of new companies in research park and incubators pre-incubator companies	25
private	10
university related	0
j. Number of employees in companies in research park and incubators	1,913
k. Royalties and license fee income	\$2.9 million
l. Total sponsored funding received	\$559.1 million
How much of this is for research	\$231.1 million
m. Corporate sponsored funding received for research and economic development: in total	\$51.5 million
in Iowa	\$12.2 million
n. Iowa special appropriations for economic development, in total	\$3.474 million
SBDC	\$0.936M
CIRAS Technology Assistance Program	\$1.365M
ISU Research Park	\$0.122M
Regents Innovation Fund	\$1.050M
o. Research expenditures (federal, state and local; business; nonprofit; institution funds; all other sources, FY19):	\$268.6 million
p. Licenses and options executed per \$10 million research expenditures (FY19 AUTM Survey)	1.2
q. Sales of licensed products by Iowa-based companies (CY20)	\$1.7 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	8,066
Note: Unless noted, the data provided above are FY21 data.	



## **Appendix 1: CIRAS, SBDC, and ISURF company and community projects**

**United Equipment Accessories (UEA)**, a Waverly manufacturer of slip rings landed a \$1.7M contract from the Federal Aviation Administration after CIRAS helped the company understand the government bidding requirements and learn how to write a formal proposal. Hemen Dattani, sales director for UEA, was tasked last March to explore federal contracting opportunities so UEA could leverage a newly forged research and development partnership to expand design capabilities and make the company competitive in new markets. He worked with a CIRAS government contracting specialist for weeks learning how to interpret the government's requirements. The nature of the project meant that UEA had to do more than simply provide a product—the company would need to write a proposal explaining how it would meet the FAA's needs. "This is selling by writing," Dattani said. "It's very different in many ways, and totally new for us. The CIRAS PTAC was very instrumental in guiding me through each step of the way."

**Weiler Inc.**, a Knoxville-based heavy equipment manufacturer, worked with CIRAS to understand a specific failure mode of a component and how to proactively detect the potential concern. The product was from a new process used by Weiler to make rock drills, causing cracking at and under the drill's surface. "CIRAS helped us hone in on the specific type of failure that we had," said Weiler's project engineer Mark Prachar. He added, "It helped us develop our grinding process and in-house nondestructive evaluation (NDE) inspection techniques." Weiler estimates that CIRAS helped the company avoid an estimated \$10 million in lost sales.

**Woofables**, a Coralville-based manufacturer of gourmet dog treats, expects to triple in size over the next three years after CIRAS gave it the confidence to expand its service of two different parts of the market for high-quality treats. "It was making us schizophrenic to serve both of these markets," said Woofables co-owner Laura Taylor. "CIRAS just gave us the confidence to say, 'We don't want to pick one. We want to serve both.'" The change comes after Taylor decided to take advantage of a pandemic-driven lull in business last year to launch a substantial review of the company. CIRAS supported Woofables through strategic planning, market analysis, e-commerce, and improving the factory to make their production lines as efficient as possible.

**The Dimensional Group**, a maker of custom packaging and commercial printing products in Mason City, facing a downturn in business due to the COVID-19 outbreak pivoted to produce much needed face shields with the help of CIRAS. CIRAS connected the company with another Iowa company to begin the production of shields within ten days. "To go from nothing to shipping product in eight or ten days, that is something that never happens," said The Dimensional Group president Adam Gold. This Iowa-based partnership produced more than 1.3 million face shields within the two months, eventually reaching nearly 2 million with the majority going to the State of Iowa to be used throughout the state.

**World Class Industries**, a Hiawatha-based assembly and supply chain integration company expects to see at least \$5 million a year in new business after CIRAS facilitated a partnership with Timilon, an air purification company. Iowa entrepreneur and Timilon investor John Pappajohn reached out to CIRAS partner North Iowa Area Community College (NIACC) Pappajohn Entrepreneurial Center (JPEC) searching for Iowa companies that possibly could assemble EnviroKlenz purifiers. CIRAS and the NIACC JPEC used internal data and

manufacturing expertise to identify companies with the manufacturing capabilities, capacity, and quality necessary to meet the company's needs, recommending six firms to Timilon, including World Class Industries (WCI). WCI was selected by Timilon and began producing 24,000 units per year just a few months after the initial inquiry. Ryan Murphy, director of business development for World Class Industries, said Timilon liked "our ability to scale with their business, as well as our capability to provide ideas throughout the process to improve the manufacturability of their product."

Yulia Dannen, D&S Services, 2021 Deb Dalziel Woman Entrepreneur of the Year. Yulia is an immigrant from Russia and has used her drive and tenacity to build a successful financial services company in Mason City. Through the help of the North Iowa Area SBDC, she has built her business to work with troubled taxpayers who need assistance in getting a fresh start. She also provides accounting, payroll, individual and tax preparation services. She is also a proud member and promoter of the Targeted Small Business program, which is run by IEDA. <https://iowasbdc.org/wp-content/uploads/2021/07/Deb-Dalziel-2021-Brochure-Yulia-Dannen.pdf>

Bruce Teague, Caring Hands & More, 2021 Neal Smith Entrepreneur of the Year. Bruce starting his company at the age of 19, realizing he has a passion working with end of life patients and their families. He began has company in a mobile home with only 2 employees, and has grown to 10 group living locations and 90 employees in the Iowa City area. He is extremely active in his community, serving as the Mayor of Iowa City. He advocates strongly for minority owned businesses. <https://iowasbdc.org/wp-content/uploads/2021/07/Neal-Smith-2021-Brochure-Bruce-Teague.pdf>

**Critical Material Recycling** - Ames Laboratory researchers developed an environmentally-friendly process to selectively recover rare earth elements critical to consumer electronics, electric cars, and wind turbine generators. ISURF is working with a local Iowa company to transition the patented technology into commercial practice. The Iowa company has received over \$1.2 million in federal Small Business Technology Transfer (STTR) funding to help scale-up the technology.

**Improving Outcomes for Iowa's Poultry Industry** - Iowa State University researchers discovered that a particular bacteria could be used as a probiotic in poultry to decrease hatchling mortality and reduce the amount of harmful bacteria present in the flock. ISURF entered into an option agreement with an Iowa-based feed company for the technology, with the company sponsoring over \$115,000 in additional research at Iowa State to further mature the technology.

## **Appendix 2: Training and Related Educational Activities**

### **Center for Industrial Research and Service (CIRAS)**

In the face of the global COVID-19 pandemic, CIRAS was able to pivot to virtual education in days. While the pandemic forced the cancellation of in-person trainings, most of them were moved online, and dozens of new COVID-related trainings were developed and launched. Throughout the pandemic, CIRAS hosted over **300 online events, educating over 9,300 attendees**. Based on success with this model and continued feedback from industry, CIRAS will continue with a significant virtual component for the foreseeable future.

CIRAS hosted the first-ever Iowa Lean Consortium virtual conference, with over 200 attendees from 73 organizations. The event, customarily the largest single educational event hosted by CIRAS, was held online in 2020 for the first time due to COVID-19. CIRAS hosted Attendees learned leading-edge ways to engage their workforce and improve productivity, a critical component to solving Iowa's workforce shortage. Globally known speakers, national experts, and Iowa leaders, provided multiple ways for companies to experience Lean remotely. CIRAS and our partners joined forces to offer 25 different trainings, mostly virtual, focused on Industry 4.0 technologies. **Over 580 people attended technology specific trainings** with topics including: 3D printing, digital scanning, automation, digital design, and cyber-security.

**CED in ISU Extension and Outreach** empowers communities to shape their own futures through research, educational programming, community engagement processes, data analysis, and data synthesis. CED has multiple community development specialists in place with expertise and/or experience working with minority-owned businesses and community business leaders. The unit facilitates countless meetings and workshops annually through which organizations and individuals discuss issues and reach consensus on solutions and action steps. CED serves as an essential conduit between Iowa's communities and the resources of Iowa State University, creating partnerships with private and public sectors for the betterment of Iowans.

In FY21, CED offered **Introduction to Planning and Zoning Workshops** virtually to 130 planning officials throughout the state.

The **Geospatial Technology Training Program** conducted one **ArcGIS** two-day short course for 18 planners and local officials from throughout the state.

**Leading Communities: A Place-based Leadership Program** is a research-based leadership program developed by ISU Extension and Outreach. It is designed to promote community engagement and increase capacity among community members for addressing common issues and problems. In FY21, 94 local leaders in six communities completed the Leading Communities curriculum.

**Agriculture and Natural Resources Extension and Outreach (ANR)** provides research-based information and resources to educate Iowa's farmers, producers, and agribusinesses. Much of Iowa's economy thrives on the state's rich agricultural heritage. ANR programs impact all Iowans, whether they live in rural or urban areas, and have

been developed to improve quality of life. ANR specialists are engaged with farmers, researchers, organizations, agencies, agribusiness, and communities at state, regional, and national levels.

**“Growing Together”** promotes healthy food access for families with low income through a partnership of ISU’s SNAP-Ed (coordinated through Human Sciences Extension and Outreach), Master Gardener volunteers, ISU Research and Demonstration Farms, and Iowa food pantries. In 2020, Master Gardener volunteers and their partners grew, harvested, and donated 81,328 pounds of fresh produce throughout the growing season, which equates to more than 243,000 servings of fruits and vegetables for food pantries. In addition, 1,016 individuals with low income participated in direct gardening and produce preparation education.

The **On-Farm Food Safety Team** (from College of Agriculture and Life Sciences, Human Sciences Extension and Outreach, and the Department of Food Science and Human Nutrition) has been leading two, million-dollar Food and Drug Administration grants and one, million-dollar USDA grant focused on food safety for fruit and vegetable growers in Iowa and the North Central Region. Within Iowa, nine Produce Safety Alliance training sessions were held with 130 participants. The team also runs the North Central Region Center for Food Safety Modernization Act Training, Extension, and Technical Assistance, and conducted an additional 50 Produce Safety Alliance trainings, educating 891 growers in the region.

The **Farm Management Team** has successfully led Central Iowa ag marketing clubs for more than 20 years and added online resources called the Iowa Commodity Challenge to the program in 2010. The marketing clubs and online resources focus on crop marketing risk management education and tools. Evaluation results in 2020 indicated the impact of improved crop marketing knowledge was more than \$21 per acre and more than \$1.7 million for all evaluation respondents.

Over half of Iowa farmland is owned by someone who does not currently farm, of which 34% is owned by owners with no farming experience, and the remaining 24% is owned by retired farmers (Farmland Ownership and Tenure Survey). **Farmland Leasing programs** were held in 86 locations across the state and led by farm management specialists to provide education to Iowans and out-of-state landowners on farmland leasing topics. The programs reached 1,444 individuals, including non-farming landowners (63%), followed by active farmers (20%), and a mix of ag professionals such as ag lenders, attorneys, accountants, and farm managers. Eighty-three percent (211) of the program evaluation respondents are using a written lease in their leasing arrangements. Of those responding to the survey, 44 were not using a written lease. When asked what changes would be made for the next year, 22 (50%) were going to move to using a written lease. Having a written agreement has been encouraged for several years during the leasing program and the number using only an oral agreement continues to decline, improving the records and relationships in leasing arrangements for all parties involved and reducing chances of misunderstanding or conflict during the lease period. Leasing meeting attendees influence 1.1 million acres of rented land in the state, representing \$242 million in economic value impacted by the program.

- **Iowa Pork Industry Center** partnered with Iowa Department of Agriculture and Land Stewardship (IDALS) and the Iowa Pork Producers Association to form an emergency

command center (Resource Coordination Center) in response to the impending packing industry shutdown due to COVID-19. The team developed a handbook, created a web page, and set up an emergency call center to help producers and to address issues arising from the pandemic disaster. Additionally, resources and expertise were identified at Iowa State University and made available to assist producers through this unprecedented time. The RCC assisted over 100 producer systems in navigating through the pandemic disaster.

**The Beef Team** held 9 Advanced Calving Clinics from 2018-2020 with more than 350 participants from 3 states. Topics included cow nutrition, neonatal calf health and care, hands-on sessions on normal calving and dystocia, and first aid. In August 2020, a survey was sent to 240 participants who attended a calving clinic in the last 3 years. Participants gained knowledge to improve calving success that led to an average benefit of \$7.56 per cow and a total benefit of \$375,900 value to the Iowa cattle industry and economy.

Swine building investment and depreciation is a major portion of the cost of operation for swine operations. Regular building inspection and maintenance can increase the life of buildings, reducing annual costs, preventing system failures, and reducing inefficiencies that can negatively impact animal health, production, and economic returns. A series of virtual and in-person **Protecting Swine Building Investment** workshops were held to increase knowledge of swine building and manure storage structure maintenance issues; 203 swine building managers attended a workshop series and 182 planned to implement a maintenance checklist or improve existing checklists as a result of the program.

**The Pesticide Safety Education Program (PSEP)** provides information through a variety of venues on the safe and effective use of pesticides. The PSEP provides recertification programs throughout Iowa and in 2020 trained 10,596 Commercial/Noncommercial/Public Pesticide Applicators and 13,359 Private Pesticide Applicators through Continuing Instruction Course (CIC) programs. The PSEP also develops study manuals and other educational publications. In 2020, over 21,000 pest or pesticide-related educational publications were distributed to the public and the PSEP website had over 28,000 unique site visits seeking pest management or pesticide safety information. The PSEP is also involved in the EPA Worker Protection Standard (WPS) education with over 45 individuals completing WPS training courses through ISU Extension and Outreach.

**Crops Team faculty and staff** held the annual two-day “Soil Fertility Short Course” to increase knowledge on effective soil fertility practices. Forty agronomists and farmers attended the course. Evaluation results showed that all respondents better understood the science of soil fertility and ISU’s nutrient recommendations, found the course helpful, and would recommend friends and neighbors to attend in the future. Over half have changed soil testing and recommendation procedures after this course, 70% have gained confidence when discussing soil fertility with their dealers, and 80% have reviewed provided materials since attending the workshop and reported increased profitability of at least \$11 per acre on a minimum of 11,500 acres they manage or advise.

**Iowa 4-H Youth Development** programs are headquartered at Iowa State University and available through ISU Extension and Outreach offices in all Iowa counties. 4-H is the premier youth program of the United States Department of Agriculture and Cooperative Extension and is the nation's largest youth development organization. Highlights from the past year include the following:

- **Checkout STEM** is a curriculum partnership between Iowa 4-H, Human Sciences Extension and Outreach, the ISU School of Education, and the Ames Public Library. [Checkout STEM](#) focuses on literacy and STEM knowledge for youth in grades K-3 and their families. It is part of a learning kit available for families to check out in libraries across Iowa.
- **Crops Feed the World** is a set of online learning modules designed for youth in grades 4-12 to learn more about crop sciences and crop production.
- **STEM Lit to Go Iowa** is a curriculum focusing on literacy and STEM knowledge for grades K-3. Each lesson includes children's books written by or focused on Iowa authors. STEM Lit to Go connects literacy development with STEM concepts. All 100 extension offices have a kit with all of the books featured and materials for each lesson.

Despite the COVID-19 pandemic, approximately 1,000 youth were exposed to the mobile **Forward Learning Experience bridging 21st Century Skills, STEM, and creative problem solving**. Youth saw and experienced first-hand emerging design technologies such as virtual reality, 3D digital and physical prototyping, and circuit bending. This provided 4-H youth throughout the state a vision of their future as 21st century citizens, positively impacting their communities and world around them using STEM skills and creative thinking. As outreach visits became possible during the pandemic, FLEx was a part of almost 9 events, STEM festivals, summer camps, and county fairs across Iowa.

**Human Sciences Extension and Outreach** provides research-based information and education to help families make decisions that improve and transform their lives. Specialists work with Iowa State's College of Human Sciences and in partnership with other organizations and agencies to meet the needs of Iowa families.

The **Volunteer Income Tax Assistance (VITA) program** trains community volunteers to provide free tax preparation to families with low and moderate income. The service is provided in local communities. During the 2021 tax season, Human Sciences Extension and Outreach worked with community partners to recruit and train 58 volunteers who helped 1,332 Iowans with low and moderate income to file their 2020 income tax returns – a slight increase over the previous year. Creating awareness of eligibility for the Earned Income Tax Credit (EITC) is an important part of VITA programs. The EITC enhances the lives of workers with low and moderate incomes by augmenting wages. In turn, this flow of income makes a substantial economic impact in local communities. Volunteers helped 341 filers claim the EITC they were qualified for, receiving \$496,767 in the 13 counties (Allamakee, Black Hawk, Bremer, Emmet, Cerro Gordo, Chickasaw, Mitchell, Palo Alto, Hamilton, Howard, Winneshiek, Wright, and Tama) that participated in the extension-community partnerships. Special efforts were made to increase awareness of the Earned Income Tax Credit (EITC) and VITA programs in rural Iowa.

Iowa's hardworking families need reliable and skilled child care to be able to work and contribute to Iowa's economy. Iowa loses an estimated \$935 million annually because of insufficient child care and poor-quality child care options for families. Human Sciences Extension and Outreach has responded to high workforce turnover and the increasing demand for training and professional development. **Online educational offerings are now widely available to support recruitment and retention of the child care workforce and to improve quality of care.** Online classes are easily accessed through computer, tablet, or smart phone. During FY 2021, a total of 22,344 early care and education professionals participated in 90,285 hours of online educational programming. Evaluation data from these 22,344 individuals showed significant increases in improved skills and knowledge of child development, early learning, managing children's behavior, nutrition, and health and safety practices.

Human Sciences Extension and Outreach specialists have taught the **ServSafe® food safety certification** program for more than 25 years as registered instructors for the National Restaurant Association Educational Foundation's internationally recognized food safety certification program. In 2021, 2,033 Iowans participated in ServSafe® classes taught by extension specialists, with 76.5 percent successfully earning the Certified Food Protection Manager credential. (Iowa's Food Code requires at least one supervisory employee in licensed foodservices be certified in food safety through an approved program.) Eight classes in Spanish were offered at various locations around the state.

### Appendix 3: Regents Innovation Fund Program

#### RIF Commercialization Infrastructure and Campus-Wide Entrepreneurial Culture Program

The ISU Research Park and EDIR entrepreneurial programs received \$602,000 of Iowa State University's \$1,050,000 RIF allocation, and is administered through the Office of Economic Development and Industry Relations (EDIR) via the Pappajohn Center. The funds provide support for units that contribute to building and enhancing the innovation and entrepreneurial ecosystems at Iowa State. A summary of the RIF funding received by each unit is provided below, while their achievements and activities are provided elsewhere in this report.

#### Summary of FY21 RIF Commercialization Infrastructure and Campus-Wide Entrepreneurial Culture Program

Unit	FY21 RIF Commercialization Infrastructure and Campus-Wide Entrepreneurial Culture Program (\$602,000 of \$1,050,000 RIF Allocation)	Award Amount
ISU Research Park	Support for operations of the ISU Research Park	\$245,000
ISU Startup Factory	Support for operations of the ISU Startup Factory	\$150,000
Small Business Development Center	Support for operations of the Small Business Development Center	\$105,000
ISU Pappajohn Center	Support for entrepreneurial programs at ISU	\$72,000
OIC	Support for commercialization activities at ISU	15,000
JPEC/CyBIZ Lab	Support for industry relations functions at Iowa State and other technology transfer activities across campus.	\$15,000

#### RIF Commercialization Program

The RIF commercialization program, which is administered within EDIR, received \$448,000 of Iowa State's RIF allocation and pairs ISU faculty with Iowa companies on projects to create or improve products or processes. These funds are a **critical source of gap funding**. They represent a unique resource that can be applied toward the success of Iowa companies. A summary of FY21 funded projects is included below. Fifty-five startup companies have been assisted, including **35 new companies that were started as a direct result of RIF and its predecessor program Grow Iowa Values Fund (GIVF) funding**. **Over the past 12 months, several of these startups have attracted significant private, state and federal funding, raising over \$3.5 million in early stage investment to facilitate commercialization and first sales**. In total, **more than 100 Iowa companies have participated** in the program.



\*A number of external funding applications were still pending at the time of reporting and not all award amounts were reported.

### Summary of FY21 RIF Commercialization Program Projects

<b>Principal Investigator</b>	<b>FY21 RIF Commercialization Program Projects (\$448,000 of \$1,050,000 RIF Allocation)</b>	<b>Award Amount</b>
<b>Shan Jiang</b>	Additive and formulation for improving waterborne coatings	\$50,000
<b>Eliot Wlner</b>	Advancing VIPRE competitiveness	\$49,073
<b>Eric Cochran</b>	Contractor-applied soybean-oil based polymer modifiers for sustainable asphalt pavements	\$50,000
<b>Ratnesh Kumar</b>	Self-powered IoT for structural health monitoring: integrated vibration sensor and energy harvester	\$50,000
<b>Chenxu Yu</b>	Machine-learning enabled non-invasive Raman spectroscopy test for diagnosing chronic wasting disease (CWD) in live animals	\$40,623
<b>Wenzhen Li</b>	Upcycling of waste nitrogen by a membrane-free alkaline electrolyzer (MFAEL)	\$25,000
<b>Abhishek Sarkar</b>	Magnetic field assisted fast charging of lithium-ion batteries	\$50,000
<b>Adam Thoms</b>	Evaluation of RAB as turf fertilizer	\$50,000
<b>Houqiang Fu</b>	Wide bandgap semiconductors based power electronics	\$33,900