

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FY19 Board of Regents, State of Iowa, Annual Economic
Development and Technology Transfer Report

PRESENTED BY
DAVID SPALDING, INTERIM VICE PRESIDENT FOR
ECONOMIC DEVELOPMENT AND BUSINESS
ENGAGEMENT, OFFICE OF THE PRESIDENT

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Iowa State University
Annual Economic Development and Technology Transfer Report – FY2019

Economic development is a top priority for Iowa State University. Indeed, it is a **prominent goal in the university's strategic plan**, and the university is very proud of the tremendous impact it has on the state economy. **In 2016 Iowa State received the prestigious designation as an Innovation and Economic Prosperity University** by the **Association of Public and Land Grant Universities** (APLU), the first university in Iowa to receive this recognition. As the APLU states, "The designation acknowledges universities working with public and private sector partners in their states and regions to support economic development through a variety of activities, including innovation and entrepreneurship, technology transfer, talent and workforce development, and community development."

The Office of Economic Development and Industry Relations (EDIR), which moved into the new **Economic Development Core Facility** in the ISU Research Park in June 2016, 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** 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 two state-based programs, with staff and partners located across campus and across the state.



- The **Small Business Development Center**, 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 companies across Iowa to solve management problems, to improve operations, to seek financing, and to pursue new opportunities. Iowa State also operates two 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.

IOWA STATE UNIVERSITY **IOWA STATE UNIVERSITY**
Research Foundation, Inc. **Office of Intellectual Property
and Technology Transfer**

- The **ISU Research Foundation** and **Office of Intellectual Property and Technology Transfer** protects, manages, markets, and licenses the intellectual property of ISU researchers and implements agreements related to research collaborations with industry.



- **ISU Research Park** provides a resource-rich environment including close proximity and easy access to Iowa State University for its tenant companies, 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 services and amenities that support the efforts of science- and technology-based organizations.

EDIR also serves as the gateway or portal to the university's expertise, capabilities, resources, and facilities that support and enhance economic development throughout the state. Thus, 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. Each year more than a million Iowans directly benefit from **Iowa State University Extension and Outreach** programs. ISU Extension and Outreach in collaboration with ISU colleges impacts economic development in the state through all of its programs – Community and Economic Development, 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

During the most recent full year for the program, the **America's SBDC Iowa**, provided business assistance to individuals and companies **in all 99 counties totaling 4,206 clients** and 12,613 counseling hours. As a result of this counseling, **219 new businesses** were started and **1,457**

jobs were created. Additionally, SBDC assistance was credited by clients with increasing their capital infusion by more than \$58.4 million and increasing their sales by more than \$61.3 million. **This translates into 121 new jobs every month, 18 new business every month and sales increases of \$5,111,504 every month.**

The **ISU SBDC regional center, the Mid Iowa SBDC regional center,** and the ISU Pappajohn Center for Entrepreneurship, provided 2,251 hours of counseling assistance to startup and existing companies; **served 823 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 37 new business starts with 204 new jobs created** that have generated **\$6,304,613 in capital infusion** and **\$4,904,379 in sales increases.**

The **Center for Industrial Research and Service (CIRAS)** was created in 1963 to improve the quality of life in Iowa by helping businesses and their communities prosper and grow. Our 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 \$2.5 billion** (sales gained or retained \$2.1 billion, new investments \$0.3 billion, costs saved or avoided \$0.1 billion) and **nearly 26,000 jobs created or retained** as a result of the assistance they received.

Last year, **1,736 businesses from 96 counties** in the state received assistance on projects or attended educational workshops from CIRAS staff or partners. Companies responding to surveys reported **\$419 million in total economic impact** (\$290 million in sales gained or retained, \$87 million of new investment, and \$42 million in costs saved or avoided) and nearly **4,500 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.

Appendix 1 provides some illustrative examples of CIRAS, SBDC, CyBIZ Lab, ISURF and ISU Extension and Outreach projects with Iowa companies and entrepreneurs during the past year.

During the five year time frame FY2015-2019 more than 16,000 different companies in Iowa representing all 99 counties benefitted from CIRAS and SBDC business and technical assistance and/or education/training services.

The **Community and Economic Development (CED) 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. During the past year, these specialists **helped 27 minority-owned business owners start or improve their own businesses and assisted with the creation and the retention of 9 jobs for minority employees.** This year CED launched an updated Iowa Retail Initiative (IRI) program that provides coaching, training, and technical assistance to small-town independent retailers. In the first six months, IRI provided help to 26 community retail leaders in 8 communities.

This past year the **Agriculture and Natural Resources (ANR) program within ISU Extension and Outreach** made over 288,000 contacts with farmers and agribusinesses through 1,889 meetings, 7,465 face-to-face consultations, and 42,801 phone and email discussions. ANR specialists present research-based information and answer technical questions to help Iowans **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.

The ISU Research Park

The Iowa State University Research Park (ISURP) is a growing technology community and incubator for new and expanding businesses, providing access to the vast array of resources available at Iowa State University. The ISURP has realized great 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 June 2016, ISURP launched the **ISU Startup Factory** to provide a stronger support system for students, faculty and staff wanting 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 in two 26-week blocks: the first a formal curriculum centered on business validation, and the second, customized to their individual business needs. To date, five cohorts have completed the program and two are currently in the program for a total of 103 new startup companies. Graduated companies have raised more than \$26 million in private and public capital, including fifteen SBIR Phase I grants,

five SBIR Phase II grants, ten Proof of Commercial Relevance awards, six Demonstration Fund awards, seventeen angel investment rounds and nine institutional investment rounds. Additionally, these companies have created 80 jobs.

Today, ISURP is a 400-acre development just south of campus with approximately 800,000 square feet of building space. **Seventeen new companies and affiliates, and 34 pre-incubator companies joined ISURP in FY19**, bringing the **cumulative total to 413 companies and 6,068 employees for current and former tenants that are still in existence world-wide**. Currently, there are **96 companies and research centers and 10 affiliates located at ISURP, employing 2253 and 89 people, respectively**. There are 20 pre-incubator companies that remain in ISU Startup Factory space.

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.

- Since 2013 the number of tenants has increased 109% to 96; square footage increased 75% to 790,000; and the number of employees increased 88% to 2,253.
- 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.
- Collaborated with Story County Conservation to bring the first of its kind nationally, urban demonstration and shared 38 acre community park for tenants and community.
- 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

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 nearly **34,000 students**, and despite our Midwest location, our student body is quite diverse. Total U.S. multicultural and international enrollment at Iowa State is 25.2% of the student body (14.7% multicultural and 10.5% international). Our students represent every Iowa county, all 50 states and 126 countries. This diversity leads to a wide array of perspectives, capabilities, and ideas that enrich the learning environment. Not surprisingly, our graduates are in high demand and we have a **campus wide placement rate of 95%** (i.e., 95% 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. 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 and university centers.** Additionally, engineering students complete a senior capstone project, and several faculty across campus integrate company projects into their courses.

During the summer of 2019, the **Pappajohn Center for Entrepreneurship** sponsored the fourth cohort of CYstarters, an 11-week summer accelerator program for students and recent graduates from across campus. **Seventeen students on 15 business teams were selected to spend the summer in a hands-on mentoring environment at the ISU Research Park to launch and grow their companies.** Students participated in educational sessions, received mentoring, and essentially interned in their own companies instead of working elsewhere during the summer. All 15 teams successfully launched their business or their MVP. Eighteen (18) of the 35 total businesses from the previous three year's cohorts are still active and have gone on to be successful in state and national competitions. Also, 9 of the 35 have received state funding or private investment.

Nearly 200 students competed in the Pappajohn Center's campus wide pitch and business competitions, a number of whom received financial support for their fledgling concepts and went on to participate in national competitions and entrepreneurship accelerators.

The Pappajohn Center partnered with the Ivy MBA Program to host a first-of-its-kind national MBA case competition, featuring an ISU technology startup, Gross Wen Technologies, as the live case. Eight universities including Baylor, Purdue, Illinois, Washington, Wisconsin, Missouri, Kansas, and Texas Tech spent a weekend at Iowa State learning about the technology and 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 support again this year from IEDA, the JPECs awarded \$120,000 in incentives for entrepreneurial ventures. Six of the twelve finalists were Iowa State University ventures.

The Pappajohn Center for Entrepreneurship **placed 46 student interns in startup companies located at the ISU Research Park**, and reported **over 3,800 students enrolled in entrepreneurship-themed coursework** across campus. **Over 10,000 individuals participated in programs and classes focused on entrepreneurship, startups and small business.**

During the summer, the Pappajohn Center partnered with University Marketing and all of the colleges to host a 10-day pitch off event at the Iowa State Fair exhibit. The university's “STANDING InnOVATION” competition included a total of 168 pitches over the course of the fair, with 12 entrepreneurs emerging as winners in several categories. In addition to showcasing

Iowa State's incredible young talent, a number of important connections were made through alumni and fairgoers who stopped to encourage those participating.

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. **Seventy-five (75) CyBIZ Lab students working part-time completed 39 consulting projects** that gave students the opportunity to work with actual businesses to solve business problems. All of the clients this academic year were Iowa-based companies or organizations.

CyBIZ Lab has established a number of partnerships across campus that have expanded the learning opportunities for students and significantly increased the impact students have had with real businesses. **CyBIZ Lab** paired up to performed **market validation research with six (6) ISU faculty members pursuing technology transfer projects through the RIF program** through EDIR, with another nine (9) RIF projects anticipated for fall 2019. CyBIZ Lab partnered with the Ivy Colleges of Business, Ivy Supply Chain Forum, University Library, and the Ames Lab Critical Materials Institute on internal program projects, and collaborated with ISU Extension and Story County Conservation on a number of community projects. CyBIZ Lab secured a grant that allowed technical graduate students to join CyBIZ Lab work on six new projects primarily focused on supporting startup and small Iowa businesses.

As part of normal operations, CyBIZ Lab works with clients that include startups, non-profit organizations, government agencies, communities, 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.

Last year, **engineering students worked on 151 projects, 129 of them with Iowa companies. This included 83 different Iowa companies across 31 Iowa counties.** Companies responding to surveys reported **impacts of more than \$84 million** for these projects.

Iowa State University Engineering Community Outreach continues to support workforce and economic development in Iowa and the nation through creation and delivery 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 engagement to increase the diversity of STEM students and exposure to career pathways. Programs directed include *FIRST®* LEGO® League and *FIRST®* LEGO® League Jr. where over 730 teams across the state participated in 60 events throughout the academic year supported by over 1,000 volunteers. Summer camps were attended by 500 youth with 50 percent being female and 29 percent under-represented minority participants. **Leadership of Manufacturing Day resulted in over 125 events with communications out to over 5,000 education and industry stakeholders to promote Iowa manufacturing and the many state organizations working in partnership.** Training materials to support industry engagement and utilization of best practice for youth engagement were created and delivered to continue to support business and industry workforce development with research-based best practice. Each year 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 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. This past year our career services offices were able to document over **2,600 ISU interns who were employed by more than 1,100 different Iowa employers located in 276 communities in 92 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.

Iowa State also contributes to workforce development in the state by supporting students' learning and skill development even before they get to the university. For example, Iowa State University's North Central STEM Hub, one of six regional hubs of the Iowa Governor's STEM Initiative, has been connecting education and business to increase student interest and ability in STEM. The North Central STEM Hub has hosted STEM festivals at the Iowa State Fair, Mason City, Boone, and Marshalltown, and with WiSE and Ames Laboratory at Iowa State University, where families engaged in hands-on STEM activities hosted by formal and informal educators, community colleges, businesses, and economic development organizations. **The North Central STEM Hub supported more than 180 educators and more than 10,000 PK-12 students** in the region with STEM Scale-Up programs in an effort to increase the students' interest and ability in STEM. ISU Extension and Outreach professionals play 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 reach nearly 100,000 Iowa youth every year.

- Over the past two 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. This past year, **4-H partnered with the Northwest Iowa Manufacturing Sector Hub**, formed through a consortium of manufacturers, to demonstrate career possibilities within modern manufacturing in youths' backyards. Now there is 360-degree tour of a manufacturing plant in Rock Valley, Iowa. This video has been used in multiple ways to introduce youth to what it is like to work in a modern facility and to challenge youths' preconceived notions

about manufacturing. The 4-H 360 sector hub partnership was featured in a panel session at the Governor's Future Ready Iowa conference and has led to work with the local Future Ready Iowa work team.

- This summer, **FLEx2GO led sessions at FutureFest** at NICC in Mason City. FutureFest is put on by Iowa Rehabilitation Services through the Iowa Department of Education. The goal of Rehabilitation Services is to help individuals with disabilities obtain employment following graduation. The use of the 4-H 360-degree materials allowed 40 high school youth with disabilities to experience career environments within manufacturing and agriculture without leaving the NICC campus, thus limiting liability and confidentiality concerns.
- **AgOvation** is a new program within Iowa 4-H that helps youth develop 21st century skills through a year-long competition. Currently teams in Sac, Jefferson, Van Buren, Cherokee, Dallas, 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 finals, slated for October 5 in Ames. Clay County hosted an AgOvation camp this summer to introduce the program. Youth started their day with a Zoom conference with the USDA Undersecretary for Farm Production and Conservation. They worked through the Armadillo Challenge from Monsanto. In the afternoon, the youth formed teams, each with an adult mentor, where they identified problems in agriculture, developed solutions, and presented to a team of industry professionals. Problems/solutions that were developed included designing a "safe" backyard poultry house, biosecurity in show livestock, and a water skimmer for goat waterers. This program was conducted through a partnership with the Spencer Middle School FFA.

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 FY19 ISU researchers submitted **165 disclosures of intellectual property**, and our technology transfer office **filed 98 patent applications**. In calendar year 2018, ISU had 34 utility patents issued, placing it 69th on the list of the top 100 institutions with U.S. patents issued. In FY19 ISU had 32 patents issued. Additionally, last year ISU technologies resulted in **46 license and option agreements worldwide with 25 in Iowa**. ISU currently has **155 license and option agreements yielding income. Iowa companies earned \$8.3 million revenue from ISU licensed technologies in calendar year 2018, and four startup companies based on ISU technologies were formed in Iowa**. Globally, total sales revenues from ISU licensed technologies were **\$88.3 million**. In addition, 103,000 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 industries (primarily new to young startups) to create economic benefit for the companies. Please see **Appendix 3** for a complete report on Regents Innovation Fund uses and results.

Research

Year after year Iowa State proves itself to be one of the nation's leading research-intensive land-grant institutions, a status that was again reinforced in FY19 when the university set new standards for total, federal and non-federal external research funding. The \$260.9 million in **total FY19 external research funding** surpassed the previous milestone of \$252.5 million established in FY16. The \$181.1 million in **federal external research funding** received in FY19 was 6.3% higher than FY18's total of \$170.3 million, and broke the previous record of \$174.8 million set in FY16. **Non-federal external research funding** for FY19 was \$79.8 million; \$57.2 million came from corporate/industry sources, of which \$20.7 million came from companies headquartered in Iowa or that have a significant footprint in the state. The increase in non-federal external research funding – up 5.8% from FY18 and 2.7% more than the previous record established in FY16 – contributed significantly to Iowa State attracting \$469 million in total external funding in FY19, the third-highest amount in the university's history.

Sponsored research funding is critically important in placing Iowa State faculty at the forefront of innovative discoveries and economic opportunities that make our state more competitive and help improve lives in Iowa and beyond. This is particularly true in the Biosciences arena that Governor Kim Reynolds has identified as a key growth engine for the state's economy.

Previous and ongoing investments in key research facilities such as the Center for Biorenewable Chemicals (CBiRC), the BioCentury Research Farm, the Plant Sciences Institute, the Nanovaccine Institute and the Veterinary Diagnostic Lab, have positioned Iowa State to play a critical leadership role in the state's overall Biosciences initiative. Together, the university and the state of Iowa are collaborating to take important first steps in establishing nationally renowned innovation ecosystems in these Iowa-advantaged Bioscience platforms:

- *Biobased Chemicals and Products;*
- *Precision and Digital Agriculture;* and
- *Vaccines and Immunotherapeutics.*

Biobased Chemicals and Products is an area in which Iowa State has already generated a great deal of momentum. For instance, through collaboration with the United Soybean Board and Argo Genesis Chemical (AGC) – and its parent company, Seneca Petroleum – Iowa State has demonstrated the utility of a bio-based polymer modifier for asphalt that was discovered at Iowa State University. With nearly ninety percent of the mass of the polymer coming from high-oleic soybean oil, this modifier enhances elastic recovery and low-temperature performance of roadways, allowing lower-quality asphalt binders and recycled asphalt pavements to be used in place of high-cost paving-grade binders. AGC constructed a one-ton per day pilot processing facility at the BioCentury Research Farm to produce the high-oleic soybean oil-based polymer (PAEHOSO) on a quasi-commercial scale to enable the bio-based polymer's performance to be evaluated in multiple field demonstration projects. The overall objective is to bring PAEHOSO to its first market segment which has the potential to consume more than 300 million pounds of high-oleic soybean oil each year. The benefit to Iowa farmers could be even greater further down the road. Thermoplastic elastomers (TPEs) such as PAEHOSO can be used in a variety of applications, from adhesives to soft-touch grips on products. With a wide range of applications available, soy-based TPEs could create a demand that exceeds one billion pounds of high-oleic soybean oil.

Also worth noting is the emergence of Ames-based Sumatra Biorenewables, LLC, a standalone company founded in 2015 that resulted directly from research conducted through CBiRC. The company develops and produces novel monomers that are incorporated into polyamides and polyesters to provide uniquely valuable properties – like enhanced tensile strength and low water absorption – that can be used in applications such as textiles, 3D printing and automotive parts. In July 2019, the National Corn Growers Association (NCGA) selected Sumatra Biorenewables as one of three winners of the association’s “Consider Corn Challenge.” NCGA started the annual challenge to highlight corn’s myriad potential uses and its flexibility as a feedstock for biobased products, helping farmers partner with industry to establish new value-added uses for their crop.

The *Precision and Digital Agriculture* platform provides one of the true successes in public-private partnership at Iowa State. Deere and Company has steadily increased its investment in research at the university and bumped up its sponsorship in FY19 by 12.6% compared to the previous fiscal year. This funding has supported a range of projects in areas that include precision agriculture, telematics data analytics and next-generation machinery automation. The value Deere sees in its partnership with Iowa State is further evidenced in the new John Deere Technology Innovation Center that the company opened in the ISU Research Park in July 2019.

Within the *Vaccines and Immunotherapeutics* platform, Iowa State is leveraging the interdisciplinary efforts of the Nanovaccine Institute (NI) to develop new vaccine paradigms based on nanotechnology. This work has resulted in a recent translational NIH-R01 award for the design of room temperature-stable universal influenza nanovaccines that would protect against a wide range of influenza A strains. The grant brings together ISU and UI researchers – along with researchers from two private sector companies – and provides support for the development of translational animal models and a lead candidate vaccine that will significantly advance progress towards clinical trials.

In a study supported by Merck, NI researchers have focused on the development of a universal influenza vaccine based on equine serum that can protect animals and humans against multiple influenza strains. The novel vaccine formulation has been shown to protect mice, chickens, ferrets, pigs, and horses from multiple influenza strains. These encouraging results suggest this novel vaccine could have a positive impact on the state’s economically significant swine and poultry industries as well. The Iowa State Veterinary Diagnostic Laboratory – with its world-class capabilities – plays a valuable role by helping identify specific disease challenges and then assessing the efficacy and impact of new vaccine technologies that might be used to address these issues. In addition, collaborations with Iowa companies such as PathoVacs and PK BioSciences have enabled development of new diagnostic methods and immunotherapeutics to combat neurodegeneration. These diagnostic methods are currently being evaluated by Roche for licensing and adoption.

Finally, two additional National Science Foundation (NSF) programs are helping fuel research that will further support Iowa’s economy. NSF launched the Innovation Corps (I-Corps) program to help prepare scientists and engineers to extend their focus beyond the university laboratory to accelerate the economic and societal benefits of NSF-funded basic-research projects that are ready to move to commercialization. Since Iowa State became an I-Corps site in 2017, the program has launched six new companies and raised more than \$1.5 million in venture financing. These companies have also engaged with the pioneering ISU Startup Factory, receiving formal training, resources and access to an invaluable business network.

Iowa State has taken the lead in a statewide effort in applying for EPSCoR (Established Program to Stimulate Competitive Research) funding. The \$20 million in EPSCoR funds, if awarded, would be invested to support *Biobased Chemicals and Products* technology development and transfer, workforce development and economic development. In addition to Iowa State, the project team encompasses the University of Iowa, University of Northern Iowa, Dordt University, and would also engage private and community colleges as well as K-12 STEM education and industry partners within the state.

Assistance to Communities

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.

CED specialists provide skills training each year for more than **50,000** community leaders, local government officials, business owners, entrepreneurs and volunteers.

Local Government Programming

The CED unit, in collaboration with the Iowa League of Cities, has assumed the activities conducted by the University of Iowa Institute for Public Affairs, including strategic planning and goal setting for local and regional governments and training on a wide variety of legal, fiscal, and policy topics related to good government best practices. In FY19, CED specialists provided strategic planning and goal setting assistance to 4 local governments and 3 nonprofit organizations.

Student Involvement in Community Development

In spring 2019, 18 upper-level Community and Regional Planning students conducted a series of focus groups in Ottumwa to garner input on the issues and opportunities for Ottumwa's continued housing development, with assistance from CED specialist Himar Hernández. The Office of State and Local Governments employed a student intern to assist in organizing and carrying out the 2018 Municipal Professionals Institute and Academy in July 2018. CED employs a graduate student intern to assist with a workforce study in Keokuk. With funding from the Vice President for Extension and Outreach and LAS, CED hired three Latino studies interns who spent 2 months in Sioux City working part time with a local partner and part time in the community developing a Latino business needs assessment. The interns conducted an inventory of Latino-owned businesses, including retail, construction, and Spanish-language media, as well as existing entrepreneur support and local organizations and agencies. They performed extensive research using data resources and personal interviews. CED plans to use the information in their final report to better determine how ISU Extension and Outreach knowledge and programming can be helpful to the Latino/a business community in Sioux City in the future. Two graduate students worked with CED specialists to conduct a needs assessment for the Iowa Department of Management and ISU College of Human Sciences for the Early Childhood Iowa Program. They analyzed data collected from 25 focus groups held throughout the state in summer 2019.

Iowa's Living Roadways Community Visioning Program

For the past 23 years, the Community Visioning Program has helped rural communities plan transportation enhancements using state funds from the Iowa DOT. To date, 241 Iowa towns have completed the process and collaborated with design teams to create conceptual transportation enhancement plans. The program continues to make a significant impact throughout the state. In spring 2019, The Iowa's Living Roadways Community Visioning Program employed **13 student interns to assist in assessments and analysis in 10 communities.**

New Programming Initiatives

- **Leading Communities: A Place-Based Leadership Program** was developed by ISU Extension and Outreach CED and the University of Wisconsin-Extension. Based on cutting-edge community leadership research, it is designed to simultaneously provide participants with community-based skills while meeting the specific needs of the places where they live and work. In FY19, CED piloted a new Leading Communities module in Storm Lake focused on characteristics of social capital in immigrant and receiving communities.
- The CED unit is now offering the **Rural Housing Readiness Assessment**, a tool that helps communities self-assess their housing needs and guides them in the decision-making process when addressing those needs.
- **Early Childhood in Iowa** is a state-legislated initiative that serves three main purposes: promoting services for children, prenatal through age five, to enter kindergarten ready to learn and ready for life; creating local flexibility to respond to the needs of young children and their families in the community; and serving as a catalyst to support and improve early childhood services, programs and activities. As part of the strategic planning process, from May 2 to July 9, 2019, CED staff members facilitated 12 parent focus groups and 10 service-provider focus groups. The input from these focus groups will help ECI better understand parents' and providers' experience and add detail to data collected from surveys and administrative reports.

Community Food Systems (CFS)

The Community Food Systems Program helps communities develop their place-based food systems. It is offered by ISU Extension and Outreach Farm, Food and Enterprise Development, involving Agriculture and Natural Resources as well as Community and Economic Development program staff. The Community Food Systems Program is offered as a fee for service to communities for a multi-year, multi-phased project. It also offers three certification programs: Local Food Leader, Community Food Systems, and Mapping 101. Projects range from production agriculture, gardening, distribution, and processing to new market development and entrepreneurship. FY19 accomplishments include the following:

- Pleasant Hill completed its three-year Community Food Systems process, including projects for workforce development and a new apprenticeship program in collaboration with Veterans in Agriculture; an agrihood residential design concept; an assessment of shared-use kitchen access; farmers market expansion; and building general awareness of local and healthy foods in the community.
- The program continued to develop the \$270,000 AgMRC grant, leading to the following:
 - Nearly 150 people attended 10 state Community Food Systems workshops; 28 people are participating in online certification to be completed by February 2020.

- Six state Local Food Leader workshops had nearly 200 attendees and 2 individuals piloted an online-only training. Of the 200 attendees, 27 completed certification and attended a train-the-trainer program in March 2019. Eight states now have trainers.
- Twenty-eight people completed the online Mapping 101 certification by August 2019.
- The program conducted a \$19,000 USDA grant feasibility study in collaboration with the business development team and Community Design Lab for a food hub for Lutheran Services of Iowa.
- In March 2019, the program celebrated its fourth year of collaboration with 13 states and approximately 100 partners. Planners, farmers, local food coordinators, culinary professionals, public health representatives, and other organizations from throughout the state gathered to share success stories.
- In summer 2019, collaboration with Northridge Village, an assisted-living facility in Ames, led to a small garden space for local procurement into the dining facility.
- The program started a Community Food Systems assessment with the Virgin Islands territory in collaboration with FEMA and numerous agencies to be completed by October 2019.

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 four sections below identify new collaborations begun or formalized this past year. The remaining sections describe on-going significant state and regional collaborations.

SBDC, Google, and Secretary of State Work together for small businesses

America's SBDC Iowa is partnering with the Iowa Secretary of State and Google to ensure Iowa businesses have claimed their listing on Google and that the information is verified for accuracy. Through this joint venture, the SBDC has a presence in the Secretary of State's booth at the Iowa State Fair. The SBDC, Secretary of State, and Google are also presenting short workshops for businesses in an effort to help get Iowa businesses online and growing. SBDC staff working in the booth help small businesses find their Google listing and assist them to customize their listing. Businesses with complete listings on search engines are two times more likely to be considered reputable. Google is supporting the booth by providing giveaways for attendees and also provided training for SBDC personnel. This will also allow SBDC to provide additional services to small businesses in Iowa. The support from the Secretary of State's office is helping to expand the reach of SBDC services to businesses in Iowa.

CIRAS Leads News Partnership to Alleviate Workforce Issues

Solving Iowa's workforce problem is the focus of an award CIRAS recently received from the Economic Development Administration (EDA). The five-year, \$1.38 million effort will allow CIRAS to assist rural communities in their search for skilled workers. The new initiative, to be known as the Iowa Workforce Innovation Network (iWIN), will be directed at communities with populations of 5,000 to 25,000 that are within commuting distance of a metropolitan area. Partners include the College of Engineering at Iowa State University, the Iowa Area Development Group, ISU Extension, local Councils of Government, and others.

CIRAS to Partner with Alliant Energy to Launch New Manufacturing Lab

With Alliant Energy's support, CIRAS will open a new laboratory in the ISU Research Park to help Iowa companies implement manufacturing technologies. The new **ISU Digital Manufacturing Lab Powered by Alliant Energy** will educate Iowa businesses about technologies such as collaborative robots and advanced vision systems and help them explore ways that automation might improve their companies. The lab will be funded in part through a generous donation by Alliant Energy to Iowa State University. CIRAS and Alliant Energy also will establish adjoining spaces in the ISU Research Park so that Alliant can complement the CIRAS effort to help manufacturers identify and implement digital technologies. Additional support for the project includes a substantial contribution from the Iowa Economic Development Authority (IEDA), a longstanding partner with CIRAS in the drive to help boost Iowa's manufacturing economy.

CIRAS Expands Partnerships to Support Food and Biochemical Manufacturing

CIRAS partnered with the Polymer and Food Protection Consortium, a unit of the ISU Department of Food Science and Human Nutrition, to hire a plastics expert to provide access to needed expertise. This expanded partnership leverages work with the Center for Crops Utilization Research (CCUR), the Iowa Grain Quality Initiative (IGQI), Meat Science Extension, and a variety of other ISU faculty to provide easy access to services for growing small and medium food manufacturers. Last year, food manufacturers reported over \$23M in impact as a result of CIRAS and our network of partners.

Iowa State University Collaborates on Technology Transfer Services

Iowa State University and the University of Northern Iowa (UNI) continue to partner in technology transfer. The partnership allows UNI to access Iowa State resources for technology transfer. UNI has the option to manage the protection and commercialization of their innovations, or they can opt to have the ISU Research Foundation provide these services. In addition, Iowa State has entered into an agreement with Drake University to provide technology transfer services.

ISU Partnership with Cultivation Corridor

Iowa State University serves 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.

CED, KSU, and UME Collaboration

To support independently-owned grocery stores in the rural Heartland, the CED program partnered with the Kansas State University (KSU) Center for Engagement and Community Development and the University of Minnesota Extension (UME) Regional Sustainable Development Partnerships to develop the proposal “Food Access and Independent Grocers: Strengthening Food Security in Underserved Communities.” The North Central Regional Center for Rural Development (NCRCRD) funded the proposal with a planning grant of \$22,012. The goal is to compile existing resources that support independently-owned groceries as sites of food security, social centers, and economic opportunity from the three land-grant university partners, review them, and identify gaps where development of additional resources is needed. From there, the partner institutions will develop a joint curriculum for working with independently-owned grocers that could be shared throughout the Heartland.

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

As of July 2019, Iowa had 98 licensed wineries and 245 commercial vineyards. At the end of 2018, total wine production was 335,012 gallons, representing a 14 percent decrease in wine production since 2017. This followed a 20.2 percent increase from the 2015 to 2016 production years. Wine sales totaled 312,320 gallons. Wine sold at wineries represented 38.7 percent of sales, while the remaining 61.3 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 federal fiscal year 2018, SBDC clients generated an increase of \$61 million in sales, \$58 million in capital invested in Iowa businesses, and created 1,457 jobs. 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!

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. Another advantage the SBDC provides for businesses is the cyber assessment for businesses. A business owner may visit www.iowacyber.com to learn about cybersecurity and their risk. Working together, we can create a stronger foundation of small businesses.

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 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 set to open in January 2020.

CyBIZ Lab will continue to partner with faculty 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.

Support is needed to educate and provide engaging experiences for a growing number of students from all disciplines across campus who are drawn to entrepreneurship and innovation as well as providing support for fledgling entrepreneurs so that they can move past the idea stage and into business launch. Resources that seed new business concepts and help match expertise and skill sets for startups and Iowa businesses will continue to be a need at Iowa State.

Iowa State University Research Park

ISURP is in the midst of a significant expansion, which has doubled the developable acreage and includes commercial amenities such as a restaurant, fitness center, child care facility, walking and biking paths that are expected by young professionals today. This past year ISURP opened a 38-acre demonstration park (Tedesco Environmental Learning Corridor) developed in partnership with Story County Conservation, and John Deere opened the doors to

a 33,000 square foot sprayer facility. In addition, ISURP in partnership with the City of Ames was awarded a \$1.8 million infrastructure grant from EDA to provide infrastructure to support expanding city services to 38 additional acres of buildable lots.

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.

Going hand-in-hand with research is access to talent. Iowa State's enrollment has exceeded 35,000 in recent years, offering a rich recruitment base for employers seeking the best and the brightest in a highly competitive market for talent. The success rate in connecting companies to future workforce is a primary factor in ISURP's continued success.

In recent years, a number of companies with an international reach have opened offices in the Iowa State Research Park, 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.

Any new funds to the ISU Research Park would be utilized to support costs associated with the expansion of ISURP companies as well as to increase 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. The lack of workforce available for growth, combined with decreasing population throughout rural areas has created a significant need to grow capacity with no additional people. Emerging "Industry 4.0" technologies such as cobots, big data, and artificial intelligence offer significant opportunities, but also create complexities for Iowa manufacturers with technologies such as cloud computing, and introduce cybersecurity risks.

New funding of \$1 million per year for expanded Industry 4.0 services can be leveraged to bring in an additional \$1 million of federal grants and fees to help Iowa businesses navigate this complex change and 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)

ISURF has been self-supportive since 1992 and over the past 10 years has returned more than \$15 million to ISU and Ames Lab, in support of growing the research enterprise. New funds generated by ISURF will continue to be distributed according to the royalty sharing policy and funds in excess of what is needed to support the operation will be utilized to support the research enterprise, as recommended and approved by the ISURF Board.

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 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. With Iowa STEM jobs expected to grow by 16 percent this decade, 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 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.

ISU Extension and Outreach expects to leverage every \$100,000 in new state funds with \$150,000 in new federal matching funds, grants, fees, and gifts to generate a projected \$2.5 million of impact and 25 new jobs throughout Iowa. For every \$100,000 of new funds, an estimated 2.5 additional staff will be hired to address growing demands and increase the depth and reach of work with families, businesses, and communities in all 99 counties across the state.

Summary of ISU Economic Development and Innovation Data	
a. Number of disclosures of intellectual property	165
b. Number of patent applications filed	98
c. Number of patents awarded	32
d. Number of license and option agreements executed on institutional technologies:	
in total	46
in Iowa	25
e. Number of license and option agreements yielding income	155
f. Revenue to Iowa companies as a result of licensed technology (CY17)	\$8.3 million
g. Number of startup companies formed (through licensing activities)	
in total	4
in Iowa	4
h. Number of companies in research park and incubators	
pre-incubator companies	34
private	77
university related	19
i. Number of new companies in research park and incubators	
pre-incubator companies	34
private	15
university related	2
j. Number of employees in companies in research park and incubators	2,253
Royalties and license fee income	\$2.8 million

k. Total sponsored funding received How much of this is for research	\$469.0 million \$260.9 million
l. Corporate sponsored funding received for research and economic development, in total in Iowa	\$57.2 million \$20.7 million
m. Iowa special appropriations for economic development, in total SBDC CIRAS Technology Assistance Program ISU Research Park Regents Innovation Fund	\$2.525 million \$1.037M \$1.365M \$0.122M \$1.050 million
n. Research expenditures (federal, state and local; business; nonprofit; institution funds; all other sources, FY19):	\$246.4 million
o. Licenses and options executed per \$10 million research expenditures (FY17 AUTM Survey)	4.4
p. Sales of licensed products by Iowa-based companies (CY18)	\$8.3 million
q. 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	6,321
Note: Unless noted, the data provided above are FY18 data.	

Appendix 1: CIRAS, SBDC, ISURF and ISU Extension and Outreach company and community projects

Global Security Services, a Davenport security company, expects to take in more than \$17 million over the next five years from new government contracts it landed after Eric Sanders, the firm’s business development coordinator, spent roughly five months working closely with their local CIRAS Procurement Technical Assistance Center (PTAC) contracting specialist. The company credits CIRAS for their newfound success by helping them understand the sometimes confusing world of government contracting. “By listening to CIRAS advice, we . . . were able to adjust the quality and content of our proposals,” Sanders said. “You can read a lot about it on the Internet, you can go to all these classes, but none of that matters without someone like CIRAS to help you piece together how it works behind the scenes. We wouldn’t be here without your program and knowledge.”

SmithCo, a Le Mars manufacturer of side-dumping truck trailers believes their business is on the road to steady growth after CIRAS helped improve the company’s management structure and confirm that its marketing is on the correct path. CIRAS matched leadership with a retired executive who began regular coaching sessions, helped lead SmithCo through a strategic plan, arranged a detailed marketing study, and performed a Finite Element Analysis on a new mining product. “The process really forced us to look at who we are, what makes us who we are, and why we exist,” said Scott Lovell, President. “It’s really focused us on the things that we do well, and it’s exposed the things that we don’t do well –maybe some gaps in our organizational structure, that would hinder us from growing.”

Precision Metal Works, a Maquoketa-based manufacturer of parts washers, estimates to up to \$1 million in new business over the next few years along with adding several new jobs after engaging with CIRAS and their metal additive manufacturing system. Wes Merryman, president of Precision Metal Works, had to deliver prototype parts in a very short timeline on a key project

for their customer Twin State Environmental. Scott Tinsman III, founder of the Davenport-based company stated, "Without the CIRAS program, we wouldn't have been able to have the prototype done cost effectively or at all." Tinsman also added, "The main advantage of working with CIRAS is the knowledge...without their knowledge we wouldn't be able to do this."

Genesis Systems, a robotics manufacturer in Davenport, hosted an Iowa Lean Consortium workshop on Lean Safety, and got the benefits of hands-on learning. Attendees from eight different companies spent the first day listening to author and consultant Robert Hafey demonstrate how companies can create world-class safety cultures by improving employee engagement, building trust, and showing team members the value of a lean environment. For Day Two of the event, participants took the tools they had been taught and applied them to Genesis Systems Group. "I guess we kind of knew at some level that issues existed," said Shannon Soupiset, senior director of operations for Genesis Systems Group. "But what we didn't know is that most of the safety issues in the plant centered around this one area... I think what this event did was it made us realize that, if we had to pick one thing to fix that would have a substantial benefit on safety, that material flow would be it."

Life Line Ambulance, a Sumner, Iowa, manufacturer of emergency vehicles believes it's on the cusp of a major innovation after Iowa State University engineering students helped the company develop a new design for a side-entry ambulance door. Mechanical engineering students visited Life Line in fall 2018 to begin the new door's design as part of a senior capstone project. A second group of capstone students then developed the design even further the following semester. Life Line engineers took over the project in May and completed the production-worthy design. "We have always tried to be a leader in the industry," said Jacob Spiegel, head of research and development. "We've always tried to be out in the forefront... I think this is going to be a very big deal, because it gives us something that the rest of the industry doesn't have."

Sara Winkleman awarded the Deb Dalziel Woman Entrepreneur of the Year in 2019. Sara is the entrepreneur behind S&B Farmstead Distillery in Bancroft, Iowa. Sara started her career as a hair stylist and salon owner. At home on the farm, she works alongside her husband with their hogs and corn crop. It was on the farm that she got the inspiration for whiskey products made with Iowa corn. Sara contacted the Northwest Iowa SBDC and Regional Director Michael Wampler for assistance. Together they worked on detailed financial projections and developed her business model. Sara carefully studied the industry, and with the help of the SBDC launched her company in 2018. Sara has accomplished all of this while dealing with challenges of Multiple Sclerosis. She is a proud mother of two, a wife, and successful entrepreneur.

Staci Ackerson awarded the 2019 Neal Smith Entrepreneur of the Year. Staci Ackerson, a United States Navy Desert Storm veteran, acquired Shankland Insurance in 2012. She had a vision of rehabilitating the historic Charles City Western Railroad depot and expanding her insurance business. Staci reached out to the NIACC John Pappajohn Entrepreneurial Center and Small Business Development Center to seek guidance in accomplishing her goal. Working with the NIACC Pappajohn Center SBDC, Community Revitalization of Charles City, and the Main Street Iowa Program, Shankland Insurance was able to apply for and receive and IEDA Main Street Challenge Grant, Charles City Community Grant, and bank funding to rehabilitate the historic building. She has completed her rehab project for her business, created executive apartments in the building, and also used pre-existing concrete piers as rental storage units. She transformed a derelict property into an advantage for downtown Charles City, while continuing to grow her core insurance business.

SAFI-Tech Corporation, an Ames-based startup company founded on technology developed at Iowa State University, recently reached technology development milestones in FY19 resulting in an investment by the Boston venture capital firm Rhapsody Venture Partners. SAFI-Tech recently announced that they were able to use the platform technology licensed from ISURF to create a cold-soldering formulation of SAC305, the world standard in high-temperature lead-free solder for electronic applications. Rhapsody Venture Partners has subsequently provided funding to SAFI-Tech and is partnering with them to bring no-heat SAC305 to market.

Gene Editing Companies. ISURF co-owns with the University of Minnesota a suite of over a dozen seminal U.S. and international gene editing patents, currently in use by many companies. The patented technologies, known as TALENS technologies, have revolutionized plant and animal agriculture. The use of the technology has already enabled Phase I clinical trials by licensee Cellectis (NASDAQ: CLLS) of CAR- T cell therapy candidates in human patients with acute myeloid leukemia. The CAR-T human therapy pipeline includes many candidates at multiple stages in the drug development process. In early 2019, Cellectis announced plans to invest nearly \$70 million in what will become its first North American manufacturing facility.

Midwest Soybean Farmers. Over many decades, ISU plant breeders have been developing commercially competitive food-grade and commodity soybeans. An important feature of the ISU soybeans is that they are certifiably GMO-free. Development of new varieties suitable for today's needs such as disease resistance for organic food production and increased yields is ongoing. With the new varieties, ISURF aims to keep its long tradition of supporting Iowa agriculture while bringing economic benefits to ISU and the developers of the soybean varieties. To date, Midwestern farmers and predominantly Iowa farmers have planted over one million ISU soybean acres.

Through **ISU's Road Scholar Program**, local business owners received training on how to capitalize on tourism in Iowa. In 2018–19, 38 citizens, 7 community leaders, and 24 business leaders/entrepreneurs received assistance through these programs. As a result, 12 businesses were expanded or improved. The estimated dollar value of the jobs that were created or retained was \$83,685.

Appendix 2: Training and Related Educational Activities

Center for Industrial Research and Service (CIRAS)

CIRAS hosted the annual **Iowa Lean Consortium conference, with over 400 attendees from 90 Iowa organizations.** 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, including hands-on workshops and tours.

CIRAS and our partners joined forces to offer 41 different trainings across the state of Iowa focused on food manufacturing. **Over 1,000 people attended food-specific trainings** including regulatory updates, food safety in manufacturing, meat product development, and advanced technologies in food manufacturing.

CIRAS co-hosted an industry day event with the Nebraska Procurement Technical Assistance Center and the U.S. Army Corps of Engineers (USACE) focused on recovery efforts from the spring 2019 flooding in Iowa, Missouri, and Nebraska. The event briefed attendees on future

construction contract opportunities available as a result of the \$2 billion in disaster recovery efforts. **Over 140 businesses attended the event and signed up for USACE bid opportunities.**

CIRAS continued to expand its Lab Tours, focused on building awareness of how technology at ISU can solve critical issues for Iowa manufacturers. Ranging from metal 3D printing to fermentation labs, on campus and around the state, **185 people attended 13 different tours.** The success of these tours, and the ability of companies to implement change as a result of them, will drive continued growth.

Community and Economic Development (CED) in ISU Extension and Outreach empowers communities to shape their own futures through research, education, community engagement, economic development, and community planning and design. CED has multiple community development specialists in place with expertise and/or experience working with minority-owned businesses and community business leaders. 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 FY19, CED began offering **Data Literacy Workshops** to help Iowans learn the skills needed to understand, visualize, interpret, and practice with data relevant to communities, organizations, and counties. The data literacy workshops can include a wide variety of topics, reviews of the data included in the Data for Decision Makers profiles, or an in-depth look at selected measures, indicators, and trends.

In spring 2019, CED offered **Introduction to Planning and Zoning Workshops** to 195 planning officials at seven locations throughout the state. "On-demand" P&Z workshops reached 403 planning officials from 13 local governments.

The **Geospatial Technology Training Program** conducted three **ArcGIS** two-day short courses for a total of 25 planners and local officials from throughout the state.

In FY2019 CED specialists delivered **Navigating Difference® cultural competency training** to the 39 ISU employees in three counties and 22 stakeholders and community leaders in Sioux County and at NIACC.

CED partnered with the University of Iowa and Pathfinders RC&D to present the **Southwest Iowa Housing Conference** on May 21, 2019, in Fairfield. At the conference, CED specialist Jon Wolseth presented the Rural Housing Readiness Assessment and CED specialist Eric Christianson presented a session on planning and zoning.

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, Master Gardener volunteers, ISU Research and Demonstration Farms, and Iowa food pantries. In 2018, Master Gardener volunteers and their partners grew, harvested, and donated 90,000 pounds of fresh produce throughout the growing season, which equates to nearly 270,000 servings of fruits and vegetables for food pantries. The average Master Gardener averaged nearly 60 hours of work during 2018, significantly more than the 20 volunteer hours each Master Gardener is required to provide. Those volunteer hours are valued at \$2.7 million spent improving Iowa.
- The **On-Farm Food Safety Team** (from College of Agriculture and Life Sciences, Human Science Extension and Outreach, and the Department of Food Science and Human Nutrition) have 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. Food safety educational information has been delivered to more than 3,000 growers in this region. Food safety needs assessments have captured the concerns of 1,200 growers. Eight Produce Safety Alliance training sessions educated leaders in food safety, resulting in 46 expert food safety trainers; 277 Produce Safety Alliance grower trainings reached 2,250 growers. Through these efforts, 261 regional extension and grower educators can provide food safety training and technical assistance to fruit and vegetable growers. To further educate, two websites have been launched along with online tools that provide on-demand education to fruit and vegetable growers on food safety.
- A **statewide food hub managers working group** has been meeting quarterly for the past three years to better understand the logistics and economics of moving locally grown and produced food from farms to institutions. The ISU Extension and Outreach Farm, Food and Enterprise program and Iowa Valley RC&D co-facilitate the group. Meeting topics range from food safety and production planning to sales, logistics, and economics. Food hubs create opportunities for farmers to grow their production and access larger markets, and are critical players in developing Iowa’s local food system.

Ag Decision Maker website, www.extension.iastate.edu/agdm, provides farmers, landowners, financial lenders, farm managers, and agriculture educators with the current, unbiased agricultural economics and business information they need to make sound farm management decisions that directly impact Iowa agriculture. This web-based resource supports ISU Extension and Outreach farm management programs and averaged 7,493 visitors per day from July 2018 through June 2019. Over 15,000 users received monthly updates highlighting the materials on the Ag Decision Maker site, with another 2,168 followers receiving information through social media (an increase of 550 from the previous year). The AgDM Twitter feed received 121,057 impressions during the 12-month period.

Iowa Pork Industry Center, with specialists in the field and on campus, works to promote efficient pork production technologies in Iowa, maintain Iowa's pork industry leadership, and strengthen rural development efforts. For example:

- The swine extension specialists partnered with agricultural engineering to deliver hands-on **ventilation training and education to pork producers** throughout the state, using a portable trailer to demonstrate state-of-the-art technology. In 2018, eight workshops

were held and attended by 171 people, who influence on-farm decisions about more than 63 million pigs finished and marketed, and over 1.2 million sows.

- Approximately 500 people attended the **Seventh Annual Iowa Swine Day** conference in June 2018. Twenty speakers with national and international reputations provided seminars that addressed topics such as misconceptions about the use of science in agriculture and issues associated with agricultural markets and consumer trends.

Iowa ranks fourth nationally in number of cattle on feed and produces over 2,000,000 head of feedlot cattle on 6,000 individual operations annually. Resources provided by the **Iowa Beef Center** give producers the information necessary to increase their herds and update their operations.

- Consumers are asking how the beef they eat is produced, and packers are listening. Several of the major beef packers will be purchasing cattle only from beef producers who are **Beef Quality Assurance** certified. The BQA program is designed to educate beef producers on the best management practices to produce cattle that are safe, wholesome, and healthy. The Iowa Beef Center has contracted to provide the educational component of the BQA program in Iowa since 2017. In 2018, 80 BQA trainings were offered either as a part of other extension beef programs or independently sponsored by industry partners. More than 5,600 producers have been certified in the BQA program in 2018. These producers now have access to additional markets for fed cattle.
- Two, three-day, **intensive, hands-on short courses** were held, one for cow-calf operators and one for feedlot operators. Nineteen people from three states participated in the cow-calf course, which focused on nutrition, reproduction, calving management, calf health, antibiotic use, and record keeping. The feedlot course focused on feed bunk management, health management and treatment, antibiotic use, quality assurance and data management. The 30 participants in the feedlot course came from five states plus Canada and influenced the decisions on more than 700,000 cattle. Half of the participants said participating in the short course will improve their cow return by \$25/cow. Estimated direct impact of the program was over \$7 million to the beef industry.
- ISU Extension and Outreach annually trains representatives from about 645 businesses and 2,500 employees who come from 95 counties in Iowa and the five surrounding states in the **commercial manure applicator program**. These businesses annually handle and apply about 1.5 million tons of solid manure and 3 billion gallons of liquid/slurry manure that has a fertilizer value of about \$250 million, while doing about \$70 million of business. The curriculum has focused on state rules, land application and separation distances, hydrogen sulfide and safety precautions, water quality, and biosecurity. More than 80 percent of commercial applicators reported this information was useful to their business.

Fifty-three percent of Iowa's farmland is operated under a lease agreement. Iowa non-farming landowners include retired farmers as well as individuals who invested in or inherited farmland but never farmed (Farmland Ownership and Tenure Survey). ISU Extension and Outreach offers a variety of tools to assist landowners and tenants in **determining fair cropland and pasture rental rates**. In 2018, ISU Extension and Outreach farm management specialists

conducted 76 leasing meetings across the state, with more than 1,444 landowners, operators, and ag business professionals attending. A post-meeting survey found that two-thirds of respondents would be making a change to their lease agreements based on information from the program. **The ISU Extension and Outreach Cash Rent Survey** was downloaded 159,078 times in 2018. Sample cash lease forms were downloaded 22,286 times.

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 2018 trained 11,307 Commercial/Noncommercial/Public Pesticide Applicators and 14,146 Private Pesticide Applicators through Continuing Instruction Course (CIC) programs. Based on 2018 wage information from Iowa Workforce Development, the PSEP directly supported commercial pest management jobs with an estimated annual base salary of over \$440 million. The PSEP also develops study manuals and other educational publications. In FY18, nearly 21,000 pest or pesticide-related educational publications were distributed to the public and the PSEP website had over 71,000 site visits seeking pest management or pesticide safety information. The PSEP is also involved in the EPA Worker Protection Standard (WPS) education with over 800 individuals completing WPS training courses through ISU Extension and Outreach.

ISU Extension and Outreach Meat Science program provides companies from the United States and around the world with cutting-edge education on meat processing and food safety technologies. In addition to offering workshops for small processors, training programs for some of the nation's largest processors also are developed and delivered. During 2018, 26 workshops or short courses were held with a total attendance of 1,447 individuals, including 90 international attendees. These educational programs resulted in a reported economic impact in Iowa of \$634,000 in retained or increased sales, \$285,000 in cost savings, \$1.3 million in increased investment, and 6 jobs created or retained.

Fourteen Crop Advantage conferences were held across Iowa during January 2018. Attendance at these sessions totaled 2,062. Survey data showed that just over 65% were active crop farmers, and 29% were agribusiness crop advisers. After-meeting surveys were given to participants. Since the dicamba topic was presented at all sites, that was the focus of most of the survey tool: 568 responses were received; 516 said they better understood the risk of using dicamba near nondicamba tolerant beans and other sensitive crops as a result of what they learned; 524 indicated they better understood factors that increase the risk of using this technology; 51 participants said that they were going to change their dicamba use plans in 2018 based on information presented; and 252 said this information confirmed their decision for the next growing season. When asked what changes they will make, answers included: not using in 2018, manage timing and weather at application time closely, apply earlier in the season to reduce risk of movement off site, pick the lowest volatility product, scout more, only use as a burn down, altering which fields to use it on to reduce risk, plant a buffer between fields, and do more homework as to what is planted in neighboring fields.

Iowa State University Extension and Outreach initiated the **Iowa Drainage School** to educate stakeholders on sub-surface drainage concepts customized to the upper Midwestern states. Since 2007, 370 participants, consisting of contractors, engineers, drainage planners, landowners, farmers, agency staff, and drainage district supervisors, have attended the school. The school has been a collaborative effort of University of Missouri, University of Minnesota, South Dakota State University, and Iowa Soybean Association, as well as USDA-NRCS, and

various industry partners. From surveys of attendees, 45% of the respondents indicated an increase in number of clients they served, 35% of the respondents indicated hiring additional staff, and 39% indicated purchasing additional equipment to manage the additional work acquired. Respondents reported developing a per year average of 373 drainage designs with an average project size of 312 acres and subsequently making improved drainage decisions on approximately 51,000 acres annually.

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 youth program of America's Cooperative Extension Service 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 received a kit in 2018 with all of the books featured and materials for each lesson.

Almost 10,000 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. The Forward Learning Experience was a part of almost 90 events, visiting school classrooms, 4-H camps, STEM festivals, science nights, county fairs, and maker fair events 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.

ISU Extension and Outreach works with communities to increase the number of **Volunteer Income Tax Assistance** programs and their outreach to rural Iowans. (VITA, a national initiative sponsored by the Internal Revenue Service, trains community volunteers to provide free tax preparation to low- and moderate-income families in their local community.) During the 2019 tax season, ISU Extension and Outreach worked with community partners to recruit and train 67 VITA volunteers. In 2019, these VITA volunteers helped 1,972 low- and moderate-income Iowans complete their 2018 income tax returns — a nearly 40% increase over the previous year. Special efforts were made to increase awareness of the Earned Income Tax Credit (EITC) and VITA programs in rural Iowa. As a result, 460 filers qualified for the EITC and received \$742,651 in the 15 counties that participated in the extension-

community partnerships. The EITC enhances the lives of low- and moderate-income workers by augmenting wages. In turn, this flow of income makes a substantial economic impact in local communities. The credit encourages and rewards work as well as offsets payroll and both state and federal income taxes. EITC recipients circulate their refunds through the local economy, creating a ripple effect that exceeds the size of the original refund. This money bolsters family financial well-being, strengthens neighborhoods, assists small businesses, and spurs local economic development.

Human Sciences Extension and Outreach offers **educational opportunities to strengthen Iowa's early childhood education workforce**. Entry-level and experienced early childhood professionals who participate in extension's on-site or online learning experiences increase their knowledge and skills to improve quality early care and education. They gain the skills and training they need to be successful and remain in the early childhood education field. During FY 2019, a total of 43,135 early care and education professionals participated in 186,304 hours of educational programming. Post training evaluations from 38,577 individuals (89%) showed significant increases in improved skills and knowledge of child development, early learning, managing children's behavior, nutrition, and health and safety practices.

Every week in Iowa, 202,698 children are in paid childcare; Iowa's childcare industry has an annual economic impact of \$953 million. However, about one-fourth of Iowans live in an area undersupplied with licensed or registered child care options. Chronically low wages have led to high turnover and an increasing demand for ongoing professional development and education to meet the needs of this constantly changing workforce. Iowa's families need reliable and skilled child care to be able to work and contribute to Iowa's economy.

Through **Juntos Para Una Mejor Educación (Together for a Better Education)**. ISU Extension and Outreach worked with local school districts, community organizations, and volunteers to assist 79 Latino families (88 youth, 96 parents) in helping their youth graduate from high school and pursue higher education. Pre/post evaluation data reveals that after participating in Juntos, significantly more parents and youth communicated with each other; knew how to contact school staff with their questions; and became more aware of high school graduation requirements, options for higher education, and how to finance higher education. Longitudinal data based on 105 youth who participated in additional "wrap around" components revealed youth increased their sense of self-efficacy, belonging and safety at school, and commitment to doing well in school, and decreased their use of marijuana, cigarettes, and alcohol. Youth improved problem solving and critical thinking skills, and empathy for and acceptance of others, as well as increased participation in extra-curricular activities. School absenteeism and being tardy decreased.

Youth who do not complete high school cost the state nearly \$90 million in reduced state tax revenues over their lifetimes, and close to \$2 million per year in additional governmental assistance. They also will face higher unemployment, have increased health issues, and are 10 times more likely to be incarcerated.

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 the past year, 2,434 Iowans participated in ServSafe® classes taught

by extension specialists, with 76 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.

The Pappajohn Center for Entrepreneurship partnered with the Ivy College of Business to support initiatives to encourage young women to consider business as a career option. The Ivy Women in Business Program hosted one-day high school events as well as a summer camp experience for Iowa high school women. The Pappajohn Center provided hands-on learning activities in entrepreneurship to foster interest and engagement in entrepreneurship and innovation, as well as boosting participants' problem solving and presentation skills.

The Pappajohn Center, in partnership with the Ames Chamber of Commerce, initiated bringing the popular 1 Million Cups entrepreneurial ecosystem development program to Ames for weekly interactions among students, entrepreneurs, and professionals to support entrepreneurial development and networking activities in the community.

The Pappajohn Center, again in partnership with the Ames Chamber of Commerce and the ISU Business Development Center, trained more than 50 community members through a bi-annual Saturday workshop program, Smart Start for Business.

END OF YEAR REPORT: JULY 2019
IOWA STATE UNIVERSITY RIF PROGRAM

EXECUTIVE SUMMARY

Regents Innovation Fund (RIF) Commercialization Infrastructure and Campus-Wide Entrepreneurial Culture Program

The RIF commercialization infrastructure and campus-wide entrepreneurial culture program received \$630,000 of Iowa State University's \$1,050,000 RIF allocation, and is administered through the Office of Economic Development and Industry Relations (EDIR). 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 provided elsewhere in this report.

Summary of FY19 RIF Commercialization Infrastructure and Campus-Wide Entrepreneurial Culture Program

Unit	FY19 RIF Commercialization Infrastructure and Campus-Wide Entrepreneurial Culture Program (\$630,000 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	\$80,000
CyBIZ Lab	Support for student consulting services to assist with primary and secondary market and industry research and business planning for RIF commercialization projects	\$25,000
Office of Economic Development and Industry Relations	Support for industry relations functions at Iowa State and other technology transfer activities across campus.	\$25,000

GIVF/RIF Commercialization Program

The RIF commercialization program, which is administered in EDIR, received \$420,000 of Iowa State's RIF allocation and pairs ISU faculty with Iowa companies on projects to create or improve products or processes. One year after the completion of the project, the Iowa companies are surveyed for impact by the Center for Industrial Research and Service (CIRAS). 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 the survey results from projects funded to date and project outcomes is below, followed by the list of FY19 projects. Since its inception, 163 projects have been funded and completed through the Commercialization Program, and many show excellent progress in improving the competitiveness and profitability of the Iowa companies involved. For example, one industry partner reported that participation in an RIF project enabled rapid redesign of its product, facilitating a more successful product launch. Fifty five startup companies have been assisted, including **34 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.

Surveys are conducted by CIRAS one year after project completion (Note: full impact takes a minimum of 5-10 years).

Survey Results for FY08-09 through FY17-18 Projects

Project Dates	Survey Year	Companies Surveyed	Jobs Created or Retained	Total Sales Increase or Sales Retained	Total Investment & Cost Savings	Average Impact per Company
FY08-09	FY10	8**	6	\$600,000	\$732,000	\$166,500
FY09–FY10+	FY11	7**	13	\$675,000	\$967,000	\$234,571
FY10-FY11	FY12	6**	6	\$1,750,000	\$1,730,000	\$580,000
FY11-FY12	FY13	12**	13	\$2,470,000	\$2,571,000	\$420,083
FY12-FY13	FY14	6**	21	\$750,000	\$1,315,000	\$344,167
FY13-FY14	FY15	2	3	N/A	\$1,167,000	\$583,500
FY14-FY15	FY16	5**	3	N/A	\$454,500	\$90,000
FY15-FY16	FY17	4*	4	N/A	\$1,120,000	\$280,000
FY16-FY17	FY18	9**	9	\$32,600,000+	\$2,440,750	\$3,893,417
FY17-FY18	FY19	8**	10	\$121,200	\$2,056,000	\$272,150

**Surveys were not completed for all projects (not everyone chooses to participate in the survey.). *All surveyed companies were start-up companies. +The sales increase was primarily from 1 successful project, but the jobs impact was spread. Many companies indicated it was too early to tell the sales impact (this is a frequent comment through the years).

Project Outcomes for FY10 through FY19

Year Project Completed	Number of Projects	Number of Publications & Presentations	Number of Invention Disclosures	Number of External Funding Applications	Number of Applications Awarded	External Funding Received*
FY19	11	5	2	8	6	\$1,117,663
FY18	16	12	2	16	7	\$1,375,000
FY17	9	12	8	9	4	\$450,000
FY16	15	10	3	18	5	\$1,070,000
FY15	14	12	2	3	2	\$384,999
FY14	7	19	1	16	4	\$370,000
FY13	4	6	2	12	5	\$795,000
FY12	11	50	4	12	6	\$6,364,000
FY11	11	46	3	20	6	\$940,000
FY10	14	99	6	47	13	\$2,720,000

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

Summary of FY19 RIF Commercialization Program Projects

Principal Investigator	FY19 RIF Commercialization Program Projects (\$420,000 of \$1,050,000 RIF Allocation)	Award Amount
Manjit Misra	A Non-Vertical Dynamic Flow Sensing Technology for Bulk Materials (Phase II)	\$32,600
Chien-Ping Chiou	Algorithm Development for Data Pre-processing, Analyses, and Calibration of FTIR Spectra for Soil Nitrate Prediction (Phase II)	\$49,821
Jean-Philippe Tessonier	Polyamides with Bio-Enabled Properties (Phase II)	\$25,000
Eric Cochran	Turnkey Automated Reagent/Sensitive Chemical Purification System for Research-scale High Purity Chemical Requirements (Phase II)	\$25,000
Balaji Narasimhan	Novel Diagnostics and Nanomedicines for Alzheimer's Disease	\$50,000
Anumantha Kanthasamy	Evaluation of Novel Brain Penetrant Mitochondrial Targeted Metformin for Treatment of Parkinson's Disease	\$50,000
Shan Jiang	"Smart" Ink for Package Printing – a New Way to Detect Predator Drugs	\$50,000
Rick Sharp	Effect of Vitamin K2 plus ATP Supplementation on Human Muscle Fatigue Development	\$34,955
Wenzhen Li	Direct Carbohydrazide Fuel Cell (DCBFC) as Efficient Mobile Power Source	\$25,000
Anuj Sharma	InControl: A Transformative Approach for Traffic Signal Management	\$27,624
Behrouz Shafei	Multifunctional Concrete Elements for Energy-Efficient Buildings	\$50,000

***Full report can be provided upon request.**