Building an Ecosystem for Agtech Startups

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AGRICULTURAL ENTREPRENEURSHIP INITIATIVE

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Technology is nothing new, of course, whether in agriculture of any other industry. What may be new is the speed and scale at which technology can shape new opportunities and disrupt existing businesses and industries. Agtech is by all indications important. There are many accelerator programs related to starting agtech businesses, funding of agtech startups has grown, etc.

Funding for agtech startups has increased significantly. As tracked by AgFunder News, investment in agtech increased from about $150 million in 2010 to more than $800 million in 2016 and more than $500 million in 2017. Transactions like Monsanto buying Climate Corp in 2013 for $930 million or in 2017 DuPont Pioneer buying Granular for $300 million certainly got attention of investors, entrepreneurs and agricultural business professionals.

Both Climate and Granular were founded in Silicon Valley, the hub for tech startups and investing. Will there be a Climate or Granular type exit event for an agtech startup from the Heartland? Is there an ecosystem for agtech startups apart from Silicon Valley?

A 2017 report from M25 examined the Midwest and labeled it as the region that will give rise to the next crop of $1 billion-plus companies (Schulman 2017). From where does that observation arise? What's going on in the Midwest?

This paper will provide examples of Iowa-based developments in agtech, and discussion of larger issues for the ecosystem for agtech startups in the Midwest and the potential implications for economies in rural areas of the region.

Agricultural Entrepreneurship Initiative, Iowa State University

The Agricultural Entrepreneurship Initiative was founded in 2005 and is one of the foremost programs for training and developing high growth agricultural entrepreneurs in the world.

The Agricultural Entrepreneurship Initiative builds on a rich history of entrepreneurship at Iowa State University. For example, twenty percent of graduates of the College of Agriculture and Life Sciences at Iowa State University between 1982 and 2006 have created at least one business, resulting in creation of almost 57,000 jobs (Jolly, Yu, Orazem, and Kimle 2010).

Agricultural entrepreneurs from Iowa State University have been responsible for innovation, invention, and business creation in important sectors of agriculture and the food industry ranging from seed, agricultural equipment, GPS, agricultural chemicals, biotechnology, pharmaceuticals, and food products.

The Agricultural Entrepreneurship Initiative's activities have a foundation in the Land Grant University mission of education, thought leadership, and outreach. By creating a broad understanding of entrepreneurship among faculty and students of the College of Agriculture and Life Sciences at Iowa State University and its supporting components, undergraduate

programs are designed to supply students with exposure and experience with entrepreneurship, both in the classroom and outside the classroom. A diverse portfolio of educational experiences is complemented by programs in business incubation, public-private partnerships, technology commercialization and industry interaction.
Each academic year, the Agricultural Entrepreneurship Initiative:

- Touches 1,200 undergraduate students in the College of Agriculture and Life Sciences with at least one program. This includes classes, out-of-classroom activities, and internships.
- Takes more than 200 students through an Entrepreneurship in Agriculture course, with students developing startup business concepts presented at semester's end to investor and entrepreneur panelists.
- Places 30 to 40 interns with entrepreneurial agricultural businesses working on various business development and innovation projects. Students are placed in both domestic and international locations.
- Brings to campus more than 150 entrepreneurs, investors, and agribusiness professionals as classroom speakers, student presentation panelists, and industry, market, and technology mentors and experts.
- Supports fifteen to twenty five student entrepreneurs as part of AgEI's Student Incubator program. Notable examples from the Student Incubator Program include Scout Pro, Agriculture Concepts, AccuGrain, and Terva.
- Partners with entrepreneurial businesses for domestic and international travel course projects. Students act as consulting team for participating businesses.
- Creates outreach opportunities such as the Entrepreneurial Agribusiness Executive Conference and the Agricultural Entrepreneurship Unconference.
- Helps foster mentoring and investment platforms for the agricultural entrepreneurship ecosystem such as the Ag Startup Engine, which was founded in 2016 and has invested in five businesses.

The Agricultural Entrepreneurship Initiative has served as a model for other programs, having assisted in creation of new programs in other states as well as Greece and Tanzania.

Agricultural Startup Engine, Iowa State University Research Park

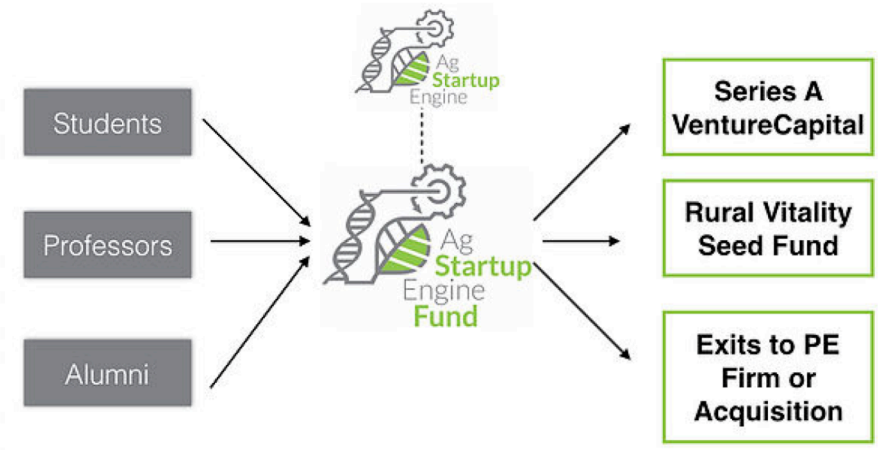
The Agricultural Startup Engine is an investment platform based in the Iowa State University Research Park to fund agtech startups. For example, students and alumni of the Agricultural Entrepreneurship Initiative may have a great idea, but not have a clear path forward toward funding. The Ag Startup Engine seeks to leverage an imbalance between quality seed stage ideas in the agricultural space and available capital to create a platform for development of high-growth agtech startup businesses.

The Ag Startup Engine believes there are two fundamental categories that need to be more robust in the State of Iowa for startups to become more successful:

1. Organized mentorship from successful entrepreneurs and business professionals
2. Early seed round investment ($25,000-$50,000)

Targets for investment include startup businesses in robotics, precision agriculture, animal health, agtech, livestock automation and clean tech.

True seed investment helps transform an idea into a startup business that establishes a target market, develops a minimum viable product, articulates differentiation, and establishes traction through customer discovery or successful grant development.



The Agriculture Startup Engine is a supportive agent in Iowa State University's major startup initiative to make it a top 5 university in startup creation. As such, it works in tandem with the Startup Factory, Pappajohn Center for Entrepreneurship , and the Agricultural Entrepreneurship Initiative around agriculture-centric ventures.

Agriculture Startup Engine investors include Summit Agricultural Group, Ag Leader Technologies, Ag Ventures Alliance, Peoples Company, Hertz Farm Management, Veridian Credit Union, Next Level Ventures and Iowa Farm Bureau Renew Rural Iowa, and Peterson Genetics.

The Agriculture Startup Engine has made five investments to date. Portfolio business include:

- SmartAg – Developed a platform for farm equipment automation. First deployment is a self-driving tractor pulling a grain cart.
- Performance Livestock Analytics – Developed a software platform for beef feedlots that automates the feed delivery process, enabling beef producers to make better performance and financial decisions.
- Gross-Wen Technologies – Invented an algal-based wastewater treatment process that recovers nutrients from wastewater. The algae biomass that is produced can then be used as a slow-release algal fertilizer.
- Terva – A farmland software platform that serves farmers, landowners and real estate professionals when buying, selling, renting, appraising and prospecting land.
- Nebullam – Developed aeroponics technology for indoor vegetable production.

The Agriculture Startup Engine aims to invest in 15 businesses in the next three years.

Can the Midwest be a Hub for Agtech Entrepreneurship?

The Midwest is home to the greatest concentration of animal protein supply chain activity in the United States and early-stage agricultural technology activity in the Midwest is particularly relevant to these supply chains. For purposes of this paper, the Midwest is comprised of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota and Wisconsin.

The Midwest has a strong concentration of public and private entities focused on developing agricultural technology. It is home to land grant public universities that provide a unique network of cutting-edge basic and agricultural science platforms. There is also a concentration of agricultural businesses engaged in technology development at many different levels. The Midwest is a catalyst of US agricultural innovation, knowledge transfer, and entrepreneurship development.

And yet there is much untapped and undeveloped potential for agtech entrepreneurship and investment-related activity.

Examples of geographic clusters of early-stage agricultural technology development in the Midwest include established public and private organizations that shape the environment for technology development, business development and entrepreneur/startup mentoring and support:

- Des Moines/Ames, Iowa.
    - Multiple plant science agricultural business such as DuPont Pioneer and Stine Seed
    - Iowa State University - land grant public university.

    - Iowa State University Research Park - assistance and accessibility for early stage businesses
    - Iowa State University Agricultural Entrepreneurship Initiative - development program for agricultural entrepreneurs and agricultural innovation
    - Agriculture Startup Engine – investment platform for agtech startup businesses
    - Iowa AgriTech Accelerator - Mentor-driven business accelerator designed to foster innovation in the AgTech industry
    - Cultivation Corridor – Organization aiming to create a global center of excellence in agbioscience, biorenewables, biotech and advanced manufacturing

- Omaha/Lincoln, Nebraska.
    - Home to agricultural businesses such as Green Plains Energy and Valmont
    - University of Nebraska - land grant public university
    - Nebraska Innovation Campus: support for early stage companies
    - Water for Food Institute - research institute for achieving food security with less pressure on water resources.
    - University of Nebraska Engler Agribusiness Entrepreneurship program - support and encourage entrepreneurship amongst students

- St. Louis, Missouri.
    - Monsanto - plant science agricultural business
    - Bio-Research & Development Growth Park - bio-research facilities for emerging scientific enterprises
    - Danforth Plant Science Center - nonprofit scientific facility to increase understanding of plant biology
    - Yield Lab - agtech accelerator with a stated mission to sustainably increase the global food supply and reduce inputs to agricultural production and distribution

- Twin Cities, Minnesota
    - University of Minnesota - land-grant public university
    - Home to agricultural and food businesses such as Cargill, General Mils, CHS, and Land O'Lakes.
    - Techstars Farm to Fork Accelerator – focused on the tech/digital side of food and agriculture from agtech, manufacturing and supply chains, to food safety, waste reduction and traceability.

Though agtech investing has risen significantly in the U.S. and entrepreneurial activity in the Midwest as evidenced by programs related to agtech has also increased, evidence of significantly higher venture capital funding in the Midwest is limited.

Venture deals in the United States have been most heavily concentrated in Silicon Valley, with up to 50 percent of total VC investment dollars in the country flowing to companies in northern California during some quarters. The Midwest remains underdeveloped relative to other parts of the United States in attracting venture capital funding. While venture capital invested in the

Midwest rose from $1.8 billion in 2007 to $4.0 billion in 2017, this represented only 4.7% of the total in the U.S. in 2017, making the Midwest a poor performer in terms of per capita venture capital investing (National Venture Capital Association Data).

Early-stage business activity is difficult to track by its nature. Inventors, entrepreneurs, and investors advance projects without extensive public disclosure, and personal networks are an important means of communication and development. To provide a proxy for the state of early-stage agricultural innovation activity in the Midwest, an analysis was conducted of business plans developed by students at the Agricultural Entrepreneurship Initiative at Iowa State University compared to those tracked by AgFunder in 2016. The dataset offered here is a snapshot of early-stage business development activity, much of it related to agricultural technology.

AgTech Interest by Subsector (2016)

	ISU *n=54**	AgFunder *n=307***
Alternative Protein	0%	5%
Animal Health & Nutrition	19%	3%
Bioenergy	0%	2%
Biomaterials & Biochemicals	5%	14%
Cannabis Technology	2%	2%
Decision Support Tech	16%	8%
Drones & Robotics	9%	8%
Farm-2-Consumer	26%	3%
Food E-Commerce	0%	32%
Food Tech	0%	2%
Food Safety & Traceability	0%	4%
Indoor Agriculture	9%	2%
Irrigation & Watertech	0%	4%
Smart Equipment & Hardware	9%	1%
Soil & Crop Technology	0%	9%
Waste Tech	0%	1%

** 94 total students pitched a business concept. 57% were AgTech.*
*** $1.8 billion invested first half 2016 by 425 unique investors.*

This analysis revealed a higher interest by ISU students in production agriculture oriented technologies than those tracked by AgFunder. Areas of activity such as animal health and management, decision support technologies, food science, energy efficiency, feed efficiency, sustainable production systems, environmental mitigation and manure management are more focused on the agricultural activities present in the Midwest.

Ecosystem Opportunities and Challenges

The common metaphor for fostering entrepreneurship as an economic development strategy is "ecosystem." But what makes an ecosystem vibrant for entrepreneurial activity?

A Harvard Business Review article provided a true/false quiz on the topic (Isenberg 2014).

> You know that you have a strong entrepreneurship ecosystem when there are more and more startups. ***FALSE***
>
> Offering financial incentives (e.g. angel investment tax credits) for early stage, risky investments in entrepreneurs clearly stimulates the entrepreneurship ecosystem. ***FALSE***
>
> In order to strengthen your regional entrepreneurship ecosystem, it is necessary to establish co-working spaces, incubators and the like. ***FALSE***
>
> According to entrepreneurs the top three challenges everywhere are access to talent, excessive bureaucracy, and scarce early stage capital. ***TRUE***

Wanting a vibrant entrepreneurial ecosystem for agtech entrepreneurs in the Midwest and actually having one are different.

Specific challenges include the following.

- Funding – The right money at the right time for each startup business is always a challenge. The good news is that there are many more sources for early-stage funds than 20 years ago. The popularity of shows such as Shark Tank has led to a proliferation of competitions that often have financial prizes, and is a cultural phenomenon that shouldn't be discounted. There are pitch and business plan competitions, incubation and accelerator programs, a greater array of local and regional funds today than ever before.
- Mentoring – Most startup success stories will also have stories about key mentors that provided key advice and perspective at key times. Entrepreneurs break rules and make mistakes in an effort to drive their businesses forward. As with funding, mentoring programs are now much more common than 20 years ago. However, the most valuable mentors for entrepreneurs are entrepreneurs, and those can be difficult to find depending on where you live. For entrepreneurs working to build high-growth businesses, the best advice will come from those who have built their own high-growth businesses. But the number of individuals who have 'done it' is not high, especially in a region with lower population density.

- Change-making culture – An element of support for entrepreneurs is cultural. A culture that is accepting of the risks and contrarian nature of new ideas is important. The friendly and egalitarian culture of the Midwest may at times be at odds with widespread celebration of entrepreneurial rule-breaking and risk-taking. There is an old saying in the Midwest that's indicative of a culture that, at times, may not be conducive to entrepreneurs: "Nothing is punished in a small town like success."
- Agglomeration – Economists view agglomeration as an issue important in economic development in that firms and professionals from an industry are often located near to each other. This concept relates to the idea of economies of scale and network effects. As more firms in related fields of business cluster together, their costs of production may decline significantly (firms have competing multiple suppliers; bigger talent pool; greater specialization and division of labor result). Cities form and grow to exploit economies of agglomeration. But what about the Midwest and agriculture? By it's nature, agriculture is spread out. The biggest concentration of agricultural production in the U.S. is in the middle of the continent while the highest populations densities are on the coasts. While it's a good thing that cities and agriculture don't on a large scale compete for land in the U.S., it also means that agricultural professionals and entrepreneurs don't have the agglomeration affects of something like the tech industry in the Bay area of California.

On the other side of each of these challenges lie opportunities. Agtech investing and the popularization of it as a sector unto itself now results in websites, funds, conferences and other events that enable coordination, new relationships and other positive spillover affects.

For the agtech ecosystem in the Midwest to continue to become more vibrant three things are critical.

1. Expose more young people to the concept that entrepreneurship is an option – Whether university programs or even high school programs, young people will benefit from being exposed to entrepreneurship. Fewer young people today grow up in families with farms and small businesses, so we need them to meet others and have experiences that expose them to the idea that they can not only someday get a job, but also make a job.
2. Continue to develop more forms of early-stage funding – The more sources of funding for early-stage startups the richer array of startup businesses that will emerge. Competitive filters on funding, whether a pitch competition or review panels for government programs, are important not only to insure the best ideas rise to the top but also to institutionalize feedback loops. The more sources of early feedback for aspiring entrepreneurs, both positive and negative, the better off they will be.
3. More Midwestern funds – The development of more professional funds in the region, whether angel, seed, venture, private equity, or whatever will benefit the region. Investors from one region and entrepreneurs from another can work sometimes, of course, but location matters. If there are more funds in the Midwest, there will be more investing in the Midwest.

Rural Vitality

Are there implications of agtech development for the economies in rural areas?

The adoption of agtech will result in a more productive and sustainable agriculture. The process of farm to fork will be more automated, connected, sensed, and traced. The ability to do and create new products, services and experiences will create opportunities that can work anywhere, including rural areas.

Will there be agtech startup businesses in rural areas? Yes. Agglomeration affects will still favor more urban environments for many agtech firms, but smaller towns that support entrepreneurs will result in startup activity. As one example, the Startup Factory program at Iowa State University has started to work with rural communities on running parallel programs for entrepreneurs in Ames and in those communities.

The most significant impact of entrepreneurs on rural economies, however, will come from Main Street businesses. The entrepreneurs with high growth agtech businesses to have emerged from programs at the Iowa State University Agricultural Entrepreneurship Initiative are to be commended. But a much higher rate of new business formation and employment has come from the many alumni who have started a new livestock operation, crop farm, vegetable farm, seed business, trenching business, crop input supply business, etc. And many or most of these businesses are in rural areas. We estimate that twenty times more alumni have started these types of farms and businesses than have started higher risk/higher reward businesses.

A 2008 survey of Iowa State University alumni from 1982 to 2006 found that 15.8 percent had started at least one for-profit business. These businesses resulted in creation of 222,569 jobs. These companies had 2007 revenues of approximately $64 billion. For an indication of magnitude, note that Iowa gross domestic product was $135.7 billion in 2008.

Of the 222,569 jobs created at the businesses started by ISU alumni entrepreneurs, only 35,242 of those were created in the state of Iowa, 15.8 percent of the total. A higher proportion of total companies founded by alumni were located in Iowa (35 percent), but those businesses located outside Iowa had more jobs created per enterprise. Large metropolitan areas both in the Midwest (Minneapolis, Chicago, St. Louis, Kansas City) and outside the Midwest (Phoenix, Los Angeles, Dallas, Seattle, San Francisco) recorded multiple alumni starting businesses. A alumni base that was greater than 75 percent from the state of Iowa created 84 percent of jobs outside the state of Iowa.

There are likely multiple explanations for this. The top response for business location in the survey was ‘where I lived’ (82 percent ranking it as very important) indicating that alumni had already moved away from Iowa to pursue their careers when they started their entrepreneurial ventures. Rather than move back to their native state of Iowa, they located their business

where they lived currently and had built their post-undergraduate career and lives. The first business start for alumni was on average 10 years after graduation.

The founding of entrepreneurial ventures by ISU alumni outside the state of Iowa may signify the 'brain drain' problem long cited in the Midwest. But the graduation period for this survey group, 1982 to 2006, had an extended period of economic distress in agriculture and other Iowa industries. Job opportunities for ISU graduates were outside of the state and even region and they settled and started their businesses elsewhere.

Will a future survey of 2007 to 2031 graduates show similar results? Preliminary indications are that no, a higher proportion of entrepreneurial activity will occur in Iowa and the Midwest. Certainly the attractiveness of a career in agriculture in 2018 compared to 1988 is higher based on enrollment at Colleges of Agriculture at Iowa State University and other universities also. More young people seeking careers in agriculture is likely positive for rural areas. 66.6 percent of 2015/16 ISU College of Agriculture and Life Sciences graduates, for example, accepted their first jobs in the state of Iowa.

And more programs, competitions, and cultural celebration of entrepreneurship is also positive for the economies of rural areas. Shark tanks can work anywhere.

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