



Kansas
2020 AGGROWTH
GROW SMARTER. GROW STRONGER. GROW KANSAS.

AGRICULTURAL TECHNOLOGY

Agricultural technology is a growing field, and Kansas is home to many agricultural technology companies that vary widely in their size and specialization.



location for advancements in agricultural technology.

Potential exists for new, innovative ideas to take root in Kansas and develop into successful businesses. Advances in technology that reduce costs and increase productivity will be key to long-term agricultural growth in Kansas. Unmanned aerial systems (UAS) technology in particular is increasingly important as farmers and ranchers work to implement precision technologies into their management practices. A strong agriculture culture positions Kansas as an excellent area for development.

Kansas is home to multiple manufacturers of agricultural equipment and technology companies, as well as a large aviation industry, and the combination of these industries creates an atmosphere that supports development of agricultural technology, especially UAS. Institutions of higher education in Kansas offer strong technology and aviation programs to grow the workforce, including UAS-related degrees which are now available within the state. The state's commitment to water conservation creates a need for new and expanded water-saving technologies to increase efficiency in the region. The strong customer base of farmers and ranchers makes Kansas a prime

Alongside the vast potential for this industry there exist some challenges which could present barriers to growth. Establishing a reliable workforce can be challenging in an industry that requires specific technical knowledge. Engaging the agricultural industry in new technologies or new innovative ideas can be difficult, especially with limited data to prove a return on investment for the producers. Similarly, new products and technologies face uncertainty in regard to policies and regulations which might limit their acceptance. Ag tech companies are often brand-new enterprises, and the financing of start-up companies generally occurs outside the traditional finance arena where much of agriculture operates.

The agricultural technology industry offers huge potential for growth, with unlimited possibilities. To foster this potential will require ongoing input and discussion among key partners as a long-term strategy for growth is developed to guide the industry. Many current resources that encourage business growth could be directed toward agricultural technology companies. A strategic growth plan created out of collaborative efforts from both public and private stakeholders will be key in the growth of this industry.

STATUS

Kansas is home to agricultural technology companies of all sizes, many led by entrepreneurs who are working to discover the next big idea. Technology companies offer great potential to adapt their products and services to serve the agricultural industry. Nearly 90 percent of Kansas' land mass is devoted to farming and ranching, providing ample customers for agricultural technology applications.

Agricultural technology is a vast industry, present in all agricultural sectors, and includes any advancement — digital or concrete — that leads to increased agricultural production and/or production at the lowest cost and with the most efficient natural resource use. Technology companies may produce the next great application to organize data or a physical product that reduces water use.

Agricultural technology companies encompass numerous agriculture and technology sectors. A majority of these sectors have economic multipliers of 1.75-2, among the highest of all sectors in the Kansas economy. Therefore, growth in these sectors can lead to large economic ripple effects throughout the economy.

A growing sector within agricultural technology is the unmanned aircraft systems (UAS) industry. Trend analysis from the Association for Unmanned Vehicle Systems International estimates the economic impact of UAS integration to reach a cumulative \$2.941 billion by 2025 and to create 3,716 additional jobs in Kansas. Agriculture is anticipated to be the largest benefactor from UAS use. UAS technology is increasingly important in agriculture as farmers and ranchers work to implement precision technologies into their management practices. The skills, knowledge and expertise in the UAS field will play a role in many careers across the agriculture industry.

Projects such as the relocation to Kansas of both the American Royal and Dairy Farmers of America are strong signals that Kansas is on the frontier for the latest agricultural technology advancements, with strong growth potential in both urban and rural areas.

Pairing the prevalence of the agricultural industry with Kansas' pro-business climate and Midwest values makes Kansas a prime location for entrepreneurs to create or expand their businesses. Potential exists to create an environment for growth in technology and a pro-entrepreneurial culture that can establish Kansas as the Silicon Valley of agricultural technology.

OPPORTUNITIES

In order to develop a strategic growth plan for agricultural technology and entrepreneurship, it is important to understand the areas where Kansas has a comparative advantage and the best opportunities for growth or expansion.

Factor	Implications for Growth and Development Opportunities
Animal Health Corridor	Kansas is located within the KC Animal Health Corridor, the world's largest concentration of animal health companies. The combination of private companies, veterinary schools and other animal health related fields of study, research facilities, technical training programs, and transportation capabilities make the Kansas City region an attractive location for animal health businesses — from initial start-ups to relocations or expansions.

Factor	Implications for Growth and Development Opportunities
<p>Established Tech & Entrepreneurship Industry</p>	<p>Discovery of new technologies and support for start-up enterprises requires funding for research and development and more. The Kansas State University Institute for Commercialization (KSU-IC) is dedicated to the start-up and expansion of technology-based, high-growth enterprises and enabling the commercialization of university and underutilized corporate intellectual property.</p> <p>Key communities and regions in Kansas have also taken proactive steps to recruit and support high-tech enterprises to the region. Knowledge Based Economic Development is an economic development partnership between K-State, Manhattan Area Chamber of Commerce, North Central Kansas Community Network, KSU-IC, KSU Foundation, KSU Research Foundation and the City of Manhattan that works to recruit and support knowledge-based companies that complement K-State's existing research strengths — including animal health, food science and safety, grain science, and plant science — to the Manhattan region. In addition, the Bioscience & Technology Business Center, a partnership of the City of Lawrence, Douglas County, Kansas Department of Commerce, University of Kansas and Lawrence Chamber of Commerce, provides support to grow the bioscience and technology industries in northeastern Kansas.</p>
<p>Existing Customer Base</p>	<p>Over 45 million acres are devoted to farming and ranching in Kansas, nearly 90 percent of the state's total land mass. Kansas has an abundance of potential customers for agricultural technology companies.</p> <p>Kansas is also home to multiple agricultural equipment manufacturers, which serve as potential customers for agricultural technology companies to develop strategic partnerships to enhance equipment with the latest precision technologies.</p>
<p>Human Capital</p>	<p>Kansas Regents institutions boast strong technology opportunities and unique experiences with unmanned aircraft systems. Additionally, departments within the Kansas State University College of Agriculture are developing new technologies and tools on the leading edge of agricultural technology. These educational programs contribute to the development of a workforce that is trained and prepared for growth in the technology sector.</p> <p>Kansas State Polytechnic boasts a strong aviation component and now offers one of the nation's first bachelor's degree programs in unmanned aircraft systems. Kansas State Polytechnic is nationally recognized for its expertise in the UAS field. Specific areas of study include UAS design and integration and UAS flight and operations.</p>
<p>Industry Relations</p>	<p>“Unmanned aerial systems” and “drone technology” are now common interchangeable terms. This is a positive for the industry, as the technology is no longer viewed as a threat, but as a tool in agriculture. In fact, management decisions now consider UAS as a key factor related to economic growth.</p>

Factor	Implications for Growth and Development Opportunities
Natural Resources	<p>Kansas is recognized nationwide for implementing proactive practices of conserving water, allowing farmers and ranchers to manage their own water while still preserving the aquifer for generations to come. Water-saving irrigation technologies can assist in addressing key challenges in other agriculture sectors, such as reducing water usage by increasing efficiency of water application consistent with the Long-Term Vision for the Future of Water Supply in Kansas.</p>
Policy Environment	<p>Kansas tax law allows sales tax exemption for farm machinery and equipment and various ag-based inputs. These state tax code provisions make Kansas a more attractive state for growth or expansion.</p> <p>Future policy changes that may result from research in the FAA's UAS Integration Pilot Program may give Kansas a comparative advantage over other agriculture states.</p> <p>The High Performance Incentive Program (HPIP) provides sales tax exemption on the construction, reconstruction, and remodeling of facilities for projects greater than \$50,000.</p> <p>Also at the state level, Kansas works closely with the agricultural industry to ensure its protection from overreaching federal regulation.</p> <p>At the federal level, Kansas is fortunate to have elected members of Congress who strongly support the agricultural industry. The Kansas congressional delegation will play an important role in influencing positive changes related to federal regulations or legislation, international trade, federal taxes, transportation rules, natural resources and more.</p>
Supporting Infrastructure	<p>Kansas is recognized nationwide for implementing proactive practices of conserving water, allowing farmers and ranchers to manage their own water while still preserving the aquifer for generations to come. Water-saving irrigation technologies can assist in addressing key challenges in other agriculture sectors, such as reducing water usage by increasing efficiency of water application consistent with the Long-Term Vision for the Future of Water Supply in Kansas.</p>
Weather and Natural Resources	<p>Agricultural technologies including UAS can assist in addressing key challenges in other agriculture sectors, such as reducing usage of water, chemicals and fertilizers.</p>

CHALLENGES

While Kansas is poised for potential expansion in the agricultural technology and entrepreneurship sector, the following factors represent challenges serving as barriers to achieving the objective of the strategic growth plan.

Challenge	Details of Challenge
Access to Capital	<p>Many agricultural technology companies are new, entrepreneurial enterprises, and the financing of start-up companies generally falls outside of the traditional agricultural lending arena. Therefore, financing options need to be sought outside of traditional lenders and inside the venture capital and start-up financing environments.</p>
Critical Infrastructure	<p>There is a lack of adequate work spaces in rural areas to provide flexible office and meeting solutions. A lack of affordable, livable housing in rural areas compounds the issue of a shortage of agricultural workers.</p> <p>The lack of consistent, reliable broadband access limits the ability of some farmers and ranchers to utilize technological advancements fully.</p>
International Trade	<p>Access to international markets for technology products is a great potential revenue stream, but resistance to free trade agreements at the federal level can hinder this access.</p> <p>Trade tariffs can serve as a barrier for agricultural technology UAS hardware in production.</p>
Policy	<p>Though not unique to Kansas, there exist significant challenges due to federal laws and regulations that affect technology. Other federal laws and regulations impacting the agricultural community as a whole could have an impact on opportunities in the agricultural technology sector.</p> <p>Federal laws and regulations impacting the agricultural community as a whole include Waters of the U.S., the Endangered Species Act and more. These policies, while potentially not impacting agricultural technology directly, affect the profitability of agriculture which creates downward pressure on farmers' ability to purchase and incorporate various types of agricultural technology into their management plans.</p> <p>Current FAA restrictions limit use of unmanned aerial vehicles and create challenges.</p>
Research and Information	<p>While there are a lot of useful methods for capturing data related to crop production, there is a dearth of information and algorithms to actually interpret the data in a way that is helpful for a producer looking to make management decisions.</p> <p>There is a lack of user-friendly systems in place to leverage the data created through UAS technology.</p>
Retention of New Businesses	<p>Other regions in the country have established reputations as strongholds for technology entrepreneurs; Kansas must provide an enticing alternative to keep these individuals in the state, as a great place to live, work and start a business.</p> <p>Marketing assistance is also challenging, particularly when it comes to finding sufficient scale to make an economic impact on marketing efforts outside of Facebook and social media.</p>

<p>Small Entrepreneurs</p>	<p>The speed at which technology research and development grows can make business development difficult for tech companies. It is difficult for small entrepreneurs to have ready access to additional capital as a new company grows. Marketing assistance is valued and will assist in the growth of this sector.</p>
<p>Uncertainties of Industry</p>	<p>Entrepreneurial endeavors in the field of agricultural technology are often forging new ground, testing new products and concepts. This may mean uncertainty in the regulatory environment, as policies adapt to new ideas and new businesses. It can also mean uncertainty in the return on investment for untested products, which can be difficult for entrepreneurs seeking investors and capital.</p>
<p>Workforce Development</p>	<p>Graduates with technical knowledge in engineering, agriculture, computers and technology will be necessary to fill the workforce needs of the technology industry. In addition to the technology workforce, the UAS industry needs engineers, operators and data interpreters.</p> <p>Community and technical colleges should be forward-thinking about working with industry to design appropriate associate degrees and certificates to meet future industry demand, to include data collection and interpretation.</p> <p>Currently, there are very few people with a background in UAS technology. This makes the job market incredibly competitive. At the university level, it is hard to keep Ph.D. level faculty because they can be offered such lucrative salaries in the industry. Graduates with technical knowledge in engineering, agriculture, computers and technology will be necessary to fill the workforce needs of the technology industry.</p> <p>High-tech graduates do not think of Kansas as a place to go for high-tech jobs.</p>

SUCCESSSES

Key successes in the ag technology and entrepreneurship industry:

- Topcon Agriculture announced a comprehensive partnership with Kansas State University to boost research and design technology advancement in agriculture research.
- The first Ag Tech Expo — a collaboration between Northwest Kansas Technical College, Kansas Ag Research & Technology Association and KDA — was held at the campus of Northwest Tech in August 2018. It was attended by more than 260 farmers, ranchers, agribusinesses and students from secondary and post-secondary programs along with 19 precision agriculture businesses which attended as vendors and provided hands-on demonstrations of their products.
- Collaborative efforts have taken place to connect established entrepreneurs with new potential business entities in a mentorship setting.
- Economic development organizations statewide have actively involved agriculture representation in efforts to bring new ag enterprises to their communities.
- Technology is growing in prominence in many sectors across Kansas agriculture, from increased use of precision agriculture in irrigation to the addition of robotic milking in dairies to the use of ultra high frequency tags and readers as part of the CattleTrace pilot program.

- In 2018, Kansas was selected as one of 10 partners in the UAS Integration Pilot Program, with a proposal that seeks to leverage a statewide unmanned traffic management system to facilitate precision agriculture operations.
- Kansas has increased our national presence in the UAS industry by annual participation in Xponential, the annual trade show of the Association for Unmanned Vehicle Systems International.
- Northwest Kansas Technical College is actively engaged with local schools in recruiting as well as promoting UAS/precision agriculture as an academic and career option to students from K-12 through postsecondary.
- Partnerships have been developed between several interested companies and either Kansas State Polytechnic and/or Northwest Kansas Technical College during 2018 in order to complete testing of UAS equipment.
- Kansas State Polytechnic became the first entity in the nation to achieve statewide access during flight operations. It has received a “beyond visual line of sight” waiver from the FAA.
- The Kansas Department of Transportation has named a director of UAS.

Policies in this document are a reflection of industry discussion and not a representation of state government.



2020 Agriculture Technology

Ag Technology & Entrepreneurship

GROWTH OBJECTIVE:

Establish Kansas as a premier state for start-ups in agricultural technology and entrepreneurship by fostering a business environment that supports new and expanding enterprises.

OUTCOMES & ACTION ITEMS

Leaders from throughout the Kansas agricultural technology industry will continue to collaborate in the development and implementation of a long-term strategic growth strategy with input and discussion among key partners. Industry-identified desired growth outcomes, initially developed in 2016 and expanded to include action items, will be implemented by industry and key partners and updated annually at the Kansas Governor's Summit on Agricultural Growth. Following are the proposed action items to continue building on the achievement of the agricultural technology sector desired outcomes.

High Priority Outcomes

Programs of study in agricultural technology and data management available at Kansas high schools and colleges that meet the needs of start-up companies.

ACTION ITEMS:

- Reach out to nonagricultural students interested in technology and encourage them to consider a program of study focusing on agricultural technology.
- Collaborate with Board of Regents and Regents schools to place a priority on current, relevant agriculture education in postsecondary programs across the state.
- Establish exact needs of technology companies and communicate to secondary and postsecondary levels addressing current skills gap.
- Develop education-to-business partnerships on secondary and postsecondary levels that address needs of both the classroom and the workplace. This could include mentoring programs and/or internships (e.g., Iowa Entrepreneurship Internship Program).
- Develop Centers of Excellence and Ag Innovation Campuses.
- Determine if blockchain technology is applicable as a program of study for data management.

Adequate in-state workforce through creation of agricultural technology internships, projects and mentorships in conjunction with Kansas high schools and colleges.

ACTION ITEMS:

- Utilize existing resources in middle schools and high schools to offer exposure and hands-on experiences demonstrating the diversity of agriculture careers (e.g., Seed to Stem, Ag in the Classroom).
- Integrate agriculture with apprenticeships, internships, projects and mentorships held in other professions (e.g., information technology, engineering and communications).
- Market availability of technology-related positions in the agriculture field.
- Develop database of existing resources and training materials to be used by teachers and guidance counselors in middle schools and high schools.
- Broaden messaging of diverse professions held in food and agriculture to attract urban youth involved in 4-H and FFA (e.g., information technology, engineering and communications).

Start-up capital available to agricultural technology entrepreneurs through investor-funded programs or state programs such as JumpStart Kansas Entrepreneur.

ACTION ITEMS:

- Develop a network that can help identify and market available programs (e.g., angel tax credits, SBA loans).
- Create a business incubator that offers incentives to start a business and that provides an avenue for entities to invest in those businesses.
- Enhance marketing of current availabilities that Network Kansas and Midwest Venture Alliance has to offer.
- Develop a newsletter with information for entrepreneurs and investors to share success stories and availability of opportunities across Kansas.
- Encourage a business-friendly climate to support agriculture technology and agriculture entrepreneurship.
- Establish regional events to link entrepreneurs with interested investors in a coordinated effort between Kansas Department of Agriculture, local governments, and local Chambers of Commerce. As progression occurs, move to a statewide event.

State-sponsored economic development incentives which meet the needs of agricultural technology start-ups. Effective array of “soft” incentives (e.g. mentorships, internships and training on interaction with financiers) which are accessible to agricultural companies to ensure they have the information, workforce and financing they need to economically grow and thrive in Kansas communities.

ACTION ITEMS:

- Pursue the creation of programs that provide training to start-ups on interfacing with the investment community.
- Create a marketing program that promotes Kansas as the place for agricultural technology businesses.
- Utilize successful agricultural entrepreneurs for marketing and training of potential start-ups.
- Distribute resources through seminars, onsite trainings and webinars.
- Author a review of current state economic development benefits and pursue legislation to alter existing programs and/ or create new programs to support this sector.
- Develop a coordinated effort between economic development directors, agriculture entrepreneurs, technology companies, Kansas Department of Commerce, and Kansas Department of Agriculture to approach the Kansas Legislature for funding to create incentives to attract potential businesses.
- Develop economic impact studies of agricultural technology companies to show the importance of funding incentive programs.
- Increase partnerships between state and local entities to expand available incentives.

Dynamic network between small and mid-sized technology companies, agricultural entrepreneurs, investors and mentors, including investment forums to encourage networking of start-ups and potential investors, and an agricultural technology incubator network to support faster company timelines.

ACTION ITEMS:

- Develop a task force of county economic development directors, agriculture technology companies and Kansas Board of Regents institutions to meet monthly and discuss advancements and availabilities in agriculture technology.
- Establish workshops for entrepreneurs and new businesses on giving “pitches” to investors.
- Support development of a “1 Million Cups” program in Manhattan geared toward agricultural entrepreneurs.
- Develop a mentoring program similar to the Pipeline Entrepreneurs program.
- Support “RedTire” program for business transition.

Seamless connectivity from mobile networks across all of Kansas. This is critical to adoption and implementation of UAS technology statewide.

ACTION ITEMS:

- Work with mobile companies to highlight potential for collaboration in expanding seamless connectivity statewide.
- Explore connection between existing cell infrastructure as well as nontraditional structures to serve as “towers.”

Rules and regulations for the UAS industry that are based on sound science and data and that support business growth. The state's involvement in the Integrated Pilot Program offers opportunities for private and public collaboration in development of rules and regulations for the future of the industry.

ACTION ITEMS:

- Encourage participation of private entities to collaborate with the Kansas Department of Transportation in the IPP with appropriate applications and practices.
- Highlight the positive benefits of UAS through social media and other marketing outlets.
- Host yearly legislative day to promote the benefits of the technology.
- Monitor legislative initiatives at the state and local level that may inhibit growth.
- Work with appropriate agencies to ensure current regulations are available to the public and that they are enforced.

Imagery interpretation systems and algorithms in use with UAS systems that provide useful recommendations to farmers. With current UAS technology farmers and ranchers are not able to effectively use the data generated by UAS, nor create solutions and management decisions, such as fertilizer application plans.

ACTION ITEMS:

- Advocate for and secure funding for advanced research in algorithm development.
- Develop methods for best development of algorithms.
- Disseminate information to agriculture technology companies.
- Determine what applications are currently needed.

Partnerships among agricultural equipment enterprises that may find mutually beneficial results from incorporating UAS technology into the menu of features provided by their products.

ACTION ITEMS:

- Identify agricultural equipment companies that have a desire to or could benefit from incorporating UAS into products.
- Invite agricultural equipment companies to participate in IPP activities.
- Work to standardize the sharing and transfer of data between partners in production as well as the specific equipment used.

Increased UAS study and degree options at secondary and postsecondary educational institutions in Kansas.

ACTION ITEMS:

- Evaluate which agricultural degree programs at Regents institutions complement the UAS industry, such as agronomy or biological and agricultural engineering.
- Expand support for a UAS minor in applicable departments.
- Strengthen the study options of UAS at Kansas State Polytechnic and Regents institutions.
- Promote UAS/precision agriculture as an academic option and a career to students from K-12 through postsecondary.

Kansas presence at regional and national UAS events in an effort to attract and establish unmanned aerial vehicle manufacturing, assembly operations, flight testing infrastructure and flight spaces to Kansas.

ACTION ITEMS:

- Continue participation at national UAS Summit & Expo.
- Continue participation at UAS Cluster Initiative events.
- Continue active participation and leadership at UAS Summit in Kansas.

Information showing a demonstrated return on investment from incorporating UAS technology into farm management decisions. Evidence of return on investment would promote farmer adoption of UAS, assist farmers in becoming more comfortable in utilizing the technology, and result in greater farm profitability.

ACTION ITEMS:

- Quantify return on investment based upon research and extension activities.

Medium Priority Outcomes

Partnerships between Kansas' existing military bases and the aviation industry to enhance the research, development and expertise of the UAS industry in Kansas.

ACTION ITEMS:

- Schedule quarterly meetings between Fort Riley and other military bases with Kansas UAS and aviation industry in order to share ideas on current efforts and identify methods for collaboration.
- Develop partnerships with interested companies in aviation/aerospace/UAS in Wichita area specific to agriculture systems for spraying and harvesting.
- Investigate repurposing Department of Defense training facilities and personnel for civilian agriculture purposes.

Research on applications in animal agriculture through collaborations between Regents institutions and industry, an area that remains largely untapped.

ACTION ITEMS:

- Research and create animal herd tracking systems that would track health and nutrients.

Business-friendly environment that attracts further expertise and innovation to the state.

ACTION ITEMS:

- Promote the Strategic Growth Initiative process, a pilot program to help counties and communities proactively seek potential business growth opportunities, working with KDA, the Kansas Department of Commerce and the Kansas Department of Transportation.
- Market the benefits of Kansas' business-friendly environment.
- Educate lawmakers on current infrastructure and policies that successfully create a business-friendly environment.
- Engage with legislators when proposed legislation threatens a pro-growth business environment in order to rectify negative results that may occur.