



SORGHUM

Kansas leads the nation in sorghum production. Sorghum is a versatile, multiuse crop well suited for Kansas agriculture. Sorghum is among the most efficient crops in conversion of solar energy, use of water, and drought resilience. Grain sorghum has traditionally been used for livestock feed and in the production of ethanol, both for domestic and international markets. Sorghum is gaining popularity in food products as a nutritious whole grain and is utilized in the production of snack foods and pet food products. State and national sorghum advocacy organizations provide strong leadership for sorghum cropping and usage domestically and worldwide. Ongoing research is creating even more possibilities for the sorghum industry.

Although sorghum's advantages are numerous, some challenges still exist to realizing sorghum's full potential. The export market is a significant part of the sorghum industry, with China as the largest buyer. Costs associated

with transportation and risk management, particularly international and specialty markets, can be burdensome to producers. Pet food and food-grade sorghum remains a very small percent of Kansas sorghum production, which is a key priority area for development to fully capitalize the potential of those premium markets.

A long-term growth strategy to expand the impact of sorghum in Kansas will rely on input and discussion among key partners in the industry. The Center for Sorghum Improvement, a centralized research center, promotes innovations for all segments of the sorghum industry and builds additional research partnerships. Statewide support for producers within the sorghum sector is welcome. Overall, collaboration between public and private stakeholders of sorghum is important in the development and execution of a strategic growth plan.

STATUS

Sorghum — a grain and forage crop — is among the most efficient crops in conversion of solar energy and use of water. Sorghum is known as a high-energy, drought-tolerant crop. Grain sorghum has traditionally been used for livestock feed and as an ethanol production feedstock. In the livestock market, sorghum is used in the poultry, beef and pork industries. Stems and foliage are used for green chop, hay, silage and pasture. A significant amount of U.S. sorghum is also exported to international markets where it is used for animal feed, ethanol and other uses. The sustainable attributes of sorghum extend to benefits for soil health and potential for carbon positive cropping.

In the United States, 447.8 million bushels of sorghum were harvested in 2021. In 2021, sorghum was planted on 3.6 million Kansas acres with 265.2 million bushels harvested. Of the 21 sorghum-producing states, Kansas ranks first in sorghum production followed by Texas, Oklahoma and Nebraska. The states in the sorghum belt lie across the semi-arid Great Plains from South Dakota to south Texas.

According to estimates prepared by the Kansas Department of Agriculture and based on the IMPLAN economic data model, the sorghum industry in Kansas has a direct output of approximately \$1.1 billion and creates 2,866 jobs in the state. Through indirect and induced impacts, the industry supports a total of 9,831 jobs and creates a total economic contribution of approximately \$2.3 billion.

Globally, Kansas sorghum's top export destinations include China, Mexico, Italy and Canada (Euromonitor, 2021 trade data).

Sorghum is gaining popularity in food products in the U.S. because of its gluten-free, non-GMO, and ancient grain properties. Sorghum is a suitable substitute for wheat, rye and barley for those who cannot tolerate gluten. Sorghum can be milled and is used to make both leavened and unleavened breads. In Sahelian Africa, it is primarily used in couscous. Various fermented and unfermented beverages are made from sorghum. The grain can be steamed or popped and is consumed as a fresh vegetable in some areas of the world. Syrup can also be made from sweet sorghum.

OPPORTUNITIES

In order to develop a strategic growth plan for the sorghum sector, 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
Acreage	Kansas leads the nation, producing roughly 50% of the sorghum in the U.S. Nationally, the total number of sorghum acres harvested annually is still low in comparison to other commodities (wheat, corn, soybeans). Increasing market share will draw more attention to sorghum and sorghum by-products. Kansas farmers planted 3.6 million acres of sorghum in 2021 and harvested 265.2 million bushels. Average bushels per acre totaled 85.
Industry Leadership	Kansas has strong leadership on the state (Kansas Grain Sorghum Commission and Kansas Grain Sorghum Producers Association) and national (National Sorghum Producers and United Sorghum Checkoff Program) levels. Kansas is in a positive situation to inform and shape strategic priorities for allocation of funds for market development, renewable research proposals and crop improvement projects.

Factor	Implications for Growth and Development Opportunities
<p>Industry Research</p>	<p>In April 2016, the United Sorghum Checkoff Program, Kansas Grain Sorghum Commission and Kansas State University announced a cooperative agreement to increase grain sorghum productivity and expand markets. This partnership created the Collaborative Sorghum Investment Program (CSIP) and provides funding for long-term research and the development of marketplaces, attributes, qualities and other factors capable of increasing demand for sorghum bushels.</p> <p>CSIP aims to increase demand, yield and value. The Center for Sorghum Improvement serves sorghum stakeholders by facilitating strategic, collaborative research and investment for the advancement of sorghum. The investments and collaborative efforts of CSIP span developing crop trait technologies such as tolerance to pests and environmental stresses, and development of new uses for sorghum with investments in novel sorghum proteins and high value uses.</p> <p>To date, the CSIP program has leveraged the farmer and K-State investment with an additional \$5.5 million to further advance the program’s mission. These resources and collaborations have yielded technologies that are used in the market today.</p>
<p>Industry Value</p>	<p>Value is traded on the basis of the corn market. The value for sorghum is virtually equal to corn for ethanol and livestock feeding, both of which are robust markets in Kansas, and at a premium for specialty markets, including pet food and food industries.</p>
<p>Marketing</p>	<p>Developing new markets for sorghum is key to strengthening demand. Today’s export market consumes most of the sorghum produced, followed domestically by livestock feed, ethanol production, food industry and the pet food industry.</p> <p>Sorghum has a low glycemic index and is high in antioxidants. Sorghum is also categorized as an ancient grain, it is gluten-free, and it has potential to fight cancer, high cholesterol and obesity (USCP, 2018). Sorghum is a versatile grain that is nutritious and easy to use and provides fuel a body needs (complex carbohydrates, B-complex vitamins).</p>
<p>Value-Added Product</p>	<p>Pet food is a key outlet for adding value to sorghum, but other markets are emerging to offer additional opportunities. New uses for sorghum and sorghum coproducts include green chemicals, aquaculture, insulation, packing peanuts, millers and bakers, and even cat litter (USCP, 2018). The United Sorghum Checkoff Program invests in a market development research portfolio. Kansas producer interests also include supporting market development research specific to human food, identity preserved, and value- added product development with the potential for a Kansas-branded sorghum product.</p>
<p>Water</p>	<p>Sorghum is a resilient crop, rain or shine. DropXL Sorghum is a state of Kansas investment managed by the Collaborative Sorghum Investment Program to advance sorghum technology for the benefit of Kansas farmers and Kansas water resource stakeholders. The project design and adaptive management is guided by mission alignment with the Kansas Water Vision (2015) and the Kansas Ag Growth Strategy (2018). The crop trait technology of DropXL is projected to decrease crop water use during periods of deficient water while preserving yields. This sorghum trait is estimated to increase yields in Kansas by 4%. DropXL is developing this technology into sorghum seed trait packages that exploit the natural diversity of sorghum for resilience under water scarcity.</p>

CHALLENGES

While Kansas is poised for major expansion in the sorghum sector, the following factors represent challenges serving as barriers to achieving the objective of the strategic growth plan.

Challenge	Details of Challenge
Critical Infrastructure	<p>The costs associated with transportation and logistics is a burden for producers. In-state freight rates add expenses when distributing sorghum domestically and internationally. The current transportation network prohibits the cost-effective transport of identity preserved grains harvested in Kansas destined for international markets willing to pay a premium for IP. In addition, the lack of infrastructure in transport and shuttle load facilities across the state is inhibiting growth.</p> <p>Kansas is home to the Logistics Park Kansas City (LPKC) freight facility in Edgerton. This complex provides access to a grain exporting facility and allows for containerized shipping to meet global grain market development orders.</p>
Industry Market	<p>Sorghum is a small crop, with less than 1/10 the plantings of corn and soybeans. The maintenance of an industry and access to new technologies relies on strategic collaborations and efficient industry advancement.</p>
International Trade	<p>Sorghum has a strong international trade program. The predominance of China as a leading customer encourages the development of new and emerging markets to complement and diversify the international marketplace.</p>
Policy	<p>The Natural Resources Conservation Service and Risk Management Agency programs do not always fit the needs of sorghum producers. However, recent technical discussions between NRCS and Sorghum leadership have worked to include more realistic language to diversify practical crop rotations with increased grain sorghum in order to protect soil quality and conserve water. Now, recognizing sorghum as a tool for regional sustainability, both the state and national NRCS offices should incorporate such language into their resource conservation policies.</p>
Value-Added Products	<p>The sorghum industry has partnered with scientific expertise to understand the unique properties of sorghum for functional and nutritional application in high value applications for human and petfood. Converting this knowledge for use in the marketplace would be a benefit to the industry.</p>
Workforce	<p>The lack of a skilled agriculture workforce is a top inhibitor of growth and expansion for many Kansas agriculture entities.</p>

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

SUCCESSSES

Key successes in the sorghum industry:

- EPA announced a Notice of Proposed Rulemaking for Grain Sorghum Oil Pathways (December 27, 2017) allowing sorghum oil to be converted into biodiesel. This rule will provide another much-needed market for sorghum oil.
- Industry representatives and leaders actively lobby for the sorghum industry as it relates to the Farm Bill, food aid, trade/tariff and industry initiatives in Washington, D.C.
- The Kansas Grain Sorghum Commission, in partnership with U.S. Grains Council and the Kansas Department of Agriculture, increased the number of inbound and outbound trade missions developing and further strengthening global relationships for the state's sorghum farmers and agribusinesses.
- The Kansas Grain Sorghum Commission developed a pipeline to fill state leadership transitions as well as support Kansas representation with strategic placement on national sorghum leadership boards, such as the United Sorghum Checkoff.
- The Kansas Grain Sorghum Commission increased education and outreach by coordinating and hosting sessions to mitigate pest tolerance and launching an educational podcast series.
- The Collaborative Sorghum Investment Program works to facilitate the testing and transfer of crop breeding tool, genetic markers, to rapidly introgress tolerance to sugarcane aphid into commercial sorghums.
- The Collaborative Sorghum Investment Program is investing in the development of novel quality feed grain sorghums, with high value protein and starch traits.
- DropXL sorghum, a trait to increase sorghum water productivity in water stressed environments, finds the trait will increase yields of sorghum by 4% in Kansas environments while reducing water demand by 8 %. The Collaborative Sorghum Investment Program (CSIP) manages the state of Kansas investment to advance the DropXL crop trait to a commercially available technology.
- CSIP partners with K-State ruminant nutritionists with preliminary evidence of the potential for grain sorghum to reduce methane in the feeding of cattle.
- KDA, K-State, CSIP and Kansas Wheat partner to execute a USDA AMS Federal State Market Improvement grant. This grant creates an innovation experience for college students, the collegiate food service programs and farmer leadership of sorghum and wheat. FarmUS is a farm to campus initiative centered on a class experience to develop innovative new food products with Kansas commodities for use in food service and dining on college campuses in Kansas.
- In 2021, Kansas farmers planted 3.6 million acres of sorghum, harvested 3.4 million acres, and averaged 78 bushels per acre. Top producing counties included Ford, Gray, Barton, Ness and Mitchell.
- In July 2022, the USDA added sorghum to its Food Buying Guide for Child Nutrition Programs, a primary resource used by school food service directors to build menus that comply with USDA nutrition requirements. Both KDA and Governor Laura Kelly wrote letters of support encouraging USDA Secretary Tom Vilsack to include sorghum products in the buying guide.

Sorghum

GROWTH OBJECTIVE:

Expand research partnerships and strengthen Kansas' position as the top sorghum-producing state in the nation.



OUTCOMES & ACTION ITEMS

Leaders from throughout the Kansas sorghum 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 sorghum sector desired outcomes.

High Priority Outcomes

Checkoff dollar funding directed toward supporting value-added education, marketing and research. These value-added sectors would include biofuels, pet food, plastics and/or human food-grade sorghum.

ACTION ITEMS:

- Encourage state sorghum industry to award checkoff dollar funding to include research targeting a variety of market-oriented opportunities: human food, identity preserved, value-add, feed and forage, industrial use.
- Utilize checkoff dollars to bring companies and assets together to drive more value into the crop as well as to develop potential market outlets.

Implementation of action items in the Vision for the Future of Water Supply in Kansas related to sorghum, and expanded awareness of sorghum's water use efficiency, leading to a longer usable life for Kansas groundwater and surface water sources.

ACTION ITEMS:

- Implement action steps included in the Water Vision document.
- Secure research funding for sorghum water intensification research projects.

Long-term strategic plan to support the newly established Collaborative Sorghum Investment Program to include key private partners and public investment that benefit the sorghum industry and state.

ACTION ITEMS:

- Secure funding for long-term CSIP sustainability (post-ten-year mark) at Kansas State University.
- Actively support the balance of collaborative investments from the federal and state levels as well as private industry and sorghum producers.
- Continue to support DropXL Sorghum water intensification research through state of Kansas research funding allocations.
- Encourage focus on market-oriented research specific to human food, identity preservation and value added.

Livestock feed research partnerships with K-State that support the use of sorghum across Kansas agriculture sectors. These research application sectors would focus on beef cattle, dairy cattle, distiller's grains, pet food, poultry and swine.

ACTION ITEMS:

- Partner with the Kansas dairy industry to author joint research regarding usability of sorghum and sorghum silage in dairy cow rations.
- Encourage acceptability and use of published sorghum research conducted at K-State and other land-grant institutions for dairy, pork and poultry industries.
- Educate and help other countries on ration creation and nutrition education.
- Educate farmers, ranchers and agribusinesses in other sectors on how to create value from sorghum.

Transportation network — including transload facilities and container load/ship — that maximizes logistical efficiencies and minimizes cost per producer to ship sorghum domestically and internationally.

ACTION ITEMS:

- Support continued development of transportation infrastructure, including new transload facilities in Kansas.
- Encourage increased state and federal funding for infrastructure improvements — e.g., adding increasing the availability of passing lanes on major Kansas highways (including Highways 50, 54, and 83) to better accommodate truck traffic.

Expansion of inbound and outbound trade missions showcasing feed and value-added market opportunities.

ACTION ITEMS:

- Leverage commodity and organizational membership resources to keep Kansas representatives engaged in outbound missions.
- Organize, host, and financially contribute to offsetting costs associated with bringing inbound sorghum trade missions to Kansas.
- Expand the sorghum circle of influence when hosting inbound trade missions to improve relationships with domestic and international trading partners. The circle of influence could grow to feature not only livestock feed but also food grade, pet food, value-added, ethanol and DDGS representatives.
- Continue to build new and improve existing trade relationships.

Medium Priority Outcomes

Identity preserved sorghum for customers around the world. This can be achieved by capitalizing on the availability of shipping containers to ship identity preserved sorghum from the point of filling the container to the point of delivery.

ACTION ITEMS:

- Participate in Kansas Department of Transportation freight studies and site selection.
- Work toward establishing container facilities in all grain-growing/shipping regions of the state.
- Develop a method for identifying the location and availability of containers.

Expanded education and outreach opportunities that support industry strategic growth.

ACTION ITEMS:

- Address challenges, issues and opportunities for the industry through a strategic plan developed by the Kansas Grain Sorghum Commission.
- Lend resources and support to the organization to address needs and overcome existing challenges.
- Research existing capacity for on-farm storage opportunities and, if needed, increase opportunities for farmers to add storage capacity.
- Educate Kansas farmers regarding on-farm storage opportunities.
- Explore promotion of alternative uses of sorghum in the energy sector, including a sorghum ethanol plant and/or advancements in a wax product that could be produced through ethanol.