



Driving Change

An Action Framework for Building Local and Flexible Solutions for Profitable Agriculture on the Ogallala

AUGUST 2024

This project was supported in part with funding from the Kansas Water Plan through the Kansas Water Office. Additional support was provided by the Kansas Department of Agriculture, Ogallala Aquifer Program, National Sorghum Producers, Farm Credit Associations of Kansas, BNSF Railway, and Veterinary Research and Consulting Services, LLC. Appreciation is extended to the project partners including the Kansas Water Institute at Kansas State University, Kansas Livestock Association, Front Porch Farms, and many Kansas feedyards and producers.

Background

The Ogallala-High Plains Aquifer, especially in the Southern Great Plains, is rapidly depleting, with Kansas experiencing groundwater declines of 25 to more than 200 feet since predevelopment. These declines led to significant losses in irrigated cropland and substantial economic impacts. From 1989 to 2017, more than 11% of western Kansas's irrigated land converted to dryland; by 2100, 24% of currently irrigated lands may lack adequate water. This trend threatens the sustainability of profitable agriculture in the region.

Kansas employs a prior appropriation system for water management, with three of its five groundwater management districts (GMDs) overseeing the Ogallala Aquifer. Kansas uniquely mandates all water right holders to meter their wells and annually report all water usage. GMDs use solutions such as Local Enhanced Management Areas (LEMA) and Water Conservation Areas (WCA) to promote water conservation. In 2013, the first LEMA for setting conservation goals was established in Sheridan County, KS, followed by the formation of additional LEMAs in Northwest and West-central Kansas. WCAs, established in 2015, appeared across the Ogallala in Kansas allowing collective water management plans. Successful examples like the Sheridan-6 LEMA and Wichita County WCA demonstrate that substantial water savings are achievable and economically feasible with supportive policies.

Effective groundwater management requires clear information. Estimates on aquifer conditions and reductions needed to achieve stabilized water levels can be readily provided from an analysis procedure known as Q-stable. Based on a water balance approach developed by the Kansas Geological Survey, the relationship between reported pumping and water-level change provides a measure of what reductions in pumping is needed, on average, to achieve stabilized water levels for the next decade or two. Because the process is entirely data-driven and does not involve any conceptualizations, it is dependent on quality water use reporting and representative water-level measurements that are spatially distributed across the Kansas Ogallala aquifer region. The Q-stable method has been successfully applied at scales ranging from several townships to entire GMDs, both as projection and measure of aquifer conditions in response to water conservation efforts.

Agricultural water management in Kansas historically focused on crop production, which accounts for more than 85% of groundwater use. However, livestock production, particularly beef, generates significantly more economic value per acre-foot of water used. Engaging the entire supply chain, including lenders and policymakers, is essential for future water management.

As Dr. Stephen Lauer et al. wrote in 2020, "...thus far, despite agreement on the existence of groundwater depletion, few institutions across the region have successfully implemented groundwater conservation policies that have brought about change. Successful policy design and implementation require a thorough understanding of stakeholder values and motivations and a discussion around the appropriate objectives for management institutions. Therefore, future research is needed to design institutions and policies that balance the competing values of groundwater. It is important not to underestimate the role of power and inequality in designing these institutions and policies. Policy can only truly optimize the value of scarce water resources in the Ogallala region if it first considers all the relevant values."

Given the bodies of research concluded to date, Kansas State University, Kansas Livestock Association, Kansas Geological Survey, and the Kansas Water Office sought the help of Aimpoint Research. The goal is to bring an unbiased third party to address not only the challenges noted by Dr. Stephen Lauer et al. regarding policy but also to provide the producers on the Southern Great Plains, GMDs, and others throughout the value chain with a framework to increase adoption of conservation practices, thus providing substantial water savings while maintaining economic feasibility with supportive policies.

A global strategic intelligence firm

Aimpoint Research®, a global strategic intelligence firm specializing in agri-food, provides a unique blend of military intelligence techniques and cutting-edge market research capabilities to help leaders and organizations understand what is happening in the marketplace, what is going to happen in the future, and what to do to ensure success in that future.

Aimpoint Research®, is part of a larger firm called Directions Inc, an integrated intelligence and research company providing data, insights and activation services.

As of August 27, 2024, the Aimpoint Research and Directions Inc names will be retired and will be known as The Directions Group going forward.

The United States' ability to produce enough food to feed its population and other populations worldwide is a significant national security advantage that we call American Food Power. However, our system has critical vulnerabilities, and the U.S. must address these threats to protect this advantage.

These critical vulnerabilities include:

- A lack of contingency planning
- Infrastructure
- Cyber security
- Policy encroachment
- Farmland control
- Political shifts
- Single points of failure
- Foreign inputs
- Labor

The Situation

Since January 2024, Aimpoint Research has **conducted various interviews, secondary research, and stakeholder engagements** to understand Ogallala Aquifer water conservation

from the perspective of farmers, producers, and others linked in the value chain. A growing community is committed to developing a workable framework

for executing conservation practices, thus ensuring the aquifer's viability while maintaining producer profitability.

This work has been **decades in the making.**

Education, technology, crop science, and other efforts have enabled progress toward more efficient water use. Several case studies highlight success, but levels within the aquifer continue to decline. Barriers still hinder producers from adopting practices and internal policies for reduced water use. This report and included recommendations are not meant to replace, contradict, or

summarize the research and analysis previously published. We recognize those contributions as critical to our knowledge and understanding of the issues and progress to date. We desire to complement them with an action framework that carries those works forward to achieve the common thread of water conservation on the Ogallala Aquifer.

Water and food production are essential to national security. Agriculture on the Ogallala Aquifer significantly impacts the Kansas economy and national beef production. If we continue to extract water at our current rate, we will run out of usable water. We intend to extend the viability of the Ogallala Aquifer while maintaining producer profitability.

Over seven months, Aimpoint Research worked directly with many who have a vested interest in the **longevity of the Ogallala Aquifer**.



and many other stakeholders throughout the state

Due to the size and scope of this project, Aimpoint examined this work in phases.

Phase 01.

The Intelligence Analysis

Aimpoint Research kicked off the Ogallala Aquifer Project by conducting a comprehensive analysis focusing on three critical areas: economic impact on agriculture, environmental impact, and America's food security.

The team also conducted 17 expert interviews across 14 organizations that touch agriculture and conservation in Kansas to build an understanding of the current state of agriculture and water in Kansas and the past efforts and work done to advance water conservation.

From these analyses and interviews with stakeholders, Aimpoint Research generated a nuanced understanding of the multifaceted impact of the Ogallala Aquifer's decline, setting the stage for targeted stakeholder engagements.

Phase 02.

Stakeholder Engagement & Alignment

Aimpoint designed and facilitated four critical stakeholder engagements, each with specific objectives related to understanding Ogallala Aquifer water conservation from the perspective of farmers, producers, and others linked in the value chain.

2024 Timeline



March 18 Tensions

Aimpoint facilitated a strategic intelligence briefing for feedyard representatives across Kansas. This session employed wargaming techniques and group activities to build a foundational understanding of attitudes, potential practices, and prevailing challenges for conservation.



June 5 Quick Wins

Aimpoint led another session with feedyard representatives and associated crop producers to identify producer barriers and tensions to long-term aquifer conservation and identify actions to address them.



June 6 Acceleration

A third engagement brought in additional value chain players who participated in various activities to build on the actions of the day before, specifically working to support and accelerate farmer & feed yard actions.



July 9 Policy

The final workshop expanded to include policy-focused organizations to explore rapid policy generation and evaluation aimed at reducing identified barriers that prevent reduced water usage or discourage joining forces to address the challenges together.



Intelligence Overview



Aimpoint approached intelligence collection via two methods: secondary research and expert interviews. The collection resulted in four primary areas of intelligence: geopolitics, the state of agriculture and economics in Kansas, consumer trends, and innovations in crop and livestock production. We then integrated research and insights from three of Aimpoint's thought leadership platforms – American Food Power, Farmer of the Future 2.0, and NextGen Consumer – with additional intelligence collection to provide a comprehensive foundation for the project.

The United States' ability to produce enough food to feed its population, as well as others around the world, is a significant national security advantage that Aimpoint Research calls

American Food Power

However, our system has critical vulnerabilities and there are threats that must be addressed to protect this advantage.

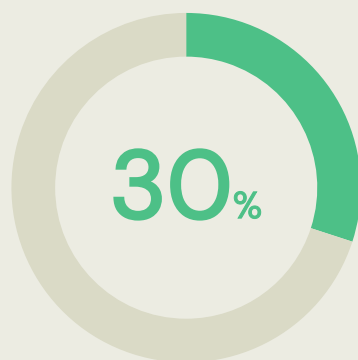
Managing the Ogallala Aquifer for **long term production viability** is one of those **critical vulnerabilities** to U.S. national security.

For more than half a century, the U.S. national strategy has outlined elements of national power as DIME

Diplomatic
Informational
Military
Economic

National power provides strength domestically and allows the U.S. to project vital leadership worldwide to secure national interests and advance fundamental ideals (human rights, the rule of law, and the pursuit of prosperity).

Agriculture and food have played a quiet, yet genuinely foundational role in all four elements of national power.



Nationally the Ogallala Aquifer supports 30% percent of the production of this U.S. asset.

Retracing agriculture's impact on U.S. geopolitics demonstrates that since its founding, American agriculture output has been a major point of value to the world, fostering key geopolitical relationships and providing leverage to American leaders. In the 20th century, the United States' agricultural output and impact worldwide was unrivaled. Access to U.S. agriculture products helped fuel developing economies by lifting millions out of poverty and hunger. U.S. agricultural exports abroad supported key interdependent relationships with developed countries and fostered order and progress in developing nations, playing a pivotal role in achieving national security objectives. The Ogallala played a key role in this American agriculture growth.

The global landscape is rapidly changing

Global competitors are demonstrating profound strategic initiative to advance their own interests and leverage food production to gain positional advantage in the world.

China's aggressive investment in agriculture and food security relationships is tied directly to its competition with the U.S.

At the same time Russia continues to weaponize food to advance its goals and policies of aggression.

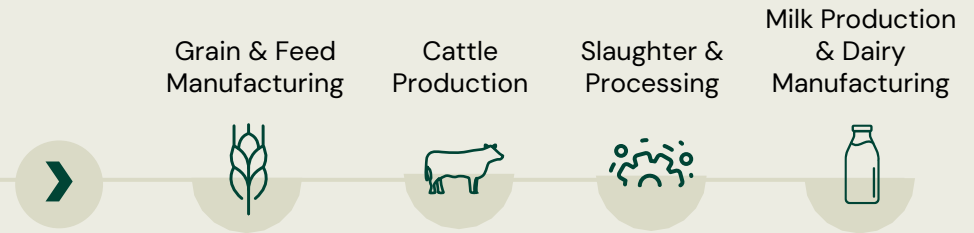
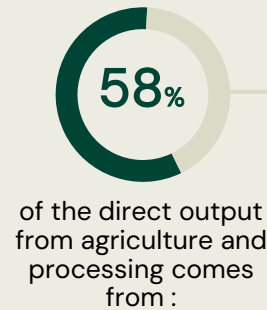
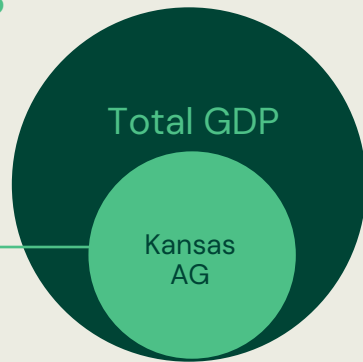
Now more than ever, agriculture must be understood and addressed overtly as part of U.S. national security strategy and competitive statecraft.

Action is required now to address the national security vulnerability of Ogallala Aquifer depletion while maintaining the agricultural production required for U.S. national security and global leadership.

Agriculture is a **critical industry** in Kansas, playing a significant role in the **state's economy**

2023

Agricultural production & processing accounted for a total of **\$81B** in economic impact which makes up **34%** of the total Kansas GDP



All have a significant presence over the Ogallala Aquifer. Each of these industries also depends on water, making it necessary to conserve water to ensure the future of agriculture in the area.

Sustaining production in Western Kansas is necessary, as attributes of the land and climate make the area better suited to **efficient, large-scale production and processing** than many other regions in the U.S.

Favorable production conditions include



Lower Humidity



Mild Winters



Annual Rainfall Of About 20 Inches

These conditions lead to consistently efficient feed conversion and fewer health concerns for cattle.

The ability for crop producers to utilize the Ogallala to irrigate grain and forage crops provides feed sources close to the animals.

The processing industry has followed the cattle supply, with significant packing companies Tyson, Cargill, and National Beef in the area, creating healthy market competition and reducing transportation distances from the feedyard to the processing plant. The area is also not densely populated, providing the space for large-scale production. The weather conditions, proximity of feed and processing, and low population density have all led to significant infrastructure investments, all contributing to economically and environmentally efficient protein production. All the same factors are also beginning to attract dairy production and processing, increasing the overall output of the area. This confluence of factors highlights the importance of agriculture over the Ogallala. The future requires sustainable use of Ogallala water. Lack of change in this area could be a significant threat, both for the state of Kansas and for U.S. food and national security.

In the next decade, Kansas has the potential to increase its output of agricultural products, particularly beef and dairy



Based on the anticipated expansion phase of the cattle cycle and USDA's beef cow inventory forecasts...

If Kansas were to maintain its share of feedlot production, an additional

+3 million feeder cattle

could be finished in Kansas in 2024-2033 when compared to 2014-2023.



Simultaneously, Kansas aims to become a top-10 dairy production state within a decade, and projections include the creation of additional supportive processing capacity.

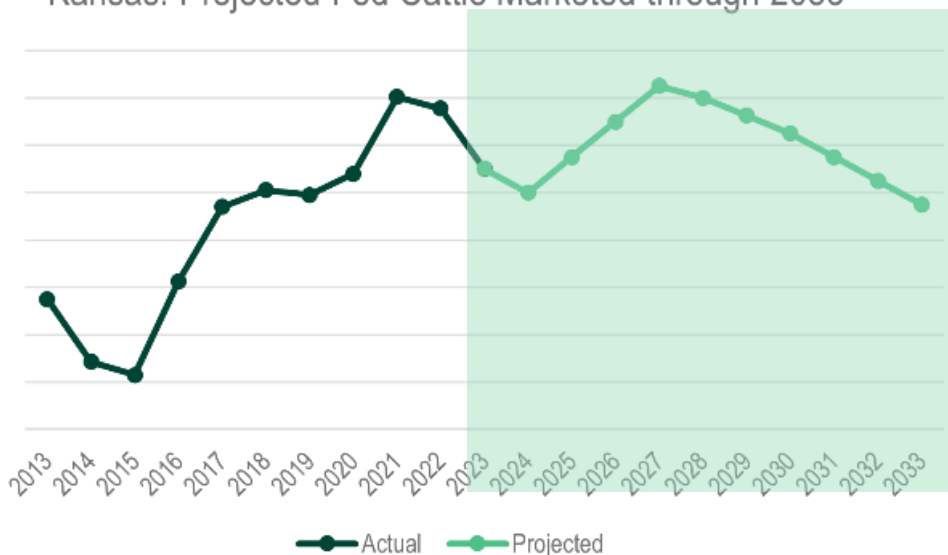
If trendline expansion continues through 2033, a further

+60,000 milk cows

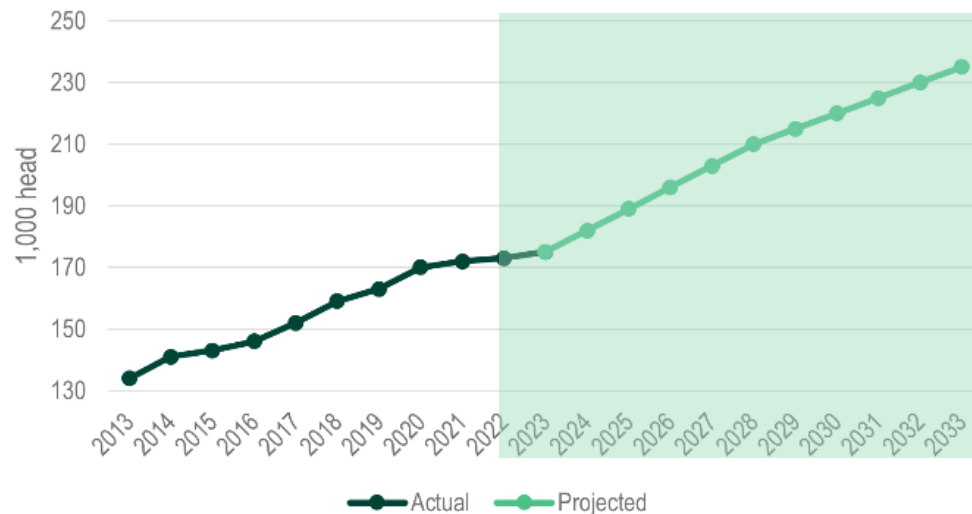
Can be expected by 2033

This potential for expansion could be vital for meeting the ever-growing global protein demand, expected to be an additional 250 million metric tons annually by 2050.

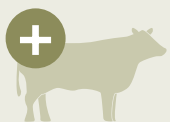
Kansas: Projected Fed Cattle Marketed through 2033



Kansas: Projected Milk Cows through 2033



The expected expansion of both beef and dairy requires additional feed



The projected expansion will add



bushels of corn feed demand



bushels of silage (equivalent)

In this scenario, feedlot use of corn would be 121.5 million bushels more in the same period compared to 2014 to 2023.

Crop production in Kansas may change to meet potential increased feed demand.

The increase in dairy silage needs will lead to the change; shipping grain is less expensive than silage.

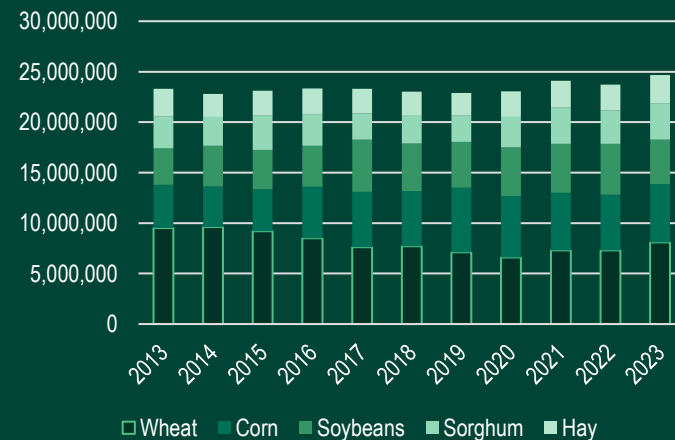
From 2013 to 2023, the distribution of crop acres remained relatively steady, although fluctuations based on commodity market cycles occurred.

Increased silage production allows Kansas producers to diversify acres into crops requiring less water, including but not limited to triticale and sorghum.

Although Kansas historically leads in U.S. sorghum production, planted acres increased 14% since 2013 to 3.6 million in 2023.

Kansas farmers also chose to plant more triticale as acres planted increased 39% from 14,883 in 2012 to 20,672 in 2022.

Distribution of Major Crop Acres Planted in Kansas, 2013 - 2023



Maintaining a healthy Ogallala aquifer through current and future productivity and profitability opportunities requires innovation

Over the years, irrigation technology significantly improved to make water use more efficient.

Such improvements include:

- Equipment advances such as specialized nozzles and sub-surface drip systems
- Supporting technologies like soil moisture probes
- Other in-field sensors and digital irrigation management systems

These can increase farmer awareness of field moisture, provide insights into best irrigation schedules, and even allow remote control of irrigation equipment for efficient time management.

Some technology providers and data management tools include: FieldNet, AquaSpy, CropX, groguru, OpenET, and Prospera. All allow for more precise management and increased awareness of water use, leading to water conservation.

FIELDNET[™] BY LINDSAY **AquaSpy** **cropx**[™]

groguru **OPENET** **prospera**
A valmont COMPANY

In livestock production, water recycling technology used in beef and dairy operations increases water-use efficiency.



Feedyards

Overflow from tanks recycles back to the drinking water for cattle, while wastewater provides crop irrigation or is filtered for use elsewhere. The resulting solids provide fertilizer.



Dairies

Milk homogenization and cooling water may provide processing water, while wastewater provides irrigation or can be further filtered for other uses. Dairy industry experts agree that dairies could recycle water up to four times, finally using it to irrigate crops.

Companies such as Infinite Water, Watermaster, Western Kansas Irrigation, Inc. and Livestock Water Recycling provide recycling technology for livestock operations.

Multiple technologies on the horizon could further reduce water usage.

Feeders historically use feed additives to increase feed efficiency in cattle, resulting in more efficient gain, reduced demand for feed, and less water for crop production. Bovaer, an additive currently used for methane reduction, also increases feed efficiency in beef cattle by 4% on average, with some studies showing more significant than 5% improvement. However, this additive costs about 10 times more than typical feedyard supplements. According to Aimpoint calculations, each 1% increase in feed efficiency saves 0.41 bushels of corn fed per head.

Artificial intelligence and machine learning could drastically increase the pace of genetic discovery. Genetic improvement increases feed efficiency and could also impact water intake and efficiency. Initial research from Vytelle, a leader in cattle genetic improvement, suggests that traits associated with water intake and efficiency in beef cattle have a sizable genetic component. While genetic improvement for water intake efficiency is likely at least 10 years away, it shows the potential for genetic innovation to conserve water.

Consumer Trends

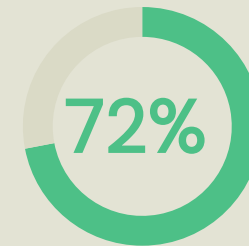
Ogallala conservation also has the potential to drive additional profitability back to the producer by fulfilling consumer demand. Aimpoint's proprietary NextGen Consumer research shows that consumer demand has evolved from attribute-based to experience- and value-based.

For example, sales of organic foods totaled

\$70 billion

in 2023, a 3.4% increase over 2022 sales and record growth for the sector.

Consumers increasingly value sustainable food production, as



of U.S. consumers feel an urgency to adopt a more sustainable way of eating, according to Sodexo's 2023 Sustainable Food Barometer .

These factors could translate into food companies or consumers paying more for less water-intensive food, benefiting producers who practice water conservation on the Ogallala.

However, food companies and consumers have other constraints, including available **disposable income**.

Inflationary conditions brought on by the COVID-19 pandemic impact consumers' financial situations and spending choices. For example, consumers now buy more private-label brands. Through the first half of 2024, private-label sales increased 2.3% yearly, while unit volumes increased 2.5%. This trend toward private labels shows consumer willingness to change purchasing habits, underscoring the volatility of relying on consumer purchases, particularly premium brands.

Aimpoint Research developed a farmer segmentation that clarifies farmers' attitudes and mindsets

The segmentation includes:

- Psychographics
- Demographic and behavioral data
- Powerful insights

that help organizations better understand, engage, and serve their existing and future customers.

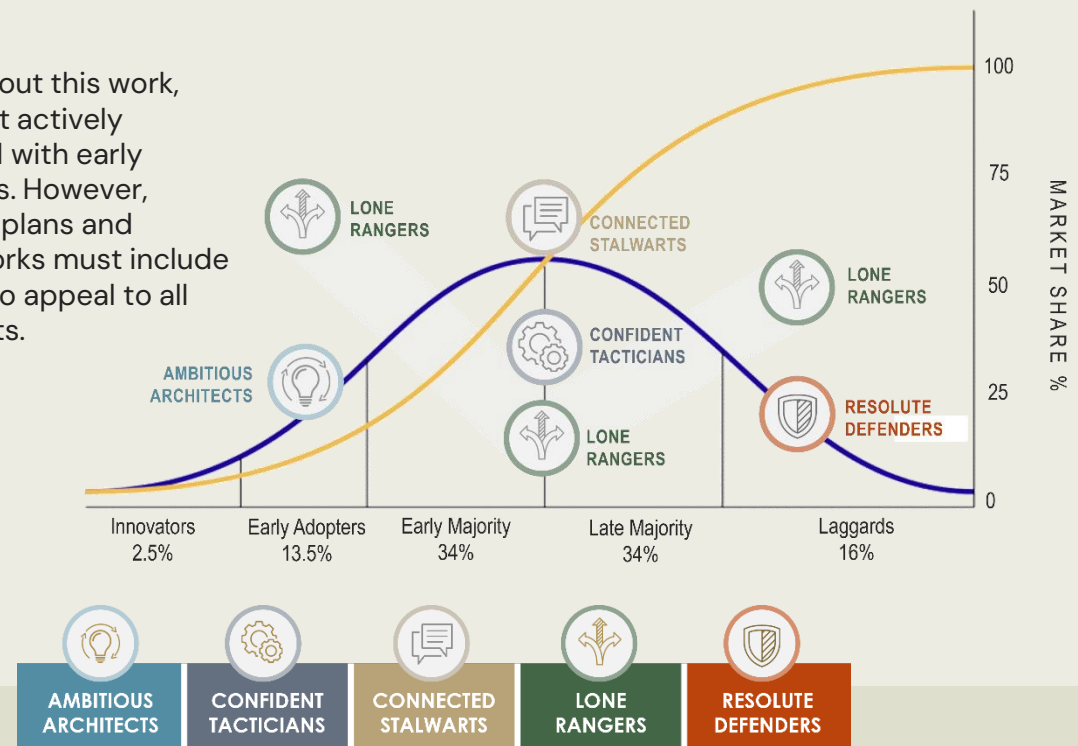
Farmer of the Future segments can help those focused on aquifer conservation meet water users where they are today.

Farms and ranches are not homogeneous; they reflect **history, heritage, and the farmers** who operate them.

Likewise, farmers and ranchers are not homogeneous. Southwestern Kansas producers require myriad solutions and differing approaches to engagement and adoption of an action framework.

To best **engage and activate Kansas producers**, we must understand how each segment sees its operation, envisions its future, and values the organizations focused on **conserving the Ogallala Aquifer**.

Throughout this work, Aimpoint actively engaged with early adopters. However, solution plans and frameworks must include tactics to appeal to all segments.



Farmer of the Future 2.0 is comprised of 5 Distinct Segments

each with characteristics that set them apart.

Understanding producer attitudes toward groundwater management is critical to creating lasting and meaningful change, as Lauer et al. noted in 2020.

Farmers and ranchers are the primary users of groundwater throughout southwest Kansas, and they will be impacted the most by changes in water levels.

A study by Laurer et al. in 2018 focused heavily on ensuring solutions included local user input regarding conservation of the aquifer.

In reviewing findings and conclusions, many of the barriers through this project work mirrored those from the 2018 study, including filling knowledge gaps and aligning policy and regulation to increase participation in conservation efforts.

Similarly to Lauer's findings, Aimpoint notes that education and a solid social business network remain critical to success. We must find actionable, farmer-friendly ways to prove value and communicate to farmers.



Case Studies

Since 2013, groups across Kansas have conducted vital research initiatives identifying barriers and potential actions to address water conservation on the Ogallala Aquifer. Several important studies led to the implementation of successful LEMAs and WCAs. Those critical case studies led to additional research and efforts to create a more widespread adoption of actions.

Flexible, multi-year allocations

— Sheridan 6 LEMA

WCA within a LEMA

— Wichita County Water Conservation Area (WCA)

Irrigation cooperative

— Northern Kearny and Finney County

Sheridan 6 LEMA

The 2012 legislature passed SB 310 making LEMAs a part of Kansas water law.

This law gave groundwater management districts (GMDs) the authority to initiate a voluntary public hearing process to consider a specific conservation plan to meet local goals. LEMAs are proactive, locally designed and initiated water management strategies for a specific geographic area that are promoted through a GMD and then reviewed and approved by the chief engineer. Once approved by the chief engineer the LEMA plan becomes law for a set period defined by the plan, effectively modifying prior appropriation regulations. The stated purpose of the LEMA legislation was to reduce groundwater consumption in order to conserve the state's water supply and extend the life of the Ogallala Aquifer.

On December 31, 2012, the chief engineer issued his Order of Decision accepting the LEMA proposed by GMD#4 producers for the Sheridan 6 high priority area. This voluntary LEMA imposed a fixed-quantity-per-right groundwater use restriction on local irrigators, which on average is approximately 20% less than historic use for all water users in the area. Producers within the boundaries of the LEMA were assigned a 5-year allocation of 55 inches per acre. The 5-year Sheridan 6 LEMA plan has been renewed for a third time and represents a successful blueprint for the future of groundwater management in Kansas. The LEMA process overcomes the problems associated with the 'top-down' Intensive Groundwater Use Control Area (IGUCA) process. To an extent, the new process also minimizes the common property externality associated with groundwater extraction.

Golden, Peterson, and O'Brien (2008) provided the initial economic analysis associated with the LEMA water use restriction. This static analysis yielded net economic losses associated with reduced groundwater use. Applying dynamic case study techniques, Golden and Leatherman (2017) suggested that, in the Wet Walnut Creek IGUCA, producers were able to mitigate the initial economic losses through innovation. This was accomplished by maintaining/expanding the production of higher valued crops and by adopting efficient irrigation technologies and practices, and incorporating flexible, multi-year water right allocations. With these alternate research results in mind, it is important that we monitor the economic outcomes associated with the water use restriction and disseminate the information to stakeholders. At present there are additional LEMAs planned for GMD 1, GMD 2, and GMD 4; however there is some hesitancy as local producers want to 'wait and see what happens in Sheridan 6 LEMA'.

When water-use is restricted, irrigated producers develop and implement strategies to mitigate potential revenue losses.

Buller (1988) and Wu, Bernardo, and Mapp (1996) suggest that producers will change crop mix by shifting from high water-use crops, such as corn, into crops with lower consumptive use, possibly even converting to non-irrigated production. Burness and Brill (2001) and Williams et al. (1996) suggest that in such cases producers will adopt more efficient irrigation technology. Harris and Mapp (1986) and Klocke et al. (2004) suggest that computer-aided technologies and improved irrigation scheduling might provide a solution. Schlegel, Stone, and Dumler (2005) report significant water savings with the adoption of a limited irrigation management strategy. This research will provide insights into the management strategies adopted by irrigated producers in the Sheridan #6 LEMA.

Monitoring the Impacts of Sheridan County 6 Local Enhanced Management Area (2018) retrieved from

<https://www.agmanager.info/ag-policy/water-policy/monitoring-impacts-sheridan-county-6-local-enhanced-management-area>

Wichita County Water Conservation Area (WCA)

In early 2016, 10 individuals from Wichita County, including water rights owners, livestock producers, a county commissioner, an economic development manager, a school board member, and a professional agronomist, formed a team to develop a plan to address the aquifer declines in their region.

According to the Kansas Geological Survey (KGS) and the Kansas Department of Agriculture (KDA), approximately 65% of the original water held in storage in Wichita County has been depleted, and use outpaces recharge at a rate of approximately 11.2 inches to 0.4 inches per year (Long et al., 2016).

With the assistance of a facilitator who was not a resident of the county, the members held multiple team meetings, as well as several public input and informational events and consultations with technical and policy experts, resulting in the development of the state's first county-wide Water Conservation Area (WCA) (Wichita et al. Area, 2016). WCAs were developed in statute in April 2015 to allow an individual or group of water rights owners to develop a plan to reduce groundwater withdrawals in exchange for flexibility in the use of water rights (Water Conservation Areas Act, 2015).

— The Wichita County WCA sets seven-year milestones beginning in 2017 and ending in 2045

It establishes a conservation factor based on historical water use, starting at 29% and increasing to 50% by the last seven-year period (Long et al., 2016). To date, 25 consent agreements have been approved under the Wichita County WCA encompassing a commitment to conserve more than 2,800 acre-feet of annual water use in the first seven years. The acres enrolled under the conservation plan represent nearly 20 percent of the irrigated acres in the county (Barfield, 2018). In March 2020, the local Groundwater Management District (GMD#1) formally requested the state's chief engineer to designate all of Wichita County a Local Enhanced Management Area (LEMA). The plan identifies water reduction measures necessary to address groundwater declines in a designated region (Local Enhanced Management Area Act, 2012). After nearly a year of public hearings, the county-wide LEMA passed. Since the LEMA provisions were less restrictive than the original WCA terms, WCA participants could choose to remain within the WCA or transfer to the LEMA. Each original Wichita County WCA participant elected to retain the more restrictive water conservation plan.

<https://wichitacountywater.wordpress.com/>

Northern Kearny and Finney County



In the fall of 2016, 13 irrigators in northern Kearny and Finney Counties met to discuss developing a water conversation plan for their region.

According to the KGS and KDA, some areas of the region experienced groundwater declines of more than 70 feet in the past 10 years. Based on historical water use and the aquifer response, reducing water use by 25% would stabilize declines, and a reduction of 15% could substantially reduce the rate of decline in the region (Kearny Finney County Proposed Local Enhanced Management Area (KFL), (2017).

The group initially intended to develop a proposal for a Local Enhanced Management Area (LEMA) to provide to the Southwest Kansas Groundwater Management District No. 3 (GMD3) for consideration and approval. After more than a year of group meetings, public informational events, monthly attendance at GMD3 meetings, and feedback collected through a survey, GMD3 determined that more consensus was needed to advance a LEMA proposal. Without a LEMA plan covering the entire region, individual irrigators in northern Kearny and Finney counties have enrolled in WCAs.

— By winter 2019, producers enrolled nearly 30,000 acres (39% of the region)

in a WCA for a total estimated water savings of 4,000 acre-feet per year (Barfield, 2018). About 21,000 acres exist within the Garden City Company, an irrigation cooperative credited as Kansas's second-largest user of the Ogallala Aquifer (Dillon, 2018).

<https://kfl2017.weebly.com/>



Engagement Observations

Aimpoint designed and facilitated four critical stakeholder engagements, each with specific objectives related to understanding Ogallala Aquifer water conservation from the perspective of farmers, producers, and others linked in the value chain.

Tensions

This engagement highlighted the **stakeholder reluctance** to join water conservation efforts for the Ogallala Aquifer and identified alternative motivators

Key findings

Producers and policymakers often misunderstand the impacts of water usage and the benefits of new technologies.



Additional awareness and adoption of innovations in **water-efficient crops** and practices, partly due to **financial and informational barriers**.



Tailored educational programs, economic incentives, flexible government **programs**, and **better access** to **interdisciplinary research**.



Cost-sharing programs and subsidies ease the financial burden of adopting new practices, while collaborative platforms can **enhance stakeholder communication** and **coordination**.



Transparency and accountability, through tools like water use **scoreboards**, can further **promote resource stewardship**.



Success stories, like those from **Local Enhanced Management Areas (LEMA)**, demonstrate how shared best practices can **achieve conservation without compromising profitability**.

Quick Wins

This engagement identified **producer barriers** and tensions to **long-term aquifer conservation** and potential actions to address them

Among feedyard representatives and their associated crop producers

Barriers & Tensions

It does not make sense for me to **pump less water** because:

- My lender doesn't consider conservation practices when determining the value of my loan.
- I'm too busy to learn about the available technologies.
- No incentive programs or those available don't apply to me.
- Current commodity subsidies incentivize me to continue producing these crops.
- If I become more efficient with my water use, I'll find new ways to profit from the water I save.
- If I use less water, the government will reduce my future allocation.
- Crop insurance incentivizes me to increase yields, not sustainability.
- To meet FSA requirements, I must irrigate a minimum amount, even on failed crops.
- No clear business case exists where my operation realizes an equal or more significant net profit.
- My operation is different, and the solutions I've heard about won't work here.
- It costs too much to buy, operate, and maintain the equipment/practices necessary to change.
- I've already reduced my water usage to the lowest possible level.
- If I use less water, my neighbor/ competitor will use more.
- Federal conservation programs require my land to be taken entirely out of production.

It does not make sense for me to **join a cooperative structure** supporting water conservation because:

- I would have to share my data with my competitors, eroding my competitive advantage and profit margins.
- I do not trust data provided by the government systems.
- I do not trust the others in the cooperative structure to fulfill their obligations.
- No one will enforce the rules on parties who violate the agreement and hold them accountable.
- It is too hard to build consensus with this group.
- The risk of litigation from my competitors is high.

Other things making it **difficult to implement the correct change** include:

- There is a disconnect between current university research and the producer's needs.
- Some regulations limit our ability to achieve efficiency/scale.
- Value chain participants want to avoid appearing to choose sides (too early).
- State money pledged to the issue is not getting to the producers.
- We need the right kind of help from the Federal level.
- A lack of dedicated staff means critical tasks get passed to different people.

Acceleration

Building on the prior day's outputs, this engagement invited value chain participants to **generate accelerating actions to support producers** in their quest to reduce water use

	● Engagement 2 Quick Wins	● Value Chain Acceleration Actions recommended by participants
Start small – 10% cut for all of GMD 3, let people adjust to it, see how it goes for x years, and then move on from there		
Engage more local growers	Create buy-in between all local stakeholders	Start the "Anti 2026" campaign – either you can have a say or not Helping facilitate connection between the entire supply chain to build a program
Create awareness of cost-share programs for more efficiency	Implement cover crops	Bring funding opportunities to producers (e.g., climate-smart, commodity-specific projects)
Share the story of the Sheridan 6 – with REAL profitability numbers	Adopt new technologies	More university research
Develop local WCAs	More practical university research; focus on need, not on grant chasing	Build a bridge to connect the university to those out in the fields with the needs Collectively identify research needs They charge so much for research, which is prohibitive to those trying to build new technologies/processes. Create a 'research roadmap' based on collective needs
Promote 5-year flex accounts on water right allocations	Finding a starting point – giving people something to react to	Utilize people from the success stories to provide a starting point/be the leaders
Change crop rotations	Building the business case for individual operations/areas	This is an accelerator for finding a starting point, which is an accelerator for finding the leaders
No more watering field crops for insurance purposes after crop failure	Get farmer-member groups more engaged with the GMDs	<i>None offered</i>
Ask the government for a 20% pumping reduction rather than allocation of production	Finding the group of leaders that is going to make the decisions	<i>None offered</i>

Policy

This final engagement explored **rapid policy generation** and evaluation aimed at **reducing identified barriers** that prevent reduced water usage or **discourage joining forces** to address the challenges together

The session expanded to include policy-focused organizations.

To support producer water conservation, participants proposed a wide range of policy actions and then selected their priority action recommendation.

8 Groups Total



Focused on the dynamics of watering failed crops for crop insurance purposes.

This might include enhanced collaboration between local and regional agencies to ensure effective use of resources, use of advanced and remote sensing technologies, and local decision-making.



Submitted tax incentives for documented water savings as their top policy recommendation.

Either through reduced property tax or tax credits. This might include state funds to replace county revenue losses.



Proposed educational initiatives and community engagement to raise awareness and participation.

Research topics included farm profitability, water conservation, public-private collaboration, and resource efficiency. Community engagement included conducting stakeholder meetings to reinforce economic interdependence and shared community.

Additional recommendations generated during the session included:

- Oversight through state statutes and local monitoring to guarantee accountability, with penalties greater than incentives for non-compliance.
- Flexible funding programs and centralized application processes to support diverse operations.
- Corporate partnerships and industry incentives to align commercial practices with conservation goals.
- Retiring water rights for compensation.
- Empowering local decision-makers.
- Investing in research.



Findings

- Decades of work, progress, barriers still exist
- The Ogallala Aquifer is not one thing
- Aversion to government intervention
- Aquifer levels still in decline
- Farmers & ranchers are not uniform
- Social business network matters

The literature review, interviews, and workshops quickly revealed that the desire to extend the viability of the Ogallala Aquifer is **decades in the making.**

Education, technology, crop science, and other efforts have enabled progress toward more efficient water use. The case studies discussed earlier in this report highlight multiple success stories. Despite a substantial body of evidence and supporting technological advances, levels within the aquifer continue to decline. Additional considerations are necessary to fully capture the challenges facing efforts to reduce water use on the Ogallala.

The Ogallala Aquifer is **not one thing**

The Ogallala Aquifer, often shown as a large underground water body, is quite varied.

Hydrological conditions, such as water levels and flow rates, differ across its vast area. Water quality also changes, with some regions facing issues like high salinity or contamination. Managing the aquifer demands specific, localized approaches rather than a one-size-fits-all plan.



Farms and farmers **are not uniform.** they exhibit diversity in many aspects.

Even if two farms appear similar in size, location, or crop type, the outcomes they achieve under the same conditions can vary widely. The individuals leading farm operations may have different philosophies, priorities, and management styles, which can lead to significant differences in productivity, profitability, and sustainability. Farming practices and outcomes are influenced heavily by local knowledge and traditions. Farmers' understanding of their specific soil types, climate, and regional challenges can shape their strategies and practices, affecting the results even under seemingly identical conditions. The history and

timeline of a farm's development also play a role. The cumulative experience and established relationships with suppliers and markets add unique dynamics to each farm. The educational background and level of expertise among farmers can lead to diverse results. Those with advanced knowledge of agricultural science, access to ongoing training, or participation in farming networks may implement more effective and innovative solutions. These factors highlight the need for personalized approaches and tailored support to address the unique circumstances of each operation.



Recommendations

Implement a framework articulating the stakeholder actions necessary throughout the value chain to ensure change and success. This Action Framework will equip producers with the tools to use water more efficiently and reduce pumping while maintaining or increasing their bottom lines.

The three significant elements to construct the recommended action framework:

Guiding Principles | Barrier Identification and Reduction | Leading Change

Identifying and addressing barriers that inhibit agricultural water users from **reducing water use is essential** to opening the door for **operations to reduce pumping**



8 General Barrier Categories

Aimpoint grouped barriers discovered during research

- Knowledge gaps
- Counter-incentives
- Investment required
- Business case
- Compliance
- Risk management
- Cooperation aversion
- Lack of buy-in to long-term vision

Aimpoint suggests

that any government intervention must follow the same guiding principles, or the net effect will be counterproductive.

Many interviewees and workshop participants stated a need to **take action to avoid government intervention.**

Many participants also called for **early government action** to set reduction targets and force earlier participation.

The social-business **network matters.**

Many workshop participants attended because they were invited by someone they work or interact with regularly. For example, feedyards historically have not been involved in dialogue around water conservation. Given their heavy reliance on local forage, the feedyard operators have strong connections to their local communities and proved essential in bringing more producers. Leveraging social and business connections facilitates the flow of information within trusted networks and amplifies the impact of a few key individuals to cause shifts in adoption, behavior, or opinion. The social network tipping point is when a small change or influence in a network causes a big shift in behavior, adoption, or opinion throughout the entire group. This happens when enough early adopters or influencers create momentum that pushes the whole network past a critical point, leading to fast and widespread spread of new ideas, products, or behaviors.

The interconnected nature of social networks amplifies the impact of a few key individuals, causing a cascade that can change the group's overall dynamics.

Guiding Principles

■ The **foundational statements** that steer **decision-making, behavior, and planning** within an organization or system. They embody **core values and priorities** that provide a consistent basis for interpreting the **actions and directions** an entity should take.

■ When applied within an action framework, guiding principles serve as a compass, ensuring that every decision and initiative aligns with these core values. By adhering to these guiding principles, the action framework and those acting within it remain cohesive and focused on the strategic vision.



Measurable Objectives

Within an action framework, measurable objectives provide clear, quantifiable targets to guide efforts and benchmark progress. These objectives transform broad goals into specific, attainable milestones, enabling precise planning and resource allocation. Organizations can regularly assess their performance by defining what success looks like, making it easier to identify areas for improvement and adjust strategies accordingly. Measurable objectives also foster accountability and motivation among stakeholders, as they can see tangible evidence of their contributions towards larger goals.



Meet Stakeholders where they are

While similar to the 'local, flexible solutions' principle, this principle focuses on identifying barriers and building solutions instead of the solutions themselves. The diversity among operations and value-chain stakeholders underscores the need for personalized approaches rather than uniform strategies. Likewise, the wide range of available supporting networks as they implement solutions requires on-the-ground engagement paired with techniques to uncover individual barriers.



Focus on Water Users

Farmers and ranchers use 85% of aquifer water. Therefore, this population comprises the central unit of action for reducing extraction from the aquifer. The rest of the value chain can contribute to overall success, but the water users implement the solutions and experience the consequences. solutions and experience the consequences.



Local, Flexible Solutions

The Ogallala Aquifer's varied hydrological conditions and water quality issues necessitate local, flexible solutions tailored to specific regions. Focused and adaptable solutions are essential to effectively managing reduced water use with sustained profitability.

Barrier Identification and Reduction

As noted in the findings, various barriers exist to reduced water use and value chain participation, including diversity of producer operations, experience, and knowledge levels.



Stakeholders face various **actual and perceived barriers** that must be **addressed individually to promote effective water conservation practices.**

These barriers can range from financial disincentives and time constraints to mistrust in cooperative systems or lack of awareness about new technologies. Identifying and reducing these barriers creates opportunities for reduced water use over the long term.

Aimpoint mapped the eight general categories for barrier identification to eight corresponding action categories for lowering barriers.

— Knowledge gaps
Stakeholders often lack critical information on advanced water-saving techniques, which hinders their ability to implement more efficient practices. Sometimes this might also mean that the information does not exist and more research is needed.
Fill knowledge gaps

— Compliance
Complex regulatory requirements and the fear of penalties can deter experimentation with new water-saving practices.
Align policy/regulation

— Business case
Stakeholders may find it challenging to justify the short-term costs and potential disruptions associated with water conservation or technology implementation, even if it promises long-term benefits.
Prove the business case

— Investment required
The high upfront costs of modern irrigation systems, monitoring, and water-saving technologies can be prohibitive for many producers.
Support investment

— Risk management
Farmers often prioritize stable crop yields over adopting water-saving methods, fearing that changes could negatively impact their production.
Manage risk

— Cooperation aversion
Effective water management frequently requires coordinated efforts among multiple stakeholders, but reluctance to collaborate or fear of cheating can impede progress.
Enable cooperation

Addressing these issues requires an iterative process of discovery and resolution, where each potential actor's unique challenges are systematically identified and resolved. This approach helps ensure that even less obvious or low-incidence barriers, which might be overlooked, are recognized and mitigated. Dealing with these barriers is a critical step within a more significant change leadership model, as it ensures that all participants can engage effectively and sustainably.

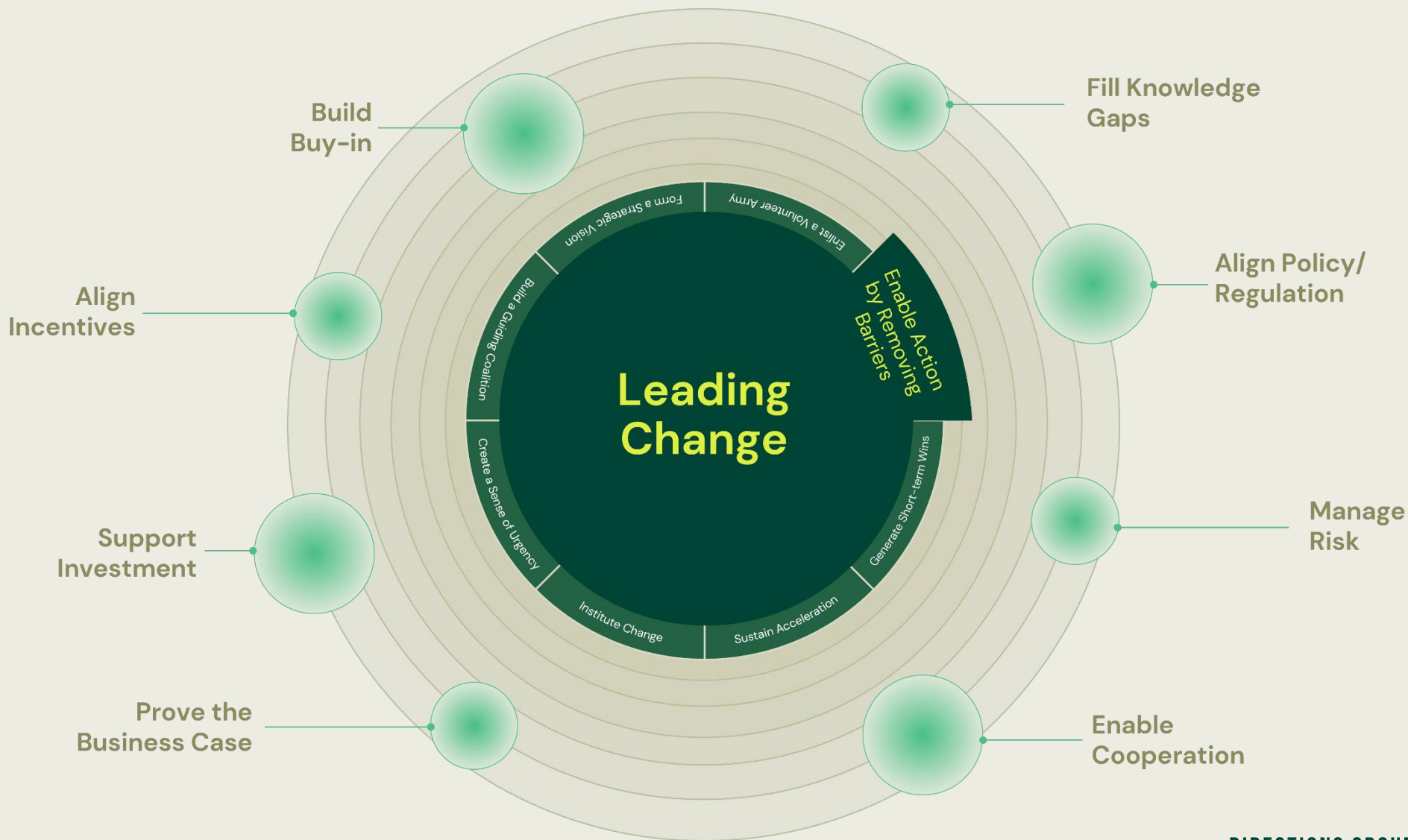
— Counter-incentives
Policies and economic incentives sometimes reward higher water usage, discouraging farmers from adopting conservation measures.
Align incentives

— Lack buy-in to long term vision
Many stakeholders may be hesitant to support external long-term water sustainability goals, focusing instead on immediate operational needs.
Build buy-in

Leading Change Model

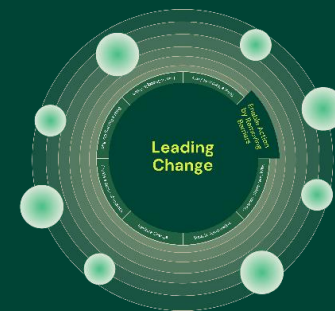
multi-faceted process, Kotter's model breaks it down into eight distinct, actionable steps that address change management's procedural and emotional aspects. From creating a sense of urgency to embedding new approaches into the organizational culture, each step builds on the previous one to ensure a cohesive and sustainable transformation. This model emphasizes leadership and collaboration, encouraging leaders to mobilize their workforce, overcome resistance, and achieve collective buy-in to drive meaningful and lasting change. It is important to note that while these elements build upon each other, all eight elements exist together and require attention throughout any transformation efforts.

Developed by Dr. John Kotter of Harvard Business School, the Leading Change model is a comprehensive framework designed to help organizations navigate and successfully implement transformative change. Recognizing that change is a complex



Leading Change Model

Implementing change in water use practices within the agriculture sector, particularly concerning the Ogallala Aquifer, requires a comprehensive approach that respects the diversity of participants and their contexts. By following Kotter's Leading Change model while adhering to the guiding principles, leaders can affect meaningful and sustainable change in water management practices.



Create a Sense of Urgency

Highlight the critical condition of the Ogallala Aquifer and its importance for agriculture, community livelihoods, and ecosystems. Use data and case studies to illustrate the risks of inaction, such as reduced water availability, increased costs, and regulatory restrictions. Recognize the local differences in aquifer depletion and the varied understanding among farmers and ranchers. Personalize the message to reflect local contexts and timelines.

Build a Guiding Coalition

Form a diverse coalition of stakeholders, including farmers, ranchers, water experts, local leaders, and agricultural extension services committed to sustainable water use. Ensure the coalition reflects the diversity of the affected community, with members who bring different perspectives, knowledge levels, and motivations.

Form a Strategic Vision

Craft a clear vision of sustainable agriculture with reduced dependency on the Ogallala Aquifer. Outline strategies that include innovative water-saving techniques and practices that enhance profitability under lower water use conditions. Develop multiple approaches to accommodate the different starting points, operating scales, and crop choices of participants.

Enlist A Volunteer Army

Communicate the change vision. Use every possible channel to communicate the vision and strategies for reducing water use, emphasizing the benefits for businesses and the community. Adapt the communication to meet stakeholders' varied communication preferences and literacy levels. Include success stories and examples relevant to different groups.

Enable Action by Removing Barriers

Eliminate barriers to change by providing resources, knowledge, and technical support for adopting water-saving practices. Foster an environment where feedback is valued, and action is rewarded. Provide tailored support, recognizing the unique challenges and opportunities in different parts of the aquifer region. Implement pilot projects to demonstrate adaptability.

Generate Short-term Wins

Identify and celebrate early successes in reducing water usage. Use these examples to build momentum and convince skeptics. Recognize meaningful achievements, whether cost savings, improved yield per water unit, or community recognition.

Sustain Acceleration

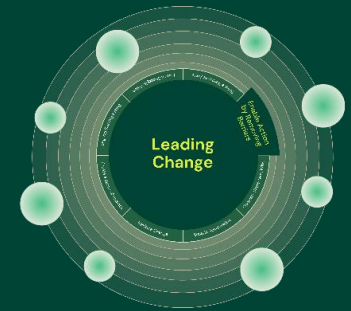
Consolidate gains and produce more change. Leverage the credibility gained from early wins to further the change effort, encouraging participants to adopt more sustainable practices and technologies. Continuously assess and adapt strategies to the evolving context and participant feedback, ensuring they remain relevant, effective, and practical.

Institute Change

Anchor new approaches in the culture. Integrate water sustainability into the core values and practices of the agricultural community. Celebrate and institutionalize successful new practices. Respect and integrate local traditions and values into the new water management practices, ensuring they become a lasting part of the regional agricultural identity.

Assessment: Leading Change

After 7 months of interaction, we offer an informal assessment of progress and current positioning against the elements of the Leading Change Model. Many of the elements were already in place before applying the model and established a strong foundation which influenced our recommendation of the model. From Aimpoint’s perspective and intelligence review, there exists a strong momentum in many of the areas and we have noticed progress over this relatively short research period. ready for review.



Create a Sense of Urgency

Our observation of current levels of urgency alone do not appear to encourage action from producers. Previous research indicates a very small percentage of water users are part of a collective effort despite a large willing percentage. While not a representative sample, many of the workshop participants did not appear to need to take near term action – an indicator of urgency. Even the timeline for GMD action plan submissions, while aggressive and urgent in typical government terms, are not due until July 2026.

Build a Guiding Coalition

The team we have worked with over the past 7 months represents a broad coalition of individuals dedicated to delivering on the strategic vision. They are a team because they actively work together to identify priorities and tasks to maintain pressure and positive action.

Form a Strategic Vision

We believe there is a strong, simple, clear, and agreed upon strategic vision that invites and allows broad participation for water users and the broader value chain.

Enlist A Volunteer Army

The Ogallala Summit, extensive body of research, consistent individual participation, and recent involvement of feedyards in the dialogue indicate there is a growing cohort willing to expend time and energy against this effort. Those who participate continue to invite those within their business-social network whom they believe can contribute and/or act in alignment with the vision.

Enable Action by Removing Barriers

Barrier identification and reduction is the consistent theme throughout the large body of supporting research, covering all areas of potential concern including technology, government, individual knowledge, incentives, etc.

Generate Short-term Wins

During a few sessions, the participants identified short term, easy actions which could be re-purposed as short-term wins. We would also classify the gathering of a broad set of stakeholders and influencers beyond water users as a short-term win.

Sustain Acceleration

We are already observing the desire to sustain momentum through continued engagement and broad involvement. Return participation is also a leading indicator for sustaining acceleration.

Institute Change

Water sustainability has always been a verbal principle but is not always a commitment in fact. Even without a clear definition of ‘sustainability,’ lasting success will only be possible when water sustainability and financial sustainability are indistinguishable from each other.

Objective-Action Framework

Throughout the research and analysis, it was clear that the variety of stakeholders and potential barriers meant an even larger variety of actions are necessary to achieve the overarching objective to extend the agricultural productivity of the Ogallala Aquifer.

Complex problems cannot be solved with simple solutions. Likewise, there is no single action that will lead to success.

Ensuring the long-term agricultural production viability of the Ogallala Aquifer, measured by a stable aquifer, necessitates a multi-tiered approach involving various actors, objectives, and action steps. The guiding coalition, including K-State, KWO, and KLA, along with state and federal government bodies, university and research partners, and farmer-member organizations, play a pivotal role in this effort. Their objectives and actions, while tied closely to the water users' and value chain participants' objectives, must be achieved first to address the 8 key barriers identified. Together, these efforts form an integrated and collaborative strategy.

Our ability to ensure the long-term agricultural production viability of the Ogallala Aquifer will be directly impacted by the actions of all stakeholders on the aquifer. We have provided a selection of key objectives, actions, and metrics designed to create broad alignment for the stakeholders closest to the water users. These are not all the necessary or available actions - organizations and individuals not explicitly included in this example also have supporting objectives and actions. Many of the success metrics have placeholder values that need to be customized for the individual or organization and their unique situation.



Many stakeholders were introduced to this framework on August 20, 2024, at Kansas State University. This 2-page executive summary is also available upon request using the email address provided by this QR code.



Recommended Objectives & Supporting Actions

Objective

Ensure the long-term agricultural production viability of the Ogallala aquifer

Success Metric

Q-Stable indicates stable Ogallala Aquifer

● Objective ● Action ● Success Metric

Guiding Coalition

Maintain positive momentum across all stakeholders

Continue to convene local sessions with producers.

Continue to share and promote business case success stories

By the 2027 Ogallala Aquifer Summit, 25% of agricultural water users are participants within a cooperative water monitoring and conservation agreement

Farmer-member Organizations

Provide easy-to-access resources for producers and feeders looking for water conservation information

Curate, Publish, and Advertise a Database of Resources On water conservation such as case studies, economic reports, research, and cost shares/ government programs that support water conservation

% of members participating within an agreement

State & Federal Government

Policies support beneficial water use and conservation

Create tax policy incentivizing participation within a cooperative water monitoring & conservation agreement

Align Government Policies to support beneficial water use and conservation. Develop a tax incentive policy which reduces or offsets property taxes for crop producers participating within a cooperative water monitoring and conservation agreement.

Address the non-beneficial use of water On failed crops. Focus on speeding up the adjustment process through remote technology. Precedence set with production practice identification through satellite imagery (OpenET). Leverage additional data and updated technology to align the interpretation of the regulation with today's capabilities.

By the 2027 Ogallala Aquifer Summit, 25% of agricultural water users are participants within a cooperative water monitoring and conservation agreement

University & Research

Provide actionable research that supports water conservation

Connect with Producers to understand their challenges & information needs

Accelerate the process to move field research to the crop producers and stock water user operations.

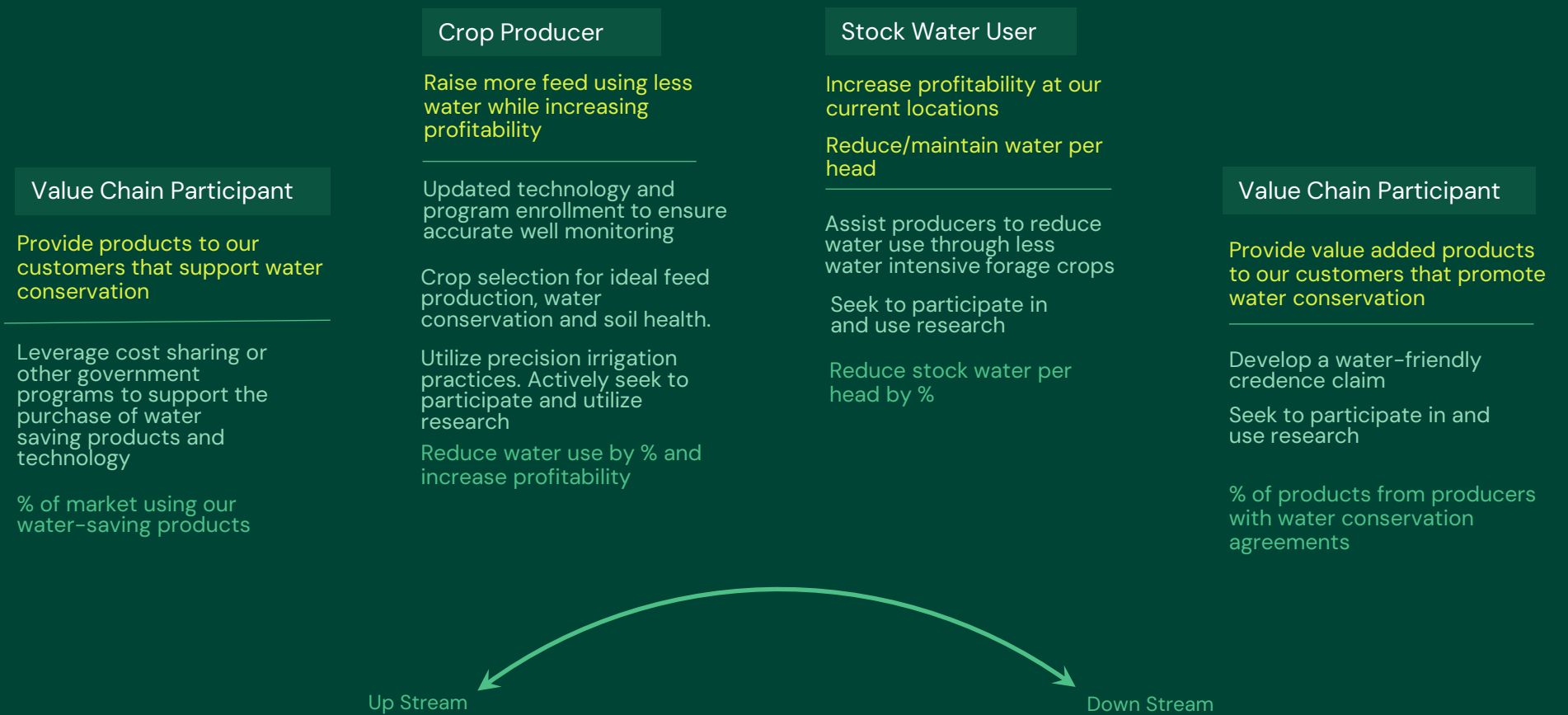
Identify value chain partners interested in supporting/ funding the research

of producers participating in research studies addressing water challenges

Recommended Objectives & Supporting Actions (continued)



● Objective ● Action ● Success Metric



Many of the success metrics have placeholder values that need to be customized for the individual or organization and their unique situation.



The Way Forward

Water is the pivotal determinant of our collective future. Kansas stands at a crossroads where the choices we make today will impact generations, shaping either a robust, thriving agricultural economy or one struggling to survive. We acknowledge that the pursuit of our objectives is not a singular event, but rather a continuous, long-term commitment. As we advance, we must recognize that conditions will inevitably change, presenting new challenges and altering our environment. The simple act of reducing irrigation will affect the aquifer recharge rate. Decision-makers and politicians will transition, and technology will advance. However, we cannot wait for the next generation of politicians or technology advances to act. As the world evolves, a dedication to the core recommendations — the guiding principles, barrier identification and reduction, and leading change model — provides adaptability and resilience. By consistently adjusting, modifying, and enhancing our objective-action framework, we can not only adapt to these changes but also excel. While success is not a single point in the future, it is attainable.

Given the assessment of progress against the Leading Change Model, focus early efforts on actions supporting Barrier Reduction and Generate Short-term Wins:

Initiate policy actions quickly to account for bureaucratic and political frictions.

Assign actions to specific organizations for individual ownership. Name the resources and organizations that will be Responsible, Accountable, Consulted, and Informed for the objective-action framework.

Customize the objectives, success metrics, and actions for identified actors to fit their specific operation and business needs.