When Does It Make Sense to Grow Sorghum on the High Plains? A Partial Budget Analysis

This research is a continuation of work funded by the USDA through generous contributions to the Advancing Markets for Producers (AMP) grant program. The specific AMP grant for this project is managed by the National Sorghum Producers, with support from CAL Consulting (dba Carbon A List).

Executive Summary

- **Purpose:** This partial budget analysis tests the natural follow-on question from CAL's Water-Aligned Feed Systems whitepaper, not just when it makes sense to feed sorghum, but when it makes economic sense to grow it, using 5 years (2022–2026) of K-State and Texas A&M AgriLife extension crop budgets across the Ogallala-dependent counties of Kansas and Texas.
- **Method:** Compares corn, sorghum, and wheat on a variable-cost basis across irrigated and dryland systems in Texas Districts 1–2 and Northwest & Southwest Kansas.
- **Headline Texas finding:** Irrigated sorghum silage provides the greatest returns and does so on less water than corn or corn silage, with a significant water-efficiency margin.
- **Headline Kansas finding:** Results split by system; corn wins irrigated grain comparisons decisively, but grain sorghum is the clear winner on dryland ground.
- **Key data gap:** Kansas extension budgets in scope had no silage data, so the Texas silage story could not be tested in Kansas, which is flagged as a priority for real farm-level data collection.
- **Bottom line:** Sorghum's business case and water conservation for growers is real but conditional: when data is available, there is a strong economic case for sorghum silage; for grain, corn wins under irrigation, while sorghum is the better dryland option with the strongest cases also the ones best positioned to deliver landscape water savings on the Ogallala Aquifer
- **Next steps:** These findings raise four open questions for what would drive adoption at scale, spanning water-use thresholds, local silage-market economics, financing and insurance barriers, and the size of payment needed to close remaining profitability gaps.

Michael Rinaldi | mrinaldi@carbonalist.com August 2026

Introduction and Context Setting

Carbon A List's Whitepaper, *Water-Aligned Feed Systems: A Landscape Approach for High Plains Beef and Dairy Resilience* (June 2026), sought to answer the question: **When does it make business sense to feed sorghum to deliver landscape water savings on the Ogallala Aquifer?** By analyzing the economic and environmental outcomes of integrating sorghum in balanced feed rations, it was found that sorghum offers a water-efficiency pathway for regional feed systems, with dairy showing the most immediate opportunity to deliver water and cost savings through the integration of sorghum silage in balanced rations.

The next step is to answer the natural follow-up question: **When does it make economic sense to grow sorghum for feed?** This means testing whether sorghum production holds up as a business decision for growers under regionally relevant costs and yields. This partial budget analysis compares corn, sorghum, and wheat production economics on a variable-cost basis across the Ogallala Aquifer region to translate the Whitepaper's directional finding into a producer decision-making framework, showing if, and where, sorghum wins as a business decision for growers and feeders.

Approach

Research Question: When does sorghum production win as a better business decision over corn and wheat production?

This analysis uses a partial budget approach, focused on variable (direct) production costs rather than total or fixed costs (which were also reviewed), to isolate the specific economic trade-offs a grower faces when choosing between corn, sorghum, and wheat production in irrigated and dryland scenarios. The geographic scope is limited to the Texas and Kansas counties dependent on the Ogallala Aquifer for irrigation Kansas Groundwater Management Districts 1, 3, and 4 and Texas Groundwater Management Areas 1 and 2.

K-State AgManager.info and Texas A&M AgriLife Extension were chosen as the underlying data sources because they are recognized by the industry as the leading two land-grant extension programs publishing regularly updated, peer-reviewed crop budgets for the Ogallala-dependent counties in scope. Their consistent yield tiers and cost structures allow direct, like-for-like comparison of corn, sorghum, and wheat within each state, and these published figures serve as a starting point to identify where real farm-level data is needed to validate and refine the analysis.

To account for seasonal variability, 5 years of crop budgets were analyzed (2022-2026) from the Texas and Kansas Ogallala counties, which map to Texas A&M AgriLife's District 1- Panhandle and District 2- South Plains, and K-State AgManager.info's Northwest, Southwest, and Western data sets. The data set aggregated primarily covers irrigated and dryland budgets for corn grain, corn silage, sorghum grain, sorghum silage, and wheat.

The key data point compared were 5-year averages, per crop and region, of Return Above Direct (Variable) Costs ($/acre), Acre-Inches Applied, and Return per Acre-Inch ($/ac-in).

Contextualized Research Question: In what scenarios, and where, do sorghum acres outperform comparable corn and wheat acres in terms of Return Above Variable Costs ($/acre) and Return per Acre-Inch ($/ac-in)?

Findings

Texas District 1 and District 2 sit further along the water-scarcity curve than Northwest and Southwest Kansas. USGS measurements taken in 2017 show cumulative Ogallala water-level declines in the Texas Panhandle averaging 44 feet since large-scale irrigation began, compared to 28.2 feet in Kansas (USGS, 2022). As a result, Texas has already transitioned more acres out of full irrigation and serves as a useful precursor: it shows how crop economics shift as irrigation capacity declines, giving an early look at outcomes Kansas producers may face as the Ogallala continues to draw down in their region. With that context, the findings below start with clearer conclusions in Texas and then insights and questions in Kansas.

Texas

Irrigated– Sorghum Silage Leads on Return and Water Efficiency

Across both Texas districts, sorghum silage posts the highest five-year average return above variable costs of any irrigated crop, and it does so while using less water than its closest competitors, corn and corn silage. The margin over corn silage is narrow in dollar terms but widens substantially once water is factored in, while the advantage over corn, grain sorghum, and wheat is large on both dimensions.

District 1 — Ranked by 5 Year Avg Return Over Variable Costs ($/acre)

Crop	Return $/ac	Ac-In	$/ac-in	vs. Sorghum Silage
Sorghum Silage	**$421.01**	**14.0**	**$30.07**	—
Corn Silage	$403.95	20.0	$20.20	-4.1% return / -32.8% $/ac-in
Corn (Grain)	$309.78	22.0	$14.08	-26.4% return / -53.2% $/ac-in
Wheat (Irr)	$79.85	10.0	$7.98	-81.0% return / -73.5% $/ac-in
Grain Sorghum	$43.31	10.0	$4.33	-89.7% return / -85.6% $/ac-in

District 2 — Ranked by 5 Year Avg Return Over Variable Costs ($/acre)

Crop	Return $/ac	Ac-In	$/ac-in	vs. Sorghum Silage
Sorghum Silage	**$422.92**	**16.0**	**$26.43**	—
Corn Silage	$374.16	20.0	$18.71	-11.5% return / -29.2% $/ac-in
Corn (Grain)	$273.49	20.0	$13.67	-35.3% return / -48.3% $/ac-in
Grain Sorghum	$3.40	9.0	$0.38	-99.2% return / -98.6% $/ac-in
Wheat (Irr)	($33.46)	14.0	($2.39)	-107.9% return / -109.0% $/ac-in

Dryland – Mixed, inconsistent results, dryland corn not feasible

Unlike with Texas's irrigated farm budgets, where sorghum silage wins clearly in both districts, the dryland farm budgets give mixed results. It is important to note that there are no dryland corn scenarios in either Texas district; corn's peak water demand during silking and grain-fill falls in July-August, the region's driest and highest-evapotranspiration period, making unirrigated yields too low and unreliable to support a standard enterprise budget and most importantly not a practical growing option to consider.

District	Crop	Return $/ac	vs. Other Crop
District 1	**Wheat (Dry)**	**$27.28**	—
District 1	Grain Sorghum (Dry)	($21.94)	-$49.22 (grain sorghum is negative)
District 2	**Grain Sorghum (Dry)**	**$13.74**	—
District 2	Wheat (Dry)	$11.08	-19.4%

Kansas

As alluded to at the start of the findings, Kansas production isn't as limited by water today as Texas's is. This might help explain the key data gap: being that the K-State AgManager.info had no farm budgets for silage corn or sorghum in the scoped data set. This data set therefore leaves open the question of whether sorghum silage's positive performance in Texas translates to Kansas, a gap worth pursuing moving forward.

Irrigated- Corn Leads in Grain Only Comparison

On irrigated ground, corn grain significantly outperforms sorghum grain on return and water efficiency across both regions. This is the least surprising result in the whole analysis: corn's yield advantage is overwhelming when not constrained by water availability. Interestingly, the water-efficiency gap here is much narrower than the return gap; corn only outperforms sorghum by 18.0% and 6.7% on a return-per-acre-inch basis, compared to the 27–32% return gap.

Region	Crop	Return $/ac	Ac-In	$/ac-in	vs. Corn
NW Kansas	**Corn**	**$633.31**	**14.4**	**$43.90**	—
NW Kansas	Grain Sorghum	$432.25	12.0	$36.02	-31.7% return / -18.0% $/ac-in
SW Kansas	**Corn**	**$572.02**	**15.4**	**$37.03**	—
SW Kansas	Grain Sorghum	$414.65	12.0	$34.55	-27.5% return / -6.7% $/ac-in

Dryland- Grain Sorghum Shines

On Kansas dryland ground, grain sorghum is the clear winner in both Northwest and Southwest Kansas, beating corn by 15.8–27.0% and wheat by 30.5–38.0% on a pure variable-cost basis. Meaning that where Kansas producers are already farming without irrigation, sorghum isn't just water-efficient it's the clear higher-return choice.

Region	Crop	Return $/ac	vs. Grain Sorghum
NW Kansas	**Grain Sorghum**	**$196.33**	—
NW Kansas	Corn	$165.37	-15.8%
NW Kansas	Wheat	$136.44	-30.5%
SW Kansas	**Grain Sorghum**	**$179.49**	—
SW Kansas	Corn	$131.03	-27.0%
SW Kansas	Wheat	$111.23	-38.0%

Synthesis and Next Steps

This partial budget analysis shows where sorghum is economically competitive for the prototypical individual farmer, but not what would drive adoption at meaningful scale. Closing that gap is key to understanding sorghum's full potential as a water scarcity solution for the High Plains.

Irrigation and Pumping-Cost Thresholds
Key question: How do yield response curves compare for corn versus sorghum per acre-inch of water applied, and where do they diverge enough to flip profitability?

Local Silage-Market Potential
Key question: As demand for feeder silage grows in Southwest Kansas, at what point does substituting sorghum silage for corn silage deliver meaningful water conservation and positively impact grower profitability?

Offtake and Risk in Lending and Insurance
Key question: Is revenue certainty, not average profitability, the real barrier to adoption, and what would it take, from insurance parity to an alternative risk-appetite framework, to close that gap with lenders?

Value-Transfer Potential
Key question: How large a per-acre payment would close the remaining profitability gap for growers, and is that level realistically financeable?

Together, these questions move the analysis from "When does sorghum outperform corn in a farmer's budget?" to "What needs to be true for water conserving, feed crop substitution to happen at commercial scale across the High Plains, and which of those conditions can Ogallala Roundtable stakeholders influence?"

Contact Michael Rinaldi at mrinaldi@carbonalist.com
for underlying dataset, analysis, and to collaborate on the next steps.