Staying profitable with shrinking water allocations

Context

Chase County is harsh and brittle, with highly variable precipitation. A diverse cropping system with realistic yield goals can better align with this context, using less irrigation, tillage and fertilizer. Chase County is not Iowa, Indiana, or Illinois, where rainfall usually allows for high, consistent yields of high water use crops.

The local water cycle of Chase County has changed in our lifetimes and will continue to change. In the past, irrigation was used as a tool to mitigate dry periods in the growing season. As weather patterns changed and yield expectations climbed, irrigation became central to the entire cropping season. **Today, irrigation is the keystone of the entire system rather than a risk mitigation tool.**

**CHASE COUNTY**

SOUTHWEST NEBRASKA CASE STUDY

**Context**

Chase County is equal parts irrigated farmland, non-irrigated farmland, and range. Since the development of center pivots in the 1970's, high yielding corn and soybeans have become the dominant crops in the region, requiring large amounts of fertilizers, chemicals, tillage, and water.

The local water cycle of Chase County has changed in our lifetimes and will continue to change. In the past, irrigation was used as a tool to mitigate dry periods in the growing season. As weather patterns changed and yield expectations climbed, irrigation became central to the entire cropping season. **Today, irrigation is the keystone of the entire system rather than a risk mitigation tool.**

Chase County gets an "average" of 19" precipitation per year - but recent years have fallen short of that average.

**A Diversified Rotation**

The chart above shows one example of a diversified rotation for this context, alongside a "conventional" corn-corn-bean-wheat rotation. This rotation uses the natural environment as a pattern, grows crops better suited to arid environments, and takes advantage of local markets for high-value food grade crops (including popcorn, peas, millet, dry edible beans, wheat, and cover crops for forage). This rotation **reduces irrigation water demand by 40%, maintains profitability during environmental extremes**, eliminates tillage, reduces fertilizer and chemical use, incorporates livestock, and increases plant diversity.

**Note:** this suggested rotation is not fixed. The key is to allow flexibility in cropping decisions, based on the realities of each year. These rotations can take advantage of early soil profile moisture, specific crop price opportunities, and so on. Also, they can offer several options for grazing and haying.

**Supported by the U.S. Department of Agriculture under agreement number NR203A750013G008.**
Hundreds of scenarios were run to compare profitability between conventional and diversified rotations. High, medium, and low values were chosen for chemical, herbicide, irrigation, harvest, and sales prices for all crops in both rotations (see the table below). Net returns were calculated after 5 years for all combinations of variables at high/med/low values.

Sales price of grain was the main determinant of profitability in these scenarios. **When prices are low, the diversified rotation has higher net returns over 5 years. When prices are high, the conventional rotation has higher net returns. When prices are moderate ($5.75/bu for corn), the rotations are similar.** 2% of the diversified rotations were less than break-even, compared to 11% of the conventional rotations.

---

**Profitability**

Comparing net returns between conventional and diversified rotations after 5 years of crops, across 700+ scenarios. Diversified rotations are shown in green. Conventional rotations are colored by sales price: peach is low prices, red is moderate prices, dark red is high prices.

The conventional rotation delivers booms with high grain prices, but also risks busts at low grain prices. A diverse crop rotation that considers the limitations of the environment can be more dependently profitable over the long term.

Yield and cost estimates were based on prices from 2021-2023, which were highly variable. Numbers may vary greatly between producers and years.

---

**Supported by the U.S. Department of Agriculture under agreement number NR203A750013G008.**