DropXL

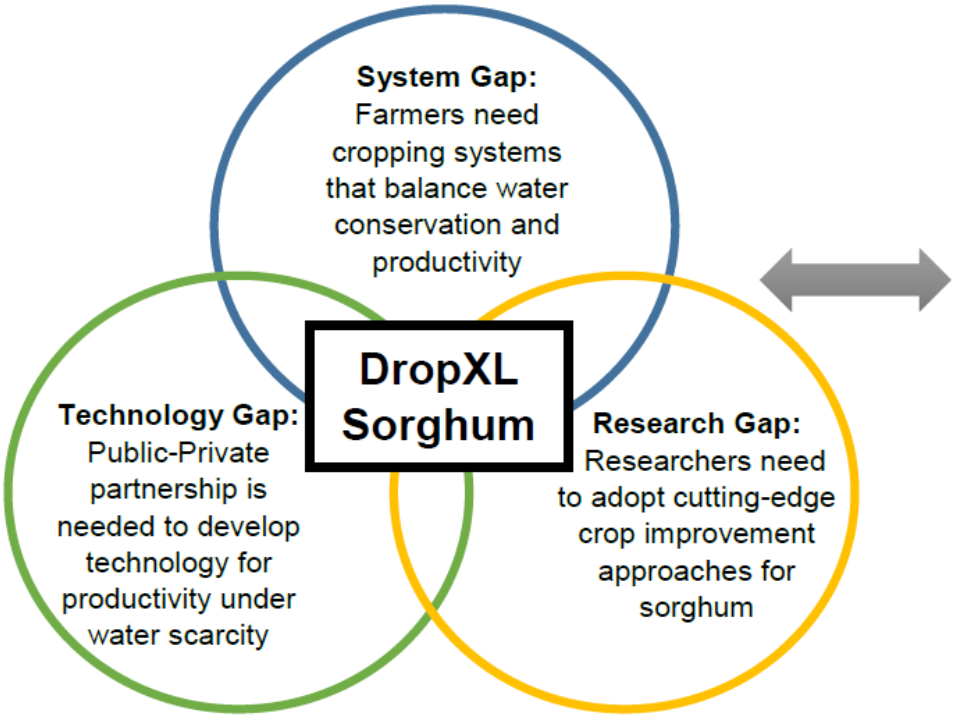
A trait technology package for water-optimized sorghum in Kansas.

Rubí Raymundo, Terry Felderhoff,
Sarah Sexton-Bowser and Geoffrey Morris.

2019 Kansas Water Conference

Deliverable: Higher water productivity under moderate water limitation

Modeling DropXL Effects → 2019 Short-term (Research)
Trait Technology Package → 2024 Mid-term (Development)
DropXL Sorghum Technology → Long-term



The DropXL mission aligns with *Kansas Water Vision Plan* and *Ag Growth Strategy*:

1. Increase utilization of less water intensive crop varieties (Vision).
2. Implement sorghum research funding mechanism based on a public-private partnership (Vision).
3. Address sorghum research needs (Vision).
4. Expand research partnerships and strengthen Kansas' position as the top sorghum-producing state in the nation (Strategy).

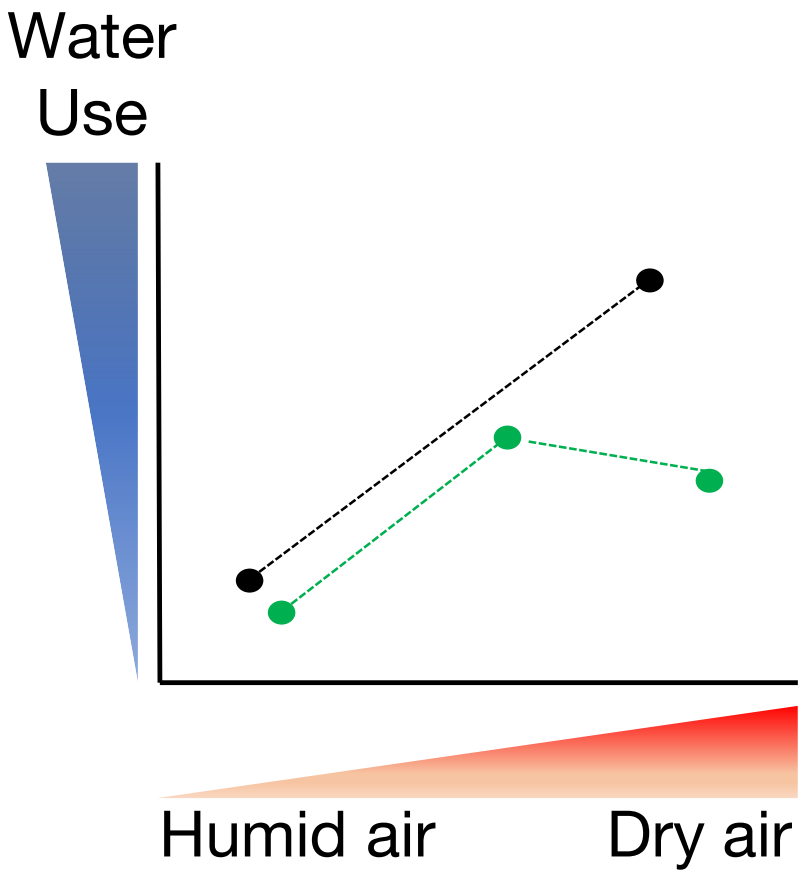
CENTER FOR SORGHUM IMPROVEMENT

2019

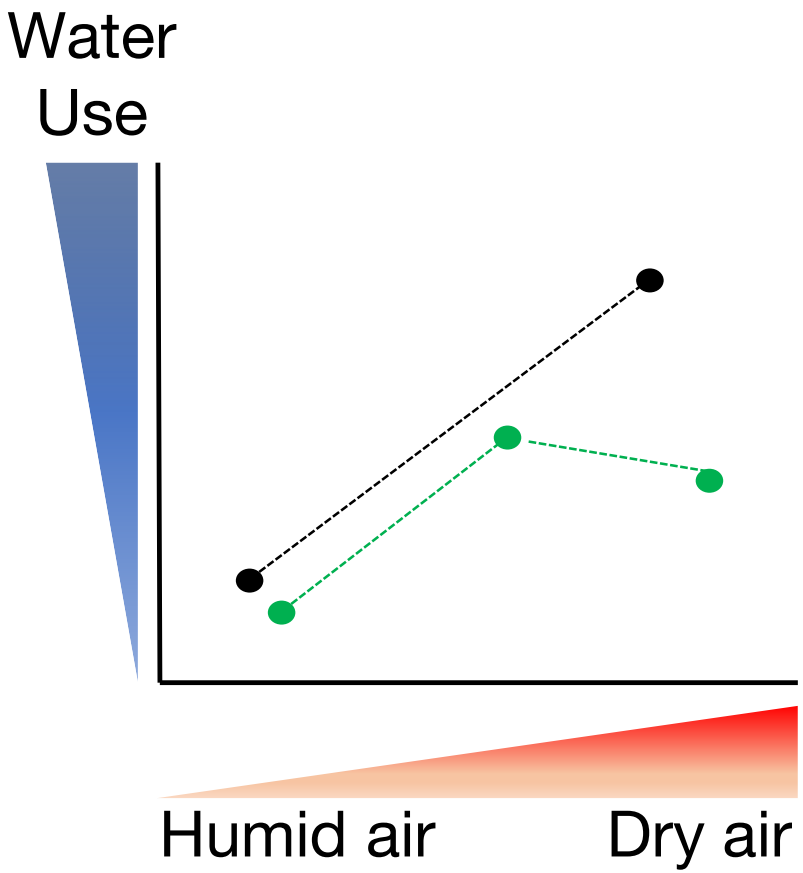
TRAIT MAP
Crop Model

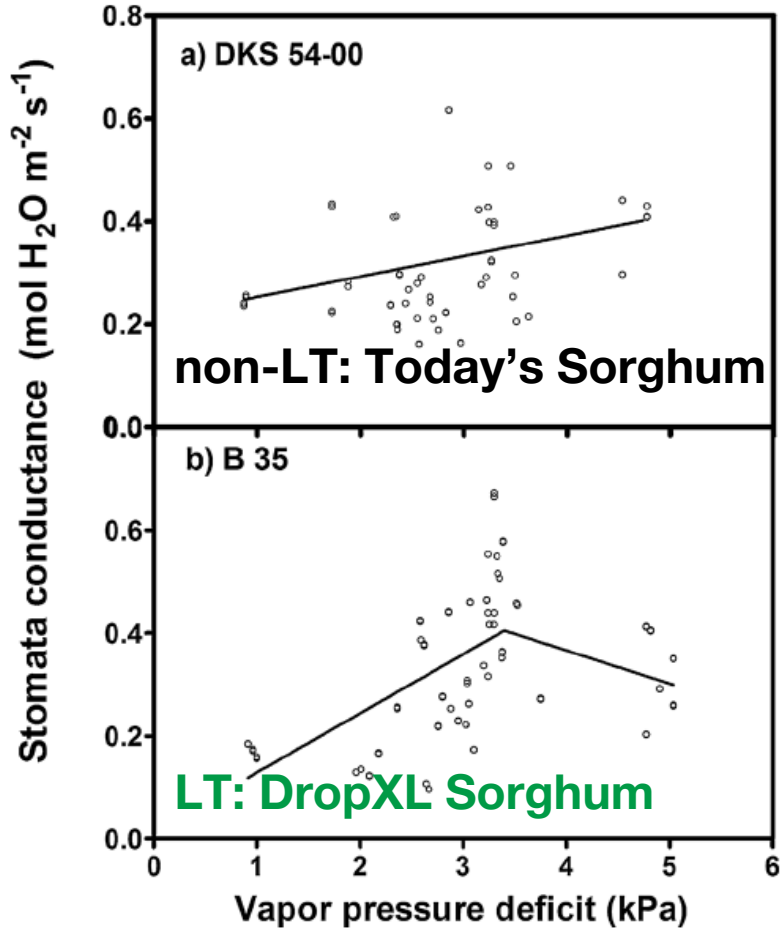
A simulation to design crop trait technology for water productivity in Kansas

DropXL, Limited transpiration



DropXL, Limited transpiration





Gholipoor et al; 2010

CROP MODEL

$$\text{Crop} = f\,(E \times M \times G$$

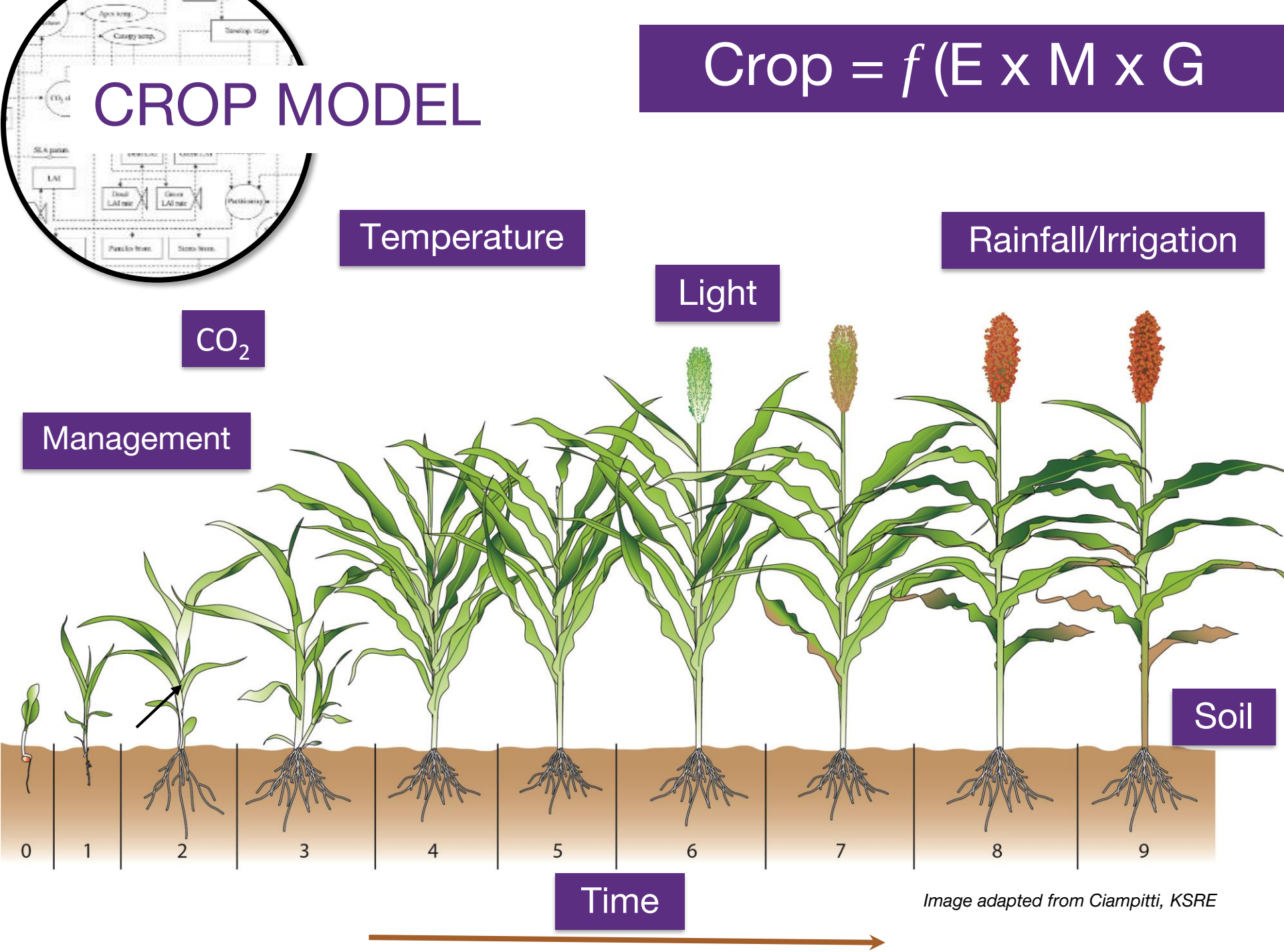
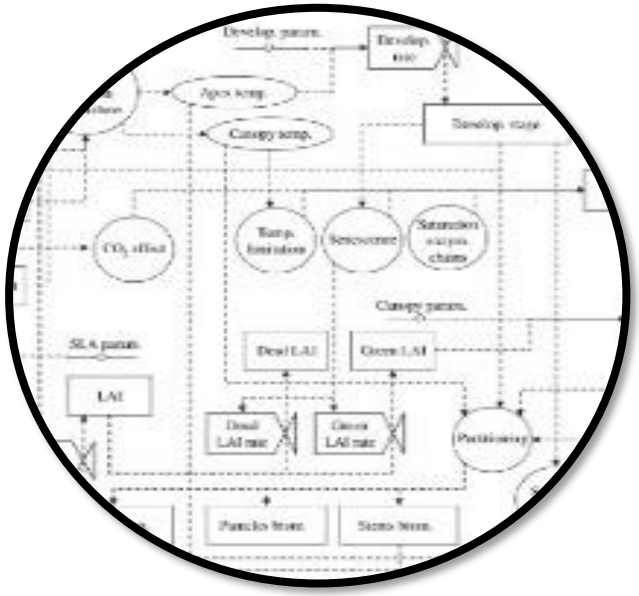


Image adapted from Ciampitti, KSRE

Methods → Results

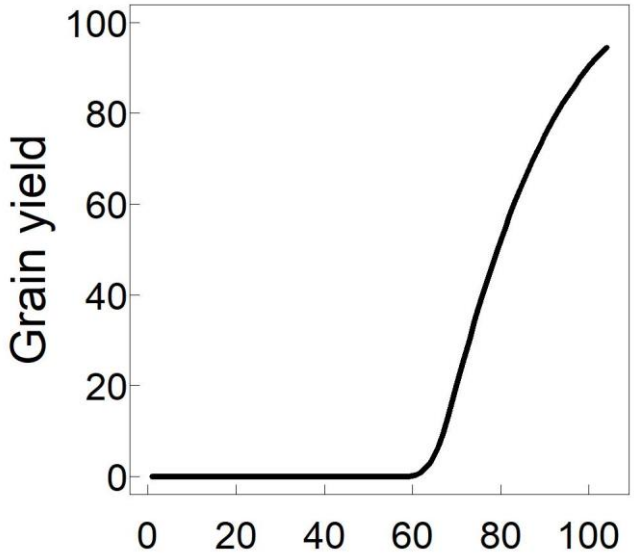
Input

Model



APSIM-Sorghum

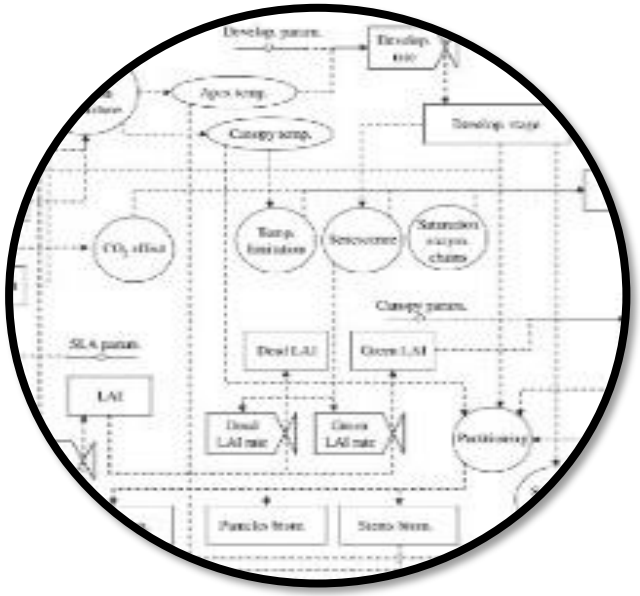
Output



Methods → Results

Input

Model



APSIM-Sorghum

Output

Methods → Results

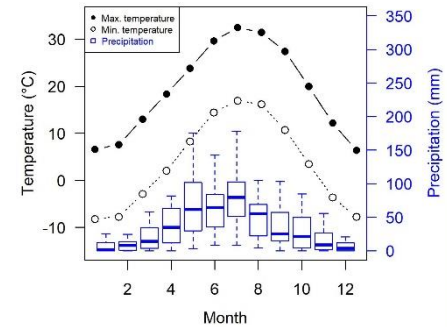
Input

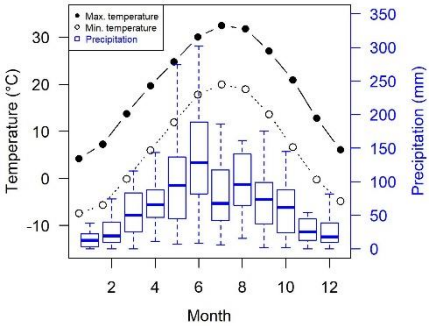
Model

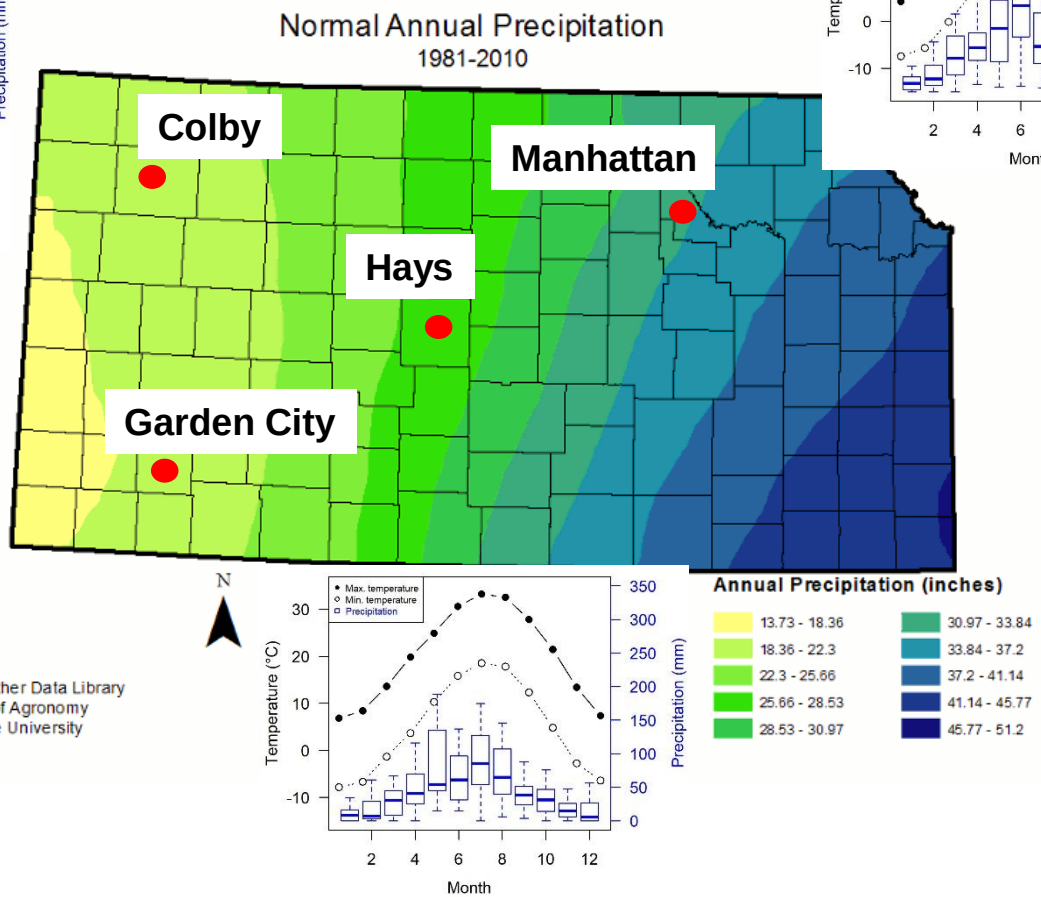
APSIM-Sorghum

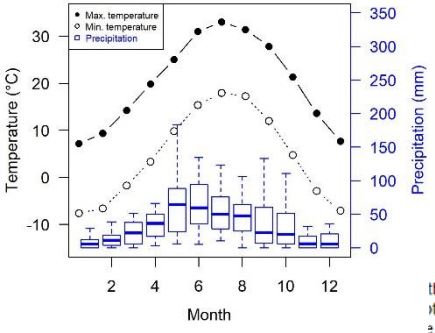
Output

Input: Daily weather (1986-2018).









Input: Management, Genetics.

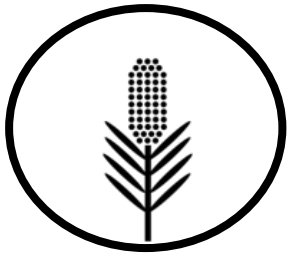
Seasonal simulations

Rainfed.

Simulations onset: January 1

Planting date: mid-May.

Plant density: 24-57,000 plants/acre



Today's Sorghum (non-LT)

Medium maturity

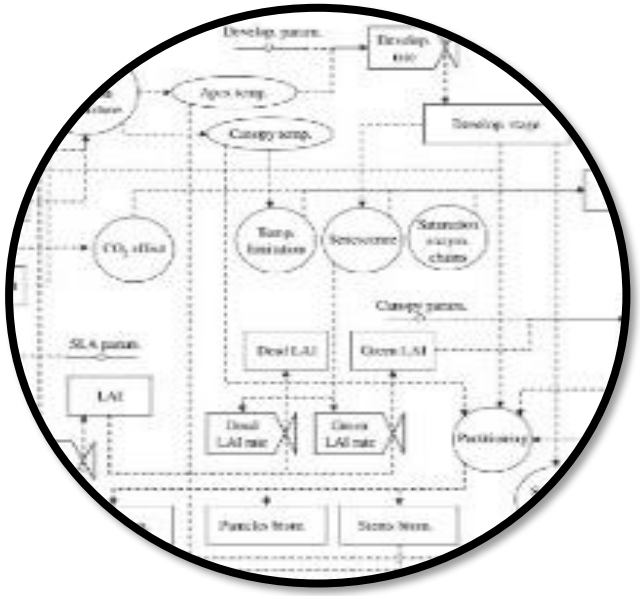
DropXL Sorghum (LT)

Medium maturity

Methods → Results

Input

Model



APSIM-Sorghum

Output

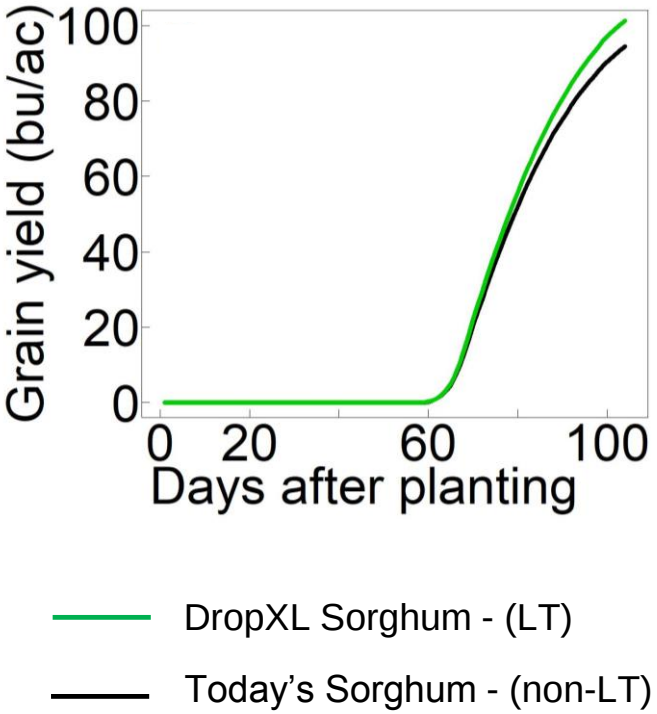
Methods → Results

Input

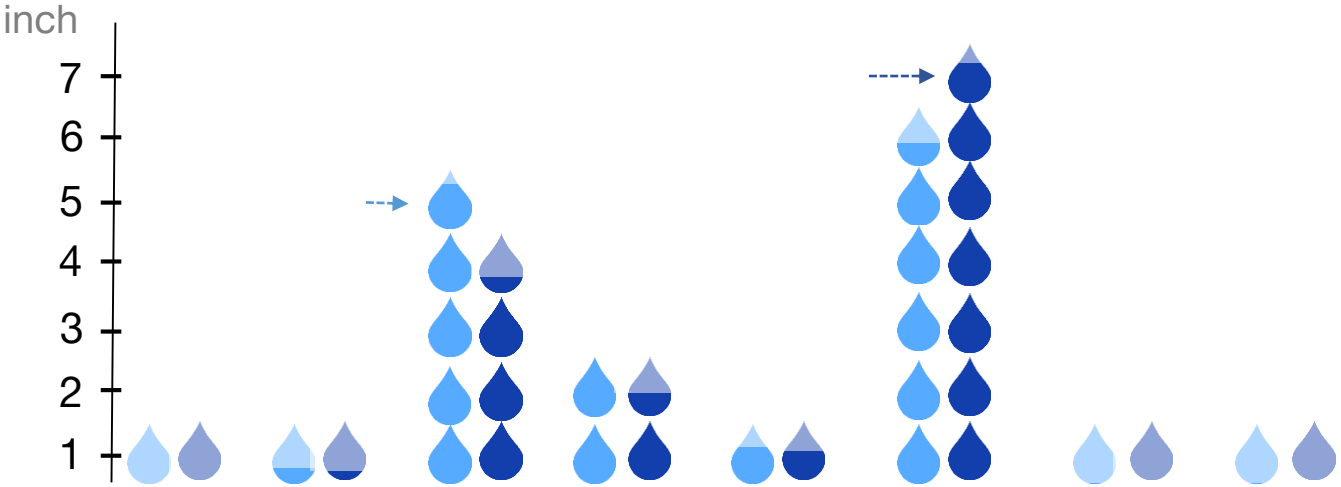
Model

APSIM-Sorghum

Output



Simulated transpiration:

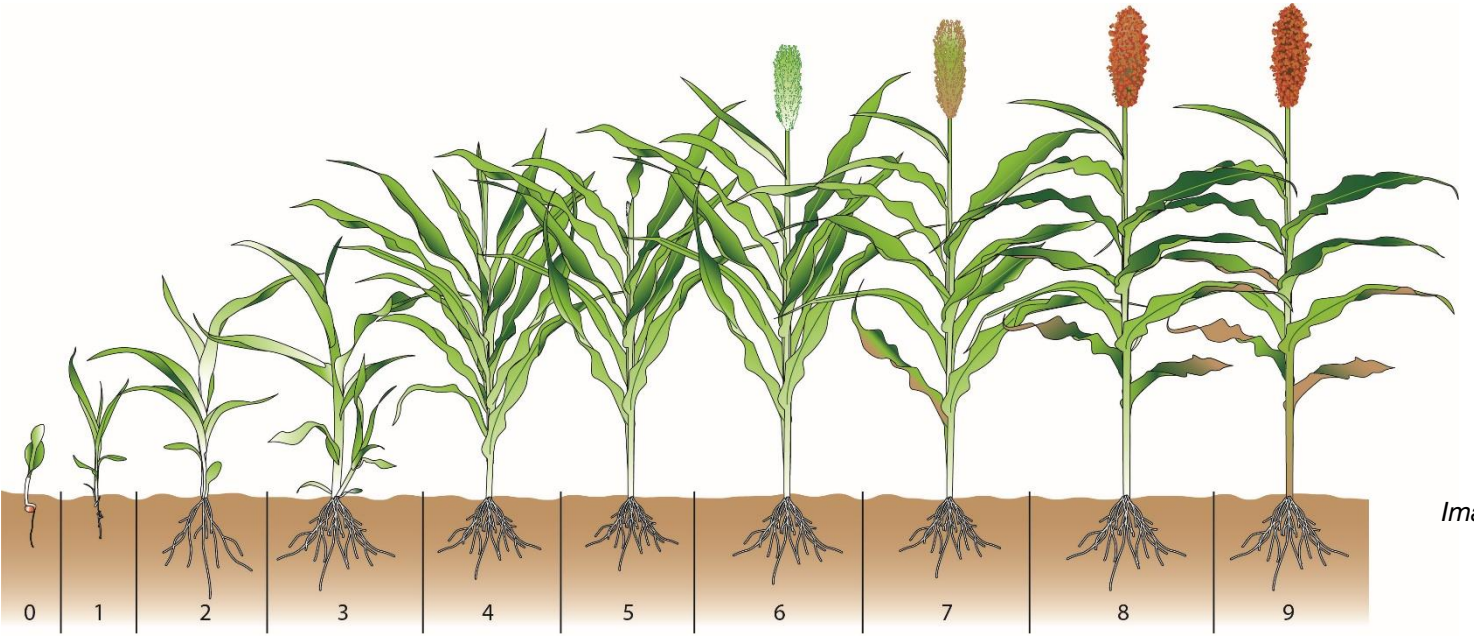


Today's Sorghum

13.3 inch

DropXL Sorghum

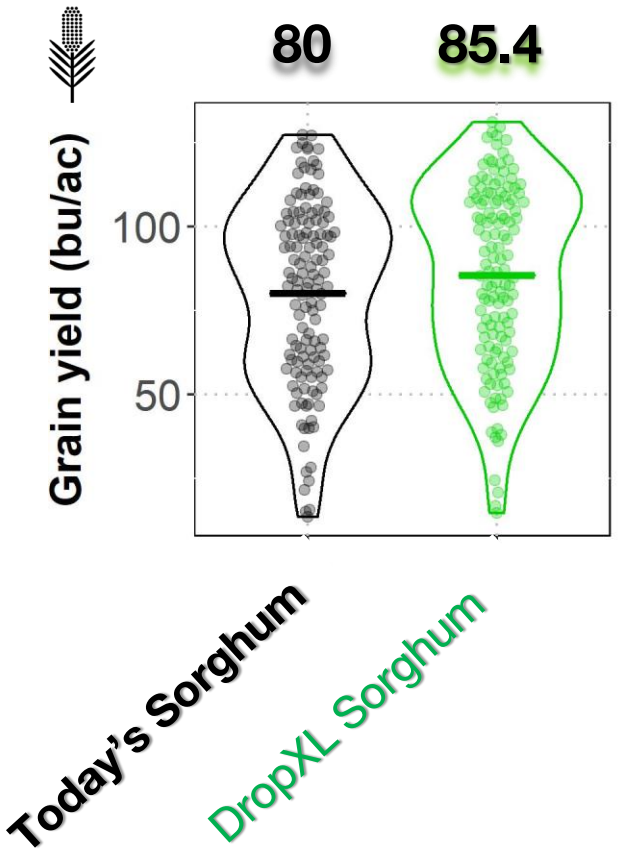
12.4 inch

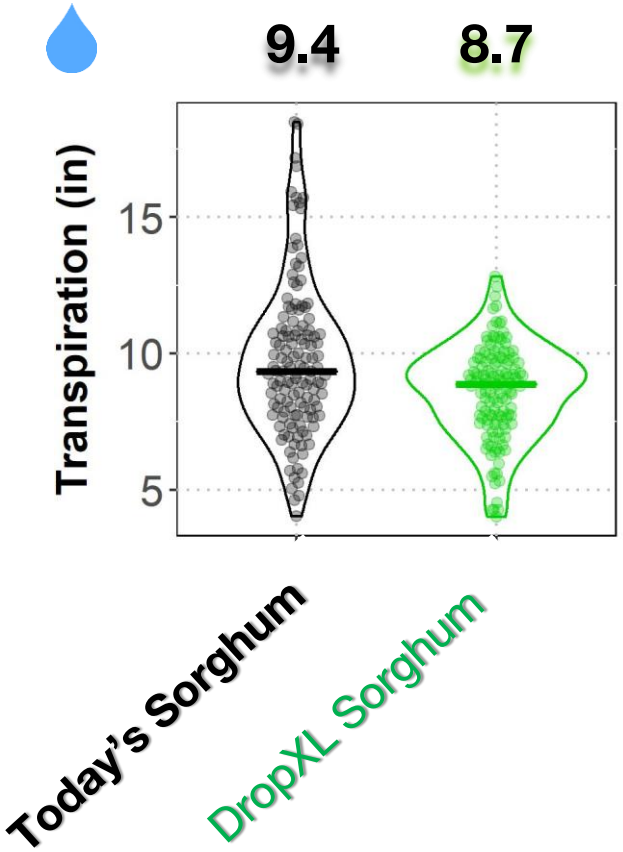


Simulations for Colby, Kansas, 1995.

Image adapted from Ciampitti, KSRE

Simulations: 33 years, 4 sites





Today's Sorghum
/ 8.5 bu/ac/inch

DropXL Sorghum
/ 9.8 bu/ac/inch

+5 bu/ac

Increase of Yield for DropXL Sorghum

.7”

Amount of water DropXL uses for increase of yield

35M Direct Impact
60M Total Impact

Economic Impact to Kansas with DropXL Sorghum
Source: KDA IMPLAN Data

MARKER
2023

DONOR
2024

G2P BRIDGE
FOR WATER EFFICIENT CROPS

CENTER FOR SORGHUM IMPROVEMENT

Kansas Water Office

Kansas Department of Agriculture

KANSAS GRAIN SORGHUM
Growers Working Together

DropXL

A trait technology package for water-optimized sorghum in Kansas.