



## Grain Sorghum Management under Limited Irrigation



# Risk Management in Sorghum

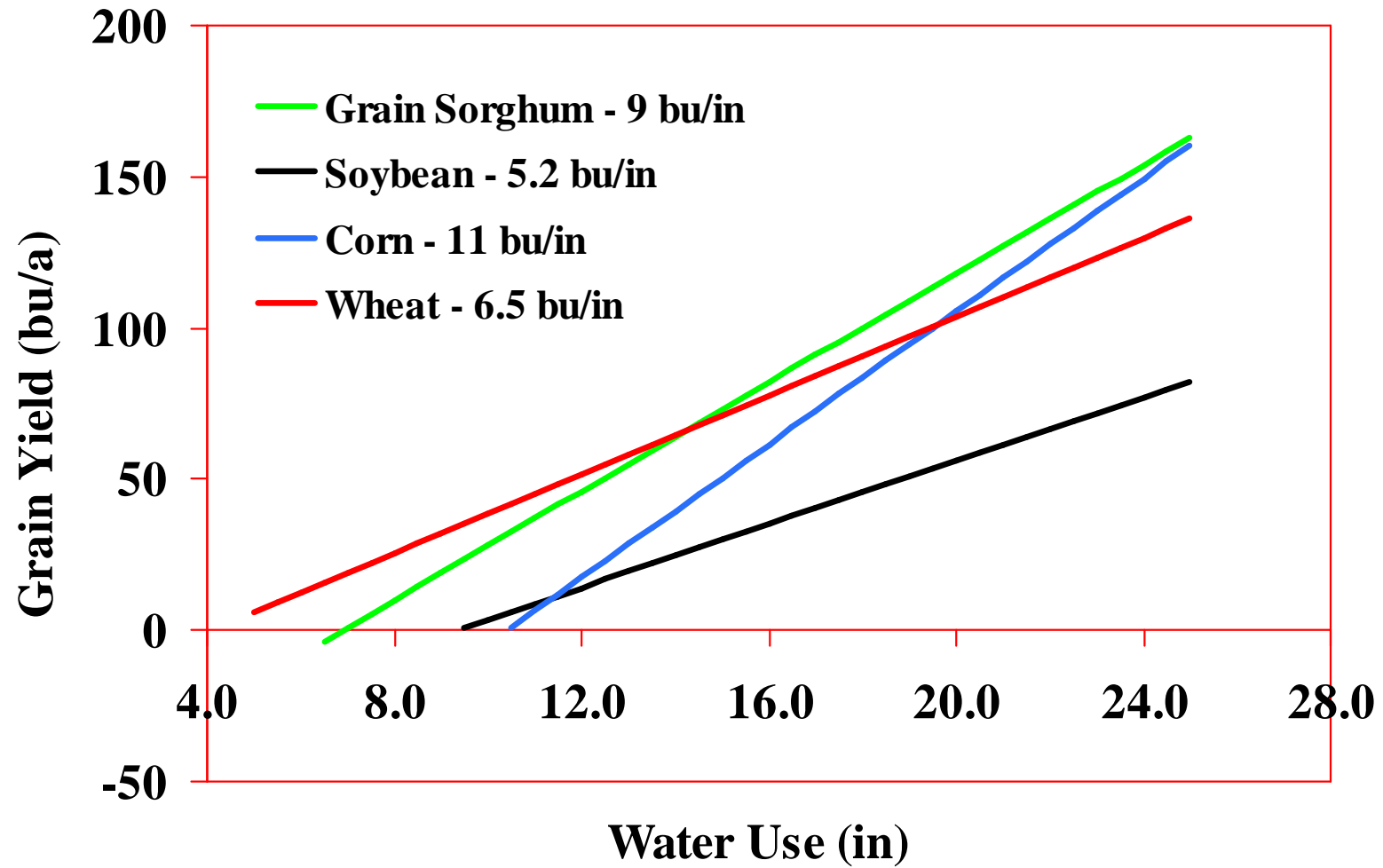
- Important Decisions
  - Hybrid selection
  - Planting date/Maturity
  - Water supply
  - Seeding rate
  - Weed control
  - Soil Fertility
  - Pest Management



# Limited Irrigation Goals

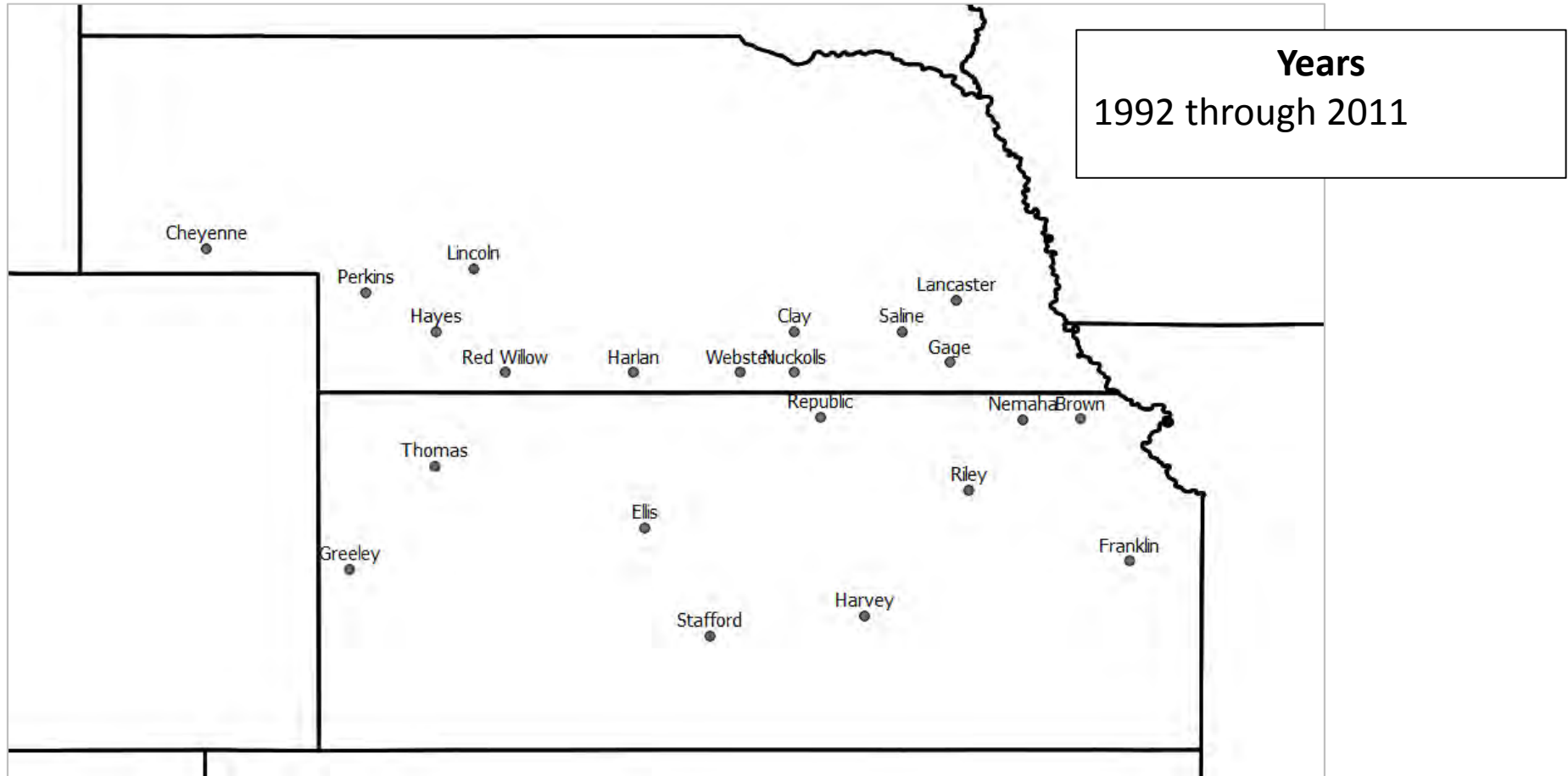
- Allocate limited resources to maximize returns
  - Drought tolerant crops?
    - Wheat or sorghum?
  - Cropping system on the acre?
    - Irrigated / Dryland crop mixture
  - Critical growth stages?
    - Not every inch of irrigation is equal when it comes to timing.

# Drought Tolerant Crops?

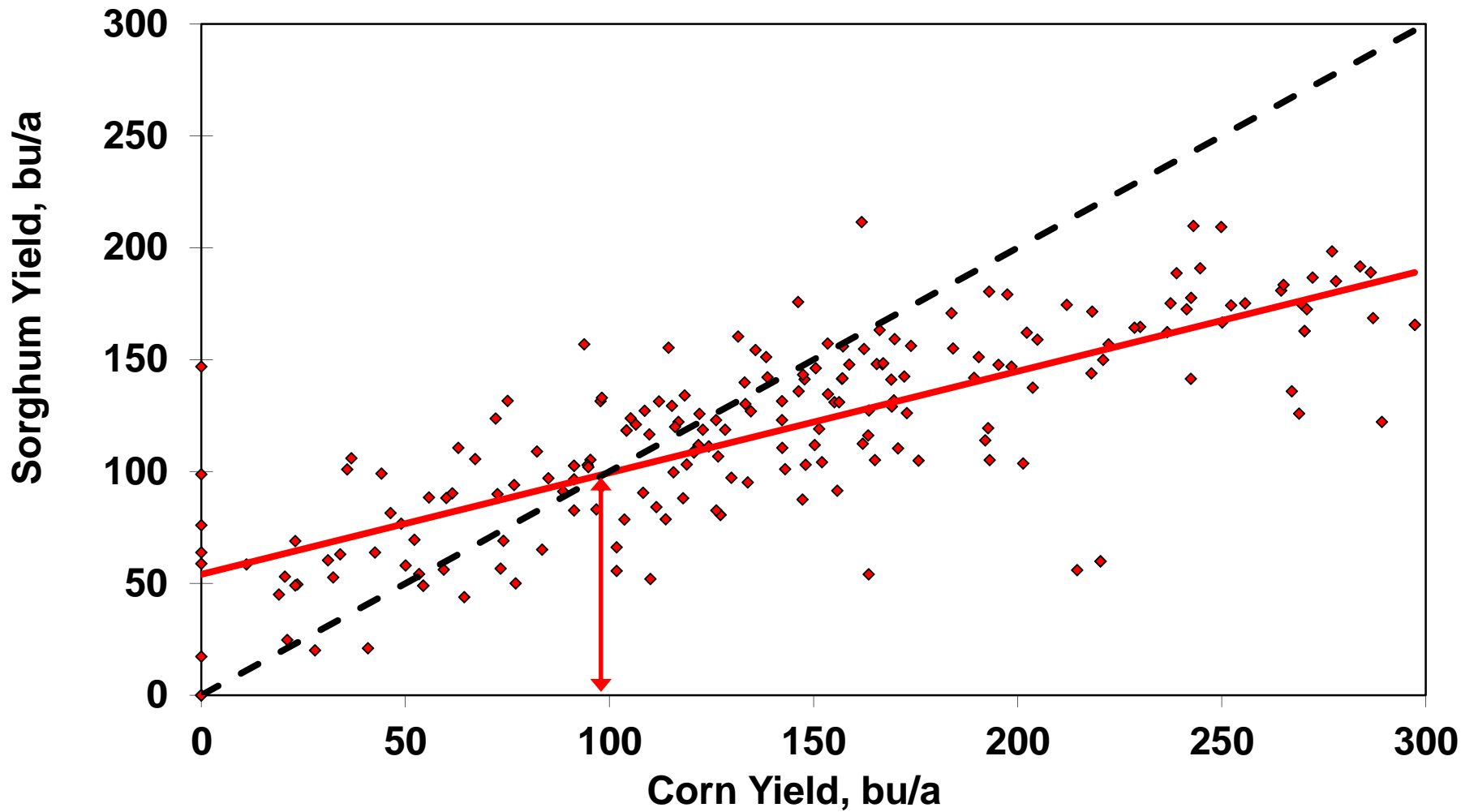




# Environments with a wide range of water



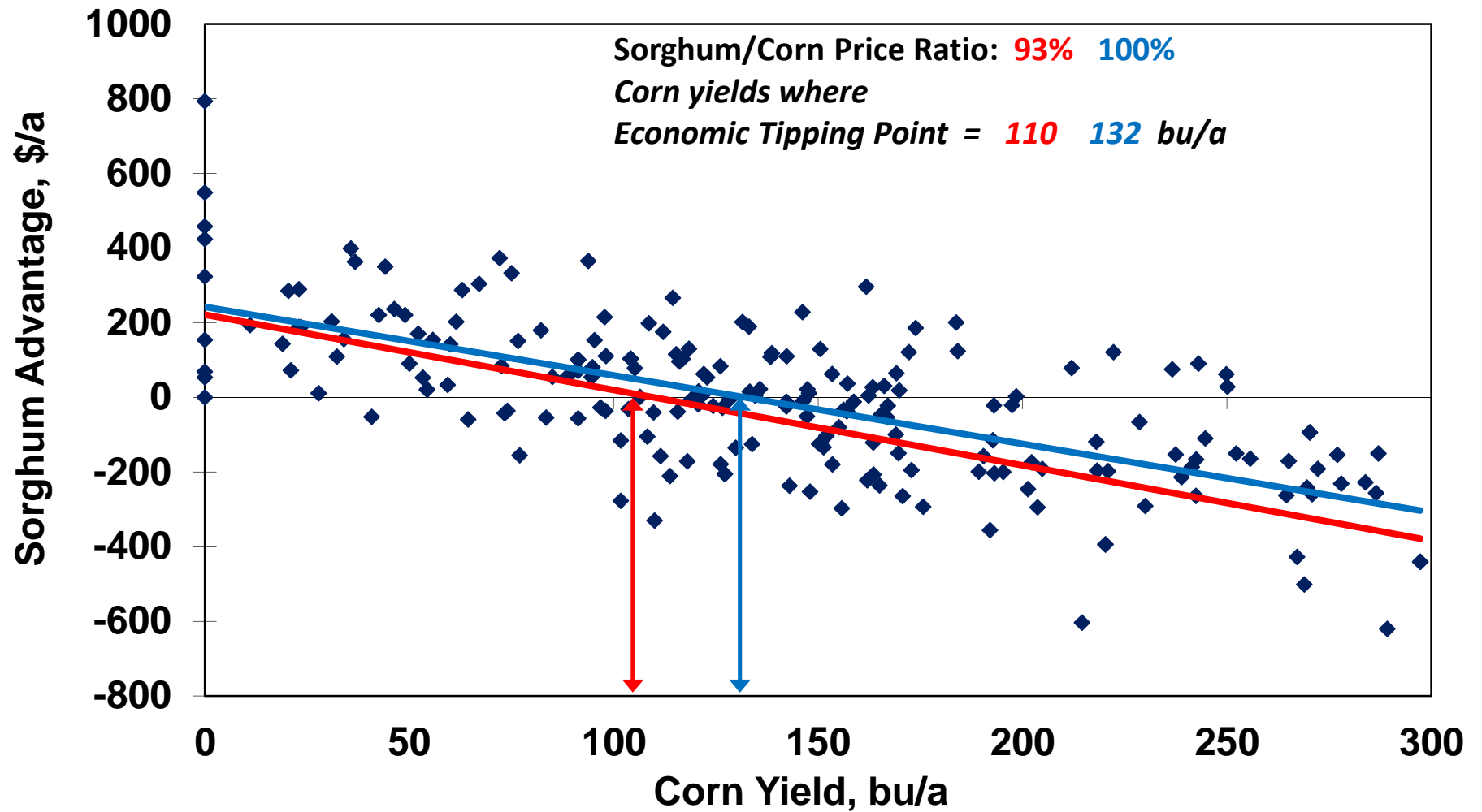
# Sorghum and Corn Yields



<b>SC Kansas Rainfed</b>		
Category	Corn	Sorghum
Yield (bu/acre)	110	110
Price per bu	5.68	5.58
Gov't Payment	16.58	16.58
<b>Total Revenue</b>	<b>641.38</b>	<b>630.39</b>
Seed	66.47	12.58
Herbicides	28.16	18.48
Insect/Fungicides	1.00	0.00
Fertilizer	85.00	94.20
Consult/Dry/Ins.	0.00	0.00
Machinery	116.76	114.02
Non Machinery Labor	13.19	12.88
Land Rent	74.40	74.40
<b>Total</b>	<b>391.54</b>	<b>332.31</b>
<b>Return over Costs</b>	<b>249.84</b>	<b>298.07</b>

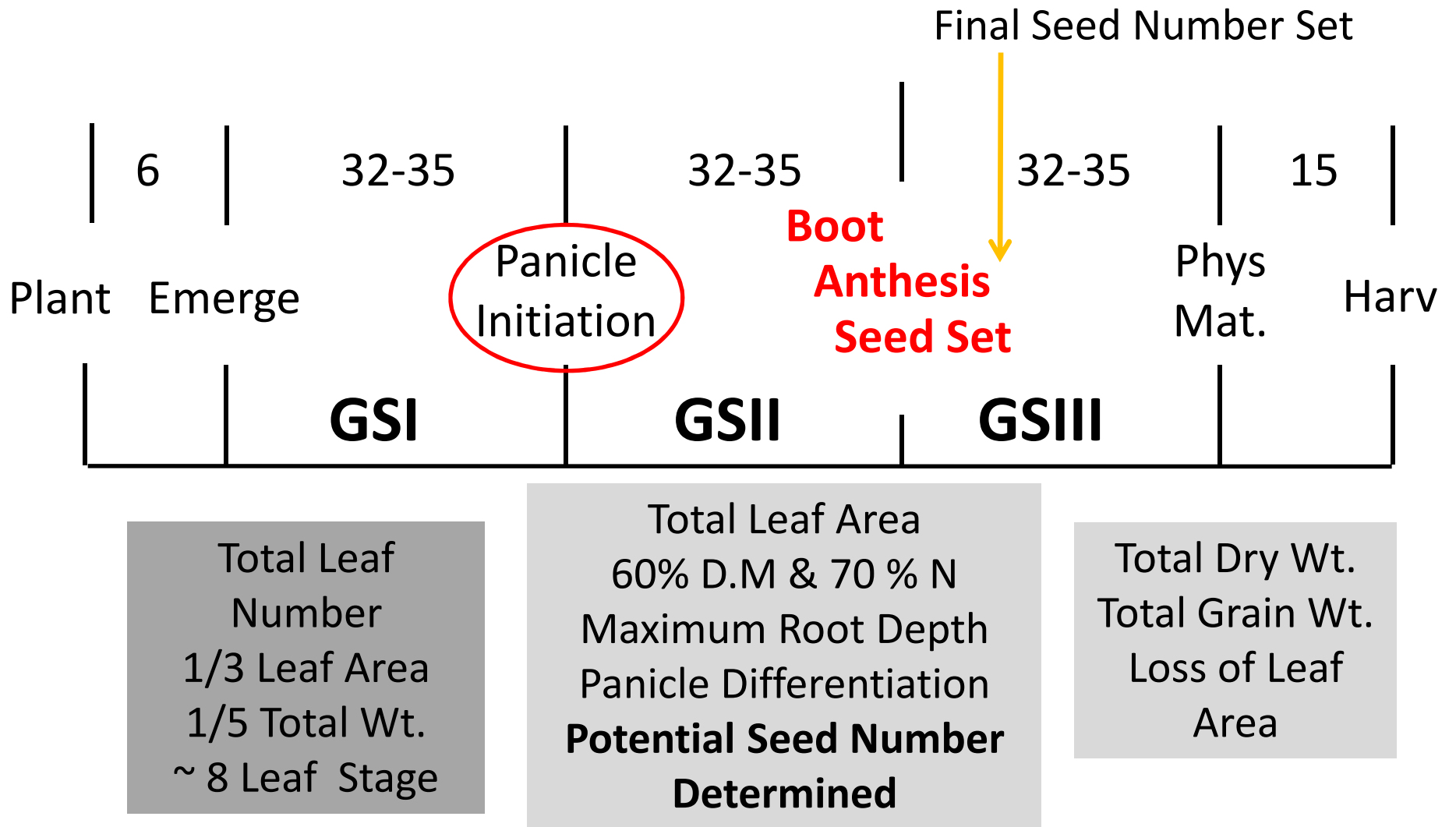
<b>NE Kansas Rainfed</b>		
Category	Corn	Sorghum
Yield (bu/acre)	160	130
Price per bu	5.68	5.58
Gov't Payment	14.68	14.68
<b>Total Revenue</b>	<b>923.49</b>	<b>740.09</b>
Seed	87.48	16.01
Herbicides	30.00	30.58
Insect/Fungicides	26.55	0.00
Fertilizer	110.56	72.80
Consult/Dry/Ins.	17.29	11.70
Machinery	98.86	87.02
Non Machinery Labor	11.17	9.83
Land Rent	136.80	136.80
<b>Total</b>	<b>527.46</b>	<b>372.99</b>
<b>Return over Costs</b>	<b>396.03</b>	<b>367.10</b>

# Economic Comparison

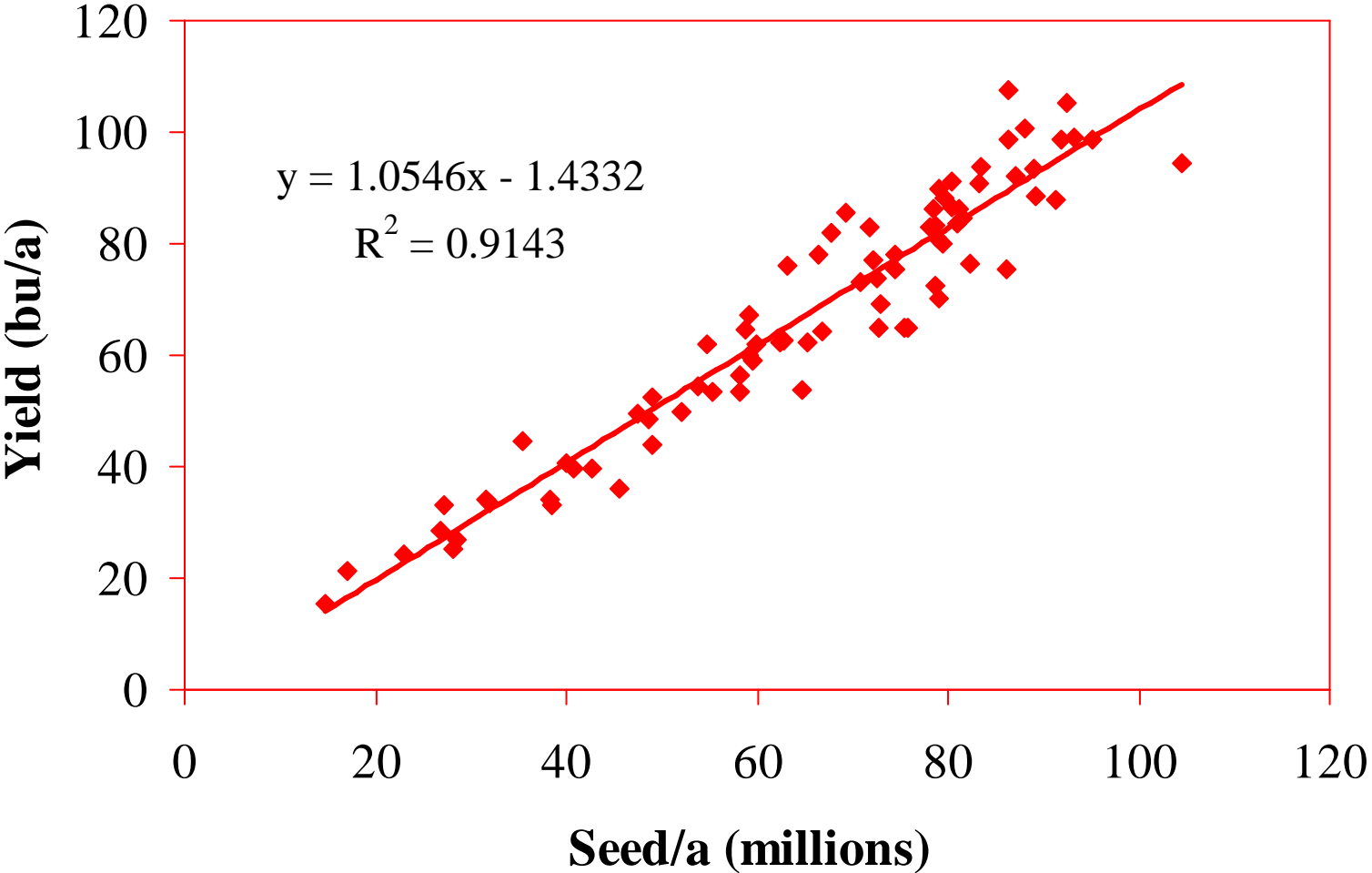




# Sorghum Growth, Development, and Yield



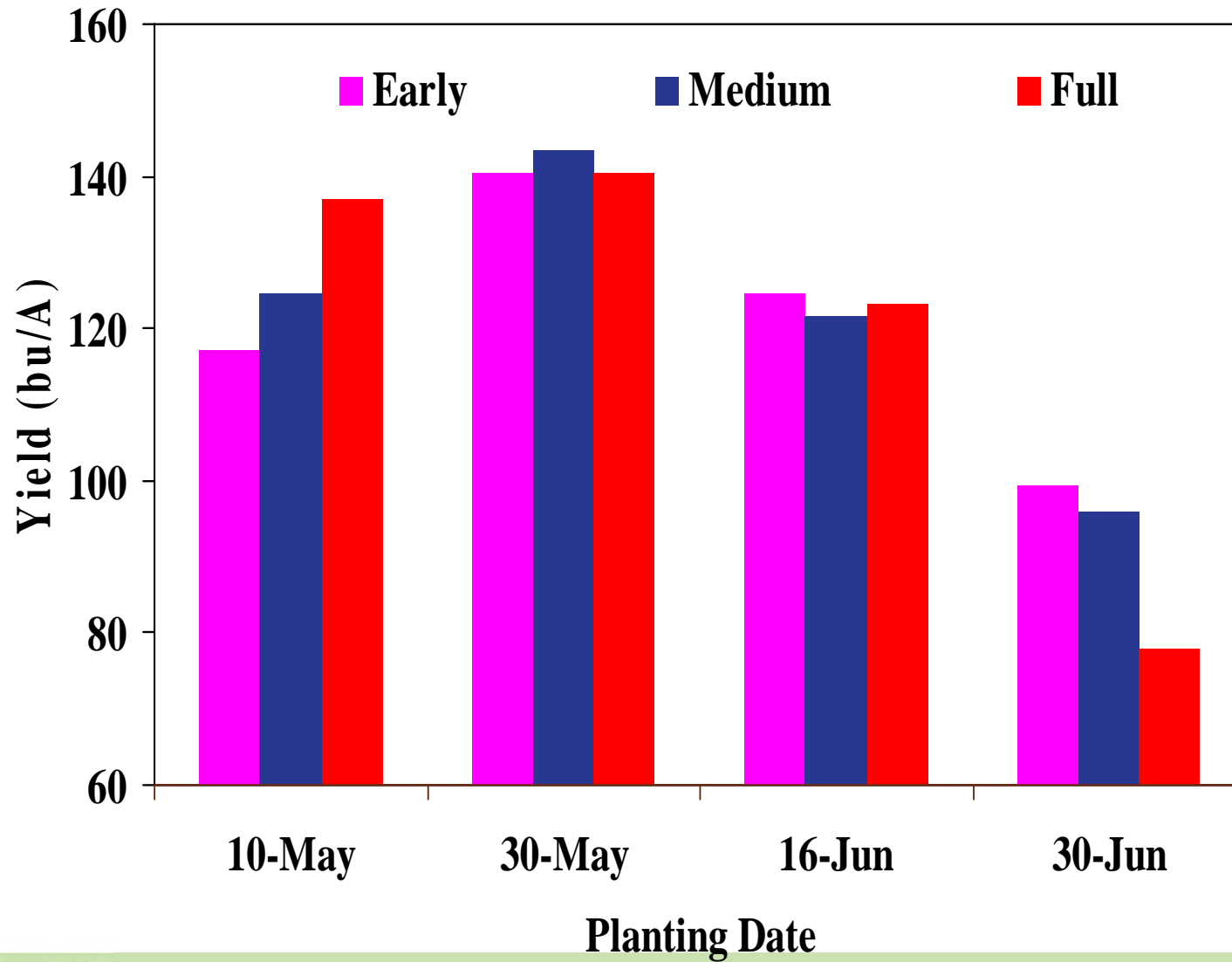
# Seed Number per Acre and Yield



# Limited Irrigation Sorghum Management

- Planting Date: Plant early
  - You want the longest growing season you can get and there is often little or now penalty for planting a bit early
- Hybrid Maturity: Fullest for your area
  - NW KS = Medium
  - SW KS = Medium Full
- Planting Rate: 70,000 seed per acre (or more)
- Row Spacing: Narrow rows might improve yields
  - Never saw lower yields in narrow rows in previous studies
  - Stand establishment with drills may be a challenge

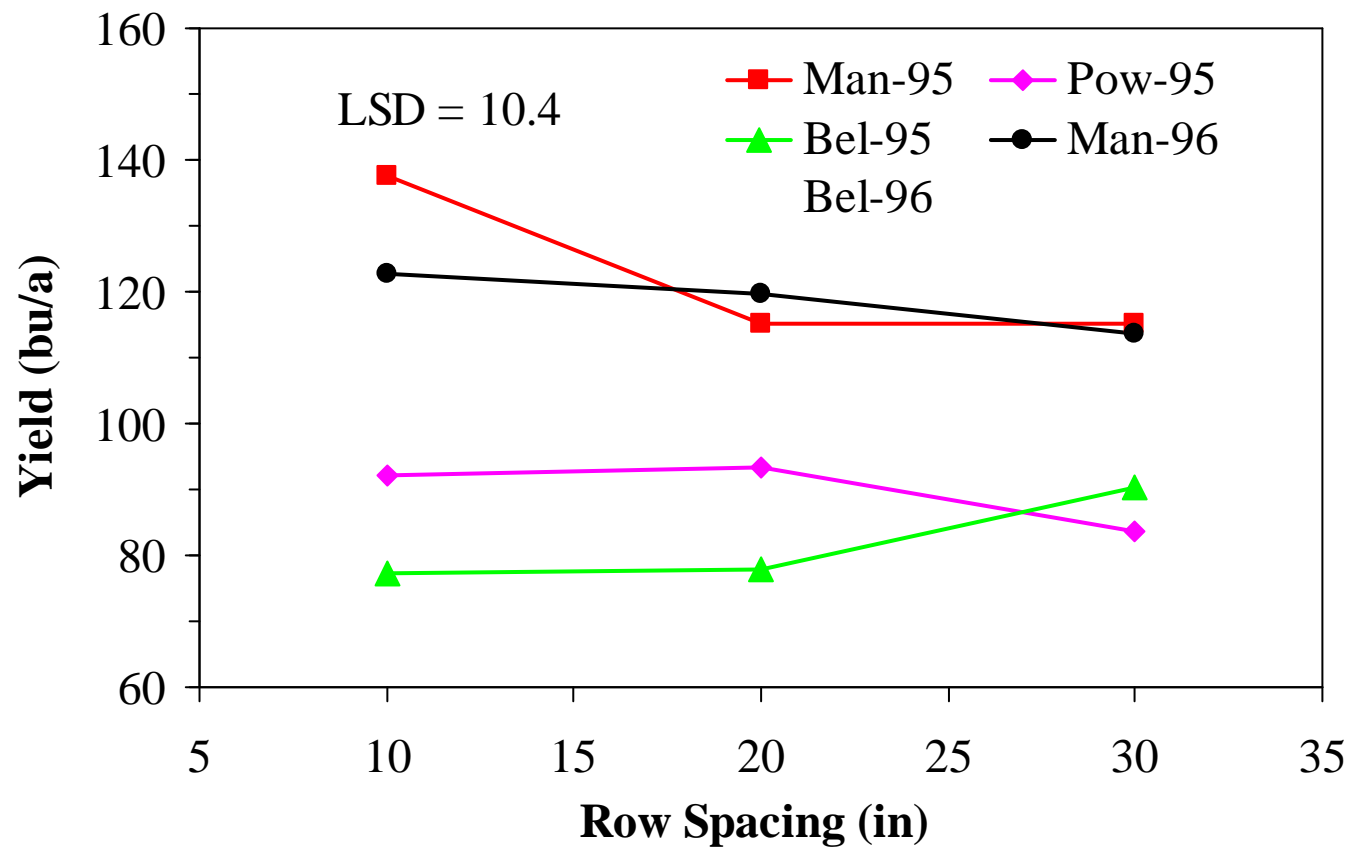
# Sorghum Planting Date – NC Kansas



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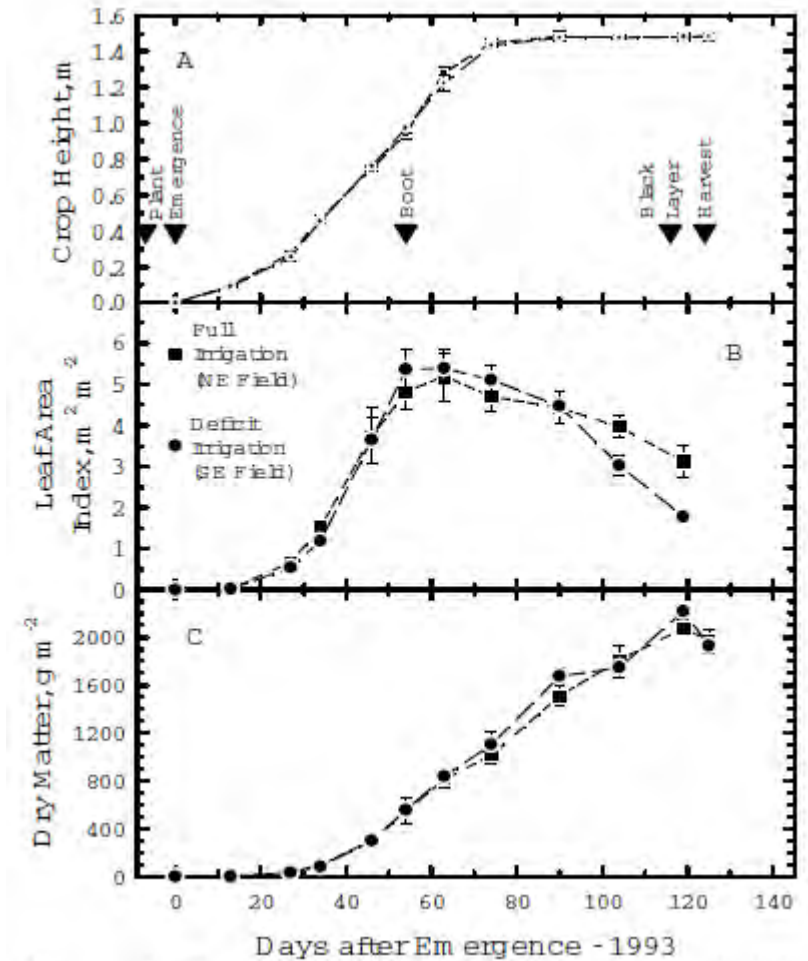
# Sorghum Row Spacing





# Deficit Irrigation – Bushland, TX

Variable	Full Irr.	50% Deficit Irr.
Rainfall (in)	8.3	8.3
Irrigation (in)	14.5	6.7
Total Water (in)	22.8	15.0
Crop Water Use (in)	24.4	22.0
Yield (bu/acre)	150.2	146.5
WUE (bu/in)	5.9	6.6



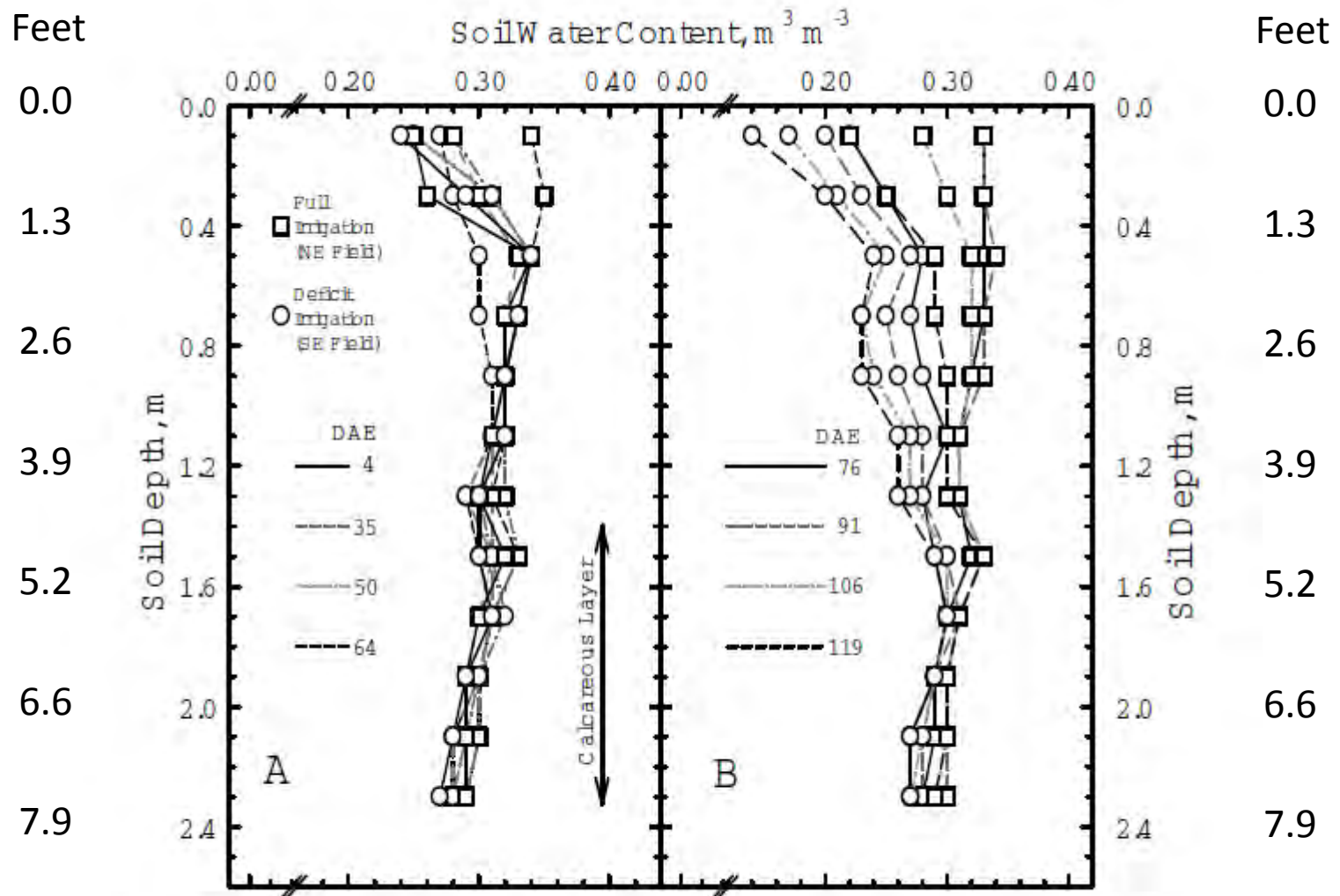
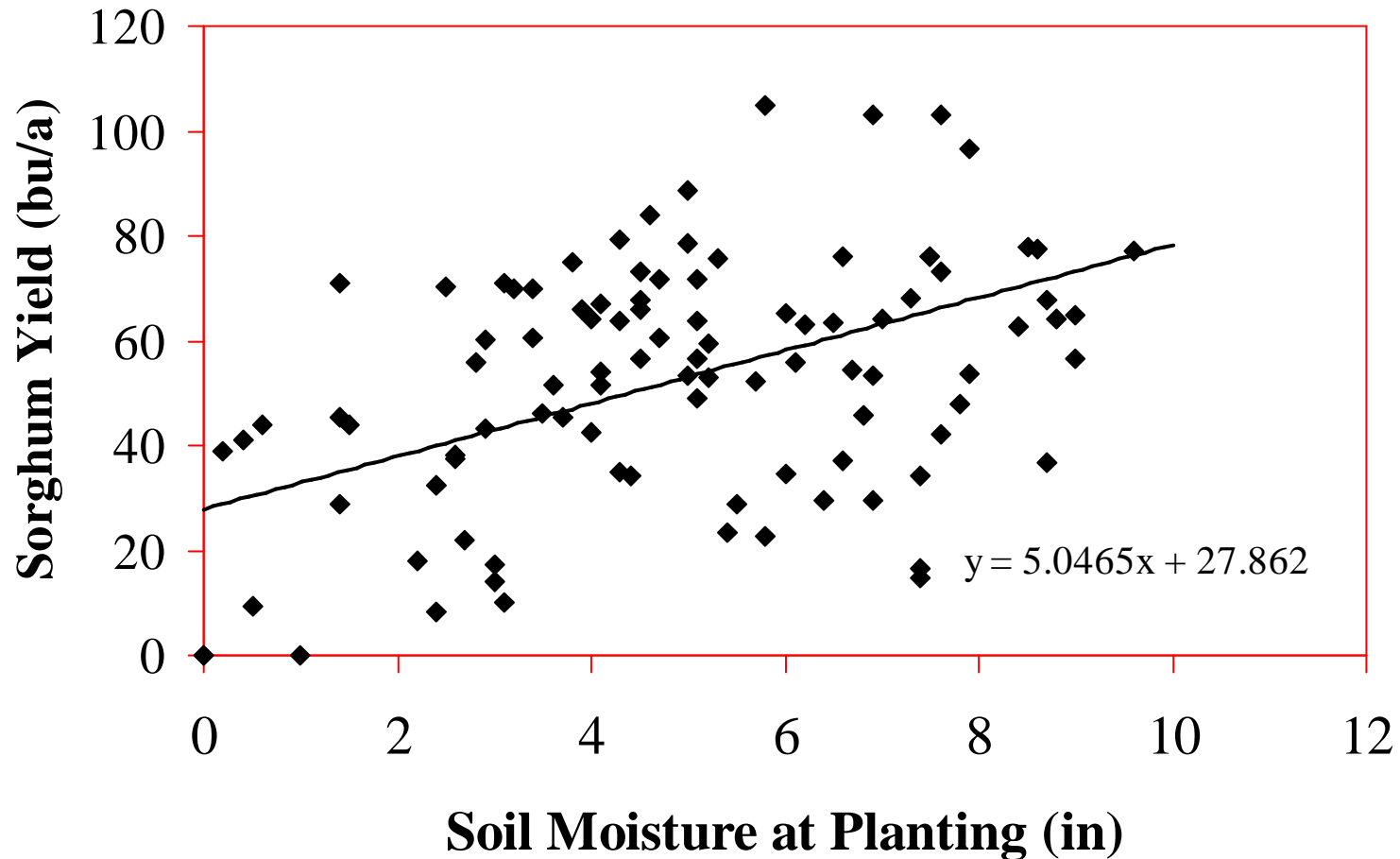


Figure 4. Soil water content profiles (mean of four neutron tube sites) in each treatment field for emergence to boot (A) and boot to maturity (B).

# Sorghum and Soil Moisture

(Tribune, KS 1973-1987)



# Irrigation Effects on Grain Sorghum Hybrids

Treatment	Medium Early	Full Season
	Yield, bu/acre	
Dryland	<b>110</b>	<b>95</b>
Boot	<b>149</b>	<b>160</b>
Mid-bloom	<b>135</b>	<b>148</b>
Boot +Mid-bloom	<b>162</b>	<b>176</b>
Hybrid Avg	<b>139</b>	<b>145</b>

# Irrigation Timing and Grain Sorghum

## Tribune, KS

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Time of Irrigation	Yield
	bu/a
Preplant only	65
Pre+Boot Stage	125
Pre+Half-Bloom	115
Pre+Soft-Dough	114
Full Season Irrigation	126

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# Limited Irrigation

## Tribune, KS

Irrigation Amount (in)	Grain			
	Corn	Sorghum	Soybean	Sunflower *
	----- bu/a -----			lb/a
5	124	124	34	1725
10	169 (36)	149 (20)	41 (20)	1978
15	184 (48)	172 (39)	47 (39)	1759

() represent % increase over 5 in irrigation

\* Stem borer infestation lowered sunflower yields



# Stalk rots

- Stalk Rots in Corn and Sorghum (KSU Pub No. L-741)
  - Stalk rot is the most prevalent disease of corn and sorghum in Kansas. Annual losses are difficult to determine, because unless lodging occurs, the disease goes mostly unnoticed. The best estimates are that at least 5 percent of the corn and sorghum crop are lost each year to stalk rot.



*Figure 5. Fusarium infected sorghum plant.*

# Stalk Rots

- Types
  - Fusarium
    - Dry early and warm, wet weather after anthesis
  - Charcola Rot
    - High soil temperatures and low soil moisture during grain fill
  - Anthrachnose
    - High temperatures and humidity
- Prevention
  - Reduce stress through late season irrigation
  - Harvest Early
  - Select hybrids that have good standability ratings
  - Select hybrids with the stay-green trait
  - Balanced N program (avoid too much or too little)
  - Maintain adequate K and Cl levels in system
  - Rotate to small grains or alfalfa

# Summary

- Consider crop mixtures or cropping systems that return the greatest \$/acre. It could be that some crops get very little irrigation water.
- Plant sorghum as early as possible and potentially in narrow rows to maximize yields under limited irrigation.
- Be certain to reduce plant water stress during GS II when the panicle is developing.
- Water during grain fill will improve yields slightly, but will result in better stalk quality and less lodging.
- Manage lodging through hybrid selection, proper fertility and appropriate crop rotations.



- Questions?

