



Efficient Management of Water and Nutrient Resources: Assessing the Potential for Drip Irrigation Fertigation

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Test Your Knowledge of High Yield Corn

- **What is the world record corn yield and what is the corn yield gap?**

The Corn Yield Gap

- **US average yield of 175 bushels per acre**
- **All 18 NCGA contest winners in 2016 exceeded 300, 5 exceeded 400, and 2 exceeded 500 bushels**
- **World Record of 532.0271 bushels per acre in 2015**

2016 National Corn Growers Contest Winners

Top Ten Yields and Locations

Randy Dowdy, Georgia @ 521.4

Kevin Dowdy, Georgia @ 501.0

David Hula, Virginia @ 485.0

Michelle Dowdy, Georgia @ 465.0

Loren Seabolt, Georgia @ 463.1

Health Cutrell, Virginia @ 347.2

Dan Gause, South Carolina @ 346.0

Daniel Gause, South Carolina @ 345.3

Kristen Corpus, Oregon @ 339.6

William Thomas, South Carolina @ 336.5

Highest Yields with Irrigation

2016 National Corn Growers Contest Winners

Winners From I States

Kevin Kalb, Indiana @ 339.0

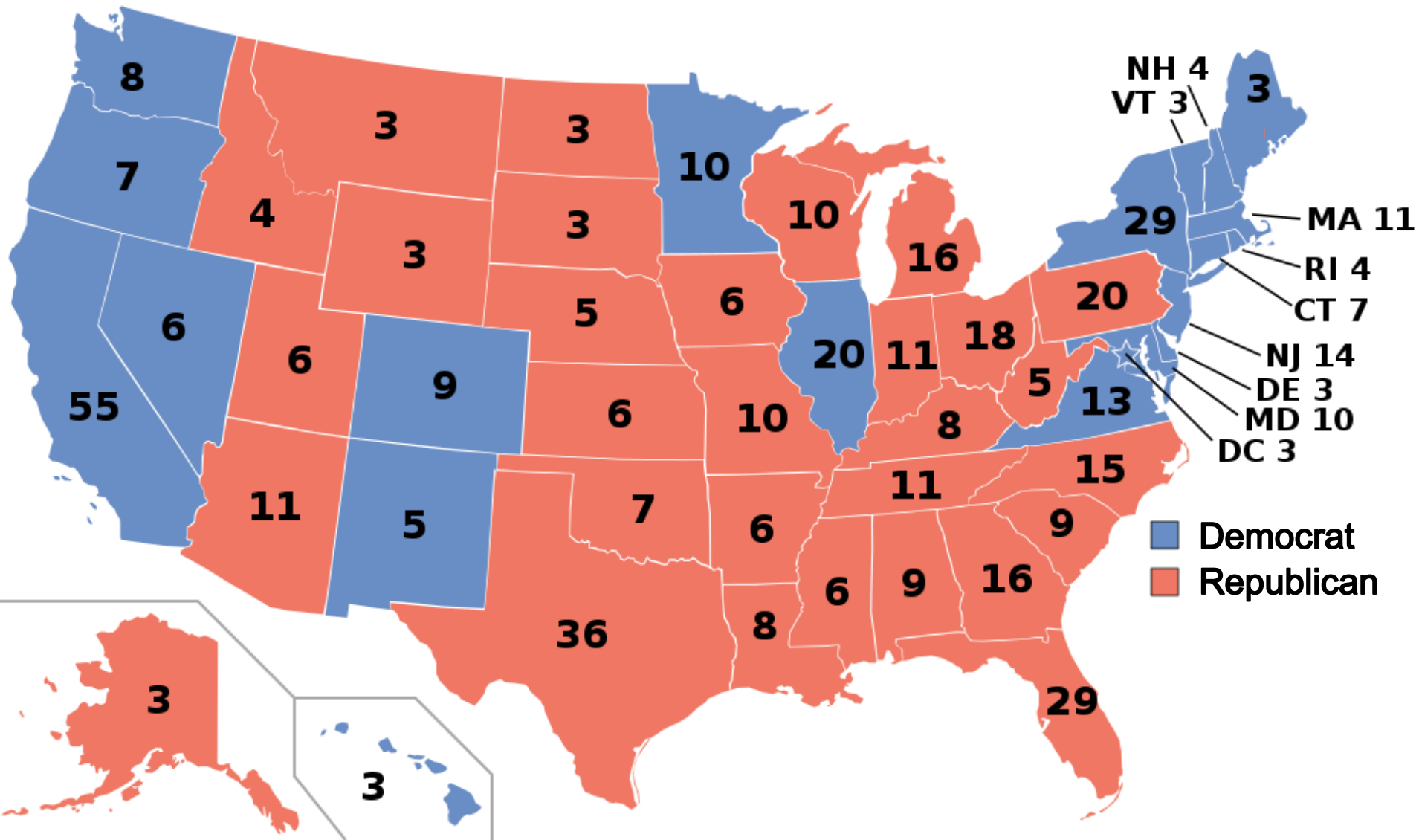
Tim, Dan & Joe Durick, Iowa @ 333.5

Robert Jensen, Iowa @ 332.7

Patrick Hammes, Iowa @ 320.3

John Ruff, Iowa @ 313.3

Illinois is a Blue State



President Trump Likes Corn



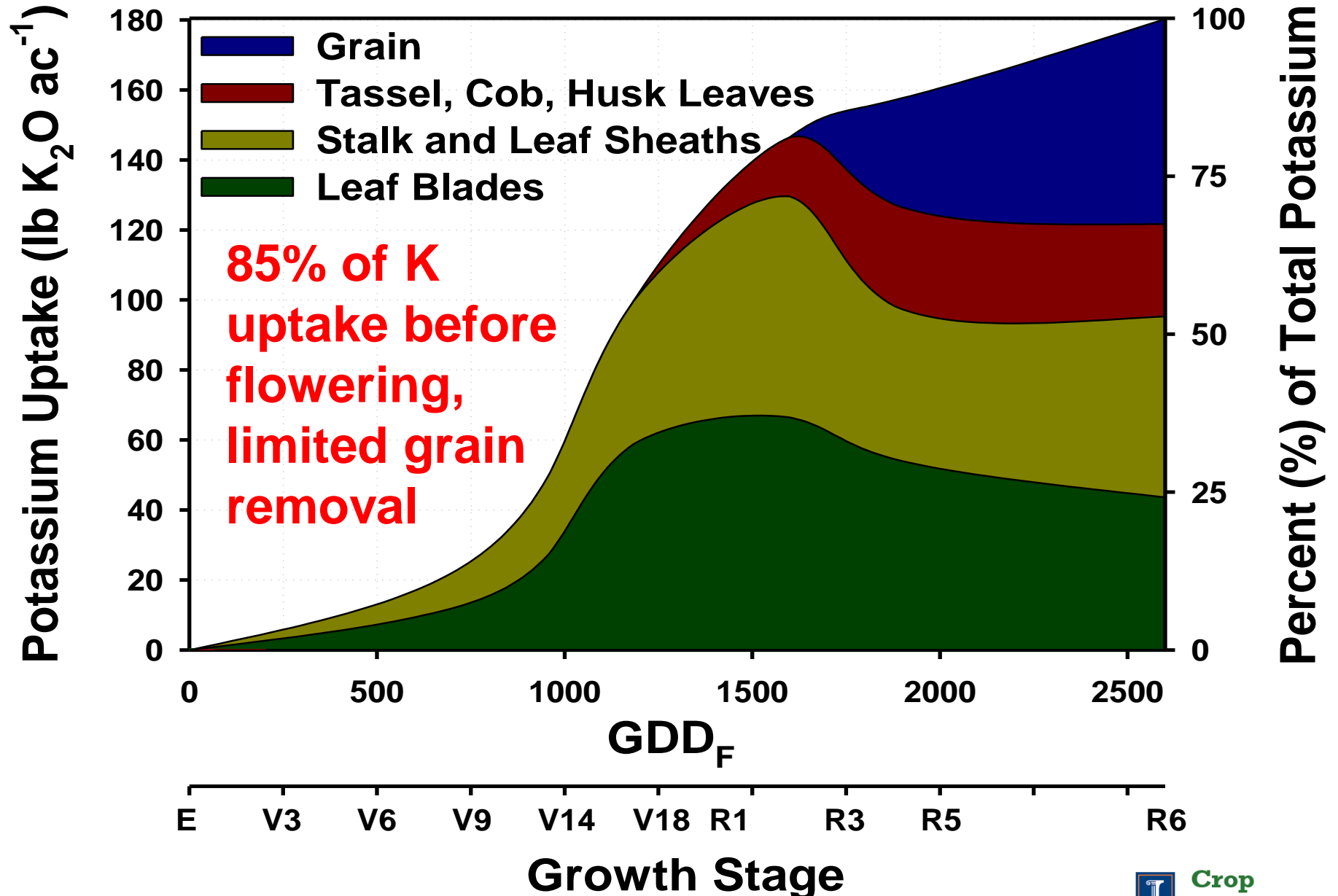
Strategy for Winning the Corn Yield Contest

- **Feed (better plant nutrition) and protect a much higher density of plants of the best 'racehorse' hybrids**
- **Make sure the crop is never stressed**

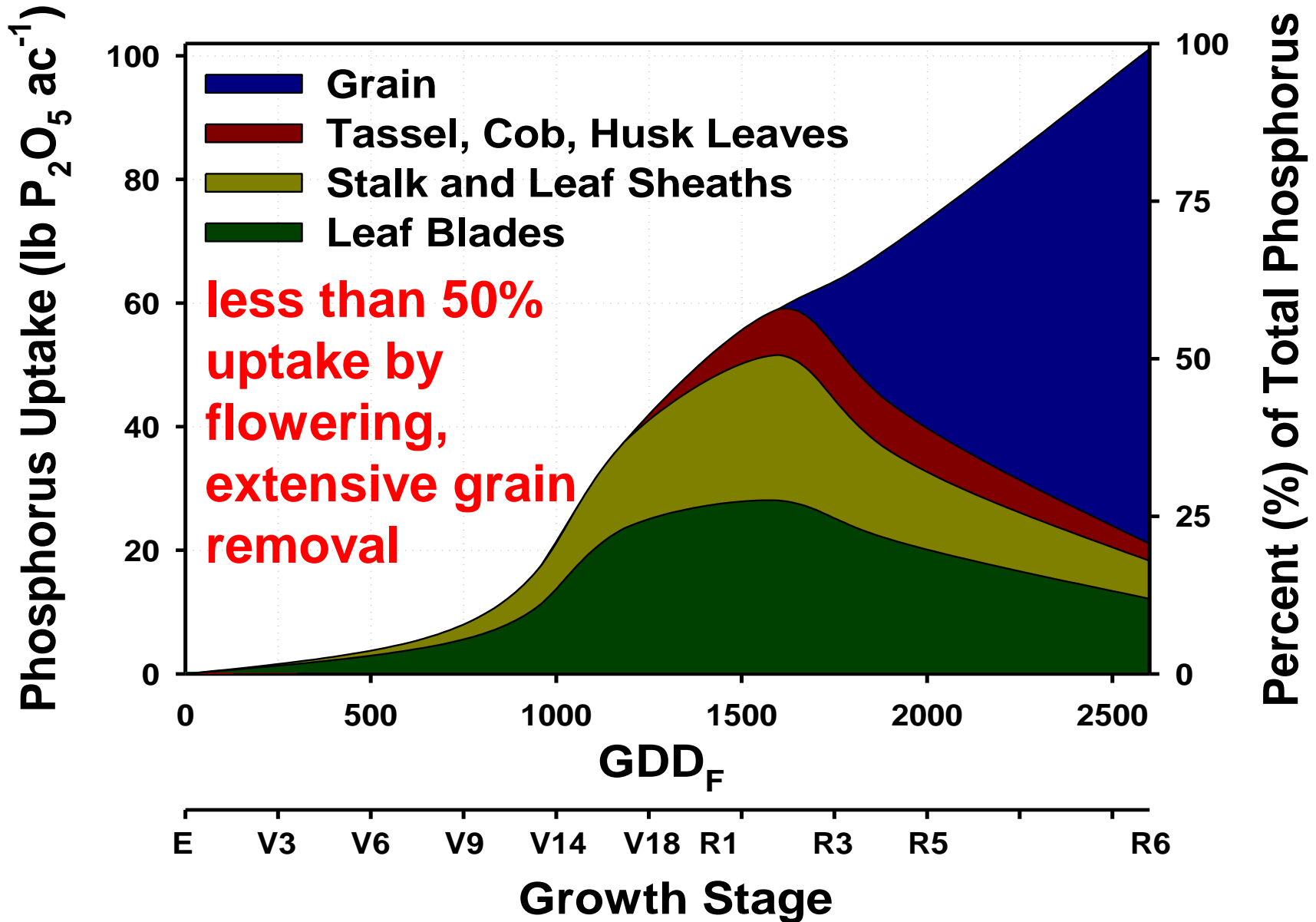
Test Your Knowledge of High Yield Corn

- **Are all mineral nutrients absorbed in the same amounts, at the same time, and used in the same way?**


K Uptake & Partitioning for 230 Bushel Corn



P Uptake & Partitioning for 230 Bushel Corn



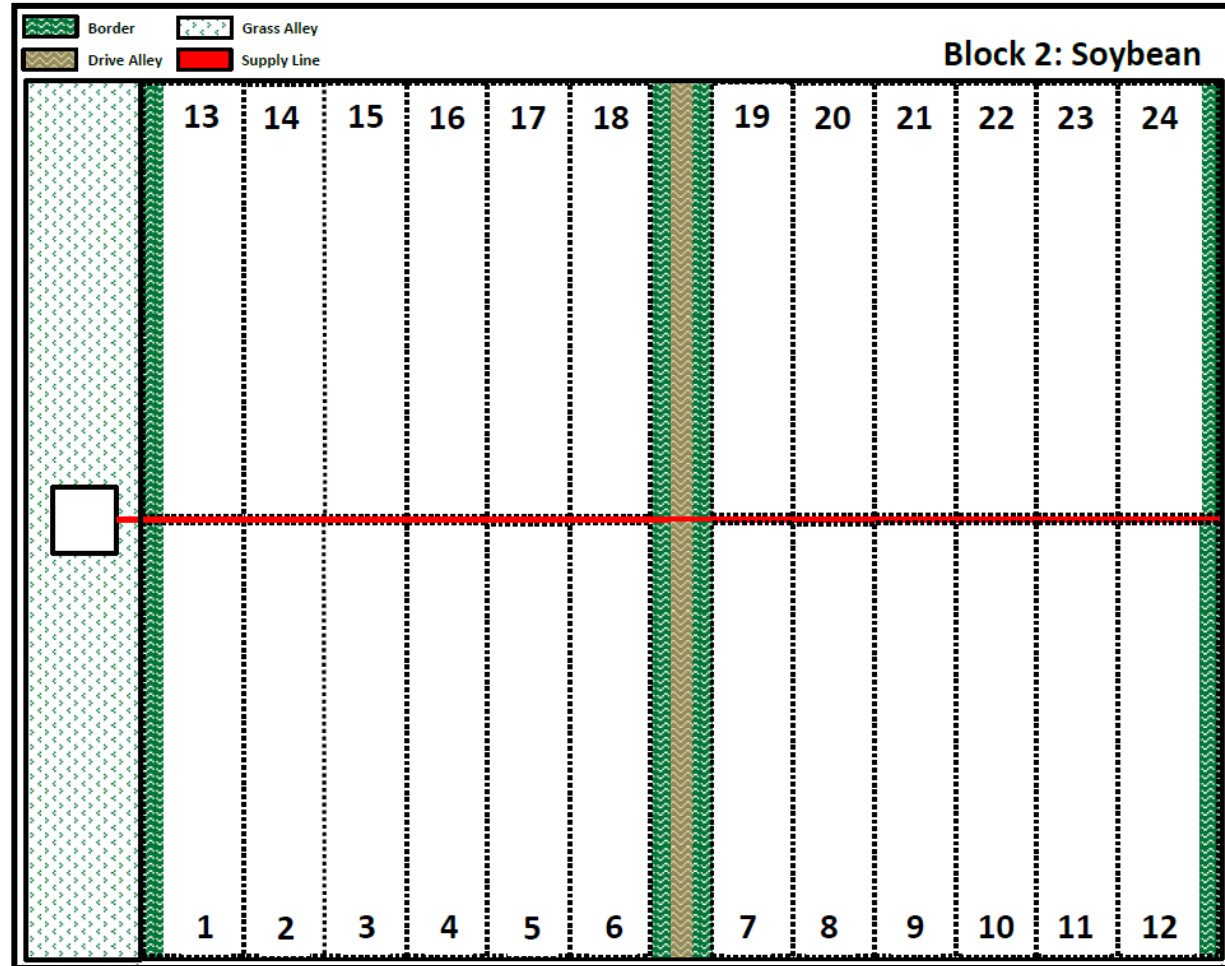
Research Objectives



Can we use subsurface
drip irrigation provide
in-season nutrient
availability and alleviate
plant stress?

University of Illinois SDI System

- Five acres of corn and five acres of soybean with 24 equally sized zones per crop
- Zones regulated for differential application of irrigation and fertigation
- Completed May, 2014



Innovative Subsurface Drip System

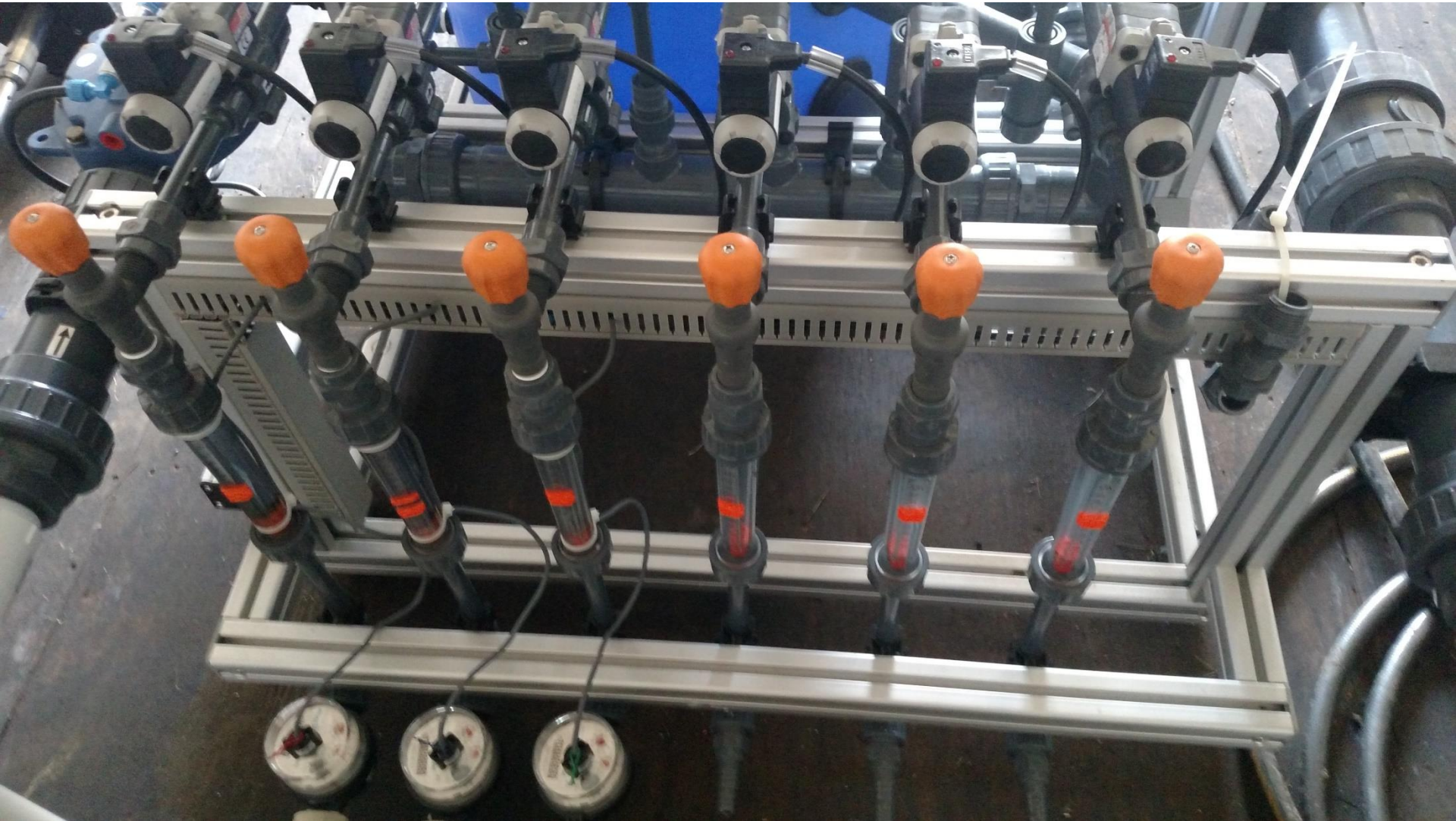
- **Dripperline spaced every 30” buried ~14-16” below ground**
- **24 different zones for each crop allows for precise application of nutrients according to plant needs**



Innovative Subsurface Drip System



Innovative Subsurface Drip System



Hypothesis for Better Nutrient Use with Subsurface Drip Irrigation

- **Even when water from irrigation is not needed, we can increase corn yields by 30 bushels by better timing nutrient availability with plant needs**

Visual Fertigation Response- 2014



All treatments balanced for water. Champaign, IL

Visual Fertigation Response- 2015

Control
180 lbs N



Fertigated
180 lbs N +
(113 -120 -150 -12S)

All treatments balanced for water. Champaign, IL

Fertigation Improved Yield Over Base Fertility

Treatment	2014	2015
bushels/acre		
Irrigated	175	194
Fertigated	195	246
Δ	20	52

- Irrigation = 180 lbs N (adequate soil test values)
- Fertigated 2014 = 180 lbs N plus 80-0-70-14S
- Fertigated 2015 = 180 lbs N plus 113-120-150-12S
- Average of 5 hybrids and 4 plant densities

Can We Improve Corn Yield By Better Timing of Nutrient Availability?

- **Same level of nutrients applied
180 N – 100 P₂O₅ – 100 K₂O**
- **Apply all to soil at planting
with no supplemental water**
- **Apply half at planting and the
other half via subsurface
fertigation (with 17" water)**

Fertigation Nutrient Application Schedule - 2016

Growth Stage	Application Amount (lbs/acre)		
	N	P ₂ O ₅	K ₂ O
V5&6	45	0	0
V7&8	9	0	10
V11&12	9	10	15
V13&14	9	10	10
VT&R1	5	0	10
R2&R3	5	10	5
R4&R5	8	20	0
Total	90	50	50

In addition to 90-50-50 lbs at planting

Critical Need for a Upfront Fertility

Hybrid	100% Preplant	50% Preplant + 50% Fert.	Δ
bushels/acre			
7087VT2P	258	197	-61*
8621VT2PRIB	244	200	-44*
DKC61-54	232	191	-41*
DKC64-87	248	205	-43*
N74R-3000GT	253	180	-73*
Average	247	195	-52*

Average of four plant densities

All treatments received (180-100-100) Champaign, IL 2016.

Upfront versus Split Application of N in 2016

- **Champaign, IL, 4th year corn with total of 160 lbs N/acre**
- **Harrisburg, IL , corn/soybean rotation with total of 140 lbs N/acre**
- **For both sites: Upfront N as surface applied urea; Split as half urea upfront and half at V8 as UAN surface applied as either broadcast or using Y-drop**
- **Measure grain yield and total (above ground) plant N accumulation at physiological maturity (R6)**

Research Y-Drop Applicator Courtesy of Yield 360



Upfront versus Split Application of N in 2016

Treatment	Grain Yield	Plant N Accumulation
	bushels acre ⁻¹	lbs N acre ⁻¹
No Applied N	63	54
All N Upfront	203	156
50/50 Split Broadcast	182	122
50/50 Split Y-Drop	190	131
LSD (0.10)	11	15

Champaign, IL 4th year corn with total N of 160 lbs N/acre
Upfront N as urea; Split as half urea upfront and half at V8
as UAN sprayed down the center of the row or as Y-drop

Upfront versus Split Application of N in 2016

Treatment	Grain Yield	Plant N Accumulation
	bushels acre ⁻¹	lbs N acre ⁻¹
No Applied N	70	51
All N Upfront	160	110
50/50 Split Broadcast	144	98
50/50 Split Y-Drop	150	98
LSD (0.10)	8	9

Harrisburg, IL corn/soybean rotation with total N of 140 lbs N/acre, Upfront N as urea; Split as half urea upfront and half at V8 as UAN sprayed down the center of the row or as Y-drop

Conclusions

- **Substantial yield increases are possible with fertigation using subsurface dip irrigation, but a certain level of up front fertility (nitrogen?) is needed for success**
- **Fertility sets the trajectory for rapid plant growth and high corn yields**

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For more information:

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University of Illinois**

<http://cropphysiology.cropsci.illinois.edu>