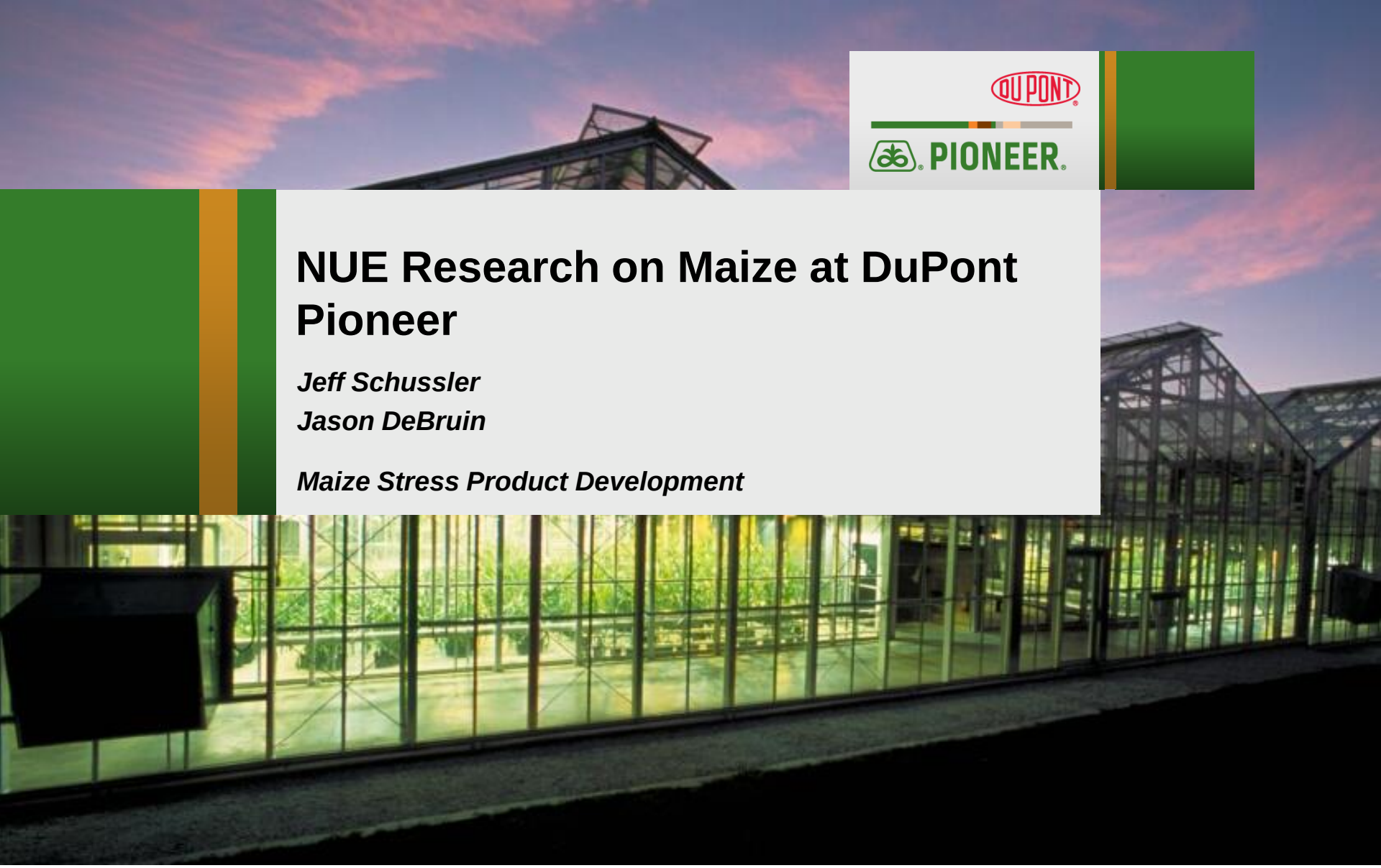

NUE Research on Maize at DuPont Pioneer

Jeff Schussler
Jason DeBruin

Maize Stress Product Development

NUE Approaches

- Identify sources of positive genetic variation for enhanced NUE.
- Native sources and transgenic sources.
- Develop testing infrastructure to measure enhanced NUE in high and low N conditions.
- Advance products.

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What is NUE?

Nitrogen use efficiency = Nitrogen in grain/Nitrogen in soil

Two components:-

Nitrogen uptake efficiency = Nitrogen in plant/Nitrogen in soil

Nitrogen utilization efficiency = Nitrogen in grain/Nitrogen in plant

NUtE is Another Important Component of NUE

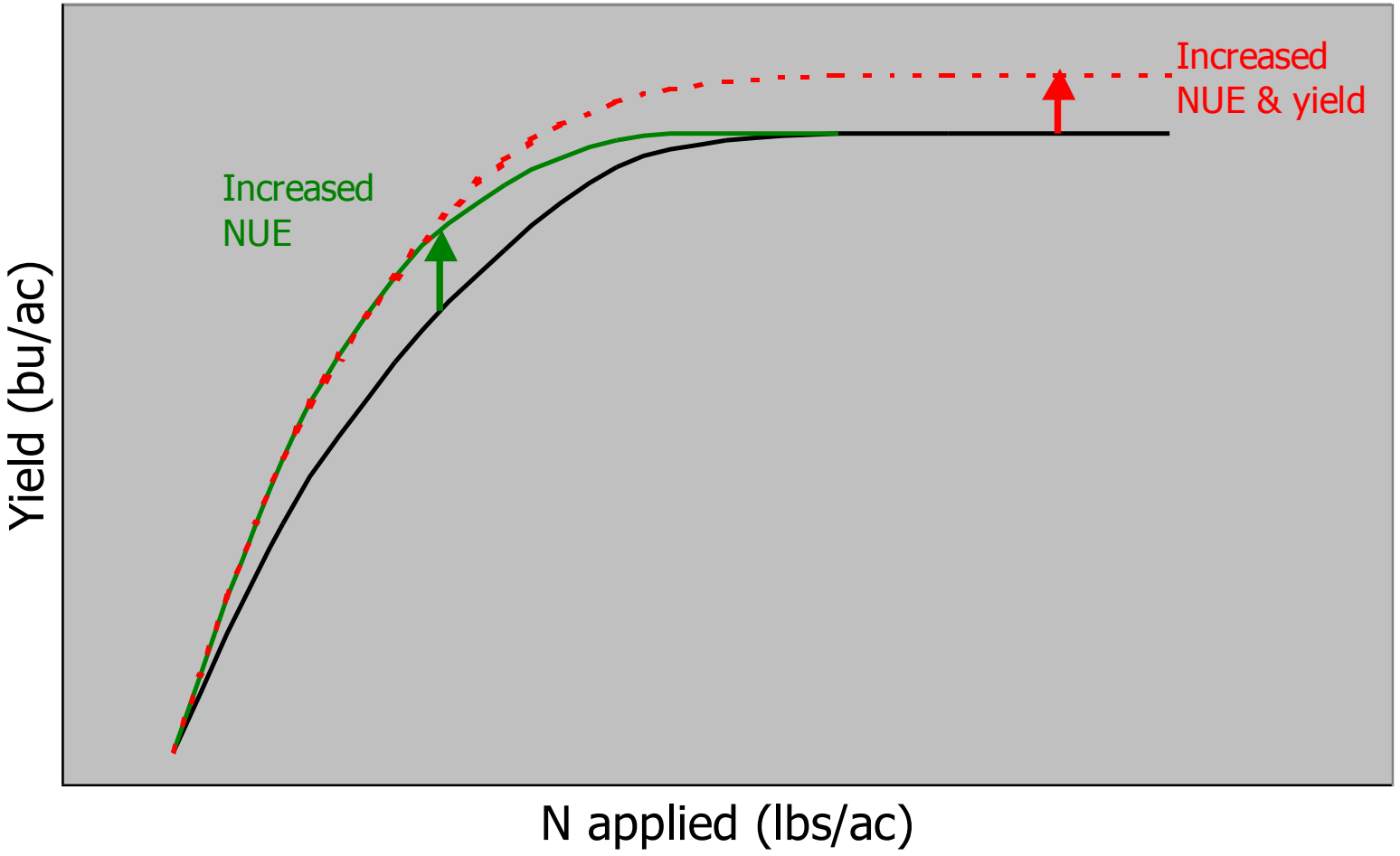
NUE = NUpE * NUtE

Genetic Diversity for NUE in Corn

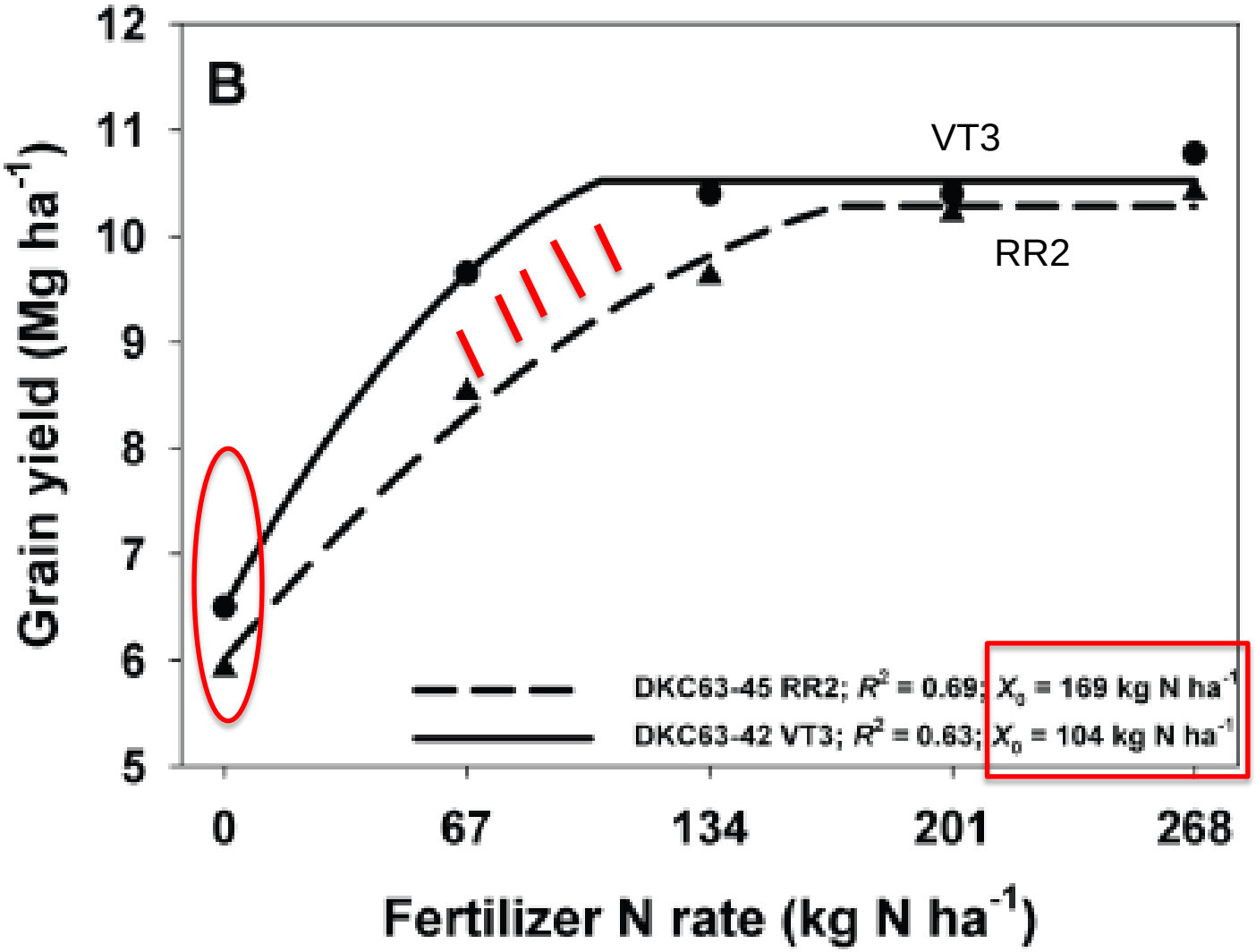
Genotype	Yield Change	NUE	NuptakeE	NutilizationE
6 commercial hybrids	4.4	25	56	40
B73xCML52	9.7	48	94	51
B73xCML247	9.0	44	48	92
B73xMo18W	8.7	43	40	108
B73xKi11	6.5	32	61	53
B73xTzi8	5.6	28	22	125
B73xKi3	5.0	25	26	97
B73xNC350	4.6	23	92	25
B73xTx303	4.2	21	36	59
B73xCML277	4.2	21	31	67
B73xMo17	3.9	19	27	70
B73xCML333	3.9	19	26	74
B73xOh43	3.4	17	25	66
B73xMS71	2.5	12	26	47

Source: Moose, Below, Buckler - Gene discovery for maize responses to nitrogen project proposal

NUE Initiative



Recent N rate x hybrid interaction due to rootworm control



Haegele and Below. 2013. Crop Sci.

NUE Lead Targets

N remobilization

N assimilation
--N & C coupling

Translocation

Nitrate uptake

NO_3^- NO_3^- NO_3^-

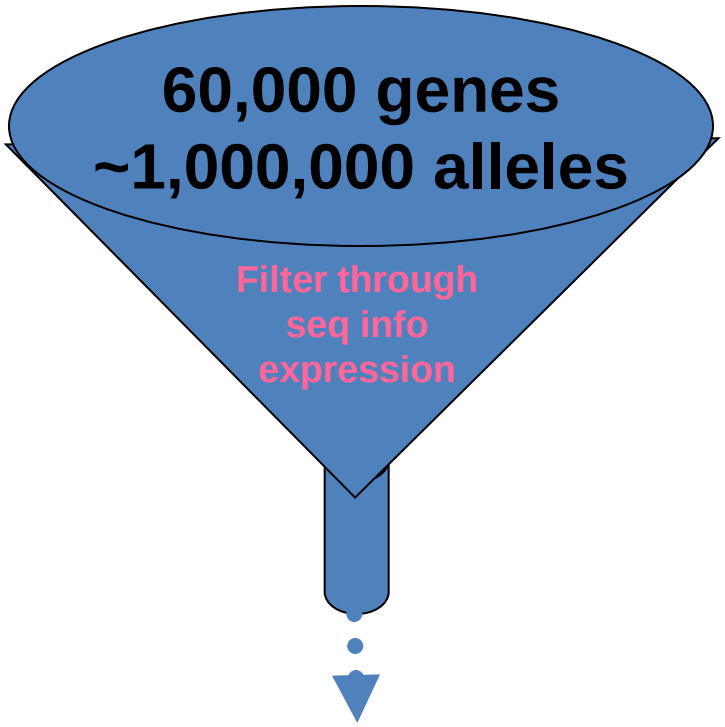
Root architecture
for better N capture

1 2

Internal / licensed leads

Model system leads

Critical issue for Gene Discovery…How to Start…



phenotype

Reverse Genetics

phenotype

60,000 genes
~1,000,000 alleles

Forward Genetics

Arabidopsis Model System

Small size, short life cycle, sequenced genome:
An excellent model system for plant genetics

Analysis of the genome sequence of the flowering plant *Arabidopsis thaliana*

NATURE |VOL 408 | 14 DECEMBER 2000

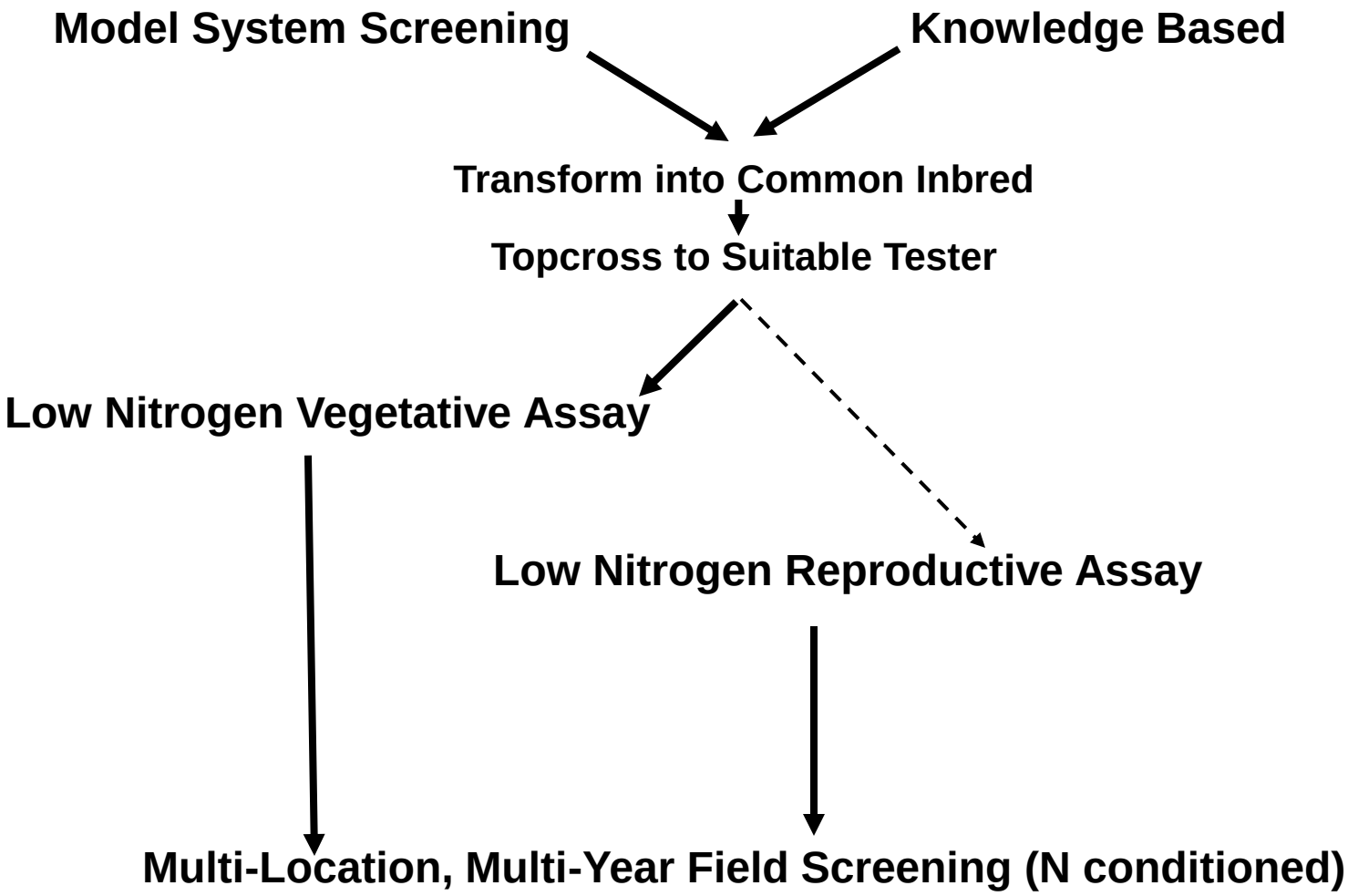
FAST Corn Nitrogen Assay

Low Nitrogen Level Treatment

Normal Nitrogen Level Treatment

FAST Corn Evaluation

NUE Pipeline

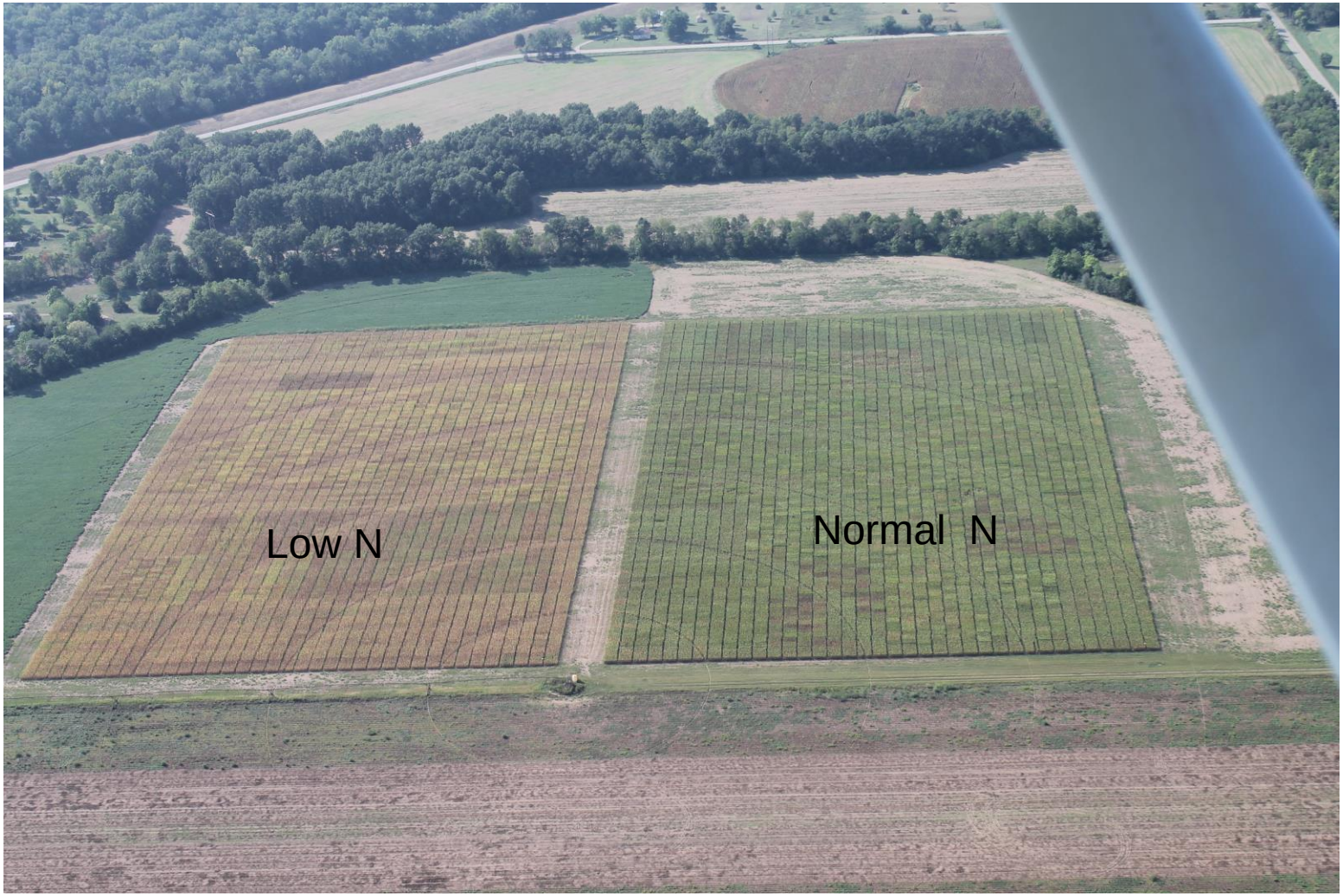



DuPont Experimental Station
Wilmington, Delaware

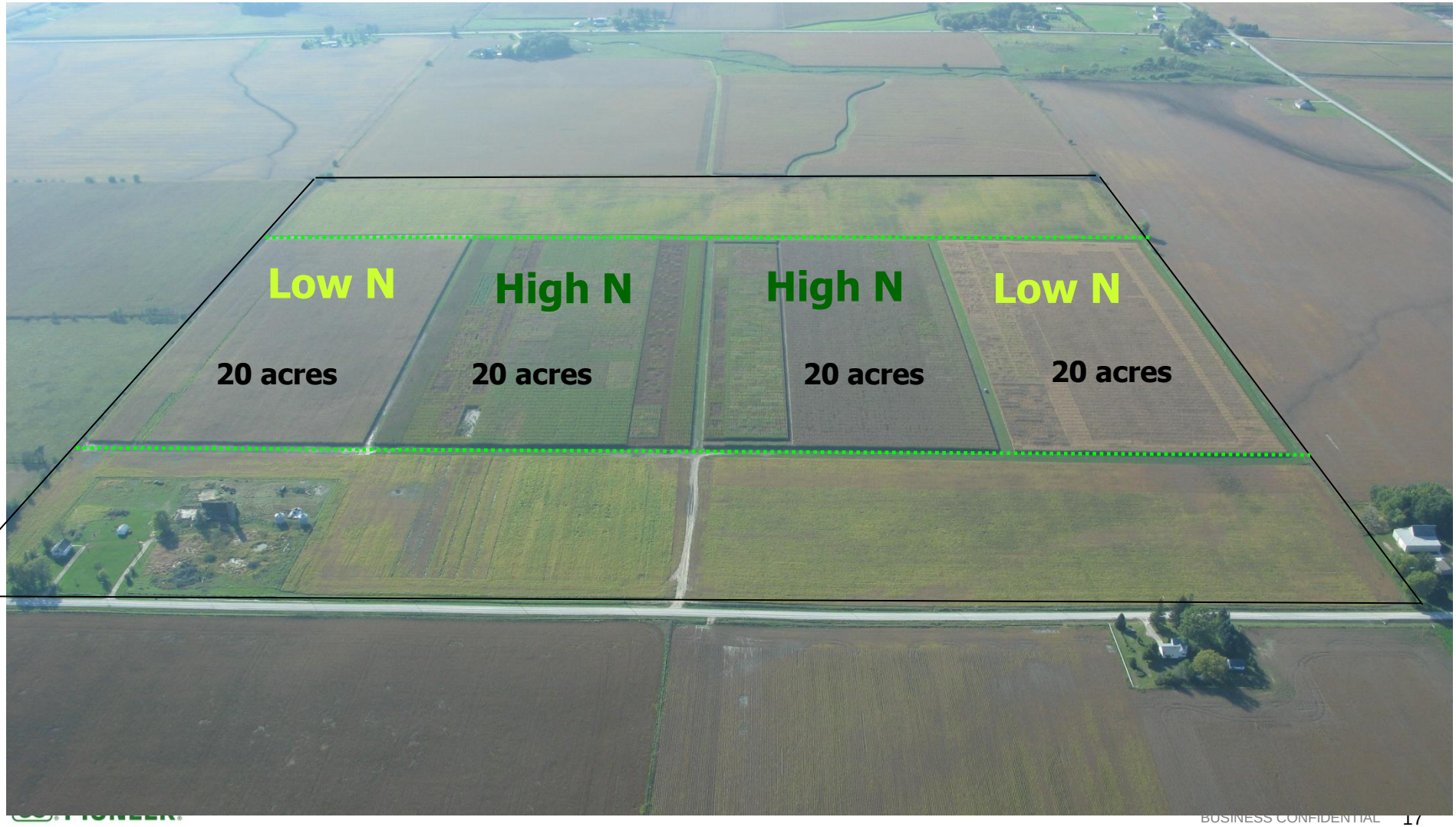
The DuPont Knowledge Center (DKC) in Hyderabad, India

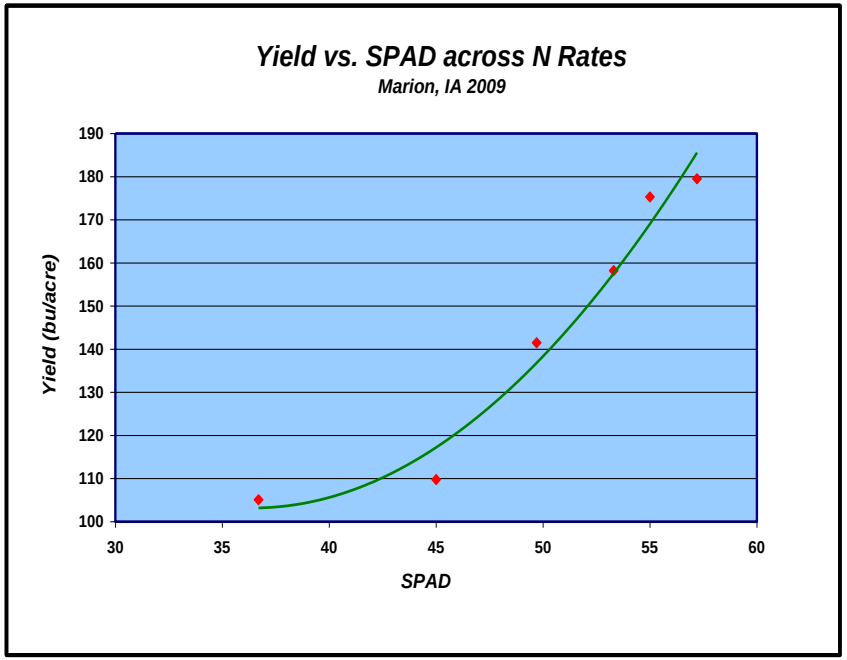
Developing NUE field sites

Developing NUE field sites



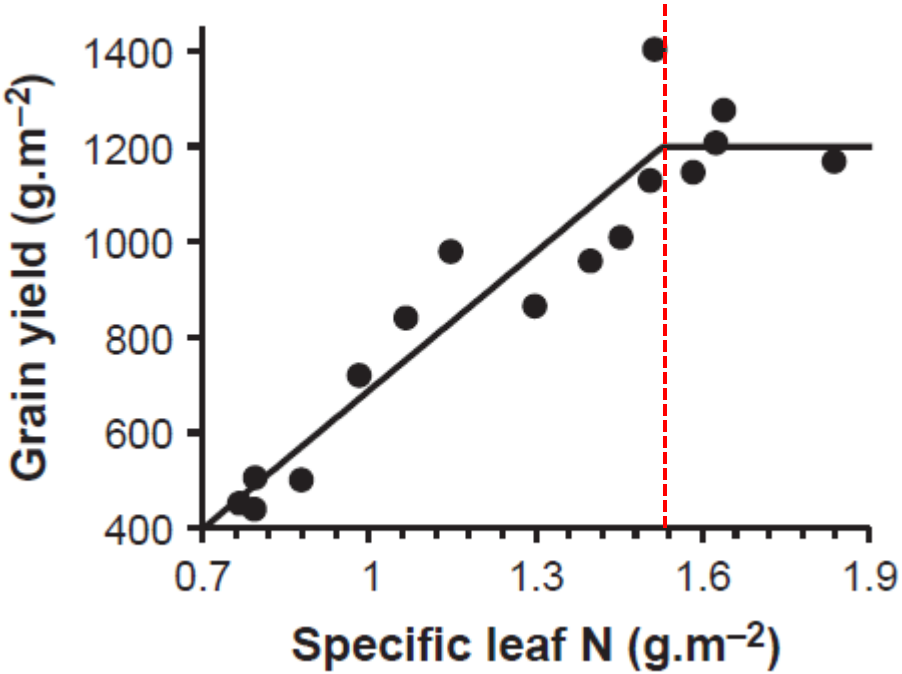
Developing NUE field sites





0 lb N/ac | 20 lb N/ac | 40 lb N/ac | 60 lb N/ac | 80 lb N/ac | 100 lb N/ac

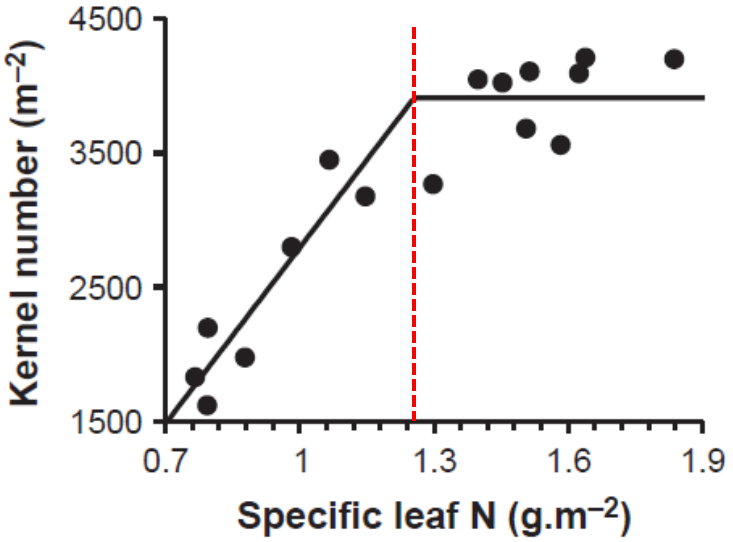
Critical SLN Value – defines the target

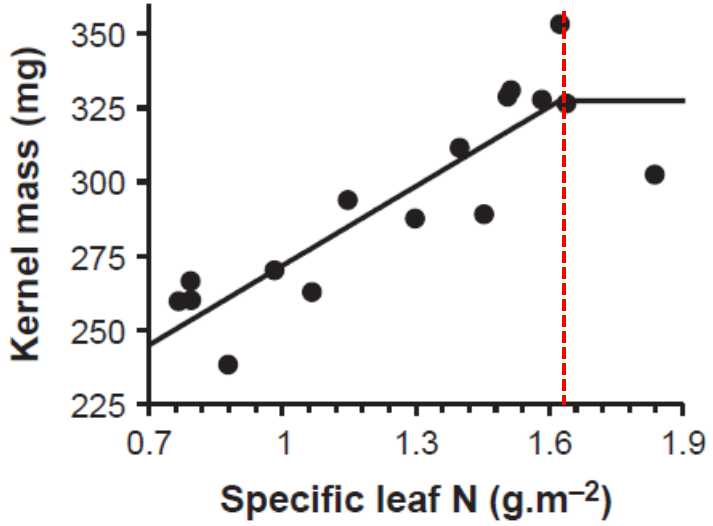


DeBruin et al., 2012. Plant Breeding

Yield components of kernel number/ear and kernel mass differentially impacted by SLN

DeBruin et al., 2012. Plant Breeding





Transgenic Testing for NUE

Dwight Tomes & Xiaomu Niu

Transgenic Testing for NUE

Transgenic Testing for NUE

+ Gene

- Gene

NUE Ear Phenotype

- Gene

+ Gene

Transgenic Pipeline

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Trial to evaluate N response curve of NUE+ hybrids from Europe and NUE- hybrids. Hybrids range from 80-94 CRM.

Entries : 6	N Rates:	Reps : 10	Locs: 3
Exp 1 NUE+	0 lb N/acre		U of MN – 2
Exp 2 NUE+	60 lb N/acre		Ithaca, MI – 1
Exp 3 NUE+	120 lb N/acre		
Com 1 NUE-	180 lb N/acre		4- row plots
Com 2 NUE-	240 lb N/acre		1200 rows/loc
Com 3 NUE-			

Plan to discuss with U of MN on August 5-6th.

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