INCREASING LATE N AVAILABILITY THROUGHOUT NEW PRODUCTS TO SOYBEAN CROPS

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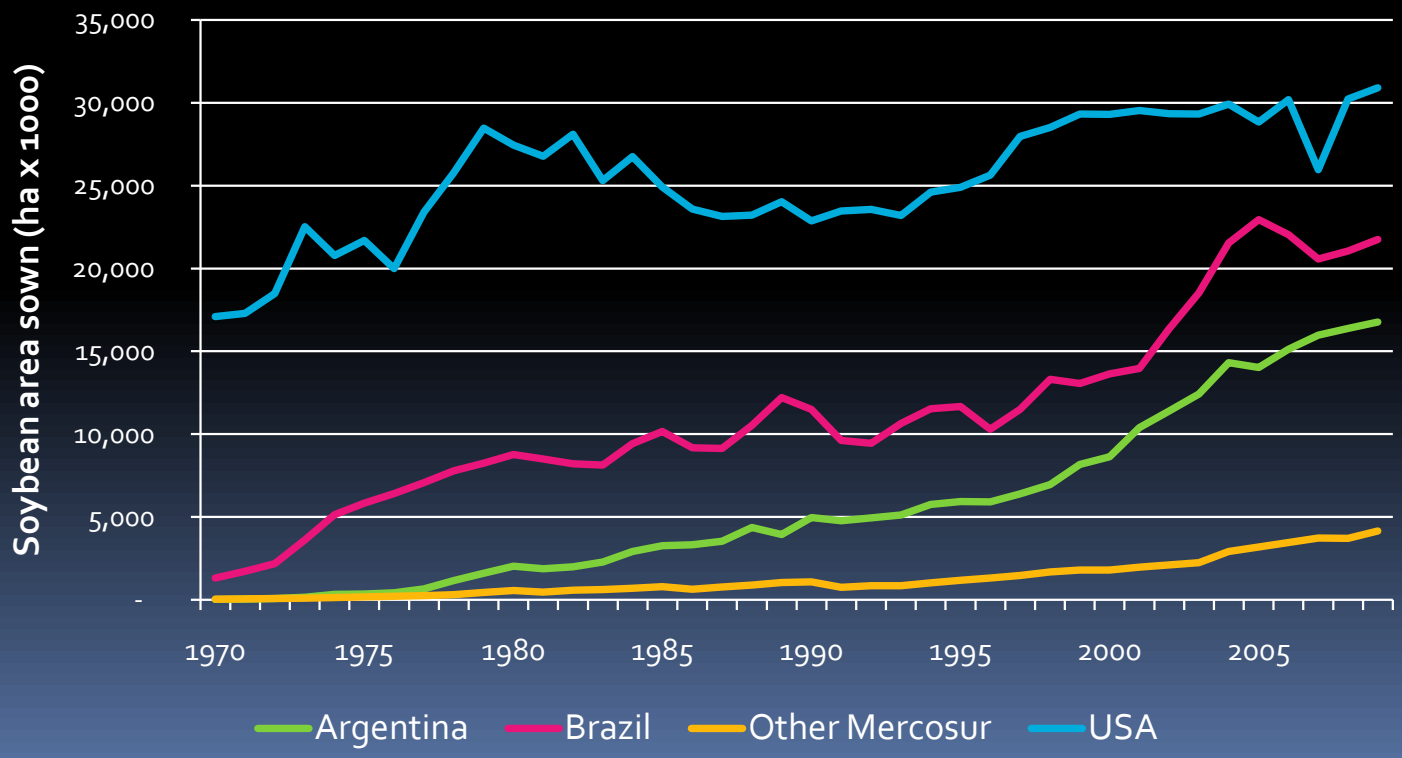
Fluid Fertilizer Foundation

INTA

Importance of soybean

- 42 % Mercosur + 33% USA = 75 % world area sown
- 4th grain sown after wheat rice and corn



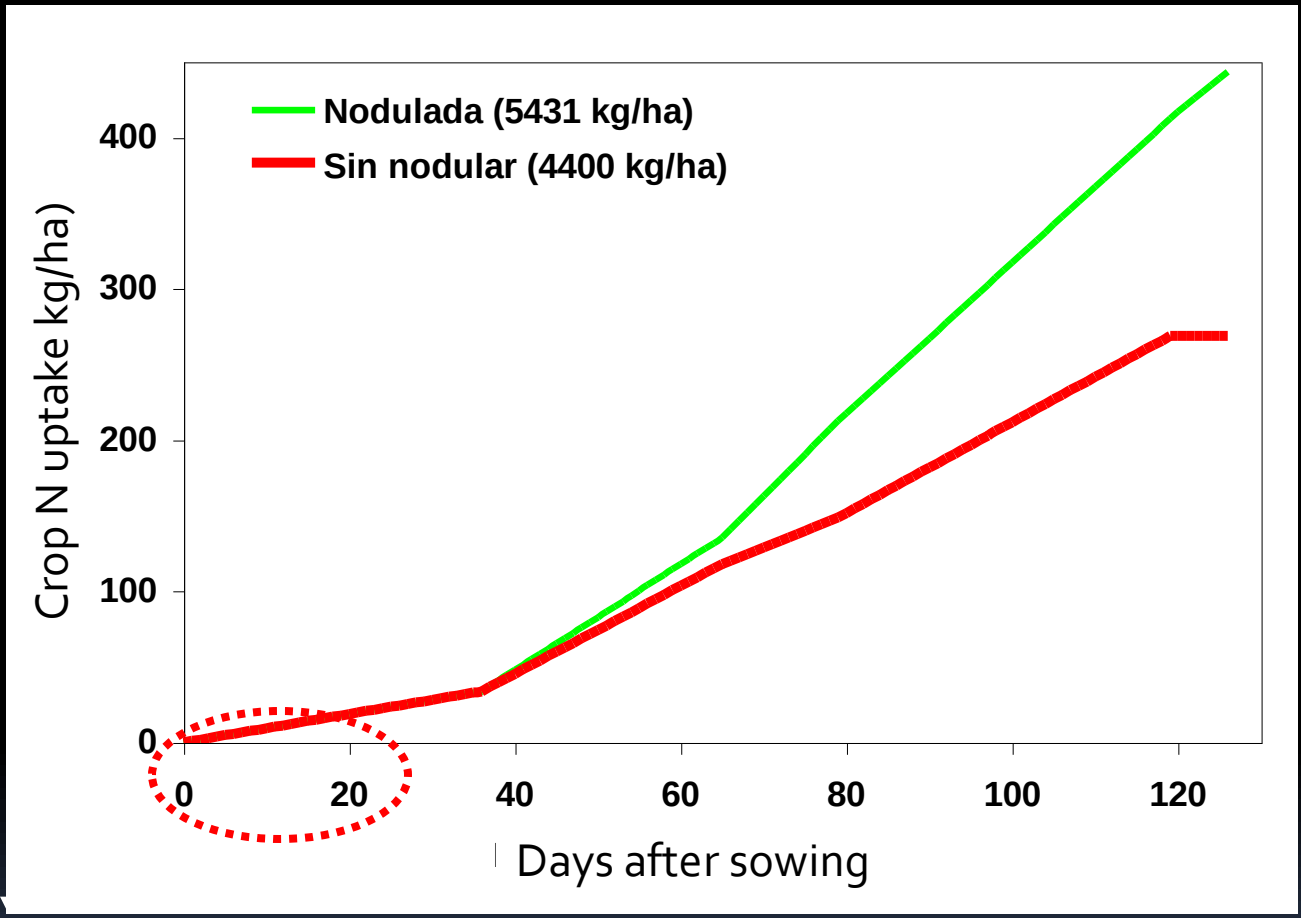
Contributions of biological N2 fixation. Implication at a global scale

- Agro ecosystems of US, Brazil and Argentina
  - Cropped in rotation with cereals (corn, wheat)
  - A great proportion under no till ➔ better C/N balance
- Proteins for the world
  - The high protein content of the soybean grains represent an important protein source for human and animal diets.
- Economy of the BNF at market values
  - **USA**. Increasing BNF efficiency worth $ 1,1 billion while decreasing 1,7 million t of N fertilizers(Tauer, 1988)
  - **Brazil.** $ 3 billion equivalent N fertilization (Hungria et al 2008)
  - **Argentina**. $ 1,1 billion equivalent N value (Ventimiglia et al, 2003)

Replacing the BNF by industrial fixation?

- Breaking the yield's plateaus
- Opportunities at farm scale economy
- New fertilizer products, precision AG tools, and farm machinery
- Part of innovation processes

Soybean - N uptake



Critical stage of setting nodules from the inoculants

- ➔ Up to R1 minimum N requirements, soil supply
- ➔ R3 - R6 maximum N assimilation. High supply by BNF

N Fertilization on soybean

Controversial

- Compete with BNF
- Inhibits nodule formation & infestation
- Inefficient – very low NUE

Facts

- Grain yield is directly related to N total in plant
- NBF Provides near between 30 to 70 % of total N uptake
- The proportion of fixed N decreases with increasing fertilizer-N additions

New products in market

Controlled release fertilizers

- Delays transformation of N of urea-compounds into soluble forms (NH_4^+)
- Nitamin & Nitamin NFusion (Georgia-Pacific)

Inhibitors of urease

- Delays transformation of urea into NH_4^+
- Agrotain

Synchronization of N in soil with plant needs maximum uptake

Objective

To evaluate the effect of increasing late N availability by improving placement/ product combinations of fluid N sources on soybean grain yields and N uptake

Field trials

- Four sites in 2008-09
- Three sites in 2009-10
  1. Crespo (Entre Rios)
  2. Pergamino (N Buenos Aires)
  3. Acevedo (N Buenos Aires)
- Ongoing in 2010-11
  - 2 locations

Nine 40 kg N ha^{-1} treatments & Check (No N)

Product	Placement
No N Fertilizer	--
Ammonium Nitrate	Broadcast
Nitamin®	Knifed or Dribbled
Nitamin NFusion	
Urea solution	
Idem + 0.5% Agrotain	

Application at V3

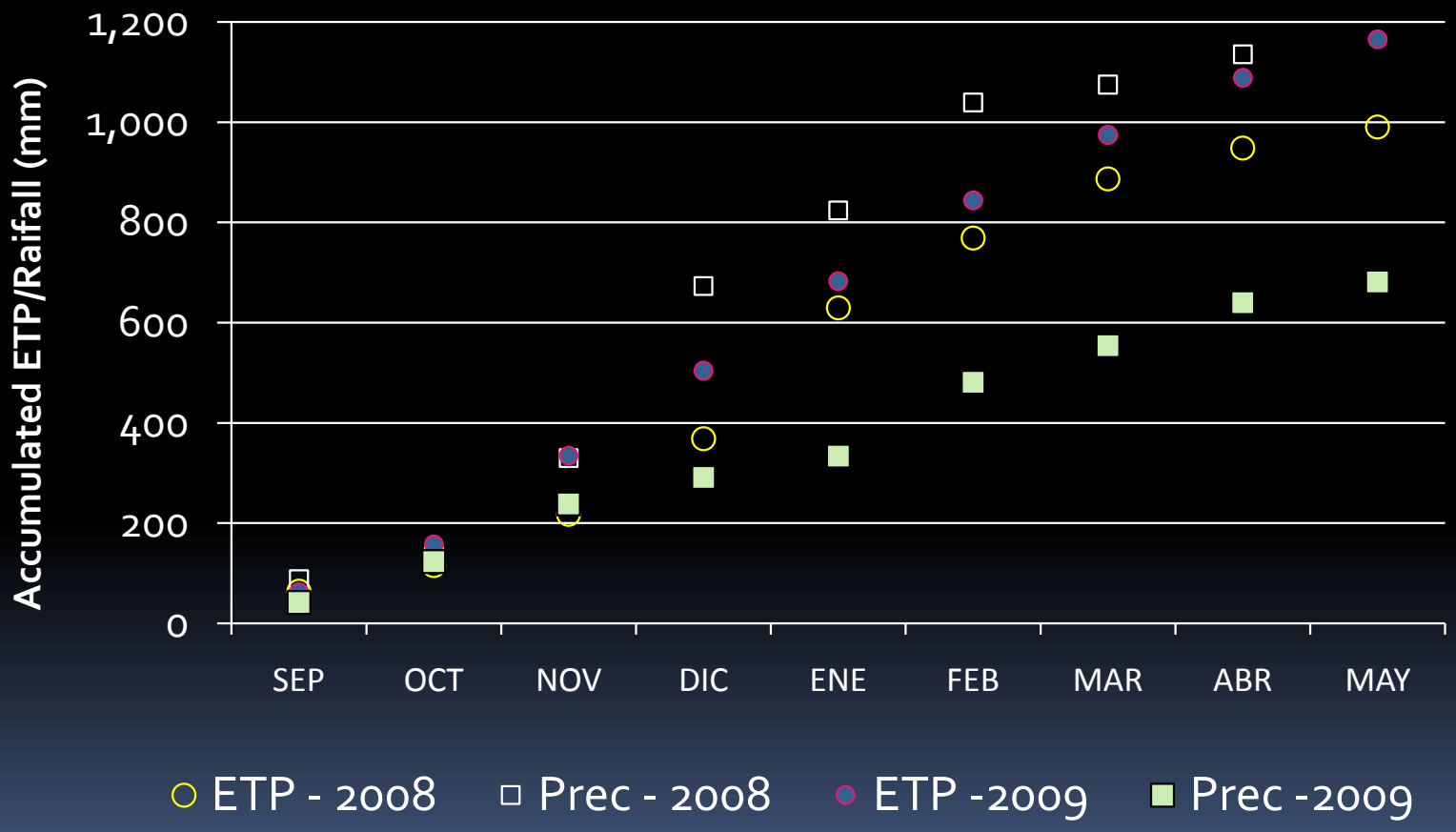
Measurements

- Total aboveground biomass at R6. (Last R-5 and Splitting leaves, stems and pods
- N concentrations in whole plants (last s. split among leaves stems & pods ➔
- N uptake in aboveground biomass at R6
- Grain yields
- Total aboveground biomass at harvest
- Grain protein

RESULTS

2008-9 & 2009-10

2008-09 Drought
2009-10 Rainy

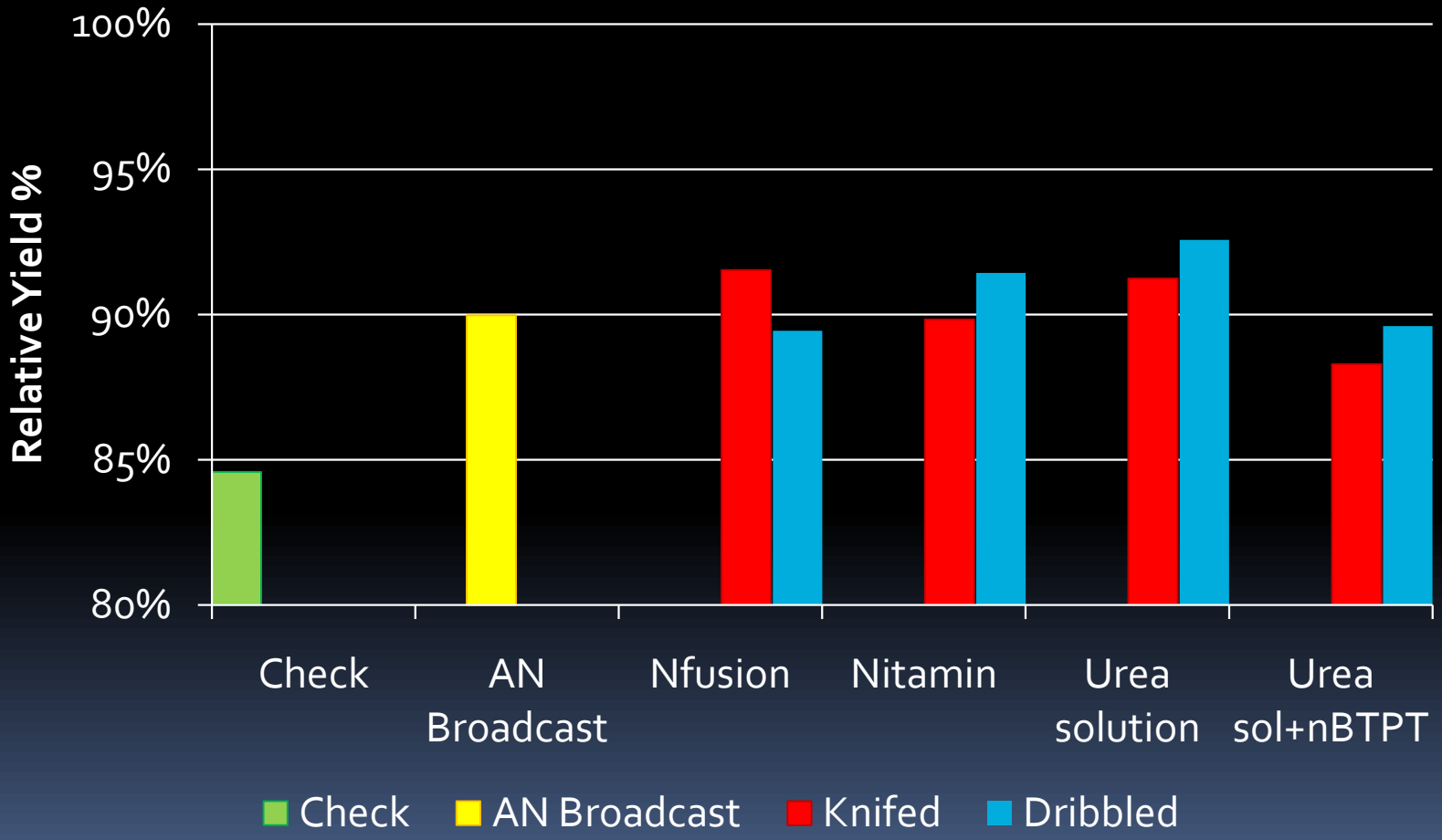


Soybean Grain Yields

Site	Check		Mean All N		ΔYield
	2008/9	2009/0	2008/9	2009/0	
	Kg ha $^{-1}$				
Mercedes	**1,825**	**-**	**2252**	**-**	**427**
Crespo	**1,953**	**2,522**	**2270**	**2914**	**354**
Ocampo/ Pergamino	**1,963**	**2,861**	**2069**	**2,865**	**55**
Acevedo	**1,471**	**3,877**	**1219**	**4,350**	**111**

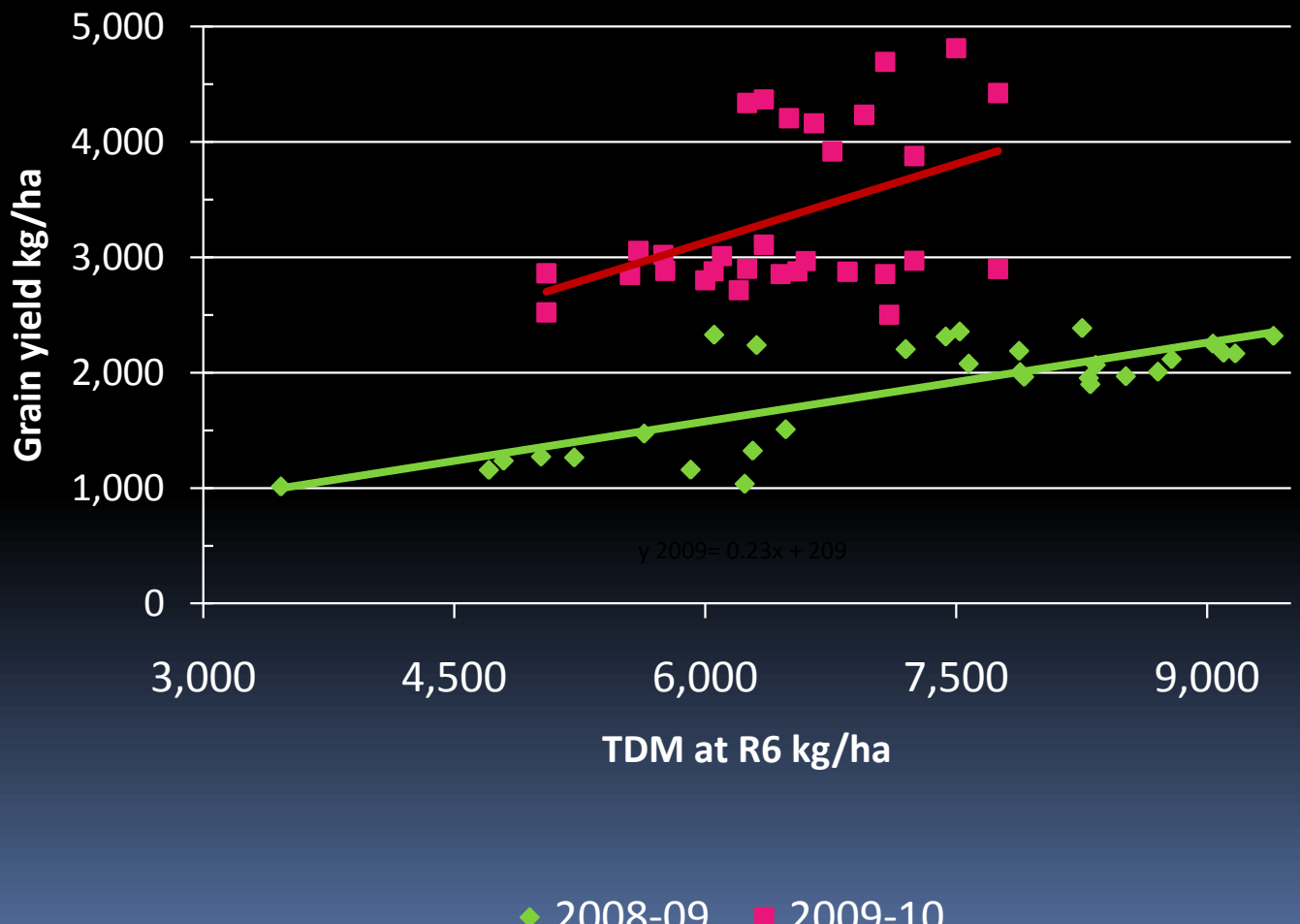
We were unable to find site factors that explain N response differences

Results across sites/years

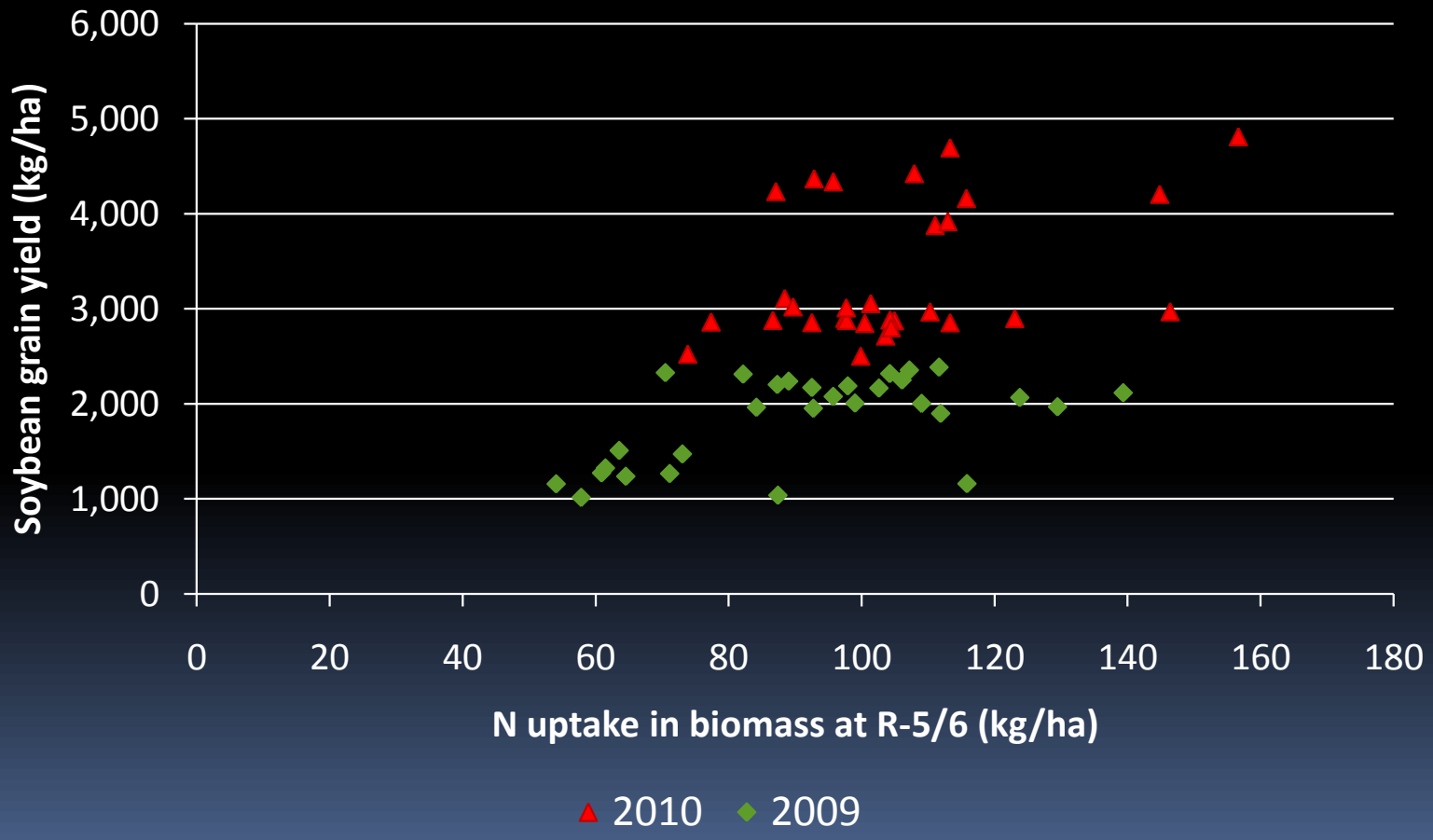


We were unable to find timing or source factors that explain N response differences

Grain yields were related to Total Aboveground Biomass Yields

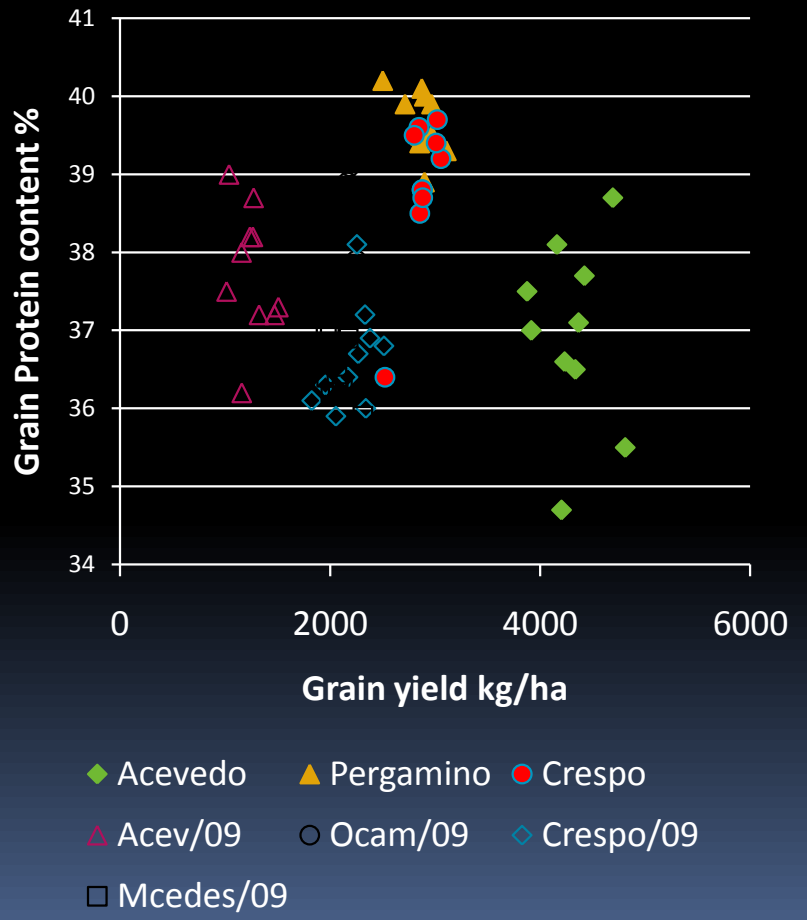


Grain yields were related to N Uptake in grain



Grain yields did correlate to grain protein, but trends exist for treatments

Treatments	Protein 2 yr Mean	
Check	37.4 %	
Control	38.4 %	
All N Knifed	38.0 %	
All N Dribbled	37.7 %	
NFusion		38.1 %
Nitamin		37.9 %
Urea Sol.		37.3 %
Urea S. + nBTPT		38.2 %



Implications at farm scale

COST

- 40 kg N - urea/ha
- @ $ 1.1 /kg
- ≅ $ 42 /ha

or

- 40 lb N –urea/A
- @ $ 0.5/lb
- ≅ $ 20 /A

BENEFIT

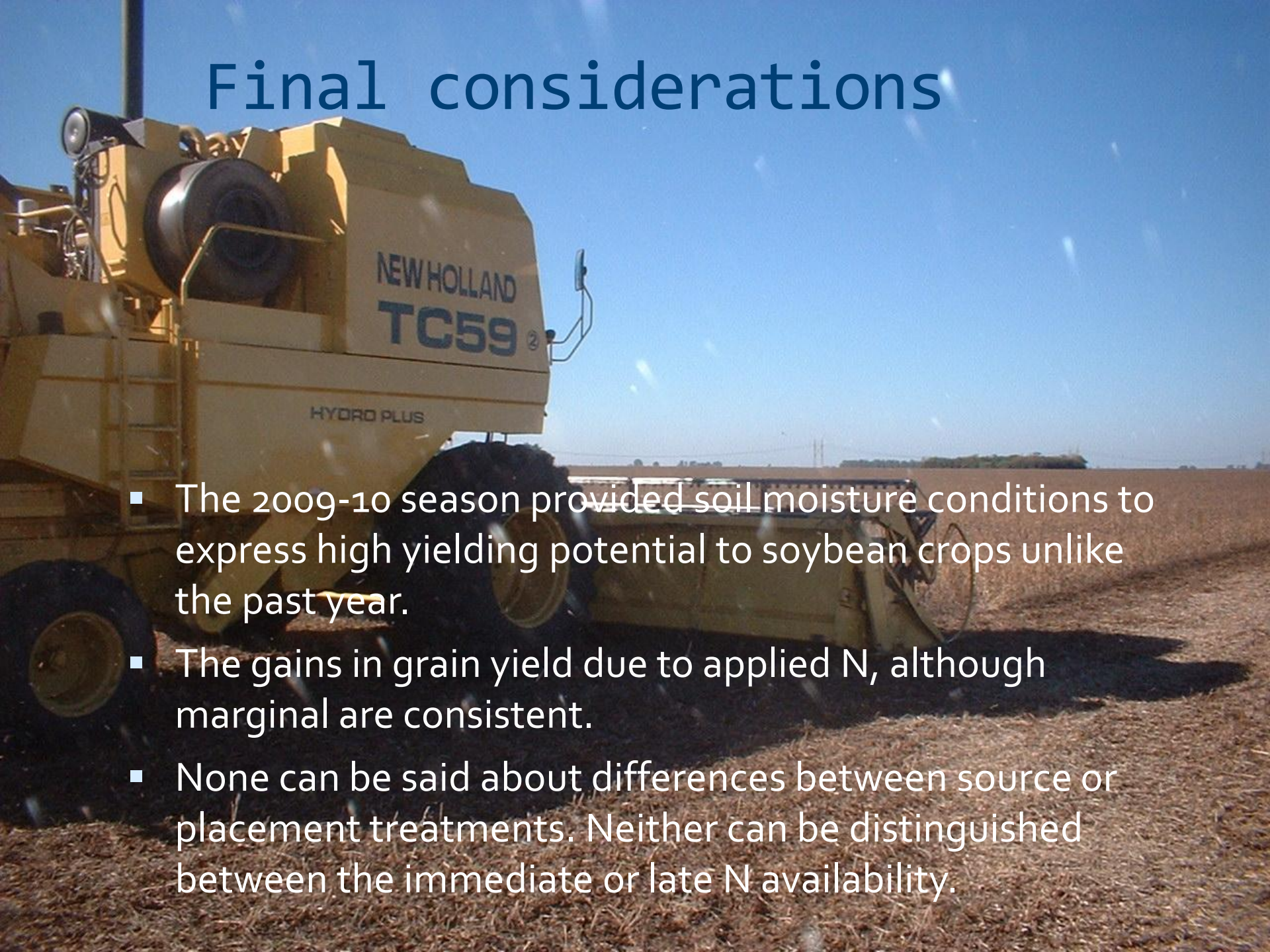
- Δ 200 kg soybean/ha
- @ $ 0.35 /kg
- ≅ $ 70 /ha

or

- Δ 2.2 bu soybean/A
- @ $ 14/bu
- ≅ $ 31/A

≅ 1:1.6

Final considerations



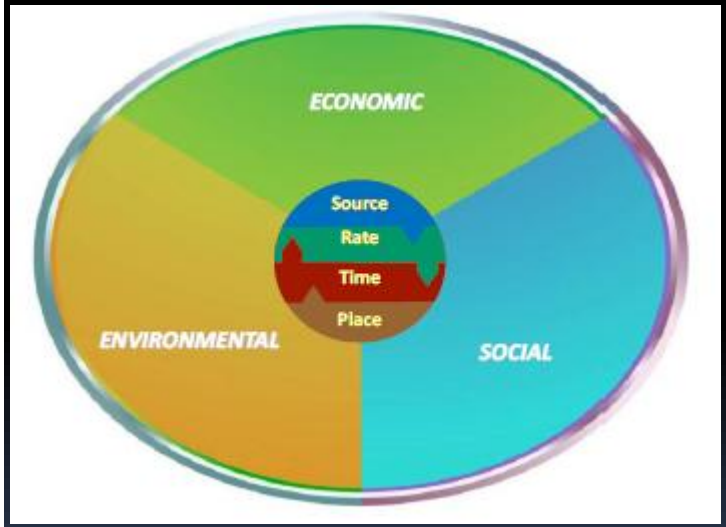
- The 2009-10 season provided soil moisture conditions to express high yielding potential to soybean crops unlike the past year.
- The gains in grain yield due to applied N, although marginal are consistent.
- None can be said about differences between source or placement treatments. Neither can be distinguished between the immediate or late N availability.

Summary findings

There was not significant differences among treatments but…

- Small but consistent yield increases. Grain yields associated to N uptake
- There were not possible to associate N sources /placement to better timing N availability
- Nor it was possible to relate with site/year factors. Responses in high & low yielding environments

What is the value of this innovation for the objective sought?



- SOURCE - Fluid – Solid -
- RATE: Low - & 40 kg N/ha
- TIME: Late - Around R1
- PLACEMENT: Fluid - Operational

The value would be much higher if diagnosis can be assesed properly. No room for trial & error approach


Thank you very much for your attention…
Questions?

Thanks so much also to my collaborators …

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