STARTER FERTILIZER OF VARYING GRADES AND RATES FOR NO-TILLAGE CORN IN ARGENTINA

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INTA - Exp.St. Pergamino and Mercedes

Fluid Fertilizer Forum , 2015

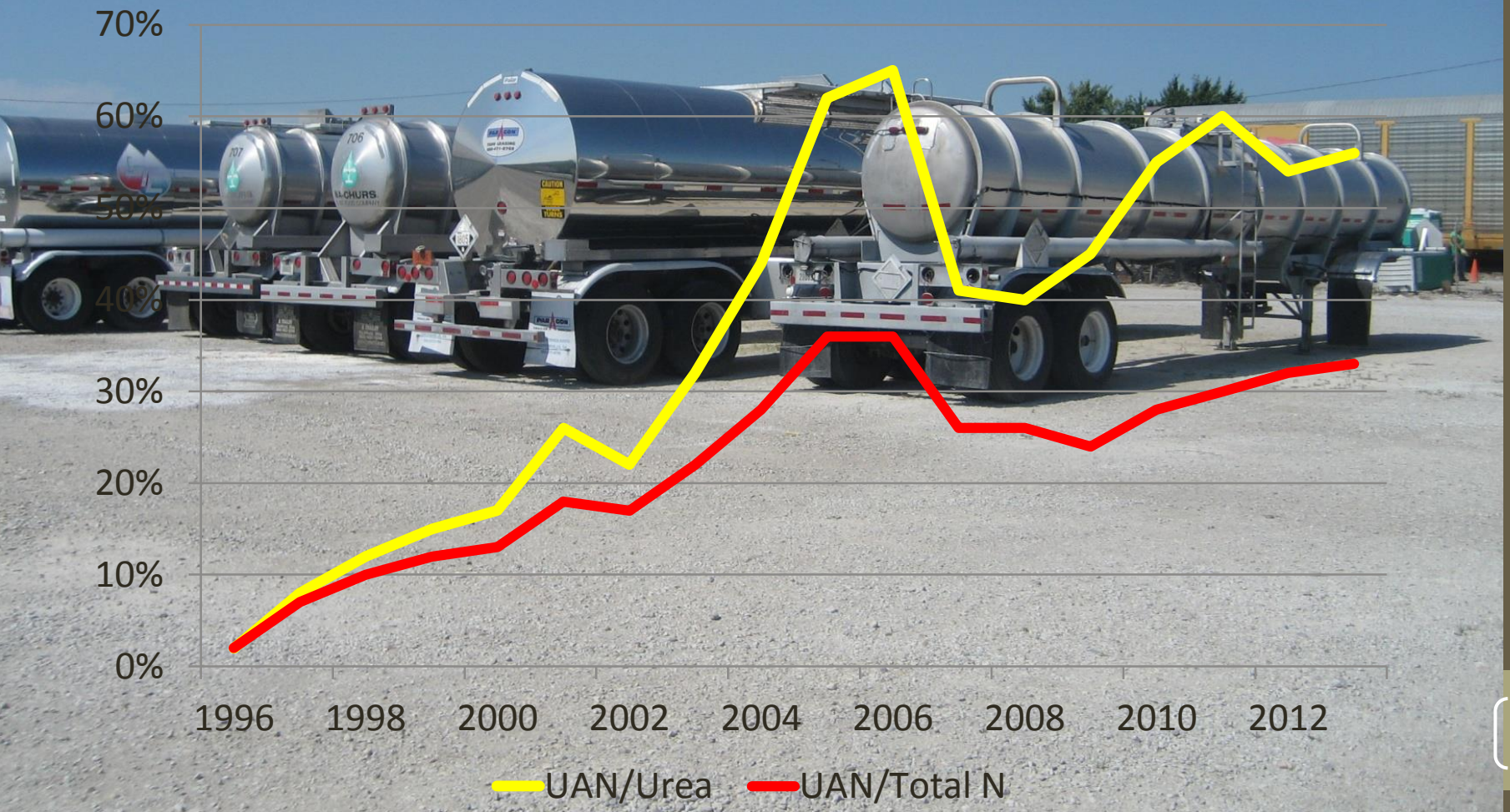
Recent market developments of NP and NPS solutions

- Mostly are manufactured by small & medium firms) for early application (pre-plant, planting, post-emergence)
- Knowledge is needed to give the proper…

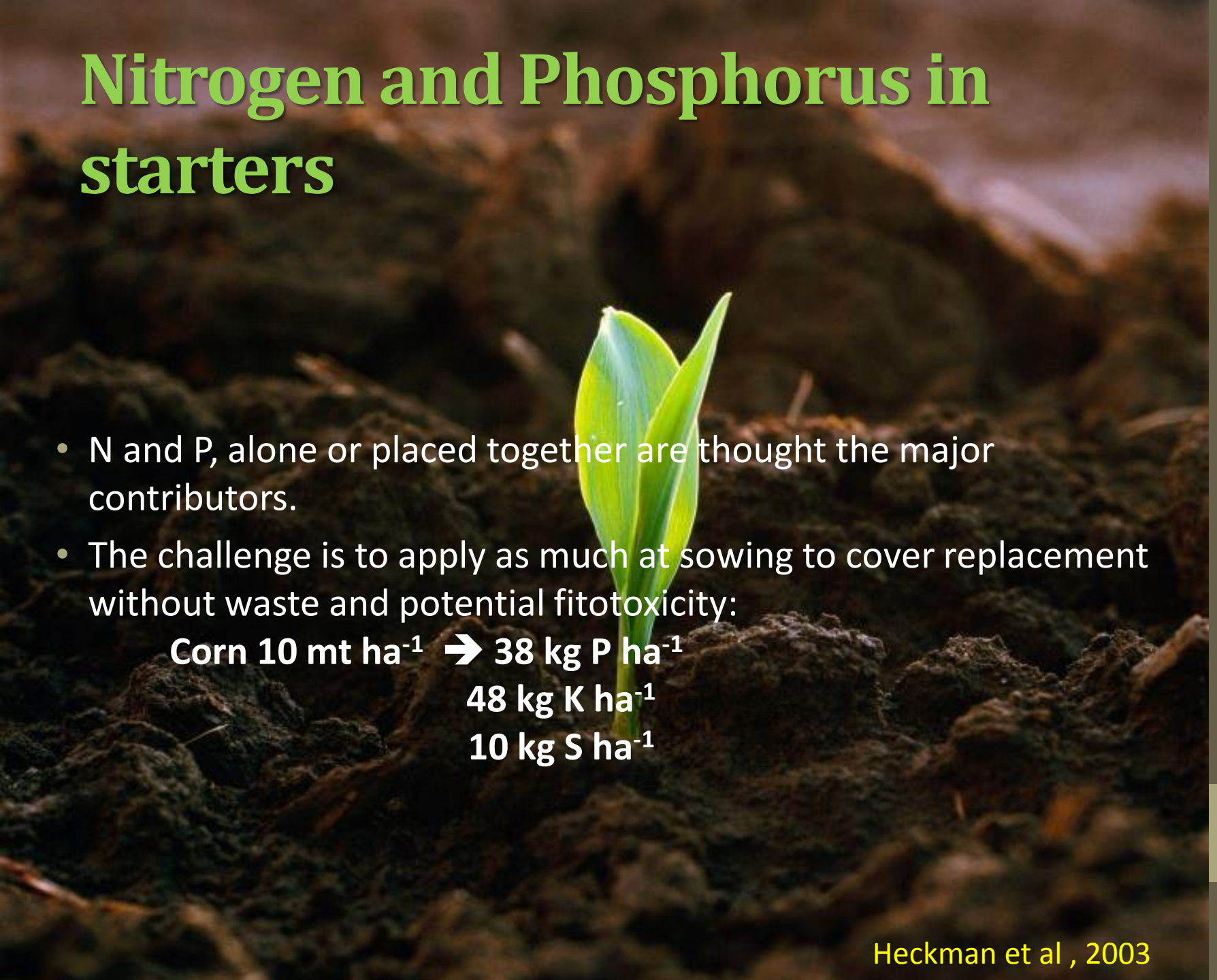
- **Timing**
- **Placement**
- **Rate**

…for this given source

Fluid fertilizers in Argentina



Nitrogen and Phosphorus in starters



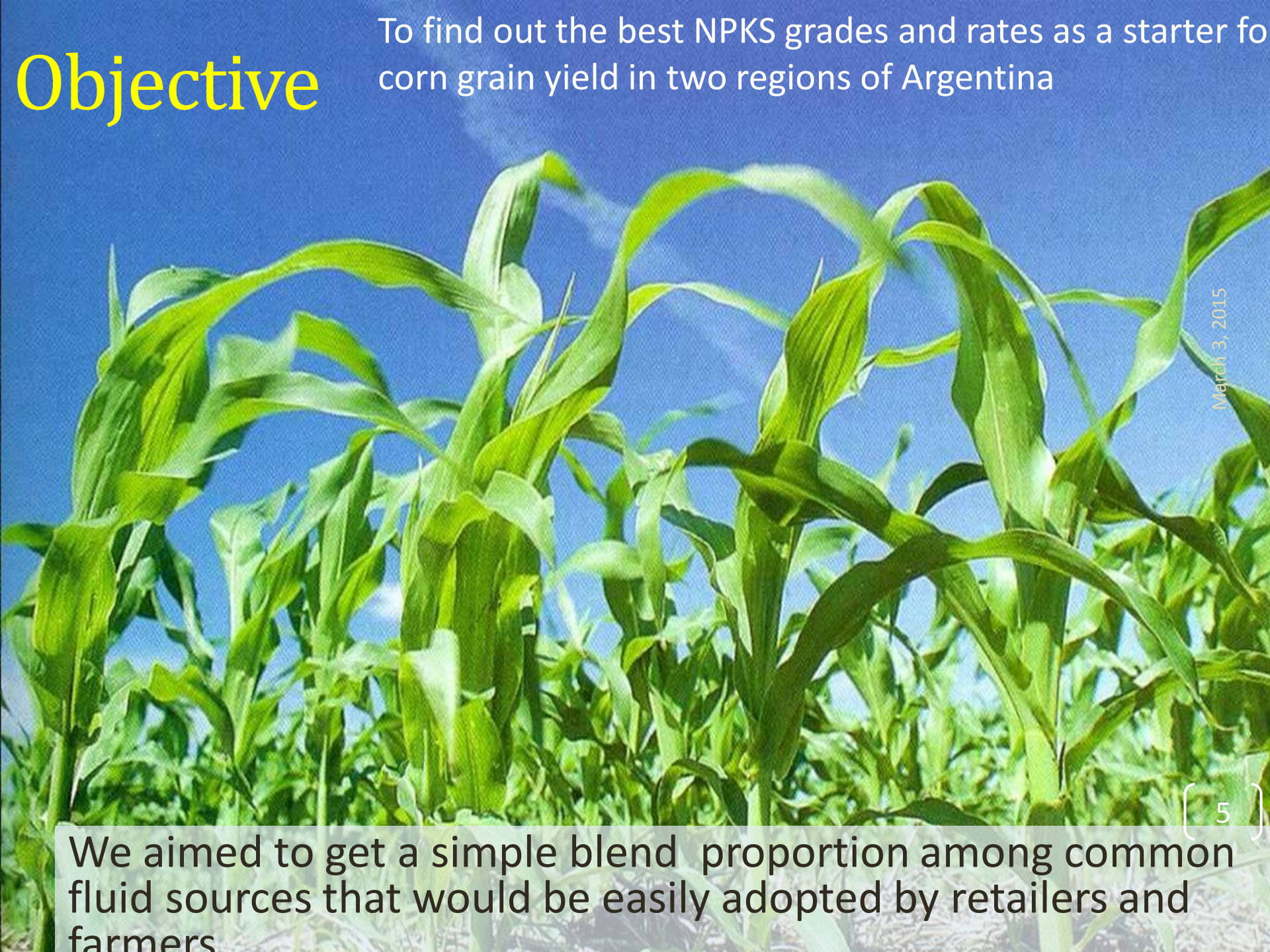
- N and P, alone or placed together are thought the major contributors.
- The challenge is to apply as much at sowing to cover replacement without waste and potential fitotoxicity:

Corn 10 mt ha^{-1} → 38 kg P ha^{-1}
48 kg K ha^{-1}
10 kg S ha^{-1}

Heckman et al , 2003

Objective

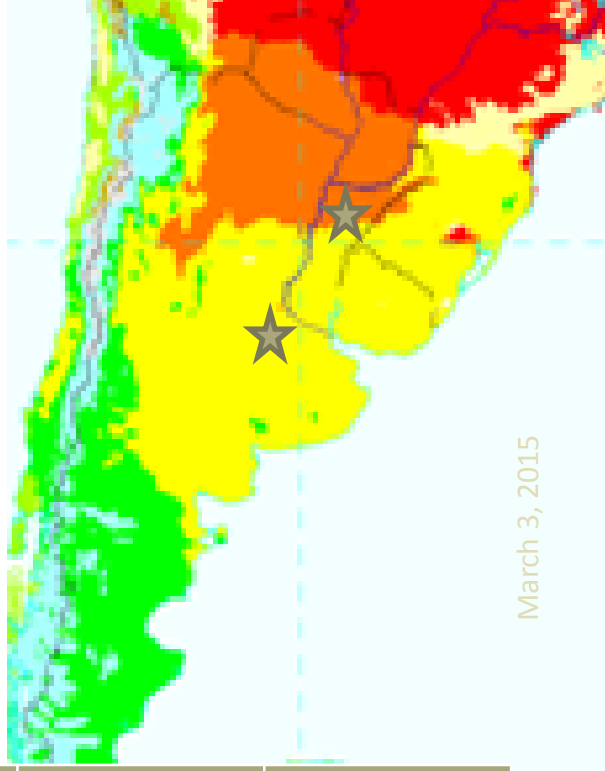
To find out the best NPKS grades and rates as a starter fo
corn grain yield in two regions of Argentina



March 3, 2015

We aimed to get a simple blend proportion among common fluid sources that would be easily adopted by retailers and farmers

Experiments in two different environments



- **Pergamino** (Buenos Aires, 34°S). Thermic. Very High soil K – low S
- **Mercedes** (Corrientes, 29°S). Hyperthermic. Very Low soil K – low S

Location	*Texture top soil*	*pH*	*OM*	*P-Bray 1*	*S-SO_4*	*K*
			g kg^{-1}	..... *mg* kg^{-1}		
Pergamino	Loamy clay	5.7	37	14.6	7.8	486
2012-13		5.5	35	44.7	17.5	505
2013-14		5.5	20	3.8	6.0	367
Mercedes	Sandy loam	5.8	24	10.0	8.0	47
2012-13		5.5	18	10.7	4.9	55
2013-14		5.5	22	5.2	5.1	51

Pergamino

2011 NK900, sown November 15-2011, 7.5 pl m^2

2012 Arvales 2310 MG, sown December 15 -2012, 7.6 pl m^2

2013 DK192, sown October 24-2013, 7.0 pl m^2

Mercedes

2011 DK390 HX RR, sown December 22-2011, 6.1 pl m^2

2012 M510 HX RR2, sown August 30-2012, 7.9 pl m^2

2013 DK190, sown September 20-2013, 6.6 pl m^2

Materials and Methods

Treatment Factors:

- Source :
  - Granular
  - Fluid
- Rates of product:
  - 120 & 180 kg/ha - Pergamino
  - 150 & 250 kg/ha – Mercedes
- Varying P:N ratios:
  - 1.0 : 1
  - 1.5 : 1
- Additional nutrient :
  - + S in Pergamino
  - + K in Mercedes

Fluid materials used to prepare the mixes

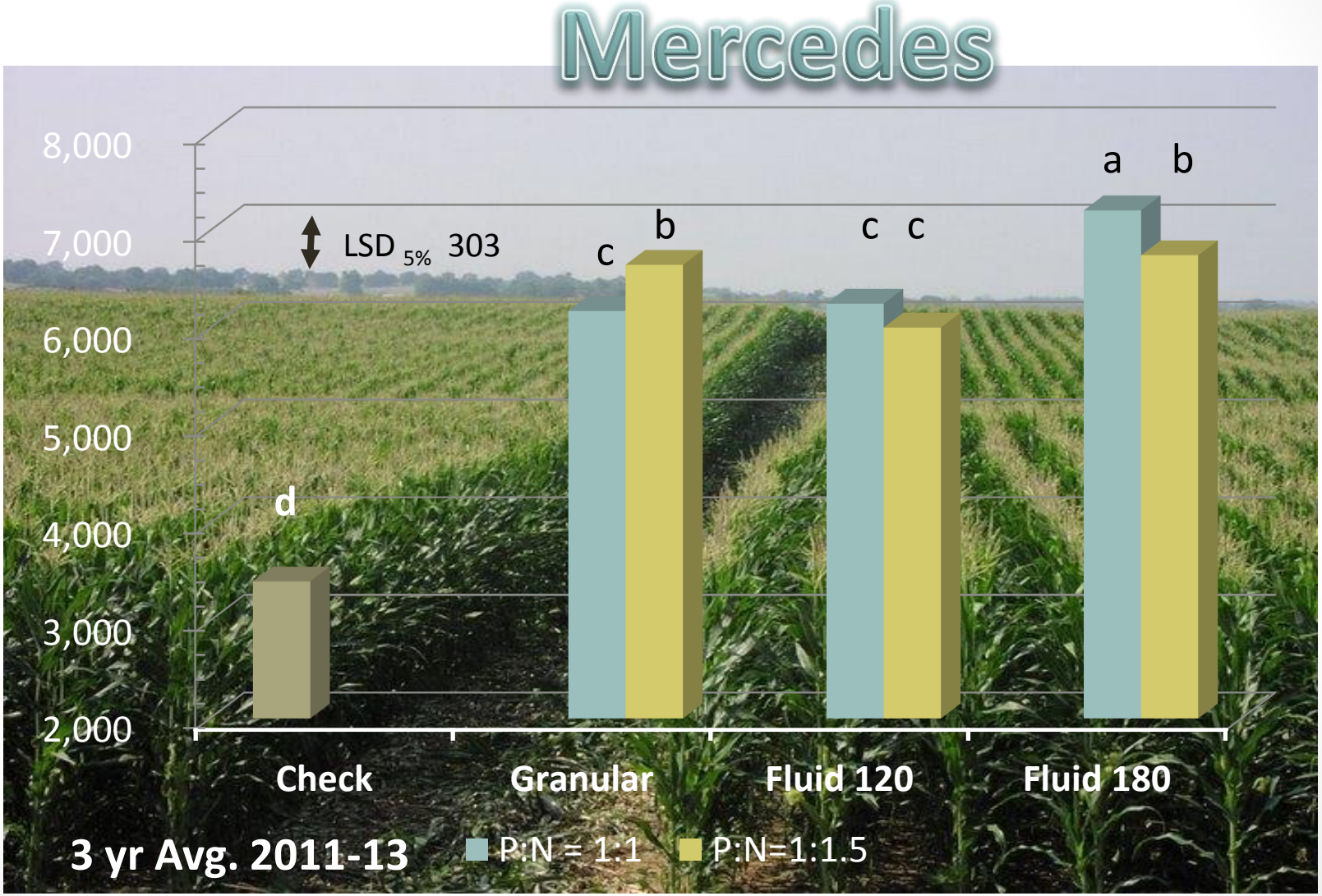
Product	N	P_2O_5	K_2O	S	SG - Density
	g/g				kg/lt
APP	0.11	0.37			1.42
ATS	0.12			0.26	1.32
KTS			0.25	0.17	1.46
UAN	0.32				1.32

Granular sources used to prepare the mixes

	Pergamino	
N:P ratio	N:P = 1:1	N:P 1:2
DAP	51%	72%
SSP	49%	28%

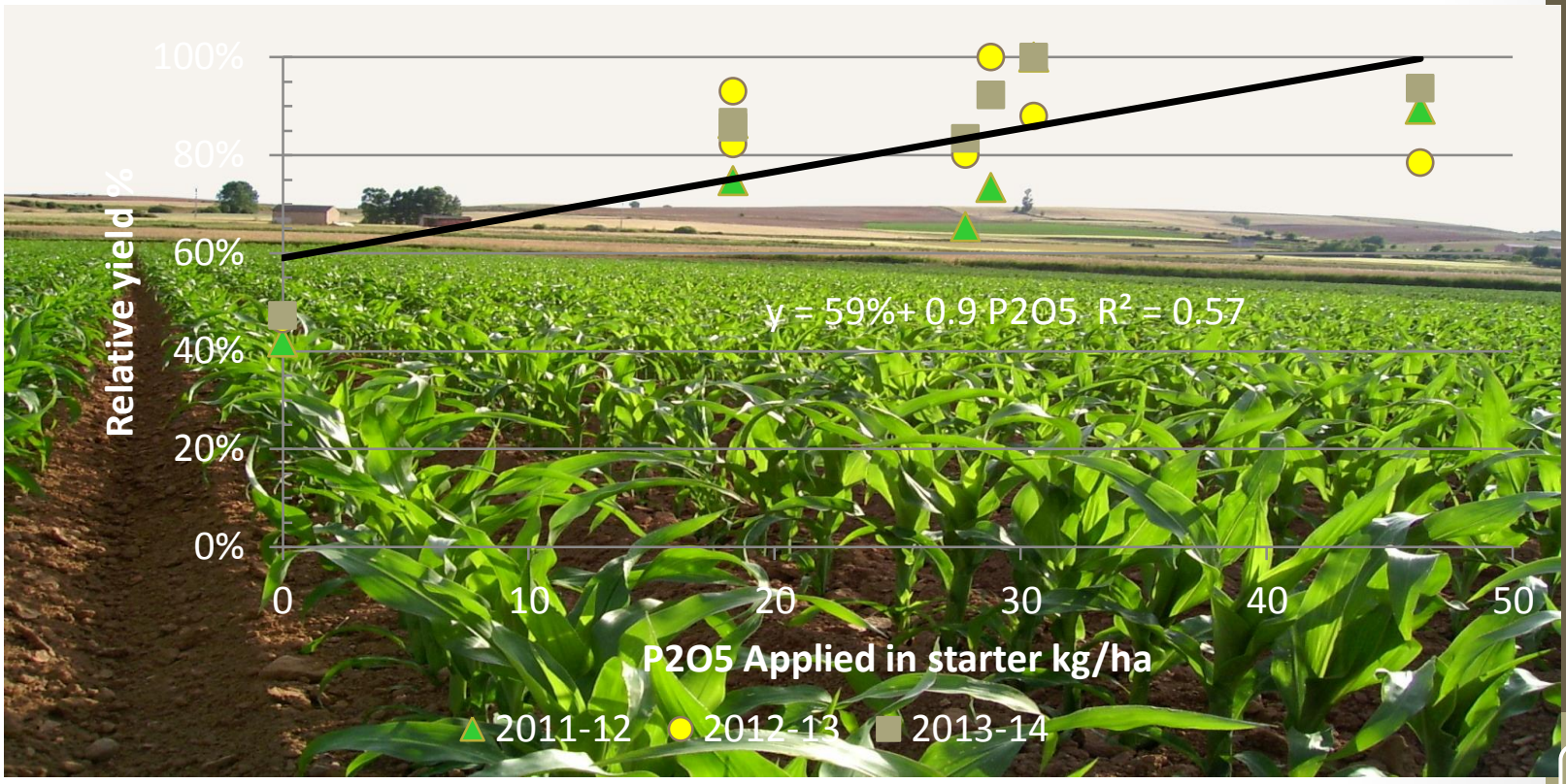
	Mercedes	
N:P:K ratio	1:1:1	1:2:1
DAP	9%	35%
CLK	21%	15%
SSP	70%	50%

Results & Discussion



Mercedes – Very Low K

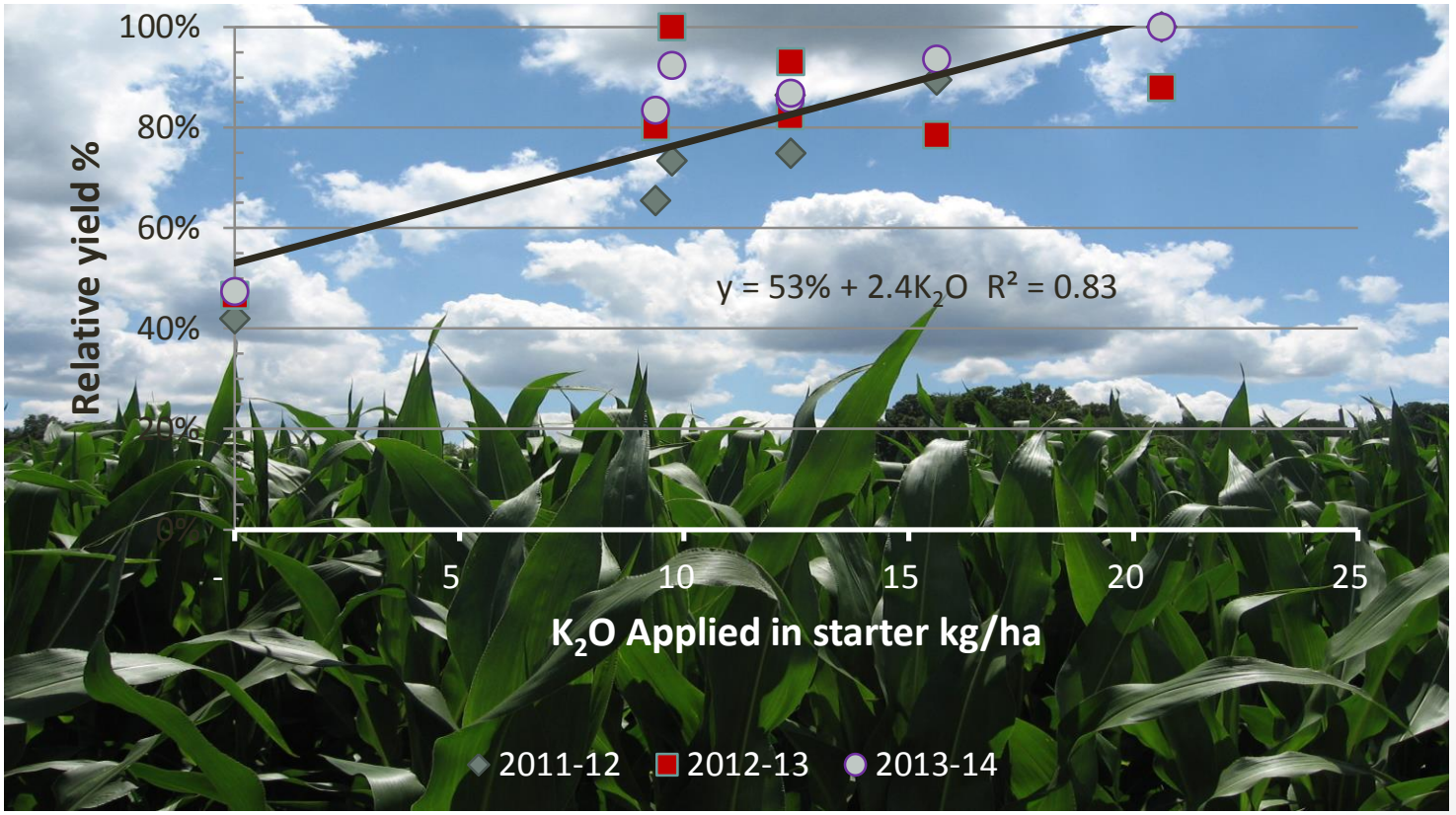
N:P ratio or the rate of the starter means a definite P rate in low P soils, regardless N ratio or fertilizer form



Soil P Bray 1 : 5 - 10 ppm

Mercedes – Very Low K

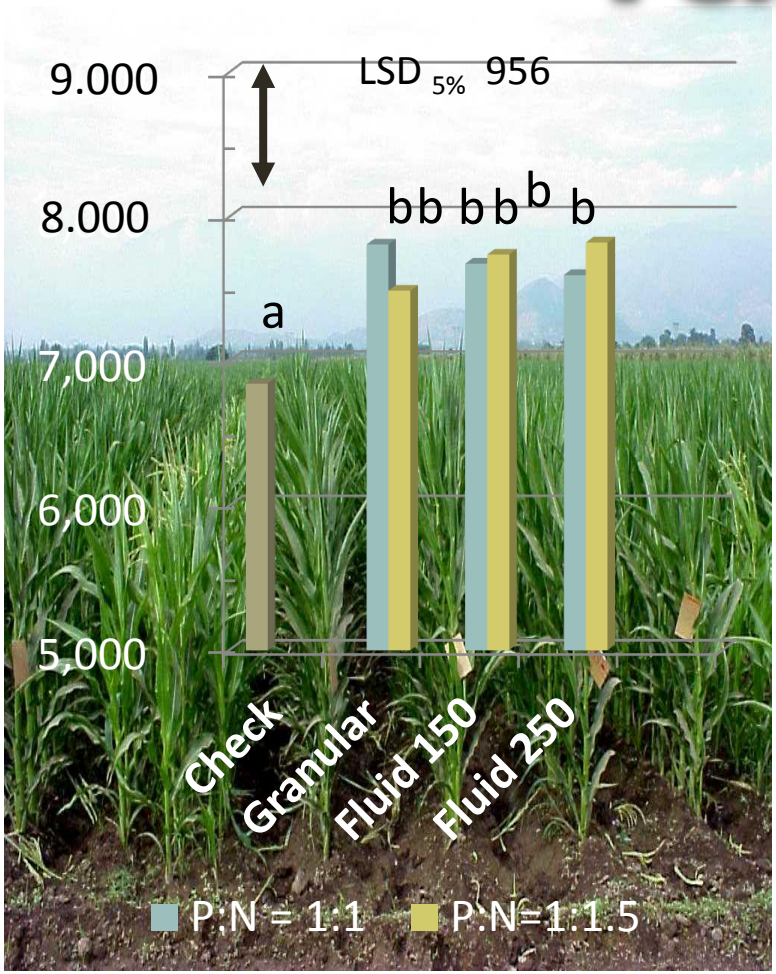
On the other hand, response to K seems linear, therefore starter response is response to K



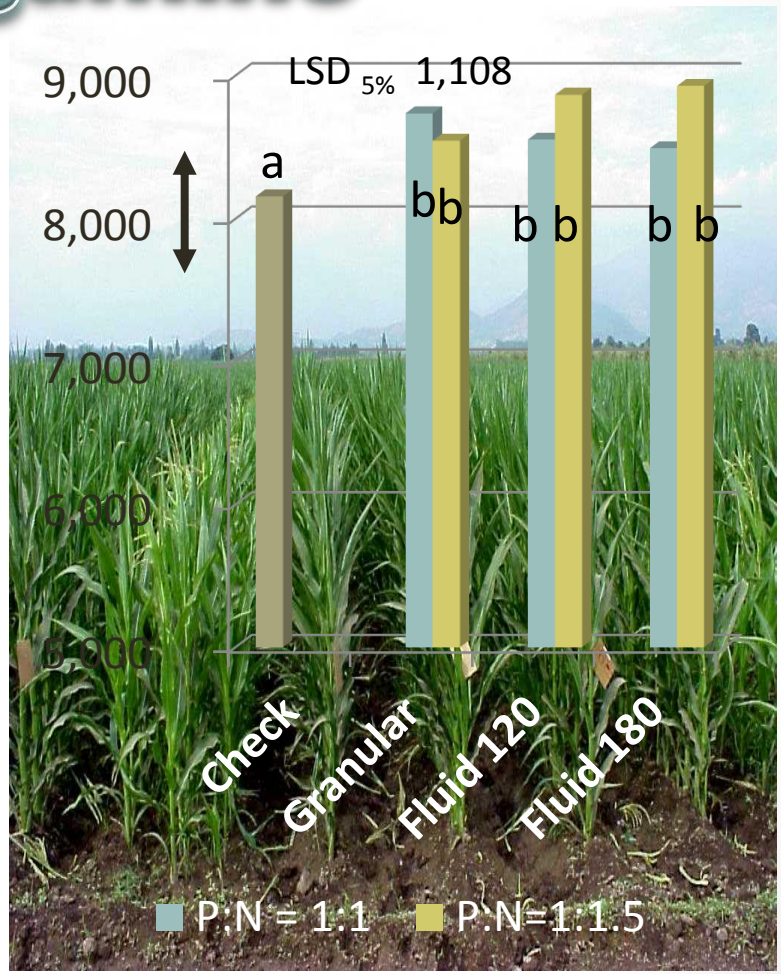
Soil exchangeable K : 47-55 ppm

Results & Discussion

Pergamino



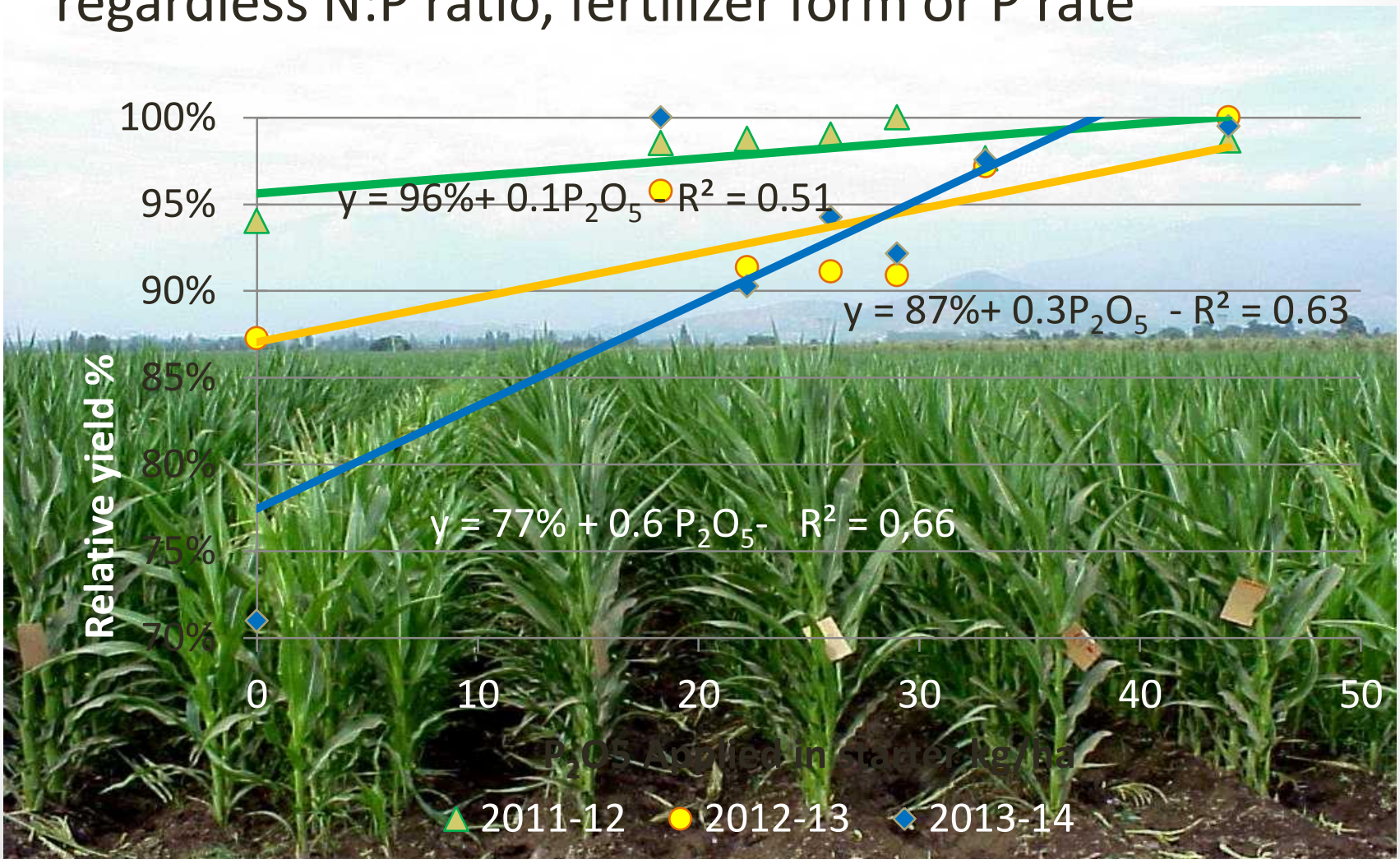
3 Yr. Average 2011-13



2 Yr. Average 2011-12

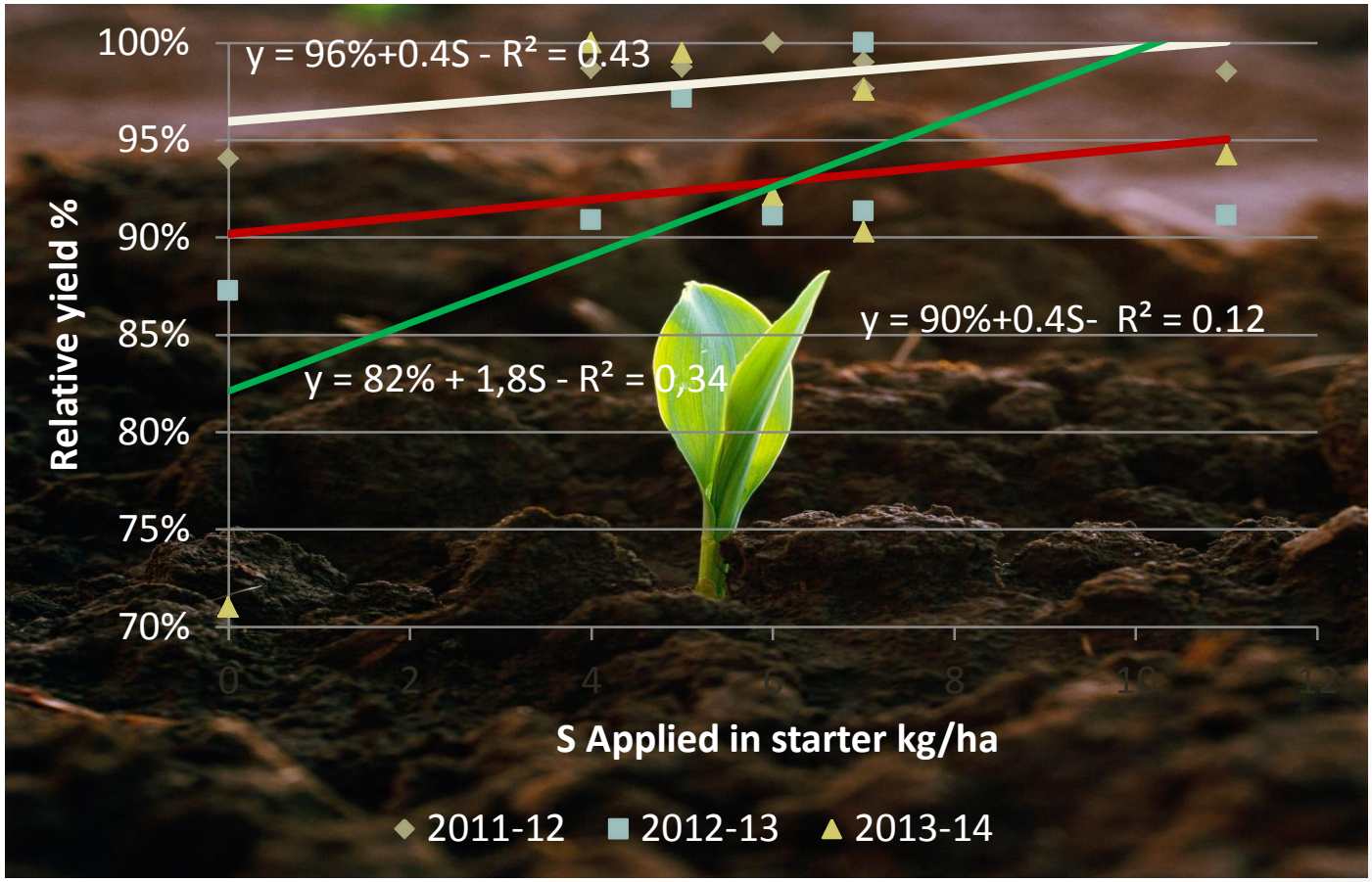
Pergamino – Very high K

In high P fertility soils the response to P is low, regardless N:P ratio, fertilizer form or P rate



Pergamino – Very high K

The same is observed on S response, low since requirement is low relative to the supply



Available S-SO4 : 8 - 18 ppm

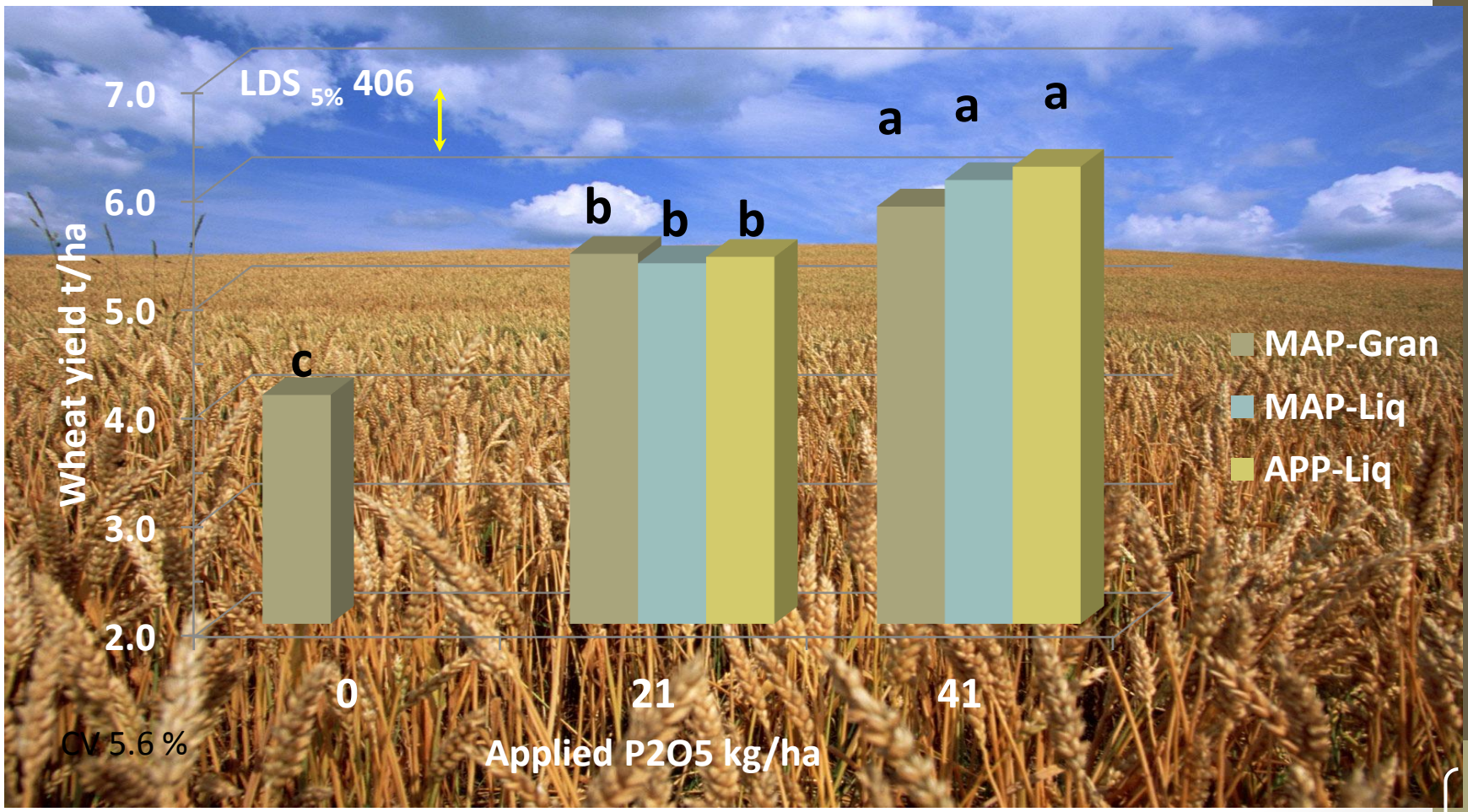
Summary

- There was response to fertilization in five of the six experiments.
- Fluid was not different to granular at same rate and P:N ratio in all trials.
- The P:N ratio 1:1 performed better than 1:1.5 in Mercedes (need less N). In Pergamino was reverse 1:1.5 was better than 1:1 (Need more N) regardless the rate.
- The rate effect was significant only in Mercedes.

Summary

- Given the responses to P, S and K, the amount supplied should be enough to cover the crop requirements, rather than looking at N:P ratio in the blend, since N demand can be later satisfied.
- The amounts of nutrients applied to the crops in the year-site combinations were enough to match the removal for P and S in Pergamino.
- In Mercedes however, the P applied was sufficient at the higher rate, but it is needed more K to cover the requirements.

Fluid sources in wheat



- No difference in grain yields among P sources
- Significant response to P on grain yields and TW, regardless the source

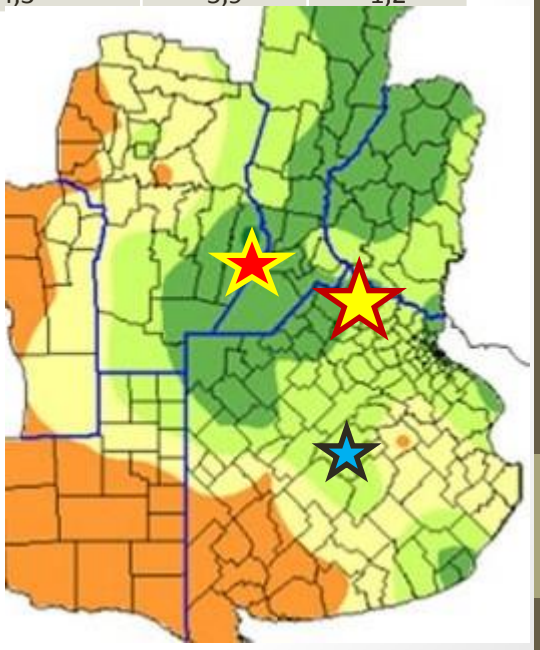
Fluid fertilizers in corn

Comparing management options for fluids in corn

- An experiment in three sites: Marcos Juarez, Pergamino, and Nueve de Julio

Sitio	Sowing	Hibrid	OM	P-Bray	Available S- SO4	pH	Zn
Marcos Juare	Oct -16	NK 900	29	13,0	9,0	6,1	0,7
Pergamino	Oct -24	DK 692 RR	20	3,8	6,0	5,5	0,7
9 de Julio	Oct – 17	LT 626 T3P	25	3,1	4,3	5,9	1,2

- A rate of 21 kg P/ha of NPS fluid was applied broadcast, banded, with herbicide (weed&feed) and compared with granular MAP-S at same placements and a with a check
- The same rate was divided 80 % banded and 20% foliar applied



Treatment descriptions

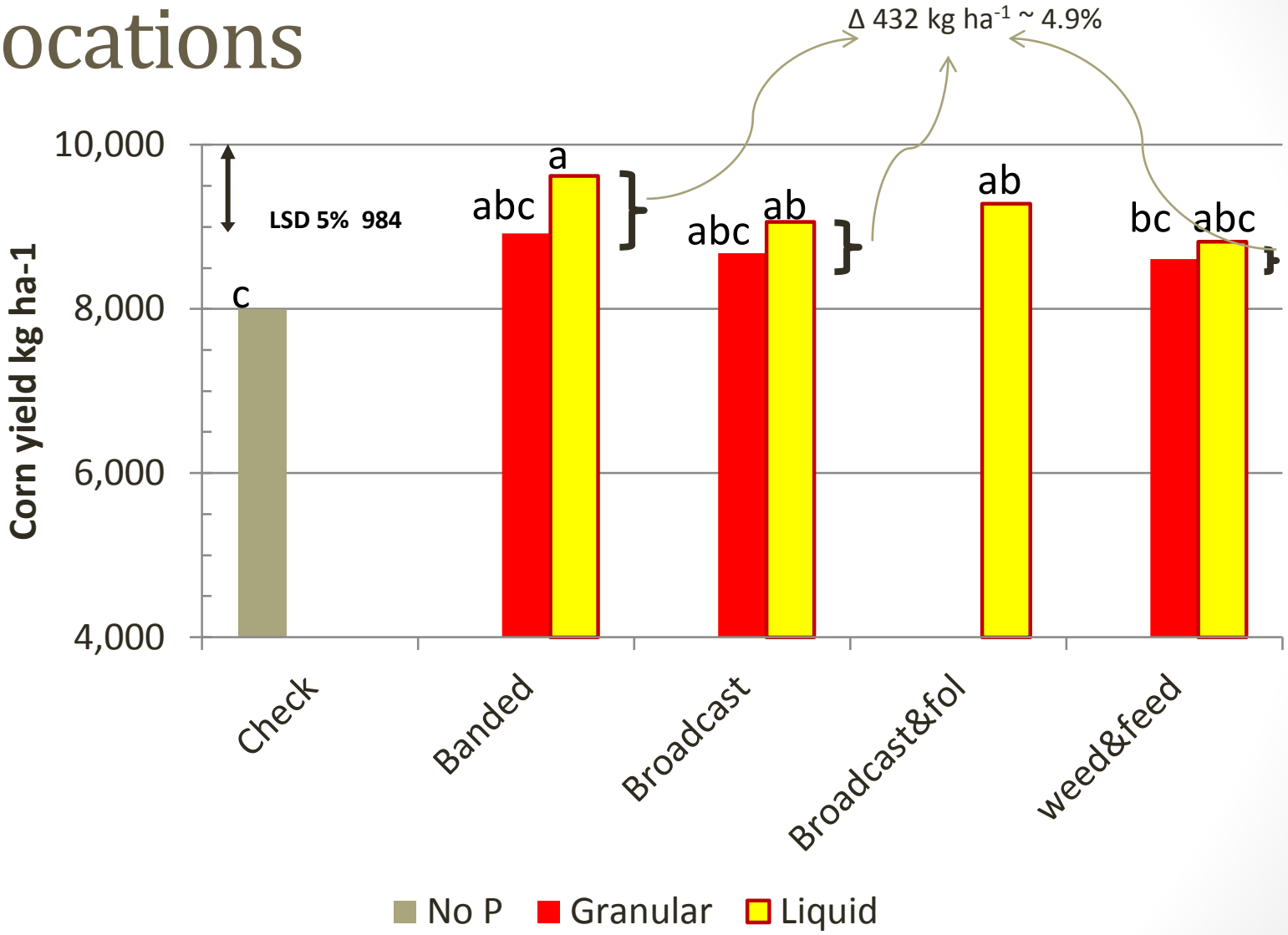
	Treatment	Placement	Timing	Product	P2O5	S	N
				kg/ha			
1	Control without P			0	0	0	0
2	Granular MAP (11-52-0-0)	Incorporated/banded	Planting	40	21	9	4
3	Fluid NPS (6-20-0-4)	incorporated/banded	Planting	104	21	9	6
4	Granular MAP (11-52-0-0)	Broadcast	Planting	40	21	9	4
5	Fluid NPS (6-20-0-4)	Broadcast/sprayed	Planting	104	21	9	6
6	Granular MAP (11-52-0-0)	Idem 4 +Atrazine	Planting	40	21	9	4
7	Fluid NPS (6-20-0-4)	Idem 5 + Atrazine	Planting	104	21	9	6
8	Fluid NPS (6-20-0-4)	80% Inc.+20%foliar	Planting-V6	104	21	9	6

- Incorporated was placing with a coulter in a band along the seed row
- Broadcast was either sprayed (fluid) or spreaded (granular)
- Herbicide was diluted in the fluid fertilizer or coating the granular

Effect of P placement by source in the corn yields across locations

	Placement	M.Juarez	9 de Julio	Pergamino
Check	**t ha^{-1}**	8.57	9.74	5.71
Granular	Banded	9.79	11.70	5.28
Liquid	Banded	9.14	11.66	8.07
Granular	Broadcast	8.27	11.34	6.42
Liquid	Broadcast	9.56	11.66	5.97
Granular	Broadcast + herb	9.87	11.35	4.60*
Liquid	Broadcast + herb	9.26	11.27	6.06
Liquid	Broadcast+ foliar	9.27	12.19	6.38
Pr> F		0,58	>0.001	0.08
LSD 5%		1.83	0.89	2.04
CV %		13.5	5.3	22.8

Treatment means across three locations



Final considerations for P management

- Fluid sources (APP & MAP) are equivalent to granular in Pampean soils
- A slight non-significant superiority of fluid over granular may be the results of placement
- Weed and feed is a proved feasible way to use fluid fertilizers as ‘carrier’s of herbicides. Atrazine may not be the best combination but other products, as glyphosate or other post-emergence herbicides, could be possible to use as enlarging the scope of the practice
- Foliar applications of NPS solutions is also promising as no leaf burning was observed at this rate Similarly , it would be convenient to evaluate as nutritional complement with other chemicals herbicides o pesticides.

Thanks you very much for your attention !

Gabriel Kuriger
Enrique Figueroa
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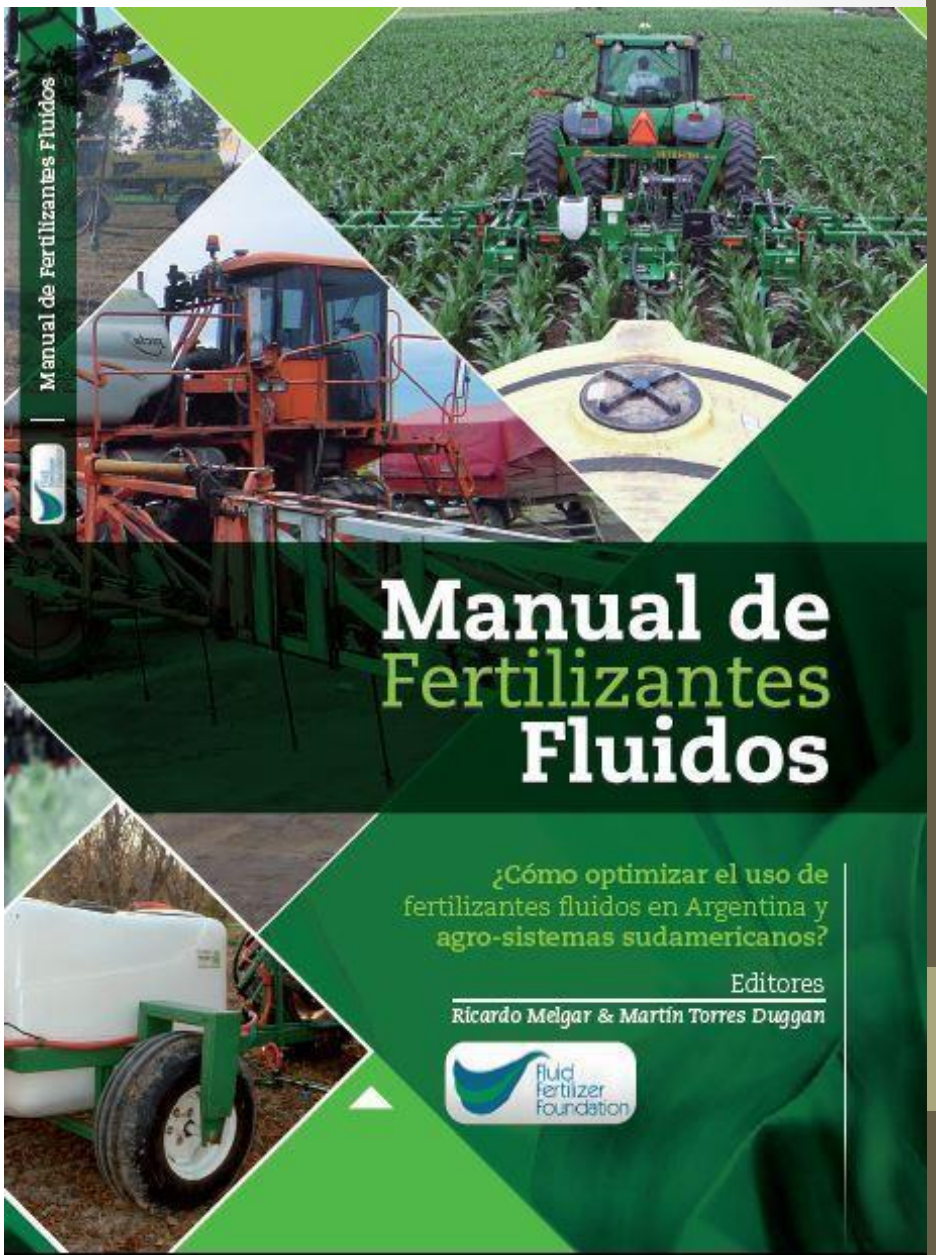
And to co-authors …

Fluid Fertilizer Foundation

We Acknowledge The Fluid Fertilizer Foundation for their support in this research

Extra appreciation to Fluid Fertilizer Foundation for supporting this Handbook



Available for downloading at www.fluidfertilizer.com