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Rates and Residual Effect of Potassium Fertilization in a Brazilian Oxisol

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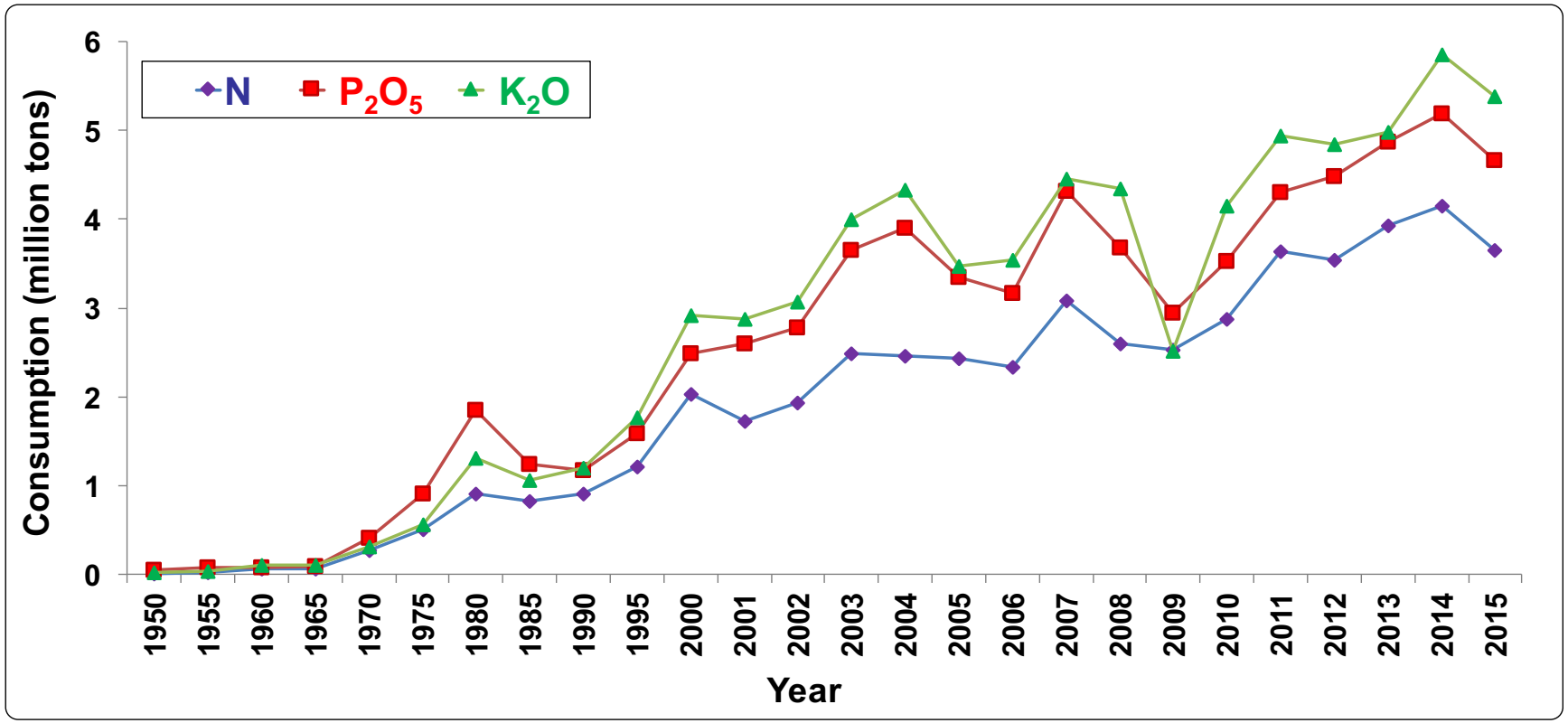
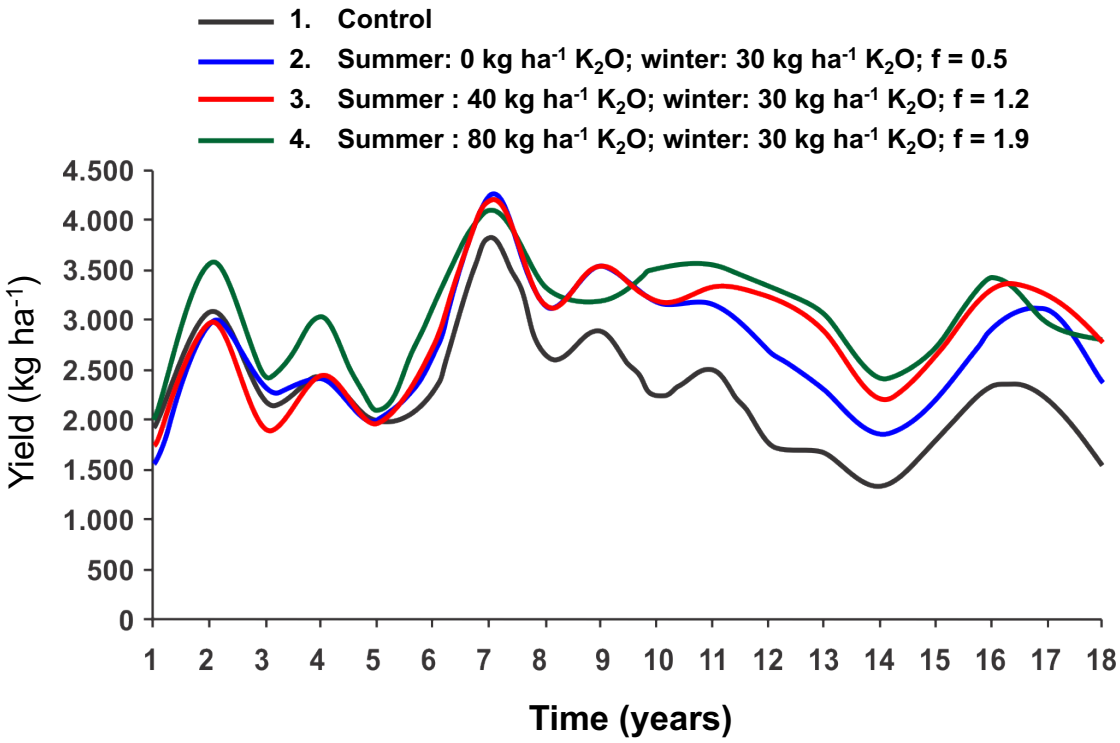
Introduction

- With higher fertilizer prices in 2008 farmers in Brazil and elsewhere started cutting back on nutrient rates, including K_2O.



Introduction

- Information was needed on possible effects of cutting back on fertilizer rates with time.



K_2O Balance:

- Treat # 2 = 200% (mining)
- Treat # 3 = 83% (building)

Source: Borkert et al., 2005

Introduction

- IPNI Brazil decided to investigate this issue further with a set of treatments allowing more adequate comparisons with time.
- Field oriented research.
- Funded by BPC and Uralkali.
- Many thanks to Alexey Scherbakov.

Location & Soil

- Oxisol
- 30 years under cultivation
- 65% clay
- 3.5% O.M.
- K medium
- 50% BS

Experiment Outline

- 4 rates of K_2O with no cut after third year.
- 4 rates of K_2O with complete cut after third year.
- Cuts of K_2O rate after third year to ¼ and ½ of the recommended rate.
- 3 rates of lime at recommended K_2O rate, with and without K_2O cut after third year.
- 3 rates of phosphogypsum at recommended rate, with and without K_2O cut after third year.
- 2 levels of placement at recommended rate of K_2O.
- 2 levels of time of application at recommended rate of K_2O.

- 24 treatments x 4 replicates.
- 4R. Source = KCl.

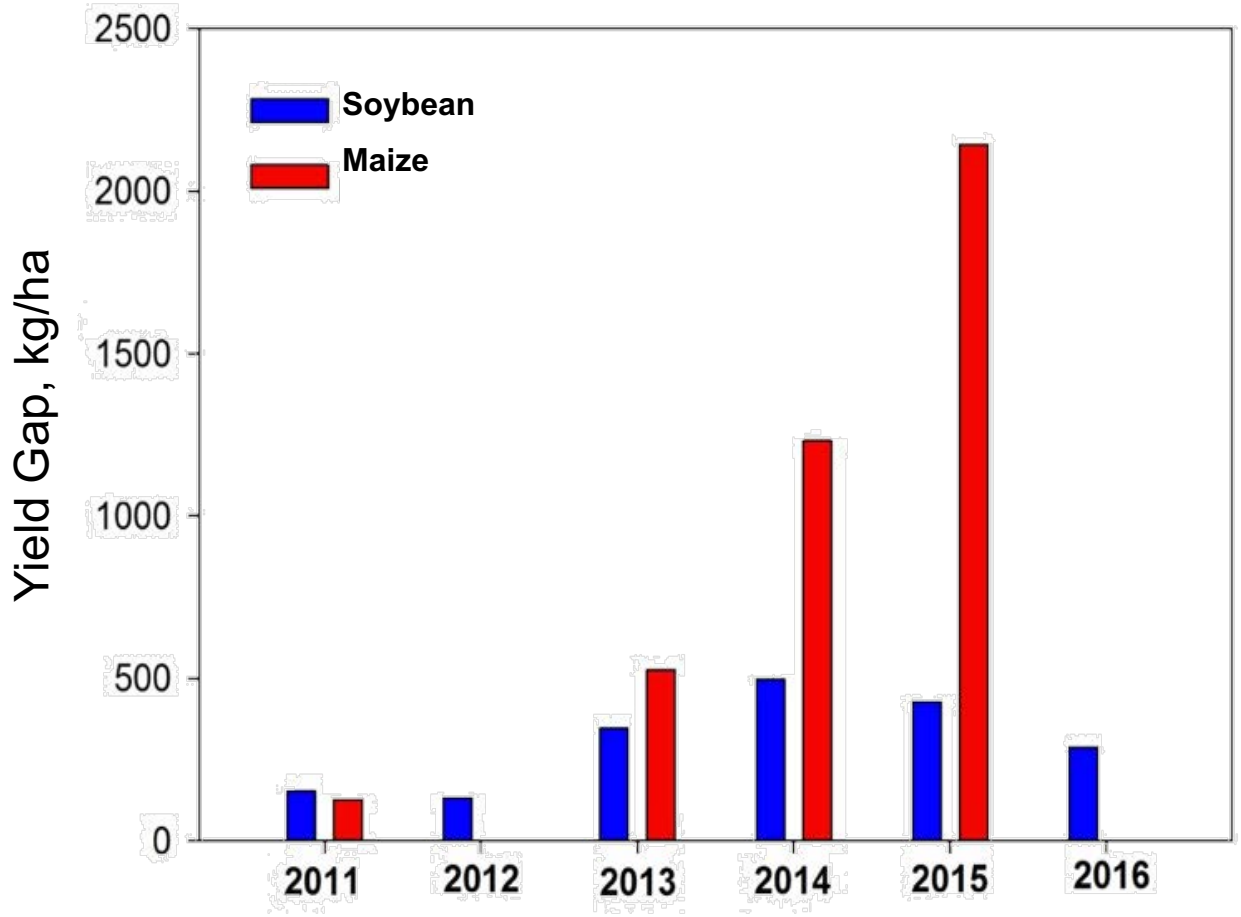
Information about

Comp #	Comparison	Treatments Involved
1	Response curve to K_2O with continuous application of K and regular practices for N, P, K time of application, K locality effect, liming and PG level (A).	T1, T2, T4, T6 and T10 (A).
2	Response curve to K_2O with K application up to 3rd year and regular practices for N, P, K time of application, K locality effect, liming and PG level (B)	T1, T3, T5, T7 and T11 (B).
3	A vs B = Effect of suspension of K application after 3rd year at regular practices	
5	Effect of liming on K fertilization with continuous application of K and regular practices	T12, T6 and T14 (D).
6	Effect of liming on K fertilization with application of K up to 3rd year and regular practices	T13, T7 and T15 (E).
12	Effect of timing of K application at regular practices	T6 and T23.
13	Placement effect of K application at regular practices	T6 and T24.

Photos

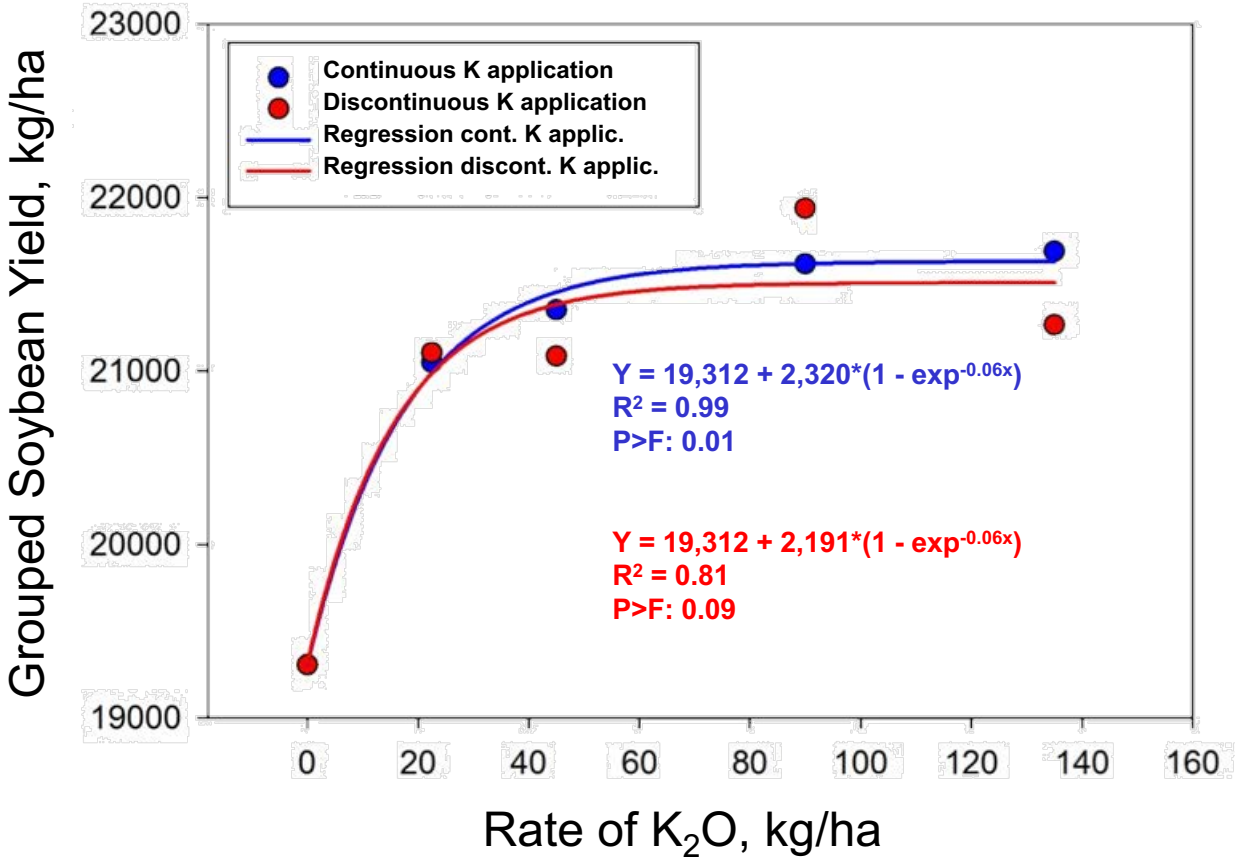
Results

Yield gap (difference between 90 kg K_2O/ha application and control; K3 versus K0) for soybean and maize 2nd crop along the six years of the project.



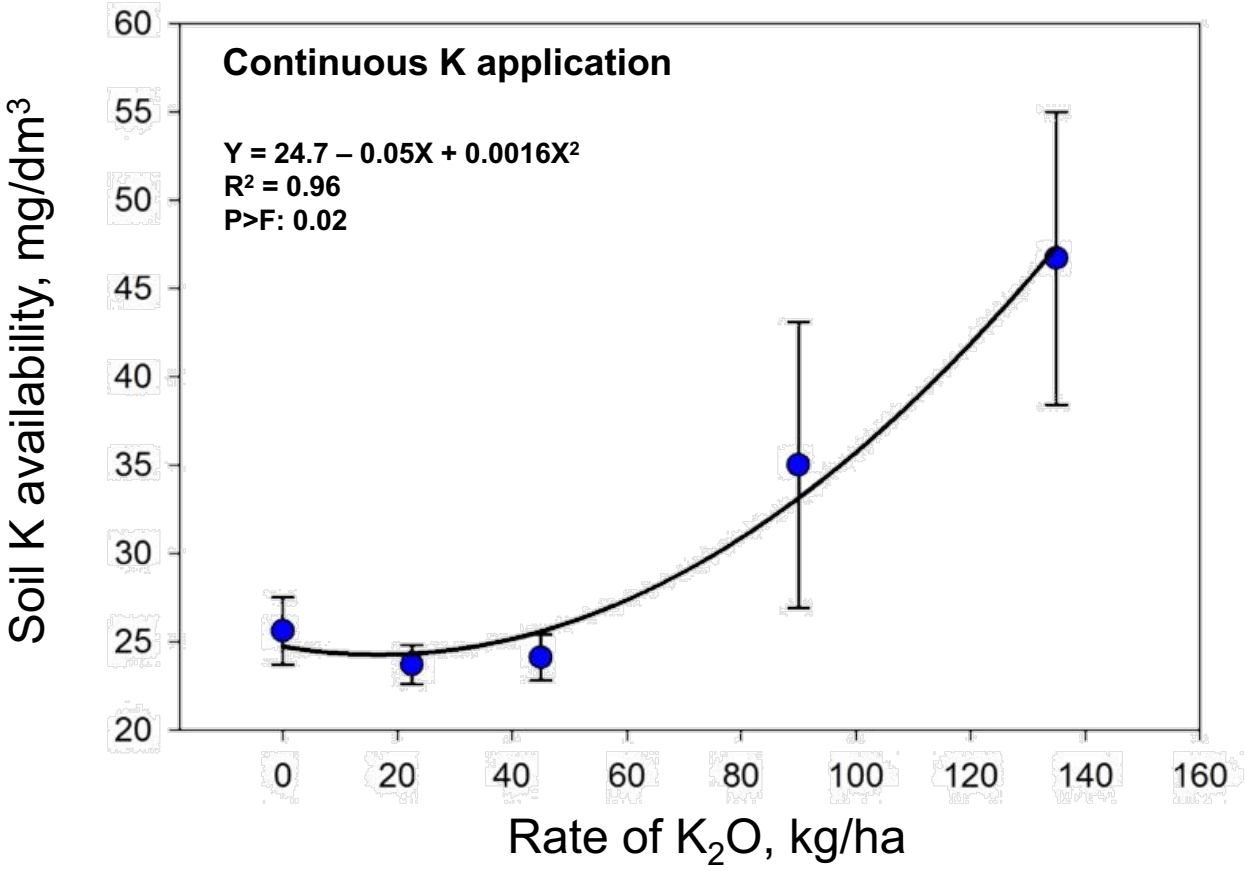
Results

Total soybean yield (6 years) response curves to K_2O rates with continuous and discontinuous K application (A vs B).

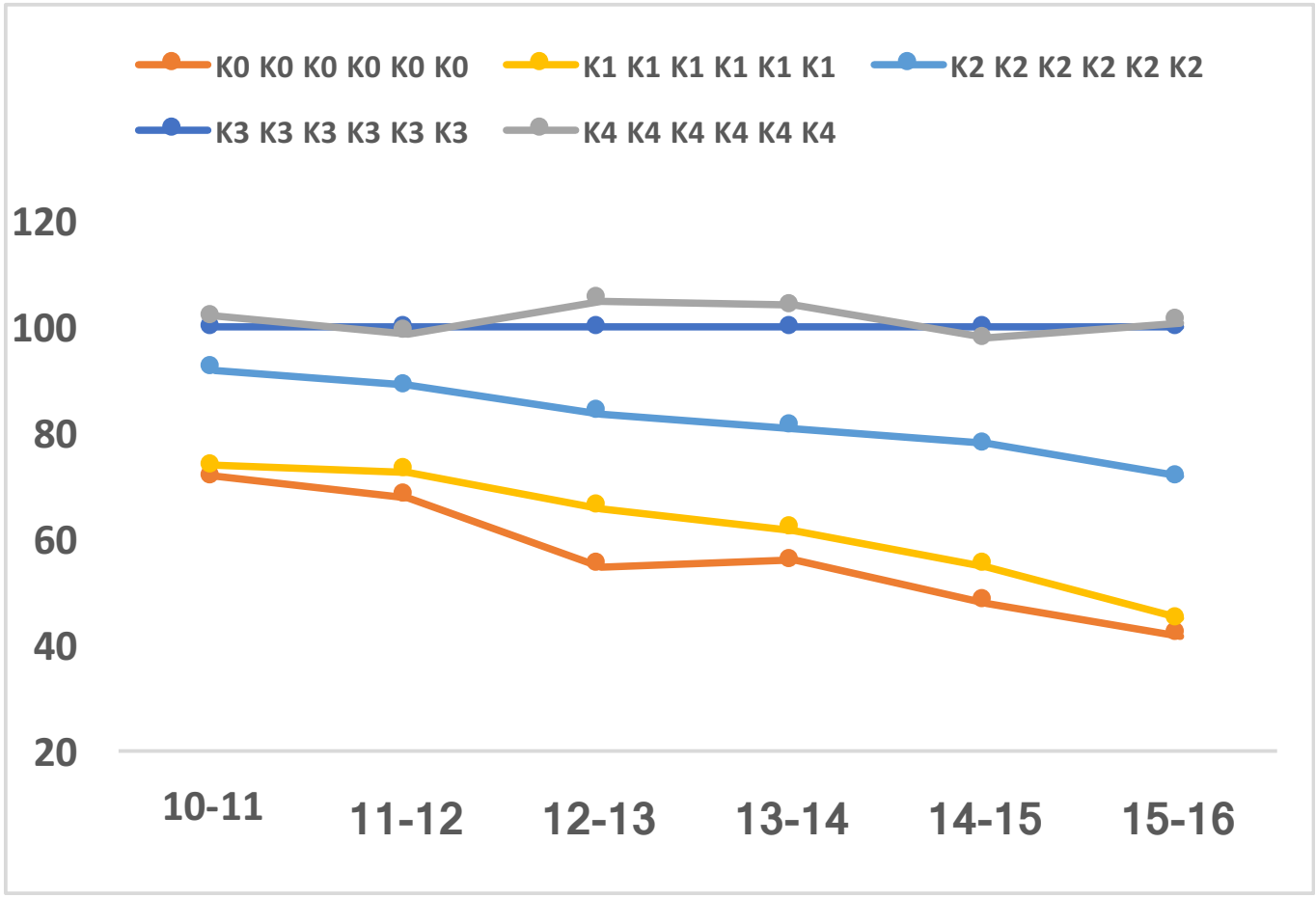


Results

Soil K availability in response to K_2O rates with continuous K application. Crop season 2015-2016.

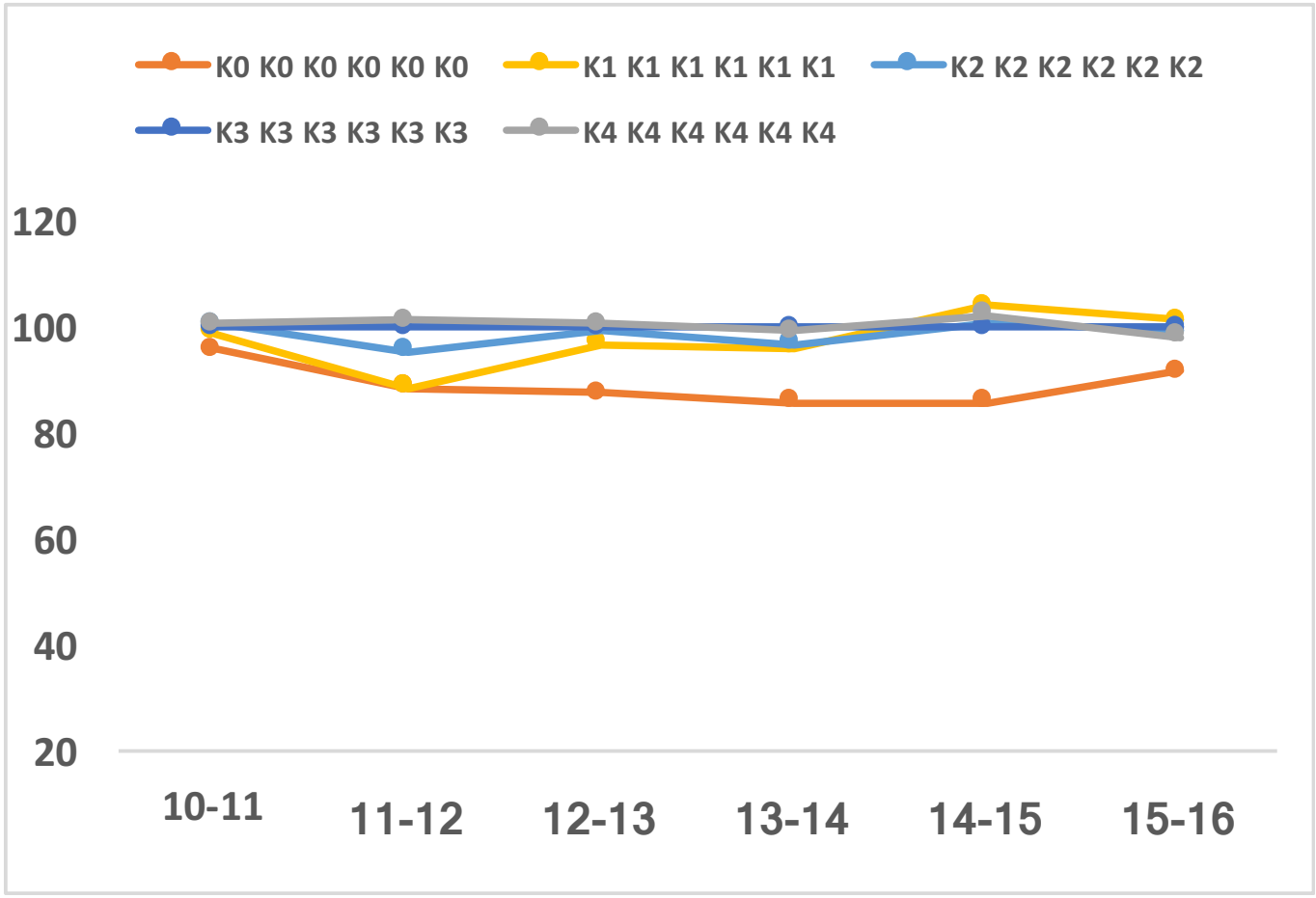


Expectation



Relative Yield of different K_2O rates with time (K3 = 100)

Real Field Data



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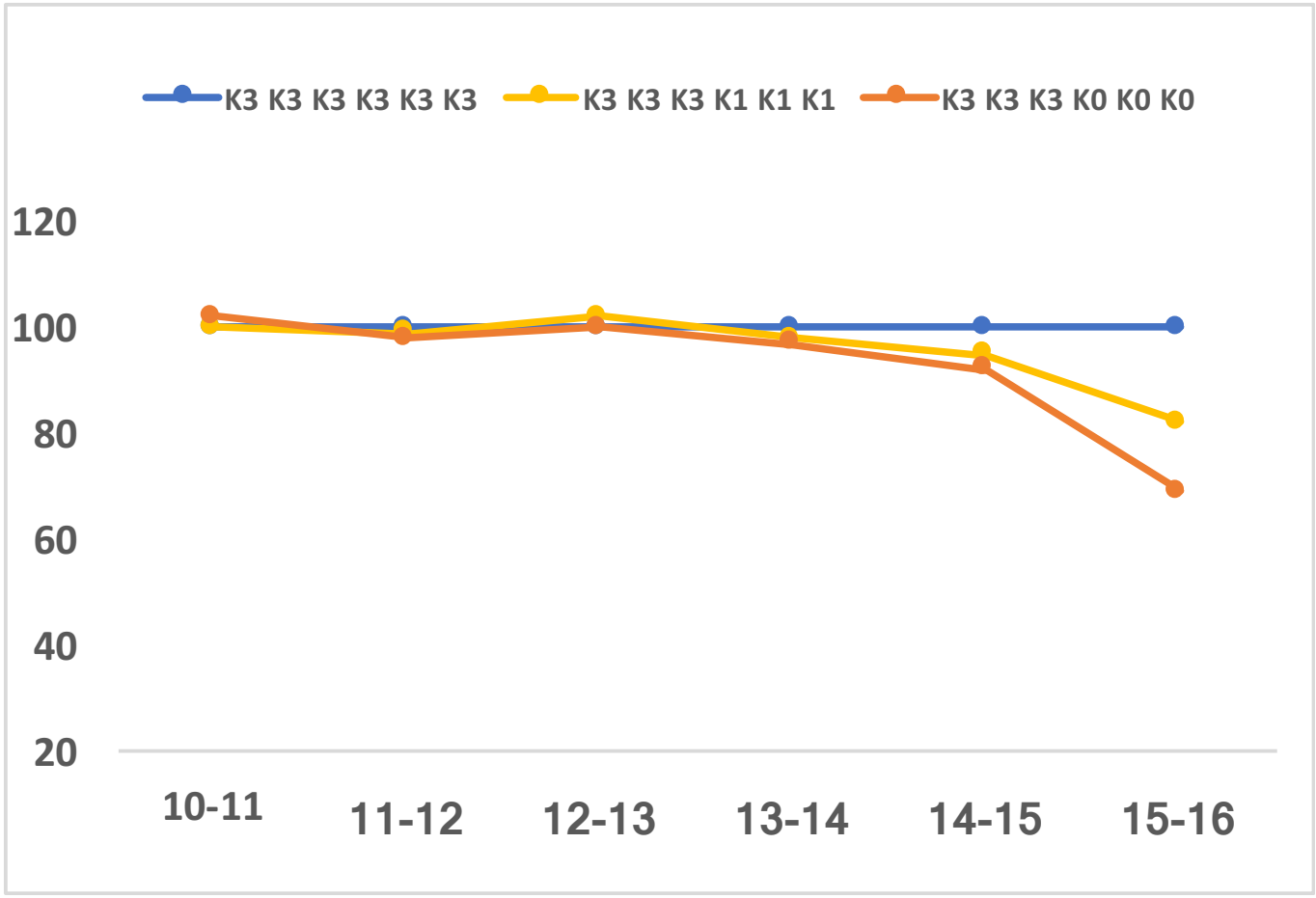
Expectation



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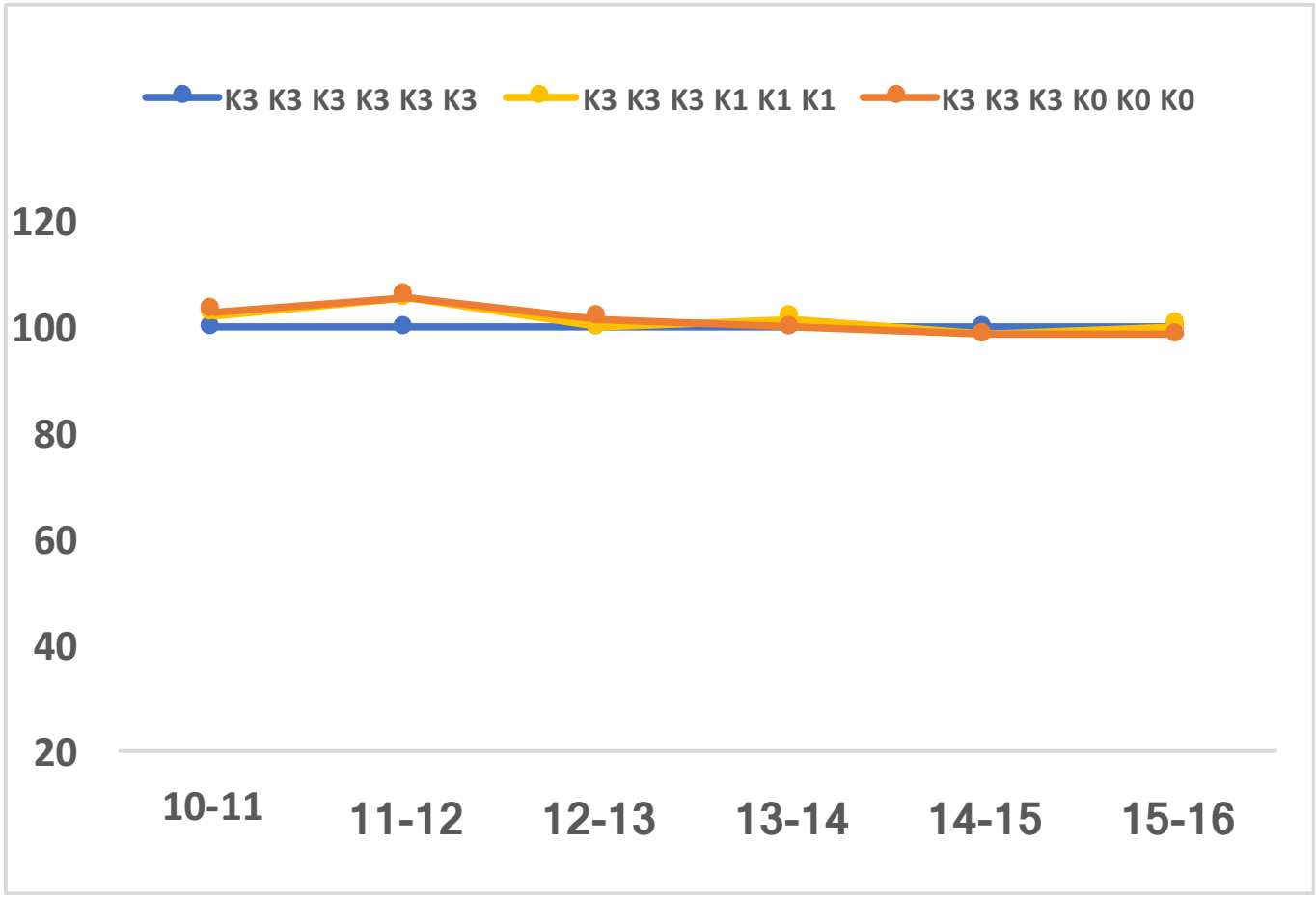
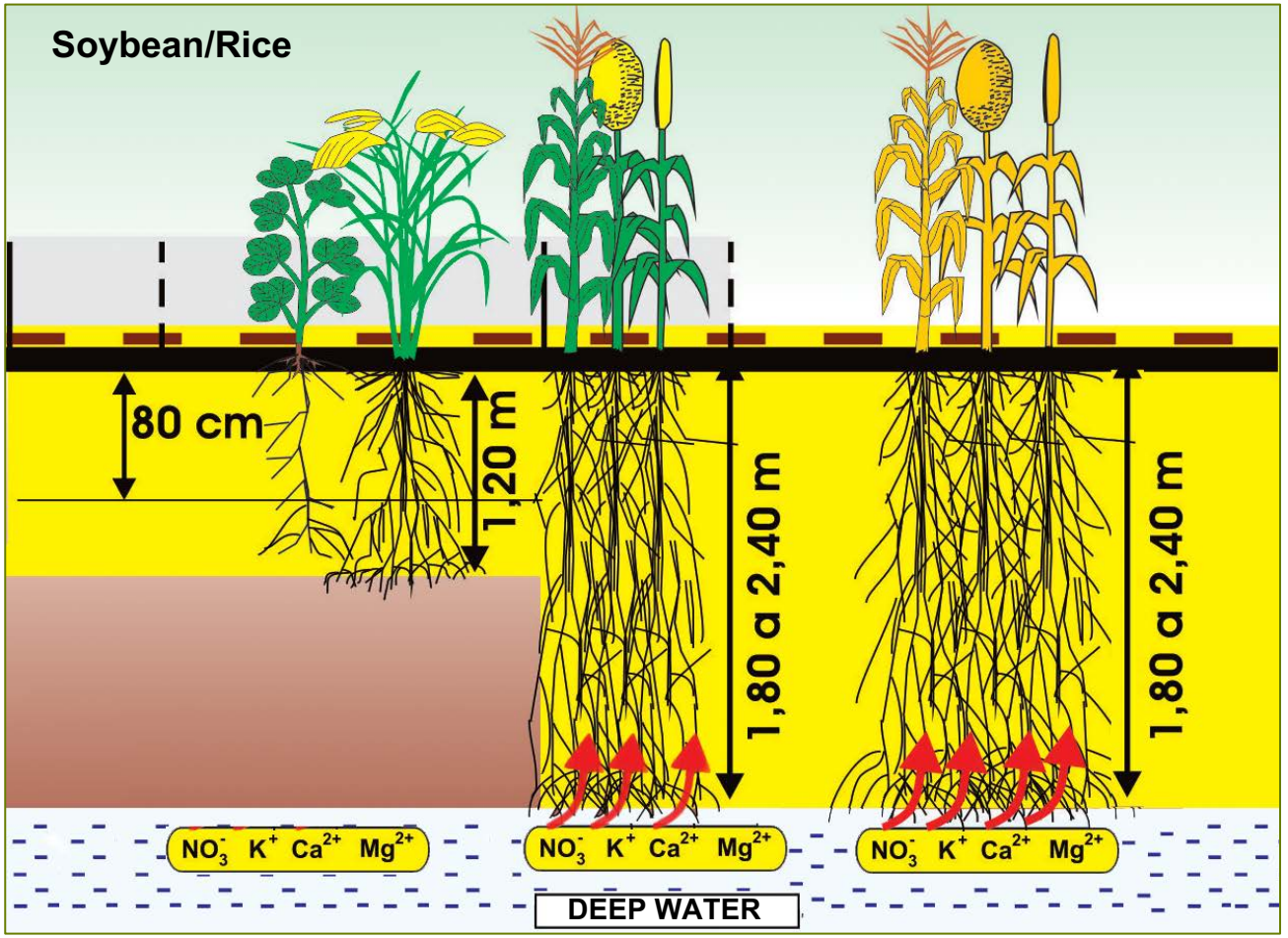
Real Field Data



Relative Yield of different K_2O rates with time (K3 = 100)

Why K_2O responses still relatively low?

- Soil with high K buffering capacity.
- Corn recycling K from deeper soil layers.



Conclusions up to now (after six years):

- Responses to K_2O are relatively low but very clear (+385 Kg/ha.year for soybean and 617 Kg/ha.year for corn).
- Hypothesis is that responses are still low because of soil high K buffering capacity and corn recycling K from soil deeper layers.
- Effect of liming in some crops x year (+ 660 Kg/ha for corn).
- Effect of phosphogypsum in some crops x year (+ 350 Kg/ha for soybean).
- Little effect from placement and time of application.

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What is next?

- It is intended that experiment continues as long as possible.
- Higher responses expected with time.

- Need to expand this type of experiment to other soils.

Thank You Very Much For Your Attention!

Questions?

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Results

Soil K availability as affected by rate of K_2O and year of crop cultivation.