

Carlos A. C. Crusciol, Antonio C. A. Carmeis Filho<sup>1\*</sup>, Lucas O. Oshiro, and Chad J. Penn

<sup>1</sup>São Paulo State University, College of Agricultural Sciences, Department of Crop Science, Botucatu, São Paulo, Brazil. E-mail: tonycarmeis@hotmail.com

## Introduction

In order to alleviate soil acidity in tropical regions, surface liming stands out among the most effective efficient strategies, however, carbonate reaction in subsurface soil layers is uncertain, mainly in regions with dry winters, which may limit wheat production in these areas.

## Objective

The aim of this study was to evaluate the effect of surface liming on wheat root growth and grain yield in a long-term experiment under no-tillage system

## Material and Methods

- The experiment was set up in October 2002 in Botucatu, State of São Paulo, Brazil.
- Soil is classified as kaolinitic, thermic Typic Haplorthox, with sandy loam texture.
- The field experiment was designed as a completely randomized block, with three rates of lime:

**Half rate**  
(1.0 Mg ha<sup>-1</sup>)

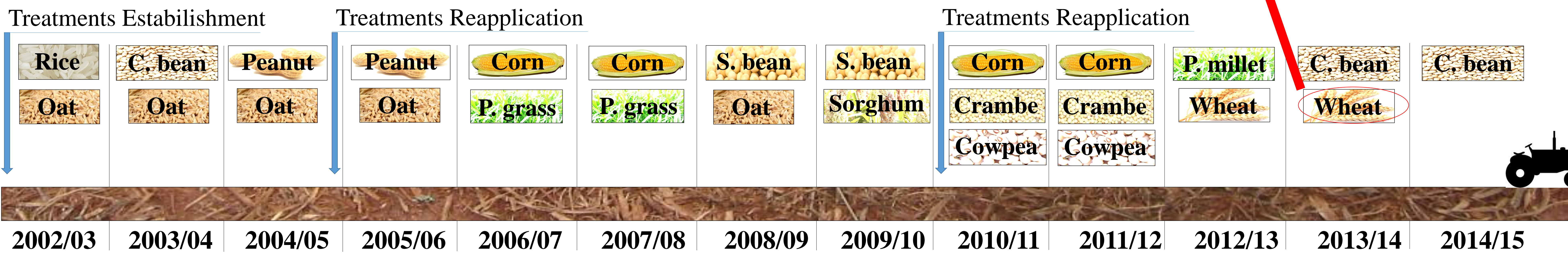
**Full rate**  
(2.0 Mg ha<sup>-1</sup>)

**Double rate**  
(4.0 Mg ha<sup>-1</sup>)

**Control**  
(no lime)

- Emergence: 03/18/2014
- Cultivar: CD116
- Sowing density: 80 viable seeds m<sup>-1</sup>
- Fertilization: 250 kg ha<sup>-1</sup> of 14-28-16 (NPK)

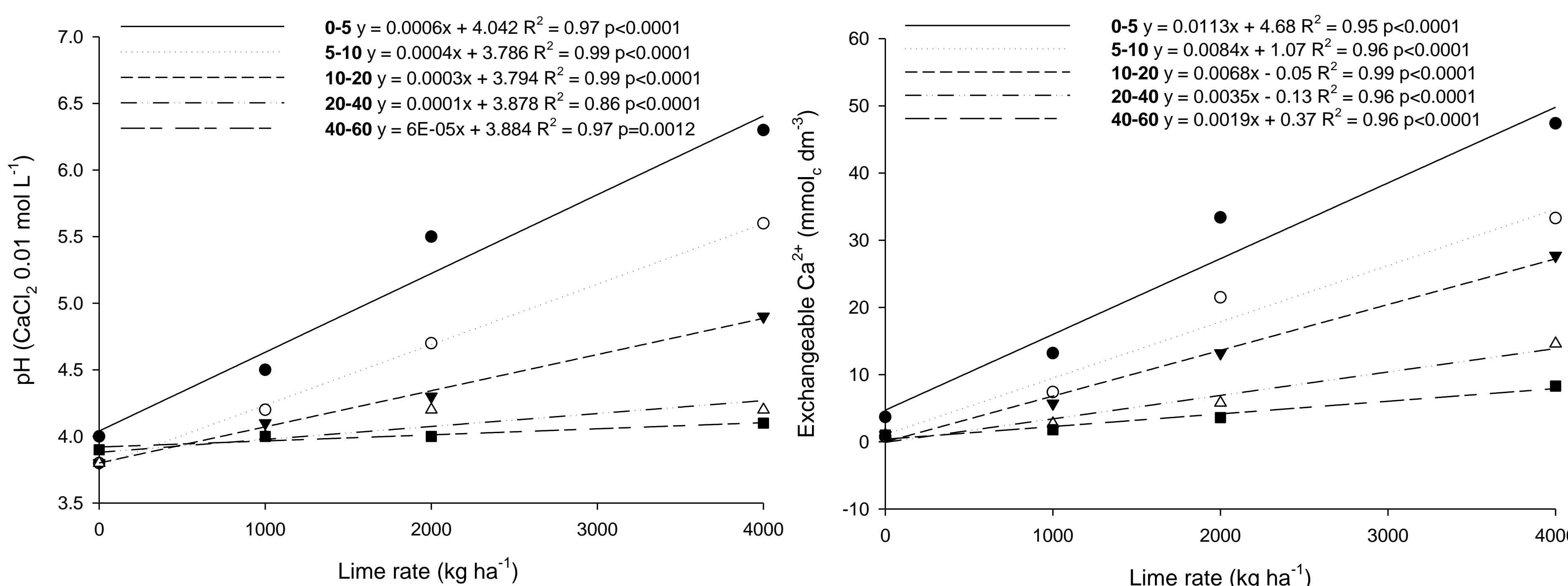
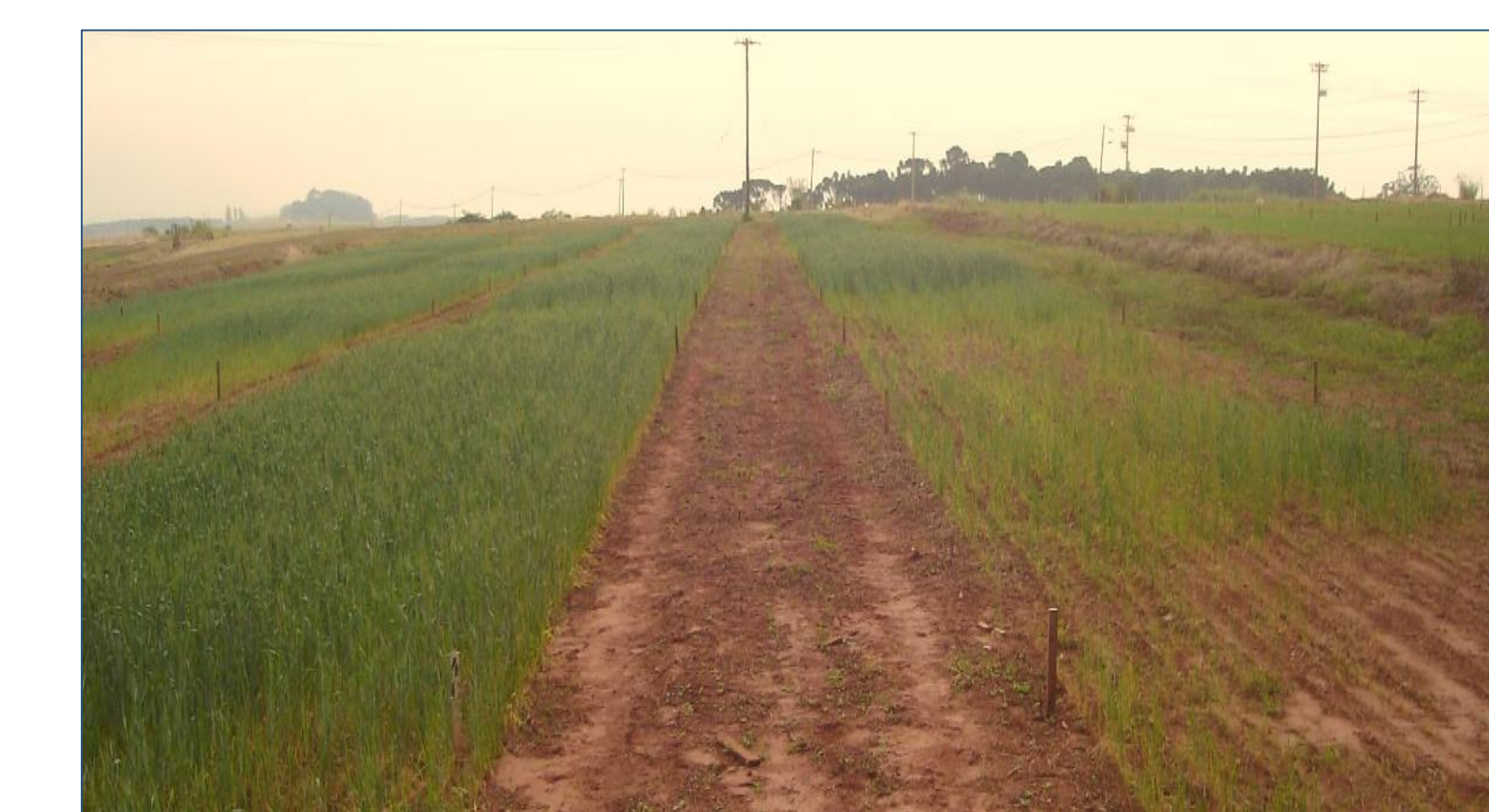
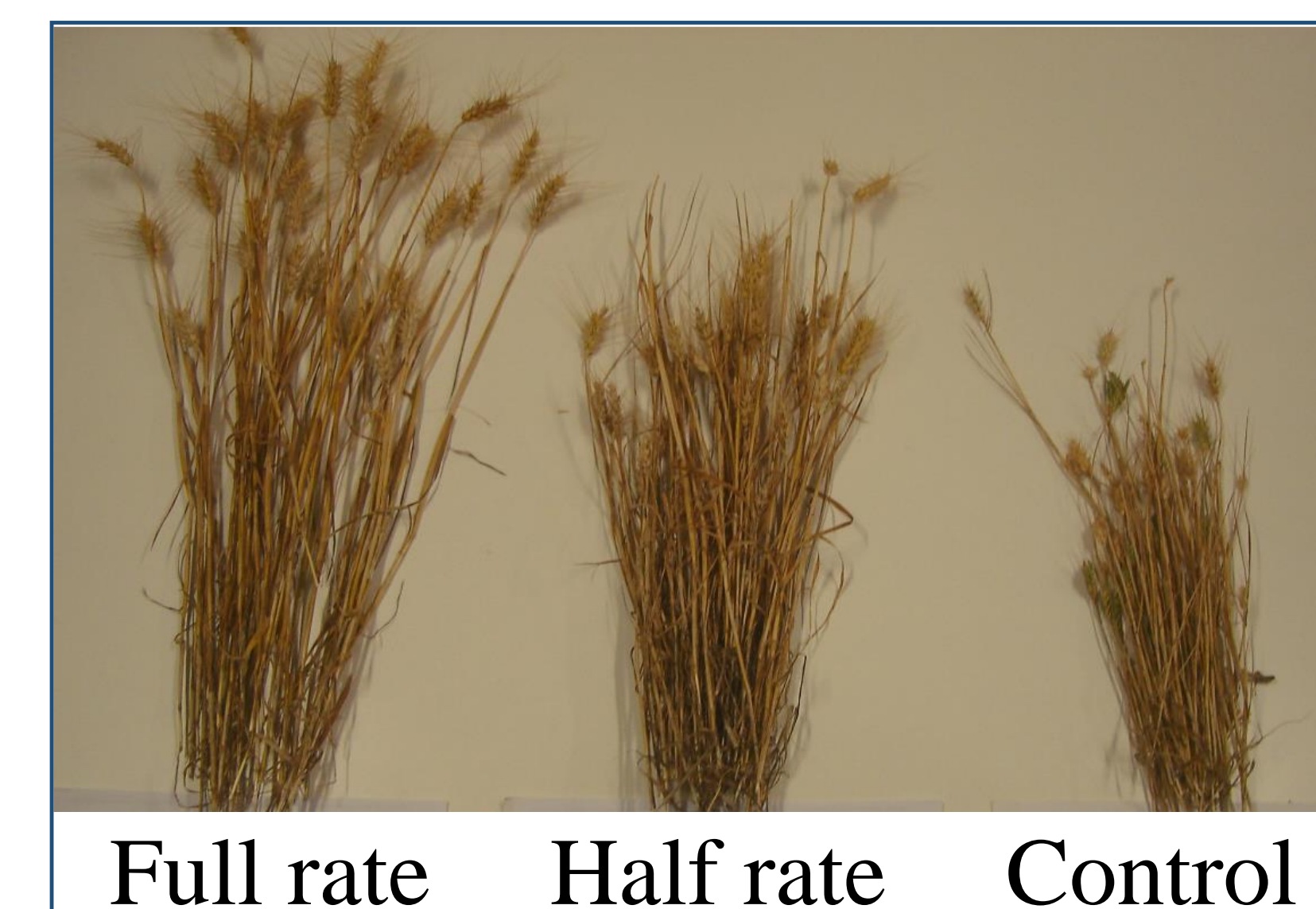
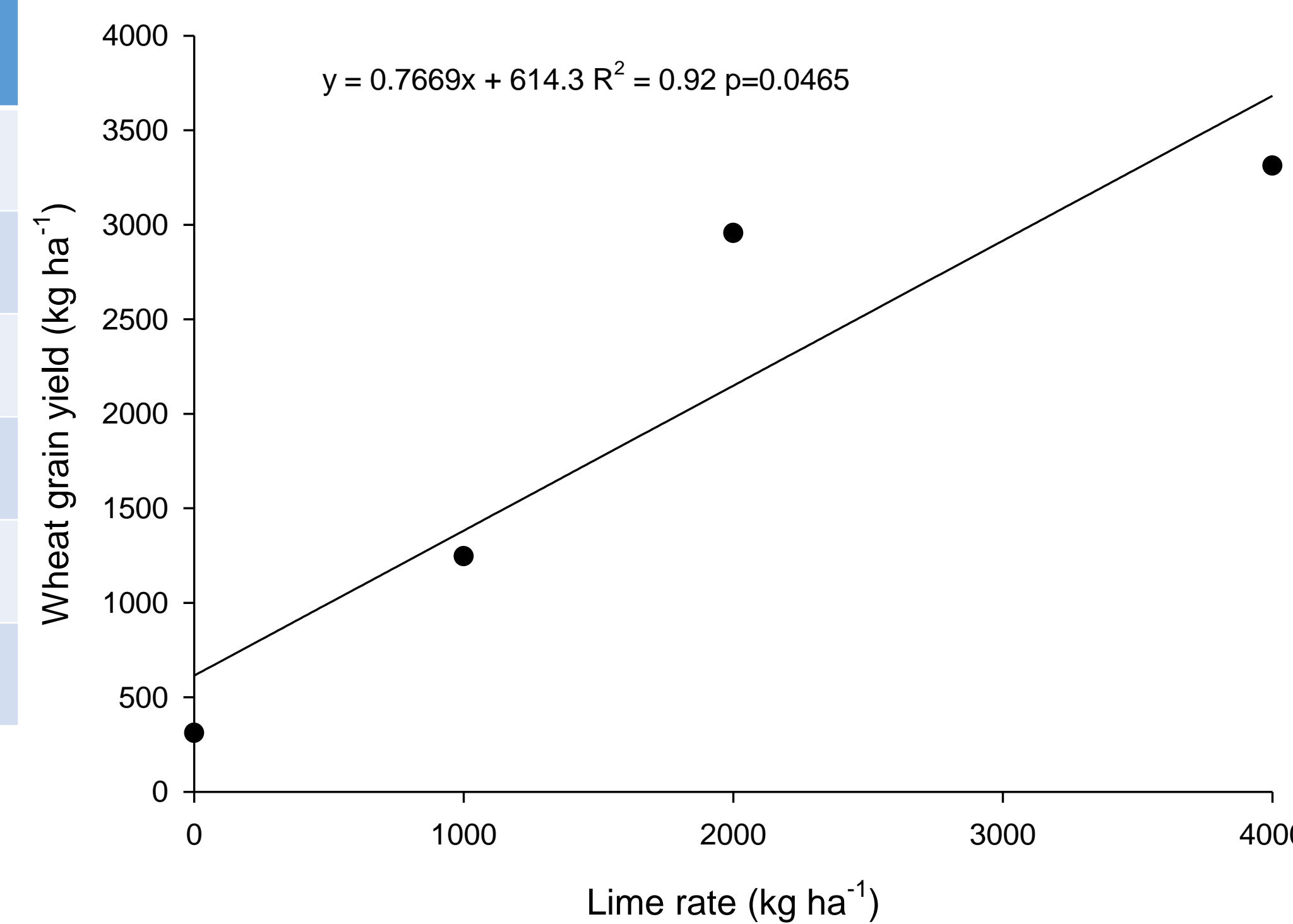
## Crop and liming management



**Evaluations:** soil chemical properties (pH and Ca), wheat root growth and grain yield. **Statistical analyses:** Means were compared by regression analyses at a probability level of 5% (for soil analyses and grain yield) and 10% (for wheat root length). Pearson's correlation analysis was conducted to investigate the relationship between root growth and soil properties (below to 20 cm) and wheat grain yield.

## Results and Conclusion

Layer (cm)	Treatments				Equation	R <sup>2</sup>	P > F
	0	1,000	2,000	4,000			
Root length, km m <sup>-3</sup>							
0-5	8.6	31.8	49.3	54.3	0.0109x + 16.88	0.81	<0.0001
5-10	4.2	14.2	26.6	31.3	0.0067x + 7.25	0.88	<0.0001
10-20	2.1	6.5	10.6	11.9	0.0024x + 3.56	0.84	<0.0001
20-40	0.6	2.7	9.1	8.8	0.0022x + 1.51	0.74	<0.0001
40-60	0.2	0.8	2.9	2.7	0.0007x + 0.48	0.71	0.0141



### Pearson's correlation

Parameter (below 20 cm depth)	Grain yield	
	r	P
Root length	0.8411	<0.0001
pH	0.5771	0.0191
Ca <sup>2+</sup>	0.9109	<0.0001

**Conclusion:** Surface application of lime alleviated subsoil acidity, which is essential to increase wheat root growth and grain yield in a region with dry winters.