

## INTRODUCTION

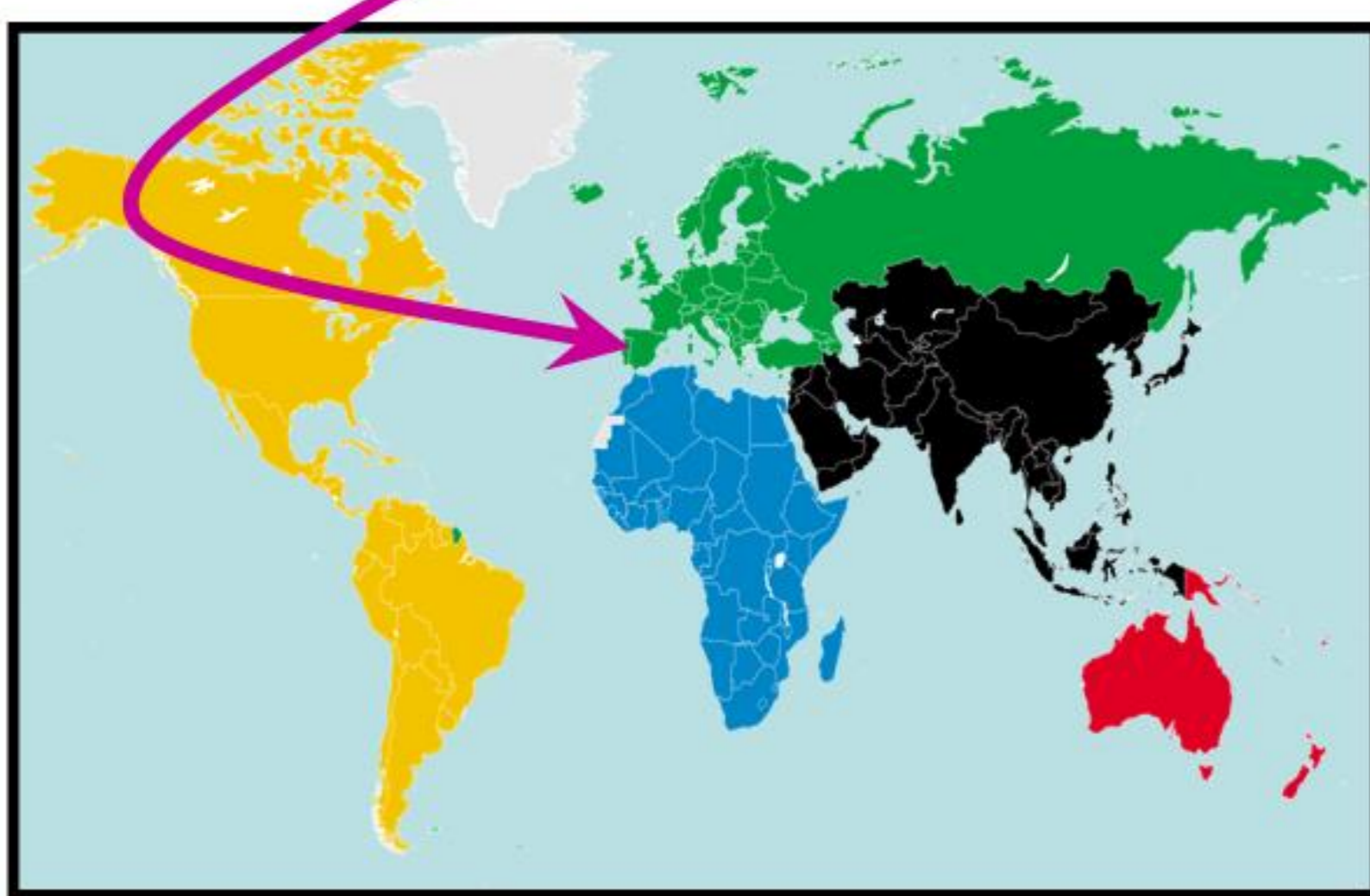
In Galicia (NW Spain), the soils tend to be acidic mainly due to the region's humid climate, the prevalence of subtractive systems, frequent fires and, often, acidic parent material which can limit the tree growth and the pasture production in the silvopastoral systems. Therefore, it is advisable to carry out management techniques and fertilisation to neutralise soil acidity and to increase the pasture and tree productivity.

## OBJECTIVE

The objective of this experiment was to compare the effect of no fertilisation, three doses of sewage sludge (160, 320 and 480 kg N total ha<sup>-1</sup>), with or without liming (2.5 t CaCO<sub>3</sub> ha<sup>-1</sup>), and the mineral fertilisation usually used in the region (8% N - 24% P<sub>2</sub>O<sub>5</sub> - 16% K<sub>2</sub>O) on tree growth in a silvopastoral system established on an acidic forest soil with *Pinus radiata* D. Don in 1997.

## MATERIALS AND METHODS

### LOCALIZATION



### EXPERIMENT DESIGN

- Randomized block (9 treatments and 3 replicates)
- 27 experimental units (96 m<sup>2</sup>) with 25 *Pinus radiata* D. Don
- Sowing with *Dactylis glomerata* L., *Lolium perenne* L. and *Trifolium repens* L.

### TREATMENTS

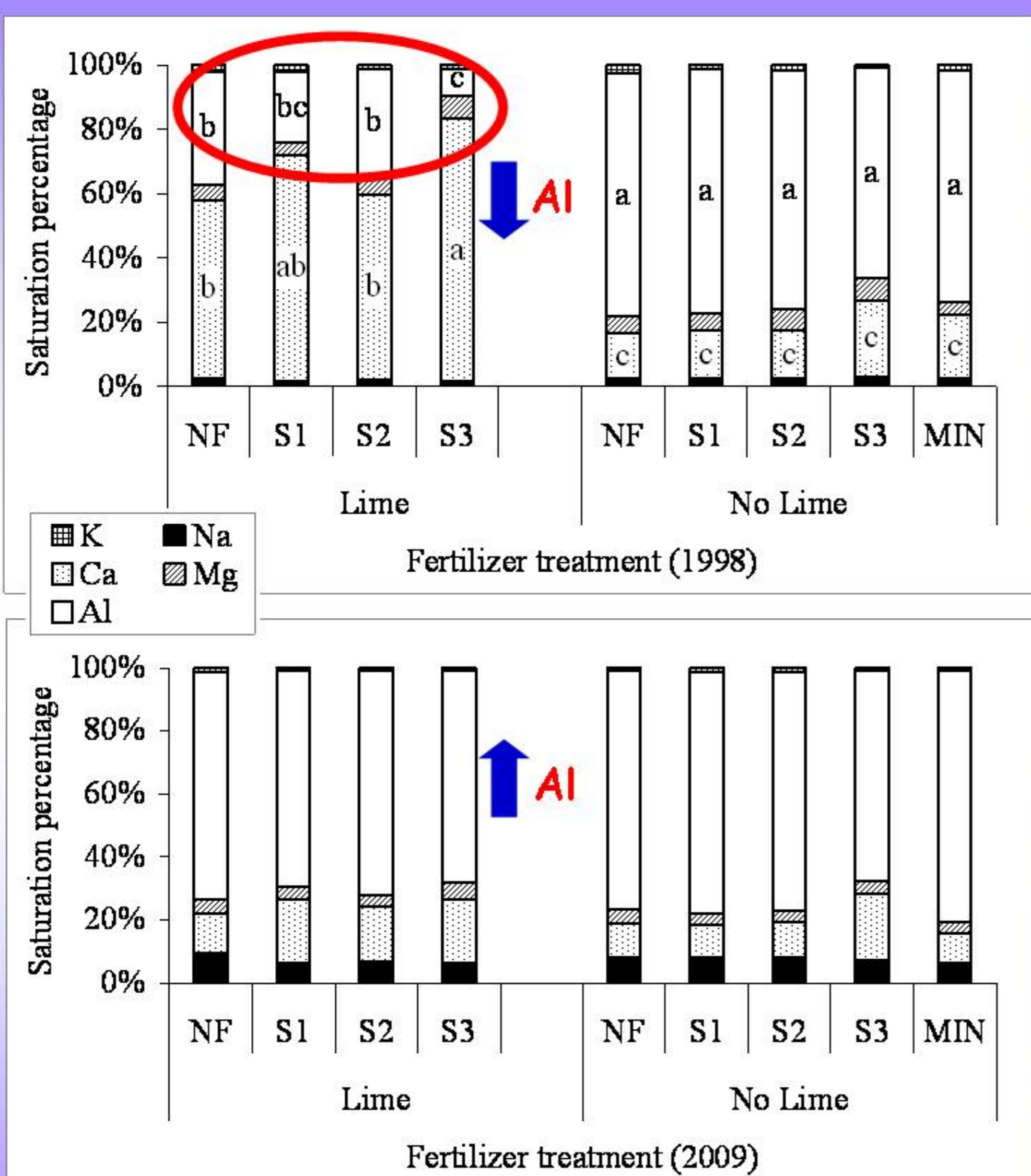
- (1) No fertilisation (NF)
  - (2) 160 kg N ha<sup>-1</sup> of sewage sludge (S1)
  - (3) 320 kg N ha<sup>-1</sup> of sewage sludge (S2)
  - (4) 480 kg N ha<sup>-1</sup> of sewage sludge (S3)
  - (5) No fertilisation (NF)
  - (6) 160 kg N ha<sup>-1</sup> of sewage sludge (S1)
  - (7) 320 kg N ha<sup>-1</sup> of sewage sludge (S2)
  - (8) 480 kg N ha<sup>-1</sup> of sewage sludge (S3)
  - (9) 500 kg of 8% N - 24% P<sub>2</sub>O<sub>5</sub> - 16% K<sub>2</sub>O (MIN)
- + 2.5 t CaCO<sub>3</sub> ha<sup>-1</sup>

**FIELD SAMPLINGS:** soil samples in December 1998 and 2009. Tree total height and normal diameter at 1.30 m in January 2001 and in November 2009

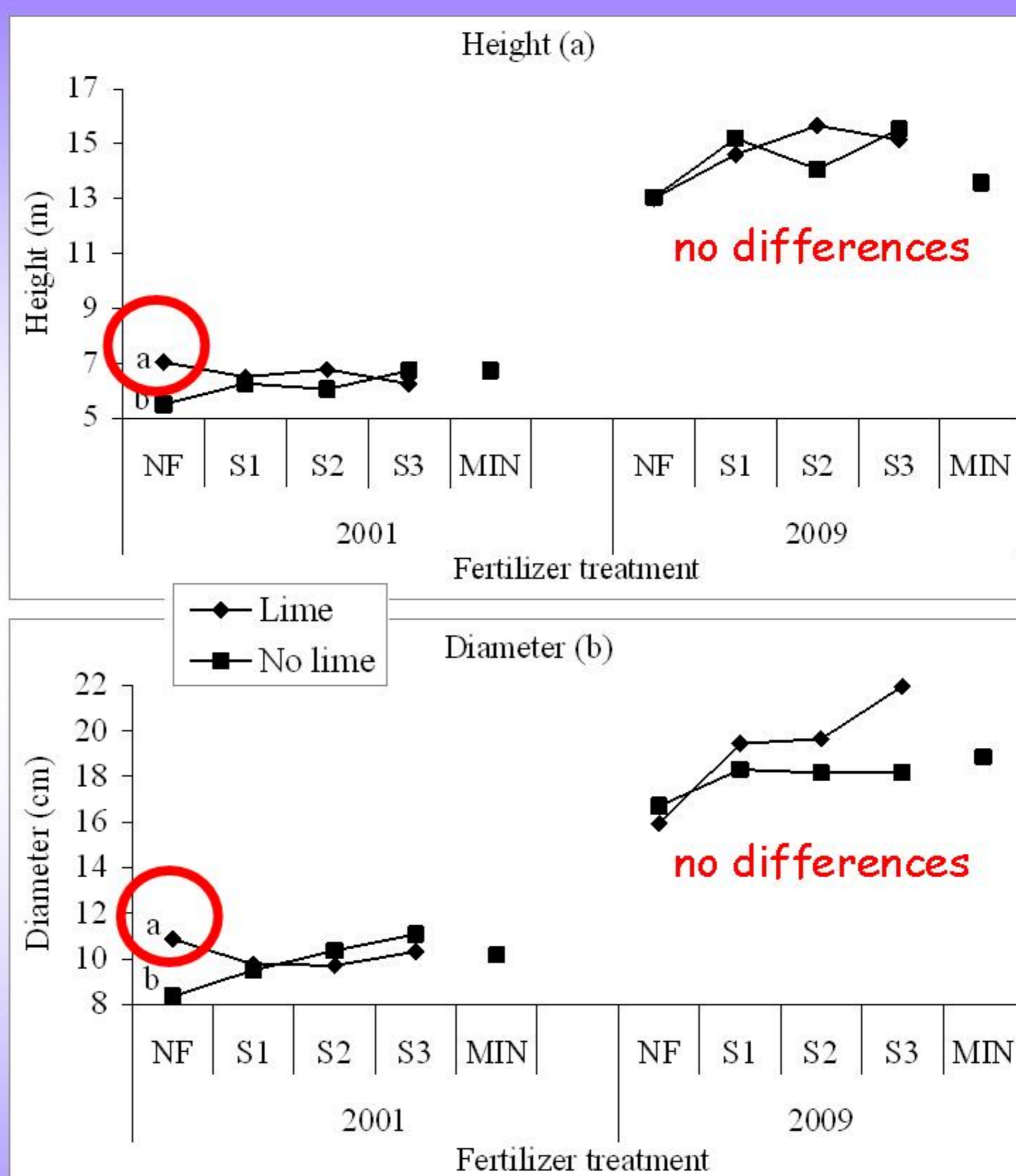
**ANALYSIS IN THE LABORATORY:** cations extracted with BaCl<sub>2</sub>

**STATISTICAL ANALYSIS:**  
ANOVA and LSD

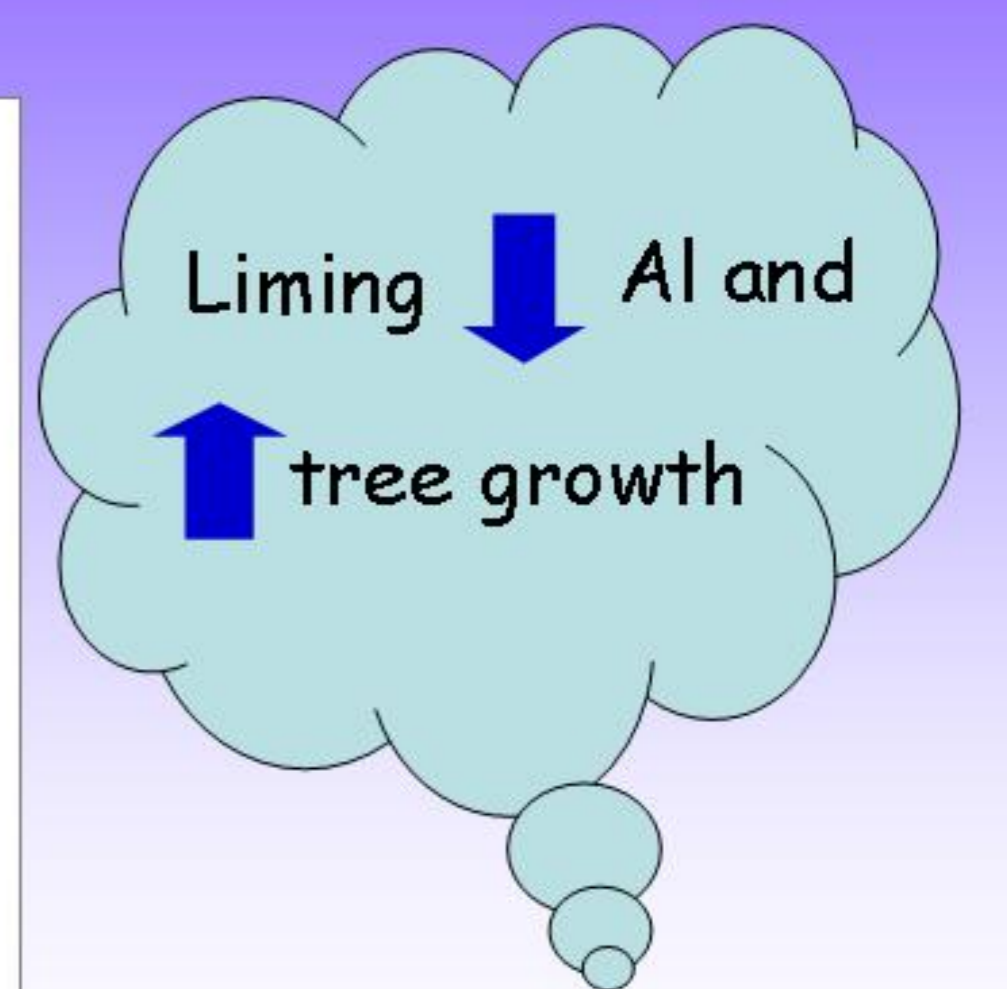
## RESULTS



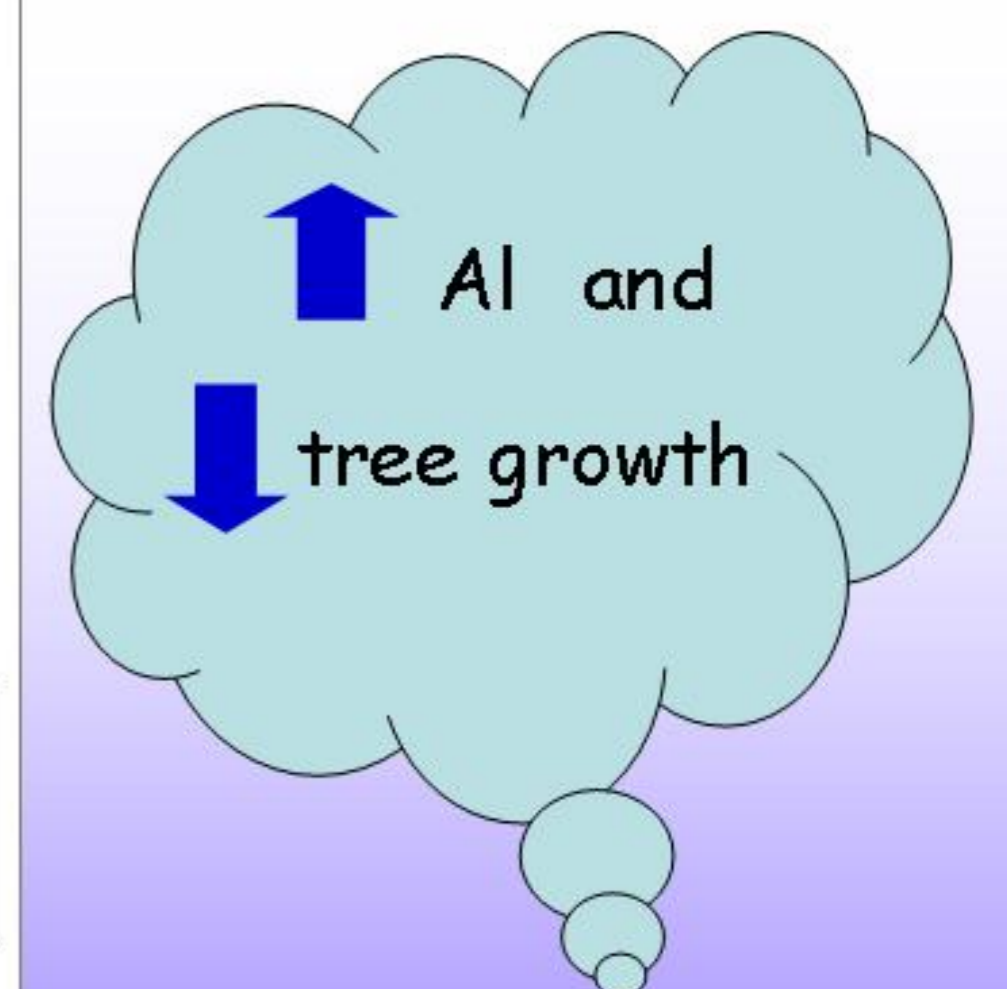
**Fig 1.** Saturation percentage of Al, K, Ca, Mg and Na in soil exchange complex (%) under each treatment in 1998 and 2009. Different letters indicate significant differences between fertiliser treatments.



**Fig 2.** Tree heights (m) (a) and tree diameters (cm) (b) under each treatment in 2001 and 2009. Different letters indicate significant differences between limed treatments within each fertiliser treatment.



**AT THE BEGINNING OF THE STUDY**



**AT THE END OF THE STUDY**

**CONCLUSION:** in the first years of the study, liming increased tree growth probably due to the reduction of the Al saturation percentage in the soil exchange complex. However, 12 years after the addition of lime and 9 years after the fertilisation with sewage sludge, the Al saturation percentage in the soil exchange complex was similar to that observed at the beginning of the study which decreased the tree growth in all plots and significant differences between treatments were not observed. Therefore, it is necessary to maintain an adequate regime of soil fertility to guarantee a sustainable growth of the forest stand.