DIFFERENTIAL RESPONSE OF SOIL CARBON,NITROGEN AND PHOSPHORUS STOCKS AND AVAILABLE POOLS TO CONVERSION FROM NATIVE FOREST TO EXOTIC PLANTATIONS IN SOILS OF CONTRASTING ORIGIN.

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EGU General Assembly 2020

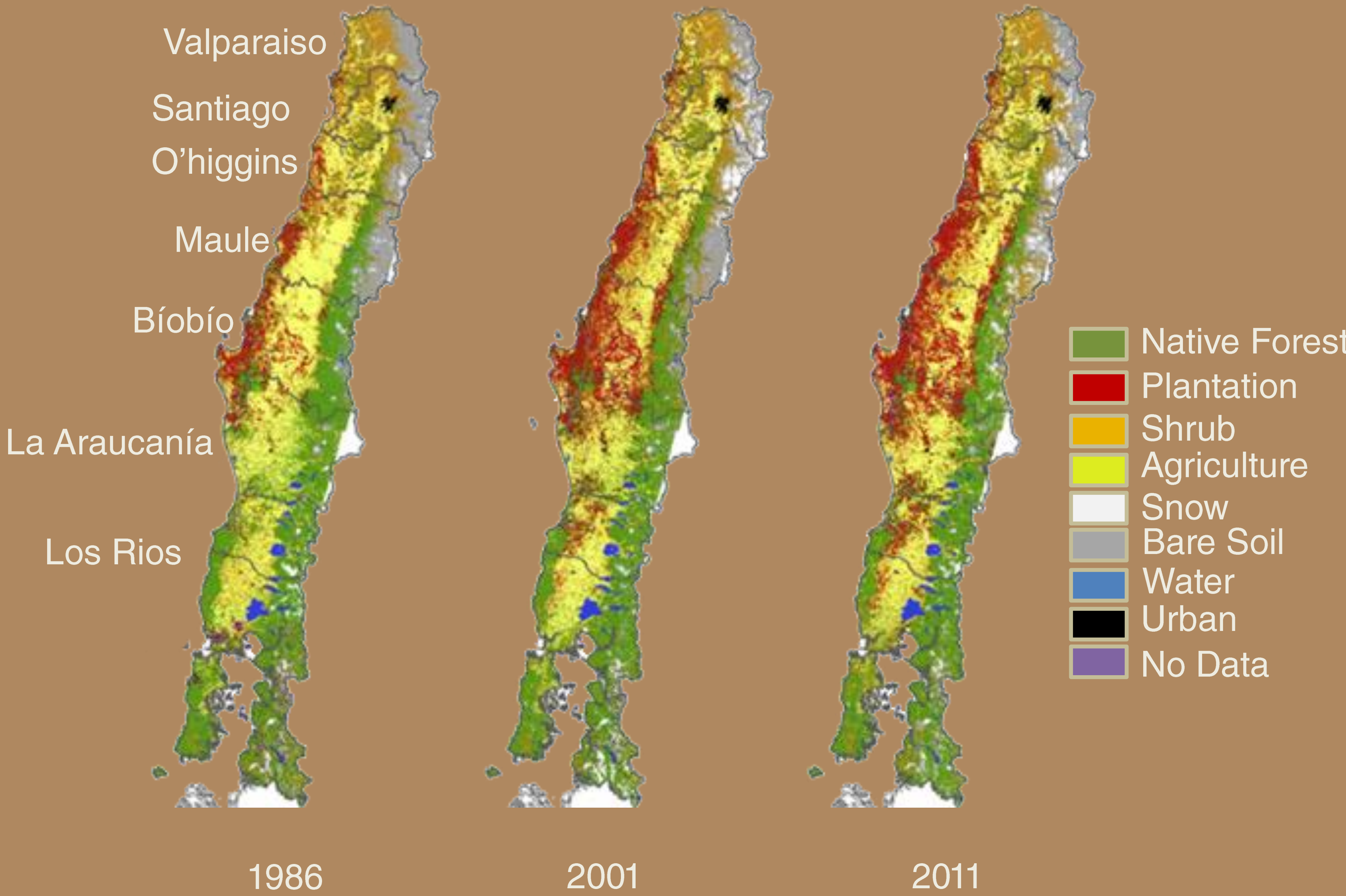
Background and motivation.

Forest

Industrial Tree Plantation

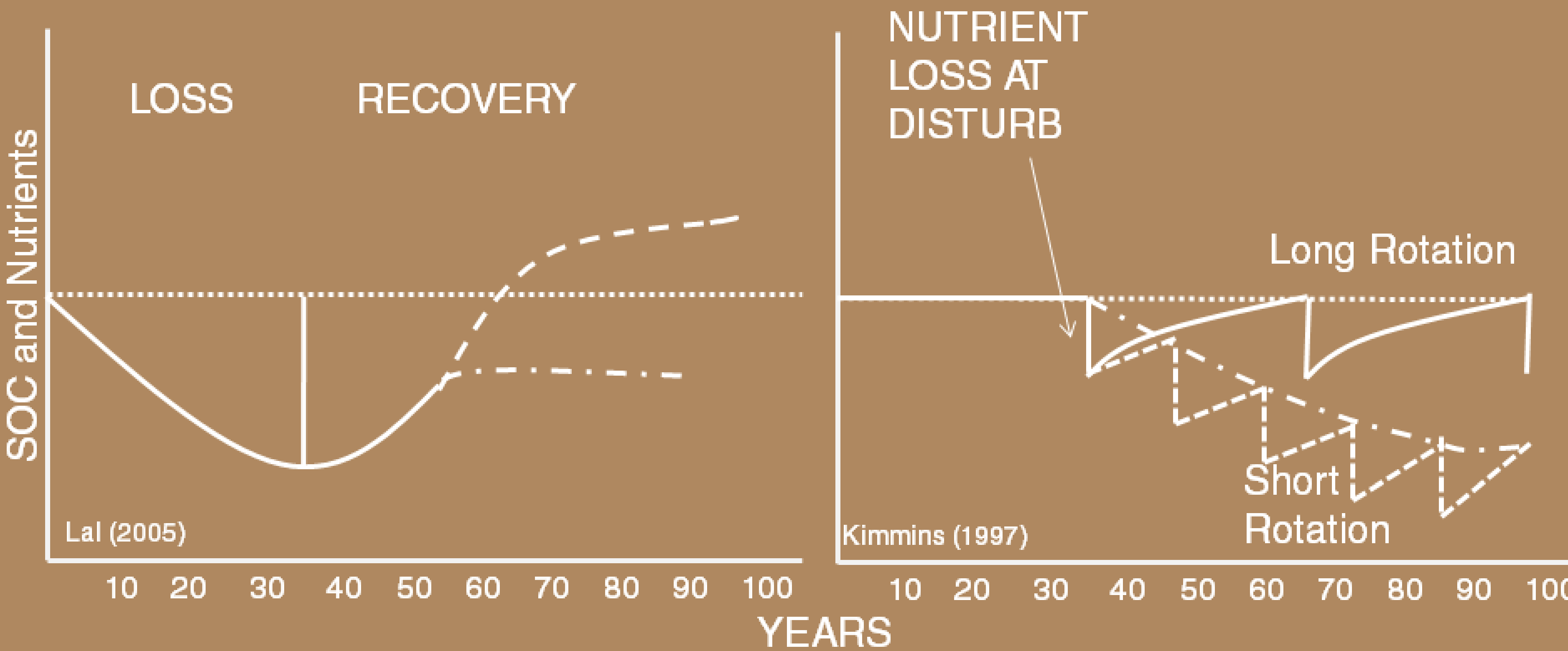
- Lower biodiversity (Brockerhoff et al., 2008)
- Increased carbon and erosion losses (Guillaume et al., 2015)
- Lower climate resilience (Domec et al., 2015)

Background and motivation.



R. Heilmayr et al.,2016, App. Geog.

Background and motivation.



- The alteration in C:N:P stoichiometry as a result of forest conversion have been generally overlooked.

- Elemental stocks alterations as a result of forest type change depend mostly on the shift on forest dynamics.

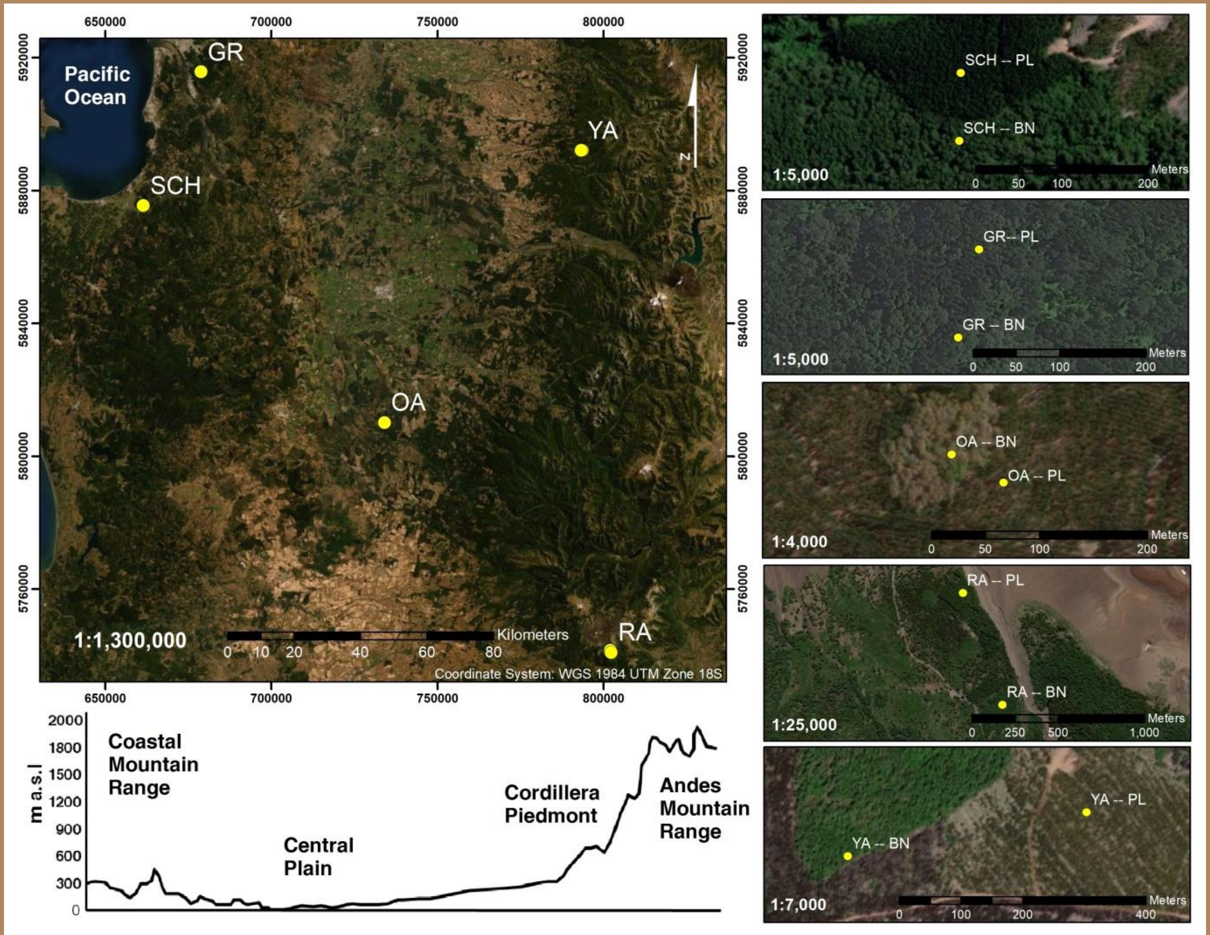
Background and motivation.

- This study aims to quantify the modulation effect of soil intrinsic properties on the response of C:N:P stoichiometry induced by native broadleaf (*Nothofagus sp.)* forest replacement by exotic coniferous plantations (*Pinus sp*.) in the south-central temperate region of Chile.

- Go Deep.

- Soil resilience to land-use change.

Methodology.



Crystalline

(Halloysite, goethite & Kaolinite)

Non – crystalline

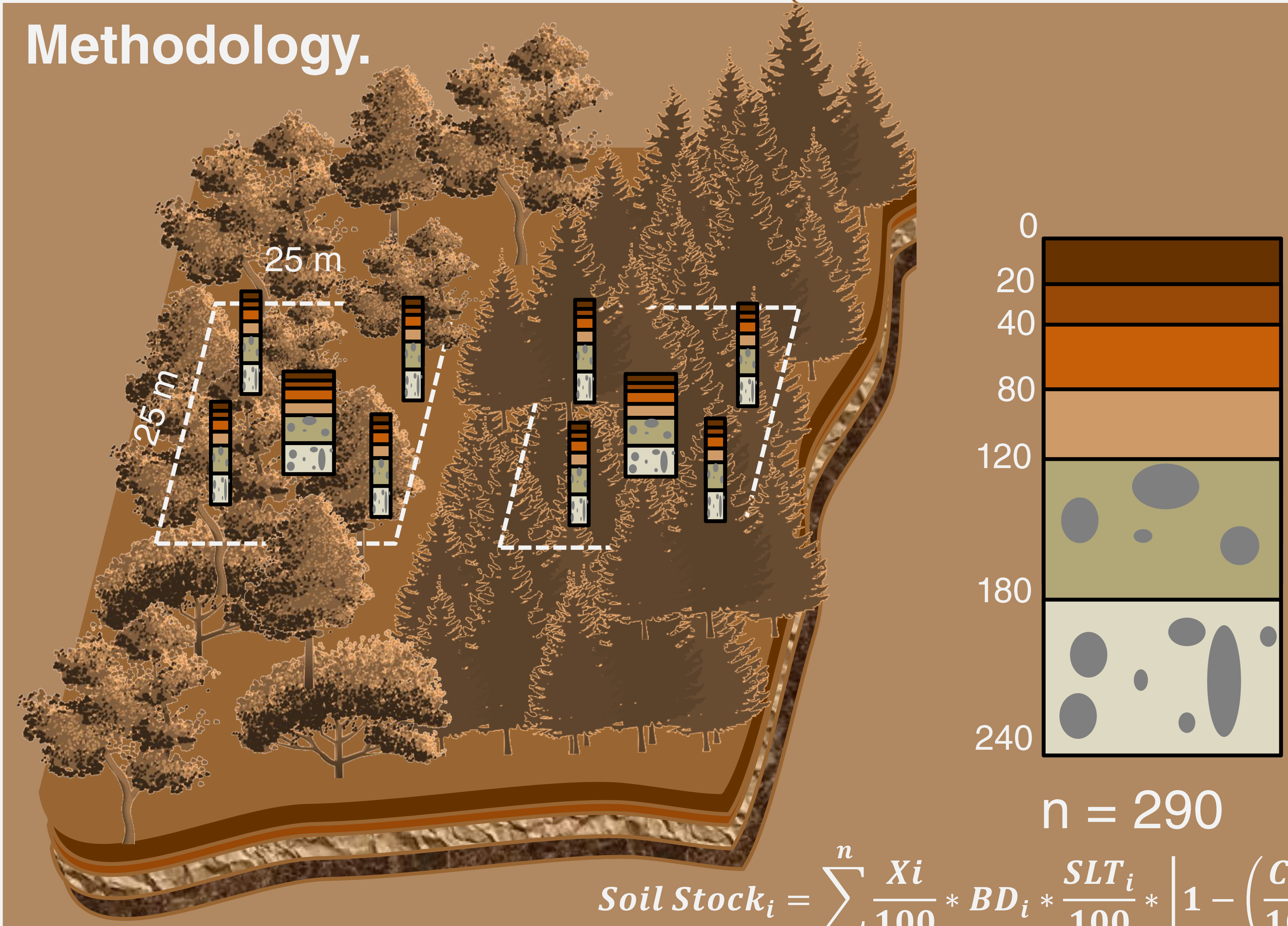
(Allophane, Imogolite & Ferrihydrite)

High

Carbon stabilization

Low

Methodology.

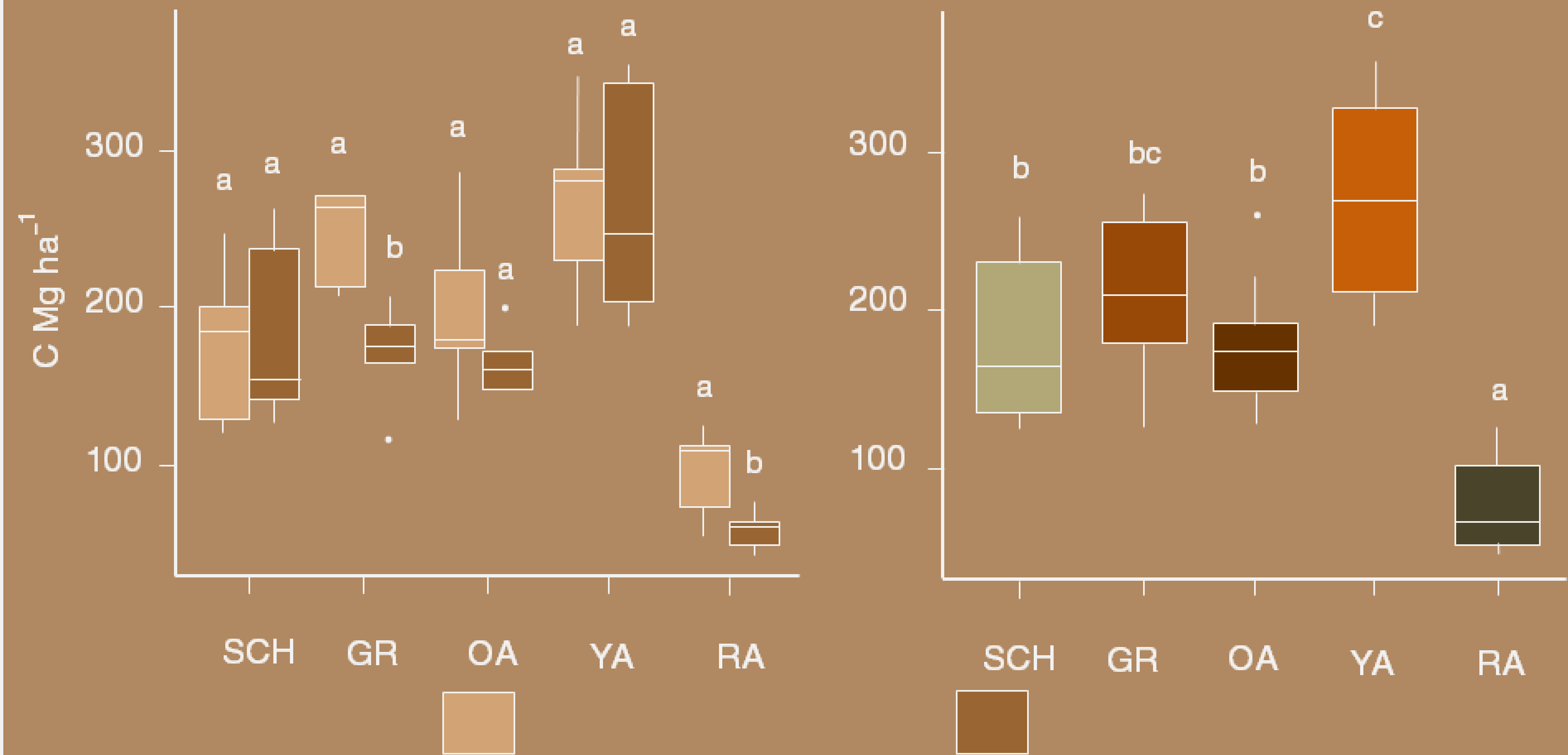


n = 290

$$Soil\ Stock_i = \sum_{i=0}^{n} \frac{Xi}{100} * BD_i * \frac{SLT_i}{100} * \left[1 - \left(\frac{CF_i}{100}\right)\right]$$

Results

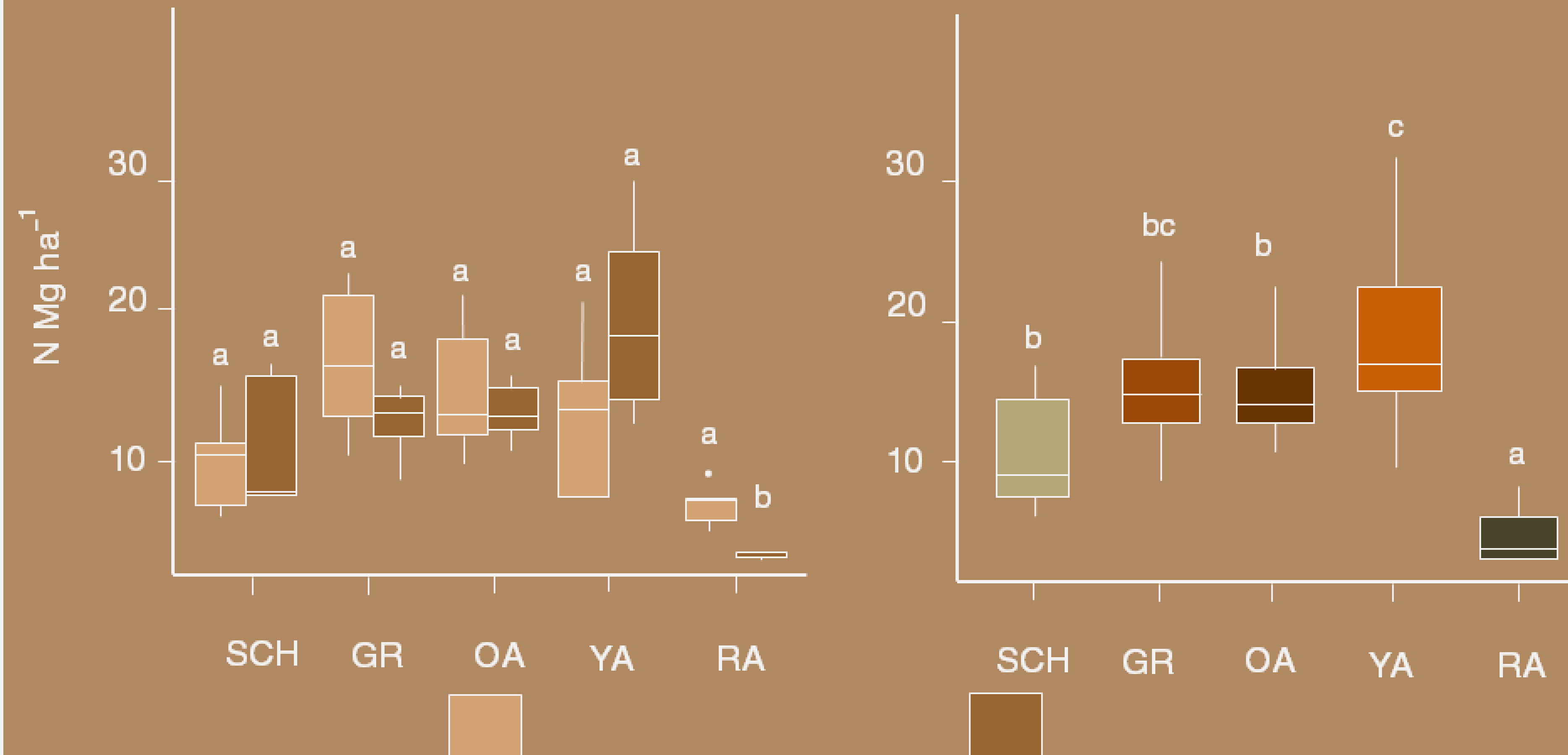
Total Carbon Stock



Crovo et al., (In Rev).

Results

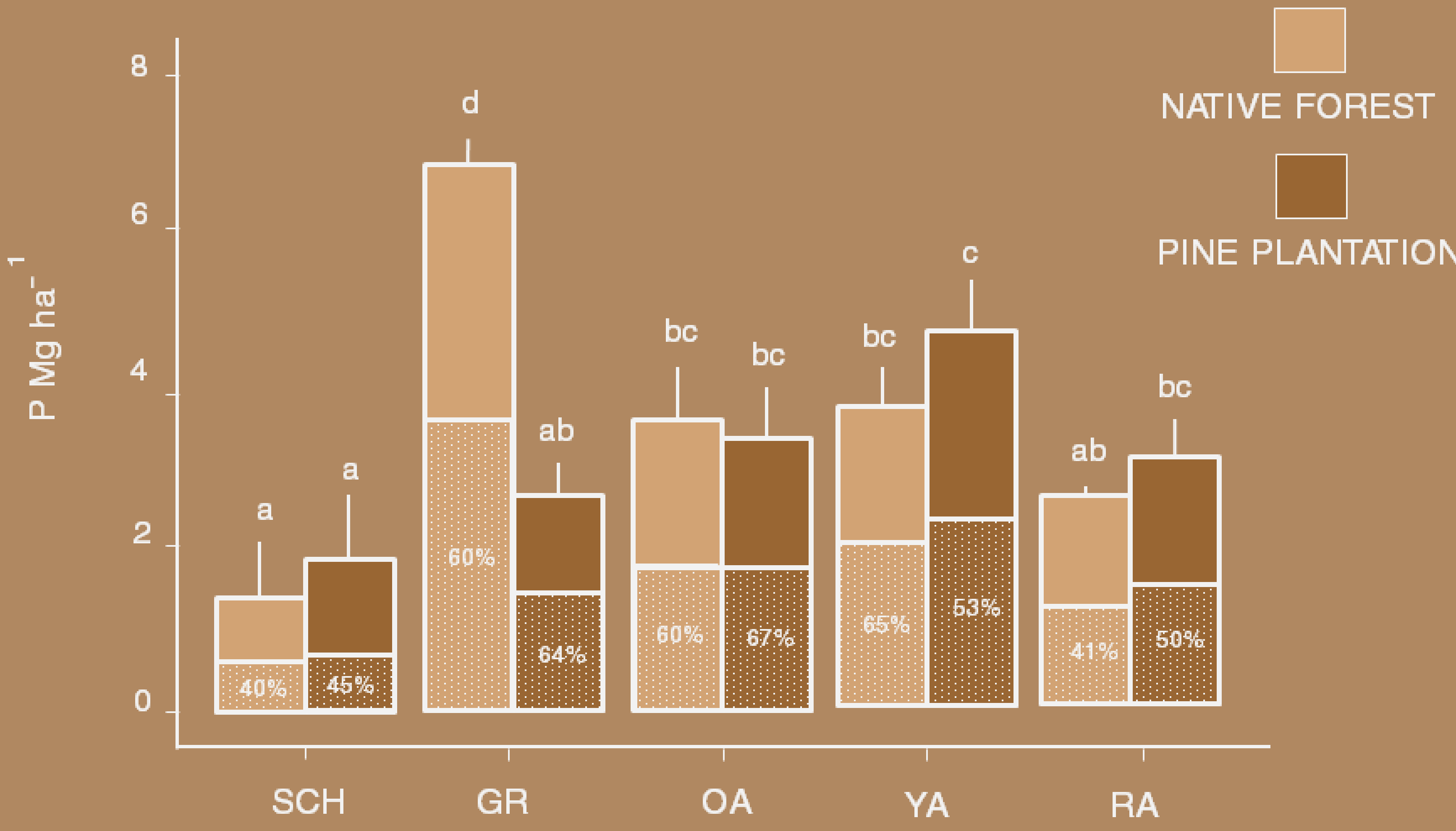
Total Nitrogen Stock



Crovo et al., (In Rev).

Results

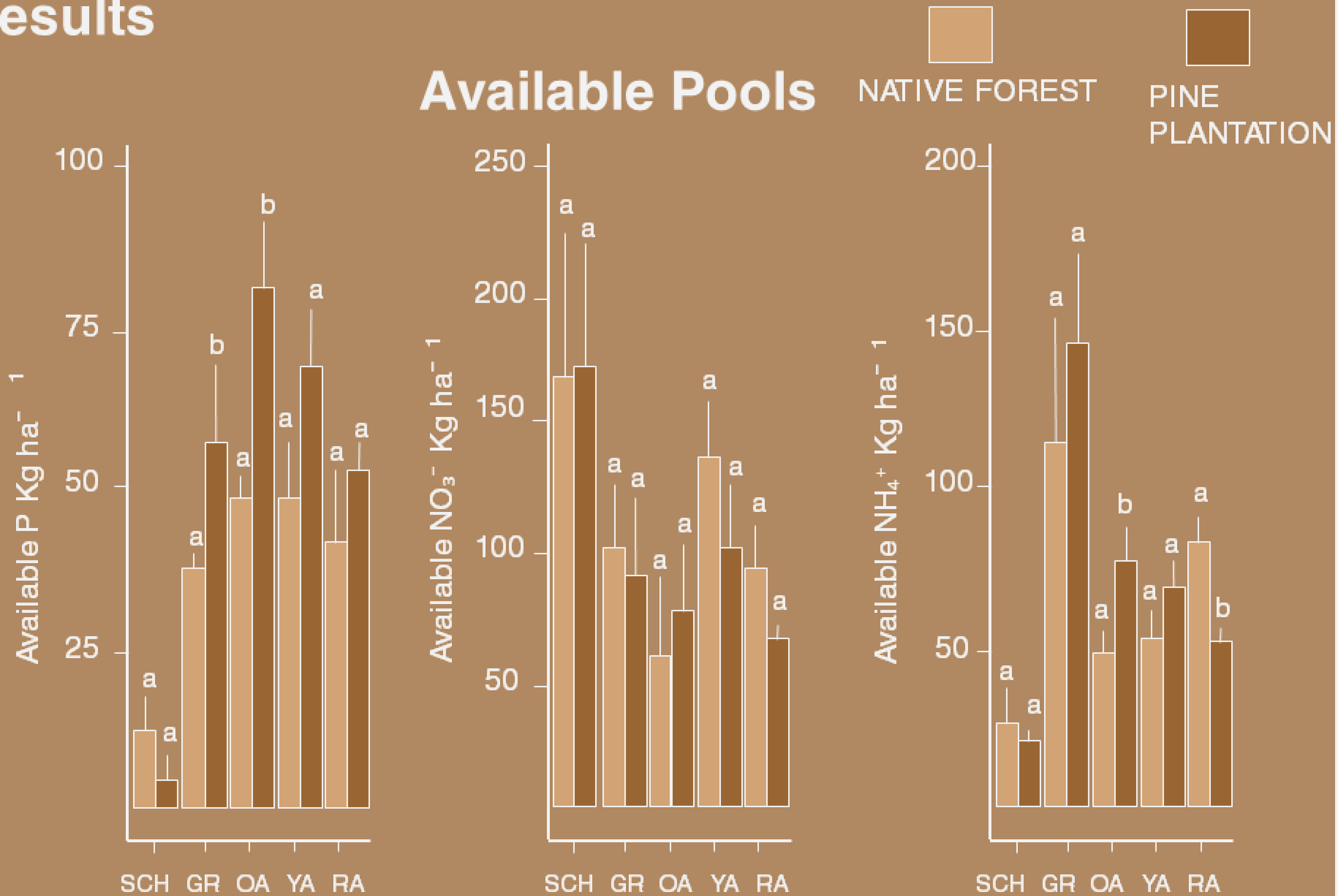
Total Phosphorus Stock



Crovo et al., (In Rev).

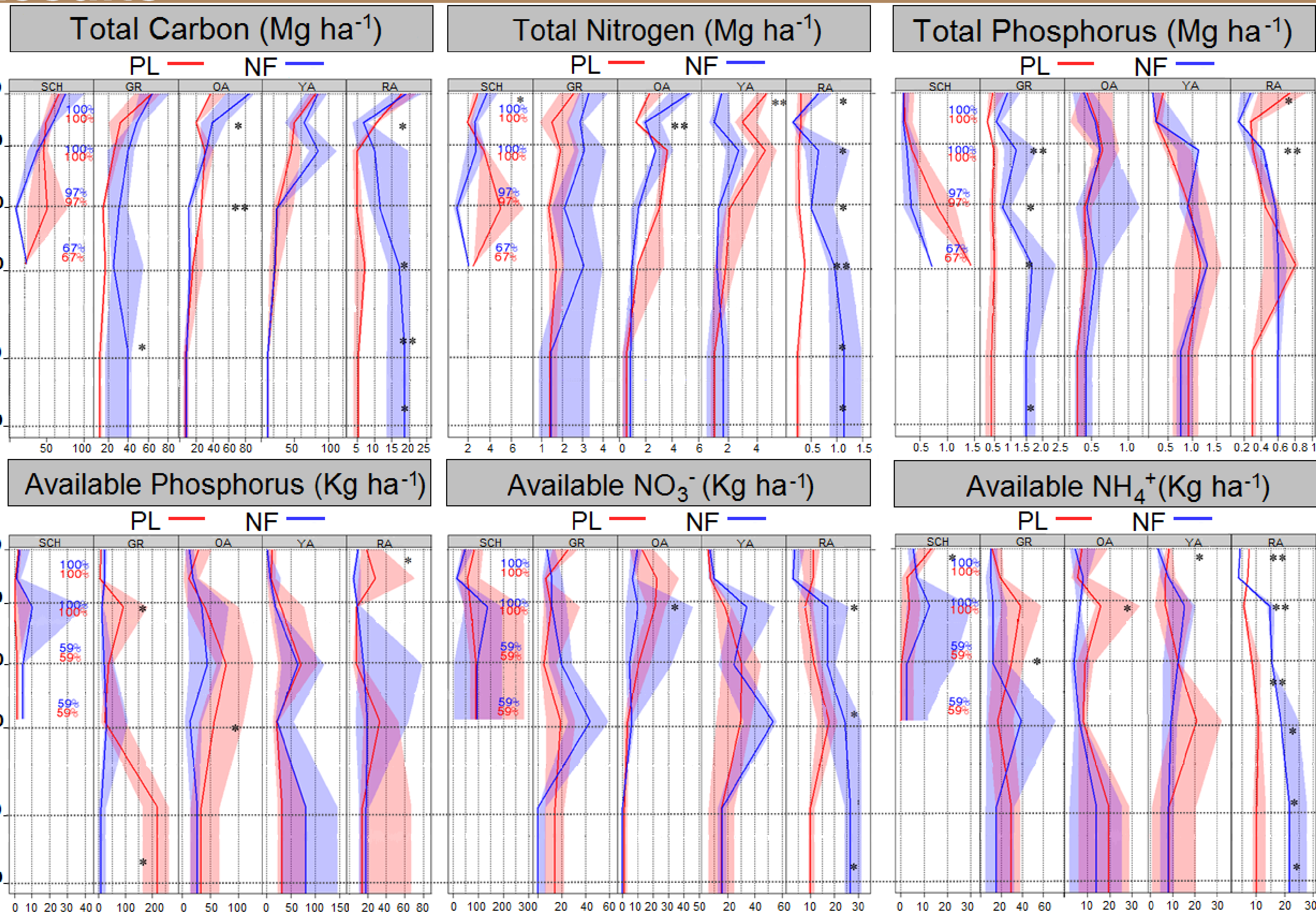
Results

Available Pools

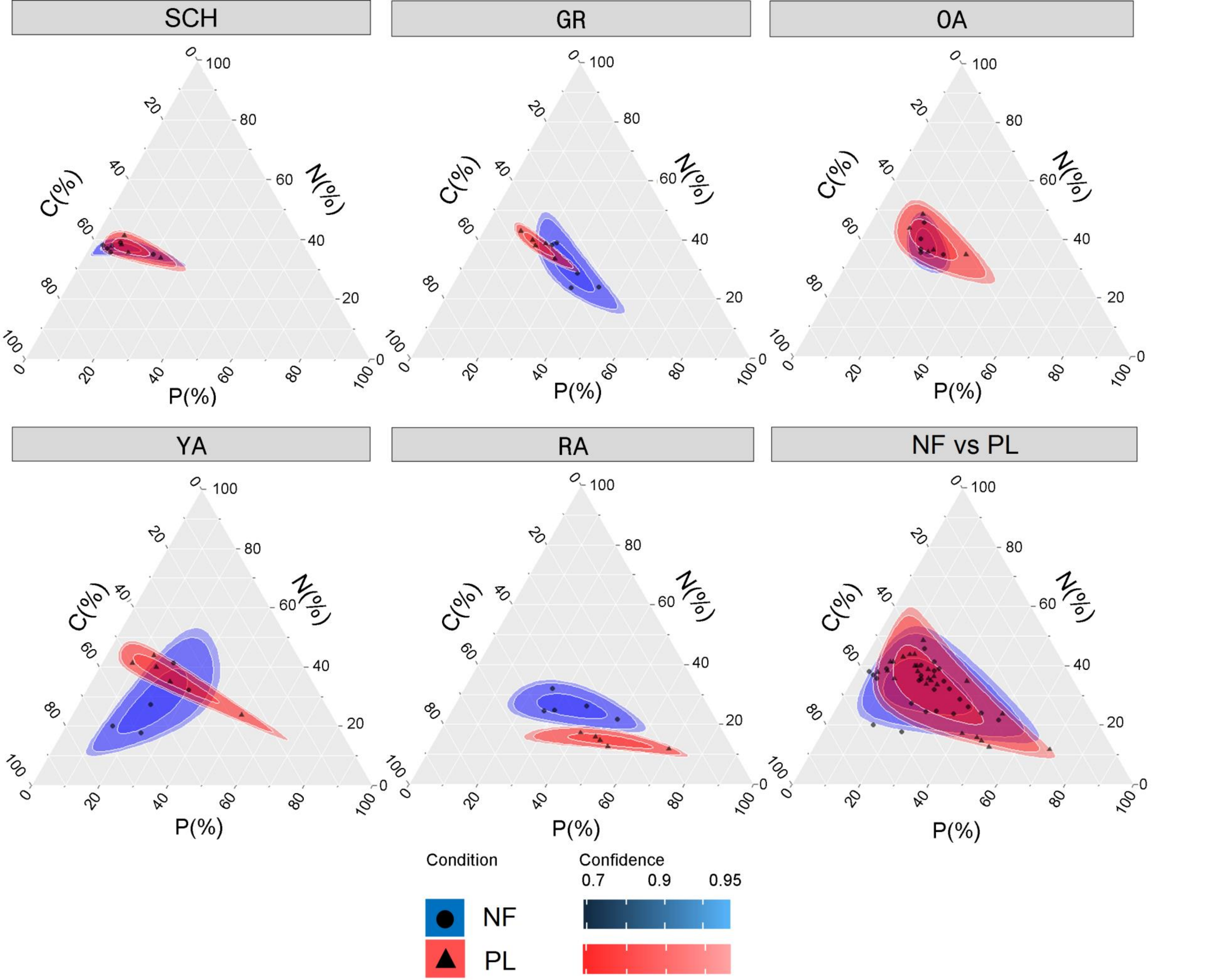


Crovo et al., (In Rev).

Results



Crovo et al., (In Rev).



Crovo et al., (In Rev).

Conclusions

- We provide evidence that total soil C, N and P reservoirs vary significantly between soil type and that the magnitude of the C:N:P stoichiometry modification caused by native forest conversion to plantation vary greatly between soil types.

- Soils with dominant crystalline low activity clays responded more strongly to forest plantation conversion displaying a net decrease in total C

- We also showed that plantation forests modified the elemental C, N and P vertical distribution in most sites, but C and N responded more strongly than P.

- Available nutrient pools are also significantly different between forest type, displaying a complex shift, generally showing a rise on available nitrate and phosphorous in most soils under plantation.

- The greatest changes in C:N:P contents and pools stoichiometry in the mineral soils occurred in the sites with low clay content (RA) and dominant low activity clay (GR), while ash-derived soils (YA) and soils with dominant high activity clays (SCH and OA) displayed less alteration.

On going research…

- Forest dynamics changes such as Litterfall, decomposition, L.A.I, CO_2 efflux, soil leachates.
- Standing biomass quantification.
- Increase paired-plots sampling sites for Carbon, Nitrogen and Phosphorus total stocks.

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EGU General Assembly 2020