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# Effects of native forest replacement to exotic plantations on forest C, N, and P pools and dynamics in south-central Chile

**Felipe Aburto**[1,2,3], Oscar Crovo[2,3], Maria Fernanda Albornoz[2], and Randal Southard[4]

[1]Departamento de Silvicultura, Universidad de Concepción, Chile (feaburto@udec.cl)
[2]Laboratorio de Investigación en Suelos Aguas y Bosques (LISAB), Facultad de Ciencias Forestales, Universidad de Concepción, Chile
[3]Iniciativa Foresta Nativa, Universidad de Concepción, Chile
[4]Land, Air and Water Resources, University of California, Davis.

Native forest substitution by intensively managed tree plantations can significantly alter carbon and nutrient biogeochemical cycling due to changes in forest dynamics and alterations on biogeochemical fluxes. To evaluate the magnitude of these alterations, we quantify the main C, N, and P pools and fluxes in paired plots established in secondary deciduous native forests and exotic pine plantation plots in five contrasting soils. Forest main fluxes were monitored for two years. We quantified total biomass and biomass C and nutrient pools, litterfall production, litter decomposition, soil $CO_2$ efflux, LAI, and annual root production. Besides, DOC, Nitrate, Ammonium, and DTP was determined on leachates.

Overall ecosystem C storage (soil and aboveground biomass) showed no differences between forest types across sites (p=0.07). However, two of the soil types displayed significantly higher C pools in the native forest sites. Besides, most native forest sites have higher total aboveground N and P stocks. Nitrate and ammonium leachate losses tend to be higher in native forests, but not significantly. On the contrary, phosphate losses were higher in plantations. Native forests and plantations differ on their annual C fluxes, particularly on their root and DOC productions. Native forests showed a significantly higher annual root production (1.76 ± 0.99 Mg $ha^{-1}$) than pine plantations (0.81 ±0.88 Mg $ha^{-1}$) (p=0.0001). Of the Measured variables, only root production showed a positive correlation ($R^2$ = 0.49) with soil total C (p=0.001). Exotic pine plantations display higher litterfall but a significantly lower root production modifying the main source of carbon to the system. Also, DOC losses increased considerably under plantations. Continuous monitoring of these pair plots will help to address the potential long term effect of this land-use change and the relative sensitivity of these systems to changes in environmental conditions.