Do differences in carbon allocation strategy account for large difference in productivity among four tropical *Eucalyptus* plantations?

Details

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Authors	EPRON, D*, Forest Ecology Ecophysiology, Nancy University, Nancy, France Nouvellon, Y, UPR80, CIRAD, Montpellier, France Laclau, J, UPR80, CIRAD, Montpellier, France Kinana, A, CR2PI, Pointe-Noire, Congo Mazoumbou, J, CR2PI, Pointe-Noire, Congo Almeida, J D, Brazil UNITAU, Taubate, Brazil Deleporte, P, UPR80, CIRAD, Montpellier, France Gonçalves, J, ESALQ, Sao Paulo University, Sao Paulo, Brazil Bouillet, J, UPR80, CIRAD, Montpellier, France
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Abstract

The increasing demand for wood products is not satisfied by natural forests, and forest plantations are expected to provide a larger part of the global wood supply in the future. *Eucalyptus* is the dominant species planted in the tropics. Intensification of wood production will rely mainly on gain of productivity and on extension of afforested area on marginal zones. Wood production does not only depend on gross primary production (GPP) but also on carbon partitioning between growth (NPP) and respiration, and on NPP partitioning among the different plant organs (allocation). Less than one third of GPP is allocated to wood production in planted forest ecosystems and we hypothesized that this fraction varies among genotypes, or because of soil fertility, in relation to productivity. The partitioning of aboveground NPP between leaf, branch and stem growth was compared in four *Eucalyptus* plantations located in Congo and Brazil over an entire rotation (6 years). In addition, total below ground carbon allocation was estimated from soil respiration and litter fall measurements. Two clones differing in productivity were studies in Congo where productivity is known to be much less important than in Brazil. Two plots (fertilized or not with K) were studied in Brazil. In Congo, the wood production was twice higher in the most productive clone (UG) compared to the less productive one (PF1). This was due to a higher aboveground NPP, the surplus being allocated to wood production. In addition, an increase in leaf lifespan reduced the amount of carbon allocated to leaf production. Similar conclusions can be drawn when comparing K fertilised and control stand in Brazil where most of the surplus of aboveground NPP in fertilised plots was allocated to wood production and where leaf lifespan was also increased. Soil respiration increased in both sites with increasing NPP reflecting that more carbon is allocated below ground in these stands. A better understanding of genetic and environmental control on carbon allocation is required for accurately predicted tree yield, especially in marginal area where plantations are thought to extent.

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