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Abstracts Book

Unexpectedly, clearcutting does not increase fine root mortality down to 17 m deep in eucalypt plantations conducted in coppice in a Brazilian throughfall exclusion experiment

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Tree growth is highly dependent on the absorptive function of fine roots for water and nutrients. Improving our understanding of the spatiotemporal dynamics of fine roots down to the root front is a key component to identify more sustainable silvicultural practices for planted forests. Our study aimed to assess the effect of clear-cutting and drought on fine-root production along the soil profile down to the water table in Brazilian eucalypt plantations conducted in coppice. Fine roots (diameter < 2mm) were sampled down to 17 m in a throughfall exclusion experiment comparing stands with 37% of throughfall excluded by plastic sheets (-W) and stands without rain exclusion (+W). Twenty-four minirhizotron tubes were installed in two permanent pits down to 17 m in +W and -W. Root dynamics were recorded over 1 year before cutting the trees and over 2 years in coppice, after harvesting. A spectacular fine-root production at more than 9 m deep was observed in both treatments, lasting 2 months from the end of the dry season each year. After the harvest, root growth was observed in deeper soil layers (> 13m) and, surprisingly, root mortality remained extremely low whatever the depth in both treatments even after the harvest. Down to 17 m depth, total fine-root biomass in coppice was 1266 g.m-2 in -W and 1017 g.m-2 in +W, 1.5 year after the harvest. Specific root length and specific root area were about 15% higher in -W than in +W. Proliferation of fine roots at great depths could be an adaptive mechanism for tree survival, enhancing the access to water. Coppice management in eucalypt plantations can be an advantage against water stress because trees take advantage of the root system already established in very deep layers where water availability can be higher. Carbon investment belowground to produce fine roots is therefore minimal over the early growth of eucalypt trees in coppice, which might contribute to explaining the very fast growth of the stem after the harvest.

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