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Managing *Eucalyptus* plantations under global changes

Abstracts Book

Changes in maximum distance of nutrient uptake (horizontal and vertical) throughout the rotation in Brazilian Eucalyptus plantations

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Climate changes will increase the probability of exceptional droughts, which may dramatically increase tree mortality. It is therefore urgent to gain insight into tree behaviour in response to drought. Our study aimed to assess the maximum distance from the trunk where *Eucalyptus* fine roots take up mobile nutrients in deep Ferralsols during the dry season. 15N-NO3- was injected at several soil depths in commercial eucalypt plantations of the same genotype (one *E. urograndis* clone) at the end of the rainy season. The 15N marker was applied in the middle of the inter row (3 replications): at 5 depths (from 0.1 to 6 m) at age 7 months, at 4 depths (from 0.1 to 9 m) at age 1 year, at 5 depths (from 0.1 to 12 m) at age 2 years, and at 6 depths (from 0.1 to 15 m) at age 6 years. 15N atom% was determined in leaves sampled in dominant and supressed trees at different distances from each injection point after the dry season. While dominant trees take up 15N-NO3- down to a depth of 6 m between 7 and 12 months after planting, the maximum depth of uptake for supressed trees was between 3 and 4.5 m. From 1.5 to 6 years after planting, 15N was mainly detected in leaves for 15N -NO3- injected in the upper 3 m and only for a few trees at a depth of 6 m. Very low 15N -NO3- uptake rates were detected between 2 and 4-5 m from the trunk. Most of the uptake of 15N occurred within 2 m of horizontal distance from the trunk, whatever tree age and tree social status. Eucalypt fine roots can take up nitrates at depths between 6 and 8 m the first year after planting. However, the velocity of exploration of deep soil layers depend on the social status of the trees. Fertilizers must be applied within 2 m of the trunks in eucalypt plantations to be taken up by all trees. When fertilization is concentrated in the first months after planting, nitrate leaching in deep soil layers might increase the heterogeneity of the stands since deep nitrates could only be available for dominant trees.

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