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Managing *Eucalyptus* plantations under global changes

Abstracts Book

Eucalyptus and Acacia mangium tree growth and stand production in pure and mixed-species plantations along an ecological gradient in Brazil

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The association of *Acacia* could increase *Eucalyptus* plantations productivity through a positive balance between facilitative effects and competition between species. In Brazil, the development of mono-specific stands of *Acacia mangium* (100A) and *Eucalyptus sp.* (100E) was compared with nitrogen (N) fertilisation treatment (100E + N) and mixed-species plantations in a 1:1 ratio (50A:50E). The study was conducted in Itatinga-SP, Sinop-MT and Colinas-TO with mean annual temperature of 19.4, 25.0 and 27.5 ∘C, mean annual rainfall of 1320, 2640, and 1850 mm, and dry season duration of 3, 5 and 7 months, respectively. The soils are sandy to sandy-clay. At 36 months, *Eucalyptus* height in 100E was 18.9, 10.9 and 13.7 m, in SP, MT and TO, respectively. For *Acacia* the corresponding values in 100A were 14.2, 13.5 and 10.8 m, respectively. This pattern, also observed for diameter at breast height, showed that Eucalyptus was proportionally more adapted to the ecological conditions than Acacia in SP, the opposite

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being found in MT. Stand basal area (SBA) was 2, 10 and 3 % higher in 100E+N than in 100E in SP, MT and TO, respectively. SBA was 7 and 1 % higher in 100E (8.33 and 3.70 m2 ha-1) than in 100A (7.77 and 3.66 m2 ha-1) in SP and TO, respectively. By contrast, SBA was 69 % higher in 100A (7.54 m2 ha-1) than in 100E (4.47 m2 ha-1) in MT. SBA was 6 and 4 % higher in 100E than in 50A:50E in SP and TO, respectively. By contrast, SBA was 21 % higher in 50A:50E than in 100E in SP. The occurrence of higher stand production in mixed species plantations of *Eucalyptus* and *A. mangium* than *Eucalyptus* monocultures depends on ecological conditions. When conditions permit high eucalypt stand yield as observed in SP, the potential N facilitation by *Acacia* cannot balance the lower potential of growth of *Acacia* trees, which are also deeply competed by *Eucalyptus* trees. By contrast, as observed in MT mixed plantations are likely more productive than *Eucalyptus* monoculture when the environmental conditions (hot and humid climate) are more favourable for acacia than eucalyptus and when the soils are deficient in N. Adverse conditions for both *Eucalyptus* and *Acacia* (e.g. extreme high temperatures, marked dry season) as found in TO are likely to prevent any efficient facilitation processes between species.

Keywords: mixture, forest plantations, environmental conditions, competition, facilitation.