

Tropical Tree Diversity Experiment: The Drivers of Production and its Temporal Stability

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EDITORIAL

Mixed-species forests appear to provide more ecological services than monospecific forests, according to growing evidence. Most research on tree diversity and ecosystem functioning relationships, on the other hand, rely on data from forest inventories (conducted under uncontrolled conditions) or very young plantation experiments. In the world's oldest tropical tree diversity experiment, we looked at the temporal dynamics of diversity-productivity and diversity-stability relationships. Sardinilla was established in Panama in 2001 and consists of 22 plots that form a gradient in native tree species richness for one-, two-, three-, and five-species populations. We measured basal area increment as a proxy for tree productivity using annual data on tree diameters and heights. We evaluated the impact of both species diversity and structural diversity on productivity and its temporal stability by combining tree neighbourhood and community-level analyses.

The general trends were consistent in both scales, suggesting that

observed diversity effects are driven by tree-tree interactions in neighbourhoods. Neighborhood tree diversity increased community productivity, but the effect of species diversity was greater and grew over time, while the effect of structural diversity decreased. The asynchronous responses of species to environmental variability and overyielding increased the temporal stability of population production as species diversity increased.

These findings shed new light on mixing effects in a wide range of tropical plantations, emphasising the significance of temporal dynamics studies in comprehending the complex relationships between diversity, production, and stability. Mixed-species forests may be able to provide both high levels of productivity and high levels of stability in the face of climate change.

During a severe El Nio-related drought, overyielding in mixtures was at its peak. Positive diversity-productivity and diversity-stability relationships predominated in general, with the highest productivity and stability occurring at the highest levels of diversity.

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