

Sunlight in tropical forest driving force behind ecological niches of tree species

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Not water, but sunlight is the main factor in determining the growth of the hundreds of tree species in tropical forests. The variation in physiological characteristics between tree species explains how the various species fit into their ecological niches, thereby contributing to diversity in tropical forests. This is the conclusion drawn by researchers from Wageningen University, part of Wageningen UR, and their colleagues from Utrecht University in a publication in the scientific journal *PNAS*.

Tropical forests are able to sustain hundreds of [tree species](#) on just a few hectares, but little is known about how this diversity has evolved. A study carried out by Frank Sterck, Lourens Poorter and Lars Markesteijn (Wageningen University) and Feike Schieving (Utrecht University) shows that the species examined all responded differently to variations in the availability of light and water because they had different physiological characteristics. Most of the species occupied a unique niche where they do better than the other species, which may contribute to the co-existence of these species and the diversity of the forest.

As part of the study, the researchers measured a range of physiological properties such as leaf surface area, wood density, photosynthesis capacity, leaf water potentials and resistance to water transport in tropical tree species from a Bolivian forest. They used a physiological [plant model](#) to calculate the speed at which the various species can grow when exposed to different combinations of water and light. The simulations show that variations in leaf production and [photosynthesis](#)

capacity enable species to specialise for a variety of light niches. The sensitivity of stoma to drought in the various species (and therefore the [water consumption](#)) also varies, but this does not lead to trees becoming specialised for dry or moist locations in the same forest.

The researchers conclude that even in relatively dry [tropical forests](#), light is the [driving force](#) behind niche specialisation in tree types. This makes sunlight more important than water in terms of whether different trees grow side-by-side or not.

This is one of the first studies for which physiological plant models have been used to scale up plant characteristics to the growth and survival of various tree species in order to explain the wealth of species in a tropical forest. In future, these models will also be used to look into the distribution of plant species along climate gradients.

Provided by Wageningen University

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