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Nitrogen fixation is not the only trait that determines the success of tropical legumes during secondary succession

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Legumes trees are well represented throughout the entire precipitation gradient of tropical forests. Many of these species are able to fix atmospheric dinitrogen through symbiosis and offer a mechanism to overcome nitrogen limitation typical of initial stages of secondary forest succession. While it is often assumed the success of legumes is linked to their fixation ability, the variation of other functional traits within this large group has received considerably less attention. Here we assessed legume abundance in secondary forest plots in 42 Neotropical chronosequences (the 2ndFOR network) that span a broad gradient of precipitation regimes and identified those traits that are favored in distinct successional environments. Our main finding is that in young secondary dry forests (5-20 years), legumes that have the potential to fix nitrogen and have small leaflet size become exceptionally abundant (up to 17-99% relative basal area). We suggest that in those species, reduced leaf area could help regulate leaf temperature and minimize water loss, and the cost of reduced total leaf area may be compensated by high photosynthetic rates maximized with nitrogen obtained through fixation. Overall, our study underscores great functional heterogeneity within tropical legumes, which likely translates into diverse biogeochemical cycles. In addition, these results provide a useful framework for active restoration of degraded areas, as it identifies a group of species that accumulate carbon at fast rates under warm and dry environments, conditions that are expected to become more common in the tropics.