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“Development on the margin”

## May Tropical Regions Suffer from a Climate-change Induced Decline of Plant Species Richness?

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### Abstract

Biodiversity represents a major precondition for human wellbeing also in managed landscapes and for agricultural production in the tropics. Biodiversity facilitates provisioning, regulating and supporting ecosystem services at genetic-, species- and ecosystem level. Even though climate change represents a major challenge to the maintenance of global biodiversity and to human development, little is known about the magnitude of related imminent changes in the global distribution of plant diversity. We present results of an empirical multi-variate analysis of the global relationship between climatic and environmental variables and the regional capacity for plant species richness as a proxy for overall biodiversity, and its projected future changes according to climate projections and possible impacts of landuse change. We find a strong relationship between the magnitude of projected temperature rise and the modeled response of the capacity for plant species richness. In global average, for the optimistic B1/+1.8°C scenario until 2100, increases in some areas are compensated by decreases in other regions. This is in contrast to the more realistic ‘business as usual’ scenario (A1FI/+4.0°C), where the regional capacity for species richness may decrease by 9.4% until 2100 in global average. In all cases, a geographically highly non-uniform pattern of the direction and magnitude of changes is evident across all considered models and scenarios. In most temperate and arctic regions, future conditions may provide habitat for more plant species than today, while there is an indication for a strong decline of the capacity for plant species richness in most tropical and subtropical regions, where in many cases 30–50% of plant species may lose their suitable habitats. Hence, those countries that are least responsible for past and present greenhouse gas emissions are likely to suffer most from its negative consequences in terms of potential biodiversity losses. Given the comparatively high dependence of many agricultural production systems on climatic and other environmental conditions in tropical regions, comprehensive land management strategies also need to consider the status and dynamics of the biodiversity matrix in which they are embedded.

**Keywords:** Biodiversity, capacity for plant speices richness, climate change, global scale, land management, multi-variate statistics, tropics