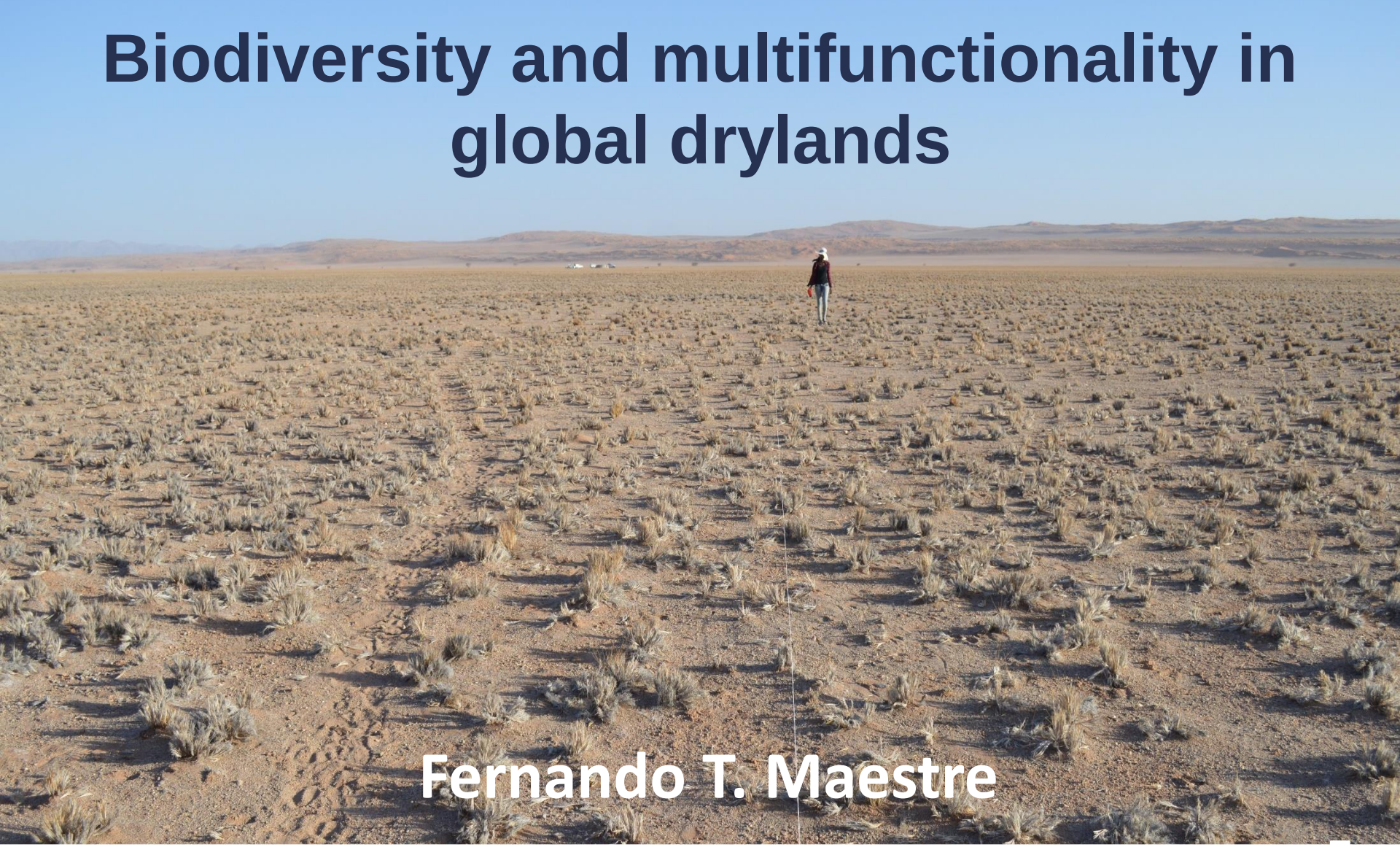
Biodiversity and multifunctionality in global drylands



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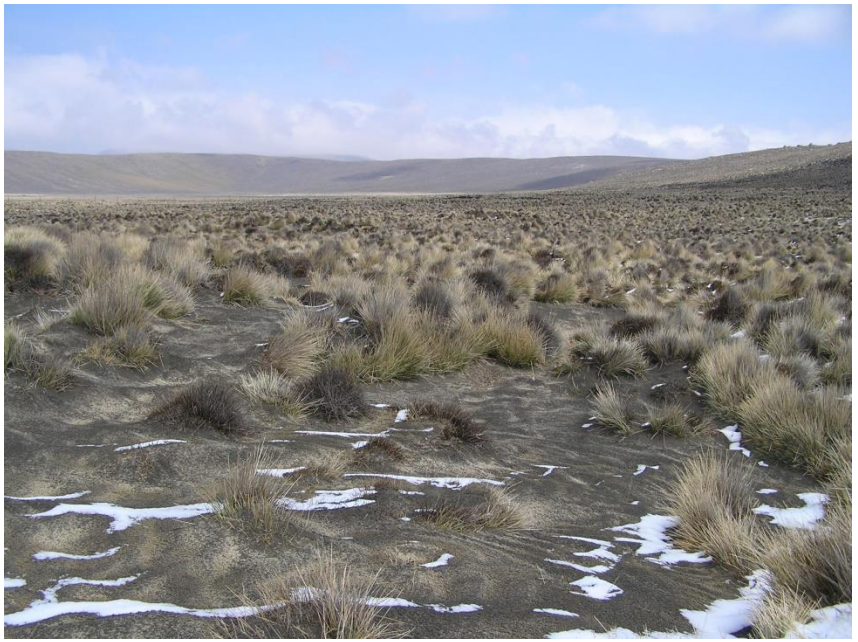
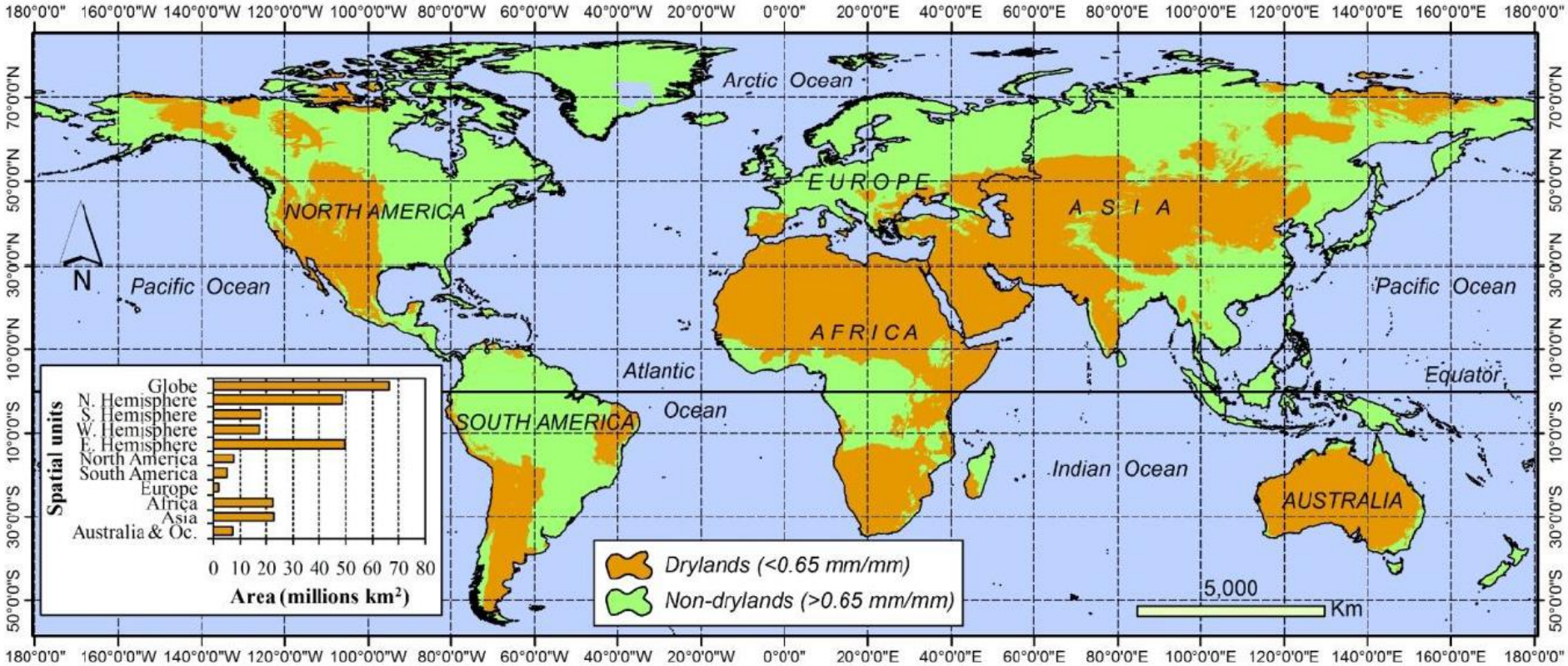
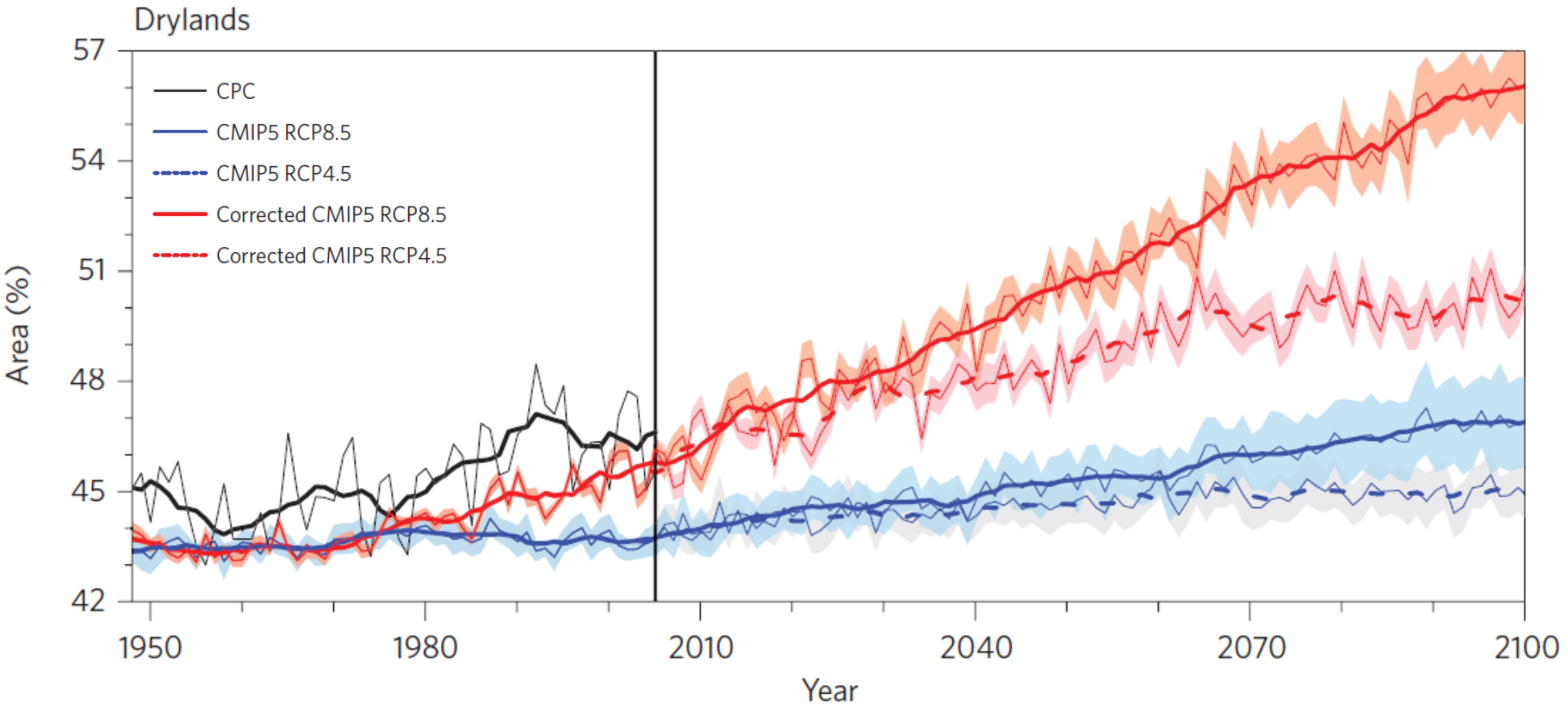
Universidad de Alicante

DRYLAND ECOLOGY AND GLOBAL CHANGE LAB





→ Drylands are a key terrestrial biome, as they cover ~45% of terrestrial surface and are the home of ~40% of global population.



→ Dryland area, projected under representative concentration pathways RCP8.5 and RCP4.5, will increase by 23% and 11%, respectively, relative to 1961–1990 baseline.

Exploring the role of biodiversity on the functioning of global drylands

The EPES-BIOCOM survey

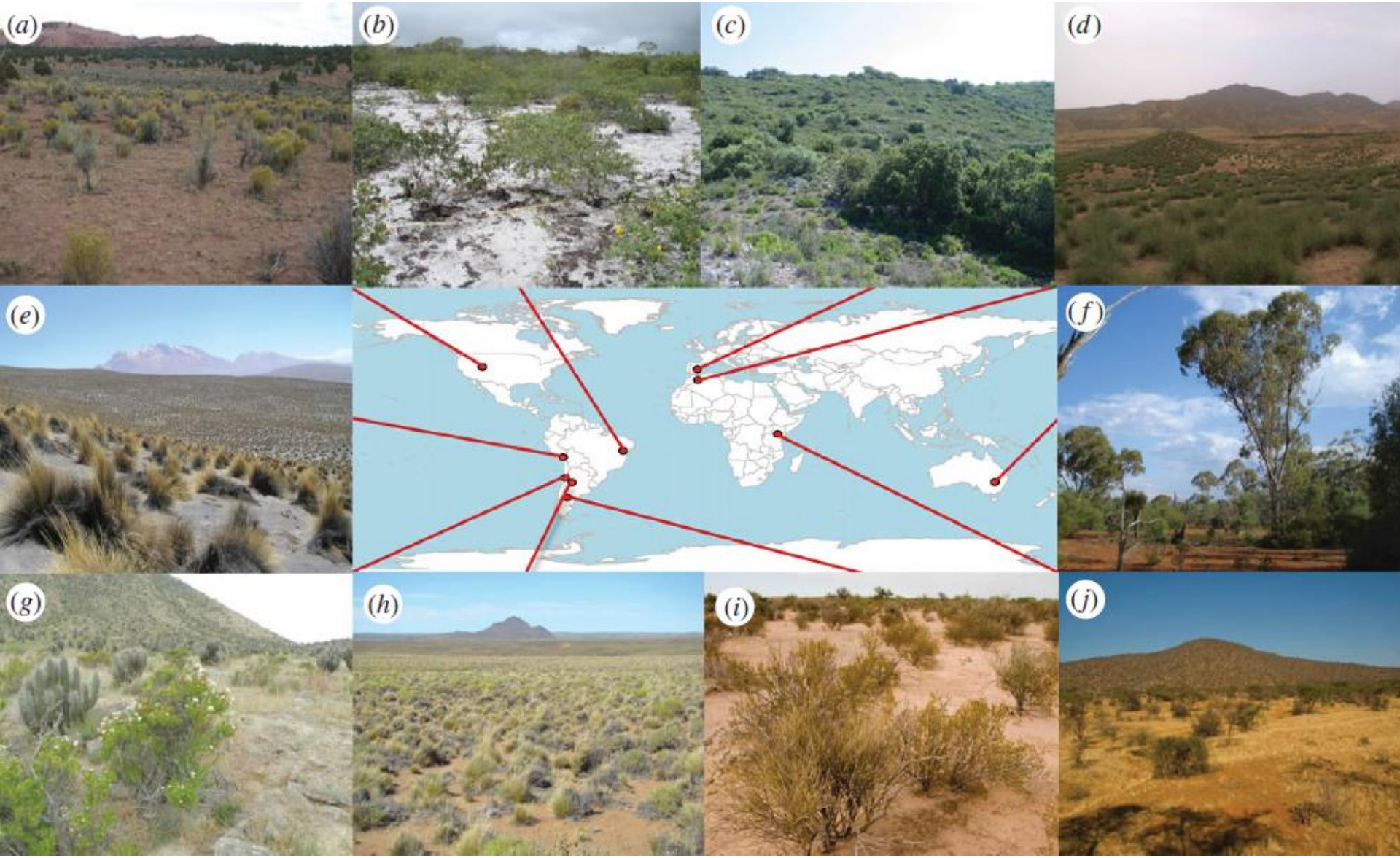
→ 236 drylands from all continents except Antarctica (21 countries).

→ Standardized vegetation and soil surveys conducted in all the sites

→ At each site, we quantified primary productivity and multiple soil variables related to C, N and P cycling (“functions”).

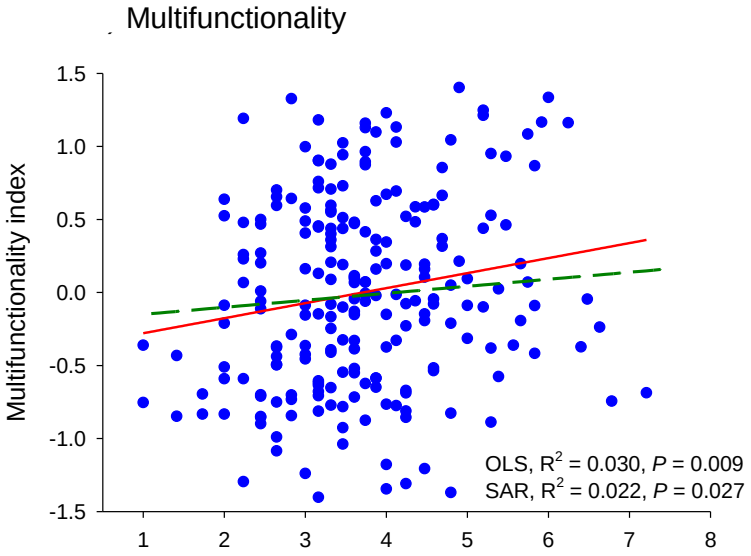
→ These variables are proxies of nutrient cycling, biological productivity, and buildup of nutrient pools, which are critical determinants of ecosystem functioning in drylands.

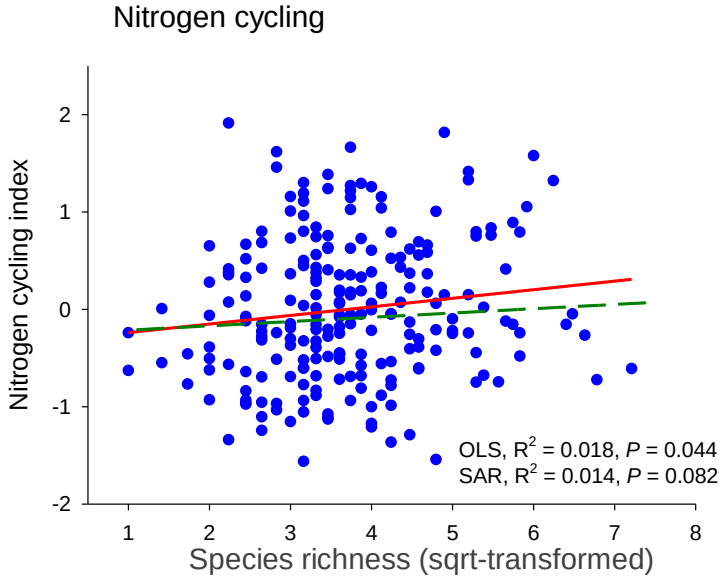
We captured the wide variety of vegetation found in global drylands

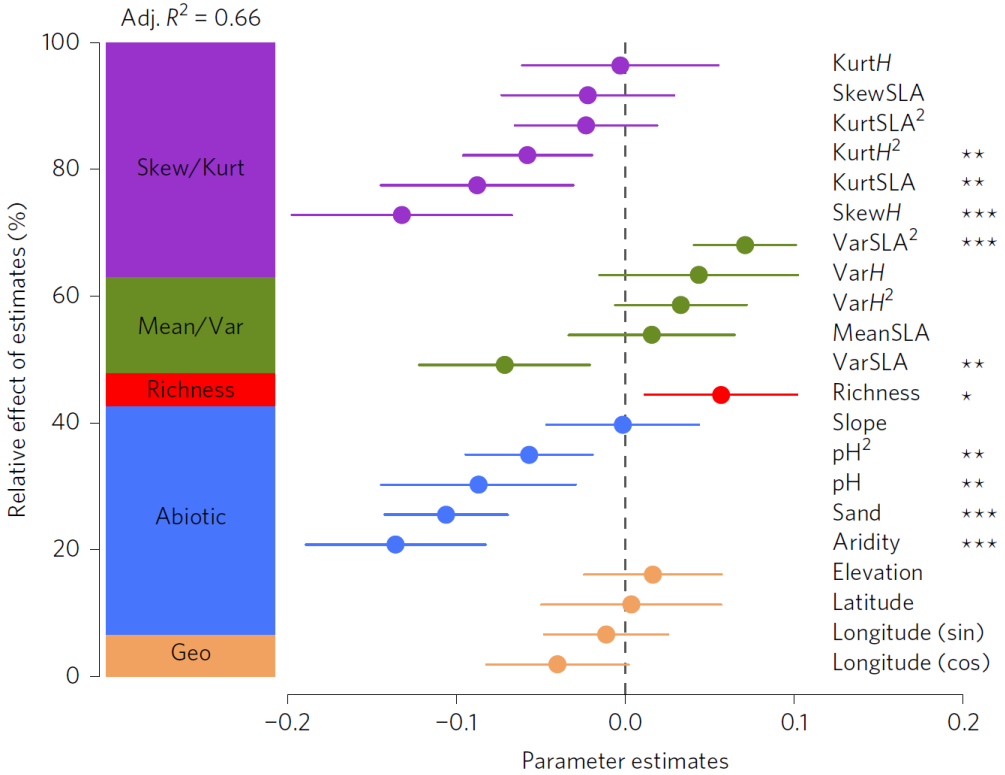


Maestre *et al.* 2012. *Phil Trans R Soc B* 367: 3062-3075

Plant species richness and functional diversity increase multifunctionality



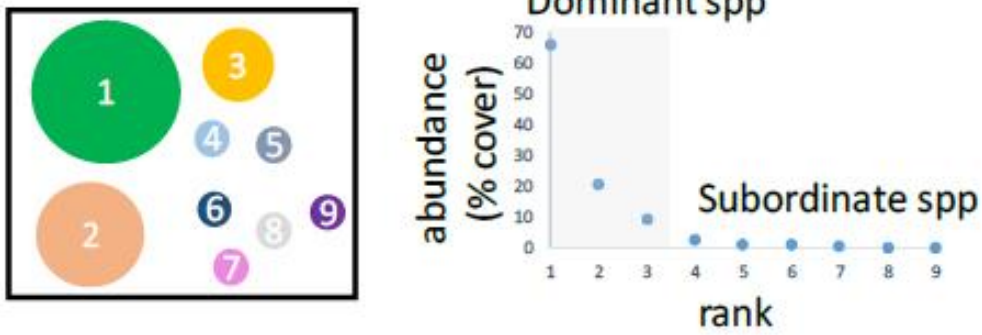


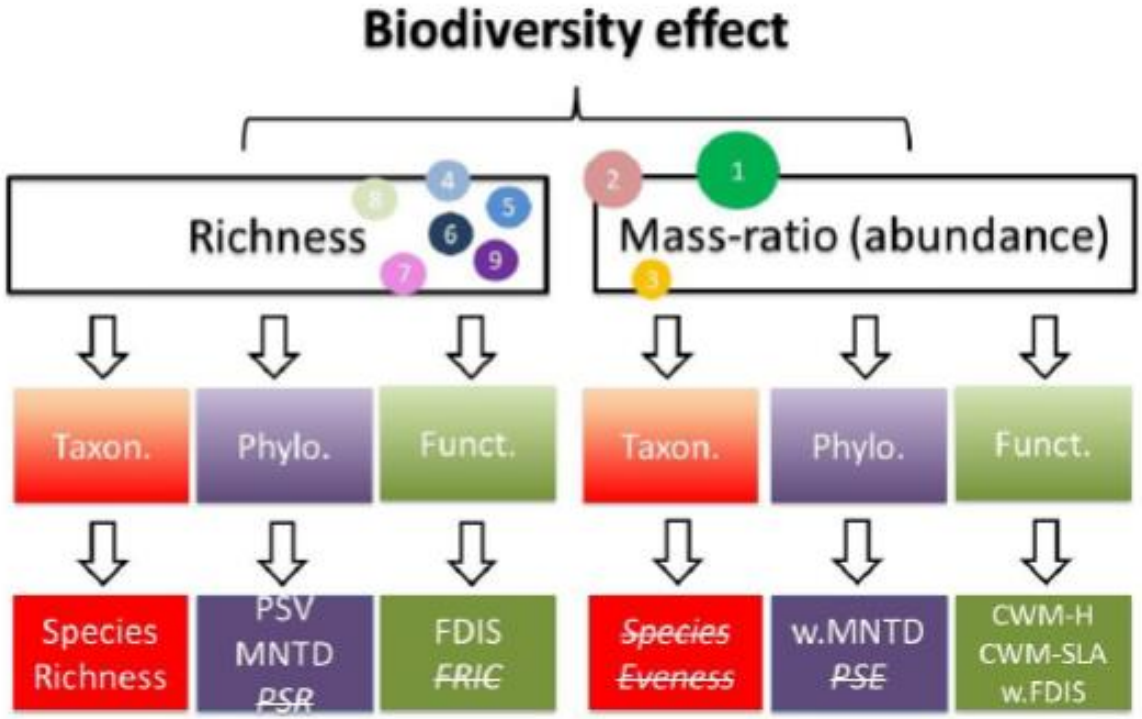


Maestre *et al.* 2012. *Science* 335: 214-218

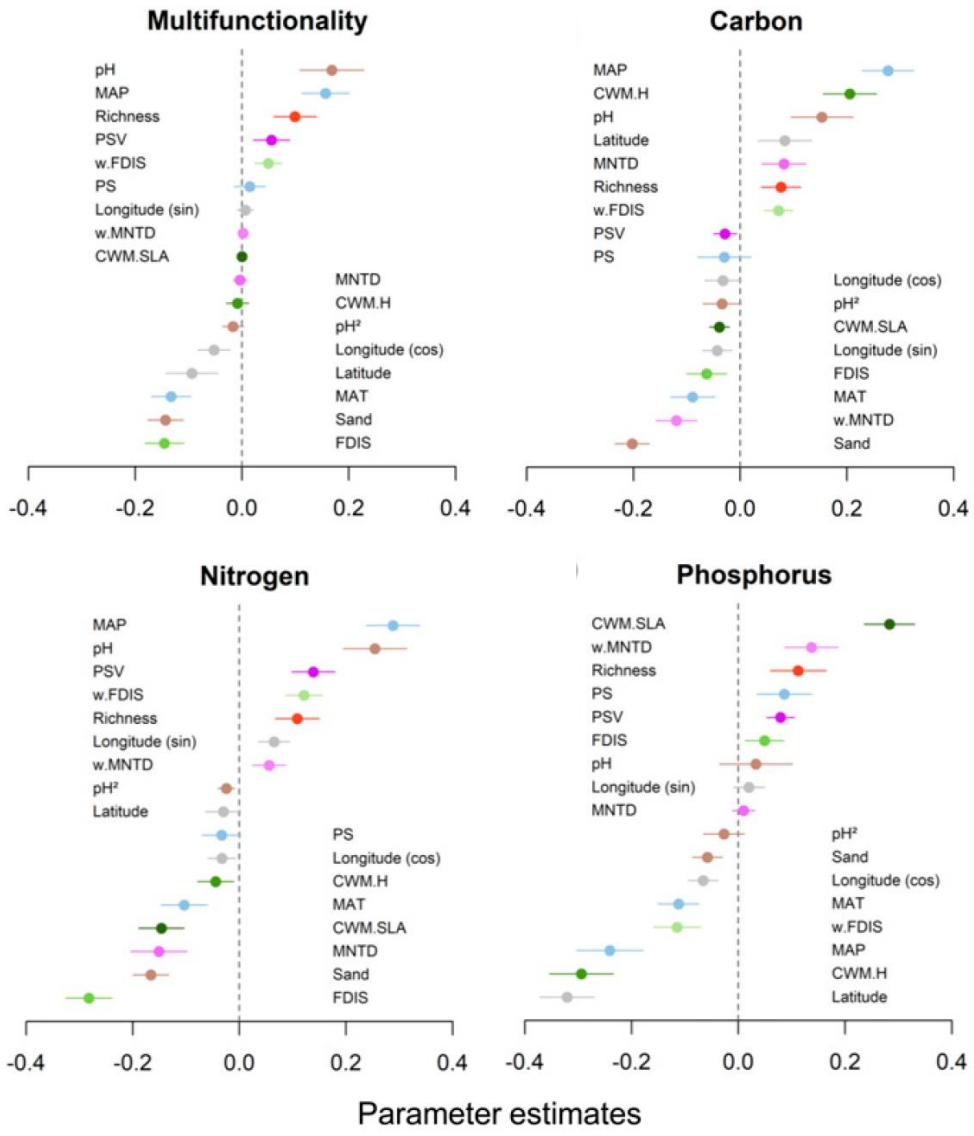
Gross *et al.* 2017. *Nature Ecol. Evol.* 1: 132

Evaluating the effects of taxonomic, functional and phylogenetic diversity on multifunctionality



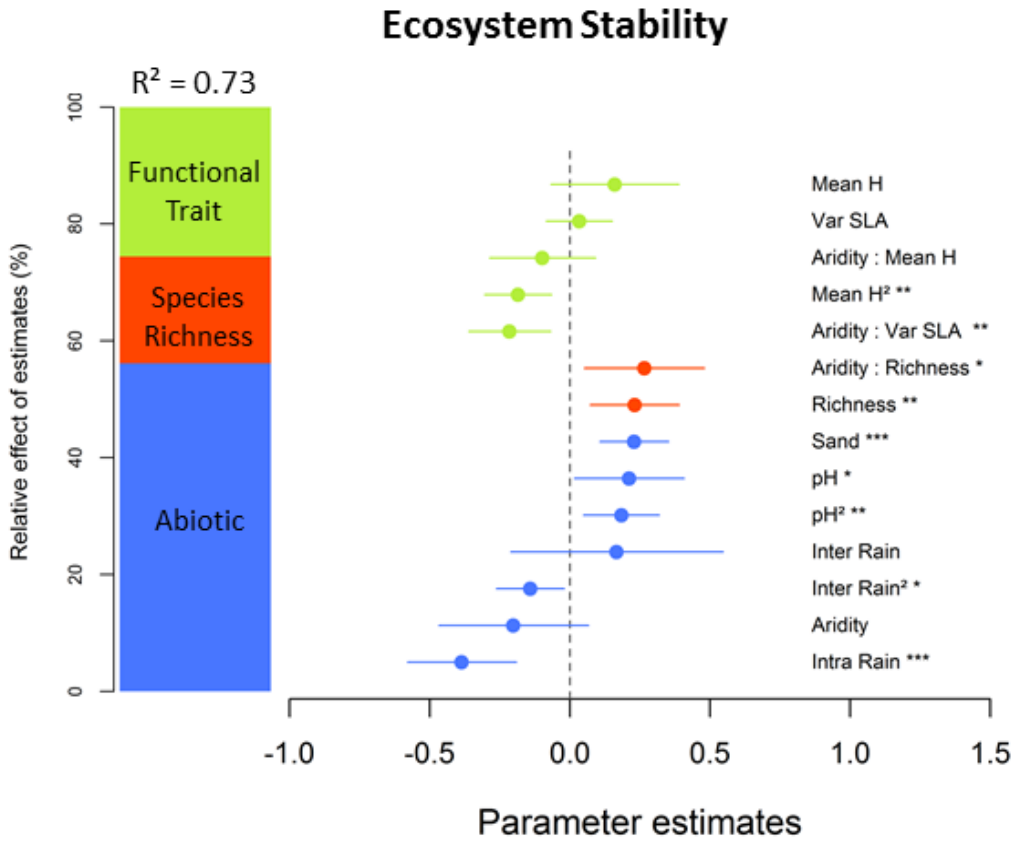


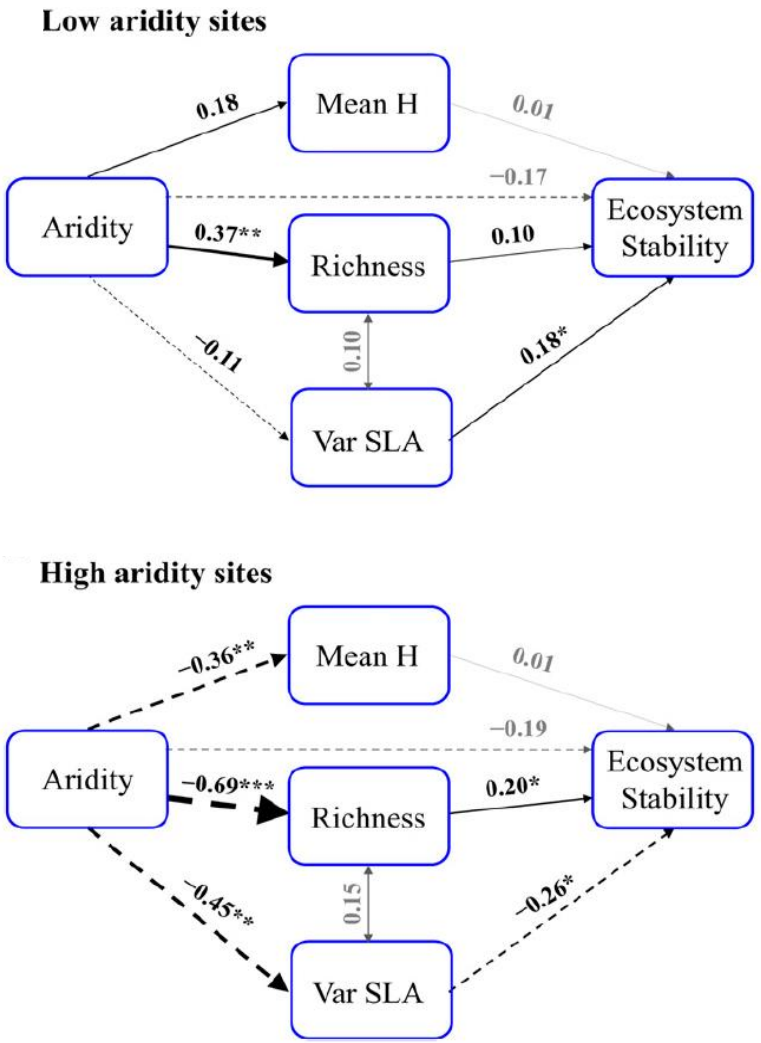
Simultaneous increases in species richness, the richness of early diverging lineages and functional redundancy increased multifunctionality



Le Bagousse-Pinguet *et al.* 2019. *PNAS* 116 8419-8424

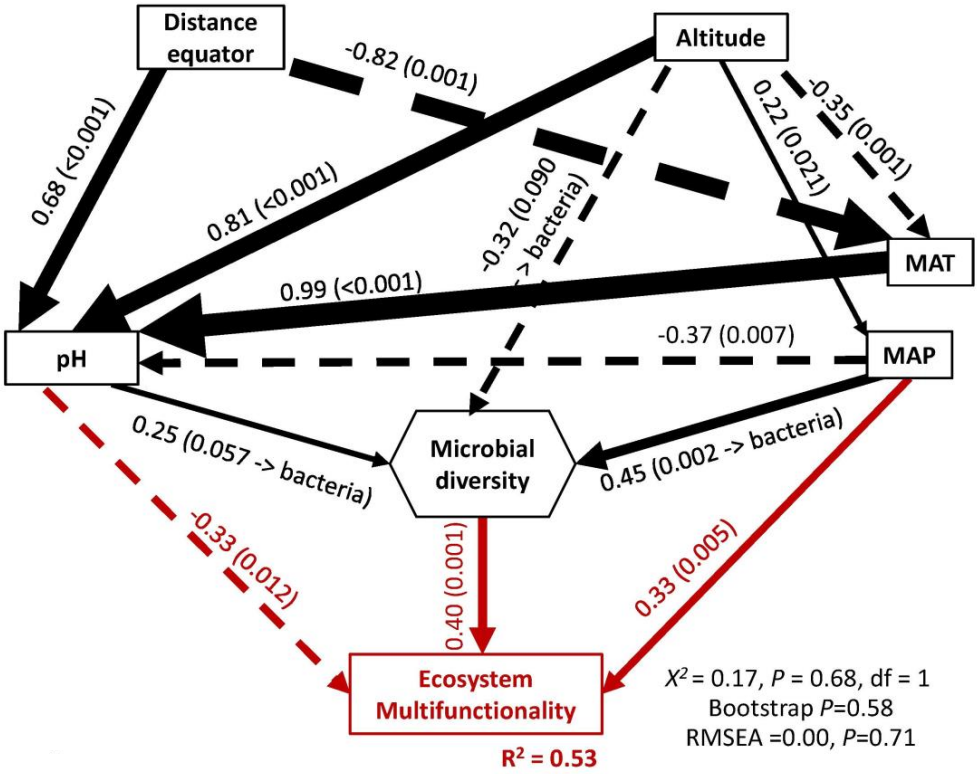
The role of plant diversity on ecosystem stability is as important as that of climate and soil factors

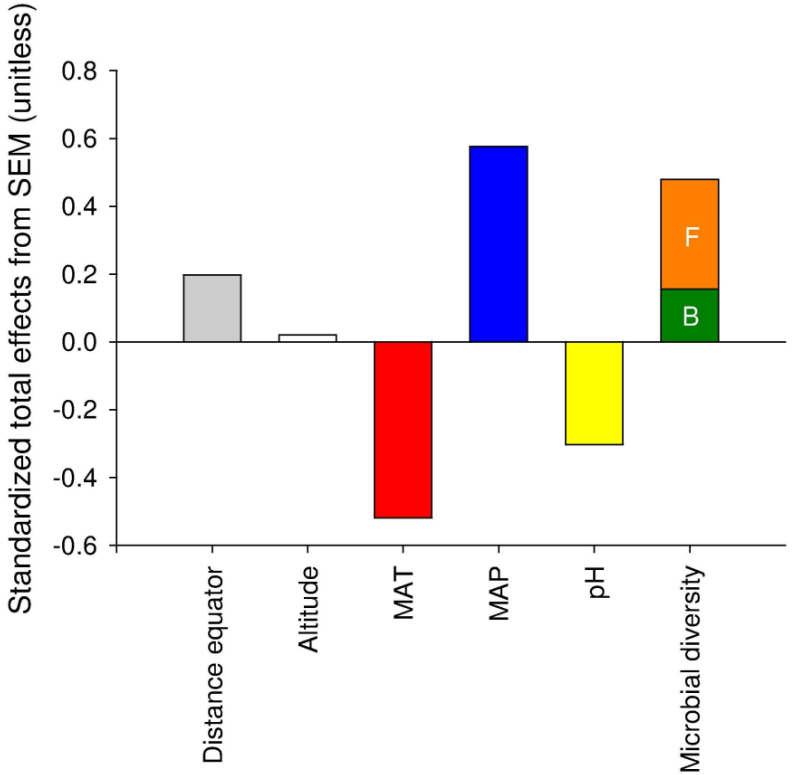




García-Palacios *et al.* 2018. *PNAS* 115: 8400-8405

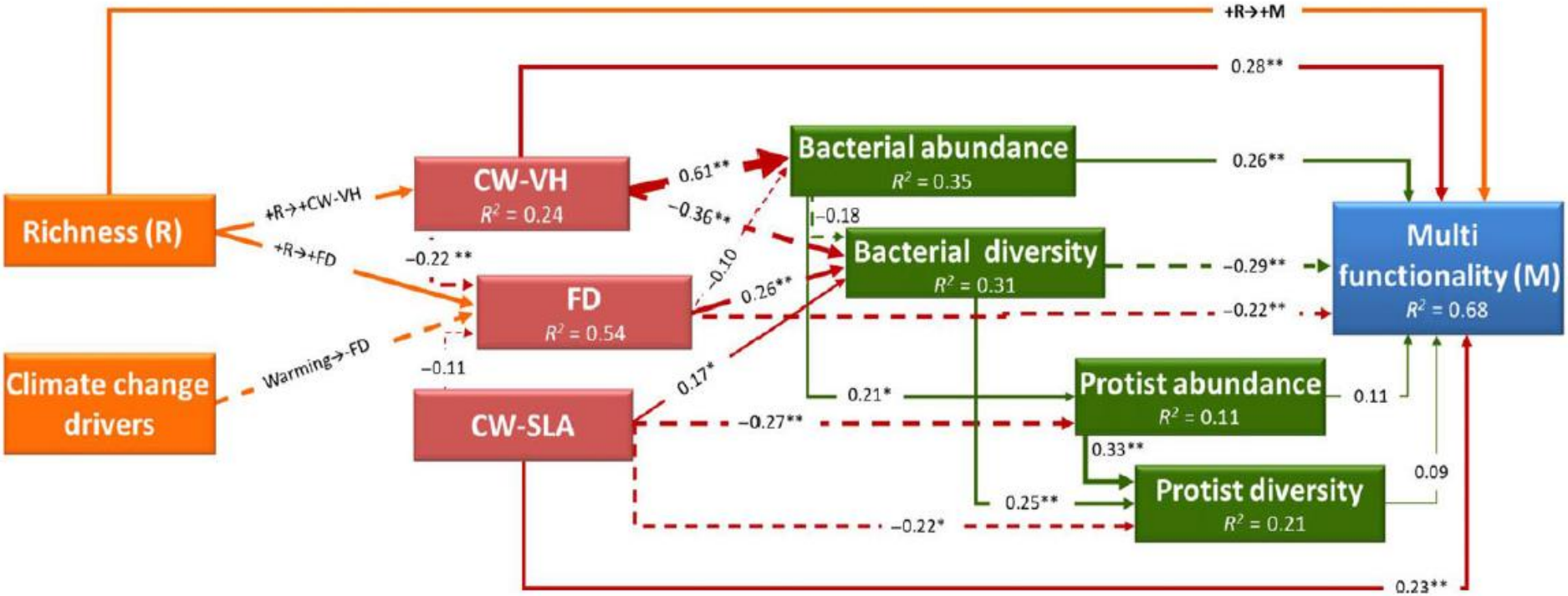
Microbial diversity is a key driver of multifunctionality





Do we have experimental evidence of these patterns?

Cascading effects from plants to soil microorganisms explain how biodiversity and climate change affect multifunctionality



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