



Plant biodiversity boosts ecosystem services in drylands

Plant biodiversity is crucial to the functioning of natural ecosystems in drylands across the world, according to recent research. Preserving plant diversity will be particularly important for maintaining the quantity and quality of services provided by ecosystems found in drylands that are vulnerable to the adverse effects of climate change and desertification.

Drylands, or arid and semi-arid areas, are important terrestrial ecosystems, covering 41% of the world's land surface. Over 38% of the human population depend on drylands for ecosystem goods and services, but as these ecosystem functions are highly dependent on rainfall and soil fertility, drylands are particularly susceptible to climate change and desertification processes.

Previous research has linked the positive effects of biodiversity to a range of ecosystem processes, including carbon storage and the accumulation of nutrients supporting soil fertility and plant growth. The ability of ecosystems to maintain multiple functions simultaneously is known as 'multifunctionality'.

In this study, conducted under the EU BIOCOM project¹, the relationship between biodiversity and multifunctionality was examined for the first time in natural dryland ecosystems at the global scale, rather than in small-scale, controlled studies.

The researchers measured the richness of perennial plants and a number of non-biological factors that also affect ecosystem functioning, such as climate, slope and soil texture, in 224 dryland ecosystems across all the world's continents, except Antarctica. In addition, the researchers analysed soil samples from the surveyed sites to assess 14 functions provided by ecosystems that are associated with the cycling and storage of carbon, nitrogen and phosphorus. The selected functions provide key supporting and regulating ecosystem services, and changes in these can act as early warning signals of desertification.

At a global scale, the number of perennial plant species was significantly and positively related to the range and quality of services provided by ecosystems (i.e. the ability of ecosystems to provide multiple functions). Compared with other factors that can affect the multifunctionality of ecosystems, the contribution of plant biodiversity was very similar to the effect of annual mean temperature and the sand content of the soil. However, whereas increased plant biodiversity enhanced the ability of ecosystems to provide multiple functions, hotter temperatures and more sandy soils reduced multifunctionality. The researchers suggest that soil water conditions play a key role in the multifunctionality of ecosystems and that this is affected by the temperature and texture of the soil.

Importantly, the results suggest global drylands could maintain the ability to provide multiple services and better resist the negative effects of higher temperatures projected under climate change, if their plant biodiversity is maintained and increased.

1. BIOCOM (Biotic community attributes and ecosystem functioning: implications for predicting and mitigating global change impacts) is supported by the European Commission under the European Community's Seventh Framework Programme. See: www.esctet.urjc.es/biodiversos/espainvestigacion/biocom/

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