Plant diversity is crucial for grassland ecosystem multifunctionality

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Humans, like other organisms, are still dependent on multiple ecosystem functions and services to sustain their livelihoods, such as the provision of food, the provision of clean water, the decomposition of waste, etc. Ironically, while the negative impacts caused by human activities are pushing many species to the verge of extinction, more and more evidence shows that biodiversity plays a crucial role in ensuring the ecosystem's functioning and provisioning of ecosystem services.

A study by Meyer et al. [1], published in *Nature Ecology & Evolution*, also provides evidence for the importance of biodiversity towards the grassland ecosystem's multifunctionality. The analysis was based on a collection of 82 distinct ecosystem variables measured along a gradient of 1-60 plant species in a single grassland biodiversity experiment: the Jena Experiment. The Jena experiment is one of the biggest and longest projects on biodiversity, funded by the German Research Foundation from 2002 to 2019 and coordinated by Jena University [2].

The study shows that the ecosystem's multifunctionality increases strongly with increasing biodiversity measured by plant species richness. Here, the multiple ecosystem functions and services are referred to as ecosystem multifunctionality. Because ecosystem functioning is fundamentally multidimensional, multifunctionality measures offer an integrative understanding of ecosystem functioning and service provision [3].

Moreover, the effects of biodiversity on ecosystem multifunctionality also become stronger when a higher number of ecosystem functions are considered. However, the strength of the association varies significantly according to the identity of the ecosystem functions used for calculating multifunctionality [1]. These findings suggest that increasing biodiversity benefits ecosystem multifunctionality in general, although trade-offs exist between ecosystem functions and services when a new species is added.

Meadow with Arrhenatherum elatius as dominant species, taken by Kenraiz Krzysztof Ziarnek (CC-BY-SA-4.0); https://commons.wikimedia.org/wiki/File:Arrhenatherum_elatius_kz02.jpg

However, improving biodiversity does not simply mean increasing species richness. The studied species already have certain compatibility with each other, as they were selected from the same environment (Arrhenatherum grasslands) and controlled in an experimental artificial environment [1]. In nature, each type of ecosystem has a particular equilibrium that keeps the interactions between living and nonliving things in homeostasis. Carelessly introducing invasive species can disrupt the equilibrium and exacerbate loss in biodiversity and ecosystem multifunctionality [4,5].

From the information-processing perspective [6,7], the equilibrium is a balance of information exchange among information-processing systems being within. Adding disruptive information (e.g., invasive species) into the system will break the established balance and create an erratic infosphere that is less compatible with native information-processing systems, reducing their chances of survival and reproduction.

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