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Supporting biodiversity: study highlights cost of more diverse grassland seed mixtures



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Intensive production has been linked to dramatic biodiversity loss in agricultural lands.

In productive grassland – for grazing or hay – plant-species diversity can support diversity at higher levels (for example insects and birds) and contribute to more sustainable milk and meat production. Land managers can sow seed to increase diversity. New research, however, shows that diverse seed mixtures¹ are often more expensive. Reducing the cost could be an effective option for policymakers to support an increase in plant diversity in grasslands and the restoration of semi-natural grasslands.

The number of species in managed and semi-natural grasslands can be increased in a number of different ways. For example, farmers may actively transfer seeds by spreading freshly mown hay from adjacent species-rich grassland sites², or simply wait for a spontaneous recolonisation of plant species following the long-term reduction of mowing and grazing intensity. Creating grasslands by sowing commercial seed mixes is often quicker and easier, though. Considering seed cost is important – especially in the context of recommendations made to farmers and other land managers by extension services (providing technical advice on agricultural production) – yet this has received little attention, note the researchers behind this study.

They investigated 262 seed mixtures offered by six online shops in Germany and Switzerland. Focusing on products aimed at professional land managers, they calculated seed-mixture cost per hectare (ha) and diversity of each mixture, using 2019 and 2020 prices.

The researchers found some mixtures containing up to 30 species aimed at restoring semi-natural grasslands. In total, 181 different species were available. However, most mixtures were aimed at intensive management (i.e., for regularly re-sown grasslands with intensive grazing and mowing), contained less than 10 species, and no herbs except for legumes. The most common species in all seed mixtures was *Lolium perenne* (English ryegrass), in 69% of mixtures, followed by *Poa*



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pratensis (smooth meadow-grass) and *Trifolium repens* (white clover), in over half the mixtures. These mixtures are not suitable for restoration of semi-natural grasslands.

Their analysis showed a strong relationship between diversity and seed-mixture price. On average, each species added 6% to the price per hectare of the mixture. The average price per hectare of a single-species product was €223, and a 10-species mixture cost about €340 (63% – or two-thirds higher). Seed mixtures with 30 species cost about €680–€1 100 per hectare, on average – about four times more than single-species products.

Using the Shannon Index – an alternative index for measuring levels of diversity in the seed mixtures, compared to the number of species in the seed mixtures – the researchers found that prices per hectare rose 59% for each increment rise in the index. The four most expensive mixtures included some common species such as *Achillea millefolium* (yarrow) and *Centaurea jacea* (brown knapweed). However, the price per hectare was generally higher for mixtures including rarer species.

The study also found higher costs associated with seed mixture attributes³. For example, mixtures aimed at permanent grassland were 30% more expensive per hectare than those for grassland re-sown every 1–3 years. Mixtures designed for oversowing were nearly 30% cheaper than those for sowing bare land, as the recommended seeding density was lower for those mixtures.

For restoration purposes, it is preferable to use native and regionally sourced seeds, which are adapted to local conditions. The mixtures containing such seeds were substantially more expensive – by about 75% per hectare – than mixtures containing cultivars (bred varieties). These higher prices reflect higher costs of production, including manual seed collection from local populations and processing. High expense and limited availability may constrain the large-scale use of these native seed mixtures.

The cost of increasing biodiversity in grasslands should be considered when making recommendations to stakeholders, say the researchers, and be balanced against the value of their benefits – such as more sustainable meat and dairy production and a reduced need for fertiliser from legumes⁴ due to their nitrogen-fixation.

The seed mixture costs may affect agri-environmental schemes and have significant financial



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implications for restoration activities often supported by policymakers, the researchers note. Measures to reduce these costs could contribute to promoting plant diversity in grassland. Reducing costs may require the development of competition among seed providers, as well as more cost-effective production methods. Conserving existing semi-natural grasslands should be a priority, followed by the restoration of degraded semi-natural grasslands, they say.

1. Plant diversity and related mixture characteristics, especially provenance, are considerable drivers of seed mixture costs.

2. Fresh or ‘green’ hay means harvested wildflowers and grasses that are just shedding their seed. Transferring green hay from a species-rich site to a species-poor site is one method of grassland restoration.

3. Organic seed mixtures were 20% more expensive than conventional. Price mark-ups for organic certification mainly affect mixtures for organic forage production, however, the demand for organic mixtures may increase in the future.

4. A legume is a plant in the pea-family such as clover.

