

# Science for Environment Policy

## Increasing grassland species improves pollination and may impact on crop yields

**Grasslands cover 30–40% of European agricultural areas.** Agri-environmental schemes leading to even small changes in grassland biodiversity could elicit extensive benefits. A new study on working farms in southwest England highlights the contribution of the plant diversity of the grassland to the abundance and diversity of insect pollinators and their potential to increase crop yields. The researchers make recommendations for which species to include in seed mixes.

Practical management options for grasslands are critical if the [Common Agricultural Policy](#)'s priority to promote sustainable [farming](#) is to be realised. This study aimed to investigate how the number (and type) of plant species in a pasture and how a pasture is managed affects the [diversity](#) and function of insect pollinators over time. The study also sought to identify grassland species that show the greatest effects on insect pollinator abundance and diversity. Finally, the impact of plant species richness to pollination of crop and wildflower species was investigated.

Three approaches were used by the researchers. First, they performed a field experiment from May to September 2011, using three different seed mixes and cattle grazing and cutting. In areas of 500 m<sup>2</sup> they recorded each pollinating insect and the plant it visited. Transects sampled the number of flowers of each plant species. Second, they conducted a study of 10 independent, mixed arable and pasture farms across south-west England possessing a gradient of grassland diversity. The farm plant-pollinator surveys were carried out in a similar fashion to the field experiment. Last, three species of plants — strawberry (*Fragaria × ananassa*), broad bean (*Vicia faba*) and red campion (*Silene dioica*) — were planted at the margin of the pasture fields of the 10 farms and their fruits harvested, counted, weighed and assessed for quality grade (based on the European Commission regulation on the common organisation of the fruit and vegetable sector [No 1580/2007](#)). These were compared to the richness of plant species in the adjacent pasture to assess the impact of plant species richness on pollination.

For both the field and farm study, the range of pollinators with different roles (functional diversity) significantly increased with an increase in grassland diversity. This was associated with more stable pollinator populations over time. In the farm study, increased pasture plant diversity was also correlated with increased pollinator species richness and abundance. However, management type (e.g. cattle grazing or cutting) did not have significant effects on pollinator functional/species diversity or abundance, likely because the surrounding areas provided refuge for pollinators during cutting. Using pre-existing pastures with inherited plant species richness means that the relationship suggested is correlative, demonstrating a need to further quantify the relationship between plant richness and pollination through more manipulative experiments at the farm scale.

*Continued on next page.*



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The researchers also make practical recommendations. For example, chicory (*Cichorium intybus*) is identified as a target species to include in seed mixes, because it acts as a pollinator resource and has high agronomic value (it causes increased weight gain in lambs and captures fertilisers). In the field experiment, dandelions (*Taraxacum* sp.) attracted 35% of all pollinator visits by 33% of all species, and in the farm surveys, creeping thistle (*Cirsium arvense*) attracted 17% of all visits by 18% of all pollinator species. Although well visited by pollinators, these species have little agronomic value.

Pasture plant species richness was significantly and positively associated with: strawberry fruit weight and quality; seed count per individual flower of red campion; pollinator functional diversity. However, broad bean showed no significant relationship, which the researchers say is potentially because pollination of this species is principally by large bees who forage at a scale beyond individual pastures. Although the use of these botanical measures do not directly relate to estimates of farm-scale crop production, maximising fruit weight and quality through natural processes — such as increasing the richness of plant species — may provide an incentive to farmers looking to achieve higher market prices due to improved crop pollination.

