

# Title: Grassland mixtures: resource use efficiency and yield stability in farmlet-and plot-scale study at Johnstown Castle

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## Abstract:

Research on grassland forage mixtures has provided strong evidence that clover-based mixtures with up to six species improve grassland performance (or compare well) relative to the respective monocultures. This has been observed in several responses, including forage yield, forage quality, weed suppression, nitrogen yield, yield stability, drought resilience and nitrous oxide emissions intensity.

Recent research by Guylain Grange from Teagasc, Johnstown Castle and Trinity College Dublin shows that multi-species mixtures receiving 150 kg/ha/year of nitrogen fertiliser, out-yielded perennial ryegrass monocultures receiving double that amount of fertiliser (300 kg/ha/year). Increases in plant diversity up to six species in intensively managed grasslands reduced the impact of drought, and produced more yield with less fertiliser. In related work, we investigated the legacy effect of multi-species mixtures on a following crop of Italian ryegrass (after shallow power harrowing). Not surprisingly, highest yields (and therefore legacy effects) of Italian ryegrass (with very low application of N fertiliser) were from plots that previously had highest proportions of clover. Legacy effects were lowest in the plots formerly with the perennial ryegrass monocultures receiving 300 kg/ha/year. Planned research will start to compare the performance of mixtures with low and zero use of inorganic nitrogen fertiliser.

A key issue for future research is to better assess the relative benefits of multi-species mixture in relation to two-species grass-clover swards. In the face of high economic and environmental costs of inorganic nitrogen fertiliser, the contribution of symbiotic N<sub>2</sub> fixation by legumes to grassland N supply will only grow in importance as a key strategy to maintain levels of production and protein self-sufficiency in a more sustainable way.

