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Title:

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Date:

2021-03-01

Citation:

Smith, K. & Elgersma, A. (2021). Editorial—Annual and perennial forage legumes in dryland pasture systems. *Grass and Forage Science*, 76 (1), pp.1-2. <https://doi.org/10.1111/gfs.12529>.

Persistent Link:

<https://hdl.handle.net/11343/298287>

Editorial – annual and perennial forage legumes in dryland pasture systems

Kevin Smith and Anjo Elgersma (eds)

Grass and Forage Science has a strong history of publishing science related to the role of legumes in grassland farming systems. Climate change, altered production systems and associated changes in land use create challenges for the sustainable intensification of animal production from grazing. Pasture legumes are uniquely placed to provide high quality forage and biologically fixed nitrogen despite the challenges associated with the incorporation of legumes into grazing systems.

Climate change, as predicted by a range of climate models, is forecast to have a great impact on agricultural production systems, particularly in regions with Mediterranean climates. Pasture legumes that are resilient under challenging agro-ecological conditions are crucial to ensure high animal growth rates in dryland pastures. It is timely to reconsider the role of pasture legumes in the context of previous research and acknowledge that the successful adoption of practical solutions in grasslands agriculture is reliant upon research that addresses the systems biology of legumes in farming.

A special theme issue on forage legumes in grassland systems appeared in June 2014 with an emphasis on European farming systems, e.g., Lüscher et al. (2014), although papers on evaluation and management of annual legumes were included (Ates et al., 2014). There is also an increased interest in the role of legumes in tropical environments, e.g., Boddey et al. (2020). This special issue expands and updates the discussion on the role of legumes in farming systems with an emphasis on lower rainfall environments.

Mediterranean-type climates occurs around the globe and whilst the major area is in the Mediterranean basin, significant agricultural regions with Mediterranean-type climates exist in Australia, USA, Sth America and Sth Africa, with some commonality of species use and grazing systems. (Porqueddu et al., 2016).

Mediterranean climates pose significant challenges to plant growth. Plants must cope with summer drought coupled with high solar radiation levels, cool winter temperatures during the growing season, and highly erratic and variable rainfall. Germination-inducing rainfall events followed by periods of drought, referred to as ‘false breaks’, are common and result in widespread death of establishing seedlings. The concentration of rainfall from autumn to spring and its absence during the hot summer

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season, accompanied by large intra- and interannual variability, determine a highly seasonal growth which favours annual and drought-tolerant perennial species. Annual plants escape this drought by forming seeds for germination in subsequent autumn–winter periods, while perennials need to have sufficient drought tolerance to survive (Porqueddu et al., 2016).

The role of legumes must be seen in a systems context, no one component can be addressed in isolation. This is also true with respect to the science on the development and use of legumes in grassland systems. Therefore, this special issue highlights some recent findings from (fundamental and applied) research that covers this spectrum from breeding, species choice and regional adaptation (e.g., Bekuma et al., 2021), the development of novel agronomic practices (Harrison et al., 2021) through to animal production and grazing management (e.g., Gulketin et al., 2021; Norman et al., 2021).

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