

Legume cropping systems & pollinators¹

Ensuring legume cropping systems help mitigate pollinator declines

Author: Lorna Cole², John Baddeley, Cairistiona Topp, Duncan Robertson, Robin Walker, Christine Watson

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Overview: Legumes have a key role to play in sustainable agricultural systems. If implemented and managed appropriately, legumes could help protect pollinators whilst enhancing agricultural yield. Combining legume species that differ in flowering period and flower structure will help create continuous forage throughout the summer and support a wider range of pollinators. To provide all resources pollinators require, implement legumes alongside agri-environmental interventions that provide early season resources, bee nesting sites and hoverfly larvae resources.

Key findings

- **A range of nitrogen-fixing crops grown as monocultures and mixtures were explored to identify how we could improve their performance with respect to providing forage for pollinators.**
- *Mixtures did not consistently provide more forage for pollinators when compared to monocultures.* Pollinators were strongly driven by flower species present, their structure and flowering period.
- *Flower structure influenced the accessibility of floral resources to different pollinators.* Deep complex legumes were inaccessible to hoverflies due to their shorter proboscises.
- *Competitive species outcompeted lower lying species.* Species such as vetch and beans outcompeted less competitive, lower lying, species such as white clover, preventing flowering.
- *Targeted mixtures have the potential to stabilise forage.* With legumes flowering at different times during the summer combining species with different flowering periods to provide a more stable source of forage throughout the season.
- *As legumes don't provide all resources pollinators require they should be implemented as part of a pollinator package to include habitats that provide:*
 - 1) Early season forage
 - 2) Decaying organic matter providing breeding sites for hoverflies
 - 3) Tussocky grass to provide nesting and overwintering sites
 - 4) Open flowers to support hoverflies

Policy Implications



Implementation and Management

- To support a diversity of pollinators and increase the stability of forage - mixtures should target legumes with different flower structures and phenologies.
- Management should enhance flowering (e.g. strip or mob grazing forage legumes) and care should be taken when including competitive species in mixtures.



Landscape scale context

- To provide all the resources pollinating insects require, integrate legumes with:
- Hedgrows and farm woodlands to provide early season forage.
 - Areas of rough tussocky vegetation to provide nesting and overwintering sites.
 - Ponds and ditches to provide resources for hoverfly larvae.

¹ This research was undertaken within the Scottish Government Rural Affairs and the Environment Portfolio Strategic Research Programme 2016-2021. For more information please see: <https://sefari.scot/about-us/strategic-research-programme>.

² Lorna J. Cole, Integrated Land Management, SRUC, Email: Lorna.Cole@sruc.ac.uk

Introduction:

Legumes deliver a range of agronomic and environmental benefits. Protein-rich, they provide a substitute to meat-based proteins for human consumption and decrease requirements for imported soybean in livestock systems. Fixing atmospheric nitrogen, they reduce reliance on inorganic fertilisers and can suppress weeds and diseases.

Legumes provide sugar-rich nectar and protein-rich pollen and consequently could help mitigate pollinator declines.

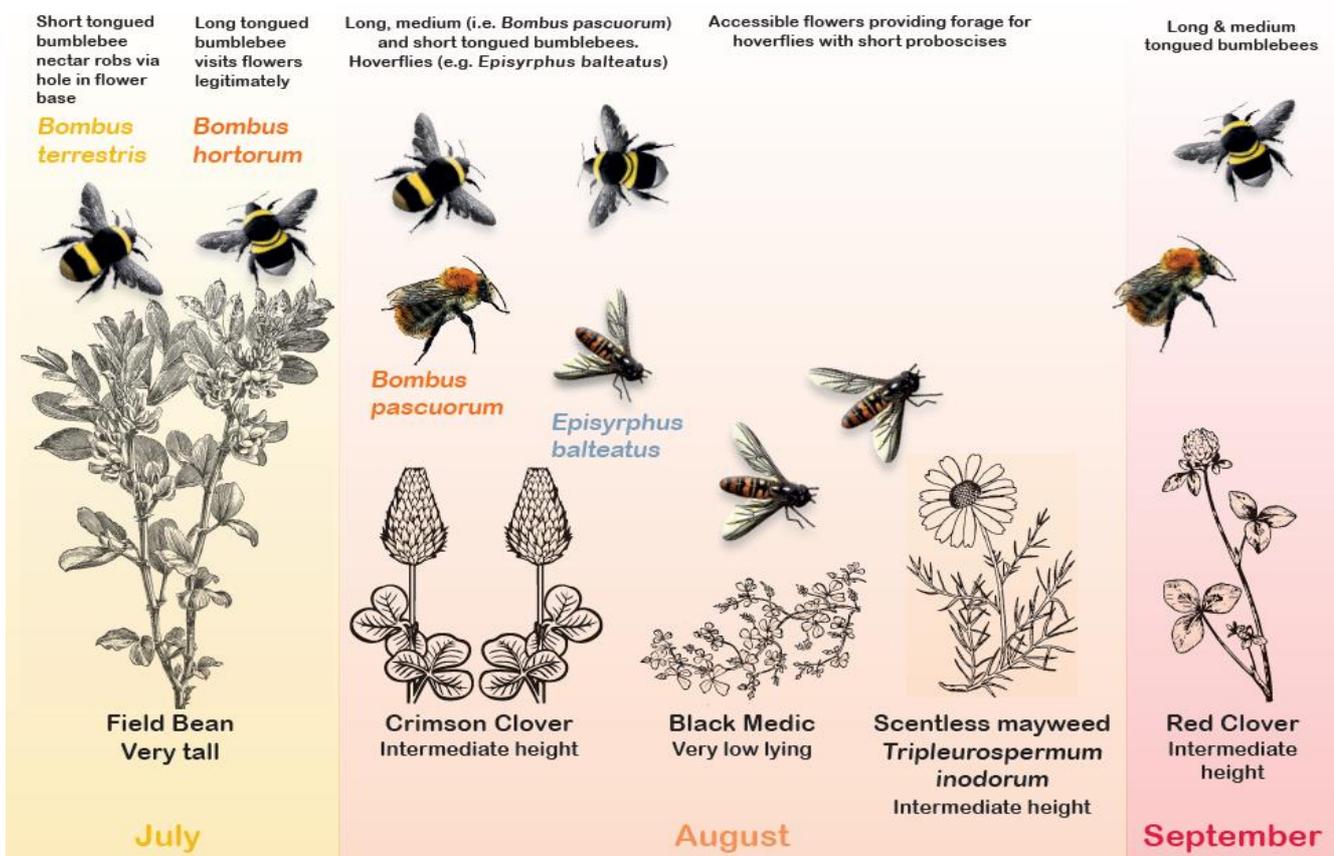
There are, however, concerns that the restricted flowering period of **grain legumes** (e.g. beans, peas) alongside frequent grazing and mowing in forage legumes (e.g. lucerne, clover) limits their value to insect pollinators.

Legumes play a critical role in sustainable agricultural systems and their prevalence in our countryside is predicted to increase.



Peacock butterfly foraging on Lucerne

Methods: Small plot field trials were established in Aberdeenshire and Midlothian to explore range of nitrogen-fixing crops grown as monocultures and mixtures. Pollinators were surveyed throughout the season using observational quadrats.



For more information on this work please contact:

T: 01292 525 295

E: Lorna.Cole@sruc.ac.uk

W: <https://sefari.scot/directory-of-expertise/dr-lorna-cole>

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