Sow, which seed is best?

Designing a permanent grassland to benefit the SDG's

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1.0 Aim

To design grassland swards to benefit the SDG's **12** – Responsible consumption and production, **13** – Climate action, and **15** – life on land.

2.0 Introduction

The leading cause of habitat loss is agricultural intensification[1]. This can result in a loss of biodiversity impacting crop production[2].

The UN designed 17 SDG's to help promote peace and prosperity to people and the planet. Improving farming practices is one way in which we can promote the SDG's. Grassland is a valuable resource for both farmers and wildlife, through increased carbon storage, increased pollinator services and maximising nutrition for livestock both parties can be benefitted[3].

Figure 3: Cocksfoot (*Dactylis glomerata*) a species that was not sown but established naturally in the plots

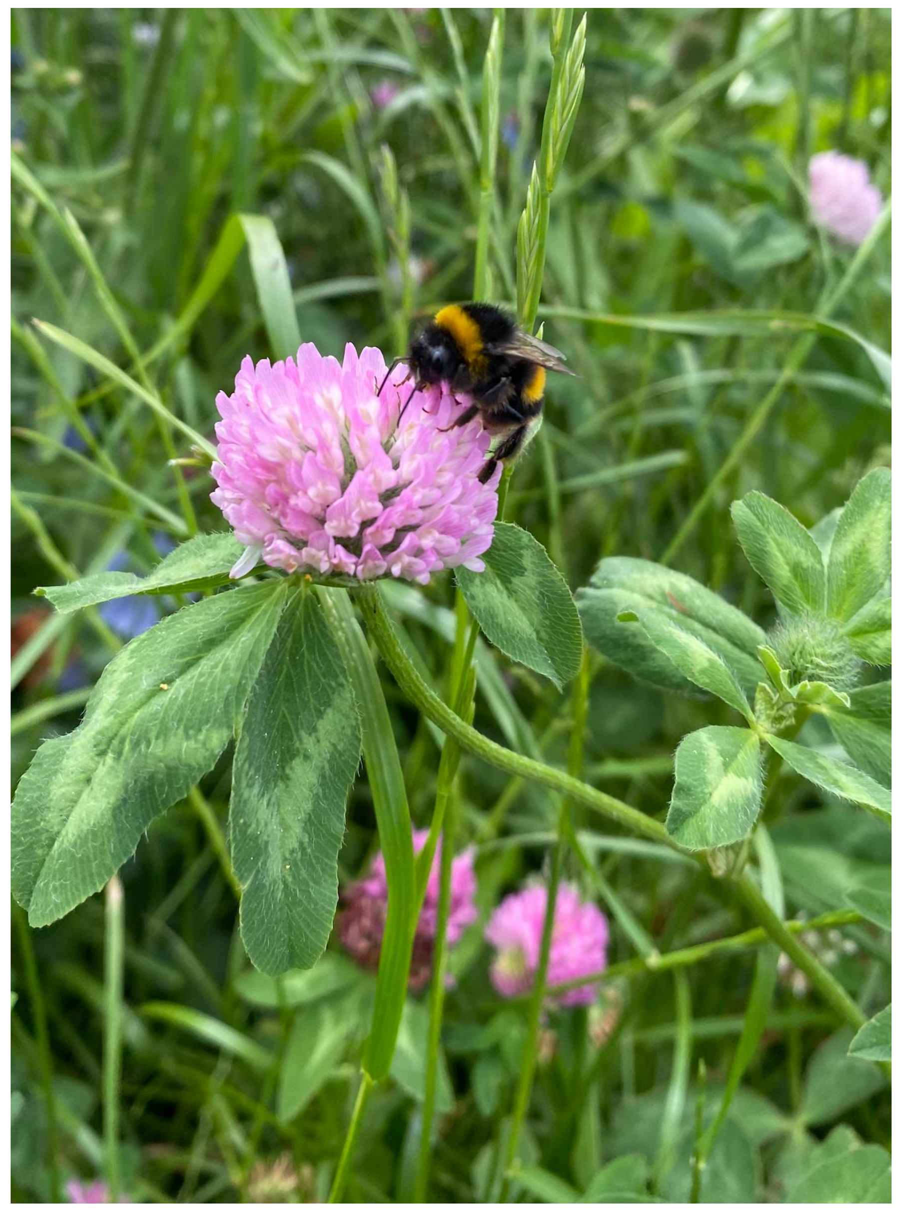

Figure 2: A pollinator, *Bombus lucorum*, on the legume, *Trifolium pratense*, on a plot located at Cockle Park Farm.

3.0 Method

- Located in Cockle Park Farm a randomised split-block design was divided into 8 sections. Within each section there were 4 replicates of 4 treatments (figure 1).
- Each of the four treatments comprised different seed mixes sown to produce differing outcomes:
  - T1: **Control –** typical grassland seed mix
  - T2: **Animal Nutrition (SDG 12)** – maximising protein content, yield, minimise bloat.
  - T3: **carbon storage (SDG 13)** – maximise carbon storage via the planting of a variety of legumes.
  - Mix 4: **Pollinators (SDG 15)** – beneficial to a range of pollinators.
- Pollinator and botanical surveys were carried out monthly from June 2022 to August 2022.

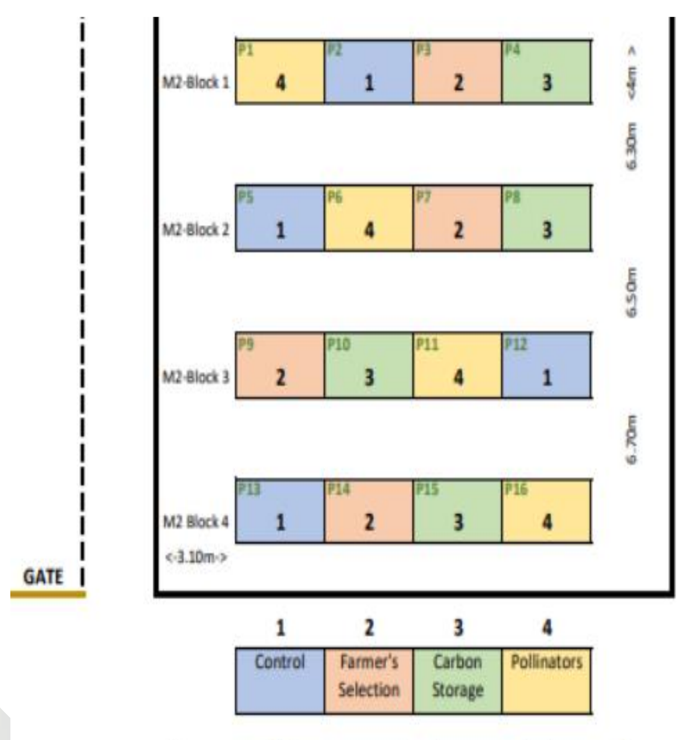

Figure 1: Randomised split-block design of 4 replicates of the 4 treatments of 1mx1m plots at Cockle Park Farm.

4.0 Results

Table 1: A summary of results collated from botanical and insect surveys (2022), yield (2021) and how well each seed mix established in comparison with initial predictions.

(green) = Highest Score   (tan) = Lowest Score

	T1 - Control	T2 – Animal Nutrition	T3 – Carbon Storage	T4 - Pollinators
Yield (kg/ha)	30040.95 (lowest)	34736.04 (highest)	31636.28	30733.92
Plant count per quadrat	3.75, SD=1.14 (lowest)	4.34, SD=1.12	4.75, SD=1.27	5.16, SD=1.17 (highest)
Mean pollinators per quadrat	1.06, SD=0.88 (lowest)	5.16, SD=1.17 (highest)	1.47, SD=1.11	1.28, SD=0.99
Seeds available for wildlife: Total area cover (m^2)	8.85 (highest)	7.02	5.50 (lowest)	6.72
Expected vs Established	Expected	Changed	Expected	Changed

5.0 Discussion

- The results indicate that overall T2 (animal nutrition) would support more of the measured variables than the other treatments, including the highest yield and mean pollinators.
- **SDG 12:** Through choosing T2 a compromise between high yield and increased pollinator services can be achieved. This has the scope to benefit both farmers and increase ecological services of pollinators[1].
- **SDG 13:** Increasing the amount of legumes grown in a grassland can help increase total carbon storage. T3 established as expected therefore, it is likely that this treatment can increase carbon storage.
- **SDG 15:** Both T2 and T4 would be the most beneficial for increasing biodiversity due to the highest mean pollinator and plant counts (figure 2).

5.1 Future Work

- Due to the complexity of this topic and the necessity of farmer engagement future research is crucial to help reach a compromise of high yield and increased climate consciousness. For this to be effective longer-term data is needed with increased replication at different sites.

References:

1) Raven, P.H. & Wagner, D.L. (2021), Agricultural intensification and climate change are rapidly decreasing insect biodiversity, *Proceedings of the National Academy of Sciences*, 118(2), pp. 1-6. **2)** Tscharntke, T. *et al*. (2012) Global food security, biodiversity conservation and the future of agricultural intensification, *Biological conservation*, 151(1), pp. 53-39. **3)** O'Mara, F.P. (2012) The role of grasslands in food security and climate change, *Annals of Botany*, 110(6), pp. 1263–1270.