

DIVERSE/HERBAL SWARD MIXTURES



Photo: ORC

PROBLEM

Rotations based on very few crops lead to a decline of soil fertility particular in arable farming

SOLUTION

Most organic farms grow nitrogen-fixing legume-based leys, whether they are used for grazing, conservation or mulched to build soil fertility. Organic standards require the inclusion of legumes in rotations and many organic farmers use diverse ley mixtures with a range of legumes, grasses and herb species. The wider benefits of legumes in saving on N fertilise and providing flowering crops as food pollinators are widely recognised.

OUTCOME

Ley farming is an important element of sustainable farming. The principle of diversity should be extended to legumes, where traditionally farmers have used only one or two key species.

More diverse ley mixtures (with several legume and grasses) have advantages over simple mixtures.

Benefits observed include:

- Greater stability providing resilience to variable weather, climate and management conditions
- Combining early and late weed suppression
- Slower decomposition on incorporation and hence potentially better N utilisation by following crops
- Extending forage availability for key insect pollinators.

PRACTICAL RECOMMENDATIONS

IMPLEMENTATION

- Herbal leys with legumes are traditionally used for grazing of cattle, dairy and sheep, but diverse leys can also be grown for silage and hay making and as green manures crops. Choices of species will vary with regions, soil types and climate
- Herbicides cannot be used!

APPLICABILITY

Applicable production types



Application time

Seeding between April and August

Clean seedbed with fine tilth

Shallow drilling (>1cm) or broadcasting, followed by rolling (several times) to get a well consolidated seed bed

Over-seeding is possible but requires careful planning to succeed.

Herbal leys can be kept for up-to 4 years, termination through (shallow) ploughing is common, but direct drilling is also used on some farms

Equipment/resource required

For cultivation for seedbed preparation and shallow drilling

Best in

Livestock farms (cattle, dairy, sheep) and for grazing, but can be used on all farms



- The following list identifies the principle fertility building legume species and their characteristics:
 - Red clover: high forage yield, high yield of subsequent crop
 - White clover: high yield, high yield of subsequent crop
 - Black medic: moderately high yield in second year, resistance to decomposition (lignin content and C:N ratio), high yield of subsequent crop
 - Birdsfoot trefoil: good yield, high yield of subsequent crop
 - Lucerne: high yield, resistance to decomposition, high yield of subsequent crop. Prefers high pH.
 - Sainfoin: moderate yield on most sites, but resistance to decomposition (high polyphenols).
 - Crimson clover: an annual with high yield, high value for pollinators
- Use bullet points to describe the step-by-step procedure for proper implementation of the method
- Inclusion of grasses is common, not only for forage production. The grass takes up the N fixed by the legumes and reduces the free N in the soil, the legume rhizobia respond to the low soil N levels and fix more N, resulting in higher overall N fixation and hence greater biomass. Grass roots also 'fix' carbon and a high C:N ratio prolongs the release of N to subsequent crops. Grass species commonly used include timothy, fescue species, cocksfoot and rye grasses.
- Many organic farmers also include herbs, such as chicory, plantain, salad burnet, sheep parsley and yarrow. Deep rooting herbs improve mineral uptake, have health benefits for animals and can improve drought resistance of the sward.
- There are several advantages to more complex mixtures. The best multifunctional mixtures grown in the three-year Leg-Link project where many different mixtures were tested contained Black Medic, Lucerne and Red clover. Several seed companies offer a range of ready-made mixtures for different conditions.

EASE OF ADOPTION ON NON-ORGANIC FARMS

- Many non-organic farmers are also using leys as a standard farming practice to improve soil fertility

BENEFITS OF IMPLEMENTATION

- Growing leys with legumes leads to reduced GHG emissions and help lock-up carbon in the soil
- The biggest economic benefit from growing leys with legumes is the saving on N fertilizer.
- Growing leys with a diverse range of legumes is good for pollinators

DRAWBACKS OF IMPLEMENTATION

- Growing a more diverse ley requires different approach to grazing management i.e. rotational grazing with investment potentially needed in fences and troughs.
- High seed costs for mixtures containing diverse legumes and herbs
- Lack of persistence of some herbs and legumes under certain conditions
- Lack of knowledge about species and what to choose for which soil conditions and costs/benefits in financial terms
- Increased time-cost associated with establishment of diverse swards
- Can be difficult to get species diversity into an existing ley

BARRIERS AND RISKS

- Initial cost of establishing the leys vs the economic gains which have not been fully explained/confirmed
- Taking land out of arable production



FINANCIAL ANALYSIS

As shown in the table below, the use of diverse/herbal sward mixtures is associated with an increase in margin due to reduction of costs

Initial investment	Ongoing costs	Yields	Financial output	Expected effect on margin
~	↓	~	~	↑

Rating approach used to describe the effect and direction of change (increase or decrease): Unknown = ? None = ~ Low = ∨ Moderate = ∨∨ High = ∨∨∨

This estimate was based on the assumption that a diverse sward mixture can provide approximately 150 kg/ha of nitrogen, thus reducing the need for nitrogen fertilisation in the following crop

RELEVANT LEGISLATION AND CURRENT INCENTIVES

- The benefits of multi-species leys for insect pollinators demonstrated by the Leg Link project has resulted in Defra including an option for Multi-Species Ley (OP 4) for arable farms under the Countryside Stewardship scheme for organic farming.

FURTHER INFORMATION

Video

- Example of under-sown herbal ley in spring barley:
<https://www.youtube.com/watch?v=pFNvjQuF2xw>
- Forage legumes, difficult for farmers to resist:
<https://www.agricology.co.uk/resources/forage-legumes-difficult-farmers-resist>

Further reading and weblinks

- Wilkinson, I (2018) Herbal leys, Cattle Breeder; Spring 2011
<https://www.agricology.co.uk/resources/herbal-leys>
- Institute of Organic Training and Advice (2015) Sowing and Management of Multi-species Leys to Encourage Pollinators
<https://www.agricology.co.uk/resources/sowing-and-management-multi-species-leys-encourage-pollinators>
- The Organic Research Centre (2015) Legumes: building soil fertility
<https://tinyurl.com/ORC-Legumes>
- OK Net Arable Guide to Diverse Fertility Building leys (2017)
<http://farmknowledge.org/index.php/search-for-ok-tools?v=31040>
- Döring T, Baddeley J, Hatch D, Marshall A, Pearce B, Roderick S, Stobart R, Storkey J, Watson C, Wolfe M (2013) Using legume-based mixtures to enhance the nitrogen use efficiency and economic viability of cropping systems. Home Grown Cereals Authority (HGCA), Stoneleigh Park, UK.
http://www.organicresearchcentre.com/manage/authincluds/article_uploads/PR513%20full%20report.pdf
- Agricology Farmer Profile – Ian Wilkinson: <https://agricology.co.uk/field/farmer-profiles/ian-wilkinson>



CASE STUDY FARMER APPLYING THE PRACTICE: HONEYDALE FARM

Location: Gloucestershire

Size: 43 hectares

Enterprises: Mixed

“At the heart of Honeydale is an 8-year crop rotation which begins with a 4 year deep rooting herbal ley. This is the engine of our rotation, which will power the rest of it, improving sustainability and animal health, boosting soil fertility and ultimately driving the profitability of the farm.



“We’re experimenting and trialling different methods of diverse farming and techniques to improve soil fertility, trying to find new ways of making smaller farms viable by growing diverse crops and having more livestock on the farm so it’s self-sufficient, the need for fertilisers and pesticides is avoided, and value is added to commodity foods like oats, wheat and milk.

“We have 90-100 Highlander ewe lambs on the farm, which belong to a neighbouring farmer, and are grazed on the permanent pasture and on the herbal leys as a management tool.

The fundamental focus of the business is providing a bridge between farmers and the scientific community. If there is one man who has inspired and influenced the work of Cotswold Seeds and guided product development it’s Robert Elliot, a pioneering farmer and author who pioneered deep rooting, herbal leys and believed in ‘health from the soil up.’”

<https://agricology.co.uk/field/farmer-profiles/ian-wilkinson>

ABOUT THIS PRACTICE ABSTRACT

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