

UNDERSOWING OF LEYS IN ARABLE CROPS



Photo: ORC

PROBLEM

Bare soil in crop rotations which leads to erosion, leaching and weed establishment. Lack of forage/ grazing availability at the end of harvest season.

SOLUTION

Grass and legume seed are drilled at same time as arable crop or spun and lightly harrowed in over the top of an established crop to keep soil covered. Usually applied under cereals although undersown green manures can also be used in field vegetable cropping/market garden contexts.

OUTCOME

When sown at the right time undersown leys provide nutrient and water retention and help to protect against soil erosion and control weeds. In addition, they provide an instant source of forage post-harvest which can be used for late-season grazing (e.g. for flushing ewes prior to tupping or for finishing store lambs or cattle).

Undersown leys also benefit wildlife by providing an uncultivated overwinter bridge allowing insects to complete their lifecycle in the soil and emerge as adults from the leys in the spring. Undersown cereals are also better for game chick survival as they support a wider-range of insects than a bare crop.

PRACTICAL RECOMMENDATIONS

IMPLEMENTATION

- Usually established successfully in spring-sown cereal.
- Although under sowing can also be used with winter wheat and oilseed rape, yield losses may be severe and careful attention is needed to reduce competition with regard to tillage/weed control practice.
- Undersowing of maize can also encourage benefits in terms of soil protection and reduced losses.
- The choice of clover species and variety to reduce competition from the under-sown crop needs careful attention.
- Use of herbicide needs to also consider the ley species
- Spring barley is the preferred choice for undersown cereals as oats are aggressive competitors for light and nutrients which can adversely affect the establishing grass and delay harvests. Early maturing, strong-straw varieties are preferred.
- Simultaneous grass/clover and spring cereal sowing is recommended in a northern-European climate to reduce costs and cultivation.

APPLICABILITY

Applicable production types



Application time

Usually spring (March-April in UK context)

Required time

Additional time required for application of the seed and spring-time harrowing crops

Regulatory compliance

Allows for adherence to Ecological Focus Area (EFA) within Greening Framework. Applicable Countryside Stewardship Scheme (CSS) higher tier option.

Reduced N fertiliser will allow compliance with Nitrogen Vulnerable Zone (NVZ) regulations.

Equipment/resource required

Regular sowing and harrowing equipment.

Best in

Taller cereal varieties and spring sown cereals to reduce competition from under-sown crop. The undersown crop should be a less aggressive species such as white clover or yellow trefoil to avoid excessive competition with arable crop.



- Undersown grass should be drilled into maize crops once the maize is established but when it is still short enough to drive through.
- With winter crops grass/clover is oversown using broadcast spreader in the spring following crop establishment.
- If sowing grass is delayed until after spring cereals are established, wait until cereal crop has reached 1 to 1 ½ leaf stage before sowing grass and clover as breaking fragile sprouts on the establishing cereal crop with a grass seed drill will lead to substantial yield penalties.
- Cut cereal seed rates and increase cereal row-width to reduce competition for light and nutrients from the cereal crop.
- An alternative can be cutting the cereal crop for wholecrop silage (avoiding potential harvest difficulties)
- As a general rule, herbicides for under-sown cereals should be used after the clover has its first trifoliolate leaf but before the first node growth stage in the cereal crop as clover will not survive the treatment before this stage and hormone-based herbicide treatment after first node establishment can lead to ear distortion.
- Consider leaving clover out of grass-seed mix for initial undersowing as weeds can then be controlled with herbicide without affecting the undersown ley (clover-safe herbicide availability is extremely limited – see ‘ease of adoption’ below).
- In the second year following establishment, close grazing and grass/comb harrowing can be used to establish clover seed in the sward.
- Fields to be undersown should be sampled for pH (optimum range of 5.9-6.2) and phosphate levels, as phosphate deficient soils will result in poor clover establishment.
- Low potash soils will benefit from dressing with farmyard manure (FYM).

EASE OF ADOPTION ON NON-ORGANIC FARMS

- Some investment in machinery/equipment required (e.g. grass sowing equipment on arable farms).
- The range of clover-safe herbicides available for use in cereals is limited at present, i.e. there are few options for herbicides that can control chickweed without affecting the clover.

BENEFITS OF IMPLEMENTATION

- Good establishment of ley crop if intended in rotation.
- Undersown leys provide readily available source of forage at the end of the growing season if establishment can be ensured.
- Use of undersown leys can also increase eligibility for subsidy payments within Countryside Stewardship Scheme (see ‘Financial Analysis’ below).
- Some reduction in fertiliser expenditure for follow on crop through increased supply of N via biological nitrogen fixation (i.e. from clover in legume/grass mixes).

DRAWBACKS OF IMPLEMENTATION

- Establishing grass competes for the same nutrients and light as the cereal crop.
- Grass growing underneath a cereal can also retain moisture leading to increased grain drying charges, in particular within areas with high summer rainfall. In most applications under-sowing produces a productive grass-sward or a high-yielding cereal but it is rare that both can be achieved.
- Short-term leys established through undersowing can be susceptible to fat-hen and chickweed. As leys get older and more established, biennial and perennial weeds such as spear thistle, docks, ragwort and couch grass can be more problematic.



BARRIERS AND RISKS

- Undersowing can lead to yield reduction and make it more difficult to clean and/or dry grain.
- Predominant attitude towards conventional approach of growing grass and cereal separately major barrier.

FINANCIAL ANALYSIS

Initial investment	Ongoing costs	Added income	Effect on productivity	Expected effect on margin
~	↓	~	~	~

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

The estimate of the financial implications of undersowing is based on the assumptions that:

- Undersowing saves costs of ploughing, combi-drill and rolling.
- Main operational costs for under-sowing are harrowing and seed broadcasting.

RELEVANT LEGISLATION AND CURRENT INCENTIVES

- Possible claim for undersown areas as an Ecological Focus Area (EFA) within Greening Framework.
- Possible benefits in terms of reduced N fertiliser usage may make it easier to meet Nitrogen Vulnerable Zone (NVZ) regulations.
- £86 per hectare (ha) available for use of undersowing cereals by 30 April with a grass/flower-rich legume ley within higher tier of CSS (2018-2019 financial year).

FURTHER INFORMATION

Video

- Example of undersown herbal ley in spring barley: <https://www.youtube.com/watch?v=pFNvjQuF2xw>
- Example of undersown clover in winter wheat: <https://www.youtube.com/watch?v=aVbgTblyELO>
- Example of undersown grassland in maize: <https://www.youtube.com/watch?v=GgTg87BEQeY>

Further reading and weblinks

- A Farming Connect guide on managing grass establishment in undersown spring cereals (2012): <https://tinyurl.com/Undersow-sc>
- Game and Wildlife Conservation Trust farming advice pages: <https://www.gwct.org.uk/farming/advice/habitat-issues/undersown-cereals/>
- An investigation of suitable varieties for undersowing in organic spring wheat: <https://www.agricology.co.uk/resources/investigation-suitable-legume-species-undersowing-organic-spring-wheat>
- A practical guide to establishing green manures published by Cotswold Grass Seeds: <https://www.agricology.co.uk/resources/sort-out-your-soil>

PhD theses on establishing clover and ryegrasses in cereal crops

- Bergkvist G (2003). Perennial clovers and ryegrasses as understorey crops in cereals. Swedish University of Agricultural Sciences Uppsala (SLU). Available at: <https://pub.epsilon.slu.se/349/>
- Känkänen H (2010). Undersowing in a northern climate: effects on spring cereal yield and risk of nitrate leaching. Faculty of Agriculture and Forestry of the University of Helsinki. Available at: <https://tinyurl.com/Undersow-northern>

A study comparing methods of undersowing and timings:

- Carof M et al. (2007). Undersowing wheat with different living mulches in a no-till system. I. Yield analysis. *Agronomy for Sustainable Development* 27, 347-356: <https://link.springer.com/article/10.1051/agro:2007016>



CASE STUDY FARMER APPLYING THE PRACTICE: OVERBURY FARMS

Location: Gloucestershire

Size: 1,536 hectares

Enterprises: Mixed with sheep

Quote from farm manager Jake Freestone:

“We undersow a mixture of red clover, perennial ryegrass (PRG), plantain and chicory into spring barley. This year we had a yield of 6 tonnes / ha with no herbicide. I deliberately chose those fields that have a brome problem to help get on top of it. This then goes into a 2 year ley for sheep.

“Another mixture we are trying is kale undersown with white clover for fattening lambs. Once grazed we then direct drill winter wheat into the white clover. I am interested to continue experimenting with this - an understorey of white clover for the whole rotation would be good.

“I am pleased to say that blackgrass is now a diminishing issue - it's now just a spot of leisurely hand rouging on a Sunday afternoon! I think this is a combination of 5 years no till, spring cropping and having a cover at all times (if the soil is going to be bare for more than 5 weeks I put a cover in). We also try to drill later but I am cautious not to push it back too far in a no till system - although the soils are drier.

“It is not the case that there are not barriers to farming in this way - there are some machinery requirements, we need to consider the rotation effects and limit the 'green bridges.' Finding markets for crops such as buckwheat is also a challenge, as is getting spring crops to contribute enough to gross margins... But I think the biggest barriers are in our minds! Have to stop worrying what the neighbours will think and take the plunge and try something new...”

<https://www.agricology.co.uk/field/farmer-profiles/jake-freestone>



OVERBURY
FARMS

ABOUT THIS PRACTICE ABSTRACT

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