



SusCatt - Increasing productivity, resource efficiency and product quality to increase the economic competitiveness of forage and grazing based cattle production systems

Cross-under-sowing: improving permanent pasture without herbicides

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About

Permanent pastures support valuable animal production although this depends on how they are managed, and hence, what plants are present. Poor conditions are often caused by neglect, although they can arise from overgrazing or damage from grazing animals or machinery in wet conditions. The pastures can be renovated using specialist machinery to introduce more productive grasses. Cross-under-sowing using a direct drill fitted with a tine cultivator proved successful without the need for controversial pesticide application.

Challenge and objectives

In many European countries, permanent grassland covers between 10% and 70% of all farmed land, which, if properly managed, is an important source of feed for ruminants. On the other hand, if neglected, they become dominated by relatively unpalatable and unproductive weeds. The main goal of this work was to improve pasture yields through mechanical weed control using a tine cultivator, combined with direct drilling to introduce tetraploid grasses, white and red clover and herbs into existing meadow swards.

We aimed to improve the yield and nutritional value of permanent pasture and meadows, using a band-tilling seeder, without relying on herbicides to destroy the existing sward during renovations. Improving both grass growth and its nutritional value, will allow farms to graze more cows and/or support higher yields or growth rates from forage.



Undersowing with rotary band-tilling with tine cultivator, cutting turf with disc coulters. Photo: J. Barszczewski.

Permanent grassland renewal: methods

Effective pasture renovation, introducing valuable grasses and legumes whilst maintaining biodiversity, can be done by 1 of 3 ways, depending on the state of the existing sward and soil conditions:

1. fertilization and rational use
2. under- or over-sowing (traditionally or using specialized seed drills)
3. full cultivation and reseeding

All have pros and cons relating to practicalities, continuity of feed supply and economy.

Grassland renewal: basic conditions

Successful under- or over-sowing can be used when:

- the surface is fairly even with limited damage
- the existing sward lack many productive grasses or legumes
- plants present are unpalatable or of low digestibility

- weeds make up less than 40% of the sward
- persistent weeds forming clumps and stolons is less than 20%
- the sward has been heavily damaged during winter or from prolonged water logging

Combined Band-Rotating Tillage and Seeding

In modern under-sowing, seeds are introduced directly into the soil using two main types of special seeders:

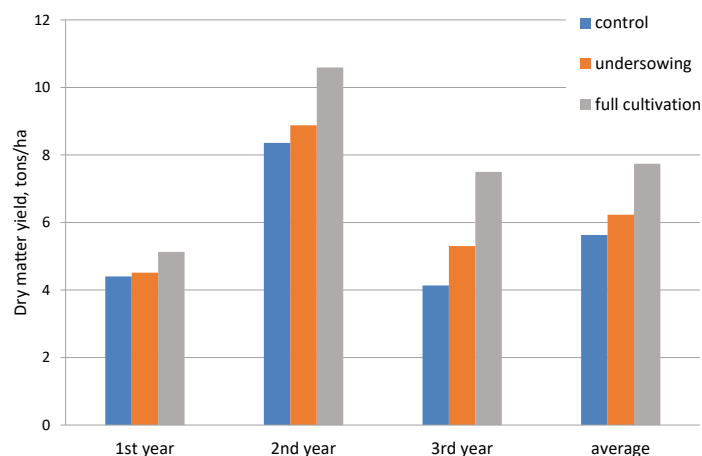
1. rotary band-tilling aggregates and slot-cutting turf (image 1). Here disc cutter or knife destroys about 40% of the old turf and introduce seeds into soil in the notches or slots created.
2. rotational (band-tilling) method – which is more effective for high organic matter soils where plasticity might lead to insufficient slotting (disc coulters) and difficulty introducing seeds into the soil



Cross-under-sowing with a rotary band-tilling seeder with tine cultivator (cutter). Photo: J. Barszczewski.

Whichever method is used, the key factor for success is adequate soil moisture, enabling rapid germination and growth of young seedlings. With moderate weed infestation on mineral soils, effective planting is possible with a single pass of the band-tilling aggregate. However, with high weed infestation, particularly poor swards or high organic matter soils, it might be necessary to use cross-under-sowing, to eliminate the need for herbicides to destroy the undesirable plants. Cross-under-sowing with the aggregate (image 2), mechanically destroys weeds, partially maintaining local ecotypes and biodiversity of the plant communities and, most importantly, replaces full cultivation limi-

ting its mineralization and associated greenhouse gases emissions.



Grass yield after direct drilling (undersowing) or full cultivation (ploughing and reseeded) compared with no renovation (Control).

The figure above shows the yield advantages following pasture renovation, comparing full cultivation and under-sowing (method 1 above, image 1) with untouched, control swards. The yield was on average 20% higher with undersowing and 30% higher with full cultivation compared with the control. However, if the underlying causes for the original deterioration (poor drainage, overgrazing, animal or machine access in wet conditions, low pH or fertility) are not addressed, this will be transient as the new plants struggle in adverse conditions. The nutritional quality of the herbage was also improved with direct drilling, with higher protein and lower fibre concentration than in control.

Imprint

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