

Red clover – agronomy and management

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Clover is the cornerstone of organic farming and the engine that drives productivity. White clover (*Trifolium repens* L.) and red clover (*Trifolium pratense* L.) are the main clover species used in Ireland. However, there are several significant differences between the two species particularly in morphology and physiology. In contrast to white clover, red clover has an upright growth habit and a strong deep root from which finer roots arise. The crown, located at the base of the stem, acts as a store of nutrients. Stems of red clover grow upwards from the crown. The optimum management and use of red clover is significantly different from that of white clover. The main role of red clover is for silage production.



Red clover can fix 150 - 200 kgN/ha

Uses of red clover

- The main role of red clover is for silage production, although it is often grazed by cattle or sheep after the final silage cut in the autumn.
- Red clover will not persist if continuously grazed or cut more frequently than every 30 days due to a combination of excessive foliage removal and plant crown damage by hoof trampling.

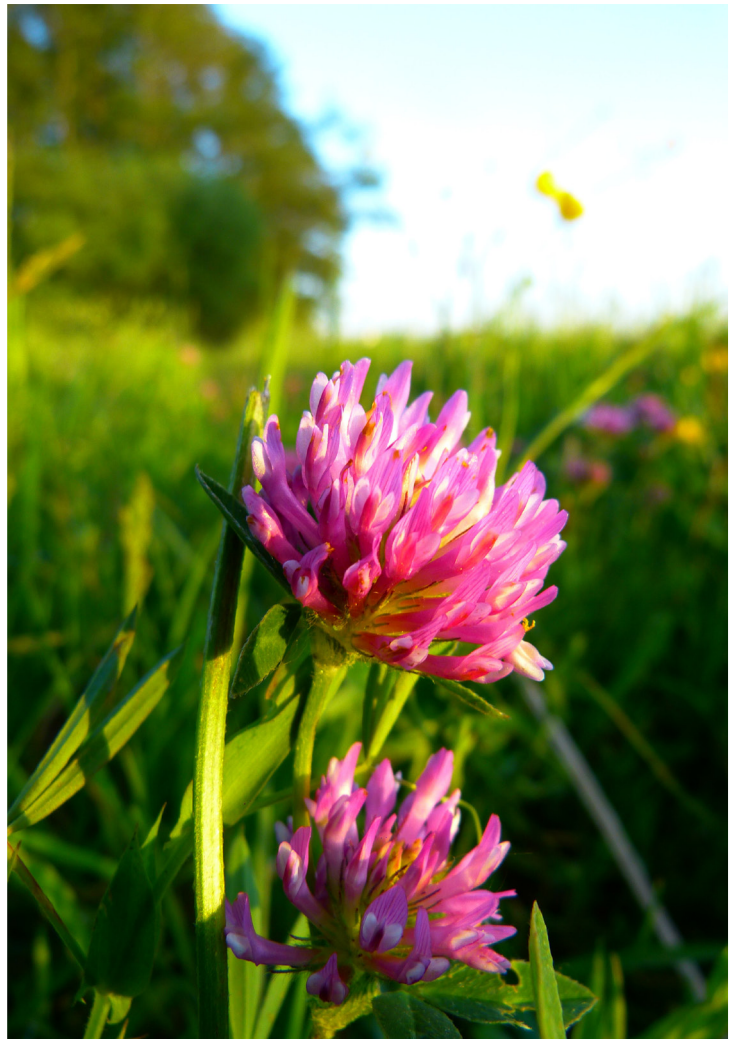
Benefits of red clover

- Red clover is high yielding with yields of 12 to 16 t DM/ha achievable when grown with ryegrass.
- It converts atmospheric Nitrogen into a plant usable form. An annual Nitrogen fixation of 150-200 kg/ha is achievable from swards with a high red clover content.
- Red clover is suitable as a break crop to improve soil structure and fertility and as a supplier of organic matter. It can also be used as a green manure crop. It is particularly valuable for building soil fertility once organic conversion has begun.
- Red clover is relatively drought tolerant due to its deep tap root. It offers superior production to white clover in dry summers.
- It has a high protein content of 16 to 20%. The feeding value of red clover silage is higher than grass silage resulting in greater animal intakes and higher levels of animal performance in terms of milk and protein yields, and liveweight gain. Results from an experiment conducted at Teagasc Grange found the mean liveweight gain in beef cattle offered different types of silage were grass silage 0.59 kg/day, grass/white clover silage 0.83 kg/day and red clover silage 1.04 kg/day.

Challenges with red clover

- Red clover is a short term crop with a lifespan of typically 2 to 4 years at farm level however recent research from Teagasc Grange has shown that the crop can persist for significantly longer (6 years +). This was considered to be mainly due to the very good initial establishment, the provision of optimum levels of soil fertility, phosphorus (P) and potassium (K) and low opportunity challenge from pests and diseases.

- To maximise its persistence: (i) do not cut or graze more frequently than every 30 days, (ii) cut silage crops at 7-8 cm height above ground level, (iii) ensure optimum grazing height of aftermaths is 6 cm above ground level, (iv) ensure over wintering height is 4-6 cm above ground level, (v) avoid heavy machinery in wet weather, poaching and severe winter grazing that will damage the plant crowns directly by physical damage and indirectly through soil compaction.
- Red clover can contain up to 1% of oestrogenic compounds. Oestrogen levels can lower ewe fertility. Therefore, do not allow breeding ewes to graze red clover swards or eat red clover silage for a period of 6 weeks before and after mating to avoid any adverse effect of red clover oestrogens on lambing percentage. Store lambs can be offered red clover swards and silage at any time. Reports of red clover affecting cattle fertility are rare.
- **Bloat:** In terms of grazing, the risk of bloat is reportedly higher with red clover than white clover. The risk is highest in cold, wet weather and when the animals are particularly hungry. The risk can be reduced by feeding roughage, such as straw or hay, before turning out and if necessary during grazing. Red clover should be introduced slowly and once introduced it should be a consistent component of the diet. Avoid daily fluctuations in the quality and quantity of clover offered. Never allow hungry stock to gorge themselves on clover-rich pastures. Moving stock onto dry rather than wet pasture also reduces the risk. Affected animals may be treated with anti-foaming agents. In severe cases remove animals from clover swards and seek veterinary advice immediately. The risk of bloat from red clover silage is negligible.
- Red clover is susceptible to a number of pests and diseases although incidences in Ireland are rare, probably due to the relatively low amount of the crop grown. Stem eelworm is the major pest of red clover. At first, patches of red clover appear with poor growth and stunted plants. These patches die out and then progressively enlarge and merge. Clover rot (*Sclerotinia*) is the most serious disease affecting red clover. This fungal disease is typically seen in the winter. The clover leaves become peppered with brown spots and there is a generalised rot of the crown, leaves and stems from which the plant rarely recovers. Pests and diseases can be spread between fields by infected plant material or soil on machinery. A 5 year break between red clover crops is recommended to combat pests and diseases. This should be extended to 7 years if clover rot or stem eelworm is known to be present. Also select more resistant varieties and avoid machinery movements between old and new crops.
- Choose red clover varieties on the Northern Ireland or England/ Wales Recommended Lists www.afbini.gov.uk
- Varieties are classified by ploidy (diploid or tetraploid) and flowering date (early or late).
- Tetraploid varieties are often larger plants with larger leaves and may smother commonly used companion ryegrasses. However, tetraploid varieties tended to be more persistent and disease resistant than diploid varieties; although this may not be true of modern varieties.



Red clover has a high protein content of 16- 20%

- Early varieties flower towards the end of May and late varieties 10-14 days later. Early flowering varieties start growth earlier in the spring, giving approximately 40% of annual yield for the first cut with progressively lighter yields in subsequent cuts. Late flowering varieties tend to be more grazing tolerant and persistent than early flowering varieties since they produce more buds from the plant crown.
- Red clover can be sown in a monoculture at 12-15 kg/ha.
- Red clover sown in a mixture with a companion grass offers a number of advantages including: (i) higher total forage yield, (ii) easier to obtain satisfactory silage fermentation as higher dry matter and water soluble carbohydrate concentrations are present in the total forage, (iii) reduced impact of poaching and (iv) utilisation of fixed Nitrogen by the companion grass. The species of companion grass should be selected based on the expected duration of the sward within the crop rotation. For 2 years duration, use Italian ryegrass or hybrid ryegrass. For 3 or more years duration, use perennial ryegrass or hybrid ryegrass. Tetraploid perennial ryegrass varieties are highly suitable as they generally have a more open growth habit and are less competitive than diploid perennial ryegrass varieties. The grass heading date should be matched with the flowering date of the red clover. If the grass heads before crop harvest, silage quality will be compromised. If the grass is too immature before crop harvest, total forage yield will be compromised. White clover can also be added to the seed mix and may become dominant when the red clover becomes less persistent after 3 to 4 years. Large leaf size white clover varieties should be used in silage swards. It is recommended to use grass and white clover varieties included on the Grass and Clover Recommended List for Ireland. The Recommended List may be found at the following link [/www.agriculture.gov.ie/publications](http://www.agriculture.gov.ie/publications)
- A typical seed rate for a red clover dominant sward is 15 kg/ha of red clover and 15 kg/ha of grass. A typical seed rate for a grass dominant sward is 7.5 kg/ha of red clover and 22 kg/ha of grass. An additional 2.5 kg/ha of white clover may be added to the seed mix, if required.
- Red clover swards may be established by direct reseeding or by under-sowing in an arable silage crop.
- Red clover performs best on well drained, fertile soils.
- Conduct a soil test and target soil pH of 6.0-6.5 and Index 3 for P and K for successful establishment.
- Sow from April to July.
- Ensure a fine, firm and level seedbed, roll both before and after sowing.
- Optimum sowing depth is 0.5 to 1.0 cm, and should never exceed 1.5 cm.

Red clover management

- In the establishment year, red clover should be allowed to flower before harvesting the first silage cut. This is to help root development and the growth of the bacteria that fix Nitrogen.
- In subsequent years, harvest at intervals of 6 to 8 weeks re-growth at any time between bud development and early flowering.
- 3 - 4 cuts can be taken each year. About 80-90% of the annual yield will be obtained from silage cuts completed by late July-early August. Cut or graze off the herbage in October, if this can be achieved without poaching, soil compaction and physical damage to the plant crowns.
- The final cut should be taken no later than mid-October.
- Cut silage crops at 7-8 cm height above ground level.
- Optimum grazing height of aftermaths is 6 cm above ground level.
- Optimum over wintering height is 4-6 cm above ground level.
- P and K removed by the conserved crops will need to be replaced using slurry, farmyard manure or other fertiliser sources, weather and ground conditions permitting.
- Annual P & K replacement requirements will be 100-150 kg/ha phosphate (P_2O_5) and 250-300 kg/ha Potash (K_2O) for a 12t D.M./ha yield/year.
- Farmyard manure (FYM) contains about 1.2 kg phosphate and 6.0 kg potash per tonne.

- Cattle slurry contains about 0.5 kg phosphate and 3.5 kg potash per 1,000 L.
- Slurry and FYM can be applied throughout the year including between cuts. Avoid applying slurry or cutting silage in wet weather as damage to the plant crowns directly by wheel damage and indirectly through soil compaction will reduce red clover yield and persistency.
- In a mixed grass-red clover sward, red clover will contribute 150-200 kg of N/ha

Red clover conservation

- Red clover is characterised by low dry matter and low water soluble carbohydrate concentrations and a high buffering capacity. As a result, it is more difficult to obtain a satisfactory fermentation with red clover than with all-grass silage.
- It is advisable to wilt for 24 to 48 hours in dry conditions to achieve 25-35% dry matter concentration. This will also concentrate sugars to encourage a desirable fermentation and reduce silage effluent production. Leaf is prone to shatter and it is advised not to use a conditioner mower. Avoid overwilted and excessive handling that can result in substantial leaf shatter and loss. It can also be difficult to consolidate very dry material in the silo.
- Red clover wilted to 25% dry matter will often ensile effectively without an additive. However, where herbage is wet or where there is a very high proportion of red clover, an effective additive can be used to ensure a stable fermentation.

Red clover-grass leys are normally harvested for silage 3 to 4 times a year on organic cattle farms

