

## USING SUBTERRANEAN CLOVER

Subterranean (sub) clover (*Trifolium subterraneum*) has the ability to produce high-quality feed in late winter and early spring. As it thrives on drier sites (sunny hill faces, stony soils), with the correct management, subterranean clover can be a valuable component of east coast, dryland, sheep systems.

## WHY IS SUBTERRANEAN CLOVER USEFUL ON DRYLAND FARMS?

### IT GROWS MORE IN SPRING

As an annual legume, sub clover produces more drymatter in early spring than perennial legumes such as white clover. This is because annuals germinate and grow at a lower optimum air temperature (10-15 °C) than perennial legumes (20-25 °C).

Sub clover starts rapid growth at least a month earlier than lucerne, white and Caucasian clovers. Well-managed dryland pastures can get 50% clover on offer in September and October.

### HIGHER FEED VALUE THAN GRASSES

Grazing animals, when given the choice, prefer a diet that is 70% clover and 30% grass. Providing quality herbage from August to November helps lactating ewes milk well, ensuring rapid lamb growth rates. This allows lambs to be finished earlier, before summer dry conditions limit pasture production.

**Table 1:** Legumes have an impressive energy value (MJME/kg dry matter) and will retain quality longer than grass.

Clover	12
Lucerne pre-flower	12.2
Young grass leaf 11.5	(declines 0.03/day)
Dead grass	8

## INCREASES GRASS PALATABILITY

Grasses in the sward become more palatable through nitrogen fixation by legumes. Legumes fix about 30 kg nitrogen (N) per tonne of DM grown. For example, four tonne DM of sub clover grown over a year would fix at least 120 kg N/ha. This extra nitrogen is taken up by grasses. Grasses with more crude protein (about 4 per cent N) are much more attractive than N deficient leaves (less than 2.5 per cent N). The amount of nitrogen present in the leaf is used to estimate the amount of protein in the grass.

## SURVIVES ON DRIER SITES

On drier sites (sunny hill faces, stony soils) most perennial legumes (with the exception of lucerne) may not survive summer drought (such as white clover). Annual clovers can survive from year to year as they set large amounts of seed in early summer before dying. This provides a seedbank and rapid regeneration of seedlings in autumn.



Clockwise from top left: Sub clover cultivars Antas, Monti, Narrikup and Woog. Photo credit: David Hollander.



*A 50:50 mix, on DM basis, of 'Antas' sub clover and grass.  
Photo credit: Sonya Olykan.*

### **INCREASING THE CLOVER CONTENT IN HILL PASTURES WHERE THERE IS AN ACCEPTABLE RESIDENT SUB-CLOVER POPULATION**

**Mid-September onwards:** Identify when sub clover flowers are obvious. Spell the paddock for two to three weeks or longer if possible (up to six weeks) to allow seed-set.

**After spelling:** Graze with cattle to limit grass-seed production. Do not use sheep. Sheep target the sub clover runners and will reduce clover seed production.

**Summer grazing:** Graze as normal but aim to reduce pasture mass to 700 kg DM/ha by the end of February.

From the end of February until significant autumn rain (over 20 mm). Remove any tag and keep pastures down to 700 kg DM/ha. This open-pasture will aid sub clover seed germination.

**Autumn:** Monitor rainfall and watch for sub clover germination. Rainfalls of over 20mm will trigger germination. Once germination occurs, spell the paddock to allow sub clover seedlings to reach the 3-4 trifoliolate leaf stage. Then, ideally, graze with cattle to reduce shading of clover seedlings.

**Winter:** Graze as required. Keep pasture above 1200 kg DM/ha. If possible, spell lambing paddocks to build clover-rich pasture for lambing.

### **NO OR LITTLE RESIDENT SUB CLOVER**

Plan to oversow sub clover the following autumn if it is weak or absent in September.

Investigate cultivar options and order seed—need 10 kg/ha. Check that soil pH is greater than 5.5, Olsen P is over 15 and Sulphate-S is greater than 8.

**September to January:** Graze as normal. If some resident sub clover is present aim to keep pasture above 1200 kg DM/ha.

**February to mid-March:** Remove any tag. Chew the pasture down to 700-1000 kg DM/ha. Opening the pasture will aid resident and oversown sub clover seed germination. Herbicide may be used to reduce drymatter before broadcasting or drilling seed.

**Mid-March:** Oversow or direct-drill with sub clover seed and apply fertiliser if required. To get maximum benefit from re-seeding it is important to feed the legume. Monitor rainfall and watch for sub clover germination—this is triggered by rainfall of over 20 mm. Spell to allow

## **ABOUT SUBTERRANEAN CLOVER**

### **SUB CLOVER LIFE CYCLE**

As sub clover is an annual, the seed germinates in autumn and flourishes in spring. It dies off as soils dry in summer. As plants mature in late spring/early summer, seed burrs are buried in the soil.

### **PRODUCTION**

Pure swards of sub clover can produce four to over ten tonnes DM/ha/year depending on rainfall. This is similar to mixed grass/clover pastures at the same site. However, clover content is likely to be only 20% of the total production in mixed pastures. Given that clover herbage has a higher feeding value than grass, a strong case can be made for using legumes to maximise lamb growth rates during spring ewe lactation, and to get more live-weight gain from the same amount of feed grown.

Lincoln University's "Max Clover grazing experiment" at dryland sites showed that superior clover content in sub/cocksfoot pastures gave greater liveweight gain per hectare than white clover/ryegrass or white clover/cocksfoot pastures.

## **MANAGING SUBTERRANEAN CLOVER**

### **DETERMINING RESIDENT CLOVER POPULATIONS**

In early September walk the paddock to identify sub clover populations. If there is more than one clover plant every second step when walking uphill, then the correct management will help increase the population. If there is less than this, oversowing will be required to get a rapid increase in sub clover. Keep grazing above 1200 kg DM/ha.

establishment and the seedlings to reach three to four trifoliate leaf stage.

**Winter/spring:** Graze lightly in this first year preferably with cattle. Keep pasture at about 2000 kg DM/ha to control grass so clover is not shaded. Lamb on pasture but spell from the grazing area once the sub clover is in full flower.

**Mid-September onwards:** Identify when sub clover flowers are obvious—usually early or mid-October. Spell the paddock for at least six weeks, then graze with cattle to control tall pasture.



Flower of Narrikup showing the red band characteristic of this sub clover cultivar. Mount Barker, the most common resident sub clover, also has a red band. Photo credit: David Hollander.

## OTHER METHODS OF ESTABLISHMENT

### DRILLING

If possible, sub seed should be drilled rather than broadcast. This is because the seed is adapted to germinate from seed burrs buried in the top 10 mm of soil. Bare (unpelleted) seed should be sown in autumn at 10 kg/ha. Sub clover should not be sown in spring. Direct drilling into a run-out cocksfoot-dominant pasture at Lincoln University's light land farm gave excellent results. Graze hard (i.e. 600 kg DM/ha) until the first good rain in March and then drill sub at 10 kg/ha. Graze to reduce grass competition once seedlings have passed the finger and thumb pull test. This maybe when they have four trifoliate leaves.

### BROADCASTING

Broadcasting success is more weather dependent. Hill slopes should be prepared by hard grazing. Stock may be used to tramp seed into the ground immediately after broadcasting. Best results are seen when seed is spread just before a prolonged wet spell in March/April. Predicting the wet spell is the problem!

Loss of soil moisture through evapotranspiration is greater in March. A week of moist, dull weather will give a good result but a wet day followed by dry northwesterly weather can result in a false strike. Early April seeding is more likely to achieve a good strike but seedlings will be smaller in winter and more vulnerable to competition from grass.

### RATES AND MIXES

Cultivars differ in seed size but in general there are only 15 seeds/m<sup>2</sup> for each kilogram sown, so 10 kg/ha will give about 100 established plants/m<sup>2</sup>. The best way to rapidly build a large sub clover seed bank is to sow it alone or at least reduce grass seed rates down to less than half what you normally sow (e.g. from 20 kg down to 8-10 kg perennial ryegrass/ ha). When sowing with cocksfoot and plantain, keep rates to 2kg/ha maximum.

Another option is to sow sub clover in autumn with rape (rape at one kg/ha or less if soil is fertile). The rape is a good nurse crop for the clover and will provide a couple of grazings over winter. After the sub clover has given a large spring seed set, grass can be over-drilled the following autumn.

In areas where annual clovers are scarce or absent, sub clover seed should be inoculated with strain C of Rhizobium bacteria, immediately before sowing. If resident sub and other annual clovers look healthy and pink nodules are present on the roots, inoculation for nitrogen fixation should not be necessary. Sub clover needs a different Rhizobium bacteria inoculant from white clover.

### CULTIVAR SELECTION

The main “modern” sub clover cultivars available, as at June 2018 were Antas, Bindoon, Coolamon, Narrikup and Rosabrook. The older cultivars; Denmark and Woogenellup are also imported and available through seed retailers. Some sub clover cultivars have been superseded due to high oestrogen levels (e.g. Tallarook), pest and disease susceptibility and/or a lack of persistence in the grazed pasture environment. Current and new sub clover cultivars are low in oestrogen, selected to be resistant to diseases and/or are very persistent under grazing (e.g. Denmark). Bindoon, Narrikup and Rosabrook were selected for red legged earth mite (RLEM) tolerance.

Some new cultivars are large-leafed and may be less tolerant of hard set-stocking than those with smaller leaves and a more prostrate growth form. More lenient grazing systems may be required to exploit the potential productivity of large-leafed sub clovers.

RLEM is a major pest of sub clover seedlings in Australia. With a warming climate, this mite has the potential to become a major problem in New Zealand.

### **SOW A MIX OF CULTIVARS TO COVER SITE AND CLIMATE VARIABILITY**

Earlier flowering cultivars are suited to areas with low rainfall (<500 mm) while the later flowering cultivars are adapted to higher rainfall (>700 mm). However, a mixture of at least two complementary cultivars will compensate for site and climate variability. Moisture is required for 10 weeks from the start of flowering for good seed yields. For example, Woogenellup starts flowering in early to mid-September so it is better suited to dry areas than the latest flowering Leura which starts flowering in mid-October. Dry areas include steep/sunny faces or soils with low water holding capacity (e.g. very stony river terraces).

In an average year in a droughty-soil site, an early flowering variety is more likely to set-seed than a later-flowering variety. Late cultivars like Denmark are more suited to soils that are moist throughout November.

### **DRYLAND SHEEP AND BEEF PASTURE ENVIRONMENTS CAN BE DIVIDED INTO FIVE CATEGORIES**

1. Grow lucerne if possible
2. Areas with five to six months average dry season use a mix of medium and late flowering sub clovers.
3. Areas with three to five-month dry season, select late-flowering sub clovers. White clover may contribute in a wet summer.
4. Areas with a one to three-month dry season, sub clover may be complementary to other perennial legumes.
5. In irrigated or summer wet situations, white clover is the best adapted pasture legume.

Sub clovers vary considerably in their flowering dates, leaf size, pest and disease tolerance and hardseededness. A mixture of at least two cultivars is recommended to cover within paddock variation in soil moisture availability and soil conditions (depth clay pans, aluminum toxicity, sub-soil stoniness), slope and aspect, rainfall patterns and evapotranspiration.

### **HARDSEED PROTECTS AGAINST “FALSE STRIKES”**

Part of the seed set contains hard seeds. Some of these seeds will germinate one or two years later than most. This helps protect the plant from “false strikes” where early germination is followed by drought and loss of seedlings. Sub clover cultivars which have a lower percentage of hard seed in summer are more susceptible to “false strike” than cultivars with a higher hard seed rating. But only about 10 per cent of the total seed bank will be lost with a major false strike.

Hard seeds “soften” faster in hot dry conditions with wide day/night temperature fluctuations. These conditions crack the seed coat. This creates “soft” seed that is then permeable to water and can germinate with the next rain event. Hardseededness is a quality that is valued in Australia where soil surface temperatures are greater than those generally experienced here. Hence some Australian cultivars with a high hardseededness rating may be less suited to New Zealand conditions. Sunny hill faces with a high proportion of bare ground in summer will require cultivars with greater hardseededness than shady faces.

### **ACKNOWLEDGEMENTS AND MORE INFORMATION**

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### **B+LNZ RESOURCES**

 [www.knowledgehub.co.nz](http://www.knowledgehub.co.nz)

- Keyword search: “sub clover” to display the full suite of resources available to view/download.

[B+LNZ Factsheet 106: Production and persistence of dryland pastures](#)

[Guide for subterranean clover identification and use in New Zealand](#). Lincoln University Dryland Pastures Research Team

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