

Lucerne Management Guide

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Background

Lucerne is a perennial legume with a long taproot that can access water and nutrients from deep in the soil profile. Lucerne has excellent growth and quality, and is very persistent if managed well.

Paddock Selection

There are five main guidelines in selecting paddocks to plant in lucerne;

- Free draining soils
- Well-prepared paddock (cleaned of weeds)
- pH over 6.0 (6.5 is optimal)
- High fertility (P>20, S>10, K>8)
- Ability to be rotationally grazed



Sowing and Establishment

It is critical to the performance and persistence of the stand to ensure that weeds are removed from the paddock before planting lucerne. Some rhizomatous weeds (e.g. couch, Californian thistle, yarrow) will take several sprays to remove, and all perennial and annual weeds should be prevented from seeding for 1-2 years, and encouraged to germinate and be sprayed before planting the lucerne crop. Avoid using herbicides during the cropping programme that may have a residual effect on lucerne (e.g. Glean, Tordon Max).

Soil pH is critical to the performance of lucerne, and should be 6.5 to 15 cm at the time of sowing. Soil should be tested as soon as the preparation programme begins, and lime applied at least six months before planting if worked into soil, and 12 months for no-tillage. It is common that high applications of agricultural lime are needed, for example 3.5 tonnes per hectare if the starting pH is 5.7. Soils with very acidic subsoils should be avoided.

The seedbed should be fine and firm, and free of clods and turf. Pre-sowing herbicides (e.g. trifluralin) are commonly used to reduce weed establishment. Trifluralin should be applied to a fine seedbed and immediately incorporated with power, or fine harrows. Seed can be sown immediately after incorporation when conditions are suitable for a fast germination, or up to 14 days later in cold, wet conditions.

The seed should be sown about 5 – 15 mm deep at a rate of 12-14 kg/ha (Superstrike), with higher rates of 20 kg/ha commonly used in moist North Island regions. All lucerne seed needs to be inoculated with viable rhizobia before planting. This can be done by ordering Superstrike or Prillcote treated seed (check that the “use-by date” has not passed), or by buying bare seed and inoculating on the farm the evening before planting.

Phosphorous is a vital element for lucerne so superphosphate should be applied at sowing, but not in direct contact with seed, at rates determined by the soil test result. Potassium is also a key element that should be applied after establishment as it can affect germination. Molybdenum is important for nitrogen fixation in lucerne, so can be added to fertiliser if pH is lower than ideal at the time of planting. Boron deficiency in the soil will also restrict the performance of lucerne. Specialist lucerne fertilisers are available, which contain trace elements required by the species.

Weeds should be controlled before establishing lucerne (cropping phase, pre-emergent herbicides). However, if they appear during establishment, control them with herbicides registered for use on the crop which are effective on the weeds present. Weed control needs to be good throughout the first season because they can severely reduce the long-term production of the crop. More than one herbicide may be needed if there are several germinations of weed seed. Fathen that is not sprayed is very competitive against lucerne in the first summer. If control of fathen is missed, graze the crop once it is 15 cm in height, and then mulch the fathen at a height setting above the lucerne crowns.

Spring sowing is ideal for lucerne as the soil temperature is increasing, allowing for fast establishment. Early-autumn (February) sowing can be done if the summer is very hot and dry. This will give the plants time to establish before the following summer. A summer fallow is recommended to conserve soil moisture. Weed control is extremely vital if sown in autumn, and grass grub may also be a problem.

It is very important to treat the lucerne stand with care in the first year. For the first harvest, cutting is recommended after 50% of plants have an open flower; if grazing, remove herbage quickly at high stocking rates. This is an important phase in encouraging root and shoot development.

Selection of Cultivar

There can be large differences in the features of lucerne cultivars, so it is important to choose carefully. Some cultivars are imported, and have often undergone no, or very little, testing for suitability in New Zealand. In New Zealand we use lucerne differently to some countries, and tend to graze stands more often.

Disease and insect pressures also vary between countries. As an example, some imported cultivars are advertised as being aphid resistant, but after planting farmers may discover the crop is very susceptible. Unless you have plenty of trial data from within New Zealand on imported cultivars, you may be wise to only use New Zealand-bred cultivars (Table 2).



Varieties of lucerne vary in their tolerance to blue-green aphid

Winter-active cultivars (ratings 6 to 10) are sometimes used in overseas countries with warm climates (e.g. Queensland, Australia); because the winters are so warm that lucerne can be harvested throughout winter. In most regions of New Zealand it is too cold in winter to realise any advantage from highly winter active cultivars. Indeed their earlier growth in spring can be a disadvantage as it exposes new growth to frost damage, and can encourage early grazing when the plant is susceptible to damage. The main disadvantage of winter-active cultivars is the higher crown (base of plant) which makes them more prone to damage from grazing, and unseasonably cold spring temperatures. It is recognised internationally that winter-active cultivars have less persistence than cultivars with less winter activity.

Semi winter-dormant (ratings 1-5) cultivars are ideally suited to New Zealand because they show good survival under grazing, and good tolerance of cold temperatures. Their annual production is at least as good as winter-active cultivars. A major benefit of semi winter-dormant cultivars in New Zealand is that they have finer and softer stems, leading to higher feed quality at cutting/grazing. This is particularly important for grazed lucerne as a greater percentage of the crop is consumed, and stock performance is optimised.

All cultivars used in New Zealand should be tested within New Zealand to have tolerance or resistance to blue-green aphid, spotted alfalfa aphid, verticillium root rot, phytophthora root rot, stem nematode (eelworm), as well as bacterial wilt and fusarium root rot (Table 1).

Table 1. Insect and disease resistance of six lucerne cultivars in New Zealand

Cultivar	Blue Green Aphid	Spotted Alfalfa Aphid	Verticillium Wilt	Phytophthora Root Rot	Stem Nematode	Leaf Diseases
<i>Torlesse</i>	R	R	LMR	R	R	MR
Kaituna	R	R	MR	R	R	MR
WL 325HQ	R	R	R	R	R	R
5454	MR	R	MR	R	MR	-
5681	R	R	MR	R	MR	-
Wairau	S	S	S	S	S	S

R=Resistant, MR=Moderate Resistance, LMR=Low-Moderate Resistance, S=Susceptible, - =No information available

Table 2. Replicated Dry Matter Trial, AgResearch Lincoln, Canterbury, kg DM/ha 1996-1998 (Sown Spring 1995)

Cultivar	1996/97	1997/98	Total
Grasslands <i>Torlesse</i>	17800	9500	27300
Grasslands Kaituna	17500	9800	27300
Wairau	16900	9800	26700

Grazing and Harvest Management

Lucerne leaves grow from the tip of the stem. When these growing points are removed during cutting or grazing, growth of that stem stops, and subsequent crop growth is solely from new stems growing from the crown (base of plant). These shoots/new stems must be allowed enough time to grow before further grazing/cutting, so that they return carbohydrates to the roots, which drive the subsequent growth of the next wave of shoots. Cutting or grazing too early will reduce regrowth, and if repeated, can allow weeds a competitive advantage and weaken the lucerne plant.



New shoots growing from the crown

The ideal length of time between grazings ranges between 35-42 days, depending on the time of year. Leaving lucerne too long between cutting will reduce the digestibility of the crop. Where stock are to be continually rotated, at least six paddocks/breaks are needed. When starting a rotation, the first paddock will need to be grazed at a shorter height than ideal (for a short duration) so that the last paddock in the rotation is not too rank.

It is not necessary to allow lucerne to flower before each cutting/grazing. The only exceptions to this are the first grazing after establishment, and once every autumn. A more useful decision tool is to **ensure that basal shoots have formed on the crown of the plant.**

Grazing duration of less than 7-10 days is advised as this is the time it takes for new growth to appear; so any longer than that, the stock may graze the new growth. **Set stocking is never advisable.**

Spring

Grazing practices as described above. The key is to start grazing the first paddock when the crop is 15-20 cm tall, which will be before any new shoots are visible on the crown. If cutting the crop, the crop should be cut late morning to mid-afternoon once the dew has lifted, as this is the time when the plant has the most sugars. However, during very hot and dry weather, it may be best to cut early in the morning to reduce loss of leaf at mowing, and then also rake early in the morning. The first fertiliser application for the season should be applied after the first cut/graze.



Established lucerne can be used for lambing, but close grazing needs to be avoided

Summer

Growth is increasing at this time of year with increased photoperiod and temperatures, and grazing frequencies can drop to 30 days. The best indicator for when to graze/cut is the initiation of new shoots at the base of the lucerne plant ("crown"). As soon as these are seen, the crop should be harvested, as these new shoots are

important for fast recovery. This is similar, but more precise, than the old rule of grazing/cutting when about 10% of the paddock is flowering.

Autumn

Management of lucerne at this time has a direct influence on the following season's production. Crops should be spelled until 50% of the crop is flowering. This will encourage significant build up of root reserves for winter, and leads to increased growth and plant survival in the following spring.

A final clean up of the paddock should be done after the first frost, as lucerne stops growing at this time. The removal of the crop, particularly by grazing, will decrease the potential disease and aphid infestations, and allowing for more effective herbicide use in winter.

Winter

A herbicide should be applied to most stands from the second winter onwards, whilst the crop is dormant. This is best done in early winter (e.g. June) shortly after the autumn-spelled crop has been grazed off (all green material removed). Spraying must be done before late winter due to the chance that new shoots can be damaged by the herbicide, resulting in decreased spring production. Once grazed in late autumn, stock must be removed until the crop is ready for grazing in spring.

Maintenance Fertiliser

The performance of lucerne will decline after a few years if fertiliser and lime are not applied at adequate levels to maintain soil fertility. Soil tests should be repeated at the same time each year to pick up any decline in nutrients.

A common mistake with lucerne is underestimating the nutrients removed in hay or silage. Each tonne of drymatter harvested will remove 2.8 kg of phosphate, 22 kg of potassium, and 2.8 kg of sulphur. This should be replaced with fertiliser in addition to the base fertiliser required for grazed lucerne (e.g. a stocking rate of 20 s.u./ha will require about 30 kg P/ha annually).

Fertiliser should be applied immediately after the first cut or graze in spring. For continuously cut crops, 1-3 applications may be needed, with rates dependent on the amount harvested.

Often farmers correct the soil pH before planting, but then forget to re-apply lime to maintain pH during the life of the crop. Typically, 2.5 tonnes per hectare is needed every 3-5 years.

Irrigation

Lucerne stands can be damaged with incorrect irrigation management, by increasing the time soil is waterlogged and weed seeds are able to germinate. Lucerne is a much deeper-rooted plant than ryegrass, so it is better to apply higher rates at less frequent intervals (e.g. 70 mm every 14 days in summer). Application rates should not exceed the capacity of the soil. It is also better to delay irrigation for 10 days after cutting/grazing, to coincide with the period that lucerne has greatest demand for soil water (the last half of the period between cuttings). This will also reduce weed growth by keeping the soil surface drier whilst the lucerne canopy is re-established.

Performance and Persistence

Lucerne can grow up to 20 tonne DM/ha on irrigated areas, and 10-15 tonne DM/ha from deep dryland soils. Persistence is dependent on management, but stands over 15 years old have been seen in drier areas where the pressure from weed grasses is less, with a more typical range of 5-8 years.

Animal growth rates are normally very good on lucerne (350 g/day + has been seen in lambs prior to weaning, and 250-300 post-weaning). If the grazing times are correct, then the quality is very good. As the plant matures the amount of stem increases, reducing the quality. Green leaf to stem ratios in lucerne tend to decrease as the season progresses, with a decline in quality in late summer and autumn.

Insects and Diseases

Insects and diseases of the foliage and roots can have a large impact on the growth and persistence of lucerne. The outbreak of stem nematode and aphids in the late 1970s led to lucerne becoming unpopular, and these pests still make it unwise to use old cultivars with no tolerance (e.g. Wairau).

The most important decision to make is to choose cultivars with proven resistance or tolerance to all the pests and diseases important in New Zealand. Torlesse was bred in New Zealand for resistance and persistence (Table 1).

Aphids can badly affect non-tolerant cultivars by sucking out the plant sap from leaves and introducing viruses. While they can be sprayed, it is more common for farmers to cut/graze to knock back aphid density.

Leaf diseases (e.g. pepper spot) also affect leaves and turn them yellow, with the only management option being to cut or graze.

Insects that feed on roots and crowns can lead to lower plant populations, and include sitona weevil and white-fringed weevil. They cannot be sprayed economically, but the sitona weevil has become less significant with the introduction of a biological control.



Spotted alfalfa aphid, adult and juveniles.

Diseases, such as phytophthora root rot (significant in the North Island), with the use of tolerant cultivars like Torlesse the only control available.

Grass and Lucerne Mixes

A number of farmers choose to plant mixtures of grass or herbs with lucerne, or to drill grass into old lucerne stands. The reasons for planting grass with lucerne include;

- Improved out-of-season growth (winter and early spring)
- Nutritional balance for grazing
- Reduction in animal health disorders
- Reduced weed invasion due to ground cover over winter and utilisation of soil nitrogen built up by lucerne plants
- Reduced wind and water erosion
- Providing a persistent legume companion to the grass, important for nitrogen supply

Disadvantages of grass/lucerne mixes include;

- Inability to harvest and grass/lucerne hay mixes (the hay still has good quality but is not as saleable)
- Inability to use some winter herbicides (depends on companion species used)
- Different grazing requirements of the two species, compromising one or the other, or resulting in one species being over-mature at grazing
- Selective grazing, putting pressure on either species
- Competition for soil moisture or light leading to premature disappearance of either species

Tall fescue (e.g. Advance MaxP[®] or Flecha) is a good companion to lucerne because it has good feed quality, thrives on the nitrogen fixed by the lucerne, is not aggressive towards the lucerne, and some lucerne winter-herbicides can also be used over tall fescue. Cocksfoot (e.g. Kara) has also been used, but can be more aggressive on lucerne and lose quality when managed to suit lucerne. Prairie grass (e.g. Atom) is also suitable, especially for drilling into old and thin lucerne stands.



Advance MaxP[®] Tall fescue and Torlesse lucerne pasture.

Ideally the grass should be drilled in alternate rows to lucerne, but has also been successful when mixed and sown with a roller-drill.

Chicory can also be mixed with lucerne, with the advantage of more consistent feed quality for grazing throughout the season, and utilisation of soil nitrogen. They are compatible in that they both have deep roots and good drought tolerance, similar seasonal growth, and some common pre-sowing and post-emergence herbicides. Chicory is not suited if hay is to be made, but is okay for silage.

Before planting a mixed lucerne pasture, you should decide on whether you want a lucerne stand with some grass, or a grass pasture with some lucerne as the legume companion. This will influence the sowing rates, and whether you graze to suit the grass or the lucerne.

Animal Concerns

Red gut is uncommon in New Zealand, but care should be taken when grazing lush spring growth. Ensure that animals are full when put onto the paddock, and that stock are monitored and have access to roughage (e.g. meadow hay).

Bloat is also possible on the high quality feed of lucerne, with cattle being more susceptible. Feed roughage and/or use anti-bloating agents, and introduce fully-fed animals gradually over several days.

Older stands of lucerne that have been attacked by leaf diseases, insects or viruses can have high levels of oestrogen, so care must be taken with ewes during mating. Healthy young stands are fine to graze with ewes.

Lucerne is low in sodium so salt blocks should be put out.

Mixing grasses with lucerne can reduce the risk of animal disorders and the need to introduce stock gradually, as well as boosting grazing capacity in winter and early-spring.