A Growers Guide to
LUCERNE

Quality Seed – direct from breeder to farmer
Lucerne is high in protein and fixes its own nitrogen

Lucerne can be undersown with spring barley

Sheep can graze lucerne at the end of the season but be very careful about bloat

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INTRODUCTION

Of all the forage crops available to livestock farmers in the UK there is no doubt that one of the most underrated and underutilised is LUCERNE (medicago sativa). Despite having a range of first class agronomic and nutritional attributes this perennial crop is confined to a relatively modest number of very enthusiastic farmers. In the past the lucerne crop was nearly always associated with light land and low rainfall but this stereotyping is now breaking down as farmers see the crop being grown on a much wider range of soil types than before.

Certainly, there is no reason why more dairy and other livestock farmers should not be exploiting the crops potential and experts suggest that well over 250,000 hectares of land in this country could easily be facilitating improved feed intakes, a reduction in the amount of bought-in feed along with the ability to reduce fertiliser costs on farm.

Although it is still a minor crop here, lucerne (also known as alfalfa in some countries), does attract interest from farmers whenever we experience drought conditions. This is because the crop has an extensive root system with a tap root capable of accessing water resources from deep into the soil profile – as much as 4 metres in fact. As a consequence fields of lucerne are often the only green areas to be seen whenever serious drought conditions prevail.

But the key factor with this crop is that it’s more than just a sowing option whenever drought is likely to be a threat.

For example, lucerne is seen as an ‘environmentally’ friendly crop due to its symbiosis with the nitrogen fixing Rhizobium bacteria which significantly reduces the crops dependence on purchased nitrogen.

The crop is also very flexible – it can be ensiled in a clamp, made into big bales and some farmers have had success by grazing dairy stock on the crop (although this specific option should not be approached lightly, due to the risk of bloat). It can be used in a total mixed ration, fed as a separate forage or zero grazed.

Once established, lucerne has the ability to produce 5 years of productive growth and some farmers have managed to keep their fields down for as many as 9 years! A well managed field can generate an annual dry matter yield of between 11-14 tonnes/ha.

Last but obviously not least, lucerne also has excellent feeding related qualities, it has excellent intake characteristics; high protein content; and a very good rating for all-important palatability. It also boasts good levels of calcium and phosphorus. Lucerne is frequently used in conjunction with maize in dairy systems because the protein in the lucerne complements the high energy in the maize crop.

In a Milk Development Council (MDC) funded trial it was found that ensiled lucerne demonstrated that it had the potential to reduce concentrate feed bills. By using lucerne the amount of soya fed in a mixed silage diet to mid-lactation cows was reduced – without having any significant effects on milk production. In fact for a typical 100 cow herd it worked out at a saving of 9 tonnes of soya over a 200 day winter!

Given all the comments above perhaps it is not surprising that lucerne is the most widely grown forage legume in the world. If the opportunity to grow such a financially attractive forage crop appeals to you then this new Technical Guide will help you to ensure that you realise all the benefits that have been outlined above.

Why Grow Lucerne?
- High protein forage
- Drought tolerant
- 4 cuts per year possible
- Lasts 5 years or even longer
- Clamp, big bale or hay
- The crop fixes its own nitrogen
- Can be dried and pelleted
Establishing a field of lucerne is a long term investment so it is important to ensure that all aspects of the establishment and subsequent husbandry are first class.

**SOWING DATE**

The lucerne crop is fairly flexible when it comes to sowing date. Ideally the seed should be sown in March/April or the operation can be left until August. Seedlings must be established well before any frosts appear. In every case the target must be to achieve a seedbed which promotes good contact between seed and soil – which, in turn, facilitates fast germination and an even emergence.

The actual date you decide on will to some extent hinge on the location of your farm. For example, if you are based in Midlands or further north it is best to go for the spring sowing option. This is because sowing later in the year could coincide with a period of cooler weather which might jeopardize establishment. Certainly, failing to enter the winter months with a field of strong plants is likely to result in excess winter kill. By sowing in the spring you might be able to achieve up to 2 cuts in the same year but the average is probably closer to a single cut.

If you are growing lucerne in southern England then it may be more convenient to aim for the summer sowing option. Remember that it is sensible to consider early/mid August as the latest safe sowing date. Also, be aware of possible slug damage at this time of the year – especially if the crop is following a winter cereal.

The key with lucerne is to select a well drained field

Subsoiling is vital if you suspect the presence of soil pans

To guard against the build-up of root eelworm it is critical to plan for a gap of 6-7 years between successive crops of lucerne on the farm.

Certainly, if you are planning to grow lucerne then make sure that the site will facilitate the provision of a fine and firm seedbed with no compaction issues. Sub-soiling is important if you do suspect that soil pans could be present because it will enable the crop’s roots to reach down to their natural depth.

**SOIL TYPE & SITE REQUIREMENTS**

The key with lucerne is to select a well-drained soil which has a minimum pH of 6.5 and if you are liming any fields then aim for a pH of 7.0. It is vitally important not to try and establish lucerne on a field which is acid or has a history of waterlogging. Poorly drained soils will encourage several root/stem diseases and these may inhibit establishment and seedling survival. A waterlogged soil discourages efficient root nodulation and therefore you will not benefit from the ‘free’ nitrogen which lucerne can deliver. So, if you plan to grow lucerne make sure that your water tables lie below the root zone.

It is worth noting that although lucerne is ideal for drought prone years, it will also thrive during wet seasons and on heavier fields providing the soil profile is correct. A well structured soil won’t crack right open in dry summers - which would tear the roots and pull the nodules apart.
Try and follow an early harvested cereal such as winter barley and aim to get the Lucerne drilled by mid-August if possible.

One of the key factors relating to sowing dates is the essential requirement to cut the crop at least once during the establishment year otherwise the crown will not form properly.

**SOWING RATE & DEPTH**

Lucerne is a small seeded species so it is very important to drill at a depth of 1-2cm. Avoid drilling any deeper as this could result in a very poor emergence.

A row width of 7.0-10cm is the standard recommendations. Avoid growing lucerne on wide rows as this approach allows weed ingress and also gives pigeons a perfect landing site in the winter months.

Although some farmers have broadcast lucerne seed this is not to be recommended as it compromises the inoculant on the seed and is too variable. Lucerne is in the ground for several years so it is obviously vital to make sure that you achieve a really good establishment.

The seed rate for lucerne varies between 20-30 kg/ha (depending on the method used and the time of year) to ensure an adequate final plant population. You should be looking for a population density of between 200-400 plants/sq m in the year following the initial sowing. Over time the population will reduce to an average of 75-150 plants per sq m but this fall usually has no effect on annual yields.

**UNDERSOWING LUCERNE**

To compensate for the relatively low yield which will be seen in the year of establishment many farmers prefer to undersow the Lucerne in a field of spring barley. If you plan to undersow in a spring barley then make sure the drilling rate for the cereal is reduced by 25-50% and select a lodging resistant variety. Remember that undersowing is nearly always a compromise and adverse competition from the cereal could impact on the establishment of the Lucerne. The spring barley should be cut at the milky ripe stage. The advantage of using the spring barley is that you will generate a very reasonable yield of forage in the first year of establishment.

The optimum approach is to drill the companion crop then oversow the lucerne with another pass with the drill or an Einbok/Opico type seeder.

**Crop Suitability**

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**Sowing Information**

- **Sowing Period**: April to late July
- **Direct Drill**: 20/30kg/ha (8-12kg/acre)
- **Oversow**
**SEED INOCULATION**

Lucerne is capable of fixing atmospheric nitrogen via the nodules on the plant roots. Seed inoculation with a suitable peat based Rhizobia product is essential to ensure the symbiotic relationship between the plant and the nitrogen fixing rhizobia (Rhizobium meliloti).

The inoculation process is a simple (and inexpensive) operation - the easiest method of application is to mix the inoculant with the seed in the drill hopper. Run your hands through the seed to ensure that you get a good coverage. Always ensure that the seed is drilled within six hours of the inoculant being applied to ensure the maximum effectiveness of the bacteria.

**FERTILISERS**

Obviously, a reliable soil analysis will be beneficial in helping to determine the rates required for this perennial crop. Generally speaking, as it is a legume, lucerne does not require any nitrogen at sowing time or thereafter due to its ability to ‘fix’ nitrogen from the atmosphere. However, if the crop is being sown after a nitrogen-hungry crop (e.g., cereals), or in a low fertility situation, then you can consider a modest application of nitrogen – 25-50 kg/ha maximum. If you plan to apply slurry to the field then this operation should deliver enough of this element in organic form.

Lucerne is like maize in that it is very receptive to FYM - however like maize it is just as susceptible to problems related to the overapplication of organic fertilisers.

It is important not to supply lucerne with excessive nitrogen otherwise the root nodulation will be inhibited and you will reduce the amount of atmospheric nitrogen which can be ‘fixed’ at no cost. The amount of ‘free’ nitrogen fixed by a healthy crop of Lucerne will vary from 120-200 kg/ha each year.

A well-established crop of lucerne which is delivering a high yield of forage will remove a significant amount of phosphate and potash each year. Account needs to be taken of this and a dressing of both elements needs to be made either after each cut or as a single application after the last cut of the season. Any fertiliser should be applied immediately after cutting otherwise the new leaf growth could be damaged (scorched).

Both phosphate and potash play key roles in the development of the lucerne crop. The former promotes good root growth and strong seedling development. The offtake of the potash is quite critical with the amount being removed accounting for around 10 units/tonne of fresh weight. A shortage of potash could have quite a significant effect on crop yields so it is essential to ensure that this element is available in sufficient quantities.
We recommend that you consult the DEFRA fertiliser manual (RB209), when you are planning your fertiliser programme.

Be aware that on light soils there may be a deficiency of magnesium, sulphur and molybdenum - these particular elements can be critical at the establishment phase. Better controls in relation to air pollution means that sulphur deficiencies have become more apparent. If you see a reddening of the stems along with a yellow tinge to the leaves then this may indicate a sulphur deficiency. Boron is a key element in cell division and other plant functions. Under drought conditions it can be the micronutrient that is most likely to limit yields. The amount of boron available will decrease as the soil pH exceeds neutral.

_A professional soil analysis will highlight these and any other deficiencies and is to be recommended if you plan to grow lucerne._

**LIMING**

Adequate lime will increase the availability and utilization of several nutrients – notably phosphorous, potassium and molybdenum. The optimum pH will create an environment conducive to the survival of the Rhizobia bacteria and will, therefore, aid root nodulation and the associated nitrogen fixation. Ideally, apply any lime around 6 months prior to establishing your crop.

_Liming is important - aim for a pH of 7.0_

**WEED CONTROL**

Weeds will compete with any forage crop for water, light and nutrients so it is essential to control them in order to protect your potential forage yield and crop quality. With lucerne it is especially vital to avoid weed infestations as the crop is not very competitive during its early growth stages. Many growers prefer to go for a stale seedbed approach to ensure that their fields are weed free.

If you decide to go for a summer (rather than a spring) sowing then the competition from any weeds is likely to be less. Providing the crop gets off to a good start any moderate weed infestations should be removed at the first cut stage and then smothered out by the subsequent re-growth of the crop.

Perennial weeds should be controlled well before the seed is sown. If you are planning to use a herbicide then seek advice from a suitably qualified specialist as the number of approved products is limited.

As lucerne is not a good competitor it goes without saying that in an ideal world you would not sow the crop straight after an old sward. The preference would be after cereals where any weeds which are present are likely to be annuals.

**WHICH VARIETY SHOULD I SOW?**

Individual varieties need to be selected on the basis of several characteristics including yield; persistence; disease resistance; and speed of recovery after cutting. Having monitored lucerne crops over many years we can make a number of recommendations in relation to individual varieties and mixtures. Please contact us for more information, and note that we have organic seed available.
COMPANION CROPS

Most crops in the UK are sown as a pure stand – although there are farmers who prefer to mix the lucerne with a companion grass.

We believe that it is best to sow without a companion grass because germination will be quicker and more uniform and, of course, there should be less stress from any other competing plants.

If you are adding grass to your lucerne then shallow drill or broadcast the former after the lucerne has been drilled. The addition of the grass companion is often taken up if the grower plans to graze the crop during the year. But you must still be very wary about the risk of bloating.

A note of caution – if you do sow a companion grass make sure that you are not tempted to apply excess nitrogen to feed the grass as this will result in a poor level of nitrogen fixation and extra competition towards the lucerne.

CROP ROTATION

It is essential to plan for a sensible rotation between crops of lucerne – 5 years is the optimum length of time. A healthy stand of lucerne which is well managed should have a productive life of up to 4 or even 5 years. The crop improves soil structure and is an excellent entry for winter wheat.

PESTS & DISEASES

It can be difficult to attempt to apply sprays to a crop which has established well. In addition, there are a limited number of chemicals which can be deployed in lucerne.

Weevils

This pest will often attack at the establishment phase and will target the young shoots. Certain pyrethroids may be used but seek professional advice from a qualified specialist to confirm what is safe to use.

Aphids

Aphids can attack the crop. Ask your AgChem Specialist about suitable products for control.

Slugs

Slugs represent a very real threat during establishment so the crop needs to be monitored. Slug pellets are an option. Use traps to estimate the level of the problem and then use pellets if the threat is deemed serious enough.

Eelworm

The eelworm (Ditylenchus dipsaci) is a potentially serious pest particularly on heavy soils. Some varieties have resistance. Seed which has been fumigated will remove the threat of introducing this pest into your soil. The symptoms are plant distortion followed by the appearance of patches of dead plants.

Verticillium wilt (Verticillium albo-atrum)

Varietal resistance is the only option with this soil borne disease. Symptoms include wilting, some stunted re-growth after cutting and necrosis of the leaflets. The symptoms generally appear following the initial cut and then get progressively worse over time. The fungus is spread by machinery and crop debris.

Phoma (Phoma medicaginis)

This fungal disease is a common problem in lucerne - especially on newer crops during their
first couple of seasons. The disease takes hold when the spores released from the infected crop debris are spread by rain splashes, the wind and insects. The early symptoms are small, dark brown/black spots on the leaves and stem which accounts for the alternative name of the disease - tarspot. As the disease develops the stem lesions will enlarge and join together - until most of the stem is blackened and some stems may well be killed. Cool, moist conditions favour the development of the disease which can then lead to a reduction in both yield and forage quality.

**Clover Rot (Sclerotinia trifoliorium)**

This fungal disease can kill lucerne seedlings. However once the crop is through its first season it should develop mature plant resistance to further attacks. A sensible rotation will generally control the disease.

**Summary**

There are a number of diseases which can attack lucerne. Growers can help alleviate any problems associated with these by maintaining the right soil pH, keeping up the levels of P and K in the soil and sound rotational practices.

**HARVEST**

The target with lucerne is to achieve four cuts a year and the plants need to bud only once each year and no more. There is around a three week ‘window’ in which to harvest the crop - so it can be timed easily to work with grass. There is significant depression in plant protein when the crop buds fully so taking it at the very early bud stage is important (and letting it bud fully for one cut when the crop has a faint tinge of purple).

In most seasons you can expect to take the first silage cut in late April/early May. The actual date will obviously be dependent of the location of the farm and to some extent the weather conditions. The cutting cycle is normally around 6-8 weeks with the crop being cut when the flower buds have set. If cutting is delayed the crop will be more fibrous and the feed value will be reduced. The protein content should be around 20/22% if the crop is cut prior to flowering – this will drop down to 17/18% if the flowers have emerged to a significant extent.

Most farmers will use the ‘bud’ stage to determine when to cut their crops. At the mid-bud stage the mature buds will have begun to open and individual flowers can be distinguished. However at this stage no flower colour is visible. The crop will reach the late bud stage when you will be able to discern a tinge of purple in the flower. At the next stage (first flower) you should be able to see an occasional open flower within the crop (around 8-10 per 100 stems). Certainly, for the maximum length of continuous field production and the highest quality the aim must be for a cutting date before first flower.

As a rule of thumb around 70% of your total annual yield from a field of lucerne will come from the first two cuts you take (35% from each cut). It is not advisable to take more than 4 cuts a year as the vigour of the crop will be reduced in the following year. It is important to maintain the gap between successive cuts to allow the crop to replenish its root reserves. The yield from the 3rd cut should represent about 20% while the last cut will be about 10% of the total annual yield.

Aim to leave an 8-10cm stubble when cutting the lucerne and then the swath can be wilted. Avoid excess drying as this will very quickly lead to leaf shattering.
The lucerne crop has a low level of water soluble carbohydrate and it has a high buffering capacity (containing around almost three times the amount of calcium than ryegrass) so precautions need to be taken if the crop is ensiled. A suitable additive designed for use on low sugar crops is essential so that a rapid fermentation is achieved – this reduces the proportion of the proteins that will be broken down to ammonia products and, as a result, encourage the level of the more desirable quality proteins.

Clamps need to be filled quickly with short chop material and good consolidation achieved. Make sure the clamp is well sealed. It is important to keep the silage face as tidy as possible.

The Ag-Bag option can also be a valuable tool if you are considering lucerne silage.

Nutritional losses are a particular problem if you plan to harvest your crop as hay. Lucerne leaves contain 70% of the protein and 90% of the vitamins and minerals compared to the stem. Clearly, the aim must be to cut the crop at the right moisture content and adopt harvesting techniques which enable the whole operation to be completed quickly.

If you turn the crop over in the swath then endeavour to do this early in the morning when the dew is still present on the leaves. A mower conditioner is a very useful machine if you are considering the hay/haylage route but such machines can and often do shatter the leaves - especially the more aggressive models. Many contractors now have mowers with no conditioners fitted at all so that they can handle the more tender crops like lucerne. The hay/haylage option is popular with the equine fraternity so it may be possible to grow lucerne as a cash crop.

Instead of ensiling the lucerne in a traditional clamp it is perfectly feasible to make big bale silage. If you wilt the crop until the material in the top half of the swath is dry and the material in the bottom half is greener and more moist you should achieve an excellent compromise for baling. If you are using a mower conditioner then you can reduce the revs down to prevent the shattering of the leaf material. As the stems are prone to piercing the bale wrap it is important to allow a minimum of 4 layers of plastic. Baled Lucerne silage is not so likely to pose a significant pollution risk because the pressure associated with a stack of bales is much less than the risk presented by a large clamp. As the bales will be fed out periodically any effluent that is released will be limited to a relatively small amount. Also, big baling generally results in a lot less wastage than a crop fed from the clamp.

As mentioned earlier, some farmers do graze their crops but there is a very real risk of bloat if you take this route.

However, in the autumn a light grazing by sheep is less likely to generate any problems, especially if the crop has reached the dormant stage. It is worth mentioning that there is less cell wall fibre in legumes, like lucerne, so lambs will eat more of this crop than grass at similar D-values.
Zero grazing is yet another option if it suits your farming system.

Of course one should also mention the specialised lucerne drying industry which is built around the supply of high protein meal or pellets for feeding cattle, sheep and young stock.

One final point - it is a good idea to let your lucerne crop flower in its establishment year.

**END OF SEASON MANAGEMENT**

The Lucerne crop needs to enter the winter period with good levels of carbohydrates in the root system. If you cut too late in the autumn then you risk the crop going into a cold period with low food reserves. You can spray out weeds during the winter dormancy growth stage.

**FEEDING THE CROP**

Lucerne fits in very well on farms where forage maize is already being grown. Generally speaking the performance of dairy animals offered maize and lucerne silage will be similar to those offered maize and grass silage.

The crop has a high protein content and is a good source of long fibre to stimulate rumination. It is worth noting that Lucerne fibre is also digested more rapidly in the rumen than grass silage so the intake level can be very impressive indeed. The silage is high in calcium and vitamin A.

In an MDC funded trial it was found that ensiled lucerne demonstrated that it had the potential to reduce concentrate feed bills. By using lucerne the amount of soya fed in a mixed silage diet to mid-lactation cows was reduced – without having any significant effects on milk production. In fact for a typical 100 cow herd it worked out at a saving of 9 tonnes of soya over a 200 day winter!

Milking cows respond well to having lucerne as part of their forage diet and the best results will be obtained when a suitable complementary crop is included as part of the feeding regime - maize for example. Grass also goes well with lucerne.

Lucerne is also suitable for beef animals - again it makes an excellent complementary silage to maize.
**SUBSEQUENT CROPPING**

The lucerne crop will leave a rich legacy of nitrogen in the soil – a ‘bonus’ which can mean a reduction of up to 70% of your nitrogen requirement for a following wheat or other arable crop. The average amount of nitrogen left will be in the order of 75-100 kg/ha.

Lucerne growers benefit from ‘free’ nitrogen which is ‘fixed’ by the crop.

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**SUMMARY**

**Why Grow the crop?**

- High protein level ✓
- Plant fixes atmospheric nitrogen ✓
- Excellent drought tolerance ✓
- Highly digestible ✓
- Up to 4 years of continuous production ✓
- Valuable mineral and vitamin content ✓
- Good soil conditioner ✓

**Target DM Yields/ha over 4 years**

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**Typical Yields and Field Value**

- Average dry matter yield: 11-14 tonnes/ha/year
- Dry matter: 30-40%
- Digestibility value: 65-70 D
- Metabolisable energy: 10 MJ/kg DM
- Starch: 6.5%
- Crude protein: 18-22%
Contact your local Seed Specialist:

Kevin Tregunna

Farm Equip - Truro - Cornwall

Tel: 07881 804442

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