Cotswold Seeds Ltd
The Cotswold Business Village
Moreton in Marsh,
Gloucestershire GL56 0JQ

Lucerne - A Practical Guide



Studies have shown that the inclusion of Lucerne silage in dairy cow diets can improve forage intake, and increase output of milk protein, with no change in milk fat. The benefits together with lower forage production costs when compared with grass silage should help to improve margin/litre of milk produced.

Yet in spite of all of these important attributes, ruminant livestock producers have been reluctant to grow lucerne silage and the area in the UK is at present small. The reasons are that in general forage legumes are perceived as crops that are currently difficult to grow and hard to conserve. This situation is changing with the availability of suitable, disease-resistant varieties, the arrival of new equipment designed specifically for rapid wilting and access to big balers, the use of appropriate additives for effective fermentation and the production of advisory leaflets such as this one from Cotswold Seeds.

All these factors have helped to renew interest in forage legumes and will increase the knowledge and experience of a crop with a future.

Lucerne - A Premier Forage Legume for home grown PROTEIN
Lucerne or alfalfa (Medicago sativa) is a legume that has been cultivated for around 2,000 years. It grows best in areas of high sunshine. There are one million hectares in France and about 12 million hectares in the USA. There is therefore a wealth of research information available on the crop.

Lucerne is tolerant of the winter temperatures experienced in England and Wales and has been grown successfully in all the arable cropping regions, but only on the right type of soils. It is a deep rooting crop which can sustain dry matter production at times of low rainfall. We must expect rising temperatures due to climate change and drought conditions are likely in the future.

So why grow Lucerne?
There are five main reasons for growing lucerne:

1. Regularity of yield - this is lucerne's trump card. In a dry summer it will do better than either ryegrasses or forage maize.
2. It gives a very high DM yield comparable to that of Italian ryegrass but will persist for four years.
3. It is a high protein crop. According to growth stage the protein content ranges from 15% - 20%.
4. It is an excellent cutting crop and is complementary to forage maize.
5. It is rich in vitamins and minerals, and if cut at the right stage is low in fibre and high in energy.

Utilisation
In the UK lucerne is best made into silage for milk production. It can also be fed green to cattle when other fodder is not available. For hay making it is excellent, given suitable weather conditions. The hay is very popular for horses, and indeed it is often imported from America for this purpose on account of the high quality of the product. Lucerne hay can also be fed to beef or dairy cattle with spectacular results.

A further specialist use is for drying when it is made into high protein meal or pellets. Dried lucerne

pellets have a high carotene content, are high in energy and with a protein of up to 20% are a valuable feed for cattle, sheep and young stock. Further benefits from growing lucerne derive from its remarkable tap root system. The roots are known to penetrate to a depth of three metres thus enabling the plant to draw moisture and minerals from a considerable depth. The breakdown of these roots contributes to the fertility of the soil by increasing the humus content, assisting in drainage, and also contributing residual nitrogen. Thus there is a benefit to the following crop. Nitrate leaching is also reduced as the plants take up a large amount of water during growth thus reducing run-off. (ref INRA)

Establishing Lucerne
The crop requires careful management, but if the guidelines are followed there is nothing difficult about it.

Field Choice
The choice of field is important. For root nodulation to take place, the pH must be in the region 6.2 - 7.8 and to a reasonable depth (a minimum pH of 6.0 to a depth of 1.5 metres is suggested). Also the field must never become waterlogged as this will kill off the lucerne. The range of suitable soil types is considerable - from clay loam to a light chalk or limestone and it is on the latter that lucerne has been usually grown. Heavier soils should not be ruled out provided that they are deep and permeable with an adequate supply of moisture during the growing season. The crop is very sensitive to poor drainage and compacted soil conditions that restrict root growth, nor will it tolerate acid soils.

Sowing Time
It is advisable to sow either in spring or summer, when the soil has warmed up. Late autumn sowing is risky as the seedlings (being slow growing at first) do not have time to develop before the onset of winter. For summer sowings it is recommended to sow after an early harvested cereal such as winter barley. The end of July or beginning of August are the latest dates for sowing provided there is sufficient moisture available.

Under-sowing Spring Cereals
This has been a satisfactory method in the past and is still popular. Priority has to be given to the lucerne with the cereal removed as soon as possible. If the cereal, usually spring barley, is cut as silage at the milky stage this provides a conservation crop in a year of establishment. A low seed rate of about 50% of normal is advised for the cover crop. Drilling without a cover crop into a 'stale' seed bed, well-prepared to a fine tilth, is satisfactory but it is usually necessary to spray out weeds which may become very competitive while the crop is becoming established.

Direct Sowing
There is cost in terms of loss of production in the first year, when only two cuts will be obtained yielding 20 to 40% of normal, but this is a sure way of establishing a successful ley. It also enables a dressing of farmyard manure or slurry before sowing to reduce the need for seedbed fertilizer, and a ”false” seedbed can be used to reduce herbicide requirements. It should be remembered that a pure stand of lucerne can be kept down for many years.

Protection of the crop

- During Establishment: Seedlings emerge within 1 - 2 weeks of sowing. Weeks grow quickly and should be sprayed with 2.4-DB as soon as the Lucerne seedlings reach the stage of having three trifoliate leaves, this will normally be about 4 - 6 weeks after the sowing date depending on the weather. Slugs can also be a problem. Traps can be set to find out the number present or otherwise some slug pellets can be put down as prevention.
- Established Lucerne: A pure stand of Lucerne can be treated with a herbicide such as Carbetamix each winter during the dormant stage of the crop. This will eliminate grass weeds and keep the crop productive.

Mixtures of Grass & Lucerne
There are several advantages in growing a mixture, but it is necessary to obtain the right balance

between the species. The total yield is likely to be higher with a mixture. If silage is the objective, as it is for most growers, the grasses present will make it is easier to obtain a good fermentation as they will supply the necessary soluble sugars. The first cut will also be bigger when grasses are present as they start growing in advance of the Lucerne. On organic farms, the advantage of a mixture with grasses is that the extra competition will discourage weeds. If on the other hand the objective is hay then it is better to grow a pure stand. This will enable the field to be kept free of grass weeds by using chemical weed control.

Which are the best grasses?
In the UK we have favoured meadow fescue and timothy as companions. These are non-competitive grasses. A low seed rate of 3 kgs per acre for meadow fescue or 1 kg per acre for timothy is used. The grass seeds should either be shallow drilled or broadcast after the lucerne has been drilled. Cocksfoot can also be used for its drought resistance.
Trials in France over three years using late cocksfoot have shown that such a mixture can be used for grazing by sheep.

Bloat
The risk of bloat when cattle are grazed is however very real and we are therefore not able to recommend grazing Lucerne other than at the very end of the growing season. The methods of controlling the bloat have often been troublesome, expensive and only partly effective.

The Seed
The seed of lucerne is a small - about l/l0th the size of wheat grain. Use a seed rate of 8 kgs per acre to avoid risk of poor establishment. The seed must be treated with a culture just before sowing. The culture consists of a live inoculum of Rhizobia meliloti. This is essential to promote effective nodulation on the roots. It is easy to do, inexpensive and should always be used. The depth of sowing for the Lucerne should be 1 - 2 cm and the seedbed must be fine enough to allow good contact between the seed and the soil. If a companion grass is to be sown then this should be cross drilled or broadcast. It is not recommended to sow the seeds mixed.

Varietal Choice
There is a huge selection of varieties to choose from. Much of the plant breeding has concentrated on the US and southern European markets. It is however essential to grow a suitable variety for UK conditions, this means one that is winter hardy and resistant to disease, particularly Wilt.

Fertiliser

- Establishment: When sown under a cover crop use the normal fertiliser programme for the cereal unless P and K levels are low, but do not apply too much N to minimise the risk of lodging. For lucerne sown as a pure stand no nitrogen is necessary unless following a succession of cereal crops when 25 kg N per hectare should be used. P and K requirements are high and rates of application should relate to the soil analysis (see table below).

Potassium Index K_2O

	0	1	2	3
At establishment	120	80	50	Nil
For first cut	150	120	90	30
Each subsequent cut	120	90	60	30

Phosphate Index P_2O_5

	0	1	2	3
At establishment	120	80	50	Nil

For first cut	150	120	90	30
Each subsequent cut	120	90	60	30

Production:
A well established Lucerne crop will not require further nitrogen. The phosphorous and potassium requirements are higher than those for grass and need to be met in order to maintain yields. Soil should be analysed every three years to assess the correct amounts needed. It should be noted that one tonne of Lucerne dry matter removes 29 kg/ha potash and seven kg/ha phosphate.

Management of the Growing Crop
In the establishment year, avoid severe defoliation at all times. Cut spring sown crops in mid-August to allow adequate recovery before winter. Leave summer sowings unmown till November when mowing should be timed to be just before winter die-back. Undersown crops should be left to grow into the winter. Crops with a companion grass may be grazed lightly with sheep in the winter.

Recommended rate of Nutrients (kg/ha) for establishment and production per cut:
Established lucerne can be weakened by too frequent defoliation. The crop should be allowed to reach a good bulk before cutting. Harvesting at the first flower bud stage gives the best compromise in terms of yield and quality. The quality falls rapidly as the flowers open. First cut will usually be about mid May and this gives time for three subsequent cuts during the season.
Autumn management is important for plant persistence. The plants must be allowed to build up their root reserves, and this means that the last cut must take place six weeks before the estimated end of the growing period (end of October). After this the crop can be either cut or grazed, but the feeding value may be low. It may be preferable to let it die back during the winter.

Lucerne Silage
The principles of making lucerne silage are the same as those for other crops such as grass or maize. However lucerne is high in protein and low in soluble carbohydrates which are needed to enable anaerobic bacteria to produce lactic, acetic and propionic acids which preserve the forage as silage, these acids reduce the pH and inhibit further bacterial and enzyme action. The process takes about six weeks.

The most critical time is during the first few hours of storage. Long exposure to air may result in the disappearance of much of the available carbohydrate and results in deterioration of the plant material. Undesirable bacteria (Clostridium) can grow under high pH and result in a butyric acid fermentation which makes the forage very unpalatable. Badly fermented lucerne silage is a total disaster and it is therefore essential to use an approved additive as well as allowing the crop to wilt. Care should be taken when handling the wilted material to avoid loss of leaf.

Moisture content
This should be less than 65% for successful silage making. An evaluation can be made by squeezing or ringing out the moisture in a handful of the forage. There should be no free juice apparent.

Additives
There are many products on the market - seek advice from your supplier. A typical analysis of well-fermented lucerne silage is dry matter 280g per kg, crude protein 200g per kg, D value 60 and ME 9.7 MJ. Round bales are commonly used as a method of conservation. The wrapping needs to be thick enough to prevent the stems of the lucerne puncturing the plastic. Bales are more adaptable than clamp silage and have significantly improved the potential for lucerne.

Spray Materials for Lucerne

Dicotyledon weeds: 2,4 - DB (Headland Spruce), Propyzamide (Kerb Flo).

Annual grasses: Propyzamide (Kerb Flo). Blackgrass, AMG, Brome, Volunteer cereals

Please check with your supplier for detailed recommendations as these are continually changing.

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