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LUCERNE GROWING IN WESTERN AUSTRALIA

By H. G. ELLIOTT, Assistant Superintendent of Dairying

LUCERNE is one of the oldest of the cultivated forage plants, and is one of the most important agricultural crops known to man. Although it gives best results where ample water is available, it flourishes under semi-arid conditions and will grow well almost wherever cereals can be profitably produced. Besides being one of the hardiest of the known agricultural crops for hot dry conditions, it is one of the most palatable and nutritious foods for livestock including all farm animals and birds, as they can maintain themselves and thrive on it.

The crop has been cultivated for centuries in the semi-arid portions of Asia, as well as in parts of Europe, and in all places it produces an abundance of fodder of the highest quality, improves poor soils and assists in eradicating weeds. This plant can be successfully grown on a variety of soils, which range from loose sand to relatively heavy clay loams.

DESCRIPTION OF PLANT

Lucerne (Medicago sativa) is a perennial plant belonging to the family of Leguminosae, of which it is probably the best known and most valuable member. The plant is either covered more or less with soft hairs, or is smooth. It grows from 1ft. to 3ft. in height, producing fairly upright stems, with many branches and much foliage. The stem originates from the crown at the summit of the tap-root, which is situated above or at the surface of the ground. The leaves, which are arranged alternately on the stems, consist of three leaflets, which in all types are wedge-shaped, but vary considerably, some being relatively long and narrow whilst in other varieties they are short and rounded. All leaflets are toothed at the summit.

The flowers, which in different varieties may be any shade of violet, from very pale to deep reddish purple, are small and typically pea-like in shape, and are arranged in loose clusters at the summit of

* Revised from Leaflet No. 634.
each branch. There are from two to six kidney-shaped seeds of a yellowish green colour in each pod, and they are about \( \frac{1}{2} \) of an inch in length, the pods being spirally twisted in two to four loose coils, open through the centre.

Lucerne is a deep-rooting, remarkably long lived and prolific perennial. Under the best conditions it may be cut many times a year, and year after year. It has been stated that there are lucerne fields in Mexico over 200 years old, and there are in France fields which are known to have been in production for over a century. There is no reason to believe that it will not be equally long-lived in Australia, if established on suitable soils, efficiently manured and given reasonable attention.

The tap-roots of the lucerne plants penetrate readily to 10ft. to 20ft., and have been traced to much greater depths. Lucerne roots have been found 30ft. below the surface of the alluvial flats of the Hunter River. Coburn records a case where the roots were found penetrating through crevices in the roof of a tunnel 129ft. below the surface of the lucerne field. This extraordinary growth of the roots of a plant which normally does not exceed 3ft. to 4ft. in height, shows that there are often differences between the habits of lucerne and other cultivated plants, and this points to the advisability of giving careful consideration to the soil conditions before attempting lucerne cultivation. It will go down to food and water if it can, and it is the farmer's business to see that it can.

It can be stated that the lucerne is one of the hardiest of the cultivated crops. Where dry and hot conditions prevail it will produce more growth than any other known perennial plant. Except at the time of seed germination, lucerne does not require much moisture near the surface, and flourishes with sunshine in hot summer temperatures. For most prolific growths, lucerne requires a well-drained deep soil, which is not acid and contains plenty of moisture, either supplied from underground, or supplemented by irrigation, ample phosphatic fertilisers, and thorough cultivation during the life of the crop.

**CLIMATE**

Lucerne loves heat and makes its maximum growth in the spring and summer. It is at its best with plentiful supplies of water in combination with heat. Under such conditions, which in this State usually involve irrigation, it is remarkably prolific, successive cuttings of luxuriant forage being obtained at intervals of five to six weeks with an aggregate yield per acre of 20 to 25 tons of green fodder, or if made into hay of six to eight tons. Owing to its deep rooting system, it is well able also to withstand extremes of temperatures. It is well adapted to withstand summer drought, and when sufficient water is available and good management is practised, lucerne gives its maximum return.

**SOIL**

Except under adverse conditions, lucerne is not particular as to soil. With suitable treatment it will grow on almost all classes from nearly pure clay to light, sandy soils. At one time it was thought that it would only grow on rich, deep, alluvial types, but experience has shown that there is hardly any kind of soil on which it will not grow providing it is not acid or waterlogged. The most favourable one is a rich, somewhat sandy loam, warm and friable.

Good drainage is the essential requirement of the lucerne plant, and waterlogged soils are useless for the crop. In naturally wet land, or land made so by the incorrect use of irrigation water, lucerne is very apt to take on a sickly yellow appearance. Under these conditions, weeds will become a severe competitor with the lucerne crop. It is well to remember that lucerne will not stand wet feet. Consequently, if the soil is not naturally drained to a depth of several feet, action must be taken to bring about this condition before lucerne is planted.

**PREPARATION OF SEED BED**

Lucerne likes a compact, well prepared seed-bed with just a little loose soil on the top. Although lucerne, when established, is one of the hardiest of plants, yet when young it is delicate, and requires favourable conditions for its support.
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In some of our drier areas it has been found that a cloddy surface seed-bed is advantageous when establishing young lucerne plants, more particularly where spring planting is adopted. Except in rare instances, the ploughing should not be done later than at least six weeks before the seed is to be sown, for if ploughed later than this, it is difficult to get the seed-bed into that compact condition which is so essential for the best results in the establishment of this crop. The planting of the seed in a loose seed-bed is a frequent source of failure with a lucerne crop.

It is also desirable to have the seed-bed very free from weeds and weed seeds, as these are a big problem in the establishment, for they will often kill or smother young lucerne seedlings, owing to the slow initial growth of the latter. This condition is the most frequent cause of failure of young lucerne stands. Where autumn planting is carried out, it is necessary that the land be properly bare fallowed, firstly to assist in controlling weeds, and secondly to assist in controlling such pests as lucerne flea and red mite. To do this it is essential that no weeds of any kind be permitted to grow.

TIME OF PLANTING

Lucerne can be seeded either in the autumn or in the spring, but the time of sowing will vary with a number of conditions. In warm areas and particularly the dry districts of Western Australia, autumn sowing, i.e. March or April, is likely to give the best results, provided the weeds and insect pests can be controlled. Rain usually falls then and the ground is warm to ensure good germination of the seed and a vigorous growth of the plants. During the winter, plants have opportunities to make good root growth, so that they become strong enough to stand the hot weather of summer. On the other hand, in cool districts with a liberal rainfall, or where weed growth, red mite and lucerne flea are troublesome, spring sowing is advisable. Where spring planting is practised, the ground should be fallowed in the autumn or winter to assist in combating pests and weeds. If the areas are to be irrigated, the seed can be sown whenever convenient to the farmer. Generally the best results would be obtained from autumn planting.

SEED

It is well known that a good seed-bed is essential for success, but the time and trouble expended on the preparation of it may be wasted by the use of poor seed, as good stands cannot be expected from such. Only seeds that are plump, bright yellow in colour, free from hard dark brown, shrivelled or immature seeds, and free from weeds should be used. Old seed is usually dull and dark in colour, as the brightness soon fades with age. Immature seed, is generally green instead of bright yellow in colour, even when not shrivelled. Germination tests of the seed prior to sowing are advisable, but still may not give a true index when sown into the soil.
VARIETIES

There are several kinds of lucerne. These are, however, types rather than varieties, and are mainly of localised character and usually distinguished by the name of the country in which they have been grown, e.g. Peruvian, Turkestan, Arabian, African, etc. Many of these have been tried in Australia and the results obtained are to the effect that none is as suitable for, or as prolific under Australian conditions, as the Australian type, which has been evolved as the result of the survival of the fittest.

Good seed of the right kind is essential, and therefore the grower should see that he obtains it by using Australian-grown seed. Realising the superiority of seed produced in the Commonwealth, the Federal Government insists that all imported seed shall be stained pink, so as to make it readily distinguishable from the local seed, which in colour ranges from green to purple. Seedsmen are required to guarantee the germination and the maximum percentage of weed seeds and impurities in the sample offered. A good sample should have a germination of about 80 per cent., and should not contain more than one per cent. by weight of weed seeds and of impurities. The sale of lucerne containing dodder and other noxious weed seeds is absolutely prohibited.

RATE OF SEEDING

The quantity of seed to sow per acre depends on the quality of the seed, the method of sowing, the nature of the soil, the firmness of the seed-bed, the district in which it is planted, and the purpose for which the crop is intended. Consequently, no general recommendation can be made. For hay-making purposes, the quantity sown by farmers ranges from 6 to 25 lb. per acre. If, however, it is intended that the crop shall be grazed, the quantity sown is much less and ranges from to 2 to 8 lb. per acre.

Generally speaking, in the South-West, if the seed is to be sown in drills, 6 to 8 lb. per acre will be found satisfactory, but if broadcasted, 10 to 12 lb. would be required for good results. Under irrigated conditions, 15 to 25 lb. of seed per acre is recommended. In the wheatbelt a rate of 2 to 6 lb. per acre should be used when sown in drills. All the rates of seeding mentioned for different conditions depend upon obtaining good seed and having good soil conditions before sowing, otherwise the rate of seeding per acre must be increased.

METHOD OF SOWING

Except on loose, drifting sands lucerne need not be sown with a nurse crop. There is a general agreement among experienced lucerne growers that if lucerne succeeds with a nurse crop it is in spite of the additional drain upon the soil moisture instead of by reason of it. This is particularly applicable to dry climates, for when there is only a limited supply of moisture available, all this will be required to germinate the seed and give the young plant a vigorous start in life.

The seed is usually broadcast and should be sown near the surface. The seed may be broadcast either by hand, by a hand broadcasting machine of the “Cahoon” or similar type, or through the grass seeding attachment of the ordinary grain and fertiliser drill. An even distribution of seed is desirable; it is not easy to obtain this by broadcasting with such small quantities of small seed. The seed can be sown down the seed box of the grain and fertiliser drill if mixed with some bulky material like bran. It is sometimes mixed with superphosphate and sown through the fertiliser box, but this method is not recommended on account of the probable destructive action of the fertiliser on the vitality of the seed.

When sowing the seed through the “shoes” of the grain drill there is some risk that the seed may be planted too deeply, but provided the risk is known it can be guarded against and avoided. When sown down the tubes of the grain drill the seed can be deposited on the surface by removing the tubes from the “shoes” and at the same time a broadcasting effect can be obtained by arranging for the seed to be dropped on to a sloping board fixed with an inclination of about 30 degrees to the ground.

The seed is sometimes sown in drills which are far enough apart to admit of intertillage. This method is believed to be
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the best for dry districts, and particularly for places where weeds are troublesome and for small patches.

**INOCULATIONS**

This is most essential for successful lucerne growing and it is recommended that, prior to sowing, the seed should be inoculated with the correct strain of nitrogen-fixing bacterial culture. These cultures can be obtained in a dry powder form from recognised seed merchants. Full instructions on how to use these cultures are given on the container.

**MANURING**

Lucerne is a heavy feeder. Under suitable conditions 20 tons of green crop may reasonably be expected in a season, and this would contain about 340 lb. of nitrogen, 60 lb. phosphoric acid, and 250 lb. potash. Fortunately, except during the period immediately following germination, this plant is not usually dependent upon the soil for its nitrogen supply. Being a legume it can, when suitable bacteria are present, obtain all its requirements in this connection from the inexhaustible supply contained in the air. But the phosphoric acid and potash must be obtained from that already in the soil or from fertilisers applied to the soil.

On fertile loams it may be assumed that the soil will contain sufficient nitrogen to meet the requirements of the young lucerne plant, and supply its needs until the necessary bacteria are sufficiently plentiful to enable it to secure all it needs in this connection from the air. Because the young plant requires to obtain its early nitrogen requirements from the soil, a small application of nitrogenous manure—sulphate of ammonia, blood, or nitrate of soda—is, however, recommended for sandy soils or others deficient in nitrogen-forming material. Guided by experience in the Eastern States, it is unlikely that, except in sandy soils, potash manuring will be necessary in the early stages, but it is equally likely that manuring with phosphoric acid will be followed by marked beneficial results. An application of from 2 to 3 cwt. of superphosphate per acre is recommended on all soils, even the best.

On loams poor in organic matter it will be advisable to supplement the superphosphate with an application of sulphate of ammonia up to 100 lb. per acre, so as to meet the nitrogen requirements of the plant until it is sufficiently established to obtain what it needs from the air. On such soils the fertiliser recommended is therefore:—Superphosphate 3 cwt. per acre; sulphate of ammonia 1 cwt. per acre. The fertiliser recommended per acre for sandy soils or those deficient in plant food is a complete one consisting of, say, sulphate of ammonia 100 lb.; superphosphate 400 lb.; muriate or sulphate of potash 400 lb.

Except in unusually rich soils it will be necessary to fertilise the crop annually. Subsequent applications of fertilisers should be governed largely by the returns aimed at or secured. It the soil is not rich enough for its latent fertility to be drawn upon, or if it is desired to replace the plant food removed by the crop, then an application of superphosphate 14 lb., sulphate or muriate of potash 25 lb., is recommended for every ton of green lucerne removed.

**LIME**

On sour and sandy soils a dressing of air-slaked lime or ground limestone at the rate of 20 cwt. per acre is recommended as a preliminary dressing to be applied at least one month before the seed is sown. This will have the effect of correcting acidity and stimulating bacterial activity.

**TREATMENT AFTER SOWING**

Even in the best prepared soil, weeds are likely to spring up, for most soils, and particularly old and fertile ones, contain dormant weed seeds, and these germinate with the lucerne seeds and become a menace to its success. It is not possible to cultivate the ground to destroy the weeds which may grow amongst the recently-planted lucerne, for in its young state it is so delicate and with so little roothold that even a harrowing is likely to pull out or damage a considerable number of plants. Lucerne planted in the autumn will rarely be strong enough to be cultivated before the following spring, or...
Fig. 3.—Typical plant of Australian lucerne showing erect growth, vigorous rooting system, and freedom from excessive branching.
that sown in spring before the following autumn. Short of hand pulling, which is only possible on small areas, the most practical method of controlling weeds in young lucerne is to mow or graze them. If this latter plan is followed the grazing should be done with small stock and as quickly as possible.

The mowing can be commenced when the lucerne plants are four or five inches high, and repeated after a short interval, say, a month. This mowing, though detrimental to weed growth, will not injure the lucerne, but rather will stimulate it. Usually the material from the first mowing will not be worth gathering, and it can therefore be left, with advantage, to mulch the ground. As the object of this mowing is to destroy the weeds it should be undertaken whenever they are plentiful enough to warrant it, irrespective of the condition of the lucerne plants and the necessity for utilising the crop. It is emphasised that mowing does not injure but stimulates lucerne.

When the young plants have a firm root hold, and this can be determined by pulling at them, cultivation of the soil can take place with advantage. Its effect will be to stimulate the crop by letting air into the soil for the benefit of the nitrogen-fixing bacteria, and by conserving the soil mixture. For the first cultivation a light harrow is probably the best implement to use, but, as the lucerne gets older, much stronger implements, such as the spring-tooth cultivator or disc harrow can be used. One of the best implements for the purpose on established lucerne—over two years old—is the disc harrow. To one not accustomed to its use it may be thought that it will destroy the lucerne as well as cultivate the soil. This, however, is not so. The discs should not be given too much angle, and they will then split the lucerne crowns and cause them to throw up additional stems.

When the soil of an established lucerne bed becomes hard it can be disced and cross-disced to loosen it up with most beneficial results. There need be no fear that surface cultivation will kill the plants, as they are too deeply rooted to be injured, and the splitting of the crowns is beneficial. Discing and cross-discing is extremely useful should the paddock unfortunately become infested with couch grass.

**HAYMAKING**

Lucerne is much more difficult to make into hay than the cereals. This is because of the very sappy character of the stems, which do not dry as readily as the leaves. These latter are the most nutritious part of the plant, and if they become very dry are likely to fall off the stem during the operations of haymaking. The methods to be adopted should therefore aim to keep the leaves limp as long as possible, as whilst in this condition they will be drawing sap away from the stems very effectively. In practice the hay is made as far as possible in the windrows or in heaps or “cocks.”

Lucerne may be cut at any time for green feed, and it may be accepted as an axiom that it is better at all times to cut early than late. Some farmers commence to cut the crop for hay shortly after the first flowers have appeared, others when the lower leaves begin to change colour. After flowering the food constituents are...
transferred to the upper portions of the plant, the stems harden and become less digestible than when younger; further, some of the leaves wither and drop off and this results in loss of weight. Deferred cutting leads to poorer growth in the succeeding crop and may also result in a lessened number of cuttings during the season because of the greater time which the respective cuttings occupy the land.

Lucerne is usually mown and it should be cut as close to the ground as is possible without injury to the blade, so as to get the maximum amount of material and to force the new growth from the crown instead of from the joints of the old stems. The usual practice is to start when fine, bright weather is expected and as early in the morning as is possible, but not until any dew which may have been deposited has evaporated. It is not desirable that the cut material be allowed to remain in the swath too long, especially if the weather is hot, for extreme heat causes rapid drying of the leaves, and these are likely to fall off during the subsequent operations. If it is allowed to remain just long enough to wilt during bright, fine, warm weather, this will take only a few hours, whereas with cool moist conditions it may take as many days.

After being wilted the material should be raked at once into windrows. If the day is a bright sunny one and the mower has been started in the morning, the rake can be started at midday, and should catch the mower before night. The next morning the material in the windrows can be placed into heaps or “cocks,” and if the weather remains favourable it is probable that the lucerne will be fit to stack the following morning.

Sometimes during hot weather the curing is completed entirely in the windrows, which should be made loose so as to admit the air freely, but in cool, damp weather it will be advisable to place the material in “cocks” and allow the curing to finish in them. When dry enough or “cured,” the hay is ready to be carted for stacking or baling. This is determined by an examination of the stalks, which need not be dry and brittle, but tough, though without any sap being noticeable when the stems are twisted tightly.

Just before carting the “cocks” are sometimes turned over to expose the bottom hay for an hour or so to the sun, so as to dry off any hay that may be slightly damp owing to its proximity to the ground. Sometimes in very hot weather the hay becomes too brittle as the day advances, and there is a danger of losing the leaves, and the carting has to be confined to the mornings.

GRAZING

It is generally recognised that considerable damage can be done to a lucerne stand by indiscriminate grazing, consequently every care must be taken to obtain best results without injury to the plant, to see that the crop is well established before grazing, and that the area is not overgrazed. The best height for grazing is about 1ft. and grazing should be controlled so that it is carried out rapidly.

Care should be taken when grazing stock on lucerne that they are not let in when it is wet, either by rain or dew, or when they are very hungry. Hoven, or bloat, is likely to be caused by feeding this succulent feed to hungry stock. The
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danger is greatly increased when the plants are wet. When cattle are being introduced to this crop after a spell away from it, it is advisable to ensure that they are well fed first so that they will not be able to consume great quantities, or, if this is not possible, to turn them in for 30 minutes and take them off, letting them on again for a similar period a few hours later. They soon become accustomed to the crop, and will be able to remain in the crop without danger. However, it must be said that grazing, whatever its advantages, materially lessens the life of a stand.

**SUMMARY**

(1) Lucerne has been grown for many centuries and consequently is well known in most of the agricultural countries of the world. As far as can be ascertained it was introduced into Australia just after the first settlement by white men and since that time has made considerable progress.

(2) Lucerne flourishes in semi-arid climates, but for maximum growth requires abundant water during the summer months. Consequently, it grows best where supplemented with irrigation.

(3) Of the many varieties of lucerne, the most important in Western Australia is Australian Hunter River.

(4) For best results only high quality seed should be used.

(5) Lucerne has many peculiarities and troubles, being somewhat delicate when young, and of all crops is the most sensitive to competition from other plants, consequently the secret of success is to keep down weeds during the first year.

(6) Lucerne will not tolerate soils which become water-logged.

(7) This plant does not need, as many assert, abundance of lime in the soil, but freedom from acid is essential. Soils that are deficient in lime, however, should receive applications of agricultural lime prior to the planting of the lucerne.

(8) Inoculation of the seed with the necessary nitrogen-fixing bacteria prior to planting is essential.

(9) The ideal seedbed for lucerne should be firm, but with a fine tilth to a depth of 1½ inches.

(10) The best fertilisers are superphosphate and potash, the rates of application per acre varying according to districts.

(11) The land must be weed-free, for these are difficult to eliminate once the crop is sown.

(12) The best method of seeding is by drilling the seed into the land, but the seed should not be sown to greater depth than ½ inch.

(13) The best time to sow in this State is in the autumn or spring. In the South-West, spring is probably the best time, as it allows time for late cultivation to kill weeds, and lucerne flea and the red legged earth mite are easier to control.

(14) According to districts and methods of planting, the seeding rates may vary from 2 lb. to 20 lb. per acre.

(15) Cover or nurse crops are not recommended or required.

(16) Farmyard manure stimulates lucerne, but should always be well rotted prior to application and not applied heavily.

(17) When seed is sown in drills, the width between drills is determined by the weed difficulty. In the wheatbelt normal drill widths are recommended. In the South-West closer planting is preferred.

(18) If the first year stand is thin, the weak patches should be re-seeded while the plants are young, otherwise it is difficult to make an even stand.

(19) Lucerne produces very heavy crops of fine-textured forage, rich in protein, lime and other minerals, and is suitable for all classes of livestock.

(20) For best results good stands of lucerne should be cut and not grazed. Under this system of management the stand will persist much longer.

(21) Experience shows that the plant, once established, can be heavily harrowed and cultivated to reduce weeds and to mulch the surface soil.

(22) The time to cut lucerne for hay is when the new shoots have started from the crowns. This usually coincides with the flowering period.

(23) Lucerne leaves have a much higher value than the stems. Consequently great care should be taken, when harvesting, to ensure that all the leaves are saved.
More than 50\% of all wheeled tractors purchased in the over 30 belt horse power class are FORDSON MAJOR

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Fordson Major is right for broadacre or small farm alike. Its engineering is absolutely practical, its power is absolutely adequate and its versatility is absolutely time and labour-saving. Its price, low running costs and the availability of service and genuine parts combine to mean both lower capital investment and lower upkeep. That is the kind of power-farming equipment you need for it means profit to you.

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