Tree lucerne: a fodder crop with a future

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Tree lucerne: a fodder crop with a future

Cover Page Footnote
The analytical data presented in Table I were provided by the Government Chemical Laboratories.
In December, 1952, an article was published in this Journal drawing attention to the potential value of white flowered tree lucerne (Cytisus prolifer) as a source of nutritious green fodder during the dry summer months. Figures were quoted to show that heavy yields could be obtained year after year with very little effort, and no outlay other than for fertiliser. The advantages to be gained from the cultivation of this tree were made very apparent and many farmers set out to grow the shrub.

It must be admitted, however, that worthwhile success has been achieved on only a limited number of properties. Fortunately, these successes have been outstanding and indicate that further consideration of the shrub is justified. It is proposed therefore, to again outline the merits of tree lucerne and then discuss the various factors which have discouraged widespread cultivation.

WHERE DOES IT GROW?

Tree lucerne originated in the Mediterranean region and was brought to Australia as an ornamental shrub. It grows on a wide variety of soils under an extensive range of climatic conditions. Vigorous shrubs can be seen throughout Southern Australia and as far north as New England in N.S.W. and Northampton in Western Australia. Self-grown thickets are common on vacant land throughout the south-west of this State. The soils supporting these thicket range from deep sand on the coast to lateritic gravel in the Darling Ranges. Tree lucerne will not persist on heavy soils which become water logged over the winter months. This appears to be the only soil type which must be avoided.

WHAT IS ITS FEED VALUE?

Tree lucerne is fully equal in food value to ordinary lucerne or to best quality young mixed pasture. Analytical details are given in Table I. In most of the samples the small stems were included, as well as leaves, so as to represent the material which would be eaten. The lush young re-growth obtained after grazing or cutting is particularly nutritious. In general practice the shrubs are kept in reserve until the late summer. The foliage can then supply protein, phosphorus and vitamins at present lacking in the diets of many animals on dry mature herbage.
Table 1

TREE LUCERNE
COMPOSITION OF FOLIAGE AND SMALL STEMS
(All figures as a percentage of the dry matter)

<table>
<thead>
<tr>
<th>Origin of Sample</th>
<th>Date Sampled</th>
<th>Crude Protein</th>
<th>Crude Fibre</th>
<th>Crude Fat</th>
<th>Carbohydrate</th>
<th>Total Ash</th>
<th>Calcium as Ca</th>
<th>Phosphorus as P</th>
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</thead>
<tbody>
<tr>
<td>Merredin</td>
<td>17/12/48</td>
<td>18</td>
<td>14</td>
<td>4</td>
<td>58</td>
<td>6</td>
<td>1-12</td>
<td>0-17</td>
</tr>
<tr>
<td>Avundale</td>
<td>20/5/50</td>
<td>20</td>
<td>19</td>
<td>4</td>
<td>52</td>
<td>5</td>
<td>0-83</td>
<td>0-12</td>
</tr>
<tr>
<td>Gabbalong</td>
<td>8/10/58</td>
<td>18</td>
<td>30</td>
<td>2</td>
<td>45</td>
<td>5</td>
<td>0-48</td>
<td>0-18</td>
</tr>
<tr>
<td>Mayanup</td>
<td>14/7/54</td>
<td>25</td>
<td>22</td>
<td>4</td>
<td>44</td>
<td>5</td>
<td>0-57</td>
<td>0-19</td>
</tr>
<tr>
<td>Nedlands A.H.N. Lab.</td>
<td>24/9/54</td>
<td>23</td>
<td>25</td>
<td>4</td>
<td>38</td>
<td>10</td>
<td>1-62</td>
<td>0-20</td>
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<tr>
<td>Nedlands, A.H.N. Lab.</td>
<td>10/8/57</td>
<td>19</td>
<td>32</td>
<td>4</td>
<td>41</td>
<td>4</td>
<td>0-56</td>
<td>0-22</td>
</tr>
<tr>
<td>south Perth—Young growth</td>
<td>25/5/50</td>
<td>25</td>
<td>27</td>
<td>4</td>
<td>39</td>
<td>6</td>
<td>0-62</td>
<td>0-32</td>
</tr>
<tr>
<td>for Comparison—Best quality young mixed pasture</td>
<td>25</td>
<td>21</td>
<td>3</td>
<td>40</td>
<td>11</td>
<td>0-9</td>
<td>0-35</td>
<td></td>
</tr>
<tr>
<td>Cereal hay of average quality</td>
<td>7</td>
<td>28</td>
<td>2</td>
<td>36</td>
<td>7</td>
<td>0-1</td>
<td>0-17</td>
<td></td>
</tr>
<tr>
<td>F.A.Q. Wheat Grain</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td>84</td>
<td>2</td>
<td>0-04</td>
<td>0-24</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 3.—Pingelly, February 1960. Regrowth on trees which had been severely grazed by sheep

(B. Clifton)

PALATABILITY

Farmers hold two contrasting opinions concerning the palatability of tree lucerne. Some say stock will not eat the shrub at all, while others claim that it is difficult to preserve the shrubs from severe overgrazing. Under different circumstances, both statements can be correct. When ample alternative green feed is available stock generally leave tree lucerne unmolested. This explains why many farmers in the lower south-west state that the shrub is of no value as a fodder. Sheep, cattle and poultry all have to acquire a taste for the foliage but there need be no fear that it will not be eaten when alternative feed is in short supply. In actual fact, the preference of animals for alternative feed is a distinct advantage, as during the winter months the farmer can utilise the ground feed in paddocks containing tree lucerne. These trees often provide welcome shelter until the pasture becomes less abundant or less attractive. The grazing animals will then commence to eat increasing quantities of the tree lucerne. Animals accustomed to grazing on it will eat stems as thick as a pencil so that shrubs used for intermittent grazing can be eaten back to a compact base very quickly.

There is no need to leave planted paddocks unstocked so that weeds and grasses run riot, to eventually become a fire hazard. The winter grazing and shelter provided by fields containing tree lucerne is one of the most important assets to be obtained from this form of husbandry.

OVERGRAZING

Many farmers consider that the plant is too vulnerable to overgrazing to be considered as a source of greenfeed in the paddock. Towards the end of a long dry summer it is to be expected that the shrub will become particularly attractive. Cattle will break down quite large trees to obtain the foliage from high limbs, and sheep will strip the bark from the main trunk. With correct management however, the trees can be grazed without any risk of damage. All palatable forage crops need protection from stock and in the section on "Utilisation" special attention is given to ways and means of harvesting this one with minimum trouble. It should also be remembered that overgrazing is a problem.
mainly where many animals have access to only a few trees. Where large areas are planted controlled grazing becomes a relatively simple matter.

Fig. 4.—Nedlands, April 1956. Foliage within reach grazed by sheep. Most of bark was eaten in May

YIELDS PER ACRE

If tree lucerne is to be grown extensively it must give assured yields comparable to other crops which can be grown. At the Animal Health Laboratories at Nedlands careful measurements were made over a period of years of the amount of edible dry matter which could be obtained from trees growing on deep coastal sand. These trees did not receive any supplementary water but were given regular dressings of superphosphate plus essential trace elements. The information obtained there indicates that well-grown trees planted every ten feet in the rows will yield about 60 lb. of edible dry matter per annum. If the rows are 22 feet apart about 200 trees will be required per acre. On this basis a field planted to tree lucerne could be expected to return 5 tons of nutritious dry matter per acre each year for many years. This dry matter is available in the form of green feed whenever the farmer should require it, the green feed being well balanced in all the essentials required by grazing animals.

In addition, the area will grow the usual cover of winter annuals, or crops can be planted between the rows. This ground feed can be particularly valuable. An area planted with tree lucerne can be depended upon to supply heavy yields of nutritious feed for use in winter and in summer.

Fig. 5.—Pingelly, February 1960. Tree lucerne in an erosion gully

ESTABLISHING TREE LUCERNE

Most farmers concede that tree lucerne is of considerable potential value but consider that the difficulties and costs associated with establishing large areas are too great to merit consideration. Fortunately, some practical farmers have shown that these difficulties are more apparent than real. Simple effective methods have been evolved to suit specific conditions. At this stage it is appropriate to emphasise that we are dealing with a crop which is expected to give high yields for many years. To establish such a crop careful planning and a considerable outlay in labour and fertiliser is justified. Even so, the cost is trivial. Mr. Basil Clifton of West Pingelly has been particularly successful at establishing and utilising it. Last autumn, with the methods he has evolved it took two men four days to prepare the land and seed, and plant 24 acres. At £3 per man daily, this works out at £1 per acre. Obviously, if a farmer decides that tree lucerne is worth trying, labour costs will be no deterrent.

STARTING WITH SEED

Tree lucerne seed can be purchased at 5s. per ounce. An ounce contains over 1,000 seeds, so theoretically this should suffice for several acres. These seeds are “hard” and may not germinate if planted without treatment. In tests carried out at this laboratory treatment with boiling water has proved most effective. A saucepan of water is brought to the boil and the seed is dropped into the water as the container is lifted off the stove. By the
time the water has cooled the seeds should have swollen to double the original size. These seeds should be collected in a strainer, mixed with the general Medicago culture as recommended for ordinary lucerne, and planted as soon as possible. Where only a small number of seeds have to be treated, these can be "nickled" with a pair of scissors or a razor blade, so that the hard seed coat is broken and water can enter and cause swelling.

Treated seed can be planted by hand in the permanent rows without a great deal of effort, particularly where the line can be ploughed, alternatively, the treated seed can be mixed with compost and dribbled along the line from the back of a vehicle. A farmer at Gabbin obtained an excellent stand by mixing treated seed with boiled wheat and sowing this through one run of a combine. The seeds seem to germinate readily if sown with organic matter or animal manure. Apparently the heating which takes place cracks the seed coats. Excellent germinations have been obtained where untreated seeds have been mixed with animal manure to that a portion containing several seeds can be dumped with a spade every ten feet along the line. The possibility is being explored of preparing mixtures of dung and fertiliser which can be made into cubes or pellets each containing one or two seeds.

Fig. 6.—Nedlands, April 1953. Ewes and lambs eating tree lucerne foliage

These pellets could be planted with minimum bother. Tree lucerne could be grown with considerable advantage in the good soil which is often found on rocky outcrops. The machines which were used for dropping rabbit baits in furrows could be adapted for use in such country. Obviously, the farmer who really wants to do the job properly, will soon find an effective way to plant seed at a low cost.

SEEDLINGS

Farmers may prefer to plant individual seeds in tins or discarded cardboard drinking cups. The planting can be done in February or March so that robust seedlings are available for planting soon after the opening winter rains. Such plants get away to a good start and in the drier areas could be sufficiently well established to survive the first summer without watering. The seedlings quickly develop a long tap root which is easily damaged in transplanting. For this reason it is best to plant the seeds in the permanent position or in containers which reduce interference with the roots.

Post-hole augers are very useful for preparing land for seedlings. Mr. Fawcett at Nabawa obtained a most successful stand on hungry sand plain country by digging an auger hole, placing a little fowl manure and fertiliser at the bottom, covering this with six inches of soil and then planting a seedling in a tin with the bottom removed.

Successes have been achieved by transplanting the seedlings which grow naturally around old trees, particularly after a fire. This transplanting must be done speedily and with care, otherwise serious wastage is inevitable.

If seedlings are obtained from the metropolitan area care should be taken to avoid introducing pests on the roots. This danger is a real one and there is little doubt that many of the failures have been due to introduced infections. Meally bug, for example, will soon kill seedlings which have suffered stress during transplanting. The use of clean seed eliminates this danger where tree lucerne is to be established in new areas.

UTILISATION

Tree lucerne will prove of greatest benefit where stock can be used to harvest the foliage. It has been shown experimentally and in practice that the trees respond very well to intermittent cutting or grazing. In trials carried out at the A.H.N.
Laboratory at Nedlands the young plants were cut back in the first year to encourage branch formation at ground level. Cuttings were continued at intervals over a period of years so that the stump became a mass of short, thick branches with the protective effect of a porcupine. After each harvest this stump was virtually defoliated but regrowth was rapid. This regrowth of long, soft shoots constituted a heavy mass of highly nutritious foliage. It was argued that, with intermittent cutting or grazing, the high yields obtained in these test rows could be duplicated under field conditions.

Mr. Basil Clifton, of West Pingelly, has demonstrated that areas planted with tree lucerne give a high return when grazed intermittently. The planted areas are used mainly as a course of feed in the late summer and early autumn, but it is estimated that the established stands carry the equivalent of 10 sheep per acre per annum. Mr. Clifton has used cattle as well as sheep as grazing animals. The cattle ate back the trees very severely but the recovery was remarkably good. It is essential, of course, to give the trees complete rest during the recovery period.

Where the object is to obtain shrubs for grazing, it is important to avoid trees with one or two main stems. Fortunately, the shrubs have a natural tendency to grow with a number of branches at or near ground level. If a newly planted area appears to be growing into “trees,” topping should be carried out. Just how to do this will depend on circumstances. Maybe a mower can be used, or the area grazed quickly with a lot of stock. Cutting by hand may not be out of the question. In a stand planted at the C.S.I.R.O. Research Station at “Glen Lossie” the trees were left to develop for two years by which time they were quite massive. In March, 1960, the branches were cut back to the stumps. The foliage obtained from one acre sufficed to maintain 50 sheep for 14 days. The stumps recovered well from this cutting and the bushy shrubs are now ideal for grazing.

For grazing purposes it seems that the shrubs should be spaced close together in the rows, approximately 6 ft. apart in heavy rainfall areas and 10-12 feet apart where moisture is likely to limit growth. On arable land the rows can be spaced some distance apart so that cereal crops can be grown. Alternatively, the intervening areas can be sown to perennial grasses to provide “balance” to the leguminous foliage.

Most farmers dislike the idea of harvesting the regrowth from tree lucerne and carting this to stock. It should be remembered, however, that this cutting for direct feeding would not involve anywhere near as much labour or machinery as does the growing, harvesting, and storage of cereal crops. As a matter of fact, the cutting of regrowth from orderly plantings of tree lucerne can be made a simple mechanical job if the modern hedge-clipping equipment commonly used in Britain is employed. The use of animals for grazing has many advantages but mechanical harvesting should not be dismissed without further thought.

Fig. 7.—Kojonup 1960. Tree lucerne planted at “Glen Lossie” Research Station. These trees responded well when cut back severely.

USE ON POULTRY FARMS

It is surprising that the plant is not used to a much greater extent on poultry farms. Poultry thrive when the foliage forms an appreciable portion of the diet and the green leaves eliminate any need for supplements of Vitamin A or yolk-colouring concentrates. If trees are planted close to external netting fences poultry will eat all the leaves which grow within reach. These leaves can be rich in protein, Vitamin A and the carotenoids which give rich colour to egg yolk. A sample of leaves collected in November, 1960, and kiln dried yielded a product containing 30 per cent. crude protein, 315 units of B-carotene and 727 units of total carotenoids. This is distinctly superior to the best lucerne meal.
obtainable. Large trees shed a lot of seed from Christmas onwards. These seeds are rich in crude protein (25 per cent.) and fats (12 per cent.) and are relished by birds.

**FERTILISER**

Superphosphate is the main nutrient required and should be applied at the rate of a bag (180 lb.) per acre. Where elements such as copper or zinc are required, these must be applied as for any other crop. High yields of fodder cannot be expected if fertiliser is lacking.

**LONGEVITY**

Tree lucerne can thrive for 20 years or more. The erroneous impression that the shrub has a short life is due to the fact that the trees will grow for a while on very poor soil but when the meagre supply of nutrients is depleted it is not surprising that “die-back” and death soon occurs. White ants do not attack healthy trees but invade the dead wood in sickly trees.

**DISEASES AND PESTS**

Tree lucerne is remarkably free from attack by pests or disease. Failure to thrive is invariably an indication of nutritional deficiencies in the soil. Occasionally, plagues of caterpillars appear; these defoliate the trees and then disappear as suddenly as they came. The test trees at Nedlands suffered one such attack in ten years. It appears that tree lucerne, when correctly fertilised is a particularly “safe” crop.

**BENEFIT TO BEE KEEPERS**

Tree lucerne flowers profusely during July, August and September. These flowers are an excellent source of pollen and nectar at a period when other flowers are scarce. Apiculturalists will benefit if extensive plantings of tree lucerne are made.

**ARE THERE BETTER SHRUBS?**

Experience indicates that the ordinary white-flowered tree lucerne or Tagasaste (Cytisus prolifer) is the best shrub to cultivate for stock feed. Periodically claims are made that other shrubs would be more worthy of attention. In particular, it has been said that the yellow-flowered tree lucerne (Medicago arborea) will give better results. Repeated attempts have been made by a number of enthusiasts to propagate this yellow-flowered shrub but so far it has failed in the field. For the present, attention should be concentrated on the white-flowered variety which has proved so suited to our conditions. If plant breeders become interested, it is probable that better strains can be isolated and “fixed”. Wherever tree lucerne is grown some bushes appear to be outstanding. Seed from such trees may give plantations with higher yields of foliage, quicker recovery from grazing, or greater drought resistance. By using growth hormones it may be possible to use cuttings from selected trees to establish new plantations. It seems that here we have a field for interesting and rewarding research.

**REASONS FOR FAILURE**

Attempts to grow tree lucerne have failed for many reasons. No doubt the comments already made will have supplied an explanation for some of these failures. Lack of adequate preparation is the most common fault. There is no short-cut to success, and careful planning is essential. Practical farmers have already shown that if attention is given to the fruits of experience, there is every reason to anticipate success. The most serious errors are:—

- Planting seed without treatment to ensure germination.
- Planting seed or seedlings too late in the winter.

Fig. 8.—W. Pingelly, February 1957. Sheep grazing tree lucerne planted by Mr. B. Clifton
Planting on heavy, water-logged soils.
Subjecting the young plants to severe competition from weeds or established pasture.
Failing to use adequate fertiliser, particularly where trace elements are required.
Over grazing or continuous grazing.
Severe cutting or grazing in mid-summer.

SUMMARY
Attention is drawn to the value of white-flowered tree lucerne as a source of palatable, nutritious greenstuff for grazing animals.

Measurements of yields over a period of years indicate that tree lucerne is a highly productive crop which can be grown over extensive areas in Western Australia.
Practical farmers have shown that large areas can be planted quickly and effectively.
It is anticipated that the widespread cultivation of this plant will remove many of the hazards from livestock production in a Mediterranean climate.

ACKNOWLEDGMENT
The analytical data presented in Table I were provided by the Government Chemical Laboratories.
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