Paper 6
COST SAVINGS IN LUCERNE PRODUCTION

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INTRODUCTION

It is often said that lucerne costs more to establish and maintain than grass/clover pastures because of additional expenditure on seed, herbicides, lime and fertiliser, and because of limited production in the year of sowing. However, research has shown that many of these costs can be reduced, and production in the sowing year increased.

ESTABLISHMENT COSTS

Plant Numbers

There is much evidence from plants ranging in size from sub clover to pine trees, that as the number of plants per hectare increases, the size and yield of each plant goes down, so that increasing the number of plants above a certain figure does not give any increase in yield (White, 1980). Farmers will be more used to this idea in relation to animal stocking rates. It is illustrated in Fig. 1.

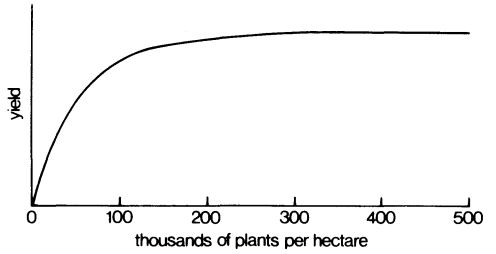

Figure 1: Relationship between lucerne plant density and yield.

This curve is arrived at by growth from sowing time as illustrated in Fig. 2 with results from a subterranean clover (*Trifolium subterraneum*) trial. At the higher sowing rates, plants begin competing with one another sooner and their growth slows down. At lower seeding rates they are free from competition for longer, and so each plant grows at a faster rate.

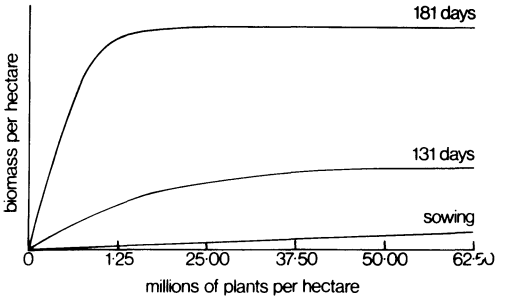

Figure 2: Relationship between clover plant density and yield at intervals from sowing (Donald, 1963).

As the stand ages, the larger plants kill out the smaller ones, and lucerne stands tend to end up with much the same number of plants per hectare over a big range of seeding rates (Fig. 3).

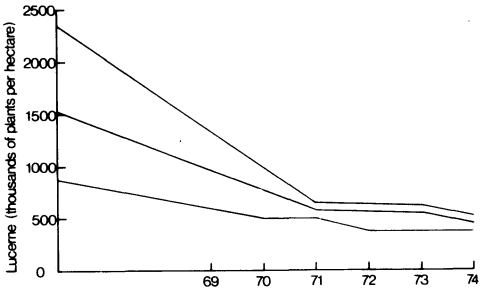

Figure 3: Lucerne seeding rates and plant density over time.

Increases in plant numbers above about 300,000 per hectare — 30 plants per square metre, or 4.5 plants per metre of 15 cm rows — give only small increases in yield. Well managed disease free stands will reduce to about this number of plants and stay there (Palmer and Wynn-Williams, 1976).

Seeding rates

There are approximately 450,000 seeds in a kilo of lucerne seed. Normally, about half the seeds sown produce seedling plants, so 2 kg of seed will produce more than enough plants for maximum production. Doubling this seeding rate to 4-5 kg will give a large safety margin. This is about half the amount of seed most farmers sow.

This recommendation is theoretically sound, and is supported by extensive field trials and farmer experience.

There is no reason to expect higher production or longer stand life from precision seeding even at seeding rates below 1 kg/ha.

Cover Crops and Weeds

Lucerne seedlings grow slowly, and do not compete strongly with weeds or cover crops. However, a number of trials (Palmer 1968; Palmer and Wynn-Williams, 1972; Janson and Knight, 1973; Wynn-Williams, 1976a, 1976b) have shown that weeds and cover crops do not kill lucerne seedlings, and that when the annual crops come off, or the annual weeds are mown or die down, the lucerne seedlings grow to full size by the first summer after sowing, and produce as much as if grown without earlier competion from weeds or crops.

Post emergence herbicides cannot be used on lucerne until it has produced at least its first trifoliate leaf. By then, weeds are large, hard to kill, and have already reduced lucerne production considerably.

Using pre-plant herbicides to keep lucerne weed-free from sowing may be profitable on highly fertile soils which can give high first year production. For first year seed production it is essential.

Otherwise, sowing with a cover crop will be more profitable than sowing lucerne alone without weed control, which will be more profitable than sowing and using post-emergence herbicides. This worst alternative is often chosen by farmers.

ESTABLISHED LUCERNE

Annual Weeds

As lucerne stands age they thin out and bare ground between plants increases. During the summer, if the interval between cuttings or grazings is long enough, large lucerne plants shade the ground fully, and use all the water available, so the stand remains free of weeds during the summer. During the late autumn, winter and early spring, lucerne growth is slowed down by low temperatures and short days, and is not enough to shade out winter annuals which fill in the gaps between the lucerne plants.

If the rainfall is high, the soil wet, the interval between cuttings or grazings are too short, fertiliser application inadequate, or if diseases weaken and kill lucerne plants, summer annuals and then perennial weeds will invade older lucerne stands (Palmer, Paper 4).

The winter annual weeds such as barley grass (*Hordeum murinum*), storksbill (*Erodium cicutarium*), shepherds purse (*Capsella bursa-pastoris*), annual poa (*Poa annua*), can be readily controlled in lucerne with herbicides. A large number of trials have shown that doing this reduces total feed produced over the winter-early spring. It often increases the amount of lucerne at the first spring cut, but usually has no lasting effect on lucerne production from the stand. It may reduce feed quality for lamb fattening (Palmer, Paper 4). If left unsprayed, these annual weeds provide winter and spring feed, and die out by November.

Why, then, spend money on spraying these weeds out? Storksbill and barley grass produce seed heads which devalue lamb pelts, make hay-making difficult and reduce the value of hay.

Paddocks infested with barley grass, storksbill or shepherd's purse which are intended for hay in November may warrant spraying. Other paddocks do not warrant spraying, and may be more productive if not sprayed.

The possibilities of taking weeds and weed seeds off in an early silage cut, and so reducing infestation in the next year, should be considered.

It is also important that any spraying which is done is done on time when the lucerne is dormant. Spraying growing lucerne with paraquat mixtures reduces spring production even further.

Perennial Weeds

Stands thin out because of mismanagement, disease or wet soil conditions. Summer weeds and perennials come into these gaps, and unless the conditions which led to their 'invasion' are corrected, they may push the lucerne out. Stands in this state can be salvaged back to full production if enough lucerne plants are there (20-30 plants per square metre).

Essential to success is management which favours lucerne over grass and weeds. This may mean drainage, more careful grazing management, or more liberal and balanced use of fertilisers (Stephen, 1964). Use of herbicides to start the mending process off will usually be worthwhile, but using herbicides without correcting management will only give short term relief.

In higher rainfall areas, introducing productive grasses into weedy lucerne stands may be a useful alternative to ploughing and re-sowing.

Fertilisers

Lucerne producing 7.5 tonnes of hay per hectare takes out phosphate and sulphur equivalent to 125 kg of super-phosphate, and potash equivalent to 250 kg of muriate of potash. On many soils this should be replaced. Sulphur fortified superphosphates provide more sulphur than needed if enough phosphate is applied.

Fertiliser application should be decided after consideration of soil tests.

Cultivars

There is considerable variation in the price of seed of different lucerne cultivars. For short term lucerne on farms not infested with stem nematode, the cheapest lucerne may be the best buy. Lucerne expected to last more than three years should be wilt resistant, but some wilt resistant cultivars are more expensive than others, without being any better.

ESSENTIAL COSTS

While cost savings can be made in seed and herbicides, and profitability increased with cover crops, there are some inputs which cannot be safely reduced.

Thorough cultivation must be carried out if perennial weeds are to be eliminated, and if establishment is to be high. Successful nodulation is important for the yield and longevity of stands. The cost of inoculum at recommended rates ($0.11/kg) is slight and money is better spent on using five times the recommended rate than on pelleting seed ($0.95%/kg including inoculum).

Use of lime may have been too low in recent years and the resulting low pH may have contributed to the problems of lucerne thrift and longevity we are encountering today.

Pests

The best way of reducing expenditure on insecticides for aphid control is the use of resistant cultivars. Failing this, strategic grazing can greatly reduce the use of insecticides. A complete grazing in winter has been shown to drastically reduce aphid numbers and delay the build up of BGLA in the spring. High infestation can be reduced by grazing, providing of course that stands are not frequently grazed at immature stages or for long period.

CONCLUSIONS

Many farmers could reduce lucerne production costs by reducing seeding rates, by sowing with cover crops and by reducing herbicide use. Fertiliser use should be reviewed in relation to soil tests, and in choosing cultivars the known disease situation, planned life of the stand, and costs of seed should be considered. Cost savings should not include reduced expenditure on inoculum or lime.

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DISCUSSION

Davidson: Did you say don't spray barley grass?

Palmer: No, barley grass is undesirable but it does produce feed. You should know what spraying for annual weeds is doing, it decreases total dry matter production and does not increase the vigour of the lucerne.

Q. Sowing rates you discussed, were these for grazing or for seed?

Palmer: For seed production lower rates still, 1 kg/ha can be used.

Cresswell: Don't you think that using 5 kg/ha of seed, or less, as you suggest, is dangerous?

Palmer: No.

McFadden: Farmers have used 5 kg/ha successfully but sowing must be done carefully.