LUCERNE VARIETIES

T. P. PALMER, Crop Research Division, Department of Scientific and. Industrial Research, Lincoln

Lucerne (Medicago *sativa*) is probably the oldest forage plant known. It is a native of northern Persia. From there it has been spread by man throughout most of the temperate regions of both hemispheres, and it is an important forage plant wherever lack of soil moisture limits summer production (1).

Lucerne is a cross-fertilised plant, and during the period it has been cultivated by man it has evolved forms suited to survival in the regions in which it has been grown. This process has been aided by crossing between *Medicago sativa* and *Medicago* ***falcata*** in areas where **they** have come in contact. The result as we see it now is a wide diversity of lucerne varieties or ecotypes, each more or less in harmony with the environment in which it is grown.

Until about 20 years ago most of the luceme grown in New Zealand was grown on medium soils in our drier areas and used principally as a hay crop. During the last 20 years the usefulness of lucerne as a pasture plant on our lighter drier soils has been increasingly recognised, and its superior production and greater reliability in this environment demonstrated (2). Increased animal production from dry-land farms in the South Island will come from an increased use of lucerne for pasture.

This light land provides quite a different environment from our more traditional lucerne growing areas. The growing season is shorter and is limited by moisture shortage, even for lucerne, for three to six summer months, depending on rainfall. Moisture is available from April to September-December, varying with the season, and to get maximum production during years of low production, that is, in years when the soil dries out early, maximum production must be obtained during April to September. In addition, extra feed in August in the pre-lambing and lambing period is particularly valuable.

Lucerne varieties vary considerably in their growth potential over the late autumn, winter, and early spring period (3), and we have concentrated on measuring production from different varieties over this period.

Trials were cut at the end of March, and then cut and weighed in the **later** part of May when growth had finished. They were then cut and weighed again at the end of August or early in September just before the main flush of spring growth began and when feed is' generally in shortest supply on most sheep farms.

Some results from these trials are given in Table 1. More detailed results from some of these trials have been published elsewhere (4).

TABLE I-PRODUCTION IN LB OF DRY MATTER PER ACRE FROM LUCERNE VARIETIES FROM APRIL' TO SEPTEMBER

Trial 1

	1959		1960	
	Yield	Difference from N.Z. Certified	Yield	Difference
N.Z. Certified	2,530	—	1,560	—
Provence	2,590	+60	1,790	+230
Du Puits	2,470	-60	1,460	-100
Hunter River	2,950	$420	2,170	+610
Italian	2,940	$430	2,000	+440
Rhizoma	1,350	-1,180	910	-650

Trial 2

	1959		1960	
	Yield	Difference from N.Z. Certified	Yield	Difference
N.Z. Certified	1,900		1,530	—
Provence	1,960	+60	2,010	+480
Du Puits	1,850	-50	1,740	+210
Italian	2,540	+640	2,460	+930
Spanish	2,120	+220	2,710	+1,180
South African	2,320	+420	2,090	+560
Glutinosa	1,530	-370	1,110	-420

Trial 3

	1959		1960	
	Yield	Difference from N.Z. Certified	Yield	Difference
N.Z. Certified	1,870	—	1,710	—
Provence	1,960	+90	2,250	+540
Du Puits	1,740	-130	1,640	-70
Hunter River	2,040	+170	2,350	$640
Italian	2,400	+530	2,630	+920
South African	2,230	+360	2,490	+780
Glutinosa	1,840	-30	1,060	-650
Rhizoma	1,030	-840	980	-730

Varieties in the one trial in any one year are directly comparable. Hunter River, Italian, and South African lucernes have consistently yielded more than N.Z. Certified over this winter period. In 1959 the Spanish lucernes yielded about 10 per cent more than N.Z. Certified; in 1960 they topped the list with 75 per cent more. Rhizoma, and to a lesser extent Glutinosa, have yielded considerably less than N.Z. Certified.

Most of the varieties which have given this extra winter production have given it in the April-May period. Yields for June, July, and August for the same trials and one other are given in Table 2.

TABLE 2-LUCERNE PRODUCTION FROM 1 JUNE TO END OF AUGUST IN LB OF DRY MATTER PER ACRE

Trial 1	1959 Yield	1959 Difference from N.Z. Certified	1960 Yield	1960 Difference
N.Z. Certified	1,680	—	880	—
Provence	1,660	-20	810	-70
Du Puits	1,610	-70	690	-190
Hunter River	1,610	-70	750	-130
Italian	1,640	-40	690	-190
Rhizoma	870	-810	590	-290

Trial 2	1959 Yield	1959 Difference from N.Z. Certified	1960 Yield	1960 Difference
N.Z. Certified	770		650	—
Provence	880	+110	760	+90
Du Puits	710	-60	560	-90
South African	880	+110	580	-70
Italian	930	+160	570	—80
Spanish	1,070	+300	1,000	$340
Glutinosa	490	-280	610	-40

Trial 3	1959 Yield	1959 Difference from N.Z. Certified	1960 Yield	1960 Difference
N.Z. Certified	1,100	—	840	—
Du Puits	920	-180	700	-140
Provence	1,190	+90	920	+80
South African	1,110	+10	780	-70
Hunter River	1,150	+50	970	+130
Italian	1,120	+20	680	-160
Rhizoma	480	-620	410	-430
Glutinosa	880	-220	590	-250

Trial 4	1962 Yield	1962 Difference from N.Z. Certified
N.Z. Certified	680	
Hunter River	880	+200
Provence	970	+290
Du Puits	790	+110
Italian	600	-80
Spanish	1,020	$340
Glutinosa	480	-200

In Trial 1 nothing was better than N.Z. Certified in either year; Rhizoma was considerably poorer. In Trial 2 Provence gave about 15 per cent more than N.Z. Certified in both years, and the Spanish lines 40 and 50 per cent more. In Trial 3 Provence gave 10 per cent more than N.Z. Certified, Rhizoma yielded only half as much as N.Z. Certified, while Glutinosa gave about 20 per cent less. In Trial 4 Hunter River, Provence, and Spanish yielded 30, 40 and 50 per cent more than N.Z. Certified.

We thus see that there are some varieties which yield considerably more over winter than N.Z. Certified and a few which yield more during the late-winter early-spring period, while some have yielded consistently less. What do these differences mean to the light land farmer?

For the low-yielding varieties the answer is obvious. Of the higher-yielding varieties Hunter River, Italian, and Provence are currently or periodically available, and their other characteristics are reasonably well known. On our better soils, Hunter River has tended to be a short-lived variety, and cannot be confidently recommended for use on light land. Provence and Italian have been grown in New Zealand for some time and are known to be satisfactory varieties in most respects. Provence, with its greater late-winter production, can be confidently recommended.

We know little about the Spanish lucernes, apart from their greater winter production, but their potential for late-winter production appears to be greater than with any other varieties we have tested. They may be useful for growing as they are or as parents for breeding forms with greater winter production.

To sum up, by growing 'varieties of lucerne which give high production during winter, a farmer on light land may make full use of the soil moisture available during the period and provide an increased amount of feed at a time of the year when it is most needed and most useful.

References

1 Klinkowski, M. (1933): Lucerne: Its Ecological Position and Distribution in the World. Imperial Bureau of Plant Genetics: Herbage Plants Bulletin No. 12.

2 Iversen, C. E. and Calder, J. W. (1956): "Light Land Pastures", Proceedings 18th Conference New Zealand Grassland Association 78-8X.

3 Palmer, T. P. (1959): "Winter Growth of Lucerne (*Medicago sativa*) I. Variety Performance in New Zealand", N.Z. Jour. Agr. Res., 2, 1195–1202.

4 Palmer, T. P. (1961): "Winter Growth of Lucerne (*Medicago sativa*) III. Variety Production at Lincoln, New Zealand." N.Z. Jour. Agr. Res., 4, 65 t-659.

DISCUSSION

Q. Have you ever done any analysis of the feed quality for the different varieties of lucerne, particularly in regard to lucerne for lucerne meal?

A. The evaluation of feed quality is a specialised business. The lucerne meal man knows that he requires a variety with a certain amount of protein and fibre. When you come to evaluate lucetne quality for the farmer you again run into difficulties because feed quality factors are not fully known.

Comment (I. L. Elliott): The Ruakura reports by Percival and Dr Wallace showed that green lucerne was an inferior feed to ordinary mixed pasture. I think I am correct in saying that the lucerne was quite high in both protein and fibre. On account of its palatability it was readily eaten but its feed value was correspondingly low.

Q. (T. Ludecke): Has your winter grazing of some varieties had any marked effect on your spring production?

A. Yes, it does effect early spring production. If you want to feed lucerne in the spring the best thing is to leave it alone in the winter. In late autumn there may be considerable grazing. If you graze 500 to 600 lb d.m. in late autumn you might lose only 100 lb d.m. in the spring. Grazing early spring growth penalises you later in the spring. If you graze in July you are going to cut back your feed in August and September.

Q. Can you give figures for 12 months' production from the Spanish varieties as compared with Marlborough?

A. No. Our trials at Lincoln have been on light land which dries out. We have never had them in a year when we've had 12 months' production or anything like it. We don't know whether we lose out in summer because of getting extra winter production-this could be the case.

Q. (Prof. Langer): Can you compare the increased growth one can expect by using an easier autumn management regime as compared with introducing a new type of material?

A. I think the answer is that if you want feed in the spring you do both things-improve your type and improve your management. As you see in Marlborough lucetne is an embarrassment in the spring unless you graze it. You can't turn it into hay because the weather is too wet and the only way to utilise good early spring production is to graze it.

Comment (C. Iversen): Some new varieties of early lucerne appear to be short-lived.

A. It is true that some of these varieties are short-lived. There is no reason why short life and earliness should go together. For the breeder this may merely be a matter of getting the right combination. T would remind Mr Iversen that he has one of these varieties in a trial which he has abused as hard as he can abuse it and it has produced more in winter than N.Z. certified lucerne and is standing up to the treatment particularly well.