LUCERNE-GRASS MIXTURES

N. A. CULLEN, Senior Scientific Officer, Invermay Research Station, Mosgiel

The sowing of a grass with lucerne is not a common practice in the south and is confined largely to the drier districts of Canterbury, Marlborough, and Otago.

In these areas cocksfoot is frequently sown with lucerne to provide grazing as well as hay. The practice of sowing a grass with lucerne is not a new one.

At the Grassland Conference in Dunedin in 1937 the sowing of cocksfoot with lucerne in a number of paddocks in Central Otago was reported.

During the next 10 years the USC of lucerne grass mixtures became more common, particularly on the lighter soils in Canterbury. R. H. Bevin at the 1949 Rotorua Conference advocated the use of lucerne-grass mixtures on these soils and recommended a mixture of 8 lb of lucerne with either 10 lb of cocksfoot or 7 lb of *Phalaris tuberosa*.

In the wetter districts of Otago and Southland lucerne is grown primarily for hay, although stands may be lightly grazed during the autumn or winter. In England luccrne-grass mixtures have shown to advantage under similar conditions for the following reasons :

1. Yields from the mixtures may be considerably higher, especially in the first year.
2. Weeds and weed grasses are less likely to be a problem.
3. The hay is easier made and there is less loss of leaf under hot, dry conditions.

Because of the similarity of the climatic conditions it appeared that more widespread use could be made of lucerne-grass mixtures in New Zealand, and for this reason investigations began at Invermay Research Station in 19.54 to seek information on this subject.

First Trial

The first trial sown in February 1954 consisted of five lucerne grass mixtures.

	lb		lb
1. Marlborough lucerne	12	S21.5 meadow fescue	10
2. Marlborough lucerne	12	S53 meadow fescue	10
3. Marlborough lucerne	12	*Phalaris tuberosa*	6
4. Marlborough lucerne	12	N.Z. certified cocksfoot	4
5. Marlborough lucerne	12	N.Z. certified , timothy	4

The grasses were mixed with inoculated lucerne seed and drilled in 7 in. rows with 3 cwt of lime-reverted superphosphatc.

Throughout the life of the trial all mixtures showed promise at various times. All four grasses provided a large bulk of herbage during the spring, but cocksfoot proved superior during the summer and winter, when it provided valuable herbage in times of feed scarcity.

Timothy was the least aggressive grass and in this plot lucerne provided the bulk of the herbage. The mixture appeared ideal for hay and silage, but its poor recovery after haying and poor winter growth proved serious disadvantages.

Meadow fescue appeared very promising in the first two years, but failed in the third and made little contribution in that season.

Phaluris *tuberosa* was productive in the spring, but lacked palatability and generally compared unfavourably with cocksfoot.

Cocksfoot was the most aggressive species and dominated the mixture where it was sown. This factor and the grazing management imposed resulted in the lucerne being very thin and unproductive after four years.

The management, which consisted of taking one or more hay cuts with periodic grazings during the summer, autumn, and winter, Eavoured the less palatable and more aggressive species, namely cocksfoot and *Phalaris* ***tuberosa,*** and resulted in suppression of the lucerne. Timothy and meadow fescue proved more palatable and in these mixtures lucerne was not detrimentally affected to the same extent.

In this trial the seeding rate ofcocksfoot was high (4 lb). In subsequent trials a lower rate proved more satisfactory.

This investigation was terminated after 3½ years because of a general deterioration of the mixtures and ingress of weeds. The plots had been grazed for considerable periods throughout thc year and undoubtedly this contributed to the deterioration.

Second Trial

This experiment compared mixtures of cocksfoot, timothy, meadow fescue, and lucerne with thc grass species and lucernc sown in alternate rows.

Details of treatments:

1. Lucerne 8 lb, cocksfoot 4 lb, N.Z. white clover 1 lb, sown in alternate rows.
2. Lucerne 12 lb, cocksfoot 2 lb, N.Z. white clover 1 lb, mixed.
3. Lucerne 8 lb, meadow fescue 5 lb, timothy 2 lb, N.Z. white clover I lb, sown in alternate rows.
4. Lucerne 12 lb, meadow fescue 5 lb, timothy 2 lb, N.Z. white clover 1 lb, mixed.

In treatments 1 and 3 lucerne was sown in every alternate row and thus spaced at 14 in., while the grass and clover were sown in the intermediate row.

In treatments 2 and 4 the mixtures were drilled in 7 in. rows. Single acre plots were sown with 3 cwt of reverted superphosphate on 4/2/55.

Results

All four treatments established well and grew. vigorously throughout the first season. After twelve months the alternate row sowings appeared superior to the mixtures where considerable lucerne suppression was evident. Cocksfoot was much superior to the other grasses under dry conditions and during the winter.

In the second season strong lucerne growth resulted in almost complete suppression of the timothy and meadow fescue and consequently the contribution from these grasses was very small. Lucerne-cocksfoot sown in alternate rows appeared very promising in this and subsequent seasons,

TABLE I-DRY MATTER YIELDS LB/ACRE
SEASONS 1955-56-1958-59

Treatment	Lucerne	Sown Grass	Other	Total
I. Lucerne and cocksfoot sown in alternate rows:				
1955–56	2,895	7,995	1,220	12,110
1956–57	6,065	5,815	330	12,210
1957–58	7,450	2,720	690	10,860
1958–59	10,350	5,240	1,080	16,670
4-year total	26,760	21,770	3,320	51,850
2. Lucerne-cocksfoot mixture:				
1955-56	2,585	7,190	1,805	11,580
1956–57	4,855	6,000	475	11,330
1957-58	6,190	4,830	195	11,215
1958-59	9,870	3,370	890	14,130
4-year total	23,500	21,390	3,365	48,255

3. Lucerne, meadow fescue, timothy, alternate rows:				
1955–56	3,355	6,585	1,020	10,960
1956–57	8,670	4,110	1,210	13,990
1957-58	10,560	200	900	11,660
1958-59	9,560	180	1,160	10,900
4-year total	32,145	11,075	4,290	47,510
4. Lucerne, meadow fescue, timothy mixture:				
1955-56	1,810	8,240	1,500	11,550
1956-57	7,500	4,670	1,160	13,330
1957-58	6,890	840	1,470	9,200
1958-59	8,750	600	1,050	10,400
4-year total	24,950	14,350	5,180	44,480

It proved superior both in yield and composition and over the four year period yielded about 10 per cent more dry matter than lucerne and cocksfoot sown in the mixture (see Table 1) , Lucerne plant mortality was less (see Table 2) in this treatment.

TABLE 2-NUMBER OF PLANTS PER FOOT OF ROW

Treatment	17/4/55	26/3/56	15/2/57	30/3/59
1. Lucerne and cocksfoot sown in alternate rows	28	17	10	6
2. Lucerne and cocksfoot mixture	27	7	4	2

Note: The number of plants in (2) should be doubled for a comparison per unit area.

In the first treatment lucerne contributed about a quarter of the dry matter in the first season, half in the second, and about two-thirds in the third and fourth season, while cocksfoot declined proportionately. It was apparent that the management adopted, taking two or three hay cuts during the spring and summer and grazing in the late winter and early spring, favoured the luccrne, which was the dominant component after four years.

Third -Experiment

This experiment compared nine lucerne-grass mixtures sown in alternate rows with luccrne sown in 7 in. rows.

Treatments:

1. N.Z. certified cocksfoot 2 lb
2. N.Z. certified timothy I lb
3. S.2 15 meadow fescue 4 lb

4. N.Z. certified perennial ryegrass 3 lb
5. N.Z. certified short-rotation rycgrass 1 lb + timothy I lb
Phalaris tuberosa 5 lb
7. S.170 tall fescue 5 lb
8. Prairie grass 3 lb
9. Cocksfoot 1 lb, timothy 1 lb, *Phalaris tuberosa* 1 lb, meadow fescue 1 lb
10. Lucerne 14 lb

Eight pounds per acre of N.Z. certified lucerne was sown in treatments 1-9; 1 lb of Montgomery red clover and 1 lb of N.Z. white clover were sown with the grasses. The treatments were replicated three times in a randomised block layout and sown on 12.2.57 with 2½ cwt of reverted superphosphate. The lucerne seed was inoculated.

Results

All species established well, the ryegrass strains, prairie grass, and tall fescue making the best initial growth. In the first winter, four months after sowing, a production cut indicated that the yield of the ryegrasses and prairie grass was much higher than that of timothy, cocksfoot, and the fescue strains. ***Phalaris*** *tuberosa* was intermediate.

In the following season dry matter yields were highest from the short-rotation ryegrass + timothy treatment, followed by tall fescue, prairie grass, perennial rycgrass, ***Phaluris*** *tuberosa,* cocksfoot, meadow fescue, and timothy. All lucerne grass mixtures, however, were significantly better than the pure lucerne treatment (see Table 3).

TABLE 3-DRY MATTER YIELDS (LB/ACRE) 1957-58 SEASON

Treatment	Lucerne	Sown Grass	Other	Total	Significance	
1. Cocksfoot	1,940	5,290	2,350	9,580	de	DE
2. Timothy	1,440	4,970	2,090	8,500	e	EF
3. Meadow fescue	1,415	5,070	2,475	8,960	e	E
4. Perennial rye.	480	9,400	1,850	11,730	abc	ABCD
5. S.R. ryegrass + timothy	160	12,750	340	13,250	a	A
6. *Phalaris tuberosa*	1,960	5,220	3,520	10,700	bcd	BCDE
7. Tall fescue	1,440	7,610	3,590	12,640	a	AB
8. Prairie grass	880	8.150	3,010	12,040	ab	ABC
9. Mixture	1,000	7,430	1,730	10,160	cde	CDE
10. Lucerne	3,470	—	3,050	6,520	f	F
c. of v.				8.7%		

For explanation of Duncan's multiple range test refer to D. B. Duncan "Multiple Range and Multiple F Tests" Biometrics, 11, l-42 1955. (Briefly treatments differ significantly only when they

have no letter in common. A 5 per cent level of significance is indicated by small letter, 1 per cent level by capitals.)

For the 1958–59 year the lucerne, cocksfoot and lucerne, tall fescue appeared the better balanced and most productive treatments, while short-rotation ryegrass was the least productive. The meadow fescue treatment also produced well, although the meadow fescue contributed only a small fraction of the total yield.

TABLE 4-DRY MATTER YIELD (LB/ACRE) 1958-59 SEASON

Treatment	Lucerne	Sown Grass	Other	Total	Significance	
1. Cocksfoot	3,850	3,070	1,130	8,050	ab	AB
2. Timothy	3,700	1,400	1,310	6,410	de	BC
3. Meadow fescue	5,290	1,150	2,120	8,570	a	A
4. Perennial rye.	2,620	3,120	1,500	7,250	bcd	ABC
5. S.R. ryegrass + timothy	1,700	2,770	1,250	5,720	c	C
6. *Phalaris tuberosa*	4.360	830	1,450	6,640	cde	BC
7. Tall fescue	3,580	3,560	630	7,770	abc	AB
8. Prairie grass	3,370	1,350	2.130	6,840	bcde	BC
9. Mixture	3,580	2,330	'930	6,840	bcde	BC
10. Lucerne	6.250	—	1,060	7,310	bcd	A B C
c. of v.				9.1%		

During the 1959–60 year the lucerne-cocksfoot and lucerne-tall fescue again appeared superior to the other mixtures. Meadow fescue had almost completely disappeared from treatment 3, while timothy, ***Phalaris tuberosa,*** and prairie grass made only a small contribution. Yield differences between treatments were small, the only significant difference being that prairie grass was poorer than the other treatments.

Conclusion

In these investigations the lucerne-cocksfoot mixtures generally gave the best results. Cocksfoot proved superior during drought conditions and, except in the first winter after sowing, compared favourably with the other grasses for winter production. It had the disadvantages of slow establishment, rather low palatability, and a tendency to become dominant, especially under a predominantly grazing management.

Timothy and meadow fescue were good during the spring, but were poor in dry conditions and in the winter. Both these species were palatable.

Tall fescue was one of the most productive species and compatible with lucerne, but like cocksfoot it lacked palatability.

The two ryegrass strains proved very productive during the first

year but were too aggressive for the lucerne. Winter production was very good but summer production only fair.

Phalaris tuberosa compared unfavourably with cocksfoot. Its summer production was relatively poor, its winter growth inferior to cocksfoot, and it was less able to compete with weeds.

Prairie grass showed promise in the first year, particularly in the winter, but was rather thin and unproductive in subsequent years.

The mixture of cocksfoot and other species (Treatment 9) was dominated by cocksfoot and behaved similarly to the lucerne-cocksfoot mixtures.

In the second and third experiments the mixtures sown in alternate rows with clovers included in the grass row generally gave better results than mixing both grasses and lucerne in the one drill,

Management of the mixtures proved very important. If the lucerne-cocksfoot mixture is treated primarily as a hay crop and grazed only in the winter and early spring, it should last for five or more years and continue to be dominated by lucerne. Overgrazing, especially in the summer, is likely to result in cocksfoot domination. For the heavier land in Otago and Southland where weeds and weed grasses are a problem a mixture of 8 lb per acre of lucerne and 3 lb of cocksfoot plus 1 lb of Montgomery red clover and 1 lb of N.Z. white clover, sown in alternate rows, is recommended.

ACKNOWLEDGMENTS

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REFERENCE

Bevin, R. H. 1949: Special Purpose Pastures on Light Land. Proc. 11th Conf. N.Z. Grassld Assn. 205–214.

DISCUSSION

Comments: (C. Iversen): Speaking of Canterbury experience considered: (I) Mixtures of lucerne and cocksfoot produced hay of inferior quality to that of lucerne alone, so that in the lnvermay trials where the lucerne contributions to the mixtures were lower than from the grass components, the hay was likely to be inferior also. Furthermore at Lincoln, yields of up to 17,000 lb D.M. per acre had been obtained from lucerne alone under grazing, a figure apparently not reached at Invermay. (2) That on wetter land, less aggressive companion species than cocksfoot, e.g.. timothy and meadow fescue, would be more suitable since they would allow higher lucerne yields to be attained. (3) That alternate row sowings were not advantageous over mixed sowings in Canterbury.

A. Invermay experience had been that the quality of lucerne and cocksfoot hay had not been quite as good as for lucerne hay, but was superior to poorly made lucerne hay, dried more easily, and was easier to make. Regarding yields, production from lucerne alone had been

consistently lower than from good grass pastures which yielded 12,000–16,000 lb D.M. in good years. Lucerne alone had given about 7,000-8,000 lb D.M. in the first year and from 10,000–13,000 lb D.M. in the second. Four-year-old stands of lucerne and (lucerne + cocksfoot) had produced about 12,000 and 14,000 lb D.M. respectively.

Concerning lucerne-meadow fescue and lucerne-timothy mixtures, he had observed that they yielded well during the first two years, and gave greater bulk of silage at the early spring cut in particular, than did the other mixtures. Alternate row sowings were higher yielding but tended to weediness after the first year, when *Poa annua* and *Poa trivialis* invaded strongly. This problem was much less serious with lucerne plus cocksfoot in alternate rows.

Q. (A. Harris): What experience have you had at Invermay with the use of Dalapon to control grassy weeds in lucerne?

A. Little to date, although Mr Meeklah had demonstrated that late wintet applications affected the lucerne less than did autumn treatments, which tended to open up the sward and allow ingress of Poa species. With lucerne-grass mixtures the problem had not arisen, so that spraying had been unnecessary.

Q. (S. Stockdill): What are the advantages of lucerne + grass mixtures over good grass pastures if the latter are more productive?

A. The advantages are the two or three hay cuts obtained from the lucerne + grass mixtures. Invermay management had been to graze in August-September only and to take the first hay cut in December, a little later than for pure lucerne. However, November is usually the wettest month at Invermay and lucerne hay made then is often not as good as lucerne plus cocksfoot hay made in December.

Q. (P. D. Sears): Were allowances made in the experiments discussed for the constant depletion of nutrients by repeated haying of the stands?

A. All trial areas were regularly topdressed with phosphate, lime, and potash as required.