

## ESTABLISHMENT OF UNDERSOWN LUCERNE IN SOUTHERN NSW

M. R. Norton and E. A. Koetz

NSW Agriculture, Wagga Wagga Agricultural Institute, PMB, Wagga Wagga, NSW, 2650.

### Abstract

Experiments to study lucerne establishment under barley cover crops were undertaken at Ardlethan, Barellan and Merriwagga in 1996/97. Rainfall received during the period of barley growth approached the mean while post cover-crop rainfall was considerably below average. At all sites lucerne density was highest when sown without a cover crop. Reduction of barley sowing rates produced an adequate lucerne population at Barellan but not at the other sites.

*Keywords cover-cropping, pasture establishment, nurse-cropping, companion-cropping*

Cover cropping is a compromise method of pasture establishment used primarily for economic reasons and results are often inferior to those observed where the pasture is sown alone. This may be related to several factors, although it is considered that lucerne establishment will fail one year in three solely because of dry conditions (B. Scott and J. Virgona, *pers. comm.*). Negative associations have been demonstrated between cereal cover crop sowing rate and legume pasture density, particularly where competition for water was a probable contributing factor (1). Therefore, reducing cover crop sowing rates might assist in producing an acceptable lucerne population in water-limiting environments. To improve understanding of these factors experiments were conducted in 1996/97 at 3 sites ranging from the most favoured environment at Ardlethan (34° 22'S, 146° 54'E; 484 mm annual average rainfall (aar)), through Barellan (34° 17'S, 146° 34'E; 442 mm aar), to the least favoured at Merriwagga (33° 49'S, 145° 37'E; 384 mm aar).

Commercial crops sown by local farmers were studied. Sowing at Ardlethan, Barellan and Merriwagga occurred on May 16, June 27 and June 28, 1996, respectively. At Ardlethan, barley (*Hordeum vulgare* L.) was sown to cultivar (cv.) Skiff at 32 kg/ha, with lucerne (*Medicago sativa* L.) cv. L52 undersown at 1.25 kg/ha. At Barellan, barley cv. Schooner was sown at 25 kg/ha with lucerne cv. Aurora sown at 1.5 kg/ha. At Merriwagga, Schooner barley was sown at 39 kg/ha and undersown with Aurora lucerne at 0.56 kg/ha. At all sites lucerne was sown onto the soil surface. Shallow soil coverage was attained using 50% of the harrow implement width at Barellan, by depositing 10 cm. behind the harrow at Merriwagga or by using steel mesh at Ardlethan.

Three barley population treatments were developed at each site by use of the herbicide Fusilade? . The population manipulation occurred prior to tillering of the barley. The first treatment removed all barley plants, the second attempted to halve the population and the third treatment did not alter the population. All trials were arranged in randomized complete block designs with 6 replications. Observations of lucerne density were made on 4 occasions with the final time being after break-of-season rains in May 1997. The plant density attained by this date represented the established pasture.

### Results and Discussion

Rainfall between 1 May and 31 October 1996, and 1 November 1996 and 30 April 1997 was 274 and 104 mm respectively, for Ardlethan, 230 and 144 mm for Barellan and 207 and 104 mm for Merriwagga. By comparison the mean rainfall for these periods is 254 and 237 mm for Ardlethan, 233 and 209 mm for Barellan and 197 and 187 mm for Merriwagga. Differences in lucerne density between the different barley populations were only apparent after the end of a summer (March) of below average rainfall (Table 1). By May 1997 these contrasts had further developed at Barellan where the B73 treatment had a significantly higher lucerne density than the B148. However, at both Ardlethan and Merriwagga, the only significant difference in lucerne density was between sowing with and without cover crops. While lucerne densities

without a cover crop at Ardlethan and Merriwagga were satisfactory, those established under cover cropping were inadequate for a dryland lucerne pasture.

Table 1. The effect of barley population on lucerne plant density and barley grain yield in cover-cropping trials at Ardlethan, Barellan and Merriwagga, NSW, in 1996/97.

?	Barley	Lucerne density (plants/sq.m) <sup>1</sup>				Barley grain yield <sup>2?</sup> kg/ha
		3 Oct. 1996	25 Nov. 1996	18 Mar. 1997	16 May 1997	
Site	density plants/sq.m					
Ardlethan	(B) 0	24 <sup>a</sup>	40 <sup>a</sup>	39 <sup>a</sup>	40 <sup>a</sup>	0
	(B) 37	21 <sup>a</sup>	26 <sup>a</sup>	4 <sup>b</sup>	4 <sup>b</sup>	2420
	(B) 50	11 <sup>a</sup>	13 <sup>a</sup>	9 <sup>b</sup>	9 <sup>b</sup>	3800
?	?	18 Sep. 1996	22 Nov. 1996	17 Mar. 1997	9 May 1997	?
Barellan	(B) 0	70 <sup>a</sup>	93 <sup>a</sup>	75 <sup>a</sup>	66 <sup>a</sup>	0
	(B) 73	77 <sup>a</sup>	78 <sup>a</sup>	37 <sup>b</sup>	34 <sup>b</sup>	2197
	(B)148	68 <sup>a</sup>	67 <sup>a</sup>	17 <sup>b</sup>	15 <sup>c</sup>	2750
?	?	20 Sep. 1996	21 Nov. 1996	18 Mar. 1997	9 May 1997	?
Merriwagga	(B) 0	63 <sup>a</sup>	26 <sup>a</sup>	29 <sup>a</sup>	26 <sup>a</sup>	0
	(B) 39	51 <sup>a</sup>	28 <sup>a</sup>	19 <sup>b</sup>	13 <sup>b</sup>	1163
	(B) 67	48 <sup>a</sup>	40 <sup>a</sup>	11 <sup>b</sup>	7 <sup>b</sup>	1373

<sup>1</sup> Each date/site observation combination analysed individually. Values with same superscript not significantly different (P = 0.05).

<sup>2</sup> Not analyzed

At Ardlethan the low rainfall between sowing and the 22nd of June, did not inhibit emergence of the deeper sown barley, but delayed emergence of lucerne until late June. This gave a competitive advantage to the barley from which the lucerne apparently was unable to recover. At Barellan the crops were sown later and both barley and lucerne had favourable moisture during emergence and subsequent early development. At this site the lucerne density established without cover cropping (66 plants/m<sup>2</sup>) would be expected to decline as this population was high and would be unlikely to be sustained in this environment. The lucerne density achieved in the B73 treatment (34 plants/m<sup>2</sup>), while significantly lower was probably more sustainable. However at the highest barley density, the lucerne population was marginal.

## Conclusions

Reduction of barley sowing rates at Barellan produced a satisfactory lucerne density. The failure of lucerne establishment at Ardlethan under cover crops confirms that lucerne should experience as few

setbacks as possible during early growth, while at Merriwagga it highlights the increased risk of establishment failure in a drier environment.

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#### References

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