

## Annual rates of N<sub>2</sub> fixation by pasture legumes on the central plateau of Tasmania

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The success of any sown pasture depends largely on the use of a suitable legume as a source of nitrogen. An extensive field study has been undertaken to assess the annual rate of N<sub>2</sub> fixation by two pasture legumes on the Central Plateau of Tasmania.

### Method

An *in situ* acetylene reduction (AR) assay (1) and <sup>15</sup>N dilution technique (2, 3) were used to estimate N<sub>2</sub> fixation rates of two temperate pasture legumes, Caucasian clover (*Trifolium ambiguum* M. Bleb) and white clover (*T. repens* L.). growing in association with grasses at two locations on the Central Plateau of Tasmania.

The <sup>15</sup>N dilution technique provided a means of calibrating the AR assay and the resulting ratios of C<sub>2</sub>H<sub>2</sub> reduced to N<sub>2</sub> fixed were used to convert monthly estimates of nitrogenase activity to actual rates of N<sub>2</sub> fixation. By using this approach it has been possible to determine annual rates of N<sub>2</sub> fixation.

### Results and Discussion

The majority of N<sub>2</sub> fixation was found to occur during periods of active growth from October through to January (Table 1). Factors such as low soil moisture in late summer and autumn and low temperatures (<5°C) over the winter months, severely limited N<sub>2</sub> fixation outside this period.

**Table 1: Estimates of N<sub>2</sub> fixation by *T. ambiguum* and *T. repens* at two Sites on the Central Plateau of Tasmania (kg N/ha).**

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
SITE 1 Alt. 1035M													
<i>T. ambiguum</i>	20	2	20	12	6	0	0	0	0	20	81	72	223
<i>T. repens</i>	9	1	9	1	1	1	1	1	4	23	57	30	138
SITE 2 Alt. 900M													
<i>T. repens</i>	12	3	6	11	5	2	3	3	11	54	65	37	212

Caucasian clover, which was only present at site 1 fixed considerably more N<sub>2</sub> than white clover at this site, despite having an extended period of winter dormancy. More N<sub>2</sub> was fixed by white clover at site 2 than at site 1, which was consistent with the slightly more favourable climatic conditions at site 2.

These estimates of N<sub>2</sub> fixation compared favourably with other reported estimates for temperate pasture legumes growing in similar climatic regions (2, 4, 5). It was concluded that rates of N<sub>2</sub> fixation in the range of 138 to 233 kg/N/ha/yr should be sufficient to maintain a productive permanent pasture not only on the Central Plateau of Tasmania but in most temperate regions of Australia where extensive methods of agriculture are practised.

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