Nitrogen fertiliser response on new and old Perennial Ryegrass cultivars
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Nitrogen (N) fertiliser is an important input in perennial ryegrass (*Lolium perenne L.*) systems for both economic and environmental reasons. A large body of perennial ryegrass N response data contributes to current recommendations used by farmer to make N fertiliser use decisions, but owing to when the experiments were completed, the responses used to derive recommendations are for now outclassed cultivars. Might modern perennial ryegrass have different response functions and as a consequence, different profit maximising N rates?
Eight perennial ryegrass cultivars ranging from those which contribute predominantly to historical recommendations (Victorian Perennial Ryegrass and Kangaroo Valley ecotypes), European and contemporary commercial cultivars to an experimental cultivar (potentially available to producers in the 2020's) were used in this experiment. Each cultivar was tested at 5 N rates; 0, 20, 40, 80 and 160kg N/ha per harvest. While data collection will continue for another year, initial results are very promising and suggest producers might benefit from N use recommendations being updated to reflect the performance of modern cultivars.

Examples of our findings include:

- in winter N responses of the best modern cultivars almost doubles those on which current recommendations are based;
- in late spring N response of some modern cultivars was described by steep linear functions as opposed to functions with diminishing return for all old cultivars; and
- in autumn under irrigation N responses ranged from as low as 6.3 kgDM/kgN for Victorian Perennial Ryegrass to between 15 and 25 kgDM/kgN for high performance modern cultivars.

Before recommendations can be made to farmers more work is needed to determine the repeatability of responses and their exact shape, however the following is clear so far:

- farmers using low rates of N fertiliser can benefit from improved growth of modern elite perennial ryegrass cultivars as they grow more than old cultivars under N limiting conditions;
- farmers using moderate rates of N on old cultivars can significantly reduce their cost of feed by changing to new elite cultivar; and
- farmers already using modern elite cultivars and moderate rates on N can likely purchase additional feed at a low cost by using more N as modern elite modern cultivars respond so well to N fertiliser in some seasons.

We conclude that for producer profits to be maximised, N use recommendations may need updating to reflect contemporary cultivar performance. Collection and analysis of more data is required to determine if cultivar specific responses exist and should be reflected in N use recommendations.

In addition, for this trial and its results to actually benefit farmers, a robust and independent cultivar evaluation scheme like the PVTN and PTN is required so producers can know the likely performance of the cultivar they choose to sow.