

Benefits from this research

Broad adaptation in the northern hemisphere and competitiveness with introduced perennial grasses indicate that, in Australia, the potential zone of adaptation of the birdsfoot trefoil could be as much as 16 million hectares.

The NSW component of this zone is characterised by acidic soils, soil fertility decline, dryland salinity recharge status and lack of adapted perennial legumes – all factors that threaten sustainability of the grazing industries. Desk-top analysis indicates that a realistic goal for birdsfoot trefoil in NSW is some 5 Mha in the tablelands and slopes where mean annual rainfall is in the range 650-1000 mm.

Improved cultivars of birdsfoot trefoil will contribute a new perennial legume to Australian agriculture and provide a deep-rooted pasture type adapted to low fertility acidic conditions. Farmers in recharge landscapes where soils are too infertile for white clover, or too acidic for lucerne, will have a bloat-safe perennial legume that can exploit summer rainfall conditions, help rehabilitate soil fertility, and reduce recharge into groundwater.

Core research sites

The project is undertaken at NSW Agriculture's 'Centre for Perennial Grazing Systems' at Glen Innes in northern NSW, using the research station's germplasm conservation facilities, glasshouses and nursery complex.

- Dr John Ayres and Mrs Leah Lane (NSW Agriculture) are characterising, merit testing and seed increasing the experimental varieties.
- Dr Walter Kelman (CSIRO Plant Industry) is contributing germplasm and estimating genetic statistics.

Restoring the balance

To provide a range of woody and herbacious perennials to develop sustainable new land use systems.

NEW AND IMPROVED PLANT SPECIES



SP5 New and improved legumes, grasses and crops

Development of birdsfoot trefoil cultivars for permanent pastures in the northern recharge zone

Legumes contribute greatly to the productive capacity of pastures, fixing soil nitrogen that improves the vigour of companion grasses and providing **high value feed** for grazing animals.

Tap-rooted perennial legumes, such as birdsfoot trefoil, offer the potential to **improve productivity and reduce deep drainage** into groundwater systems.



Linkages with related CRC projects

Subprogram 5

- National field evaluation and selection of pasture plants
- Developing new *Lotus* species for southern Australia
- Seed harvest improvement in *Lotus* spp.



To find out more about Birdfoot trefoil for the northern recharge zone contact:

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New and improved legumes, grasses and crops
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Birdsfoot trefoil for the northern recharge zone

Birdsfoot trefoil (*Lotus corniculatus*), a warm season tap-rooted perennial legume is adapted to low fertility acidic soils and will **reduce recharge in high rainfall upper catchments** in the Murray-Darling Basin of eastern Australia.

The project will produce new cultivars adapted to low latitude/high rainfall recharge environments, by:

- developing three experimental varieties of birdsfoot trefoil by 2005
- testing to quantify the genetic improvement
- producing a 'technology package' to support commercialisation.



These new varieties will include prostrate, semi-prostrate and semi-erect types for different management systems, all with more prolific flowering and high seedling recruitment capability, thereby enhancing adaptation and persistence.

Definitions

Germplasm – the array of genes available to the breeder during a plant breeding program

Polycrossing – where plant populations are created by the use of several parents simultaneously

Genotype – the genetic description of an individual.

The research challenge

Birdsfoot trefoil has not been widely used commercially in Australia despite it being a mainstream pasture legume in comparable environments elsewhere in the world. We lack well adapted cultivars, and until recently a suitable commercial inoculant.

Birdsfoot trefoil is a long day-length plant, with current imported cultivars requiring approximately 16 hours photo-period for full expression of flowering, seedbank development, seedling recruitment and persistence. With a maximum day-length in northern NSW of only about 14 h, overseas cultivars flower sparsely and produce few seeds and seedlings. Also, experience in the US shows that widespread adoption of birdsfoot trefoil can be accompanied by increased susceptibility to fungal diseases, so seedling recruitment is essential for maintaining population density.

Long term persistence of birdsfoot trefoil therefore requires new cultivars adapted to shorter day-length conditions.

KEY RESEARCHERS

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How is the research being done?

Research in eastern Australia has defined the prospective zone of adaptation of birdsfoot trefoil, characterised a working collection of accessions and selected suitable germplasm capable of prolific flowering. From this germplasm and from crossing and selection work, the researchers have developed three elite breeding lines.

Plant breeders in the CRC are now progressing these breeding lines to experimental variety status, and are on track to complete this by 2005.

The project comprises three conventional breeding strategies:

- selection within a narrow germplasm base
- selection within a broad germplasm base
- recombination and selection.

Selected genotypes have been polycrossed to form breeding lines that are currently being characterised and tested, and seed increased to provide breeder seed for commercialisation.

Preliminary data comparing the seed yield components of the selected genotypes against an unselected population indicate large genetic gain and high heritability of key characteristics.