

# Potential to reduce nitrogen costs

**A**n important part of the equation in Australian grain growers' declining terms of trade in recent seasons has been the rising price of fertiliser.

Many soils in our cropping regions are limited by nutrient deficiencies, so nitrogen fertiliser is usually an inescapable cost component in farming budgets.

Of course, there are alternatives to applying a lot of nitrogen. Legumes play a critical role in cereal rotations by providing disease and pest breaks to cereal crops but also by returning nitrogen to the soil, and one of the most effective legumes for this purpose is vetch.

Rade Matic, who leads the vetch breeding program at the South Australian Research and Development Institute (SARDI), says trials across five sites over three years had shown an average increase in soil mineral nitrogen (as reported in commercial soil tests) in the 0–10 cm soil layer of 17 kg per hectare after a vetch grain crop.

From two sites over two years, there was an average increase of 30 kg per hectare after vetch hay production and a substan-

tial 51 kg per hectare average increase following green manuring. At current prices for urea, these nitrogen inputs would be worth approximately \$33, \$59 and \$100 per hectare respectively and they only represent a tip of the iceberg – there could easily be twice as much more nitrogen from the vetch in the deeper layers of the soil profile (10–60 cm).

It doesn't stop there. Field trials conducted by CSIRO Plant Industry at Narrabri in New South Wales on vetch in cotton rotations found that vetch's ability to fix nitrogen exceeded all other legumes in the trials, including field peas, faba beans, clovers and medics.

Vetch commonly fixed up to 200 kg per hectare of atmospheric nitrogen in the trials, and there were several other notable outcomes. Soil organic matter in cotton fields with vetch in the rotation increased by 14 per cent and subsequently, cotton grown after vetch showed improvement in its uptake of key nutrients including nitrogen, phosphorus and beneficial trace elements.

Soil structure was also improved, mak-

ing cultivation easier, as was the soil's water-holding capacity.

Demand for vetch appears to be increasing. According to Seedmark's Bryan Robertson, high nitrogen prices and difficulties with fertiliser supply have helped to create a great deal of recent interest in vetch among Australian growers.

Bryan says there has also been an increase in interest from European farmers for Australian vetch seed, which can fetch prices of \$1500–\$2000 per tonne for Australian growers. Again, European demand is being driven by high nitrogen fertiliser prices along with the recent fall in the Australian dollar.

## Rasina

The vetch breeding program at SARDI released the new variety Rasina late in 2006 to be marketed by PlantTech. Rasina was developed with support from growers and the Australian Government through the GRDC.

Rasina is a rust-resistant, ascochyta-...vi▷



**Vetch has the ability to offer substantial improvements in soil fertility, structure and organic matter.**

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resistant, soft-seeded vetch variety suited to low-medium rainfall areas of southern Australia. Trials prior to its release showed Rasina was superior to any other vetch in terms of grain yield, early establishment and dry matter production. It is also tolerant to shattering.

But another important quality of Rasina and other vetch varieties such as the high-rainfall Morava is their ability to offer substantial improvements in soil fertility, structure and organic matter. Further varieties being developed in the GRDC program will be targeted at grain production in lower rainfall cropping areas (a variety which matures earlier than Rasina) as well as a replacement for Morava.

One of the difficulties in using legumes to replace nitrogen and deliver other benefits has been the relatively poor yields associated with growing them in low-rainfall areas which dominate much of the Australian southern cropping belt.

But with Rasina, growers now have access to a versatile vetch variety which is better suited to low-rainfall environments and which has considerable capacity to reduce their reliance on nitrogen fertiliser. Further funding from SA Grains Industry Fund (SAGIT) aims to assess and develop new vetch (*Vicia*) species for forage and grazing in low-rainfall environments. ■



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## Pearl lupin shines

It may only be a few years before Australians are consuming a high protein, semi-domesticated grain eaten by the Incas a thousand years ago.

Pearl lupin (*Lupinus mutabilis*), a nitrogen-fixing legume very high in oil and originally from the Andes in South America, is to be developed for medium to high rainfall zones of Australia.

Its name derives from the appearance of the lustrous, spherical, pearl-white seeds.

A three year GRDC-funded project, involving the Centre for Legumes in Mediterranean Agriculture (CLIMA) at The University of Western Australia (UWA) and the Department of Agriculture and Food WA (DAFWA), will focus on increasing grain yield and improving adaptation, with the ultimate aim being commercial release of a new variety.

It builds on previous GRDC supported work on preliminary breeding, agronomics and germplasm evaluation by Jon Clements of CLIMA and Mark Sweetingham of DAFWA.

CLIMA Director, Professor William Erskine, says Australian farmers presently grow narrow-leaved lupin as a nitrogen-fixing crop in broadacre farming rotations.

"But broad-leaved pearl lupins are unique among crop lupins because the seed quality is similar to soybean and it could become the cool season equivalent of that crop.

"Pearl lupins have the unusual combination for a legume of high protein, at up to

47 per cent and high oil at up to 18 per cent. A thin seed coat is an added bonus as it increases grain value and seed can be more readily dehulled," he said.

Pearl lupins also had a good profile of amino acids relative to other legumes, lysine levels are similar to soybean and the oil has high oleic and linoleic acid.

"Traditionally eaten as a porridge with maize or quinoa, pearl lupins have potential for modern human diets in bread, sausages, cakes and yoghurt – in fact any food that soybean is currently used for," William said.

"Their value for inclusion in fish and pig feed rations will also be assessed."

CLIMA's Jon Clements will conduct the breeding work in partnership with project supervisor, DAFWA Senior Lupin Breeder, Bevan Buirchell.

"Rapid breeding cycles, combined with genotype by environment and germplasm characterisation and evaluation studies, will help us develop domesticated material with improved agronomic and disease resistance traits," Bevan said.

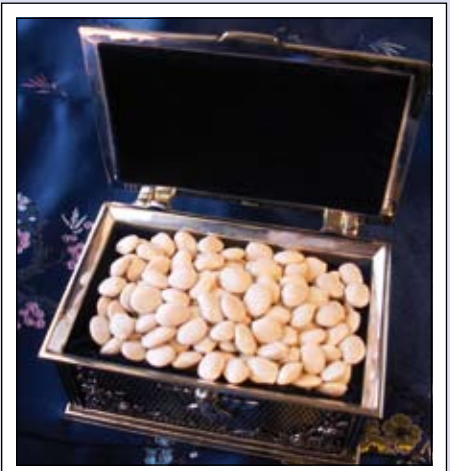
According to Jon, the critical factors are yield and adaptation and therefore the project would evaluate lines in medium to higher rainfall regions in Western Australia and New South Wales.

"Transferring the high oil and protein characters from pearl lupin to narrow leaved lupin (*L. angustifolius*) would be particularly valuable, if possible," Jon said.

The group, assisted by CLIMA's Gordon Francis, John Quealy and Larissa Prilyuk, will also assess closely related South American species for possible trait transfer into the pearl lupin gene pool. ■



Assessing pearl lupins at UWA's Shenton Park Field Station are (L to R) Gordon Francis, Technical Officer, CLIMA, Dr Jon Clements, Research Fellow, CLIMA, Dr Bevan Buirchell, Senior Lupin Breeder, DAFWA and Michael Blair, Manager, Field Station.



Pearl lupins through the camera lens.