



LEFT: Perennial wheat could offer substantial benefits for mixed enterprise farmers who use it as a dual purpose grain and graze crop. (Photo: C Nicholls)

# Putting perennial wheat to the test

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Initial importations of perennial wheat germplasm from the United States and Argentina are now being put through rigorous quarantine procedures before trials to determine its potential under Australian conditions can start.

With soaring fuel, fertiliser and herbicide prices and recent highly variable seasons researchers are stepping up investigations into the potential of perennial wheat.

## Background investigations

According to Dr Philip Larkin from CSIRO, there has been an interest in perennial wheat in Australia for some time.

"Initial investigations were carried out by researchers Len Wade, Mike Ewing and Lindsay Bell, under the former CRC Salinity, into the potential uses and ecological and agronomic value of a truly perennial cereal grain crop," Dr Larkin said. "The conclusion was that high potential returns were possible under Australian conditions, despite some uncertainties."

"The most obvious benefits of perennial wheat are reduced cropping inputs and soil erosion and increased farm and soil biodiversity and carbon sequestration.

"The deeper root system of perennial wheat will also reduce waterlogging, sub-soil acidification, groundwater recharge and subsequent dryland salinity. Deeper roots are also more resilient to climatic variation and so reduce seasonal risk.

"The greatest economic potential is undoubtedly for mixed farmers who use the perennial wheat as a dual purpose grain and graze crop, as it offers good quality stubble during summer and a rapid source of forage when the season breaks."

## A few challenges

However, commercial production of perennial wheat faces a number of challenges.

"The single greatest risk to the concept of perennial wheat is disease," Dr Larkin said. "We must be cautious in introducing a perennial crop with the same disease spectrum as annual wheat, as this increases the opportunity for diseases such as rust to overcome current resistance in annual wheat varieties."

But working in its favour is the fact that perennial wheat will need to have strong summer dormancy to be successful in an Australian cropping situation. This will mean there is no 'green bridge' to incubate leaf diseases, although there will still be the potential for crown and root diseases to carry over. For this reason Dr Larkin favours the development of perennial wheats as stable hybrids between wheat and wheatgrasses, in much the same way as triticale is a stable hybrid between wheat and rye. This will make the acquisition of perenniality easier and facilitate the deployment of the strong disease resistances associated with wheatgrass.

Little is currently known about the likely grain yield and quality of perennial wheat. While it may not be bread quality initially, long-term breeding programs should be able to increase yield and quality, especially given the longer growing season and deeper root system of perennial wheat. In the meantime it is likely the grain will make excellent animal feed.

## Overseas experience

The germplasm imported into Australia from the US was the result of trials during the past decades at the Land Institute in Kansas and Washington State University. The trials aimed to transfer perenniality to wheat from *Thinopyrum* or *Agropyron* groups of wheat grasses. Due to crossing two different grass species, the resulting material including the imported germplasm is still genetically variable. But US field trials of the perennial wheat have been promising although there is no commercial production as yet.

"The ability of the wheat to become dormant over summer will be crucial in Australia so this will be a major aspect of the field studies and selection criteria for our research," according to Dr Larkin. "The germplasm developed in Washington State is likely to have been selected for winter survival, so the Kansas Land Institute germplasm may be more relevant for us as winter survival is less important there. In this respect the Argentine material may prove to be very valuable for Australian research."

## Where to now?

Importers of the two sources of perennial wheat germplasm have agreed to work in collaboration to see which strains of the material will be most suitable for Australian production systems. But before any material is released from quarantine for use in plot and field trials, the issue of disease potential must be addressed.

"We hope soon to organise a workshop of experienced pathologists to examine the issues surrounding this aspect of the perennial wheat concept and work out the best approach to minimise or eliminate this risk," Dr Larkin said.

"Following this, the next step is to get the available germplasm into field plots at the Cowra Research Station for perenniality and summer dormancy evaluation. The root biomass of the best few lines will then be analysed to determine their genomic composition and resistance to rusts and the barley yellow dwarf virus." ↓

## More information

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