

Future crops may hinge on gene rescue



PHOTO: BRAD COLLIS

GRDC investment is helping to save important crop species in Central Asia – the birthplace of many grain crops – and forging research relationships that will have a long-term benefit for Australian growers, writes **Brad Collis**

■ Access to potentially vital genetic traits – including increased tolerance to extreme weather events and resistance to disease such as rusts – should be the pay-off for Australian growers' contribution to an international effort to conserve Central Asia's genetic resources.

The GRDC has been one of the first international crop research bodies to contribute to the new Global Crop Diversity Trust, recognising that access to germplasm in the region where many crops originated, particularly cereals and legumes, will have long-term value.

The Trust is an instrument of the International Treaty on Plant Genetic Resources for Food and Agriculture, established last year to try and arrest the alarming depletion of plant genetic resources.

The GRDC's contribution is A\$1.2 million a year for five years, part of which has been earmarked specifically for Central Asia and the Caucasus (CAC).

This is where valuable genetic resource collections in countries like Armenia, Turkmenistan and Kazakhstan are suffering severe deterioration.

An ICARDA-based Australian researcher, Dr Ken Street, who is playing a central role in administering the Trust's activities in CAC, says there is considerable genetic material in the region that would be of immediate relevance to the Australian grains sector.

He says this genetic resource includes seed from wild relatives, progenitors (more advanced relatives), landraces, and modern varieties developed under the former

USSR crop improvement programs.

"Despite Central Asia being the centre of origin for cereals, and in fact for most food grains, there is very little genetic material from here in Australian wheat genealogy," he explains.

"The genetic base of Australian wheat is comparatively narrow, coming from a Western European lineage. However, this is the obvious place to look for genes that can confer traits like frost and drought tolerance, and resistance to diseases such as stripe and yellow rust.

"In screening Central Asian material we have found resistance to all rusts – leaf, yellow and stripe – in many wild relatives and landraces."

Dr Street says Australian help in securing these resources puts representative bodies such as the GRDC in a prime position for ongoing access to genetic resources from the region. "The world is losing irreplaceable seed from these collections simply because the local people can't afford to replace water pumps, or stored seed is being eaten by mice. This is an absolute tragedy; doubly so because it is avoidable."

Dr Street says some of the initial GRDC funding is being used to secure the world heritage apple and horticultural collections in Turkmenistan and Kazakhstan.

"These fruit tree gene-banks are important to Australian horticulture, and although they are not grain collections, our support and involvement becomes important strategically in terms of our access to other collections."

He says that regional tensions and

politics are an ever-present backdrop, making relationships such as the one being built by GRDC important for long-term, mutual benefits.

"We are making a full inventory of seed collections throughout Central Asia, and building a database linked to all the host institutes.

"When it is finished, plant breeders in Australia will be able to hook into a central data hub and find out what genetic resources are available.

"It's a massive task, logistically and politically, because data sharing has traditionally been a 'no-no' among many countries. However, it also helps to rationalise genetic resources and eliminate duplication. The benefit to Australia is access to genes that could solve many current production constraints."

As part of the overall effort to either rebuild, or add to, gene banks in Central Asia, Dr Street has in recent years undertaken a number of cereal and legume seed collection expeditions, looking for ancient relatives or lost landraces growing in harsh conditions and which have obvious genetic strengths.

These expeditions, such as a recent mission in Armenia, are also used to set

up small genetic resource units which provide an opportunity to train and equip local expertise, and create an opportunity for young agricultural graduates to begin careers in genetic resource management. Some of this work has been funded by the Australian Centre for International Agricultural Research (ACIAR).

Dr Street says that while the diminution of crop genetic resources is a global issue, there is an opportunity to derive from Australia's participation some competitive advantages in its own trading arena.

"A three or four-year head start, for example, with a trait that gives us sustainable yields through periods of drought or episodes of frost, has enormous economic impact," he points out. "It is also putting genetic resources firmly on the research and political agenda and that alone is a significant achievement."

More reports page 23



GRDC Research Code ICA1

For more information:
Dr Ken Street, k.street@cgar.org;
The Global Crop Diversity Trust,
www.startwithseed.org/items/
homepage.php

International Treaty on Plant Genetic
Resources for Food and Agriculture,
www.uitk.org/ica2.htm

"THE WORLD IS LOSING IRREPLACEABLE SEED FROM THESE COLLECTIONS SIMPLY BECAUSE THE LOCAL PEOPLE CAN'T AFFORD TO REPLACE WATER PUMPS, OR STORED SEED IS BEING EATEN BY MICE. THIS IS AN ABSOLUTE TRAGEDY"
– DR KEN STREET