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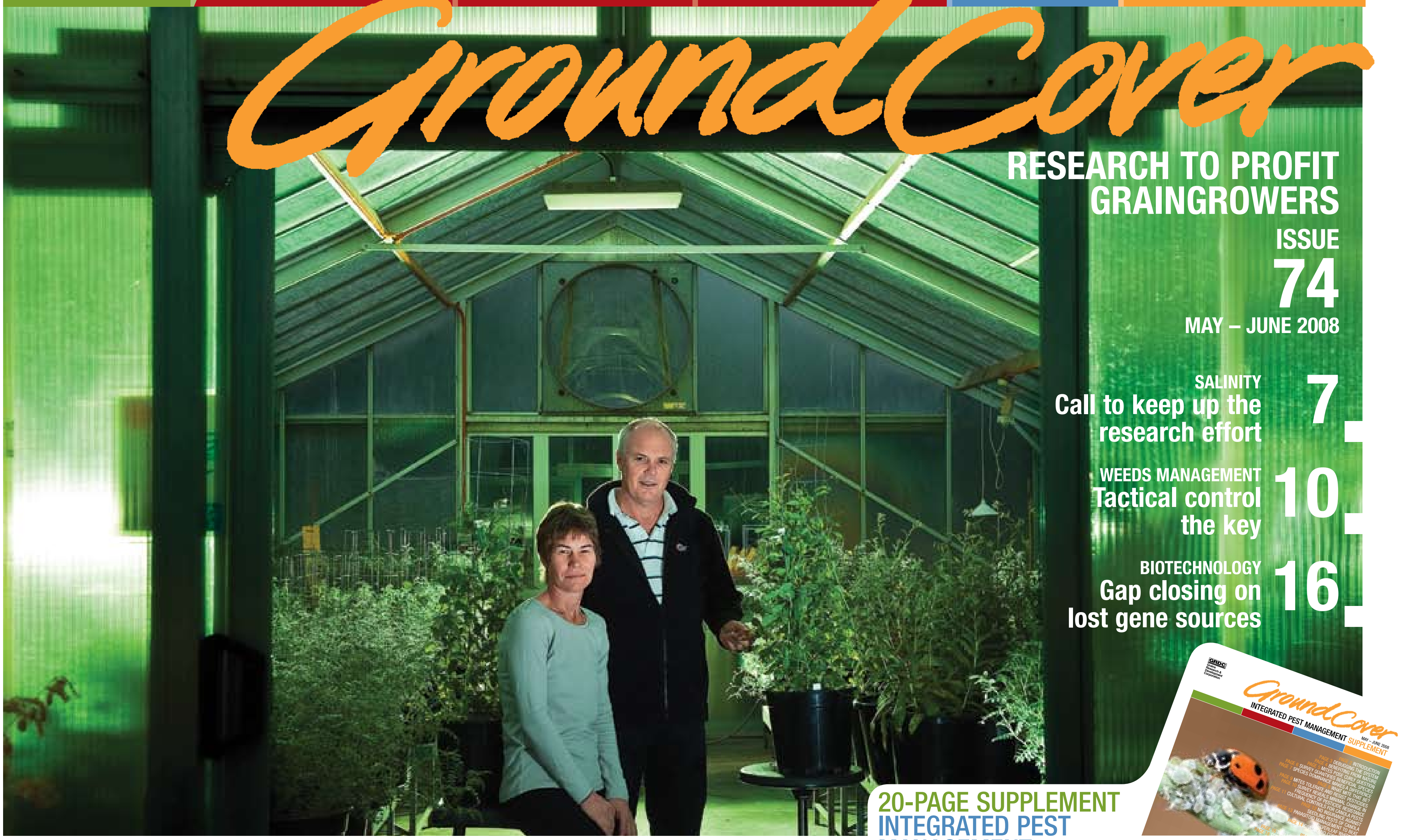

20-PAGE SUPPLEMENT INTEGRATED PEST MANAGEMENT

Dr Oonagh Byrne and Dr Darryl Hardie have successfully transferred traits from a wild to a domesticated legume species. PHOTO: EVAN COLLIS

Wild species to boost legumes' genetic diversity

WESTERN REGION

■ Pre-breeding legume researchers in WA have successfully transferred pea weevil resistance from a wild pea species to an early generation breeding line. The transfer of traits from relatives to a domesticated species is a significant scientific breakthrough in crop biotechnology, and is part of an international effort to broaden cultivated legumes' narrow gene pool by accessing the genetic diversity of wild species.

The transfer was made by Dr Oonagh Byrne, from the Centre for Legumes in Mediterranean Agriculture (CLIMA), and Dr Darryl Hardie, of the Department of Agriculture and Food, WA. They have sent their newly generated hybrids to Pulse Breeding Australia for further analysis.

While the breakthrough with field peas is commercially important in its own right, for CLIMA it amounts to just an early achievement in an ambitious R&D pipeline.

CLIMA is partnering with Canada and India to develop techniques to cross even more distantly related species in the quest for resistance to major pulse-production constraints, namely diseases such as ascochyta blight, and stresses such as frost.

Given the agronomic value of including a legume in Australia's crop rotation, the project stands to reduce crop-protection costs and improve the profitability of growing chickpeas, lupins and peas. The resistance to pea weevil alone stands to save growers up to $16 million in insecticide costs.

The main technical challenge facing researchers is the genetic distance between wild and cultivated species, especially chickpeas and lupins. The greater the genetic distance between parents, the less viable the hybrid progeny.

To compensate for this loss of viability, techniques are being developed to rescue embryos from the mother plant before the hybrid pod is aborted. That requirement is seeing CLIMA scientists growing and germinating hybrid embryos in 'test tubes' in their tissue culture facilities at the University of WA.

The pea project succeeded early because the wild and cultivated parents were not so distantly related and the resultant embryos needed less advanced survival procedures.

Researchers need to recruit traits from wild relatives because at this stage there are few non-GM alternatives for enhancing legumes.

Other traits that could be enhanced through techniques such as hybrid embryo rescue technology include frost and ascochyta blight resistance, lupin grains with higher protein content; and herbicide tolerance for pulses.

– Gio Braidotti

Special report: Pages 16 and 17

R&D THE KEY TO MITIGATING CLIMATE CHANGE IMPACTS

BY MELISSA MARINO

■ Australia's agricultural production, including grains, could fall by up to 10 per cent over the next two decades unless the effects of climate change can be offset, according to a comprehensive study by the Australian Bureau of Agricultural and Resource Economics (ABARE).

The ABARE report says this is greater than the forecast worldwide drop of two to six per cent. (Australia already has a lower average rainfall in its agricultural areas.)

ABARE Climate Change Analysis Branch head Dr Helal Ahammad points out that this means climate change is likely to affect Australian farmers – particularly the producers of grain, beef, dairy products and sugar – more than their competitors.

And if research and modified practices still fail to offset the projected global warming, Australian production of these commodities could decline by up to 19 per cent by 2050 – against a global fall of about 11 per cent.

The key to avoiding this scenario will be sustained research into reducing greenhouse gas emissions across the economy, and agricultural technologies that allow farmers to adjust their production systems.

The report, drawing on international and national research and ABARE modelling, says projected higher average temperatures and lower rainfall will be the main causes of reduced production in Australia.

The modelling predicts that wheat production across NSW, Victoria, South Australia and Western Australia will decline by 8.3 to 9.6 per cent by 2030, and 12 to 19 per cent by 2050.

Globally, the report says countries at lower latitudes, particularly developing nations, will be hardest hit, while mid to high-latitude countries are expected to experience only limited losses, and may even benefit from the atmospheric changes.

The critical factors underpinning the modelling are calculations that show mean surface air temperatures will increase from between 1.1˚C and 6.4˚C by the end of the century. Average Australian temperatures are tipped to increase by between 1˚C and 5˚C within 65 years, and by at least 1˚C by 2030 – enough to have significant biological effects.

For example, the report reveals that a temperature rise of just 1˚C relative to 1990 temperatures could result in a 4.2 per cent and 7.3 per cent decline in wheat productivity in NSW and WA respectively. An increase in temperature of 1˚C to 2˚C could see a 15 per cent decline in pasture productivity, while a 3˚C to 4˚C rise could see a 128 per cent increase in tick-related weight-loss in cattle.

Dr Ahammad says broadly there are two ways of dealing with climate change: emission abatement and adapting to change. Given the climate-change impacts are already locked in from existing accumulated

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