



# Molecular Plant Breeding CRC

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Newsletter of the Molecular Plant Breeding CRC JULY 2010

### From the CEO

**Welcome to the final edition of On the Mark.**

As the MPBCRC draws to a close, I am pleased with the commitment by our management team, researchers and partners into making sure the centre finishes on the same high that we've endured for seven years.

It has been a very busy 2010 and we have made some significant in-roads with our research programs and ongoing successes with our community and student/teacher education programs.



For the first time, our award-winning 'Get into Genes' program has gone off-shore to facilitate workshops with teachers in regional Malaysia. The idea for this cross-cultural exchange came from a meeting with a high level biotech trade delegation from Malaysia which visited us last year and was very impressed with our Education and Training Program.

Taking *Get into Genes* into Malaysia has been very beneficial and the start of what is likely to be a long-standing and fruitful exchange of teaching and learning practices and ideas (see update in this issue).

Finalising programs and reviewing our outputs has taken a strong focus over the past few months. We will be releasing the final Economic Impact Analysis Report on the CRC's research programs shortly. This has been a challenging project, as so many of the programs are still in development and due to the nature of innovation, there are long development pathways and many hurdles towards commercialisation. Our analysis has taken into account assumptions about these factors and we believe that based on conservative estimates the MPBCRC can be very proud of its achievements. There are benefits arising for the broader understanding of plant breeding, as well as the future opportunities and tools that will become available for the farming community.

All of our programs have long-standing visions and the overall benefit is not just for farming communities, but also for consumers/community, Australia's economy and the environment.

I am pleased that many of our programs are taking up new homes with our partner organisations and affiliates and will be in good hands to follow through these developmental pathways.

**Post MPBCRC – where to?**

Not surprisingly, many of our talented management team have found new jobs to go to after MPB. Ian Christensen, our Chief Operating Officer, has gone to a similar role at the Auto CRC. Vicki Kokolakis, our Finance Manager, is working part-time at AGT Pty. Ltd. and will move into a full-time role there on October 1. Melanie Carew, our Communications Manager has taken up a similar role at the Oral Health CRC and is consulting back to us to help with the wind-up. William Lancaster, our IP and Contracts Manager, has gone into an in-house lawyer role at CSIRO. Nora Veljanovski, our Executive Assistant, will be taking up a similar role in the Dairy Futures CRC starting October 1. Heather Bray, our Education and Training Program Manager has taken up an education-focused role at the University of Adelaide and starts there in July. I am delighted that organisations outside of the CRC have recognised what we have all known for many years – that this is a team of highly competent managers who achieve great results.

It has been an absolute pleasure to be involved in the MPBCRC over the years and work with such a diversity of people. I particularly wish to thank the very hard working management team, researchers and our commercial partners who have contributed so much to the CRC's success. Thank you for your support.

**Glenn Tong**

**Understanding Biotechnology for Women Farmers**

Women farmers are strong decision-makers on the farm, yet when it comes to workshops and committees, they are under-represented. Recognising the need to provide women with more opportunities to learn and access the right information on innovative technologies, the MPBCRC recently held a series of workshops focused on recognising the role of women farmers in decision making.

The series of workshops provided women with insights into the science behind the future of Australia's farming and included presentations from researchers. The workshops were held in regions of WA, SA and Victoria.

The 'hands-on' and interactive workshops included an exercise to extract DNA from plant material. The workshops are an excellent way for women to ask questions, and held a strong focus on two-way discussions.

A survey completed after the workshops outlined the needs and concerns of women farmers. This information is to inform researchers, plant breeders and science policy makers on views towards agricultural biotechnology.

Initial results suggest that the workshops helped to allay concerns some of the farmers held about the role of biotechnology in cropping. All indicated that they would like more information and education about the technologies. In particular, there was a high interest in drought tolerant varieties and potential solutions to this problem.

In the future, the workshops may be linked into other forums and conferences to help increase the ability for farmers to participate. It is likely that future workshops will also include men, as often decision-making is a joint process on the farm. The workshops were part of a grant from the Australian Government Department of Agriculture, Fisheries and Forestry through its Farming Future initiative. The workshops were free for participants.

### Reflections of the Education Program

Heather Bray

I was recently asked to present at the CRC Association Conference on "Reflections on an Education Program" which really brought home that MPBCRC is finishing and my work here is done. Looking back, there are some key areas within the Education and Training program of which MPBCRC can be proud.

We have attended an amazing number of community events and talked to a diverse range of people about our research and its applications. Get into Genes, our schools program run in conjunction with the Australian Centre for Plant Functional Genomics has had over 10,000 students and teachers participate in SA and Victoria. This is a remarkable achievement and Get into Genes will live on after MPBCRC has finished.

The other aspect of the Education program that we can be proud of is the Student Retreats for our postgraduate students. In addition to the skills obtained through workshops, it is the broader network and comradeship developed at the retreats that will continue long after MPBCRC.

But rather than just give my own opinion, I thought it was important for the program to speak for itself. However, I would like to say that I've really enjoyed working within the Education program for the last 7 years. It's been a great experience. Here's to MPBCRC and to all who've sailed in her!



Image: Gene Juice Bar at a Hamilton Field day.



Image: A teachers workshop in action.



Image: Ryegrass growing under lights



Image: Students at a Get into Genes workshop.



Students get to do hands on activities connected with genetic manipulation that we cannot do at our school.

The presenters this year were excellent, friendly motivated and clear communicators.

Image: Get into Genes materials.

### Feedback from Teachers and Students in the Program

"Enables students to see that what is taught in the classroom actually does occur in the real world."

"Spending time with other students, ability to have input at all times during the course. Built [my] confidence in general."

"The group areas [was my favourite], where people from all backgrounds group together and share problems, experiences and successful moments of their studentship."

"I think coming together for the student retreat really builds on making you feel a part of a more united group, which is great. The workshops are valuable in developing our skills to be more employable. Overall great on both the social and the personal development aspect."

"MPBCRC has also provided me with the opportunity for continual development of my public speaking skills through participation in Get into Genes and other community outreach sessions. Overall, MPBCRC and the education team have provided me with expansive and well rounded professional development opportunities which were not available to my fellow university postgrads."

### TAFE, Techniques and a Collaboration to Tackle the Loss of Crop Scientists

**Trained, professional plant scientists and crop breeders are in high demand to meet the unprecedented importance of food security and climate change. With an additional 90 plant scientists needed to fill the industry gap by 2020, the MPBCRC has developed a training techniques visual aid.**

In an Australian first, scientists from the MPBCRC, University of Adelaide and TAFE SA have collaborated to produce a commercial DVD to assist students.

The industry requires a huge surge in the training of plant scientists and breeders to maintain Australia's capacity and productivity of its crop agriculture. The majority of current scientists in the field are over 50 years of age and will retire over the next 15 years. This leads to industry estimates of an additional 90 plant scientists and 35 crop breeders being required by 2020, just to meet current levels.

Through its PhD training program, the MPBCRC will have supplied two-thirds of the demand for plant scientists and one third of breeders between 2010 and 2015. The DVD is another element of the training strategy.

There are also many associated industries whose growth depends on the successful acquisition and deployment of techniques described in the DVD. The visual aid covers the molecular techniques required, as well as skills and standard equipment found in molecular biology labs. It has a printable manual for use in the lab and troubleshooting hints as well as animation sequences and video. Topics include: nucleic acid extraction, polymerase chain reaction, restriction enzyme digests, gel electrophoresis, cDNA libraries and cloning, blotting of nucleic acids and an introduction to molecular markers.

The DVD will be used within TAFE SA programs such as the Diploma in Laboratory Technology (Biotechnology), as well as in the University of Adelaide's – Master of Biotechnology program and undergraduate programs, such as the Bachelor of Agricultural sciences.

The DVD was developed after a search found there was no easy one-resource guide for exploring how the technologies students were learning about related to the real world.

The DVD was launched in Adelaide on 11 May 2010. The 'Introduction to Molecular Technologies: Theory and Practice' DVD is commercially available from <http://www.moleculartechniques.com.au/>

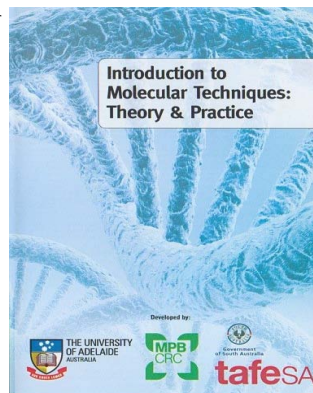


Image: Cover of the DVD



Image: Larry Keig from TAFE SA checking the monitor while Rebecca Fox from MPBCRC loads acrylamide gels  
(Photo: Heather Bray, MPBCRC)

### Get into Genes Program

#### Crossing cultures: Malaysian and Australian teachers 'share genes' to empower

Teachers in resource-poor provinces of Malaysia are learning the latest in molecular and food production technologies.

**A new type of cultural exchange, via the highly successful 'Get into Genes' science education program, is working in regional Malaysia to share insights into teaching science and biotechnology research.**

In May, Belinda Griffiths from MPBCRC facilitated a series of workshops for teachers. Participants learnt about relevant, real-world applications of gene technology to crop improvement in the face of climate change. They also gained first-hand experience with activities that they can take back to their classrooms.

The workshops were run at three Malaysian Universities, including the Universiti Malaysia Sarawak in Kuching, and at universities in Terengganu and Melaka.

Australian educators and students benefit too. This unique knowledge-exchange project, supported by Australia's Department of Innovation, Industry, Science and Research, will provide insight into the science learning experiences of one of Australia's closest neighbours.

"I have seen enormous benefits in terms of children's engagement and teachers' confidence in biotechnology through these workshops," said Belinda Griffiths, MPBCRC.

"It empowers teachers to understand the science behind the issues so that they can lead an informed and evidence-based debate in their classrooms," Ms Griffiths said.



Image: MPBCRC's Belinda Griffiths at a 'Get into Genes' workshop for students.



Image: Teachers learning at one of the Malaysian workshops.

The Malaysian Ministry of Education selected teachers to attend the workshop. Over sixty teachers will benefit from this initial program, covering areas such as plant breeding, biotechnology, DNA extraction, DNA fingerprinting and bioinformatics tools.

Dr Mahaletchmy Arujanan, Executive Director of the Malaysian Biotechnology Information Centre (MABIC), says that the workshops will be crucial to helping create a pool of knowledge workers to fuel the growing biotechnology industry in Malaysia.

The program has been highly successful in Australia, with over 10,000 students participating since 2004.

The 'Get into Genes' program is a joint initiative of the Molecular Plant Breeding CRC and the Australian Centre for Plant Functional Genomics, and is supported by La Trobe University. The program will continue under the new Dairy Futures CRC once the MPBCRC closes.

For further information, contact Belinda Griffiths: [Belinda.griffiths@molecularplantbreeding.com](mailto:Belinda.griffiths@molecularplantbreeding.com)

### Economic Impact Assessment

**As part of the MPBCRC's wind-up, the Board of Directors commissioned a cost-benefit analysis of the key activities and outcomes of the MPBCRC and their contribution to Australian agriculture.**

The MPBCRC made a significant contribution towards lifting agricultural productivity in Australia. The MPBCRC outputs are particularly timely as the world now faces considerable challenges to feed its growing population. Not only are the number of mouths increasing but urban expansion, climate variability, and rising costs of fuel and fertiliser, in combination with historically low levels of food reserves have significantly reduced global food security.

**MPBCRC has delivered significant insights and progress to advance the rate of crop and pasture breeding and the production of new varieties capable of addressing changing global needs.**

While the primary purpose of the analysis was to determine the economic impact of the CRCs programs, it also summarises the broader social, commercial and environmental benefits arising from the work. The MPBCRC's significant contribution to training agricultural researchers and educating the community about agricultural biotechnology were also highlighted. As many of the CRCs programs are still in progress, the analysis is based on pragmatic implementation scenarios that include an assessment of the probability of successful implementation.

The MPBCRC programs will provide benefits to Australian growers and producers in three ways:

- decreases in the costs of production,
- increases in output (yield),
- and decreases in operational variability, leading to increased profit.

While the report is limited to examining the impact of CRC outputs on the cereal and pasture industries in Australia, many of the technologies will be relevant in other countries and could earn additional royalty income for Australia.

Eight projects were selected as being representative of the whole CRC effort for the analysis.

#### Transgenic technologies

1. Drought tolerant wheat
2. High energy (high fructan) perennial ryegrass
3. High digestibility (low lignin) forages – temperate and tropical

#### Non transgenic technologies

4. Salt-tolerant wheat and barley germplasm
5. Genetic markers and breeding strategies
6. Molecular markers and pasture plant improvement

#### Education and training

7. Trained researchers
8. Community education



Image: Dairy cows enjoying ryegrass.

**Drought tolerant wheat**– delivery of 28 experimental transgenic wheat lines containing candidate genes for drought tolerance. Three field evaluations have been completed with yield improvements of 10-20% displayed. This program has the potential to deliver a substantial return on CRC investment.

**High energy (high fructan) perennial ryegrass**– field evaluation trials achieved consistently higher plant sugar levels than the best commercial cultivars. The first product is primarily for use by the dairy industry and is due to be ready for commercialisation in 2016. This is expected to deliver improved pasture quality, cow productivity and ultimately farm gate returns.

**High digestibility (low lignin) forages**– will be easier for animals to digest. In this way the plants will deliver higher unit food values which is expected to produce faster weight gain and lower animal methane emissions. Although still at experimental stage, the technology is being applied across a range of forage species and holds a solid cost-benefit advantage that will be of interest to beef and sheep producers across a number of climatic regions.

**Salt-tolerant germplasm**– With 83% of cropping land in Australia at risk of salinity, salt-tolerant varieties will be important to sustaining higher yields. The parts of the genomes of both wheat and barley that are associated with salt tolerance have been identified and markers associated with good performance have been found and trialled. Experimental salt tolerant germplasm appears to increase biomass by 10%.

**Genetic markers and breeding strategies**– are expected to make a substantial contribution to the rate of productivity growth in the cereal industry. Rate of technology uptake by the industry will impact the return on investment. The supporting systems of this program are used extensively by researchers and commercial breeders.

**Molecular markers and pasture plant improvement**– Pasture improvement has historically attracted less investment than cereals and yet is of major importance to livestock industries. Major opportunities exist for cultivar improvement and marker assisted breeding has the potential to substantially accelerate yield improvement and trait optimisation.

**Training researchers**- the MPBCRC has produced 43 graduates. Based on recent demographic analyses the MPBCRC training program is expected to supply two-thirds of the industry demand for plant scientists and one-third of the demand for breeders between 2010 and 2015.

**Community education programs**– A broad range of education programs have seen engagement with farmers, the metro-community, students and teachers. The risk of community rejection of biotechnologies has reduced substantially during the period of the CRCs community outreach activities. There are many factors contributing to community perceptions of the technologies, the MPBCRC programs have provided a contribution to this change in perception, with risk of rejection altering from 80% to 20%.

There are many benefits arising from the MPBCRCs programs. Some will result in new products, some in more productive processes and some in greater community understanding. Given the very long timeframes under which agricultural innovations operate, the benefits of the investment in MPBCRC will be delivered over the next two decades.

The economic analysis was conducted by John Madden of Arche Consulting with input from David Hudson of SGA Consulting on aspects relating to GM wheat and GM pastures.

The report will be made available as part of the CRC wind-up process in the third quarter of 2010.

**The final word**

*If you think you can, you can. And if you think you can't, you're right.*

- Henry Ford.

On the mark is produced quarterly. This will be the final newsletter of the MPBCRC.

**Contact**

Molecular Plant Breeding CRC  
 1 Park Drive, Bundoora Vic 3083  
 P: 03 9479 1698 F: 03 9479 5022  
 E: [mpb@molecularplantbreeding.com](mailto:mpb@molecularplantbreeding.com)  
 W: <http://www.molecularplantbreeding.com/>

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