

Cooperative Research Centre for National Plant Biosecurity

Annual Report 2010-11

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Cooperative Research Centres Program



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1 Executive summary

1.1 Achievements

Key highlights, awards and special commendations

CRCA Excellence in Innovation Award

A highlight for this reporting period was when our CRC was recognised for the groundbreaking research it has been undertaking, winning an Award for Excellence in Innovation for its Remote Microscope Network (RMN).

The award was presented by Professor Margaret Sheil – CEO of the Australian Research Council – at the annual CRC Association Conference Awards Dinner, which was held at the Brisbane Convention and Exhibition Centre on 18 May 2011.

The new RMN system, which links field officers with national and international experts, has enabled a dramatic speed-up in the identification of exotic insects and diseases which may pose a threat to crops and the environment in Australia.

The RMN is used in conjunction with the Plant Biosecurity Toolbox™ (PBT), which includes high quality images as well as information about the distribution. Together they enable field officers to identify pests quickly and accurately, and respond to any threats. This could save millions of dollars in eradication costs and lost market access for Australian producers.

The project pioneers the use of existing technologies to develop a new and innovative approach to diagnostics for the plant health community.

Corporate Publication

This reporting period saw the development and publication of our new corporate publication, *Plant Biosecurity – collaborative research initiatives*. The publication, which contains 69 articles, is a great showcase of the diversity of research undertaken within the CRC and illustrates the benefit provided to our end-users. It highlights the accomplishments of projects from our research portfolio over the preceding five years as well as our education and training activities.

Plant Biosecurity Program

This postgraduate study in plant biosecurity, consisting of a Graduate Certificate, Graduate Diploma and Masters, was developed specifically for those working in the plant biosecurity sector or for people who wish to pursue a career in plant biosecurity. The units for each course are delivered on-line, allowing distance education students to complete their studies from home

Feedback regarding the postgraduate study has been extremely positive with many students commenting that the course content and format were excellent and very relevant and useful to them.

The course was delivered in 2010-11 by a consortium of five of our Participant universities: Murdoch University; Queensland University of Technology, University of Adelaide, La Trobe University and Charles Darwin University.

PhD candidates

At June 30 2011 the CRC had a portfolio of 36 postgraduate candidates. Of these, four candidates had successfully submitted their PhD theses and were awaiting formal graduation from their respective university. In the interim, two of the candidates returned to their State agricultural agency employer; one candidate accepted a position with a State museum while the fourth candidate accepted a postdoctoral position in the USA.

A further two candidates had submitted their PhD theses and were awaiting the result of examination. The remaining 30 candidates continued to progress their studies and the CRC remains confident that it will fulfil the Commonwealth contracted commitment of 32 PhD graduates.

Science Exchange 2011

Our Science Exchange 2011 was held in the Barossa Valley from 9-11 February. 155 people attended, including researchers, PhD students, staff, Board, Participants Committee, industry and government representatives. The two and half day event provided an opportunity for everyone to meet, network and discuss our research portfolio, in particular, what it is delivering to end-users. The Science Exchange was preceded by a number of meetings including our annual PhD professional development workshop, Science Committee, Participants Committee and Board meetings.

During the Science Exchange, 52 oral presentations were given and 31 scientific posters were presented. Researchers and students showcased their work under seven themes.

The significant impact and contribution our researchers and project teams make in developing scientific solutions to plant biosecurity issues was recognised at a formal Science Exchange Awards Dinner. The Science Committee nominated a number of project teams for awards in key areas:

- *Collaboration Award*: – The Grains Knowledge Networks project team. The project was nominated for successfully bringing together many elements of the grains industry including bulk handlers, state departments of agriculture, Grains Research and Development Corporation (GRDC), Department of Agriculture, Fisheries and Forestry (DAFF), CSIRO and Plant Health Australia (PHA) to work together and develop and agree to a strategy aimed at extending the life of phosphine as the fumigant of choice for the Australian grains industry – a significant task that the project managed to accomplish. The project has been instrumental in establishing Grains Biosecurity Officers across the mainland states to work with departmental extension officers and GRDC to encourage the implementation of the best practice strategy, overcoming traditional jurisdictional barriers and providing a national approach to grains biosecurity.
- *Innovation Award* – PhD student Sharon van Brunschot for her project which looks at novel detection assays for the tomato leaf curl complex of geminiviruses. The project team was nominated for work on a new technology platform, nanoscaled biosensors, for the multiplex detection of begomoviruses. She is part of the larger nanotechnology project based in Queensland. Despite facing problems with the original nanobeads, Sharon has developed and published new molecular diagnostic methods for viruses, and is now working with researchers in

the Netherlands to assess the use of The Luminex® platform for high-throughput nucleic acid detection of plant viruses and vectors in Australia.

- *Impact on Industry Award* – YongLin Ren on behalf of the project team who are looking for alternatives to the use of phosphine as a grain fumigant. For the first time internationally, in collaboration with farmers and grain companies, this project team is developing low oxygen technology as a practical, cost-effective commercial alternative to phosphine fumigation for the treatment of grain. This development is supported by detailed research on the effects of low oxygen on insect pests, grain in storage and grain quality. Low oxygen will provide the industry with a complete no-chemical treatment and a viable alternative to phosphine.
- *Science Excellence Award* - Tony Clarke on behalf of the project team who are working on resolving the *Bactrocera dorsalis* complex. The team that scoped the project recognised the need to address a complex but fundamental problem in biosecurity with a multi-disciplinary approach. As a result the project brings together elements of molecular, morphological and behavioural biology to address species distinctions in the dorsalis complex - this is a strongly and genuinely collaborative project. Prime evidence of science excellence is the independent and international validation of the approach taken. The model used by this project has been adopted as the project structure for a multinational, International Atomic Energy Agency (IAEA)-led project to look at resolving cryptic species complexes in insects, with this project team, and the dorsalis complex, as a focus of activity.
- *Poster Awards* – There were three awards presented for the posters:
 - *Board Award for Best Poster* – Kelly Bailey for her poster titled Investigating the receptors involved in chemical communication for the pest beetle *Tribolium castaneum*.
 - *Board Award for best Student Poster* – Brian Garms for his poster titled The South African Citrus Thrips (*Scirtothrips aurantii*) in Queensland, which is highly polyphagous and does not show strong preferences for its only recorded host in the field.
 - *People’s Choice Award for Best Poster* – Rebecca Zappia for her poster titled Sampling irrigation water for plant pathogens – coherently working together or organised chaos?

Biosecurity Farmer of the Year

On 21 September 2010, Kununarra producer Lachlan Dobson was announced as the *Biosecurity Farmer of the Year Award* in the plant category at the inaugural Farming Ahead conference in Sydney.

The CRC were pleased to nominate Mr Dobson for this award as he continually demonstrates strong commitment to biosecurity across the properties he manages, as well as in the community. Among other tactics to raise awareness of biosecurity, he also provides industry supervision for two of our PhD students. He is also the first non-academic supervisor of a PhD project appointed by Charles Darwin University.

This award was supported by Plant Health Australia (PHA) and provides recognition for producers who implement sound biosecurity practices, inspire other farmers and encourage investment in Australian agriculture.

Lachlan manages the quality assurance and farming processes from produce grown from 120,000 mango trees and 80,000 red flesh grapefruit trees in the Kimberley's Ord River Irrigation Area (ORIA). He has been involved with biosecurity in the ORIA since the 1998 outbreak of Panama disease in the Darwin banana growing area. He was involved in the development of the Western Australian Banana Industry Biosecurity Plan and also the OrdGuard regional biosecurity plan (the first of its type in Australia and the world).

Key events and changes

Throughout the reporting period there were a few changes to the staff in the CRC, as follows:

- Ms Alana van Meurs left the position of Communications Officer in January 2011. Her position was filled by Mr Andrew Crichton.
- Mrs Kate Scott left the position of Communications Manager in March 2011, which was filled by Mrs Max Knobel.

1.2 Risks and Impediments

We have not experienced any major risks or impediments to achieving our objectives during the reporting period. There was a minor impediment/risk in that two PhDs candidates withdrew from their studies, but this was identified and managed effectively and progress overall has stayed on track.

We continue to focus on delivering project outcomes, especially as projects reach maturity. The number of final reports from projects is growing and we are continuing to ensure that our research outcomes translate into impact for our end-users. In the coming financial year, we will continue to consult with industry to measure the impact of our research.

1.3 End-user Environment

As indicated in the *Annual Reports* for 2009 and 2010, the Australian grain industry has been operating in a deregulated environment since July 2008. Although this legislation has not directly affected the CRC or our ability to meet our objectives, the subsequent market structure changes have highlighted the increased risks in the export market. At the same time, our export markets have become more discriminating, requiring guarantees of the pest-free status of grain. This is further compounded by the growing phosphine resistance in grain pests which poses a serious threat to the competitiveness of Australian grain.

As indicated in the later *Program 5: Post-harvest Integrity Research* section, the CRC has been putting much effort into providing both long and short term solutions for industry in these areas.

The CRC's Research Programs remain well aligned with the changes occurring in plant industries. One of the strengths of the CRC is that all of the end-user groups – rural industry, state and Australian Governments – are heavily involved in the CRC itself. In addition, the majority of plant biosecurity entities participate in the CRC. These entities either are, or have direct contact with, direct users of CRC outputs. This allows the CRC to maintain sound knowledge of the on-going end-user environment and to react quickly if changes in this environment occur. In addition, the CRC has both Grains and Horticulture Advisory Panels that meet several times a year to ensure the needs of our end-users are met.

1.4 Outcomes

Value of outcomes to date compared to the expectations in the Commonwealth Agreement.

In the *Commonwealth Agreement*, it was noted that while pest incursions directly threaten the viability of Australia's plant industries, the cost varies considerably depending on whether the pest spreads widely or if it can be contained in certain areas and, if so, whether area freedom status can be achieved and recognised.

In response, we have focused on building scientific capability and delivering impact within the biosecurity framework that comprises prevention, identification and detection, surveillance, impact management and post-harvest integrity. During the current year there has been strong progress in all areas and outcomes are being extended in line with end-user priorities and expectations.

The outputs of the CRC are delivering economic, environmental and social benefits to Australia. However, as detailed in the *Commonwealth Agreement*, the majority of outputs from this CRC are knowledge-based products, for which it can be difficult to provide a monetary figure. In addition, it is difficult to know which pest or disease might next affect our plant industries, nor which industry will be next affected.

In order to quantify the outcomes of the CRC, we commissioned a report in May 2011 from the Centre for International Economics (CIE) which examined scenarios for incursions of pests and diseases in the grain and horticulture industries. The report determined the following for one scenario:

Scenario 1: grains

Basic scenario: Exotic grain storage pest is detected in a shipment of Australian grain at import into the destination country.

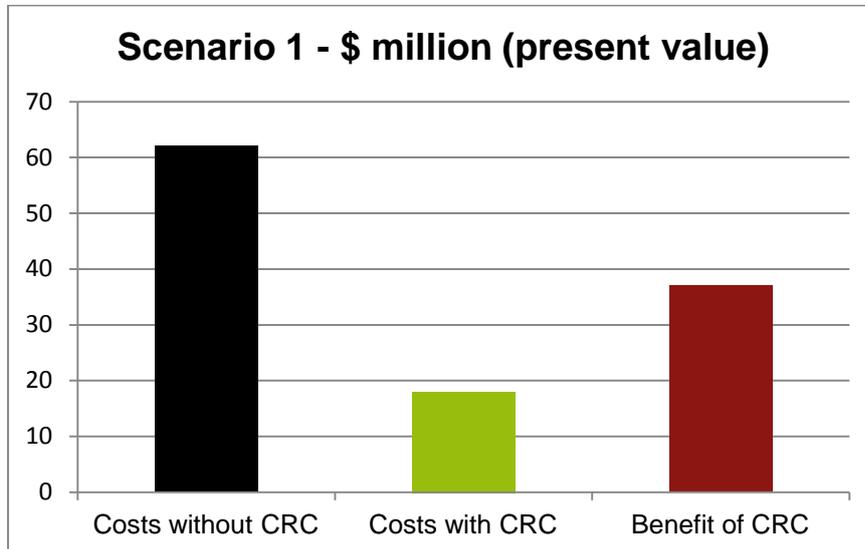
Without the CRC: Suspension of all Australian grain exports while an urgent six week investigation is undertaken. Costs include ships delayed in port, stand down of loading facilities, increased storage costs.

- Price reduction of 20% on the shipment under suspicion.
- Urgent survey undertaken in Australia to confirm presence or absence of the organism at a cost of \$1m. Absence confirmed.
- Activities to settle other markets cost \$0.5m.

With the CRC: CRC survey technology is in place and data being routinely collected showing that this pest is not present in Australia. CRC diagnostic technology allows rapid

(<1 week) detailed characterisation of the pest found. CRC data tools show that pest is same as organism in the importing country. The problem quickly resolved by alerting the country of origin to the contamination and taking measures to prevent entry to Australia.

Summary benefits of CRCNPB



Data source: CIE estimates using Quality Wheat Model and HI_Link model.

2 Governance and Management

2.1 Governance – Board, Committees and Key Staff

Structure

CRCNPB is operated by CRC NPB Limited in accordance with the *Commonwealth Agreement* and *Participant Agreement*.

CRC NPB Limited is a Public Company limited by guarantee and, as such, must abide by the *Corporations Act*. Its activities are governed by its constitution which must be consistent with the Participant Agreement and the funding Agreement between the Commonwealth and the Participants. It is a taxable entity.

The Board of Directors of the Company are responsible for the corporate governance of the Company. The Board guides and monitors the business and affairs of the Company on behalf of the members by whom they are elected and to whom they are accountable.

CRCNPB Board

Our Board plans, develops and oversees delivery of our strategic objectives. The skills-based Board is made up of a Chair and six other Directors, who are all independent of our Participants. The Board also undergoes an annual Board performance review.

The Board was established with careful consideration ensuring a broad field of expertise to maximise the value of the Board's input into our direction and management. There were no changes to the Board membership during the reporting period.

At the 2010 Annual General meeting (AGM), the tenure for three Directors (Mr Barry Windle, Ms Christine Campbell and Professor John Irwin) was due to expire. All three retiring directors re-nominated for the vacant Director positions and, as there were no other nominations, were duly reappointed to the Board of CRC NPB Ltd.

The names, qualifications and experience of the Board of Directors in office during the period and until the date of this report are detailed in the following table.

Governance/Management Issues

The CRC did not experience any governance or management issues during this reporting period.

Board Members

The table below provides details on the Directors of the CRC NPB Ltd.

Name	Role	Key skills	Independent/ Organisation
Professor John Lovett	Chair	Qualifications: BSc Hons (Agric), PhD, MAICD Chair: Agrifood Awareness Australia Ltd (2004-2011); CRC for Greenhouse Accounting (2004-2006). Board Member: Primary Industries Education Foundation(2009-2011); HRZ Wheats Pty Ltd (2004-2006). Member Executive Board: Global Crop Diversity Trust (2006-present). Managing Director: Grains Research and Development Corporation (1994-2003); Lovett Associates Pty Ltd (2004-present). Professor of Agronomy: University of New England (1987-1993); Professor of Agricultural Science: University of Tasmania (1984-1987).	Independent
Mr Barry Windle	Deputy Chair	Qualifications: B AgS, Dip Hort Sci Chair: AFMA Great Australian Bight Trawl Fishery Management Advisory Committee (current); Central Hills Water Allocation Plan Advisory Committee and member of the Central NRM Group – Adelaide and Mount Lofty Ranges; NRM Board (current); Working Group: Market Access Research and Development HAL (current); Executive Director: Agriculture, Food and Fisheries, Primary Industries and Resources SA; Executive and Policy roles: PIRSA (1988-2004); Horticultural Research Officer and related policy roles (1971-1988).	Independent
Ms Christine Campbell	Director	Qualifications: FCPA, GAICD Director: Twynam Agricultural Group (current); Executive Chairman (1999 to 2010); CEO (1986-1999); and Financial Controller (1977) Twynam Agricultural Group. Director: Cotton Australia (1999-2005). Chair: of the National Farmers' Federation Water Taskforce (2005-2006); Australian Cotton Industry Council (2002-2005); Cotton Australia (2001-2003); Private Sector Advisory Panel to International Cotton Advisory Council (2004-2005). Member: Policy Council of the National Farmers' Federation (2004-2005); Executive Committee of the National Farmers' Federation (2002-2004).	Independent
Dr Jim Cullen	Director	Qualifications: BA (Hons), PhD Director: Entocosm Pty Ltd, (2002-2004). Board Member: CRC for Australian Weed Management (Weed Management Systems) (1995– 2002) (Acting Director 1995). Member: Quarantine & Exports Advisory Council (1997–2003); Australian Weeds Committee (1988–2002). Chief: CSIRO Entomology,	Independent

		(1997–2002). Founding President: ACT Branch, Australian French Association for Science and Technology (AFAS) (1991-3). External Advisor (Science & Research): Environmental Risk Management Authority NZ (2002). President: Australian Entomological Society (1997–2000).	
Professor John Irwin	Director	<p>Qualifications: BSc Hons (Agric), MSc (Agric), PhD, DSc (Agric)</p> <p>Professor Emeritus: University of Queensland (2009 – present). Editor in Chief: Crop and Pasture Science (formerly Australian Journal Agricultural Research) (2009 – present). Professor: School Biological Science: University of Queensland (1993 – 2009). CEO: CRC for Tropical Plant Protection (1999 – 2006); CRC for Tropical Plant Pathology (1992 – 1999). Member: National Crop Improvement Committee; Grains Research and Development Corporation (1991 – 1993); Oilseeds Research Council (1989-1991). Lecturer/Senior Lecturer/Reader: University of Queensland (1982-1992). Plant Pathologist/ Research Fellow: Queensland Department of Primary Industries/University of Wisconsin (1972-1982).</p>	Independent
Mr Chris Richardson	Director	<p>Qualifications: Diploma in Agriculture, GAICD</p> <p>Chair: Biosecurity Council of WA (2008-present); Agriculture Protection Board of WA (Board member since 1998 and Chair 2002-2010); WA Footrot Eradication Campaign Advisory Committee (1999 – 2011); WA Ovine Johnes Disease Advisory Committee (2004 – 2011). Board member: Corredene Pty Ltd. CEO: Australian Merino Society Inc 1999 – 2010).</p>	Independent
Mr John Sandow	Director	<p>Qualifications: BSc Hons, MSc, MAICD</p> <p>Director: Cooperative Research Centre for Australian Weed Management, (2002-2008); Western Australian Herbicide Resistance Initiative (WAHRI) (2002-November 2007). Member: Steering Committee "Grain Protection Genes" (GRDC/CSIRO joint venture) (2002-November 2007). GRDC Program Manager: Crop Protection (2002-November 2007), Crop Care Australasia Pty Ltd - National Technical and Development Manager (2001-2002), Marketing Services Manager (2000-2001), Group Product Manager (1998-2000): Product management and technical roles (1989-1998), Entomologist: Western Australian Department of Agriculture (1979-1989).</p>	Independent

Function and frequency of Board meetings

Our Board meets quarterly in various locations around Australia. During the 2010-11 financial year, there were five Board meetings. Four meetings were regular Board meetings and one of the February meetings was scheduled for strategic planning. Attendance is indicated below:

Name/Date	Sep 10	Nov 10	Feb 11	Feb 11	Jun 11
Professor John Lovett	✓	✓	✓	✓	✓
Mr Barry Windle	✓	✓	✓	✓	✗
Ms Christine Campbell	✓	✓	✓	✓	✓
Dr Jim Cullen	✓	✗	✓	✓	✓
Professor John Irwin	✓	✓	✓	✓	✓
Mr Chris Richardson	✓	✓	✓	✓	✓
Mr John Sandow	✓	✓	✓	✓	✓

Board Committees

Finance and Audit Committee

The Finance and Audit Committee provides assistance to the Board of Directors in fulfilling its corporate governance and oversight responsibilities in relation to our financial reporting, internal control structure, risk management systems and external audit functions. It meets once a quarter, usually two to three weeks prior to a Board Meeting and by video or teleconference.

Name	Role	Key skills	Independent/ Organisation
Ms Christine Campbell	Chair	See details under Board	Independent
Professor John Irwin	Member	See details under Board	Independent
Mr Chris Richardson	Member	See details under Board	Independent

Board Nomination Committee

The Board Nomination Committee consults with the Participants and Directors to identify suitable candidates to the members for election as Directors. The Committee convened twice by teleconference in September 2010 in preparation for the AGM in November 2010.

Name	Role	Key skills	Independent/ Organisation
Professor John Lovett	Chair	See Board above	CRCNPB
Dr Martin Barlass	Member	<p>Qualifications: BSc Hons, MSc, PhD</p> <p>Chair: National Horticultural Research Network (2009-present); Participant Committee of the CRC National Plant Biosecurity (2008-present), Board member: Australian Biosecurity Intelligence Network (2008-present), Member: National Apple and Pear Advisory Committee, Director Science Innovation: Department of Primary Industries Victoria (2011-present), Deputy Executive Director: Biosciences Research, DPIV (2008-2011), Deputy Executive Director: Primary Industries Research Victoria, DPIV (2003-2007), Director: Agricultural Industries, Department of Natural Resources and Environment (2001-2003), Director: CRC for Viticulture (2002-2004), General Manager: Plant Industries, Agriculture Victoria, Department of Agriculture Victoria (1998-2001), Principal Scientist: Plant Biology, DAV (1992-1998), Manager R&D: Phytotech Pty Ltd. (1989-1992), Member: Dried Fruits Research and Development Council (1988-1994), Research Scientist: CSIRO Horticulture (1977-1989).</p> <p>Skills: plant virology, research management, science innovation, strategic planning.</p>	Department of Primary Industries Victoria
Associate Professor Giles Hardy	Member	<p>Qualifications: BSc Hons (Agric), PhD Plant Pathology</p> <p>Director: State Centre of Excellence for Climate Change, Woodland and Forest Health (2009-current); Centre for Phytophthora Science and Management (2003-current).</p>	Murdoch University
Mr Ernestos Kostas	Member	<p>Qualifications: BEnvSc (Biology)</p> <p>Manager: Grain Protection and Sealing, Co-operative Bulk Handling (2005-present); Member: Grains Advisory Panel (2008-present); Representative: Participants Committee, CRCNPB.</p>	CBH Group

Adjunct Professor Shashi Sharma	Member	<p>Qualifications: BSc, MSc, PhD</p> <p>Director: Plant Biosecurity Program, Department of Agriculture and Food, Western Australia. Adjunct Professor, Murdoch University. Chairman: WA Grains Industry Biosecurity Committee (GrainGuard) (2006-present); WA Horticulture Industry Biosecurity Committee (HortGuard) (2006-present); WA Bee Industry Consultative Committee (2009-present). Member: Australian Plant Health Committee (2001-present); CABI Program Advisory Board for Crop Protection, UK (1997-1999). Head and Professor: Division of Nematology, Indian Agriculture Research Institute, India (1999-2000). Scientist: International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) (1983-1998). International Fellow: Rothamsted International, UK (1994-1995). Visiting Professor: University of Missouri, USA (1993-1994).</p> <p>Skills: Biosecurity science, regulation and policy.</p>	Dept of Agriculture and Food WA
Dr Andy Sheppard	Member	<p>Qualifications: BSc (Hons), PhD, DIC FRES</p> <p>CSIRO Senior Principal Research Scientist & Theme Leader Biosecurity (2006-present); Board Member: CRC for Australian Weed Management (2006-2008); Board Member of CABI (2002-2005); Member: Environmental Biosecurity Committee (2008-2010); Member: Plant Health Committee (2008-2010); Président : Centre International de Lutte Biologique Agropolis, Montpellier France 2003-2005; Australian Representative: Governing Body of the OECD Cooperative Research Programme (2002-2006); Australian Representative: Executive Council of CABI (2002-2006).</p>	CSIRO
Mr Rod Turner	Member	<p>General Manager Programs, PHA (2006-present); Program Manager, PHA (2002-2006); Member: Participants Committee, CRCNPB.</p>	Plant Health Australia

Key Staff

The table below details the key staff in the CRC in 2010-11.

Name	Organisation	CRC Position / Role	Time committed
Dr Simon McKirdy	CRCNPB	Chief Executive Officer	100%
Mr Nicholas Langley	CRCNPB	Business Manager	100%
Dr David Eagling	CRCNPB	Research Leader	100%
Mrs Kate Scott (until 4/3/2011)/ Mrs Max Knobel (from 4/3/2011)	CRCNPB	Communications Manager	100%
Dr Kirsty Bayliss	Murdoch University	Education and Training Leader	100%
Dr Paul de Barro	CSIRO	Program Leader	50%
Dr Pat Collins	Department of Employment, Economic Development and Innovation (QLD)	Program Leader	50%
Ms Jane Moran	Department of Primary Industries Victoria	Program Leader	50%
Dr Deb Hailstones	NSW Department of Primary Industries	Program Leader	50%

2.2 Participants

List of Participants during the reporting period

We have participants from all states and territories on mainland Australia and involve a majority of plant biosecurity specialists in the country.

Participant's Name	Participant Type	ABN or ACN	Organisation Type (or Individual)
Department of Agriculture, Fisheries and Forestry	Core	24 113 085 695	Australian Government
CABI	Supporting	N/A	International
Charles Darwin University	Core	54 093 513 6	University
Charles Sturt University	Supporting	83 878 708 551	University
Co-operative Bulk Handling Ltd	Core	29 256 604 947	Industry
CSIRO Entomology	Core	41 687 119 230	Australian Government
Department of Agriculture and Food, Western Australia	Core	18 951 343 745	State Government
Department of Employment, Economic Development and Innovation	Core	24 830 236 406	State Government
Department of Primary Industries, Victoria	Core	42 579 412 233	State Government
GrainCorp Ltd	Core	60 057 186 035	Industry
Grains Research and Development Corporation	Core	55 611 223 291	Industry
Horticulture Australia Ltd	Supporting	19 095 566 108	Industry
La Trobe University	Core	64 804 735 113	University

Murdoch University	Core	90 325 712 904	University
NSW Department of Primary Industries	Core	72 189 919 072	State Government
Northern Territory Department of Resources	Supporting	84 085 734 992	State Government
Plant Health Australia Ltd	Core	97 092 607 997	Other
Queensland University of Technology	Core	83 791 724 622	University
Saturn Biotech Limited	Core	36 096 225 508	Private Sector
South Australian Research and Development Institute	Core	53 763 159 658	State Government
Southern Cross University	Supporting	41 995 651 524	University
University of Adelaide	Supporting	61 249 878 937	University
University of Western Australia	Supporting	37 882 817 280	University
Viterra Ltd	Core	59 084 962 130	Industry

Changes to Participants

There were no changes to the Participants of the Cooperative Research Centre for National Plant Biosecurity during 2010-11.

2.3 Financial Management

The CRCNPB's financial performance overall can be measured with reference to the level of expenditure on the CRC's Activities against the agreed expenditure documented in the Commonwealth Agreement. The CRC's Activity cash expenditure (see table 3 of the Financial Tables) in 2010-11 was \$9.7 million and was behind the agreed level by \$317,000. Total Activity expenditure for the six years to June 2011 stands at \$45.7 million. This is just over a million dollars behind the agreed figure to that date.

However, our contracted project expenditure and other Activity expenditure are budgeted at \$9.5 million in the 2011-12 year which will take the CRC's Activity expenditure for the life of the CRC to \$55.2 million - \$219,000 more than agreed for the life of the CRC.

Overall contributions accounted for (accruals basis) by the CRC in 2010-11 were as follows:

Source	Amount
Cash from Participants	\$3,776,000
Cash from DIISR	\$5,600,000
In-kind – staff	\$4,740,980
In-kind – non staff	\$407,485
Total	\$14,524,465

Of these contributions \$14.45 million was combined with other income of \$0.48 million to pay for \$13.7 million of program expenditure and \$1.3 million of administration and other expenditure.

Participant contributions have been received by the CRC as expected bar one. Our smallest cash contributor (\$9,000 p.a.) has failed to make the last three quarterly contributions during the year. This leaves this Participant \$6,750 under contributed overall. They have been notified that unless this is addressed by the end of September we would commence procedures to have them expelled from the CRC. This has been reflected in our audited Annual Financial Report as our only doubtful debt.

The CRC's cash balance at the end of June 2011 stood at \$3.1 million, down on last year's balance of \$4.4 million. While the CRC is behind in Activity expenditure by just over \$1 million, the lower cash balance reflects our efforts to reduce our 'unpaid milestone' liabilities on our projects (approx \$400,000) as well as the increase in our Receivables (approx \$477,000). The latter was mostly due to one large cash contribution not being paid until July 2011.

With one year to go the CRC has well established financial systems including a detailed financial forecasting system. These systems allow the CRC to closely manage its funds as the Activities draw to a close. Using these systems the CRC has recognised that some funds may be freed up as budgeted administrative expenditure is not realised and we have in place plans to use those funds (should they eventuate) to further enhance the impact of some of our project work.

2.4 Communications

Communication continues to play a major role in the dissemination of our research activities to end-users including industry, plant industry representative bodies, government and growers. To facilitate communication, we continue to work closely with our participants Plant Health Australia, Grains Research and Development Corporation and Horticulture Australia Limited who act as a conduit to their relevant industries.

The website continues to play a key role in the CRC's communication strategy and is vital in promoting our research activities and results to both internal, through the member's area, and external stakeholders. The website is easy to navigate meaning visitors can access and search for information on our projects, researchers, publications, corporate activities, staff, news and events.

The wealth of information continues to grow as the final reports of our projects are uploaded. The site is regularly updated and received nearly 20,000 hits from visitors from 156 countries. Additionally, five editions of our bi-monthly newsletter *The Leaflet* were sent out to a range of stakeholders. In a positive sign, interest in the newsletter continued to grow throughout 2010-11 and there are now over 800 subscribers on its distribution.

Internal communication activities

In addition to the website and *The Leaflet*, the Science Exchange is an invaluable way for CRCNPB staff and researchers to network and share information about their research. This year's Science Exchange was held over three days in the Barossa Valley and was attended by 155 people. The event included 52 presentations, along with 31 scientific poster displays.

External communication activities

In this financial year, the CRC developed and published a corporate magazine – Plant Biosecurity, Collaborative Research Initiatives – to promote its research projects. The magazine was posted as a soft copy on the CRCNPB website, sent out to key stakeholders and was handed out at industry conferences attended by the CRCNPB.

We have continued to support agricultural plant industry conferences, such as Australian Banana Industry Congress and Australian Grains Industry Conference, using our presence as a way of raising awareness of our biosecurity research activities and the benefits they will provide to Australia's plant industries. We also supported plant science conferences, for example the Australasian Plant Pathology Society and Australasian Plant Virology Workshop, as generally these attendees are the end-users of many of the technologies and research methodologies we develop. By communicating our research outcomes to these groups, we increase our opportunity for adoption of these outputs.

This year, we have increased the level of participation in social media. To complement the CEO's blog (talkingplantbiosecurity.com), we have launched a Facebook page to provide regular updates to both stakeholders and anyone with an interest in plant biosecurity. The Facebook news feeds include not only CRCNPB activities, media releases and CEO blog, but also any media articles that are relevant to plant biosecurity. In addition to Facebook, we also established a Linked-In page to build on professional networks and to further promote the CRC. This has provided another way for

stakeholders to contact CRC staff members. All of these forms of social media provide a fast, cost-effective means for disseminating information about the CRC's activities.

2.5 Intellectual Property Management

Key pieces of IP held by the CRC

As at June 30 2011, the CRC held the following key pieces of intellectual property (IP):

- Several copyrighted teaching resources and manuals
- A device to remotely monitor the levels of phosphine during fumigation of a sealed grain storage facility
- Copyright protected software to allow the collection of biosecurity surveillance data on hand-held devices
- A fumigation unit for sealed grain storages that incorporates a nitrogen generator, power supply and application subsystems
- A trademark protected Plant Biosecurity Toolbox
- Software required to run a new diagnostic system based on "OptoPlex Beads".

IP management arrangements

Our well established IP management processes continued to perform as expected during the 2010-11 financial year.

Our Canberra office has a responsibility to identify, secure, maintain and protect the new knowledge developed across our research portfolio. Pursuant to our governing documents, we define new knowledge to include both public domain and protected outputs and our IP register appropriately reflects this distinction. The IP register is situated within our online project management system, with access restricted to ensure confidentiality.

As project development was significantly less than in previous financial years, identification of new IP was limited during the reporting period. Nonetheless, due diligence in identifying new IP was carried out and all new projects continued to have the relevant IP and confidentiality stipulations built into their individual contracts. As a part of our ongoing efforts to continually reassess the IP status of our projects, research program leaders continued to provide quarterly updates as to any material changes in the IP status of the projects under their administration. As an additional level of IP oversight, the Board and its Finance and Audit Committee continue to receive quarterly reports updating the IP status of all our research projects and updated copies of our IP register.

Adherence to the National Principles of IP Management

Our *IP Manual* continues to be the cornerstone of our IP arrangements, providing policies and procedures for the classification of IP and, if appropriate, acquiring suitable protection on IP that has been deemed suitable for formal protection. The manual remains in compliance with the *National Principles of IP Management* and is administered by the Business Manager and Delivery and Adoption Officer.

The IP register underwent a complete audit and restructure during the financial year with a focus on ensuring that all IP listed adequately represented the final project outputs, not the outputs anticipated at the commencement of a project. This was informed by the impact and implementation assessment process conducted by the CRCNPB's research team. Entries on the register now list the actual tangible output or knowledge content developed by a project, as well as indicating where the IP is located, who is responsible and what dissemination has occurred. Whilst this information was contained in the previous iteration of the register, the updated version is more robust, current and is organised in a way most suitable for wind-up activities or transferral to a new CRC at the conclusion of the current Commonwealth Agreement.

Additionally during this reporting period, two external consultants were engaged to review the IP developed and enhance identification of commercial needs and value. Efforts focussed on an initial market analysis of opportunities to extend Research Program 2 and 3 project outcomes through commercial channels. In the context of Research Program 2, a new commercial opportunity was identified as the recent increase in demand for lure and trap technologies for insect pest control. This opportunity is currently being explored in more detail with a commercial company. With regard to Research Program 3, activity focussed on updating the CRCNPB's analysis of the grain industry and its key drivers. The report identified an opportunity for the CRCNPB's research in phosphine monitoring as a niche market opportunity. To further this, work is underway to develop a commercialisation strategy with implementation to occur in parallel with the remaining project research.

Maximising benefits

Our IP arrangements ensure that our technologies will accrue maximum benefits to Australia by releasing material suitable for the public domain while keeping potential commercial successes confidential. As the development of our technologies continue to advance, arrangements for their commercialisation, technology transfer and accrual of national benefits will continue to develop commensurately and will focus on the specifics of the technology and associated market under consideration. This process may involve formal IP protection or technology transferral through mechanisms in the public domain as deemed appropriate by us and as guided by our IP policies and procedures. Irrespective of the pathway, these processes will follow the basic premise of assessing the cost to us versus the return to us, our participants and the return to Australia more generally.

Patents held by the CRC

The CRCNPB holds the following patents:

- Patent filed - New OptoPlex Beads Application, Software and Probes
- Patent filed USA – Descriptor of a Hyperspectral or Multispectral Image.

3 Performance against Activities

3.1 Progress against the Key Challenge / Outcomes

The overall aim of the CRC as set out in the *Commonwealth Agreement* is to 'develop novel technologies, and to rapidly and efficiently transfer tools, knowledge and technology to end-users – agribusiness, producers, and the Australian and state governments – to pre-empt and diminish the economic and environmental impact of Emergency Plant Pests across Australia'.

The *Commonwealth Agreement* also details seven outcomes, aligned to our programs, which contribute to our achieving the objective, namely:

- Outcome 1: Prevention – Reduced incidence of harmful plant pest incursions.
- Outcome 2: Identification – World class biosecurity capability for early identification of emergency plant pest and pathogens.
- Outcome 3: Detection – More effective national surveillance systems.
- Outcome 4: Response – Reduced losses from incursions of emergency plant pests.
- Outcome 5: Response – Post-harvest integrity: Cost effective insect pests control practices and future risk management aligned with market demands and industry.
- Outcome 6: Education and training – Increased awareness, knowledge and skills levels of industry personnel, and supply of trained scientists.
- Outcome 7: Commercialisation and utilisation.

The CRC is working hard to meet the challenge and is making very good progress in achieving the expected outcomes. A total of 11 *Commonwealth Agreement* milestones were due for completion in this reporting period, of which all but one has been achieved.

The table below provides details of the active and completed milestones as at 30 June 2011.

Program	Active milestones	Completed milestones
Preparedness and Prevention	5	3
Diagnostics	9	8
Surveillance	5	12
Impact Management	6	9
Post-Harvest Integrity	11	5
Education and Training	34	20
Delivery and Adoption	6	4
Cross Program	2	0
Total	78	61

3.2 Research

The past financial year has been a busy and satisfying year for the CRCNPB with many of our projects reaching maturity and delivering tangible outcomes to our end-users.

The commentary below demonstrates key research achievements for each program during the reporting period. We have also mapped our achievements against each program's 'Indicators of success' as outlined in our revised *2009-2012 Strategic Plan*.

Program 1: Preparedness and Prevention Research

Strong progress was made towards achieving the program output with completion of the two contracted Commonwealth milestones that fell due in the reporting period.

The first milestone was titled "The influence of climate change on emergency plant risk assessment determined" (R1.2.4).

In achieving this milestone the CRC increased understanding of the role of rising CO₂ and its influence on wheat pests and diseases using a combination of field-based experiments and artificial chambers.

The CRC used a series of model pest species to demonstrate that under future climates, new vegetative growth flushes will probably start earlier and be available to insects for shorter periods. There will also be a gradual southward expansion of shorter durations of the vegetative growth flushes accompanied by a geographic expansion of regions where second and third flushes of growth can occur as temperature increases move the insect spread from northern Australia to the southern coastline.

The second milestone was titled "Research on the biology and epidemiology of selected species" (R1.3.2)

This milestone was achieved through a combination of projects and postgraduate studies and encompassed work on both pest and diseases of relevance to the national grain and horticultural industries.

The remaining projects in the program continued to progress well and there are no technical or scientific impediments that may prevent or delay future delivery. There are also no planned changes in future directions.

Overall the completion of these projects adds to Australia's ability to strengthen its abilities to address likelihood of entry and consequence and our ability to improve our capacity to better allocate resources in terms of biosecurity prioritisation. This body of work helps deliver towards the risk-return approach identified in the Beale Review.

The body of research being produced by Program 1 is primarily aimed at the science/policy interface and is increasingly being used with Department of Agriculture, Fisheries and Forestry, the principal end-user of this research. Additionally, Plant Health Australia is using the various threat identification and prioritisation tools developed through the program.

Program 2: Diagnostics Research

We are on well on track towards achieving the program output with completion of a contracted Commonwealth milestone that fell due in the reporting period. The milestone

was titled “Network of facilitators, protocols and experts identified and data submitted to coordinating bodies” (R2.4.1).

Completion of this milestone focused on a series of projects to develop novel digital tools for the plant biosecurity community and improve the sharing and optimization of diagnostic information.

A key success factor was the development and release of a new version of the Pest and Disease Image Library (PaDIL). This achievement, in conjunction with expansion of the CRC’s Remote Microscope network to comprise forty seven locations established a network of experts across Australian state departments and key regional partners in SE Asia and New Zealand.

These developments resulted in greater flexibility for users to create and customize their own personal image libraries and to capture and personalize their PaDIL useage via their own Dashboard. The Dashboard is central to the Remote Microscopes portal, which now offers an identification enquiry system that can manage, report and search laboratory information.

In the final activity to complete the milestone, a number of protocols were submitted to the federal government’s Subcommittee on Plant Health Diagnostic Standards. This subcommittee oversees the process of developing and releasing National Diagnostic Protocols which allow users to rapidly and accurately diagnose specific plant pests, particularly when there is an incursion. Acceptance as a National Diagnostic Protocol ensures the CRC research is consistent with Australia’s agreed approach to diagnosing plant pest’s and assists Australia meet its international plant protection obligations when responding to pest incursions.

In addition to the above, the CRC addressed the quandary of providing robust and rapid identification of bacterial pathovars, by evaluating the ability of novel platforms that analyse expressed proteins and metabolites to differentiate pairs of closely related taxa. Numerous proteins have been identified that have opened the transitional pathway – the proteins are tracked back to the genes that encode them and DNA-based diagnostics are currently being developed and validated. Analysis of metabolites also revealed concentration differences in sugars and amino acid peaks between different pathovars and possibly even for different strains within a single pathovar. This is the first application of these methods to plant bacteria and both offer real promise of new diagnostic protocols.

There are no technical or scientific impediments to progress and project members continue to participate in international projects led by the Food and Agricultural Organisation (FAO)/IEAE.

Program 3: Surveillance Research

Strong progress was made towards achieving the program output although there was no contracted Commonwealth milestone due in the reporting period.

A key achievement towards the program output was the CRC’s support of a national Grains Farm Biosecurity Program (GFBP) which was initiated by the Australian grains industry in response to an industry need to prepare for and respond to biosecurity threats and incursions.

The GFBP includes Grains Biosecurity Officer positions which operate in the five major grain states (WA, Qld, Vic, SA and NSW). The Officers have undergone a structured training program and in undertaking standardised surveillance activities have developed networks that provide information and demonstrate biosecurity practice change to the grains industry through:

- Identification of target audiences and stakeholders – who they are, their current knowledge and perceptions of biosecurity
- Identification of the knowledge and information that stakeholders require to demonstrate current biosecurity practices
- Identification of 'trusted sources' of information and development of long term relationships between these sources and stakeholders
- Defining effective methods of communication to produce relevant messages that address the risks and issues of the stakeholders

During the reporting period the GFBP targeted awareness of biosecurity issues including the development of media releases on grain storage and hygiene, development of resistant insects, changes to the phosphine label, biosecurity associated with contractors working on grain farms, and surveillance in stored grains. Media monitoring picked up distribution of these articles in about 50 publications.

In addition to the contracted Commonwealth milestone, significant progress was made towards the outcome of a more effective national surveillance system based on scientifically sound sampling tools and survey methodologies.

A significant achievement was surveillance improvements for fruit fly. Since 1990, fruit fly surveillance has been managed through codes of practice under national and international agreements. The standard practice is based on the deployment of static trapping grids covering orchards, towns and urban areas. The grids are relatively effective when numbers are high, but are an inefficient strategy to detect early fruit fly incursions and are becoming increasingly expensive to deploy and maintain due to the prescribed fixed distances between traps.

The research found that traps may be placed in unsuitable environments for fruit flies to satisfy trap spacing regulations. To counter this, the research demonstrated that dynamic trapping which targets the hosts is most likely to attract fruit flies and would considerably reduce monitoring costs.

Related CRCNPB research showed that food-based attractants for female fruit flies did not work consistently as lures. Laboratory results showed that the likelihood of capturing a female fruit fly in a trap with a protein-based lure is very low, particularly if the population is low, as would be expected with an exotic incursion.

Using a lure based on food attractants considerably raised the chance of success showing these types of lures could be used effectively for surveillance of areas free from the pest. These results are currently being discussed with a commercial party to explore how the findings might underpin lure development.

During the reporting period, the CRCNPB also completed efforts to examine the contribution that passive and targeted (or active) surveillance can make to the on-ground management of harmful plant pests and diseases.

The research illustrated that a multi-pronged surveillance approach may be needed to control the spread of harmful plant pests and diseases based on a case study of the European Wasp in Western Australia.

For more than 30 years the Department of Agriculture and Food of Western Australia has been using a combination of passive and targeted surveillance techniques to detect and then destroy wasp nests to control the European wasp. A major challenge for the surveillance program is that if a nest is missed during one summer it may overwinter allowing the release of new queens. The population of wasps and their colonies can therefore exhibit explosive growth within a single summer. Additionally, with hibernating wasp queens being continually imported into WA from rail or road transport freight there is an ongoing need for this cost effective surveillance program to continue.

Finally the research identified a critical link with the reported Commonwealth milestone on national standards, identifying that the development of standards for the use of GPS devices (in Personal Digital Assistants or other hardware) would reduce the time required for data cleaning and manipulation and facilitate faster, more prompt analysis of surveillance data sets. This issue has been addressed in a related CRC project on the development and deployment of Personal Digital Assistants for surveillance.

Program 4: Impact Management Research

We continue to make progress in achieving the program output although there was no contracted Commonwealth milestone due in the reporting period.

To enhance the integrity of post-entry quarantine, a novel approach to virus detection has been developed that enables the detection of both known and new and emerging potyviruses. The work has been submitted to the Sub-committee on Plants Health Diagnostic Standards (SPHDS) for national endorsement by Plant Health Committee (PHC).

To assist the viticulture industry manage the impact of plant pathogen incursions a non-destructive technique to eradicate surface pathogens has been developed. It also showed the effect of burning wood as part of eradication. Discussions with Plant Health Australia have confirmed that the eradication protocol (in published form) will be included in the upcoming Viticulture Industry Biosecurity Plan version update planned for later this year. In addition a decision reference tool has been developed to provide a guide for consideration of non-destructive eradication by scientific assessment panels convened as part of consultative committees during incursions.

In related research, the use of pheromone based approaches in areas where the use of traditional agrichemicals is unpalatable to the local residents is showing great promise in field trials in peri-urban areas in Australia and New Zealand. Field trials in vineyards in Australia have also demonstrated the efficacy of this approach.

Work continues on gaining a better understanding of fruit fly ecology and how that can inform the development of systems approaches for fruit fly control and market access. Trials have been conducted that were designed to determine where flies causing infestations are coming from into crops. This will enable the development of strategies for the placement of mass annihilation technique (MAT) blocks and protein baits in and around crops to minimise infestation of susceptible fruit and vegetable crops. Results

are interesting and are giving us new insights into fruit fly behaviour at both the crop and landscape level.

Program 5: Post-harvest Integrity Research

With no contracted Commonwealth milestone due in the reporting period the program continued to focus on the industry need to manage phosphine resistance in grain pests. This resistance is an extremely serious threat to the competitiveness of Australian grain and grain products in both domestic and international markets, valued at \$7 billion annually.

The CRCNPB research strategy has been to commission multi-disciplinary teams to provide both long and short term solutions for industry. The portfolio includes research directed at both controlling outbreaks of resistant insects in storages now and managing resistance into the future. This includes the development of chemical and non-chemical alternatives and ensuring current treatments including phosphine are effective. In addition, we are undertaking targeted research on the ecology and evolution of resistance in insect pest species as a basis for long-term, sustainable management. Our delivery strategy includes end-user participation within every research team and a consultative and interactive process of project development and execution.

No contracted Outputs relevant to this Program were due in 2010-11; however, the Program has already delivered or is confidently on target to deliver a suite of contracted Outputs due in 2011-2012. For example, the CRCNPB has successfully developed a clean, non-chemical technology for disinfesting stored cereal grains and oilseeds. The technology uses nitrogen to exclude oxygen from the storage and its commercial viability was demonstrated in a series of trials undertaken on the property of a farmer collaborator. The new treatment successfully disinfested wheat and canola and ensured that both commodities were maintained in excellent market condition.

A fumigant new to Australia is also being developed by the CRCNPB for use by the grain industry. Using laboratory generated data and field trials in industry partner facilities, collaborators are testing and optimising use of this new control option, particularly as an immediate, emergency treatment for control of phosphine-resistant insects.

Effective resistance management also requires best practice use of phosphine to avoid selection. The storage type most at risk is bunkers, each storing up to 40,000 tonne grain. In a collaborative project led by industry partners, CRCNPB research has mapped the flow of phosphine gas inside storages and through bulk grain and the effect on gas movement of external factors such as temperature and wind direction and strength. This information is being used to develop predictive models of gas flow, results of which have already indicated improvements to application and storage design.

Best practice cannot be achieved if storage integrity is breached and grain security threatened. In a related project, collaborators are evaluating several issues, the most important of which is the materials and methods most appropriate to maintain storage integrity and ensure effective control of insect pests. The outputs of this project include a range of industry-ready procedures and manuals for implementing effective grain biosecurity. Project recommendations have already been adopted in the construction of a large central storage in Western Australia.

Fumigating grain is potentially a dangerous process, not only are fumigants toxic, some can cause fires or explosions and application of the gas is physically quite hazardous in many silos. On-farm, commercial scale research by CRCNPB partners has demonstrated that phosphine fumigant can be applied safely without the need to climb silos. Specially designed “generators” linked to a “thermosiphon” system allow safe effective application of the fumigant from the ground.

At the request of industry collaborators, two new grain insect pest trapping programs were initiated during the year, in central Queensland and south-western WA. These programs build on the success of insect trapping in southern Queensland and southern NSW. Initial data confirm conclusions of the earlier work showing that different species show quite distinct flight activity and distribution in relation to grain storages and other features of the landscape. These results have overturned assumptions regarding the dispersal of these insects and have suggested several pest management options and opportunities.

Development of resistance is an evolutionary phenomenon and an understanding of the genetic as well as the ecological processes involved is needed for effective sustainable management. Phosphine resistance is controlled by two major genes and CRCNPB research has mapped and identified one mechanism and is close to discovering the second. This process required the generation of a complete genome sequence for one major species as its genetics was unknown. DNA analysis of a range of population samples of highly resistant insects has shown that the resistance mutation is polyphyletic, that is, that different populations of resistant insects have the same resistance gene but each has a different mutation. This indicates that resistance has been selected multiple times in different populations and not spread from a single source.

During the year, new investments were made in integrating and optimising aeration cooling technology and timing of fumigation treatments into insect biosecurity strategies.

CRCNPB research outputs support the grain industries national phosphine resistance management strategy, which is published on Grain Trade Australia website http://www.graintrade.org.au/chemical_tolerances

3.3 Utilisation and Commercialisation

This reporting period saw the completion of five contracted Commonwealth milestones that fell due in the reporting period and the CRC remains on track to achieve this program output.

The first two related milestones were titled “Surveillance prediction tools developed and incorporated into national surveillance networks” (C3.1.4) and “Tools to underpin surveillance and response delivery developed” (C4.1.1).

To achieve these milestones a workshop was conducted with the national Surveillance Reference Group (SRG). The SRG provides national leadership for surveillance related activities and brings together representatives from federal and state governments, as well as Plant Health Australia. A range of surveillance project outcomes were discussed with SRG delegates in the areas of prediction tools, modelling, trapping, ecological and economic research.

Additional activity was then undertaken with SRG members, resulting in the establishment of standard data collection procedures for digital devices used in surveillance. The standardisation incorporated the needs of the relevant federal group (BioSIRT) and a number of devices were distributed to members for use in their workplaces.

The third milestone was titled "Manuals prepared and training workshops held to communicate results to appropriate agencies" (C4.1.2).

This was achieved through the CRCNPB developing and running a number of national training workshops covering core skills in diagnostics and surveillance. In addition, the CRCNPB developed and ran a number of diagnostic workshops across south-east Asian countries to assist in capacity building.

Complementing these efforts was the CRCNPB's work with communities across Northern Australia and Eastern Indonesia. This pioneering work with indigenous communities resulted in the development and implementation of plant biosecurity enterprise models and highlighted the benefits that can accrue to both community and government when a shared understanding of biosecurity issues is reached.

The fourth milestone was titled "Registration of an alternative treatment for stored grain and plans negotiated with commercial partner" (C5.1.1)

During the reporting period the CRCNPB tested deployment of an alternative treatment for the management of stored grain pests. However the final deployment did not require a commercial partner as the CRCNPB was able to achieve the result through a novel combination of existing technologies.

In related work, interest from commercial partners has been sought in the distribution of a new remote phosphine monitoring technology. While not an alternative treatment, the new technology will assist industry in the management of stored grain and initial proof-of-concept trials have been successfully completed at sites in Queensland, New South Wales, South Australia and Western Australia. Furthermore, discussions have taken place between the CRCNPB and a potential commercial partner interested in distribution should the trials be successful.

The final milestone was titled "Delivery of integrated grain protection protocols targeting specific sectors of the grain supply chain" (C5.2.1).

To achieve this milestone the CRCNPB developed a national grain management strategy for a key industry fumigant. The work targeted the storage sector of the grain supply chain and recognised that best practice cannot be achieved if storage integrity is breached. CRCNPB research included a range of industry-ready procedures and manuals for implementing effective grain biosecurity which informed the development and implementation of the management strategy.

To complement this work the CRCNPB supported Grains Biosecurity Officers with targeted grain protection messages designed specifically for growers. This work also included efforts to assist national coordination to deliver standardisation of messages and materials across Australia.

3.4 Education and Training

This year saw a number of our PhD candidates submit their theses for examination. Mark Stanaway, Nichole Hammond, Alistair McTaggart, Mark Castalanelli and Paul Royce have all completed what will possibly be their greatest ever academic achievement, in the form of their PhD theses. Mark Stanaway and Nichole have now returned to their employers, Biosecurity Queensland, and the Department of Agriculture and Food WA. Alistair McTaggart has taken up a postdoctoral position in the USA, whilst Mark Castalanelli is working with the entomology group at the WA Museum. We also had three Honours completions, with Elizabeth Venter, Megan Jansen and Matt Davis all achieving great results. We congratulate all of our students in seeing their projects through to the end, and we thank them for their commitment to the CRCNPB.

As always, our annual professional development workshop for our PhD candidates was highly popular. This year we invited Hugh Kearns and Maria Gardiner to work with our students in a PhD Masterclass. The students covered topics such as “Turbo Charging your Writing” and “The Seven Secrets of Successful Research Students”. This was followed up by 12 weeks of online coaching and support. The Masterclass was immediately followed by the annual CRC Science Exchange, where our students were able to present their research to the other members of the CRC, and it was particularly pleasing to see a number of our students nominated for prizes at the annual awards dinner. Awards were given to students under the categories of Innovation, People’s Choice Poster, Best Student Poster and Best Student Talk.

Our pilot trial of the new course in Grain Storage and Biosecurity was conducted this year by Charles Sturt University (CSU). The course was developed to meet a need expressed by the grains storage industry for an accredited training program to ensure industry personnel managing the storage of bulk grain have the required knowledge and skills to protect and preserve stored grains to meet market demands. The project entailed industry consultation and development of training materials and assessments to enable the award of a Statement of Attainment for the National VET Competency Standard: AHCBA406A Maintain grain quality in storage. Materials have been developed for on-line delivery to enable easy updating and access by participants, and are supported by a three day hands-on workshop.

Feedback from course participants was particularly pleasing. They were enthusiastic about the course, its content and delivery. They commented a number of times that the knowledge and skills they learnt were highly relevant and focussed exactly on their industry needs and operations. In the words of one of the course participants, “... *the information I have gained has given me the opportunity to see how and where we should make improvements in our Storage and Handling*”. The course will continue to be a feature on the CSU calendar.

Other workshops that were conducted by the CRC this year were primarily focussed on the Plant Biosecurity Toolbox, Remote Microscope Diagnostics and the Pest and Disease Image Library. More than 100 people attended across Australia, with a similar number attending the international workshops. These workshops are designed to inform the biosecurity community about the new tools available to them, and provide hands-on experience. The workshops were delivered by Gary Kong, Michael Thompson and Ken Walker, with experts in various pests also participating in the Remote Microscope

training. We are now preparing training materials from the workshops, that will be available online.

Our postgraduate degrees in plant biosecurity continue to grow, with 14 new students bringing our total cohort to 25. We are currently negotiating with two new universities to join the teaching consortium which will really strengthen the program. We achieved our first graduation this year, with our first Certificate student completing her course in June. This is a fantastic achievement so soon after starting these courses. We are also planning a major publicity exercise to start recruitment of our 2012 intake of students.

The CRC is on target to achieve its education and training outputs. The ongoing success of the Education and Training Program is primarily thanks to the involvement of numerous participants and end-users from academia, government and industry in developing and conducting our activities. The PhD candidates alone have more than 24 individual university supervisors and more than 50 from industry and government. This in-kind contribution of their time is very gratefully acknowledged.

3.5 SME Engagement

The CRC's SMEs are the 50,000 farmers involved in plant industries. These SMEs are represented and engaged through their industry R&D organisations, GRDC, HAL and Plant Health Australia, who are participants in the CRC. In addition, the CRC works closely with other organisations, such as the Grains Producers Australia and National Farmers Federation, who represent farmers and agribusinesses.

The list of CRC research projects contains many projects involving our SMEs. For example, we have an eradication project which has been examining black rot disease in grapes and which has been doing trials with vineyards in the Sunraysia region, near Mildura, Victoria. Similarly, we have been conducted trials with grains farmers in Queensland on cool grain fumigation.

We regularly exhibit at industry conferences and congresses. For example, in 2010-11, we had exhibition booths at the Australian Grains Industry Congress and Banana Growers Congress. This allows us to speak directly to growers and agribusinesses and inform them of the work being undertaken by the CRC. We also provided 450 copies of the corporate magazine, *Plant Biosecurity collaborative research initiatives* as bag inserts for the AusVeg National Conference.

3.6 Collaboration

The year witnessed further growth and development of the CRC's network of remote microscopes.

Remote Microscopy connects insect and plant pest and disease specimens with experts in real time via a web based feed, allowing immediate, interactive and accurate identification of specimens.

The network has a nominal headquarters in the Australian National Insect Collection (ANIC) which is located in Canberra, Australia and during the year the network expanded to 44 locations across Australia, New Zealand, Thailand, Vietnam, Singapore and East Timor. The network operates as a community with a high level of collaboration and participation within the growing network community.

The mutual benefits in skill acquisition and expert utilisation gained through the network provide a tangible example of our efforts to develop a national network for biosecurity science with linkage to international efforts and expertise.

We continued collaborative efforts through the quadrilateral scientific collaboration in plant biosecurity (QUADS-SciCo) alliance. In working with biosecurity colleagues in Canada, New Zealand and the United States of America, key areas of development and interest during the reporting period were risks posed to biosecurity by climate change and new surveillance technologies.

Ongoing development of collaborative links with Indigenous communities in northern Australia and eastern Indonesia resulted in implementation of a community biosecurity model at the political system level, industry system level and education and training system level.

During the reporting period it was pleasing to witness national policy in Indonesia adopting the term 'biosecurity'. A number of senior Ministries worked on implementation activities which were highlighted by the Maluku Province of Indonesia apportioning a budget to roll out biosecurity measures in partnership with the CRCNPB.

In Australia, the biosecurity model and associated resources were adopted by a number of Indigenous communities and the Northern Australian Indigenous Land and Sea Management Alliance to develop their strategy for a surveillance data collection program. The model was also used by the Northern Territory Government's Department of Natural Resources, Environment, The Arts and Sport to negotiate and improve community engagement in plant biosecurity and other related work.

At a commercial level, we also continued to provide successful consultancy services to Chevron Australia Pty Ltd. This commercial collaboration continues to assist Chevron in meeting the environmental operational requirements of the Gorgon project off Western Australia's northern coastline. These activities fell within the Activities specified in the *Commonwealth Agreement*.

4 Other activities

During the 2010-11 financial year, all activities undertaken by the CRCNPB fell within the Activities specified in the *Commonwealth Agreement*.

5 Additional Requirements

5.1 Third Year Review

All recommendations from the *Third Year Review* were reported as completed in the *Annual Report 2009-10*.

6 Glossary of Terms

Acronym	Meaning
AGM	Annual General Meeting
ANIC	Australian National Insect Collection
BioSIRT	Biosecurity Surveillance, Incident, Response and Tracing
CBH	Co-operative Bulk Handling Limited
CEO	Chief Executive Officer
CIE	Centre for International Economics
CRC	Cooperative Research Centre
CRCA	Cooperative Research Centre Association
CRCNPB	Cooperative Research Centre for National Plant Biosecurity
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSU	Charles Sturt University
DAFF	Department of Agriculture, Fisheries and Forestry
DIISR	Department of Innovation, Industry, Science and research
FAO	Food and Agricultural Organisation
GFBP	Grains Farm Biosecurity Program
GPS	Global Positioning System
GRDC	Grains Research and Development Corporation
HAL	Horticulture Australia Limited
IAEA	International Atomic Energy Agency
IP	Intellectual property
MAT	mass annihilation technique
NZ	New Zealand
ORIA	Ord River Irrigation Area
PaDIL	Pest and Disease Image Library
PBT	Plant Biosecurity Toolbox™
PDA	personal digital assistant
PHA	Plant Health Australia Ltd
PHC	Plant Health Committee
PhD	Doctor of Philosophy
PIRSA	Department of Primary Industries and Research South Australia
QUADS	Quadrilateral Agreement on Plant Health
QUADS-SciCo	quadrilateral scientific collaboration in plant biosecurity

R&D	research and development
RMN	remote microscope network
SME	small to medium-sized enterprise
SPHDS	Subcommittee on Plant Health Diagnostic Standards
SRG	Surveillance Reference Group
USA	United States of America
VET	Vocational Education and Training

7 Publications

Book Chapters

Khuwuthyakorn, P., Robles-Kelly, A. and Zhou, J. (2011), 'Affine Invariant Hyperspectral Image Descriptors Based Upon Harmonic Analysis', in Hammoud, R., McMillan, R.W., Fan, G., Ikeuchi, K. (eds.), *Machine Vision Beyond Visible Spectrum*, Heidelberg, Berlin, Springer-Verlag, pp. 179–199.

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Low Choy, S., Murray, J., James, A. and Mengersen, K.L. (2010), 'Indirect elicitation from ecological experts: from methods and software to habitat modelling and rock-wallabies', in O'Hagan, A. and West, M. (eds.), *The Oxford Handbook of Applied Bayesian Analysis*, Oxford, Oxford University Press, pp. 511–544.

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