



Our vision...

is to be a world leader in the generation, development and delivery of plant biosecurity science and education.

Our mission...

is to foster scientific collaboration and engage stakeholders to deliver plant biosecurity technologies that will reduce risk to, and ensure sustainability of, Australia's plant industries.

Established and supported under the Australian Government's Cooperative Research Centres Program.



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The Cooperative Research Centre for National Plant Biosecurity is the central coordinating body for plant biosecurity research across all Australian states and territories.

Cover image:

Collaboration is important throughout the research activities of the Cooperative Research Centre for National Plant Biosecurity. Researcher, Rob Emery demonstrates the use of PDA assisted surveillance tools in the field to CEO, Dr Simon McKirdy, Mr David Fienberg from Co-operative Bulk Handling Limited and Board Director, Mr Chris Richardson.

This project will provide digitised biosecurity surveillance technology that improves the speed and accuracy in capturing and analysing data.

IMAGE: L TO R:

Dr Simon McKirdy, CRCNPB CEO Dr Simon McKirdy, CRCNPB Researcher, Department of Agriculture and Food, Western Australia Mr David Fienberg, Senior Manager Supply Chain Quality, Co-operative Bulk Handling Limited Mr Chris Richardson, CRCNPB Board Director IMAGE ACKNOWLEDGEMENT:

Simon Eyres, Department of Agriculture and Food, Western Australia

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Executive summary and CEO report



Dr Simon McKirdy, Chief Executive Officer

This reporting period has seen a significant change to the Cooperative Research Centre for National Plant Biosecurity Ltd's (CRCNPB) research portfolio. In late 2007, the CRCNPB commenced a \$30 million biosecurity research alliance to protect Australia's highly valuable grain market from biosecurity threats. The alliance was formalised through a successful supplementary bid, resulting in the establishment of the Post-Harvest Integrity Research Program.

This new program aims to maintain Australia's reputation as a world leader of high quality grains and to control emerging pest and disease threats to stored grains such as wheat and barley. It combines the skills of industry, government, and scientific institutions in a unified national approach to develop new technologies, training and biosecurity safeguards in the grains industry.

To facilitate collaboration and engagement with grain industry members, the CRCNPB formed a Grains Advisory Panel with representatives from ABB Grain Limited, GrainCorp Operations Limited, Co-operative Bulk Handling Limited and the Grains Research and Development Corporation. The panel provides invaluable oversight and advice on the project development and delivery of post-harvest integrity research activities to the CRCNPB Board.

Another landmark achievement was the successful Science Exchange held in mid-November 2007. This inaugural event promoted strong partnerships and facilitated project collaboration within the CRCNPB. The meeting provided all members with the ability to meet face-to-face, discuss research activities and exchange ideas.

The CRCNPB's Annual General Meeting and November Board meeting were held at the same time as the Science Exchange. This gave the Participants Committee and the Board of Directors an informal opportunity to meet and engage with project teams. Pertinent to the timing of the event was the opportunity to introduce the recently launched Post-Harvest Integrity Research Program and welcome new participants.

A common theme in biosecurity literature is the recognition of the critical role plant biosecurity plays in global trade. With many biosecurity threats posing equal concern to Australia's trading partners, the CRCNPB continued to identify and pursue collaborative research and training opportunities internationally. In March, the CRCNPB joined 15 international agencies to form PRATIQUE, a consortium under European Union funding that will address the pest risk analyses for major global biosecurity threats. The CRCNPB has recognised climate change as a significant plant biosecurity challenge. Partnering with PRATIQUE, the CRCNPB is committed to providing Australian plant industries with the capacity to make informed decisions about changing biosecurity needs and to manage climate change impacts.

To develop strategies for plant biosecurity training across international borders, the CRCNPB continued its membership with the quadrilateral scientific collaboration in plant biosecurity. This initiative provides a framework for scientific cooperation in research, training and technologies regarding plant biosecurity across Australia, Canada, New Zealand and the United States.

In this reporting period, the Education and Training program continued to grow with a total number of 22 students enrolled in PhD studies. The CRCNPB has almost accomplished its target of 32 PhD candidates, with another seven confirmed students due to commence in the first half of 2008-09. It is expected the CRCNPB will have reached its target number of students by the end of the 2008-09 financial year. Another significant milestone was met with Dr Craig Webster being the first CRCNPB PhD student to submit his thesis and graduate.

During 2007-08, the CRCNPB modified the overarching management of its seven programs. With structural changes to the research portfolio, and the increase in projects moving from development to delivery, the CRCNPB recognised the need to make changes to its resourcing requirements.

In February 2008, Dr David Eagling was appointed as Research Leader to manage, lead and provide guidance to the CRCNPB's research portfolio. This coincided with Dr James Ridsdill-Smith becoming the CRCNPB's Principal Scientist. Both roles have enhanced the strategic and operational performance of the science research portfolio.

During 2008-09, many projects across the CRCNPB's programs will move into the delivery phase. Consequently, the CRCNPB will continue its strong focus on establishing partnerships and engaging stakeholders and end-users to adopt CRCNPB research outputs.

Dr Simon McKirdy Chief Executive Officer

Chairman's report



Professor John Lovett, Chairman (accompanied by his biosecure Angus Bull, Harold)

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This, the third *Annual Report* of the CRCNPB affords an opportunity to reflect on how well the CRCNPB is delivering on a key undertaking which was made as part of the original bid.

The proponents of the putative CRCNPB pointed to a significant effort in biosecurity research in Australia but observed that this effort was severely fragmented. Coupled with the loss of skilled practitioners in key disciplines and with the growing risk of incursions, this situation presaged major biosecurity breaches unless remedial action could be taken.

As a result, the CRCNPB bid was launched on a platform of 'biosecurity built on science' with a significant plank in the platform being to establish a network which would draw together the existing fragments in Australia's states and territories into a coherent, collaborative whole. The year under review has seen significant advances made in the networking context. An important component has been bringing together Australian CRCNPB participants with some international counterparts. This forms part of the CRCNPB's commitment to establish means of addressing as many biosecurity matters offshore as is possible.

The *ATSE* Crawford Fund has a substantial record of supporting master classes in subjects related to agriculture, which involve participants of proven expertise in specific topics together with peers and presenters from a number of countries. Several master classes have been held in Australia but a number have been hosted in other locations when this has offered the advantage of achieving the master class purpose. Such is the case with plant biosecurity.

With this in mind, The *ATSE* Crawford Fund agreed to support the CRCNPB to provide an International Master Class in Plant Biosecurity in Malaysia. Participants were invited from a number of Association of Southeast Asian Nations (ASEAN) countries and some other Asian countries of trading significance to Australia in the region. CABI (South-East Asia) and the Department of Agriculture and Agro-based Industry (Malaysia) were enthusiastic collaborators in this endeavour.

The aim of the Master Class was to reach participants who are 'influencers', that is, persons with a scientific and technical background in the disciplines associated with biosecurity and who have the ability to interface with policy makers and regulators in their home countries and, potentially, abroad.

Held from 2 June to 13 June, 17 participants from 10 countries took part in an intensive program of presentations, practical work, discussion groups and field visits – organised, principally, by CRCNPB personnel. The desired outcomes of the Master Class were threefold, namely, to:

- raise awareness of the plant biosecurity continuum (pre-border at border and post-border) in ASEAN countries and some of their neighbours with a focus on the global context of biosecurity
- increase the level of knowledge of risk analysis processes among Australia's neighbours and trading partners, and
- further develop collaborative links between the Master Class partners and between the partners, the participants and their home countries.

Feedback from participants indicated that these objectives were attained. Several desired follow-up activities were identified by the participants and the CRCNPB is working, especially with CABI, to deliver on some of these.

While the Master Class aimed to reach senior practitioners in plant biosecurity, an important networking activity in the Education and Training Program has been directed at primary school classes in Australia. Launched in the Australian Capital Territory in 2007, some 2,800 school students were enthusiastically involved in a program of school visits and plant biosecurity-related activities. So successful was the 2008 trial program that this important initiative is being evaluated with the intent to 'go national'.

This 'schools program' will assist the CRCNPB in its objective of enhancing community awareness of biosecurity issues, a vital adjunct to the professional efforts which are being made by biosecurity scientists.

The potential long-term benefits to be gained from linking biosecurity awareness in primary schools in Australia, through the broader community to biosecurity scientists and a plant biosecurity network among Australia's international neighbours are great. It is gratifying to be able to report that, in 2007-08, the CRCNPB has made progress towards obtaining this objective.

Finally, mention must be made of the highly successful Science Exchange, which was held as part of a group of CRCNPB activities in Melbourne on 15 and 16 November. Participant representatives, scientists and students, Board and management took part in a stimulating and entertaining series of sessions which highlighted the best aspects of Cooperative Research Centres in generating cooperation and collaboration in far-flung networks.

Professor John Lovett Chairman

Context and major developments

Industry context

The CRCNPB provides research and education in plant biosecurity to enhance Australia's agricultural sector, and ultimately retain its strong market access position.

During 2007-08, Australia's agricultural industries continued to be affected by severe drought conditions, resulting in loss of stock and low crop yields. The economic impacts of the drought did not affect the CRCNPB's level of funding from industry; conversely new grain industry participants joined the CRCNPB who are key stakeholders in biosecurity issues related to stored grain. However, the ongoing drought has the potential to impact on the CRCNPB's activities should it continue.

Throughout the 2007 equine influenza crisis, researchers working on CRCNPB projects assisted the government to manage the outbreak and provide scientific advice. While the outbreak was of an animal biosecurity nature, many of the methodologies associated with managing an incursion are similar to the plant industries. The diversion of researchers at this time impacted on the progress of a number of CRCNPB projects.

Major developments

In February 2008, the Minister for Agriculture, Fisheries and Forestry, the Hon. Tony Burke MP announced a comprehensive, independent review of Australia's quarantine and biosecurity systems. As the strategic focus of the CRCNPB research activities are a result of the critical gaps in Australia's plant biosecurity system, the CRCNPB provided an eighteen page submission to the review panel which addressed these issues. The final report from the review is expected to be released to the public in November 2008.

During June 2008, a phosphine review panel independently commissioned by the CRCNPB travelled throughout Australia visiting stored grain stakeholders and facilities. Chaired by Dr Peter Merriman, the panel was made up of several subject matter experts with a role to identify investment priorities in chemical and non-chemical research for the control of insect pests in stored grain. The final report from the panel is due for completion in late 2008 and its outcomes will be published on the CRCNPB website.

To evaluate and improve internal business processes, the CRCNPB initiated a review of its administrative and governance structures. The outcomes of the review are due for completion in late 2008.

Key events

Up until 31 December 2007, CRC NPB Limited (the Company) provided management services to the Cooperative Research Centre for National Plant Biosecurity Joint Venture (the Centre). With the agreement of participants, the CRCNPB business model was streamlined from 1 January 2008 to establish an improved accounting and reporting structure.

During the reporting period the operations of the CRCNPB focused on the:

- continued enhancement of systems and procedures to manage programs and projects
- incorporation of the supplementary bid activities into the programs
- development and delivery of the program in accordance with the *Commonwealth Agreement*, and
- relocation of the registered office and principal place of business.

Changes to staff

Through the reporting period there were several changes to staff, both as a result of the growth of the CRCNPB and structural changes, as well as staff moving on to other opportunities.

- Ms Carla Tadich was appointed in a newly created position of Project Officer in August 2007.
- Mr Nick Langley filled the vacant positions of Business Manager and Company Secretary in October 2007.
- Dr Pat Collins was appointed Program Leader for the Post-Harvest Integrity Research Program.
- Dr David Eagling moved from the position of Program Leader for the Impact Management Research Program to become the CRCNPB's Research Leader in February 2008.
- Dr James Ridsdill-Smith moved from Science Coordinator to the role of Principal Scientist in February 2008.
- Ms Kate Scott was appointed Communications Officer in March 2008.
- Ms Jane Moran replaced Dr David Eagling as Program Leader for the Impact Management Research Program in April 2008.
- Ms Rochelle Temby left the position of Executive Assistant in March 2008, and this role was filled by Ms Lauren Searson-Patrick in April 2008.
- Dr Gary Kong left the position of Program Leader for the Diagnostics Research Program in June 2008.
- Ms Sue McKell left the position of Delivery and Adoption Program Leader in June 2008.

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National research priorities

The CRCNPB is a major contributor to Australia's national research priorities and, in particular, the '*Safeguarding Australia'* priority to protect Australia from invasive diseases and pests. The proportion of CRCNPB research that relates to national research priorities and goals are given in the table below.

Table 1: National research priorities and CRCNPB research

NATIONAL RESEARCH PRIORITIES	CRCNPB RESEARCH (%)
FRONTIER TECHNOLOGIES FOR BUILDING AND TRANSFORMING AUSTRALI	AN INDUSTRIES
Stimulating the growth of world-class Australian industries using innovative technol cutting-edge research	ogies developed from
Frontier technologies	3
Smart information use	4
Promoting an innovation culture and economy	3
SAFEGUARDING AUSTRALIA	
Safeguarding Australia from terrorism, crime, invasive diseases and pests, and secu particularly with respect to our digital systems	uring our infrastructure,
Protecting Australia from invasive diseases and pests	88
Protecting Australia from terrorism and crime	2

Governance and management

Organisational structure (from 31 March 2008)





Cooperative Research Centre for National Plant Biosecurity Board members

Left to right: Dr Jim Cullen, Mr John Sandow, Mr Barry Windle, Ms Christine Campbell, Mr Chris Richardson, Professor John Lovett (Chairman), Professor John Irwin

Board of Directors and Committees

The CRCNPB's Board develops and oversees delivery of the CRCNPB's strategic objectives. The skills based Board is made up of a Chair and six other Directors - all independent of the CRCNPB's participants.

The Board was established with careful consideration to ensure a broad spectrum of expertise to maximise the value of the Board's input into the CRCNPB's direction and management.

The Finance and Audit Committee provides assistance to the Board of Directors in fulfilling its corporate governance and oversight responsibilities in relation to the CRCNPB's financial reporting, internal control structure, risk management systems and external audit functions.

The Board Nomination Committee consults with the CRCNPB's participants and directors to identify suitable candidates to the members for election as directors.

The names, qualifications, special responsibilities and experience of the Board of Directors in office during the period and until the date of this report are on the following pages. During the reporting period, Dr Peter Merriman's tenure as Director expired and Mr John Sandow was appointed.

Professor Emeritus John Lovett

Membership: Chairman, Board of Directors; Chair, Board Nomination Committee

Qualifications: BSc Hons (Agric), PhD **Tenure:** Appointed 3 August 2005, reappointed 15 November 2006

Chair: Agrifood Awareness Australia Ltd (2004). Chair: CRC for Greenhouse Accounting (2004-2006). Board member: HRZ Wheats Pty Ltd (2004-2006). Member Executive Board: Global Crop Diversity Trust (2006). Managing Director: Grains Research and Development Corporation (1994-2003). Managing Director: Lovett Associates Pty Ltd (2004). Professor of Agronomy: University of New England (1987-1993). Professor of Agricultural Science: University of Tasmania (1984-1987).

John Lovett is Chairman of the CRCNPB's skills-based Board of Directors. Professor Lovett's other board appointments include Chairman of Agrifood Awareness Australia Ltd and Chairman of the former Cooperative Research Centre for Greenhouse Accounting.

From 1994 to December 2003 he served as Managing Director of the Grains Research and Development Corporation. Over that period the Corporation's investments in research and development and technology delivery increased from \$30 million to more than \$120 million per annum.

Since leaving the Corporation, John has assisted a number of industries with various aspects of strategy and planning – grains, meat and wool in Australia, and dairy in New Zealand.

He has also assisted Land and Water Australia to develop an industry-focused plan for dealing with the impacts of climate change.

An Emeritus Professor at the University of New England, where he held the Chair in Agronomy, John Lovett was formerly Professor of Agricultural Science at the University of Tasmania and has had research associations in Indonesia, Finland and the United Kingdom.

In 2006 he was appointed to the Executive Board of the Global Crop Diversity Trust, established to protect the world's crop genetic resources in perpetuity. The opening of the so-called 'Doomsday Vault' in Svalbard (February 2008) has captured world-wide attention for this very important endeavour, in which Australia has played a key role.

In his spare time, with the help of his bull 'Harold', he breeds Angus cattle on a small property near Canberra.

Mr Barry Windle

Membership: Deputy Chair, Board of Directors Qualifications: BSc Agric, DipSc(Hort) Tenure: Appointed 3 August 2005

Chair AFMA Great Australian Bight Trawl Fishery Management Advisory Committee (current). Chair Central Hills Water Allocation Plan Advisory Committee and member of the Central NRM Group - Mount Lofty Ranges NRM Board (current). Chair Working Group on Market Access Research and Development HAL (current). Former Executive Director: Agriculture, Food and Fisheries, Primary Industries and Resources SA, Executive and Policy roles PIRSA (1988 – 2004). Horticultural Research Officer (1971 – 1988).

Barry is a former Primary Industries and Resource South Australia (PIRSA) Executive Director responsible for Agriculture, Fisheries and Aquaculture programs and related regulatory and emergency management services. He retired from full time work with PIRSA in 2004 and has since taken on roles with the CRCNPB, Australian Fisheries Management Authority, Horticulture Australia Limited, Adelaide and Mount Lofty Ranges Natural Resources Management Board, and the South Australian Department of Families and Communities.

Barry began his career at the University of Adelaide with a focus on horticultural science, plant pathology and entomology and joined the Department of Agriculture as a research officer in horticulture. Management roles started after working in India on an Australian International Development Assistance Bureau project in the 1980s. Management positions started with horticulture research and policy in the 1980s and progressed to executive leadership of the state's Agriculture Food and Fisheries programs for a decade or so until retirement.

In various executive positions, Barry had responsibility for most of the state's primary industry regulatory services covering animal and plant health, viticulture, food, fisheries and aquaculture planning and compliance with much of this relating to State and industry biosecurity. In past positions Barry has been a member of Primary Industries Standing Committee biosecurity committees, Plant Health Committee and Chief Inspector for plant quarantine.

Currently, Barry is chairing several committees as well as being Deputy Chair of the CRCNPB. These are the Great Australian Bight Trawl Fishery Management Advisory committee for the Australian Fisheries Management Authority, the Working Group on Horticulture Market Access for Horticulture Australia Limited, Central Hills Water Allocation Advisory Committee, Adelaide and Mount Lofty Ranges Natural Resource Management Board and is a member of other community and Natural Resource Management groups.

Barry lives in the Adelaide Hills and enjoys working on his property, time with grandchildren and river boating on the Murray.

Ms Christine Campbell

Membership: Board Director; Chair Finance and Audit Committee Qualifications: FCPA Tenure: Appointed 3 August 2005

Executive Chair: Twynam Agricultural Group. CEO (1983) and Financial Controller (1977) Twynam Agricultural Group. Chair: of the National Farmers' Federation Water Taskforce

(2005-2006). Chair: Australian Cotton Industry Council (2002-2005). Member: Policy Council of the National Farmers' Federation (2004-2005). Member Executive Committee of the National Farmers' Federation (2002-2004) Chair: Cotton Australia (2001-2003). Private Sector Advisory Panel to International Cotton Advisory Council (2004-2005). Director: Cotton Australia (1999-2005).

Christine Campbell has been on the Board of Directors of the Cooperative Research Centre for National Plant Biosecurity since August 2005

Christine is the Executive Chairman of the Twynam Agricultural Group which is based in New South Wales. Twynam's agricultural interests are both in dryland and irrigated farming, principally producing beef, wool, cereals, rice and cotton.

Christine's 30 years experience in both Twynam and the agricultural organisations listed above have provided her with extensive experience in financial and corporate management in the Australian Agricultural, Resource, Manufacturing and Investment Industries. She has been a member of CPA Australia since 1969 and a Fellow since 1990.

Dr Jim Cullen

Membership: Board Director Qualifications: BA (Hons), PhD Tenure: Appointed 3 August 2005, reappointed 14 November 2007

Member: Quarantine and Exports Advisory Council (1997-2003). Chief: CSIRO Entomology (1997-2002). Board Member: CRC for Australian Weed Management (Weed Management Systems) (1995-2002) (Acting Director 1995). Member: Australian Weeds Committee (1988-2002). External Advisor (Science and Research): Environmental Risk Management Authority NZ (2002). President: Australian Entomological Society (1997-2000).

Dr Jim Cullen's research background is in entomology and population ecology, with an emphasis on biological control of insect pests and weeds, the latter requiring a prolonged excursion into plant pathology during his career with CSIRO. This also included two uplifting educational experiences, the first liaising with the Industries Assistance Commission on cost: benefit analyses of agricultural research, plus a 'legal period' of eighteen months when he was responsible for coordinating CSIRO's response to the High Court injunction on the program against Paterson's Curse. He has published on biological control, insect physiology, plant pathology, weed management, agricultural economics and legal issues in agriculture.

Jim was responsible for several weed and insect biological control projects, ran the CSIRO European Laboratory in France from 1983 to 1987 and was a member of, or chaired several Standing Committee of Agriculture technical committees on biological control and weeds research. He led much of the early discussions with Australian Quarantine and Inspection Service (AQIS) to develop protocols for the introduction of biological control agents and was responsible for the original design of CSIRO's high security quarantine facility in Canberra. Jim was a member of the Australian Weeds Committee for many years and coordinated the successful proposal for the first Weeds CRC. Following the Nairn Review of Quarantine, he was appointed a member of the Quarantine Exports and Advisory Council and worked with AQIS and the Import Risk Analysis Review system at various times.

Jim was leader of the CSIRO weeds group, Assistant and Deputy Chief of CSIRO Entomology 1991-97 and Chief of the Division from 1997 to 2002. An acknowledged francophile since his Montpellier days, Jim was also inaugural President of the ACT Chapter of the Australian French Association for Science and Technology. He was President of the Australian Entomological Society from 1997-2000 and External Advisor (Science and Research) to the Environmental Risk Management Authority, New Zealand in 2000.

Jim retired in 2003, but has had his finger dragged back into a number of pies since then.

Professor John Irwin

Membership: Board Director, Finance and Audit Committee

Qualifications: BSc Hons (Agric), MSc (Agric), PhD, DSc (Agric)

Tenure: Appointed 3 August 2005

CEO: CRC for Tropical Plant Protection (1999 – 2006). CEO: CRC for Tropical Plant Pathology (1992 – 1999). Professor, School Integrative Biology: University of Queensland (1993 – present). Member: National Crop Improvement Committee, Grains Research and Development Corporation (1991 – 1993). Lecturer, Senior Lecturer, Reader: University of Queensland (1982-1992). Member: Oilseeds Research Council (1989-1991) Plant Pathologist/ Research Fellow: Queensland Department of Primary Industries/University of Wisconsin (1972-1982).

John Irwin is a Professor in the School of Integrative Biology at the University of Queensland. John has actively researched the areas of plant pathology/plant genetics since he started his career in 1972, and has bred or co-bred 10 cultivars of pasture and forage species.

The first 10 years of his career were in the Queensland Department of Primary Industries and Fisheries, three of which were spent at the University of Wisconsin-Madison, and the remainder in various roles at the University of Queensland.

From 1992-2006 he was CEO of two CRCs, the CRC for Tropical Plant Pathology and the CRC for Tropical Plant Protection. A major focus of both of these CRCs was the development of molecular tools for identifying plant pathogens. The work had a major international impact for several major groups of plant pathogens both endemic and exotic to Australia. These included *Phytophthora, Colletotrichum, Fusarium, Ralstonia* and others.

Education activities have been important to John Irwin. He has been principal supervisor to over 30 graduated Masters and PhD students at the University of Queensland, and he has taught undergraduate classes in several areas of plant science.

He has served on national committees of the Grains Research and Development Corporation, and as a panel member for Import Risk Analysis conducted by Australian Quarantine and Inspection Service. He has been the Editorial Board Chairman of both the Australian Journal of Agricultural Research, and the Australian Journal of Experimental Agriculture.

Mr Chris Richardson

Membership: Board Director, Finance and Audit Committee

Qualifications: Diploma in Agriculture **Tenure:** Appointed 3 August 2005, reappointed 14 November 2007

Chair WA Biosecurity Council (2008). Chair: Agricultural Protection Board of WA (2002-present).Chair: WA Ovine Johnes Disease Advisory Committee (2004- Present) .Chair: WA Footrot Eradication Campaign Advisory Committee (1999 - present). Board Member: Corredene Pty Ltd. CEO: Australian Merino Society Inc (1999 – present).

Mr Chris Richardson is an independent director on the Board of CRCNPB Ltd.

Chris has a farming background and has experience as a grains and livestock producer in the Great Southern region of Western Australia.

He has served as a company director with companies with an agricultural industry focus since 1994 and also has experience in local government.

Mr Richardson has experience with biosecurity policy and regulation in Western Australia and is currently Chairman of the Agriculture Protection Board of Western Australia which has statutory responsibility for the control and management of declared plant and animal pests in that state. He also has experience in the management of plant and animal pest incursions in Western Australia.

He was recently appointed Chairman of the newly established Biosecurity Council in Western Australia that has the responsibility to advise government on the delivery of biosecurity services and compliance with regulation and policy in regard to all biosecurity issues in WA for agriculture, fisheries and marine, forestry and government lands including the conservation estate.

Chris lives in Perth with his wife Annie and sons Blair and Sam.

Mr John Sandow

Membership: Board Director Qualifications: BSc MSc MAICD Tenure: Appointed 14 November 2007

Director, Cooperative Research Centre for Australian Weed Management, (2002-current), Western Australian Herbicide Resistance Initiative (WAHRI) (2002-November 2007); Member of 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), various product manager and technical roles (1989-1998), Entomologist, Western Australian Department of Agriculture (1979-1989).

John's career in agriculture spans almost 30 years and began as a biological control entomologist in the Western Australian Department of Agriculture.

In the late 80s he joined the Western Australian research and development team of ICI Rural Division, later Crop Care, one of the leading agricultural chemical suppliers in Australia. Gaining broad agronomic and technical experience, John then moved to marketing, filling several national marketing roles before returning to research and development in 2001 as the national Technical and Development Manager for Crop Care.

He joined the Grains Research and Development Corporation in 2003 as Manager - Crop Protection, routinely engaged in prioritising, planning, commissioning, managing and evaluating grains research and development programs involving national and international research teams from universities, state agencies, CSIRO, CRCs, private contractors and grower groups.

John retired from this role in November 2007 and is an independent consultant.

Dr Peter Merriman PSM

Membership: Board Director Qualifications: PhD Tenure: 3 August 2005 to 14 November 2007

Board Member: Chair: Victorian Strawberry Industry Certification Authority. Chair: Institute Bio-Safety Committee for Hexima Pty Ltd. Consultant to Horticulture Australia Ltd, Plant Health Australia Ltd and the Toolangi Certified Strawberry Runner Growers Cooperative, Victoria. Manager Plant Health and Principal Research Scientist: Plant Protection DPI Victoria (1970-2003). Member: Plant Health Committee and the Consultative Committee for Emergency Plant Pests and Diseases (1980-2003). Member: Advisory Board of the Centre for Environment and Stress Adaptation Research (2000-2003). Director: Australian Development Project on Control of Coffee Leaf Rust PNG and Coffee Research Advisory Committee PNG (1988-1992).

Dr Peter Merriman was a Director of the CRCNPB from August 2005 until November 2007.

During this time, Peter's other board appointments included Chair of the Victorian Strawberry Industry Certification Authority and Director for the Australian Development Assistance Project to control leaf rust in Papua New Guinea.

Peter has a long involvement with Australia's plant biosecurity system, including as a former member of the Australian Plant Health Committee and Consultative Committee for Exotic Plant Pests and Diseases (1980–2003), and as Principal Research Scientist at the Victorian Department of Primary Industries from 1990–2003.

Director's meetings held

MEETINGS OF COMMITTEES MEETING TYPE: DIRECTORS' MEETINGS Finance and Audit Board Nomination* Number of meetings held: 4 4 2 Number of meetings attended: Ms Christine Campbell 4 4 Dr Jim Cullen 4 _ Professor John Irwin 4 4 _ Professor Emeritus John Lovett 4 2 Dr Peter Merriman PSM 2 _ Mr Chris Richardson 4 4 Mr John Sandow 2 Mr Barry Windle 4

The CRCNPB Board meets quarterly in various locations around Australia.

Board meetings are also attended by Dr Simon McKirdy, Chief Executive Officer and Mr Nick Langley, Company Secretary/Business Manager.

***Board Nomination Committee**

Professor Emeritus John Lovett (Chair) Dr John De Majnik (GRDC) Mr David Fienberg (CBH) Dr David Hall (NSWDPI) Dr Pauline Mooney (SARDI) Dr Sashi Sharma (DAFWA) Dr Andy Sheppard (CSIRO)

Program Leaders (2007-08)

NAME	ORGANISATION	CRCNPB POSITION/ROLE
Dr Paul De Barro	CSIRO Entomology, Brisbane	Program Leader: Preparedness and Prevention Research Program
Dr Gary Kong	Queensland Department of Primary Industries and Fisheries, Toowoomba	Program Leader: Diagnostics Research Program
Dr Darryl Hardie	Department of Agriculture and Food Western Australia, Perth	Program Leader: Surveillance Research Program
Dr David Eagling/ Ms Jane Moran	Department of Primary Industries Victoria, Melbourne	Program Leader: Impact Management Research Program
Dr Pat Collins	Queensland Department of Primary Industries and Fisheries, Brisbane	Program Leader: Post-Harvest Integrity Research Program
Dr Kirsty Bayliss	Murdoch University, Perth	Program Leader: Education and Training
Ms Sue McKell	Cooperative Research Centre for National Plant Biosecurity	Program Leader: Delivery and Adoption

Lettuce aphid is primarily a contamination pest. The aphids can colonise lettuce hearts and rosettes and make them unsaleable. For small insects like aphids, movement is mainly through wind and human activity. The distance dispersed is influenced by many factors. Understanding how these interact to influence dispersal is critical in determining the size of quarantine zones.

CRC60002: LETTUCE APHIDS

CRCNPB PhD student Craig Feutrill has designed and built six, nine-metre fully automated suction traps for sampling for lettuce aphid *Nasonovia ribis-nigri*. The traps sample 45 cubic metres of air per minute which is funnelled down through a fine mesh cone to 70ml sample jars containing polyethylene glycol. The eight jars are replaced weekly and are on an automated turntable which rotates one jar forward at midnight. Three traps are erected in Tasmania and South Australia with more to go up in New South Wales and Victoria.

IMAGE: Craig Feutrill

CRCNPB Participants

During the reporting period the following organisations became participants of the CRCNPB with approval from the Commonwealth Government:

Core Participants

- ABB Grain Ltd
- Co-operative Bulk Handling Limited •
- GrainCorp Operations Ltd •
- La Trobe University

Charles Darwin C**BH**GROUP UNIVERSIT Australian Government 75 Department of Agriculture, Fisheries and Forestry ABB Department of Department of Agriculture and Food Victoria Primary Industries GrainCorp CSIRO GRD A TROBE UNIVERSITY NSW DEPARTMENT OF **Research & PRIMARY INDUSTRIES Development** UNIVERSITY Corporation QUI Queensland Government Department of Primary Industries and Fisheries Plant Health SARDI Saturn Biotech Providing Assurance for Agriculture RESEARCH AND DEVELOPMENT **CHARLES STURT**

portin

Core Participants

Grains







HAI

Know-how for Horticulture'



Northern



16

Supporting Participants

Charles Sturt University

Participants Committee

The Participants Committee monitors the progress of the CRCNPB including current and proposed projects and commercialisation of the CRCNPB's intellectual property. The Participants Committee meets as required.

Participants Committee Membership 2007-08

MEMBER NAME	ORGANISATION
Ms Jane Moran	Department of Primary Industries, Victoria (Chair until April 2008)
Dr Martin Barlass	Department of Primary Industries, Victoria (Chair from April 2008)
Mr Neil Barker	GrainCorp Operations Ltd
Professor Tim Brown	La Trobe University
Mr John Chapman	Queensland Department of Primary Industries and Fisheries
Dr Anthony Clarke	Queensland University of Technology
Mr David Fienberg	Co-operative Bulk Handling Limited
Adj. Associate Professor Chris Florides	Saturn Biotech Limited
Mr Greg Fraser	Grains Research and Development Corporation
Dr David Hall	New South Wales Department of Primary Industries
Associate Professor Giles Hardy	Murdoch University
Mr Kim James	Horticultural Australia Limited
Associate Professor Mike Keller	University of Adelaide
Professor John Kent	Charles Sturt University
Mr Geoff Masters	ABB Grain Ltd
Professor George Milne	University of Western Australia
Dr Pauline Mooney	South Australian Research and Development Institute
Dr Kathy Ophel-Keller	South Australian Research and Development Institute
Mrs Lois Ransom	Australian Government Department of Agriculture, Fisheries and Forestry
Dr Shashi Sharma	Department of Agriculture and Food Western Australia
Dr Andy Sheppard	Commonwealth Scientific and Industrial Research Organisation
Dr Peter Stephens	Northern Territory Department of Primary Industries, Fisheries and Mines
Professor Acram Taji	Queensland University of Technology
Mr Rodney Turner	Plant Health Australia Ltd
Professor Robert Wasson	Charles Darwin University
Mr Stephen Williams	Southern Cross University

Changes to Participants Committee

- Dr Martin Barlass replaced Ms Jane Moran as Chair (DPIVIC)
- Professor Acram Taji replaced Dr Anthony Clarke (QUT)
- Dr Kathy Ophel-Keller replaced Dr Pauline Mooney (SARDI)
- Mr Neil Barker (GrainCorp), Professor Tim Brown (LU), Mr David Fienberg (CBH), Professor John Kent (CSU) and Mr Geoff Masters (ABB) joined the Participants Committee as new members.

Research programs



Dr David Eagling Research Leader

Research activities and achievements

During 2007-08, CRCNPB has made significant progress towards meeting research outcomes, outputs and milestones as contracted under the *Commonwealth Agreement*.

As the CRCNPB's research activities involve exotic pests and diseases (which by definition originate external to the affected country) the CRCNPB has continued to proactively identify collaborative opportunities to share knowledge with international partners where exotic pests are present. This international collaborative approach provides both essential confidence in the applicability of the research outcomes by end-users as well as enhancing the scientific rigour of the research itself.

In the Preparedness and Prevention Research Program, the CRCNPB has contributed to both PRATIQUE, a consortium under European Union funding that will address the major global threats for pest risk analysis, and the Asia Pacific Network initiative to establish a major project focused on climate and crop disease risk management. Both contributions recognise climate change as a significant plant biosecurity challenge, and the partnerships underscore the CRCNPB's commitment to transfer knowledge to end-users, enabling them to make educated decisions on plant biosecurity issues.

Through the Diagnostics Research Program, the CRCNPB has developed a 'remote microscope' concept which will bring taxonomic expertise to the specimen rather than the specimen to the expert. This will provide rapid identification of pest species during key biosecurity events such as an emergency plant pest incursion.

This concept requires establishing a distributed system of taxonomic hubs connected to remote sites throughout Australia. In partnership with Australian government agricultural agencies, the CRCNPB has installed a central network node in Canberra and three remote nodes in the Australian states of New South Wales, Queensland and Western Australia. This work has received international interest and the CRCNPB is currently planning to add new Australian nodes to the distributed system as well as nodes in Thailand and Indonesia. In the Surveillance Research Program, the CRCNPB has been working with state agricultural agencies to demonstrate mobile field application development on personal digital assistants (PDA). A key focus has been the capability to use free PDA Google maps to record the sample location. While this requires internet connectivity, the instant map and street imagery provided by this system can be accessed anywhere in the world, and is updated at no charge by the relevant third party.

Through the Impact Management Research Program, genes putatively associated with virulence in the Russian Wheat Aphid (RWA) – a destructive global pest of grains – have been identified from a pea aphid salivary gland library. An unexpected level of variation in salivary gland proteins has been found in relation to other world-wide efforts which had been unable to find sequence or molecular marker variation between these biotypes in any other part of the genome.

This research resulted in a publication on aphid saliva and the characterisation of salivary protein C002 in the pea aphid which has been accepted in the prestigious journal *Proceedings of the National Academy of Science.* The work has also been presented at an Aphid Genome Annotation Workshop at Princeton University.

This CRCNPB research is now closely linked with the international pea aphid genome consortium which includes leading United States and Chinese researchers. This collaboration will examine RWA genetics and virulence in western China, an area where RWA is indigenous.

In the newly formed Post-Harvest Integrity Research Program, a key focus has been on phosphineresistant biotypes of insect pests of stored grain. Industry consultation identified the performance of phosphine fumigation in cool grain was particularly important. A survey conducted by the Australian Bureau of Agricultural and Resource Economics found that, of grain stored on farms for one month or longer, between 24 and 40 per cent was fumigated with phosphine, either initially or after infestations were detected.

In response, the CRCNPB investigated the performance of phosphine fumigation at lower temperatures for naturally cool grain, or grain cooled with aeration technologies. The research identified the average phosphine concentrations will be higher in fumigations of cool grain, and tends to be higher the longer the grain has been in storage before being fumigated. Importantly, the high level of sorption in sorghum means that the margin for error is smaller when fumigating this grain. In June 2008, a significant milestone for the Education and Training Program was reached when Dr Craig Webster submitted his thesis to become the CRCNPB's first completed PhD candidate. His research identified the first *Hardenbergia mosaic* virus (HarMV) endemic to Western Australia and developed microarray methods for diagnosing viruses of economic importance. To disseminate his research results, Craig's work has been published in scientific journals and he has provided oral presentations at scientific meetings.

Northern Australia is already the focus for many plant biosecurity activities which are often managed through the Australian Quarantine Inspection Service's Northern Australia Quarantine Strategy. In this region, the support of local communities is crucial to government activities, particularly as successful eradication of an incursion critically depends on the length of time between the initial incursion and its subsequent identification. Through the Delivery and Adoption Program, the CRCNPB identified processes to work with local communities in both Australia and neighbouring countries to develop risk mitigation strategies.

These approaches to community partnerships represent a paradigm shift to proactively manage incursion threats between countries. The CRCNPB is confident that working with local communities in both Australia and neighbouring countries will enhance awareness and knowledge to manage incursions moving across international borders. The collaboration will also identify ways to harness existing community capacity to implement future risk mitigation and incursion management strategies.

Dr David Eagling Research Leader

Biosecurity, research and education for Australia's plant industries...















Dr James Ridsdill-Smith Principal Scientist

Plant biosecurity is a continuum that includes preborder, border and post-border responses to plant pests and diseases. The programs of the CRCNPB cover this continuum through seven programs which are: Preparedness and Prevention Research, Diagnostics Research, Surveillance Research, Impact Management Research, Post-Harvest Integrity Research, Education and Training and Delivery and Adoption.

This year, the main effort has been to develop new projects within the agreed CRCNPB *Commonwealth Agreement*. Projects have been tracked carefully against the Commonwealth milestones and outputs to identify where there are gaps in coverage, and to prioritise new projects. Existing and planned projects are now in place that will cover the areas that were agreed in the CRCNPB *Commonwealth Agreement*. While all projects are considered strategic in terms of their aims, care has also been made to ensure that they include a mix of those with research which is:

- high risk and have potentially large benefits to projects, and
- low risk but probably more likely to have outcomes that will be adopted by stakeholders.

Most projects that have been developed depend on inputs from other stages in the continuum, and their outputs feed into the remaining stages of the continuum. While this has been recognised during project development, the CRCNPB has attempted to keep each project as an independent piece of research so that it is measurable and has a clearly defined timeline with a beginning and an end. As a result, each piece of research is judged for its ability to deliver to the reduction in risk for an incursion or the successful management of an incursion.

When benefit cost assessments were carried out on a number of ongoing projects it became evident that the benefits of controlling the same threat were being measured at different points in the continuum, from threat prioritisation before it was present in the country to impact management assuming that it was established in Australia. The benefit could be achieved at different points in the continuum, but it seemed unlikely that it would be equally achieved at all of the points. As a result the Science Committee are now considering delivery from a number of separate areas of research that can form part of a suite of projects that will work to solve larger problems.

In this approach, one example is to investigate the benefits from several research projects around surveillance of fruit flies and the eradication of fruit fly incursions from regions. In each case there are at least six CRCNPB projects contributing to different aspects of each research area. These areas include threat identification, diagnostics, improved surveillance/monitoring, improved traps or better lures for traps, and reduced impact based on a better biological understanding of the ecology. Initially the CRCNPB had considered developing these as large mega-projects, but it was thought to be too unwieldy to manage. The approach now taken is to divide up the problem and tackle it in parts, with the final outcome integrating all parts of the research.

It is important to consider how the research in the CRCNPB will deliver to industries. Two industries that co-invest with the CRCNPB have joined industry committees that meets regularly with the CRCNPB management to consider the research and the research direction and help decide priorities for new projects. The first is the Grains Advisory Panel which includes representatives of the main external funders of post-harvest grains research in the CRCNPB, namely Grains Research and Development Corporation, Co-operative Bulk Handling Limited, ABB Grain Ltd and GrainCorp Operations Ltd. This panel meets several times a year and the external members also attend relevant CRCNPB researcher workshops.

The CRCNPB has also signed a letter of agreement with Horticulture Australia Ltd (HAL) aiming to encourage collaboration and co-funding of research areas. This Committee meets with senior CRCNPB managers twice a year to discuss priorities and exchange information about research directions. In addition one of the CRCNPB Board members, Mr Barry Windle is the Chair of the HAL Working Group for Market Access Research and Development (WGMARD). The Principal Scientist, Dr James Ridsdill-Smith and one of the newly appointed Program Leaders, Dr Deb Hailstones are also members of WGMARD. These relationships assist the CRCNPB to develop its research program in close association with its stakeholders.

James Kelsdill Smith

Dr James Ridsdill-Smith Principal Scientist

Climate change is clearly recognised as a major threat to agricultural systems. The expected increase in temperature, atmospheric CO₂, heavy and unseasonal rains, increased humidity, drought and cyclones, are likely to affect crops, pests and diseases and host pathogen interactions.



CRC10071: CLIMATE CHANGE

This is a screenshot output from the Asian citrus psyllid – citrus growth model using the IPPC A1Fi climate change scenario with a Google Earth application. The ground overlay represents daily spatial variation in the population of adult psyllids displayed sequentially in an animation of 365 frames for the year 1990. The graphics depict temporal variations in the population of the Asian citrus psyllid and increasing temperature for the years 1990, 2030 and 2070 for a specific location. A total of 11,330 graphics can be accessed in the interface (one graph for each 50 km, two-grid cell on which the model was run) providing Australian coverage can be accessed in the interface (one graph for each 50 km two-grid cell on which the model was run) providing Australian coverage.

Program One: Preparedness and Prevention Research



In 2007-08, the Preparedness and Prevention Research Program established three new projects as part of fulfilling the milestones outlined in the Commonwealth Agreement. Two of these projects CRC10067 Evaluating risk analysis systems and CRC10068 Comparison of quarantine risk analysis systems are in collaboration with the Australian Centre for Excellence in Risk Analysis (ACERA). The third new project in this program is CRC10071 Understanding and responding to the risks associated with climate change and plant biosecurity. This means the program now has active research activities against all Commonwealth Agreement outputs and against all milestones with the exception of Milestone 1.2.1 'Develop models to predict spread of biosecurity threats.' However a project is currently under the final stages of development to meet this milestone.

In addition, the program successfully linked its portfolio of research projects to the European Union 7th Framework PRATIQUE consortium bid. PRATIQUE is composed of 15 Partners from eight European Union countries, two international organisations (EPPO and CABI), Australia and New Zealand. The purpose of PRATIQUE is to address the major challenges for pest risk analysis in:

- predicting the entry and establishment of new plant pests, diseases and invasive alien species in the European Union
- estimating potential economic, environmental and social impacts, and
- preventing eradicating, containing and controlling invasions.

This will be achieved through PRATIQUE's three principal objectives to:

- assemble the datasets required to construct effective pest risk analysis valid for the whole of the European Union
- 2. conduct multi-disciplinary research that enhances techniques used in pest risk analysis, and
- 3. develop an improved web-based, user-friendly decision support scheme.

In addition, the program is engaging through the Asia Pacific Network initiative to establish a major project focused on climate and crop disease risk management as well as developing linkages to the new CSIRO Climate Adaptation Flagship. These contributions recognise climate change as a significant plant biosecurity challenge and a key activity in enabling Australian primary producers to adapt the impacts of a changing climate.

The program has also undergone a series of strategic planning exercises with a view to making sure the suite of project activities within the program are well integrated, and to ensure maximum opportunity from cross collaboration. This has seen a number of new elements being added to various projects as researchers in one project identify opportunities in other projects where they can add value. This has contributed to the development of a strong integrated set of project activities which will add value beyond the initial scope.



Program Two: Diagnostics Research

During 2007-08, the CRCNPB's Diagnostics Research Program developed a highly sensitive molecular assay for the detection and identification of the organism causing Karnal bunt, the most serious disease risk to Australian wheat. The assay has been incorporated into an enhanced diagnostic protocol that overcomes the rate-limiting steps of earlier diagnostic procedures. Recent economic analyses have indicated it will be a more cost efficient tool for diagnosis in an incursion scenario. The project team held a national workshop to train diagnosticians from all Australian states in methods to implement the testing. This national group has also been engaged in validating the protocol.

Another highlight involved the development of a Nanobead Diagnostic Platform. Nanotechnology uses biological molecules such as oligonucleotides and antibodies, bound to beads of less than a few hundred nanometers in size, to detect pathogens in animal or plant cell extracts or environmental samples and is one of the most promising new approaches for pathogen diagnostics. In a partnership with the Queensland Department of Primary Industries and Fisheries, the Australian Biosecurity Cooperative Research Centre for Emerging Infectious Disease and Nanomics Pty Ltd, the CRCNPB worked during the reporting period to develop and test the technology for its applicability to the diagnosis of plant and animal pathogens. During the reporting period the CRCNPB also developed a 'remote microscope' concept. The concept was developed in response to the process of biological specimens requiring identification being mailed to taxonomic experts for determination. To achieve this, methods have been developed to essentially bring taxonomic expertise to the specimen rather than the specimen to the expert, thus saving time and effort and providing nearly immediate identifications.

The concept requires the establishment of a distributed system of taxonomic hubs connected to remote sites throughout Australia. The CRCNPB, in partnership with Australian government agencies, installed a central network node in Canberra and three remote nodes in the Australian states of New South Wales, Queensland and Western Australia. This required the provision of both infrastructure and training, and the web-enabled sites now allow real-time observation and manipulation of specimens, permitting identifications to be undertaken without the need to transfer specimens from their place of origin.

Currently there is no single information resource, web-based or otherwise, to provide diagnostic information for targeted emergency plant pests. Fast access to diagnostic information at the time of a suspected incursion is vital to biosecurity responsiveness.



CRC20012: NATIONAL DIAGNOSTIC DATABASE

The *Plant Biosecurity Toolbox* was initiated by the CRCNPB in response to a critical need for a digital repository for diagnostic information that relates to emergency plant pests. From its conception, the CRCNPB has worked closely with agencies such as the Australian Government Department of Agriculture, Fisheries and Forestry, Office of the Chief Plant Protection Officer, Australian Quarantine and Inspection Service and Plant Health Australia, consulted with scientists in State Departments of Agriculture and worked with the Sub-Committee for Plant Health Diagnostic Standards to ensure that the *Plant Biosecurity Toolbox* offers a user-friendly interface and provides a high standard of diagnostic information.

The result has been the integration of the *Plant Biosecurity Toolbox* into the (Pest and Disease Image Library) PaDIL website, where diagnostic information, images, references and links to experts, biosecurity agencies and documents can be found. The *Plant Biosecurity Toolbox* has public open-access and will represent a 'One-Stop-Shop' for all critical diagnostic information for emergency plant pests. It will be the place of choice for diagnosticians, researchers, consultants, inspectors and regulators to search for diagnostic information.

Barrow Island is a Class A Nature Reserve which sits 130km off the north-west coast of Western Australia and is also home to Australia's largest operating onshore oilfield. Environmental approvals to operate on the island have imposed stringent conditions on the project, including quarantine management. The environment is distinctive for its relative lack of features to the untrained eye, yet within the arid, spinifex-dominant landscape is a rich fauna that is almost free of invasive species and includes several species of mammals, reptiles and invertebrates that are found nowhere else.



CRC30084: BIOSECURITY QUARANTINE MODEL SYSTEM

The methodology of the Chevron surveillance design is very reliant on expert judgement to make risk-based technical decisions. The map is an example of the risk-mapping CRCNPB researchers are using to design a surveillance system that is targeted to risk, making the system efficient and effective. The key components of risk are the probabilities of entry and establishment of non-indigenous species. Risk values are calculated using the Analytical Hierarchy Process and mapped using a Geographical Information System.

Program Three: Surveillance Research

The 2007-08 year for the CRCNPB's Surveillance Research Program has been successful in reaching contracted outcomes, outputs and milestones from the *Commonwealth Agreement*.

The cost of implementing and maintaining good surveillance practices in Australia has been a prime driver for the CRCNPB. The focus of the Surveillance Program has been to facilitate the development of more efficient and technically sound sample/survey methodologies and systems. This research is being undertaken to enhance Australia's ability to capture a wide range of high quality information, accurately and cost-effectively, that will be accepted at the domestic and international level.

Coupled with the preceding requirements and Australia's limited surveillance research base, the Surveillance Program has been able to expand the research capacity in this area by adopting and expanding methodologies and technologies from science disciplines outside traditional plant biosecurity groups of entomology and plant pathology. Statisticians, ecologists, computer programmers, modellers, engineers and social scientists are some of the professional groups that have been engaged in the development of new and existing projects during 2007-08.

The diverse skill sets provided by these professional groups have enabled a number of short-term proof of concept projects to be undertaken. The use of camera-based hyperspectral imaging as a tool for detecting the presence of pathogens in crop plants, prior to symptoms being visible to the human eye, is looking very promising. The use of this same technology to discriminate between closely related species of insects is also returning very encouraging results. Another short-term project to investigate the use of digital technology to collect field surveillance and other biosecurity information has systematically evaluated a number of hardware and software platforms, and the associated connectivity issues with these devices. These projects were conducted in collaboration with stakeholder entomologists, plant pathologists or surveillance staff to maintain direction and relevance to plant biosecurity.

Collecting data on the restrictive presence, or the absence of emergency plant pests while important, is only one aspect of surveillance. How to interpret and use the data requires an entirely different set of skills. The development of statistical tools to determine sampling rates for 'known not to occur' and projects on simulation modelling for predictive spread of emergency plant pests are projects where mathematics plays an invaluable role in the Surveillance Program.

The successful CRCNPB supplementary bid in the stored grains areas provided the Surveillance Program with a number of roll-over projects from the Grains Research and Development Corporation (GRDC). The three phosphine resistance monitoring in grain insect projects were successfully completed. Further, a single nationally focused and coordinated project was work-shopped and written which will commence in the new year. This project will deliver standardised testing procedures for grain insect resistance in Australia to allow interstate comparisons on rising phosphine and protectant resistance levels and has also benefited from the statistical base being developed within the CRCNPB.

Fruit flies are another area that has a strong focus within the Surveillance Program. Collaborative projects with Horticulture Australia Limited (HAL) are progressing well. Given the importance of this area of research within the CRCNPB, an expert review panel consisting of stakeholders and industry representatives has been set up for each project. These panels will examine research findings each year of the project's life to provide feedback to the researchers involved. The main aim of these panels is to keep the projects focused on market access and deliver outputs that can be used by industry and government to facilitate horticultural exports. The fruit fly projects are very focused on the 'known not to occur' principle and once again mathematics in the form of spatial statistics is a key driver in these projects.



Program Four: Impact Management Research

Significant progress continues to be made in all projects in the Impact Management Research Program and international linkages have now been cemented. The profile of the CRCNPB internationally will benefit from becoming an official component of the international pea aphid genome consortium, through its Russian Wheat Aphid project. This project has also developed new linkages with China. Collaborations with New Zealand and the United States continue to flourish and will be further developed as phase two projects are implemented. However, it is important not to forget linkages within Australia especially collaborations that involve the end-users of the CRCNPB's research.

Post-entry quarantine is a critical part of the biosecurity continuum and quarantine pathologists are often dealing with the unknown. The dilemma they face is the ability to test for a large number of known and an untold number of unknown pathogens. This is especially important for viruses. To better protect Australia's plant industries, quarantine pathologists and CRCNPB researchers are jointly working to develop and deploy advanced molecular tests that are sensitive, efficient and reliable and which have a capacity to detect both known and unknown emergency plant pests. Phase One of this project developed a novel primer design approach that has been used to develop a generic test for Potyviruses that is currently being validated by New Zealand's Ministry of Agriculture and Forestry (MAF). Once these tests have been validated they will be proposed to the sub-committee on plant health diagnostic standards (SPHDS) for adoption as national diagnostic standards for use in post-entry guarantine and by diagnostic laboratories in Australia and New Zealand.

Eradication of emergency plant pests is costly especially when the destruction of perennial crops is involved. A model system designed to eliminate pathogens without total destruction of the crop has been developed. Trials have been established in grapevines in Sunraysia and once the protocols have been evaluated they will be trialled in the United States on grapevine black rot, an emergency plant pest that threatens Australian grapevine production. Industry is keenly interested in the outcomes of the research and they are actively informed of research progress. Ultimately the protocols will become a key part of industry biosecurity plans.

Incursions of arthropod emergency plant pests often involve urban and peri-urban areas and past strategies to control them have led to community outrage. It is now not acceptable to spray chemicals in many places due to social and environmental impacts. Approaches that exploit weaknesses in the biology of the insects, without widespread spraying of chemicals, by disrupting their mating have been developed as part of existing impact management programs. These approaches are being developed into protocols for eradication of emergency plant pests that can be used during incursions. The recent incursion of light brown apple moth (LBAM) in California has fast tracked the use of sterile insect technology for the eradication of LBAM. Research conducted by CRCNPB researchers has been used as the springboard for the eradication program in the United States.

The Australian viticulture industry exports wine to more than 100 countries worldwide and contributes approximately \$5.5 billion dollars to the nation's economy. The impact of an incursion of an exotic disease/pest would have a devastating effect on the wine industry, and Australia's export market. The current strategy for managing such an incursion includes complete removal of affected and suspected plants, followed by burning and/or burial.



CRC40016: PATHOGEN ERADICATION STRATEGIES

Eradication methods, such as the complete removal of plants can incur significant costs to growers and the industry. The time taken to re-establish a vineyard to its previous level of economic production, following removal, can be many years. This is particularly devastating for wine connoisseurs who enjoy a glass of premium Shiraz produced from 100-year-old vines. The image below depicts the alternative strategies of drastic pruning the CRCNPB is developing. If successful, this research will optimise the eradication process and minimise the economic cost of returning the crop to its previous quality and production, and potentially save the Australian wine industry millions of dollars in the event of an exotic disease incursion.



IMAGES: Dr Mark Sosnowski, SARDI

Use of phosphine in unsealed silos results in underdosing as gas can leak rapidly from the silo. Underdosing selects for resistance to phosphine in grain insect pests.

CRC50060: COOL GRAIN FUMIGATION

CRCNPB researchers Philip Burrill (*top*) and Greg Daglish (*on ladder*) setting up phosphine fumigation monitoring lines inside a farmer's grain silo. This project will assess phosphine fumigation efficacy against resistant insects in cool grain (aerated or naturally cooled) and make recommendations to Australia's grain storage industry.

Program Five: Post-Harvest Integrity Research



During 2007-08 the Post-Harvest Integrity Research Program was established as a result of a biosecurity research alliance with an aim to protect Australia's grain market from biosecurity threats.

As a new program, the focus during the year was on project development. With the formation of the CRCNPB Grains Advisory Panel, a number of projects were developed which targeted priority issues relevant to plant biosecurity in grains. Additionally, a review of chemical and non-chemical treatments for the control of insect pests of stored grain was initiated. This review was undertaken in response to the growing concern among the Australian grains industry of resistance to phosphine by key insect pests. The emerging resistance over the past fifteen years is now viewed as the critical biosecurity threat in stored grains. The results and findings from the review are due in late 2008 and will underpin the activities of the Post-Harvest Integrity Research Program.

The program also included a project on the performance of phosphine fumigation of cool grain that built on two years prior investment by Grains Research and Development Corporation. Results of trials held across Australia during the year showed that:

- the rate of sorption in sorghum decreases with time, which has implications for fumigation practice, and
- phosphine fumigation of cool grain (aerated or naturally cooled) is viable, provided longer exposure periods are used than would be the case with warm grain.

The work is currently being extended to industry through a series of recommendations.

Another commissioned project was developed in response to the September 2007 detection of resistance to phosphine in the Flat Grain Beetle, a key storage pest of grains. Fumigation protocols developed to control resistant Lesser Grain Borer (the species/genotype with the highest known resistance to phosphine) failed to control these populations and the project was developed to provide industry with an immediate short- to medium-term solution. During the year, the principal investigation focused on the manipulation of phosphine dosing parameters based on evidence from other grain pest species which showed that insects with strong resistance to phosphine can be controlled effectively by increasing either the concentration of phosphine applied or the exposure period or both.

CRCNPB projects 2007–08

ð	PROJECT NO.	PROJECT NAME	PROJECT LEADER
S AN	CRC10001	Early Warning Threat Identification	Dr David Cook, CSIRO
NES	CRC10010	Enhanced Biosecurity Planning Tools	Dr David Cook, CSIRO
red Evei	CRC10067	Evaluating Risk Analysis Systems	Dr Paul De Barro, CSIRO
EPA PR	CRC10068	Comparison of Quarantine Risk Analysis Systems	Professor Kerrie Mengersen, QUT
РВ	CRC10071	Climate Change	Dr Jo Luck, DPIVIC
	PROJECT NO.	PROJECT NAME	PROJECT LEADER
	CRC20004	Improved Karnal Bunt Diagnostics	Dr Mui-Keng Tan, NSWDPI
	CRC20012	National Diagnostic Database	Dr Gary Kong, QDPI&F
s	CRC20025	Remote Microscopes	Dr John La Salle, CSIRO
TIC	CRC20030	Nanobead Diagnostic Platform	Dr Andrew Geering, QDPI&F
SON	CRC20054	Plant Bacteria Platforms	Dr Deb Hailstones, NSWDPI
IAG	CRC20055	DNA Databank	Dr Andrew Geering, QDPI&F
Δ	CRC20080	Phosphine Resistance – Molecular	Dr David Schlipalius, QDPI&F
	CRC20082	Khapra Beetle Diagnostics	Mr Mike Grimm, DAFWA
	CRC20093	Increasing Diagnostic Capacity in Thailand	Dr Gary Kong, QDPI&F
	CRC20112	Aphid Diagnostics	Dr Glynn Maynard, DAFF
	PROJECT NO.	PROJECT NAME	PROJECT LEADER
	CRC30009	Grains Surveillance Strategy	Dr Sharyn Taylor, PHA
	CRC30014	PDA-Assisted Surveillance	Mr Robert Emery, DAFWA
	CDC20015	Lunguage stud Daths can Datastian	Ms Alison Mackie, DAFWA
	CRC30015	Hyperspectral Pathogen Detection	Dr Shane Hetherington, NSWDPI
	CRC30022	Female Fruit Fly Lures	Dr Katina Lindhout, NSWDPI
щ	CRC30023	Smart Trap Scoping Study	Dr Louise Morin, CSIRO
ANC	CRC30032	Flying Spore Traps	Dr Kirsty Bayliss, MU
	CRC30039	Fruit Fly Area Freedom	Dr Francis De Lima, DAFWA
IRVE	CRC30062	AIMS	Mr Robert Emery, DAFWA
SL	CRC30064	Resistance Monitoring and Management – Southern Region	Dr Joanne Holloway, NSWDPI
	CRC30065	Resistance Monitoring and Management – Northern Region	Dr Manoj Nayak, QDPI&F
	CRC30066	Resistance Monitoring and Management – Western Region	Mr Robert Emery, DAFWA
	CRC30073	Surveillance Simulation Platform	Professor George Milne, UWA
	CRC30084	Biosecurity Quarantine Model System	Dr Peter Whittle, QUT
	CRC30086	Sampling Strategies for Stored Grains	Dr Grant Hamilton, QUT
	CRC30116	Resistance Monitoring	Dr Manoj Nayak, QDPI&F
	PROJECT NO.	PROJECT NAME	PROJECT LEADER
	CRC40005	Rice Blast Races and Cultivar Susceptibility (Completed)	Dr Ric Cother, NSWDPI
ENT	CRC40006	Russian Wheat Aphid	Dr Owain Edwards, CSIRO
EMB	CRC40007	Predictive Economic Model	Ms Lisa Elliston, DAFF
AAG	CRC40016	Pathogen Eradication Strategies (Phase 2)	Dr Mark Sosnowski, SARDI
MAN	CRC40024	Insect Eradication	Mr Bill Woods, DAFWA
CT.	CRC40035	Movement of EPP Samples (Completed)	Dr Alan McKay, SARDI
MPA	CRC40049	Community-Based Biosecurity (Phase 2)	Dr David Eagling, CRCNPB
_	CRC40050	Post-Entry Quarantine AU/NZ	Dr Brendan Rodoni, DPIVIC
	CRC40088	Pre-Harvest Fruit Fly	Dr Anthony Clarke, QUT
	PROJECT NO.	PROJECT NAME	PROJECT LEADER
ST	CRC50059	Fumigation Technology	Mr James Darby, CSIRO
RVE RITY	CRC50060	Cool Grain Fumigation	Dr Greg Daglish, QDPI&F
-HA TEGI	CRC50089	Grain Insect Ecology	Dr Greg Daglish, ODPI&F
POST- INTI	CRC50092	Review of Chemical and Non-Chemical Alternatives to Phosphine	Dr Pat Collins, ODPI&F
			- /
	CRC50098	Flat Grain Beetle Fumigation Protocols	Dr Manoj Nayak, QDPI&F

During 2007–08, the CRCNPB had 87 active projects, with five of these reaching the completion phase. At 30 June 2008, there were 14 projects in the draft proposal stage, and four project proposals (in addition to the seven PhD projects) in Education and Training that had been accepted to commence in July 2008.

	PROJECT NO.	PROJECT NAME	PROJECT LEADER
	CRC60047	National Plant Biosecurity Curriculum	Dr Anthony Clarke, QUT
	CRC60069	School Education Strategy	Ms Kirsti Burtenshaw, CRCNPB
	CRC60072	Master Class in Plant Biosecurity	Professor John Lovett, CRCNPB
	CRC60114	Crawford Fund Training Course	Dr Sophie Peterson, PHA
	PROJECT NO.	PROJECT NAME	STUDENT
	CRC60002	Lettuce Aphids (PhD)	Mr Craig Feutrill
	CRC60003	Ascochyta Wind Tunnel (PhD)	Mr Steven Coventry
	CRC60008	Terrestrial Observation Predictive Systems (PhD)	Mr John Weiss
	CRC60011	Ordguard Community Engagement (PhD)	Mr Paul Royce
	CRC60017	Detection in Pathogen Mixtures (PhD)	Ms Bernadette Vogelzang
	CRC60026	Citrus Canker Fingerprinting (Hons) (Completed)	Mr Jonathan Terlich
	CRC60027	Scarab Beetle Barcoding (Hons)	Ms Kelly Rigg
	CRC60033	Hosts of Phytophthora ramorum (PhD)	Ms Kylie Ireland
	CRC60034	Bayesian Surveillance Systems (PhD)	Mr Mark Stanaway
	CRC60037	Fire Blight Diagnostics (PhD)	Ms Rachel Powney
	CRC60038	Epiphyas Revision (PhD)	Ms Roberta Hitchcock
	CRC60040	Luteovirus (PhD)	Ms Mai Hlaing Loh
	CRC60041	Surveillance Systems Analysis (PhD)	Ms Nichole Hammond
	CRC60042	Phytophthora Taxonomy (PhD)	Mr Alex Rea
	CRC60043	Microarrays for Virus Diagnostics (PhD Top-up)	Mr Craig Webster
	CRC60044	Nematode Taxonomy (PhD)	Mr Matthew Ian
	CRC60045	Phytophthora in Nurseries (PhD)	Ms Amy Smith
	CRC60051	Knapra Beetle (PhD)	Mr Mark Castalanelli
	CRC60051	Silverieal whitely in Sydney (nons) (<i>Completed</i>)	Mrs Jennier Spinner
	CRC60056	White Ely Systematics (PbD)	
	CRC60063	Women in Biosecurity (PhD) (commencing July 2008)	Ms Eka Martiningsih
	CRC60070	Tomato Leaf Curl-nano (PhD)	Ms Sharon Van Brunschot
	CRC60074	Smut Fungi (PhD)	Mr Alistair McTaggart
	CRC60075	NICTA Smart Trap (PhD)	Ms Pattaraporn Khuwuthvakorn
	CRC60076	Spore Modelling (PhD)	Mr David Savage
	CRC60077	Fruit Fly (Hons)	Ms Wendy Rahtz
	CRC60097	Fusarium TR 4 (PhD)	Ms Rachel Meldrum
	CRC60103	Indo Citrus Greening (PhD) (commencing July 2008)	Mr Wayan Mudita
	CRC60104	Biosecurity Policy (PhD Top-up) <i>(commencing July 2008)</i>	Mr Scott Knight
	CRC60106	Fruit Fly Parasitoids (PhD) (commencing July 2008)	Mrs Jennifer Spinner
	CRC60107	Nano Bananas (PhD) (commencing July 2008)	Ms Jenny Vo
	CRC60109	Fruit Fly Host Use (PhD) (commencing July 2008)	Mrs Sakuntala Muthuthan
	CRC60111	Russian Wheat Aphid (PhD) (commencing July 2008)	To be appointed
z	PROJECT NO.	PROJECT NAME	PROJECT LEADER
TIO	CRC70036	National Communication Strategy Framework	Mr Jim McGrath, PHA
рор	CRC70096	Grain Knowledge Networks	Dr Sharyn Taylor, PHA
⋖	CRC70099	Economic Analysis of Project Impact	Dr Simon McKirdy, CRCNPB
	PROJECT NO.	PROJECT NAME	PROJECT LEADER
	CRC100117	Chevron: Surveillance Planning for Plants and Vertebrates	Dr Peter Whittle, QUT

Ms Carla Tadich, CRCNPB

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DELIVERY AND

CONSULTANCIES

CRC100118

Chevron: Preparation of Digital Images

Research collaborations

By nature of the way they were developed, cooperative research centres provide the opportunity for collaboration across industry, research organisations, universities and end-users. Throughout this report the CRCNPB demonstrates its commitment and effectiveness in pursuing all opportunities for collaboration.

Collaboration with CRCNPB participants is extremely important, especially as many are end-users of research activities. The benefits of this collaboration was highlighted at the inaugural Science Exchange held in Melbourne.

The CRCNPB also pursues opportunities to collaborate with other cooperative research centres who work in the biosecurity spectrum, including Australian Biosecurity CRC for Emerging Infectious Diseases and Invasive Animals CRC. The CRCNPB also worked with the CRC for Molecular Plant Breeding to provide professional development workshops to teachers in the Australian Capital Territory and Western Australia.

Plant biosecurity is a worldwide issue and as a result, the CRCNPB is dedicated to spreading networks internationally to ensure the best outcomes for Australia's biosecurity practices. This is done through close affiliations with New Zealand's Better Border Biosecurity, and research projects in Thailand, China and Indonesia. The CRCNPB also works closely with North Carolina State University, Utah State University, Kansas State University and Cornell University on projects.

CRCNPB researchers worked collaboratively with the United States Government to provide scientific advice on its recent Light Brown Apple Moth incursion. In Europe, the CRCNPB is a member of PRATIQUE which addresses pest risk analyses of global trade.

The CRCNPB collaborates and works with other research agencies such as Rural Industries Research and Development Corporation, the Australian Centre for International Agricultural Research and the Australian Centre of Excellence for Risk Analysis.

With rapid advances in technology, the CRCNPB works closely with the National Information and Communications Technology Australia to ensure its research activities use the most up-to-date and modern communication technologies where appropriate.

All the CRCNPB's PhD students have at least one industry supervisor. This is considered integral in providing students with the opportunity to network and understand the needs of industry end-users.

NATIONAL	
Australian Biosecurity Cooperative Research Centre	Australian Centre of Excellence in Risk Analysis
Australian Centre for International Agricultural Research	Australian National University
Curtin University	Invasive Animals Cooperative Research Centre
National Information Communication Technology Australia	Rural Industries Research and Development Corporation
Tasmania Department of Primary Industries and Water	The ATSE Crawford Fund
University of Queensland	University of Sydney
INTERNATIONAL	
Better Border Biosecurity New Zealand	CABI
Canadian Food Inspection Authority	Center for Integrated Pest Management, North Carolina State University
Centre de cooperation internationale en recherché agronomique pour le developement, France	Centre for Environmental Policy, Imperial College London, UK
Central Science Laboratory, UK	Community Ecology, Zoological Institute, University of Bern, Switzerland
Cornell University	European and Mediterranean Plant Protection Organisation, France
Federal Biological Research Centre for Agriculture and Forestry, Department for National and International Plant Health, Germany	HortResearch New Zealand
Institut National de la Recherché Agronomique, UR633, Zoologie Forestiere, France	Institute of Botany, Academy of Sciences of the Czech Republic
Kansas State University	LEI Wageningen UR, Netherlands
Lincoln University	Malaysian Government Department of Agriculture
Ministry of Agriculture and Forestry New Zealand	National Centre for Advanced for Bio-Protection Technologies, NZ
National Aeronautics and Space Administration (NASA)	Plant Protection Institute, Bulgaria
SOFEI/BAKTI	Thailand Government Department of Agriculture
US Dept. of Agriculture: Center for Plant Health Science and Technology	Universitas Kristen Satya Wacana
Universitas Mahasaraswati	Universitas Nusa Cendana
University of Padova, Italy	Utah State University
Wageningen University, Netherlands	

Collaborative partners

Commercialisation and utilisation

Program Seven: Delivery and Adoption



Project delivery plans were completed for all active CRCNPB projects during the reporting period. This achievement underpins the CRCNPB efforts to identify key end-users, project intellectual property and pathways to adoption for the outcomes of its projects.

A key achievement of the Delivery and Adoption Program was the establishment of the Knowledge Grains Network project which parallels the biosecurity research alliance to protect Australia's grain markets. This project is a high-priority for grains industry end-users and aims to develop an effective change management strategy to improve outcomes when managing phosphine resistance.

The project recognises that industry practice issues are critical to the grain industry's ability to manage resistance, yet the key factors that drive acceptance have not (thus far) been examined as part of implementing a successful resistance management strategy. As every link in the value chain is critical to grain industry biosecurity, it is important that existing weaknesses within industry knowledge networks are targeted as a key part of the ability to deliver a resistance management strategy. Similarly, given that knowledge exchange is a two-way process, a better understanding of the grain industry's knowledge networks also has the potential to enhance information capture within national surveillance and resistance monitoring programs. An unprecedented opportunity to engage end-users and discuss technology transfer was held through the inaugural CRCNPB Science Exchange. Evaluation and feedback from the event was overwhelmingly positive with all delegates rating the event as either good or excellent. Feedback indicated the key success factor was the opportunity for networking and the event supported many formal and informal project meetings outside of the formal exchange program.

During 2007-08, CRCNPB researchers provided excellent service delivery by preparing a 'Key Issues Paper' for federal government agencies which was incorporated into the development of a national plant health strategy. This paper focused on the issue of climate change and the risks associated with the biosecurity of Australia's cultivated flora and access of Australian agricultural products to international markets.

Another highlight was the completion of an economic assessment of selected investments of the CRCNPB. Cost benefit analyses were undertaken on a number of current research projects. The independent assessment identified that each of the analysed projects had a strong prospect of realising benefits, with most projects relevant to more than one plant industry and/or plant pest.

Intellectual property management

The CRCNPB is responsible for identifying, securing, maintaining, and protecting any intellectual property (IP) associated with its research operations. IP is defined by the CRCNPB as 'new knowledge' derived from the CRCNPB's 'public good' status. The CRCNPB's IP register seeks to capture all IP ranging from public domain IP to highly valuable commercial IP.

Background and potential IP from the CRCNPB's projects is identified as part of the development and recommendation stages of all new projects. The IP register was established during 2006-07 as part of the CRCNPB's online project management system and continues to be developed by the CRCNPB's Business Manager.

The CRCNPB has taken steps to protect IP arising from its projects by stipulating confidentiality in individual project agreements and has developed policies and procedures to enable the preservation of suitable protection on all non public domain IP. These mechanisms work towards the CRCNPB's adherence to the National Principles of IP Management.

The CRCNPB also seeks to formalise IP arrangements where there is collaboration with external parties. Progress has been made towards establishing IP agreements on collaborative projects that present potential value for the CRCNPB, its partners or its end users. Currently, this includes agreements between the CRCNPB and National ICT Australia (NICTA) on the development of hyper spectral imaging surveillance technology, and Nanomics Biosystems on the development of diagnostic nanotechnology.

As the development of these and other CRCNPB technologies are still in their infancy, arrangements for their commercialisation, technology transfer, or the accrual of national benefit from the CRCNPB's IP are still in development and are yet to be realised. These arrangements will follow the basic premise of assessing the cost to the CRCNPB versus the return to the CRCNPB, its participants and/or the return to Australia.

Communication strategy

The CRCNPB pursues all opportunities to effectively engage and communicate with its stakeholders. Communication with participants is considered pivotal in the role of capturing the benefits and synergies to accelerate progress in plant biosecurity science and technology.

Through 2007-08, the CRCNPB continued to develop and build linkages with international research agencies to ensure Australia has access to the world's most advanced technologies and intellectual properties in plant biosecurity. The CRCNPB also continued to build solid relationships with other cooperative research centres who focus on plant or biosecurity issues.

Membership of the Grains Advisory Panel provides the CRCNPB with a platform to engage directly with the grains industry and to ensure they (as end-users) contribute to the development and outcomes of all stored-grain projects.

During 2007-08, the CRCNPB developed linkages with Chevron Australia. The CRCNPB is providing Chevron with biosecurity tools to ensure its Barrow Island operations are free of introduced species.

For most part of the reporting period, the CRCNPB only had a part-time communication resource. With the appointment of a full-time Communications Officer in March 2008, communication activities will increase providing more opportunities for effective engagement with key stakeholders

End-user involvement and CRCNPB impact on end-users

A key strength of the CRCNPB is the involvement of participants who are, in many cases, end-users of research results. This ensures maximum benefit and impact in the delivery of project outputs, development of new products and services and capture of intellectual property.

	End-user name	Relationship	Type of activity/end- user location	Nature / scale of benefits to end-user	Actual or expected benefit to end-user
t (DAFF)	Department of Agriculture, Fisheries and Forestry (DAFF)	Participant	Biosecurity Management (National)	Better preventative systems, diagnostic tests, surveillance methods, and impact management tools.	Reduced risk of incursions and improved capacity for incursion response and management.
	Australian Quarantine Inspection Service (DAFF)	Participant	Quarantine Services (National)	More accurate, efficient and cost-effective quarantine detection systems.	Better diagnostic tests expected to increase accuracy and efficiency of quarantine detection systems.
Governmer	Biosecurity Australia (DAFF)	Participant	Quarantine Assessment and Policy Advice (Canberra)	Improved surveillance data and modelling for quarantine assessments and policy advice.	Enhanced data expected to help ensure pest-free status and maintain international export markets.
Australian	Northern Australian Quarantine Strategy (DAFF)	Participant	Quarantine services (North Australia)	More accurate, efficient and cost-effective quarantine detection systems.	Better diagnostic tests expected to increase accuracy and efficiency of quarantine detection systems.
	Office of the Chief Plant Protection Officer (DAFF)	Participant	Biosecurity Management (National)	Improved risk analysis, diagnostics, surveillance and response strategies for biosecurity threats.	Enhanced data and strategies expected to help ensure pest-free status and maintain international export markets.
	Department of Agriculture and Food, Western Australia	Participant	Biosecurity Management (Western Australia)		
	Department of Primary Industries, Victoria	Participant	Biosecurity Management (Victoria)	-	
State Governments	Department of Primary Industries and Resources South Australia (PIRSA)	Participant	Biosecurity Management (South Australia)	Better preventative	Reduced risk of incursions and improved capacity for incursion response and management.
	New South Wales Department of Primary Industries	Participant	Biosecurity Management (New South Wales)	surveillance methods, and impact management tools.	
	Northern Territory Department of Primary Industries, Fisheries and Mines	Participant	Biosecurity Management (Northern Territory)	-	
	Queensland Department of Primary Industries and Fisheries	Participant	Biosecurity Management (Queensland)	-	

	End-user name	Relationship	Type of activity/end- user location	Nature / scale of benefits to end-user	Actual or expected benefit to end-user
Research Agencies	Australian Centre for International Agricultural Research (ACIAR)	Collaborative Research Provider	Biosecurity Management (International)	Better preventative systems, diagnostic tests, surveillance methods, and impact management tools.	Reduced risk of incursions and improved capacity for incursion response and management.
	САВІ	Collaborative Research Provider	Biosecurity Management (International)	Better preventative systems, diagnostic tests, surveillance methods, and impact management tools.	Reduced risk of incursions and improved capacity for incursion response and management.
	Commonwealth Scientific and Industrial Research Organisation (CSIRO)	Participant	Biosecurity Management (National)	Better diagnostic and surveillance tools.	Enhanced research capability to protect Australia's plant industries.
	Grains Research and Development Corporation (GRDC)	Participant	Biosecurity Management (National)	A high plant biosecurity status is maintained for plant industries.	Reduced risk of incursions and improved capacity for incursion response and management.
	Horticultural Australia Limited (HAL)	Participant	Biosecurity Management (National)	A high plant biosecurity status is maintained for plant industries.	Reduced risk of incursions and improved capacity for incursion response and management.
	International government agencies	Collaborative Research Providers	Biosecurity Management (International)	Better preventative systems, diagnostic tests, surveillance methods, and impact management tools.	Reduced risk of incursions and improved capacity for incursion response and management.
	Rural Industries Research and Development Corporation (RIRDC)	Collaborative Research Provider	Biosecurity Management (National)	A high plant biosecurity status is maintained for plant industries.	Reduced risk of incursions and improved capacity for incursion response and management.
	ABB Grain Ltd	Participant	Biosecurity Management (SA and Vic)	Market access and trade maintained through enhanced grain storage.	Minimised impact of phosphine and protectant resistance in stored grain insect populations.
Industry	Chevron	Industry	Biosecurity Management (WA)	Minimised environmental impact of industry activities.	Provide a high-level of confidence in biosecurity status of areas where industry is operating and tools to ensure accountability to government on retaining pristine environment.
	Co-operative Bulk Handling Limited	Participant	Biosecurity Management (WA)	Market access and trade maintained through enhanced grain storage.	Minimised impact of phosphine and protectant resistance in stored grain insect populations.

	End-user name	Relationship	Type of activity/end- user location	Nature / scale of benefits to end-user	Actual or expected benefit to end-user
	GrainCorp Ltd	Participant	Biosecurity Management (Vic, NSW and Qld)	Market access and trade maintained through enhanced grain storage.	Minimised impact of phosphine and protectant resistance in stored grain insect populations.
Industry	Ordguard	Industry	Biosecurity Management (WA)	Better preventative systems, diagnostic tests, surveillance methods, and impact management tools.	Reduced risk of incursions and improved capacity for incursion response and management.
	Plant Industry SMEs*	Industry	Principal beneficiaries of CRCNPB outputs (National)	CRCNPB outputs will minimise economic, social and environmental impacts of future pest incursions leading to increased export opportunities and stable production costs.	Enhanced plant biosecurity will ensure market access and enable new market potential. Production costs will not increase due to minimising impact of future incursions.
	Saturn Biotech	Participant	Commercialisation (Perth)	New technologies and tools will provide faster, more cost-efficient and accurate diagnostics	Outputs from diagnostic projects will enhance Saturn Biotech's service provision to the plant industries.
Industy/government coordination	Plant Health Australia	Participant	Plant Health Management (National)	Better biosecurity planning and communication tools.	Reduced risk of incursions and improved capacity for incursion response and management.

* Plant Industry SMEs

A3P, Almond Board of Australia, Apple and Pear Australia Limited, Australian Banana Growers' Council, Australian Citrus Growers' Inc, Australian Cotton Growers' Research Association Inc, Australian Dried Fruits Association Inc., Australian Honey Bee Industry Council, Australian Macadamia Society Ltd, Australian Mango Industry Association, Australian Nut Industry Council, Australian Olive Association Ltd, Australian Passionfruit Industry Association, Australian Processing Tomato Research Council Inc., Australian Table Grape Association, Australian Walnut Industry Association, AUSVEG, Avocados Australia, CANEGROWERS, Canned Fruit Industry Council, Cherry Growers of Australia Inc., Grains Council of Australia, Growcom, Nursery and Garden Industry Australia, Onions Australia, Ricegrowers' Association of Australia, Strawberries Australia, Summerfruit Australia Ltd, Winegrape Growers Association of Australia, Winemakers' Federation of Australia



Program Six: Education and Training

During 2007-08, the Education and Training program continued its strong growth. With a target of 32 PhD candidates, this reporting period saw a total number of 22 students enrolled in PhD studies, with another seven confirmed students due to commence in the first half of 2008-09. It is expected the CRCNPB will have reached its target number of students by the end of the 2008-09 financial year.

A significant milestone for the Education and Training Program was the completion of its first PhD candidate in June 2008. Dr Craig Webster completed his research in the use of microarrays for virus diagnostics and has been offered a postdoctoral position to further his skills in diagnostics.

During 2007-08, the CRCNPB supported four Honours candidates with three completions and the fourth due to submit her thesis in July 2008. One of these students is currently working with the Australian Quarantine and Inspection Service.

All postgraduate students, both at PhD and Honours level, have a minimum of one academic (university) supervisor and one industry supervisor. This ensures that every student has regular interaction with the CRCNPB's industry participants. Additionally, the CRCNPB's postgraduate students and one junior post doctoral student attended the annual professional development workshop in November 2007. At the workshop the students participated in training in Plant Biosecurity Awareness and also Networking Skills.

This year an innovative School Education Strategy in primary and secondary schools was trialled in the Australian Capital Territory. As part of the strategy, the CRCNPB is focusing on educating the younger generation currently enrolled in the school system. By portraying plant biosecurity and science in a positive and exciting manner to students from a young age, it is hoped that more students will be encouraged to pursue science as a career and, in the long-term, fill some of the science skills gaps.

The CRCNPB also participated in the National Youth Science Forum, and conducted a number of professional development sessions for teachers. In conjunction with the Delivery and Adoption program it is expected to extend the school strategy to more states in the second half of 2008-09. This will meet the strategic action of developing strategies and protocols for community education and engagement in plant biosecurity systems. The CRCNPB is currently developing a postgraduate curriculum in plant biosecurity with an active expert advisory group that consists of eight members from industry and end-user organisations. The CRCNPB also has strong international collaboration with colleagues in the USA, Canada and New Zealand. This ensures students enrolled in the curriculum will have access to material that is of a world standard. The postgraduate curriculum in plant biosecurity is expected to enrol its first students in 2009.

With an aim of transferring knowledge and increasing skills in the plant biosecurity industry, four workshops were organised during 2007-08. The first Australasian workshop was facilitated in all states of Australia, as well as New Zealand and introduced participants to the online Pest and Disease Image Library (PaDIL). The workshop demonstrated the features of PaDIL and its potential use to raise awareness of emergency plant pests within industry.

The second workshop was held to enhance skills in new diagnostic protocols for Karnal bunt. The workshop was attended by key diagnosticians from various state agencies as well as representatives from the Department of Agriculture, Forestry and Fisheries, Plant Health Australia and the CRCNPB's new grain participants.

Two Master Classes were held in June 2008 to provide education and training for people who work in the plant biosecurity field in neighbouring countries. The first was an International Master Class in Plant Biosecurity, which was held in Kuala Lumpur Malaysia. The CRCNPB partnered with the *ATSE* Crawford Fund, CABI and the Department of Agriculture and Agrobased Industry, Malaysia to deliver the workshop. Participants came from countries including Indonesia, Singapore, India, Bangladesh, Laos, the Philippines, Malaysia and Thailand.

The CRCNPB also partnered with the *ATSE* Crawford Fund and Plant Health Australia to provide a workshop on plant biosecurity to six quarantine officers, researchers and agricultural field staff from Papua New Guinea. This workshop was hosted in Melbourne by the Department of Primary Industries, Victoria.

Biosecurity, research and education for Australia's plant industries...



CRC60069: SCHOOL EDUCATION STRATEGY

As part of its Education and Training Program, the CRCNPB is committed to educating the next generation of science users and scientists.

In the *Scientists of Tomorrow* primary schools program, students from across schools in the Australian Capital Territory role-played being part of a plant biosecurity research team.

By portraying plant biosecurity and science in a positive and exciting manner to students from a young age, it is hoped children will become more aware of plant biosecurity issues and in the long-term, encouraged to pursue science as a career.

The *Scientists of Tomorrow* program is the keystone of the CRCNPB's school education strategy and after evaluation, it is hoped to expand the program nationally.

CRC60046: KHAPRA BEETLE (PhD)

Khapra beetle is a high-risk serious pest for all stored grain and would have a serious impact on market access and production costs if it became established in Australia.

Around the world there are many closely related species of beetle and misidentification can cause concern to quarantine authorities in countries.

In his PhD research with the CRCNPB, Mark Castalanelli is developing rapid molecular based testing to correctly diagnose these species. His research will also allow end-users, such as Quarantine Inspectors, to acquire a better understanding of the species family, which is paramount to protect Australia from such a devastating pest.





CRC60072: MASTER CLASS IN PLANT BIOSECURITY

An International Master Class in Plant Biosecurity was held in Kuala Lumpur, Malaysia in June 2008 as part of the CRCNPB's strategic objective to provide vocational training to the plant biosecurity community in neighbouring countries. The CRCNPB partnered with the *ATSE* Crawford Fund, CABI and the Department of Agriculture and Agro-based Industry to deliver the Master Class.

The aim of the Master Class was to reach participants who have scientific and technical background in the disciplines associated with plant biosecurity, and who have the ability to interface with policy makers and regulators in their home country, and potentially, abroad.

Participants came from countries including Indonesia, Singapore, India, Bangladesh, Laos, the Philippines, Malaysia and Thailand.

Publications

Books

Falk, I., Surata, K., and Suwondo, K. (2008) *Community Management of Biosecurity* (English language ed), Kritis, Indonesia and Learning Communities, Australia

Book chapters

Emery, R. and Nayak, M. (2007), 'Pests of Stored Grains', in Bailey, P.T. (ed.), *Pests of Field Crops and Pastures: Identification and Control*, Collingwood, Victoria, CSIRO Publishing, pp. 40-560.

Refereed publications

- Cook, D.C. and Matheson, A.C. (2008), 'An estimate of the potential economic impact of pine pitch canker in Australia', *Australian Forestry*, 71, pp. 107-112.
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- Zheng, L., Wayper, P.J., Gibbs, A.J., Fourment, M., Rodoni, B.C. and Gibbs, M.J. (2008), 'Accumulating Variation at Conserved Sites in Potyvirus Genomes is Driven by Species Discovery and Affects Degenerate Primer Design', *PLoS ONE* 3(2), e1586, oi:10.1371/journal.pone.0001586.

Seminars, conferences, workshops, industry meetings

- Bayliss, K. (2008), 'Education frameworks for biosecurity', International Master Class in Plant Biosecurity: Issues and Responses, Kuala Lumpur, Malaysia, 2-13 June 2008.
- Bayliss, K. (2008), 'Risk Analysis: Introduction to concepts and international frameworks', International Master Class in Plant Biosecurity: Issues and Responses, Kuala Lumpur, Malaysia, 2-13 June 2008.
- Bayliss, K., Jensen, T., Zeller, L., Walker, R., MacLeod, W., Vawdrey, L. and Kong, G. (2007), 'Enhancing surveillance with remotely controlled aircraft to demonstrate freedom from emergency plant pathogens', 16th Biennial Australasian Plant Pathology Society Conference, Adelaide, 24 September 2007, p. 178.
- Carmichael, A. (2008), 'Diagnostic Theory', International Master Class in Plant Biosecurity: Issues and Responses, Kuala Lumpur, Malaysia, 2-13 June 2008.
- Collins, P.J. (2007), 'Biosecurity for the grains industry,' Grains West Expo, Perth, 27 July 2007.
- Collins, P.J. (2008), 'Post-Harvest Integrity Research Program', CRC National Plant Biosecurity Science Exchange, Melbourne, 15 November 2007.
- Collins, P.J. (2008), 'Post-Harvest grain research in the CRC for Plant Biosecurity', Plant Health Committee (PHC) Meeting, Canberra, 26 February 2008.
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- Cook, D.C. and Proctor, W.L. (2008), 'Deliberative Multi Criteria Evaluation: The Wherefore and the Why,' Department of Agriculture, Fisheries and Forestry - Australian Centre of Excellence for Risk Analysis Seminar: Structured Decision Analysis for Biosecurity and Resource Management, Canberra, 9 April 2008.
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Third Year Reviews – 2004 Round CRCs

As the CRCNPB completed its third year of operations in June 2008, planning for the official 'Third Year Review' began. The CRCNPB Board is responsible for commissioning and overseeing the review, and implementing any recommendations which arise. The Board has formed a steering committee consisting of Professor John Lovett, Mr Barry Windle and Professor John Irwin. The independent review panel has been selected, chaired by Dr Kevin Sheridan. The remaining panel members are Dr Craig Phillips and Mr David Crawford with a fourth member, Professor Elizabeth Deane appointed by the Department of Innovation, Industry, Science and Research. The formal review will be undertaken in December 2008.

Glossary of terms

ACRONYM	MEANING
ACIAR	Australian Centre for International Agricultural Research
ACERA	Australian Centre of Excellence for Risk Analysis
ASEAN	Association of Southeast Asian Nations
AQIS	Australian Quarantine and Inspection Service
СВН	Co-operative Bulk Handling Limited
CDU	Charles Darwin University
CEO	Chief Executive Officer
CRC	Cooperative Research Centre
CRCNPB	Cooperative Research Centre for National Plant Biosecurity
CSIRO	Commonwealth Scientific and Research Organisation
CSU	Charles Sturt University
DAFF	Department of Agriculture, Fisheries and Forestry
DAFWA	Department of Agriculture and Food, Western Australia
DPIVIC	Department of Primary Industries, Victoria
EPP	Emergency Plant Pest
EU	European Union
GRDC	Grains Research and Development Corporation
HAL	Horticulture Australia Limited
ICT	information and communications technology
IP	Intellectual property
LBAM	Light brown apple moth
LU	La Trobe University
MAF	New Zealand Ministry of Agriculture and Forestry
MU	Murdoch University
NICTA	National ICT Australia
NSWDPI	New South Wales Department of Primary Industries
NTDPIFM	Northern Territory Department of Primary Industries, Fisheries and Mines
NZ	New Zealand
OCPPO	Office of the Chief Plant Protection Officer
PaDIL	Pest and Disease Image Library
PDA	personal digital assistant
PHA	Plant Health Australia Ltd
PhD	Doctor of Philosophy
PIRSA	Department of Primary Industries and Research South Australia
QDPI&F	Queensland Department of Primary Industries and Fisheries
QUADS	Quadrilateral Agreement on Plant Health
QUI	Queensiand University of Technology
K&D	research and development
RIRDC	Rural Industries Research and Development Corporation
RWA	Russian wheat aphid
SARDI	South Australian Research and Development Institute
SB	Saturn Biotech
SCU	Southern Cross University
	Sinai to medium-sized enterprise
SPHUS	Subcommittee on Plant Health Diagnostic Standards
UA	University of Adelaide
USA	
UWA	University of Western Australia



LPO Box 5012 Bruce ACT 2617 phone: +61 (0)2 6201 2882 fax: +61 (0)2 6201 5067 email: info@crcplantbiosecurity.com.au ABN: 13 115 589 707

www.crcplantbiosecurity.com.au