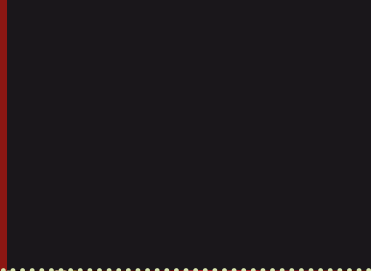
COOPERATIVE RESEARCH CENTRE FOR NATIONAL PLANT BIOSECURITY



CRC PLANTbiosecurity

COOPERATIVE RESEARCH CENTRE FOR NATIONAL PLANT BIOSECURITY

Annual Operating Plan

2006-2007


CRC PLANT biosecurity

Contents

Overview

Purpose

The purpose of this document is to provide information about the actions planned by Cooperative Research Centre for National Plant Biosecurity (CRCNPB) for 2006-2007 that support achievement of Commonwealth Outcomes and Program Goals.

Objects

The objects of CRCNPB are:

To be a non-profit scientific institution to:

(a) facilitate the creation of, and to manage, operate and govern, the Centre with the capability of pursuing world-class research and training relevant to the Centre Field;

(b) ensure that the Centre achieves its objectives and, in particular, to:

- i encourage the Members and other Participants with their differing disciplines and background, through their participation in the Centre, to add value to one another so that the performance of the Centre will be greater than that of each Member and other Participant acting independently;
- ii increase the skills of the persons already working in the Centre Field and to train and equip new postgraduate and other students with the skills and attributes to continue being productive in the Centre Field;
- iii promote a managed and cooperative approach to research and education in the Centre Field so as to maximise the benefits from that research and education; and
- iv carry out education activities in the Centre Field for students and for the professional development of the persons working in the Centre Field;

(c) promote the CRC Programme Objective; and

(d) act as trustee of the Centre IP and Commercialisation Income; and

(e) commercialise Centre IP in such a manner as to ensure that the maximum benefit accrues to Australia, including Australian industry, the Australian environment and the Australian economy generally.

Source: CRC NPB Ltd Constitution

Vision

The vision of CRCNPB is:

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

Source: CRCNPB Strategic Plan 2005–2012.

Mission

The mission of CRCNPB 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."

Source: CRCNPB Strategic Plan 2005–2012.

Outcomes

The outcomes to be delivered by CRCNPB are:

1. Prevention – reduced incidence of harmful pest incursions.
2. Identification – world-class biosecurity capability for early identification of emergency plant pest and pathogens.
3. Detection – more effective national surveillance systems.
4. Response – reduced losses from incursions of Emergency Plant Pests.
5. Realisation of the benefits of the CRC by stakeholders as the result of adoption of improved knowledge-based systems by government and primary producer organisations, and commercialisation of diagnostic and other technologies through the private sector.

Source: Commonwealth Agreement 18 November 2005.

Key Definitions

The Centre Field is biosecurity in plant industries.

Source: CRC NPB Ltd Constitution.

CRC Programme Objective

The CRC Programme Objective is to enhance Australia's industrial, commercial and economic growth through the development of sustained, user-driven, cooperative public–private research centres that achieve high levels of outcomes in adoption and commercialisation.

Source: Commonwealth Agreement 18 November 2005.

Current Company Status

Introduction

The purpose of this section is to provide a summary of the current status of CRCNPB in order to provide context for the planned activities during 2006-2007.

Governance

- The Company was established on 18 November 2005 and a Board of Directors has been appointed.
- The Board meet quarterly and has met five times prior to 30 September 2006. Prior to the establishment of the Company, the Board met informally two times.
- A Finance & Audit Committee has been established and their operations will continued to be formalised in 2006–2007.
- Company secretarial and financial management functions were outsourced until the full-time commencement of the Business Manager in August 2006.
- The Centre is establishing a Directors' handbook and planning cycle to support Board activities.
- Implementation of financial systems and arrangements suitable to the CRC's future needs will be completed by the end of the 2nd quarter of 2006–2007.
- A Science Committee has been established for defining and recommending projects to the Board and will continue working on Program and Project plans during 2006–2007.

Board

Chairman	Prof John Lovett
Deputy Chair	Mr Barry Windle
Director	Ms Christine Campbell
Director	Dr Jim Cullen
Director	Prof John Irwin
Director	Dr Peter Merriman
Director	Mr Chris Richardson

Management

The Centre's Management is outlined in the following table along with the status of each position.

Chief Executive Officer Commenced 28 Nov 2005	Dr Simon McKirdy
Office Manager / Executive Assistant Commenced 16 January 2006	Ms Mellanie Balment-Sanders
Business Manager Commenced 1 May 2006 Part-time until 1 August 2006	Mr Sunther Suntheraraj
Communications Manager Commencing 1 December 2006 Consultant to CRCNPB until 30 November 2006	Ms Sue McKell
Education Officer Currently defining requirements for appointment in February 2007.	TBD

Office

- The CRC's office has been established at Phipps Close, Deakin.
- The installation of furniture, fixtures and fittings has been completed.
- The office IT network has been installed, is operational, and is supported externally.

Website

The website was deployed in August 2006 and will continue to be developed and updated in 2006–2007. The Centre's URL is www.crcplantbiosecurity.com.au.

Projects

- Scoping and resourcing has commenced on Projects within Programs.
- A Project Management system has been selected and installed.
- Roll out project management system in 2nd quarter of 2006–2007.
- Train all users in 2nd quarter 2006–2007.
- Project Management System fully operational in 3rd quarter of 2006–2007.

Budget

	Total Cost $	Total Cash $	Salaries / Stipends $	Travel $	Operating Costs $	Uncommitted $	In-kind $
TOTAL CRCNPB							
Research	4,829,530	2,102,377	1,175,734	244,185	682,468	513,153	2,214,000
Education and Training	1,378,500	402,000	236,000	32,500	133,500	293,000	683,500
Delivery and Adoption	387,000	50,000	45,000	2,500	2,500	289,000	48,000
Centre	849,460	849,460	437,830	158,000	253,630		
TOTAL BUDGET	7,444,500	3,403,847	1,894,564	437,185	1,072,098	1,161,734	2,945,500

Project #	Project Name	Total Cost $	Total Cash $	Stipend $	Travel $	Operating Costs $	In-kind $
EDUCATION AND TRAINING							
CRC50002	Lettuce Aphids	97,500	36,000	24,000	5,500	6,500	61,500
CRC50003	Ascochyta Wind Tunnel	73,500	36,000	24,000		12,000	37,500
CRC50008	Terrestrial Observation Predictive Systems	187,000	77,000	24,000	12,000	41,000	110,000
CRC50011	Ordguard Community Engagement	88,500	39,000	24,000		15,000	49,500
CRC50017	Detection in Pathogen Mixtures	80,500	40,000	24,000		16,000	40,500
CRC50026	Citrus Canker Fingerprinting	27,500	5,000	5,000			22,500
CRC50027	Scarab Beetle Barcoding	27,500	5,000	5,000			22,500
CRC50028	Fusarium Head Blight Characterisation	15,500	5,000	5,000			10,500
CRC50029	Taxonomy of *Phytophthora Citricola*	32,500	5,000	5,000			27,500
CRC50033	Hosts of *Phytophthora Ramorum*	94,500	30,000	24,000		6,000	64,500
CRC50034	Bayesian Surveillance Systems	154,500	30,000	24,000		6,000	124,500
CRC50037	Fire Blight Diagnostics	104,000	59,000	24,000	10,000	25,000	45,000
CRC50038	*Epiphyas* Revision	102,500	35,000	24,000	5,000	6,000	67,500
TOTAL EDUCATION AND TRAINING		1,085,500	402,000	236,000	32,500	133,500	683,500

Project #	Project Name	Total Cost $	Total Cash $	Salaries $	Travel $	Operating Costs $	In-kind $
DELIVERY AND ADOPTION							
CRC60036	National Communication Strategy Framework	98,000	50,000	45,000	2,500	2,500	48,000

Project #	Project Name	Total Cost $	Total Cash $	Salaries $	Travel $	Operating Costs $	In-kind $
RESEARCH PROGRAMS							
Preparedness & Prevention							
CRC10001	Early Warning Threat Identification	258,264	159,264	118,100	13,000	28,164	99,000
CRC10010	Enhanced Risk Analysis Tools	472,836	298,336	243,836	25,000	29,500	174,500
		731,100	457,600	361,936	38,000	57,664	273,500
Diagnostics							
CRC20004	Karnal Bunt Detection	178,107	89,607	49,607	5,000	35,000	88,500
CRC20012	National Diagnostic Database	156,000	32,000	30,000	2,000		124,000
CRC20025	Remote Microscopes	115,000	25,000			25,000	90,000
CRC20030	Molecular Analysis Systems	532,000	220,000		20,000	200,000	312,000
CRC20031	Detection of *Phytophthora Ramorum*	126,962	33,962		6,712	27,250	93,000
		1,108,069	400,569	79,607	33,712	287,250	707,500
Surveillance							
CRC30009	Grains Surveillance Strategy	166,270	106,270	60,770	24,500	21,000	60,000
CRC30014	PDA-assisted Surveillance	185,000	80,000	25,000	15,000	40,000	105,000
CRC30015	Hyperspectral Pathogen Detection	243,500	82,500	15,000	20,000	47,500	161,000
CRC30020	Surveillance Staff Training	139,000	60,000	25,000	10,000	25,000	79,000
CRC30022	Female Fruit Fly Traps	215,672	151,672	122,771	5,000	23,901	64,000
CRC30023	Smart Trap Technology	111,841	41,341	31,341		10,000	70,500
CRC30032	Flying Spore Traps	184,160	48,660	10,000	10,660	28,000	135,500
CRC30039	Fruit Fly Area Freedom	247,778	153,778	94,872	10,000	48,916	94,000
		1,493,221	724,221	384,754	95,160	244,317	769,000
Impact Management							
CRC40005	Rice Blast	106,050	26,550		23,313	3,237	79,500
CRC40006	Russian Wheat Aphid	139,310	103,310	63,310	15,000	25,000	36,000
CRC40007	Predictive Economic Model	222,300	141,300	98,800	7,500	35,000	81,000
CRC40016	Eradication Strategies	216,827	102,827	72,827	15,000	15,000	114,000
CRC40024	Insect Eradication	212,000	96,000	75,000	12,000	9,000	116,000
CRC40035	Risk Management Process	87,500	50,000	39,500	4,500	6,000	37,500
		983,987	519,987	349,437	77,313	93,237	464,500
TOTAL RESEARCH		4,316,377	2,102,377	1,175,734	244,185	682,468	2,214,000

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Programs, Actions and Projects Structure

Introduction

The purpose of this section is to provide information about the structure of programs undertaken by the CRCNPB.

Programs

The CRCNPB manages 6 programs in order to deliver outcomes in accordance with its constitution and funding agreements. The programs are:

1. Preparedness and Prevention Research
2. Diagnostics Research
3. Surveillance Research
4. Impact Management Research
5. Education and Training
6. Delivery and Adoption

Details for Projects in each of these Programs are given in the sections following.

Goals, objectives, actions and performance indicators for the above programs can be found in the CRCNPB Strategic Plan.

Appendices 1 and 2 contain further information regarding the relationship of the above programs to the Commonwealth Agreement.

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CRCNPB PROGRAM 1

Preparedness and Prevention Research

The Preparedness and Prevention Program will initiate projects to address key areas of need in the risk analysis pathway. The research will focus on improving our capacity in threat identification and prioritisation and will benchmark these against existing practice. The program also focuses on improving our understanding of those factors that influence the capacity of invasive species to establish and spread and, through this, further strengthen our ability to prioritise threats. Global climate change will play an increasingly important role in Australian agriculture over the next century; its influence on the potential for impact by EPPs is unknown, but is likely to be considerable. How climate change may influence pest prioritisation will be a core focus of research for the program.

Project: CRC10001

Early Warning Threat Identification

Project: CRC10010

Enhanced Risk Analysis Tools

Project: CRC10001

Early Warning Threat Identification

Early warning of pre-emergent pest threats

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Increased capacity to effectively identify plant biosecurity threats that have not been detected using existing systems.

What is the biosecurity problem? A lack of capacity to effectively identify plant biosecurity threats that have not yet emerged sufficiently to be detected using existing systems.

Project status Approved

Project start-completion date

Start: December 2006
Completion: November 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Contrast the similarity approach to threat detection to the existing approaches for identifying pre-emergent EPP threats and determine which is the most robust approach to early warning of EPP threats.
2.	Develop a robust early warning capability for threat identification.
3.	Utilise a similarity approach based on that developed by Lincoln University to improve the capacity to identify pre-emergent EPPs.
4.	Incorporate within this a climate change scenario to determine the potential impact of climate change of pest threats.
5.	Datamine interception and Australian Pest and Disease databases; Dept of Primary Industry pest and disease records, and literature to identify those EPPs already established in Australia and to identify EPPs that have a history of incursion and identify pathways.
6.	Use a risk analysis approach to rank the threat posed by the pre-emergent EPPs identified.
7.	Compare the pre-emergent EPPs identified through this process to those identified using the PTQ/DTQ approach which follows the FAO guidelines for pest prioritisation.

Project leader Dr Matt Thomas, CSIRO

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr Matthew Thomas	CSIRO	20
Dr Simon Barry	DAFF	10
Mr Marc Poole	DAFWA	10
Mr Kevin Powell	DPIVIC	5
Mr Greg Baker	SARDI	10
Mr Peter Gillespie	NSWDPI	5
Dr Roger Shivas	QDPI&F	10
Mr Graham Brown	DPIFM	10
Dr Mike Cole	DAFF	10
Dr Cathy Young	TAS DPIWE	10
Total in-kind		**100**
Postdoctoral To be appointed	CRCNPB/CSIRO	100

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$118,100
Travel & Accommodation	$13,000
Operating costs	$28,164
Total Operating Budget	**$159,264**

End-users/Output The output will be a protocol for identifying pre-emergent threats. It is anticipated that the protocol will be delivered as a computer-based package. The package will be used primarily by PHA, its industry members and the State and Federal agencies charged with undertaking the identification and assessment of external threats. The package will be used in conjunction with risk analysis protocols to identify the threats and to then prioritise them. The resultant rankings will support decision-making in regard to the allocation of resources to mitigate identified threats and to support the development of pre-emptive approaches to threat mitigation. The protocol will link to CRC10010.

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Project: CRC10010

Enhanced Risk Analysis Tools

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective A nationally agreed methodology for enhanced biosecurity threat identification and prioritisation to support preparedness.

What is the biosecurity problem? Biosecurity prediction is notoriously uncertain and, in planning biosecurity investments, industries need confidence in the planning process. The current system depends on expert opinion over a number of questions. While this is the best available system for prioritizing threats at present, it is well known that opinion is susceptible to framing, context dependence and motivation leading to bias and possibly misleading prioritisation. We aim to develop a methodology that deals better with these issues to give a higher level of confidence to Australia's plant industries in their preparedness and investments. We will utilise economic based assessments, likelihood pathways and methodologies that look at competing demands on resources and competing values and preferences to reach decisions, using a Multi-Criteria Decision Analysis.

Project status Approved

Project start-completion date
Start: July 2006
Completion: November 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Rigorous methodology for identifying and prioritizing threats.

Project leader Dr David Cook, CSIRO

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr David Cook	CSIRO	40
Dr Satendra Kumar	DAFWA	20
Mr Mark Stuart	DAFWA	30
Dr Paul de Barro	CSIRO	10
Ms Simone Tuten	DAFWA	10
Dr Kim Lowell	DPIVIC	30
Dr Kathy Gott	NSWDPI	5
Tbd	DAFF	5
Mr Rod Turner	PHA	5
Total in-kind		**155**
Postdoctoral (to be appointed)	CRCNPB/CSIRO	100
Postdoctoral (to be appointed)	CRCNPB/DAFWA	100
Postdoctoral (to be appointed)	CRCNPB/DPIVIC	100

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$243,836
Travel & Accommodation	$25,000
Operating costs	$29,500
Total Operating Budget	**$298,336**

RIRDC & HAL are co-investors in this project.

End-users/Output The output will be a rigorous methodology for identifying and prioritising threats for plant biosecurity. The threat identification and prioritisation package will link to CRC10001. The threat identification and prioritisation methodology will be used primarily by PHA, its industry members and the State and Federal agencies charged with undertaking the identification and assessment of external threats. The identification and prioritisation package will support decision making in regards to the allocation of resources to mitigate identified threats and to support the development of pre-emptive approaches to threat mitigation.

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CRCNPB PROGRAM 2

Diagnostics Research

The Diagnostics Program will provide scope through its diverse participants, to discover and evaluate new information and techniques for the diagnosis of emergency plant pests. By delivering cheap, accurate and rapid diagnostic tests, and by providing accredited diagnostic information and building expert connections into national networks, the Diagnostics Program will enhance our response to pest incursions and reduce their impact on our agricultural industries

Project: CRC20004
Karnal Bunt Detection

Project: CRC20012
National Diagnostic Database

Project: CRC20025
Remote Microscopes

Project: CRC20030
Molecular Analysis Systems

Project: CRC20031
Detection of *Phytophthora Ramorum*

Project: CRC20004

Karnal Bunt Detection

Enhancing the detection of Tilletia indica*, the cause of Karnal bunt*

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Implement an internationally recognised cost-effective molecular assay for *Tilletia indica* that does not require spore germination or microscopy.

What is the biosecurity problem? Australia does not have Karnal bunt and is at a considerable distance from known infested areas and, thus, quarantine is extremely important to maintain Karnal bunt-free status. Any possible incursion would cause severe disruption to Australia's international wheat trade.

The current diagnostic protocol involves the tentative identification of spores based on morphology followed by germination of the spores and a molecular protocol to confirm the identity. Microscopy and spore germination are very rate-limiting and labour-intensive.

Project status Approved

Project start-completion date

Start: March 2006
Completion: June 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Develop an internationally recognised cost-effective molecular assay that does not require spore germination or microscopy.
2.	Develop improved extraction of spores from grain and other commodities.
3.	Launch the protocol as a standard biosecurity tool.

Project leader Dr Mui-Keng Tan, NSWDPI

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr Mui-Keng Tan	NSWDPI	40
Ms Dominie Wright	DAFWA	30
Dr Gordon Murray	NSWDPI	10
Dr John Mullen	NSWDPI	5
Total in-kind		**85**

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$49,607
Travel & Accommodation	$5,000
Operating costs	$35,000
Total Operating Budget	**$89,607**

GRDC are a co-investor in this project.

End-users/Output An accurate and reliable DNA-based protocol for the identification of Karnal bunt will be developed. The methodology will be validated by accredited laboratories both in Australia and overseas. The resulting Diagnostic Protocol will be endorsed by SPHDS and Plant Health Committee. The protocol will be used by Biosecurity diagnosticians in government agencies and industry, both nationally and internationally. The protocol will be made available electronically via the Diagnostic Database Web Site or as hard copy from OCPPO.

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Project: CRC20012

National Diagnostic Database

A national diagnostic database for EPPs

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Easily, quickly and broadly accessible diagnostic information which assists responsiveness to a suspected incursion.

What is the biosecurity problem? Currently there is no single information resource, web-based or otherwise, that is dedicated to providing diagnostic information for targeted emergency plant pests (EPPs). Having quick access to specific diagnostic information at the time of a suspected incursion is vital to Biosecurity responsiveness and ultimately impacts on the risk that the EPP might pose.

Project status Recommended for approval

Project start-completion date

Start: December 2006
Completion: June 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Develop a standard diagnostic information template in consultation with staff involved in plant Biosecurity diagnostics.
2.	Conduct an audit of diagnostic information relating to EPPs to populate the template and to identify gaps in diagnostic information.
3.	Design and construct a web-based portal to access diagnostic information.

Project leader Dr Gary Kong, QDPI&F

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr Gary Kong	QDPI&F	20
Dr Roger Shivas	QDPI&F	10
Dr John Thomas	QDPI&F	10
Dr Michael Priest	NSWDPI	10
Mr Rob Emery	DAFWA	10
Dr Ric Cother	NSWDPI	10
Dr Peter Whittle	QDPI&F	10
Assoc Prof Karen Gibb	CDU	10
Dr Jacek Placinski	DAFF	5
Dr Ryan Wilson	PHA	5
Total in-kind		**100**

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$30,000
Travel & Accommodation	$2,000
Operating costs	$0
Total Operating Budget	**$32,000**

End-users/Output A collection of nationally accredited diagnostic templates for EPPs will be produced. To ensure that all future developed protocols are easily accessible, an EPP Diagnostics website will be constructed. Both of these outputs will enhance the network of expert diagnosticians who can be contacted. The website will also provide a location for other biosecurity diagnostic tools, such as remote microscope access. The outputs, diagnostic protocols as well as other features embedded in the website, will be used by Diagnosticians (both government and industry) and persons involved with any aspect of biosecurity or crop protection.

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Project: CRC20025

Remote Microscopes

Improved EPP identification through a web-based remote microscope system

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Improved responsiveness to potential incursions by reducing delays in diagnosis.

What is the biosecurity problem? Currently, biological specimens needing identification are routinely mailed to taxonomic experts for determination, causing delays in diagnosis and subsequent responsiveness to potential incursions.

Project status Development

Project start-completion date

Start: December 2006
Completion: December 2007

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Evaluate the effectiveness and practicalities of using web-based microscopes which are supported by user-friendly software to dramatically reduce the time required for expert taxonomic identification of EPPs.

Project leader Dr John La Salle, CSIRO

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr John La Salle	CSIRO	40
Mr Rodney Turner	PHA	10
tbd	DAFF	10
Dr Murray Fletcher	NSWDPI	20
Total in-kind		**80**

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$0
Travel & Accommodation	$0
Operating costs	$25,000
Total Operating Budget	**$25,000**

End-users/Output Methodology and technology to provide national and international real-time microscope links between experts and non-experts. The established network of diagnostic centres will be linked via web-based communication, for example, through an access portal located on the Diagnostic Database website (see CRC20012). The output will be utilised by Biosecurity researchers (expert-to-expert) and operational staff (expert-to-non-expert) who will have the opportunity to access the remote microscope network via central hubs.

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Project: CRC20030

Molecular Analysis Systems

Cost-effective and robust assays for EPP diagnosis.

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Identify the most cost-effective and robust molecular assay for diagnosis of EPPs.

What is the biosecurity problem? Biosecurity diagnostic protocols currently depend upon a complicated variety of tests based on a wide range of (often expensive) technological platforms. Each platform requires significant investment in single-use equipment and training. Despite this investment, results can be ambiguous and require multiple (and different) tests to produce a confirmed result for a single pest or pathogen. These factors can lead to delayed diagnoses and subsequent delays in responsiveness to biosecurity threats.

Project status Development

Project start-completion date

Start: February 2007
Completion: December 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Design diagnostic platforms to utilise generic equipment and certify for critical diagnosis of emergency plant pests.
2.	Facilitate the delivery of field and lab-based technology to deliver faster diagnosis with greater sensitivity and specificity.

Project leader Dr Gary Kong, QDPI&F

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr Deb Hailstones	NSWDPI	20
Dr Jo Luck	DPIVIC	20
Dr Dave Berryman	MU	10
Dr Ric Cother	NSWDPI	10
Dr Linda Semeraro	DPIVIC	50
Dr Brendan Rodoni	DPIVIC	10
Ms Barbara Hall	SARDI	10
Mr Mark Whatman	DAFF	10
Dr Don Hutton	QDPI&F	20
Dr David Yeats	CSIRO	10
tbd	QDPI&F	100
Dr Andrew Geering	QDPI&F	20
Dr John Thomas	QDPI&F	5
Dr Kathy Ophel-Keller	SARDI	5
Dr Alan Mackay	SARDI	10
Total in-kind		**310**

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$0
Travel & Accommodation	$20,000
Operating costs	$200,000
Total Operating Budget	**$220,000**

End-users/Output The project will provide a critical evaluation of platforms for delivering diagnostic tests, including various nanobead technologies, microarray and other reading systems and provide recommendations for preferred molecular analysis systems for use in biosecurity diagnostics. Diagnostic data for a range of pests and pathogens of biosecurity significance will be developed as well as optimisation of a range of novel molecular analysis systems, including proteomics, metabolomics, surface membrane, antibody and oligonucleotide technologies. The outputs of the project will be utilised by government/university and industry diagnostic labs and field-based (operational) biosecurity staff such as AQIS/NAQS and state government agencies.

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Project: CRC20031

Detection of *Phytophthora Ramorum*

To develop a diagnostic testing protocol for Phytophthora ramorum and Phytophthora kernoviae.

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective To develop a diagnostic testing protocol for *Phytophthora ramorum* and *P. kernoviae* that can be used on a wide range of asymptomatic host nursery stock material to confirm that the material is NOT infected with these pathogens.

What is the biosecurity problem? The recent detection and spread of *P. kernoviae* and *P. ramorum* in trading countries such as US, UK and NZ has required the urgent development of a reliable and robust diagnostic test for susceptible plant species currently in post-entry quarantine (PEQ) in Australia. Significant numbers of imported plants are currently still being held in Australian PEQ facilities awaiting the development of a test.

Project status Recommended for approval

Project start-completion date

Start: October 2006
Completion: April 2007

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Development of a specific diagnostic test for detection of *P. kernoviae* and *P. ramorum.*
2.	Development of reliable and robust method for extraction of DNA from plants for use in *P. kernoviae* and *P. ramorum* test.
3.	Screening of susceptible plants currently in Australian PEQ facilities

Project leader Dr Giles Hardy, Murdoch University & Mr Chris Florides, Saturn Biotech Ltd

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Mr Chris Florides	SBL	20
Asoc Prof Giles Hardy	MU	10
Dr Phil O'Brien	MU	10
Ms Alison Mackie	DAFWA	5
tbd	DAFF	5
tbd	SBL	20
tbd	SBL	20
Total in-kind		**90**

Project budget This project has the following budget for the 2006-2007 financial year:

Item	Amount
Employee costs	$0
Travel & Accommodation	$6,712
Operating costs	$27,250
Total Operating Budget	**$33,962**

DAFF are a co-investor in this project.

End-users/Output The project will develop a robust and reliable test for the detection of *P. kernoviae* and *P. ramorum* in plants imported through PEQ. The test will be delivered through Saturn Biotech and will be available for use by industry and government agencies.

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COOPERATIVE RESEARCH CENTRE FOR NATIONAL PLANT BIOSECURITY

CRCNPB PROGRAM 3

Surveillance Research

The Surveillance Program will develop a full and balanced portfolio of projects which will over time deliver a mix of short, medium and long-term goals. In the short-term, projects will deliver base applications and establish national guidelines for surveillance with hand-held equipment, and investigate the use of emerging hyperspectral camera technology and shape recognition software to enhance surveillance trapping and field operator effectiveness. The medium-term projects will increase surveillance effectiveness generally, in particular grain surveillance and fruit fly trapping for market access. A long-term goal of the surveillance program is to develop a simulation tool for surveillance

Project: CRC30009
Grains Surveillance Strategy

Project: CRC30014
PDA-assisted Surveillance

Project: CRC30015
Hyperspectral Pathogen Detection

Project: CRC30020
Surveillance Staff Training

Project: CRC30022
Female Fruit Fly Traps

Project: CRC30023
Smart Trap Technology

Project: CRC30032
Flying Spore Traps

Project: CRC30039
Fruit Fly Area Freedom

Project: CRC30009

Grains Surveillance Strategy

Development of a national surveillance strategy for EPPs of the grains industry

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Enhanced preparedness of Australia's grain industry for incursions of EPPs through development of a national surveillance plan and specific contingency plans.

What is the biosecurity problem? At present, there is no national surveillance plan for Australia's grain industries. It is critical for market maintenance and preparedness for EPP incursions that a nationally accepted surveillance plan be implemented. Contingency plans have only been completed for a small number of priority EPP threats to the Australian grains industry. Contingency plans ensure the most cost-effective and efficient responses to future incursions. The project will address both oth these biosecurity problems.

Project status Approved

Project start-completion date
Start: January 2006
Completion: October 2008

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Develop a national surveillance plan for the high priority EPPs to the grains industry that will: a) focus on new innovative operations that are cost-effective and achievable; and b) determine what is the minimum amount of data required to provide scientific evidence of freedom and the most cost-effective means of collecting this data.
2.	Develop 15 specific EPP contingency plans.
3.	Raise biosecurity awareness in the grains industry.

Project leader Mr Rod Turner, PHA

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
tbd	PHA	20
Dr Angela Freeman	DPIVIC	5
Dr Sally Corcoran	QDPI&F	5
Dr Kathy Gott	NSWDPI	5
tbd	DAFWA	5
tbd	SARDI	5
Mr Rodney Turner	PHA	10
Total in-kind		**55**
Project Officer (Ms Mona Akbari)	CRCNPB/PHA	100

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$60,770
Travel & Accommodation	$24,500
Operating costs	$21,000
Total Operating Budget	**$106,270**

GRDC are a co-investor in this project.

End-users/Output The Australian grains industry. The project will provide a national surveillance strategy that will assist in maintaining and acquiring market access and will also provide contingency plans for key exotic threats to Australia's grains industry. One of the biggest risks to the Australian grains industry is the lack of a national surveillance plan for the grains industry. Australia's grains industry relies heavily upon export markets, and our freedom from many emergency plant pests and diseases allows these markets to continue to accept our product and also enables new market access opportunities to be attained. Challenges to our area freedom declaration have the potential to greatly impact on grains exportation. With a national surveillance strategy in place, the grains industry can respond quickly to potential market restrictions and ensure the continued export of grain.

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Project: CRC30014

PDA-assisted Surveillance

Using PDA (Personal Digital Assistant) technology to provide a national system for rapid and secure plant biosecurity surveillance data capture

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Automation, including improved speed and security, of biosecurity surveillance data capture.

What is the biosecurity problem? In Australia, nearly all field-collected surveillance information is recorded manually to paper, reducing the rate of capture, integrity, conformity and security of the data for biosecurity purposes.

Project status Approved

Project start-completion date

Start: September 2006
Completion: September 2008

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Facilitate the development of systems that automatically collect and synchronise data with server applications to provide live updates of detections and distribution for Commonwealth and State reporting and prediction systems.
2.	Recommend a standard to enable regulating at a base level the collection of plant biosecurity surveillance data which is BIOSIRT compliant.
3.	Allow transparent and consistent data exchange across collaborating organisations.
4.	Establish mapping data standards that will allow GPS modules to collect data in appropriate form and allow the rapid compilation of specific information for area freedom and other market access issues.

Project leader Mr Rob Emery, DAFWA

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Mr Rob Emery	DAFWA	25
Mr Richard Walker	NSWDPI	5
Dr Col Beavis	QDPI&F	30
Mr John Bruce	DAFWA	25
Dr Paul Pheloung	DAFF	5
tbd	PHA	5
Total in-kind		**95**

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$25,000
Travel & Accommodation	$15,000
Operating costs	$40,000
Total Operating Budget	**$80,000**

End-users/Output State agencies involved in Plant Biosecurity are developing national surveillance databases to enhance and maintain access to overseas markets. There is a need for a field-based digital interface in the data collection chain to provide a national system for rapid, validated and secure plant biosecurity surveillance data capture. This project will provide outputs that include three main software applications for surveillance (trapping programs, destruction surveillance and general surveys). The project will also select PDA hardware that will be robust in the field and which has suitable memory/processing capability, bar-coding and GIS/GPS compatibility. The outputs will be used by Federal and State Agencies involved in on-ground quarantine (AQIS, QDPI&F, NSWDPI, DPIVIC, TASDPIW, SARDI, DAFWA, NTDPISM). It will also be utilised by consultants working within the plant industries who have reporting responsibilities. All developed software will be BIOSIRT compliant and will interface with a National Plant Surveillance Reporting Tool (under development) or the staging databases in the state Agencies.

CRC PLANTbiosecurity

Project: CRC30015

Hyperspectral Pathogen Detection

Investigation of the potential use of hyperspectral imaging in surveillance for emergency plant pests

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Develop methods and algorithms relevant to the use of hyperspectral imaging for the purposes of detecting a range of plant pathogens in horticultural and broadacre crops and native plants. Assess future areas of strategic interest for the use of hyperspectral imaging to detect and survey plant pathogens.

What is the biosecurity problem? Current ground surveillance by trained staff for EPP pathogens is very inefficient and time-consuming, and this project is the first step in developing a simple but robust detection methodology and specific signatures for a large number of species.

Project status Approved

Project start-completion date
Start: November 2006
Completion: November 2008

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Determine the usefulness of hyperspectral imaging for the detection of plant pathogens (bacteria, viruses, fungi and phytoplasmas).
2.	Conduct a scoping study to assess the feasibility to develop a cheap, robust method of utilizing hyperspectral imaging for surveillance of plant pathogens.
3.	Utilise an MOU with NICTA to gain access to the latest technological advances in sensor technology.

Project leader Ms Alison Mackie, DAFWA & Dr Shane Hetherington, NSWDPI

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Ms Alison Mackie	DAFWA	20
Dr Shane Hetherington	NSWDPI	20
Ms Barbara Hall	SARDI	10
tbd	QDPI&F	10
Dr Brendan Rodoni	DPIVIC	5
Dr Kevin Powell	DPIVIC	40
Dr Jo Luck	DPIVIC	5
Dr Roger Jones	DAFWA	10
Ms Brenda Coutts	DAFWA	10
Dr Kirsty Bayliss	MU	10
Prof Mike Jones	MU	10
tbd	DAFF	5
Dr Nerida Donovan	NSWDPI	5
Total in-kind		**160**

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$15,000
Travel & Accommodation	$20,000
Operating costs	$47,500
Total Operating Budget	**$82,500**

End-users/Output This is a scoping project and the first of a number of potential developments in the remote sensing area which could be utilised by Federal and State Agencies involved in on-ground surveillance, and which could result in considerable cost savings and advances in plant pathogen surveillance. The project will produce two outputs: (1) a library of unique spectral signatures that identify specific foliar EPP pathogens; and (2) detection hardware. Off-the-shelf digital still and video cameras would be re-formatted for a specific pathogen signature, allowing surveillance staff to undertake field assessment with this visual aid. In time, this type of assessment could become the main tool to aid in the declaration of area freedom for EPP pathogens.

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Project: CRC30020

Surveillance Staff Training

Selection and training of quarantine and/or surveillance staff

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Availability of appropriately skilled quarantine/surveillance staff for proactive and emergency response surveillance activities.

What is the biosecurity problem? An empirical process is required to optimise the selection and training of technical staff who work in Quarantine and/or surveillance related areas to ensure effective and rigorous delivery of surveillance activities, both proactively and during emergency response.

Project status Development

Project start-completion date

Start: January 2007
Completion: December 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Development of a tool to measure suitability of quarantine/surveillance officer applicants.
2.	Development of a calibrated index of applicants suitable for quarantine/surveillance work.
3.	Development of improved methods of the effectiveness of quarantine/surveillance personnel.

Project leader TBD, QDPI&F

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr John Chapman	QDPI&F	10
Dr Darryl Hardie	DAFWA	10
tbd	QDPI&F	20
tbd	DAFF	20
tbd	NSWDPI	10
Total in-kind		**70**

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$25,000
Travel & Accommodation	$10,000
Operating costs	$25,000
Total Operating Budget	**$60,000**

End-users/Output The main outputs from this project will be the development of guidelines on the psychological profile required for good biosecurity (quarantine and surveillance) staff; a number of simple standard tests to assess potential performance in field situations; and methods to better train and up-skill existing staff. Methods of benchmarking staff in actual field situation will also be developed. The outputs of the project will be utilised by Federal and State Agencies involved in on-ground quarantine and surveillance.

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Project: CRC30022

Female Fruit Fly Traps

Developing female lures for improved market access

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Enhanced surveillance capability for exotic fruit fly species.

What is the biosecurity problem? The high risk of incursions of exotic critical quarantine fruit fly species that are non-responsive to currently deployed lures entering Australian horticultural production zones which are, at present, free from these species.

Project status Recommended for approval

Project start-completion date

Start: December 2006
Completion: December 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Develop new lures for female fruit flies based on the science that identifies the attractive components of these lures.
2.	Develop improved trap efficiency to achieve reduction in costs associated with the deployment and servicing of female fruit fly traps.
3.	Develop an effective female fruit fly monitoring system design that is cheaper and easier to maintain than the current McPhail trap system.
4.	Develop an effective early warning system for incursions of exotic fruit flies that will protect current markets for Australian fresh horticultural produce.

Project leader Mr Andrew Jessup, NSWDPI

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Mr Andrew Jessup	NSWDPI	30
Dr Frances de Lima	DAFWA	10
Dr Olivia Kvederas	NSWDPI	10
Ms Traci Vinnicombe	DAFWA	10
Total in-kind		**60**

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$122,771
Travel & Accommodation	$5,000
Operating costs	$23,901
Total Operating Budget	**$151,672**

End-users/Output The users of any new development in female lure technology will be government bodies (State departments of Agriculture & NAQS), responsible for detecting incursions of fruit fly, and fruit growers who are battling endemic fly populations or as part of a systems approach for market access. This project has the potential to add a valuable tool to declaration of area freedom for fruit flies and will inform the various fruit fly Codes of Practice and Interstate Certification Assurances that govern interstate movement of fruit fly host produce.

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Project: CRC30023

Smart Trap Technology

Scoping study to assess the value of spectral imaging and pattern recognition to develop automatic detection systems for EPPs caught in early warning traps

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Greater cost efficiency of the use of insect traps in surveillance.

What is the biosecurity problem? A valuable strategy to enhance detection methods would be the development of a 'smart trap' concept. Current Biosecurity trapping programs in Australia use low-cost or disposable units which are inspected on a weekly or fortnightly basis, and re-lured or replaced monthly or quarterly. Inspectors visit trap sites and collect specimens, remove debris and non-target species from traps. Many inspectors never encounter the target species, and while that is a good thing, it also means many wasted and costly trips to trap sites, and over time it becomes difficult to maintain an inspector's enthusiasm for surveillance. The development and use of 'smart traps' would greatly enhance trapping efficiency and maintain an inspector's alertness to the presence of an EPP by reducing the number of manual inspections.

Project status Approved

Project start-completion date
Start: January 2007
Completion: December 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Develop improved trap design and other surveillance hardware utilizing state-of-the-art sensor and communication/data transfer technology.

Project leader Dr Louise Morin, CSIRO

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr Louise Morin	CSIRO	20
Mr Richard Johnston	DAFWA	10
Mr Bill Woods	DAFWA	5
Mr David Williams	DPIVIC	5
Dr Debbie Kent	NSWDPI	5
tbd	QDPI&F	20
Dr Ruth Huwer	NSWDPI	5
Total in-kind		**70**

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$31,341
Travel & Accommodation	$0
Operating costs	$10,000
Total Operating Budget	**$41,341**

NICTA are a co-investor in this project.

End-users/Output This project will develop a trapping system that could detect the presence of a specimen via an in-trap camera and relay the information wirelessly or by mobile phone connection to a web-based interface. The second output of the project will be to develop specific miniature cameras that can detect specific UV and hyper-spectral signatures to differentiate between related but different species of fruit flies, moths and beetles. Existing software will be adapted and tested to determine the suitability of digital shape and pattern recognition to differentiate different species within the above groups. The collaborative team will determine the logistical and economic feasibility of developing an automatic detection system suitable for insect traps. The outputs of this project will be utilised by Federal and State Agencies involved in broad-scale surveillance.

CRC PLANTbiosecurity

Project: CRC30032

Flying Spore Traps

Using a remotely-controlled aircraft to spatially monitor spores (scoping study)

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective To develop and assess UAV technologies for more efficient and effective EPP surveillance

What is the biosecurity problem? Existing spore sampling devices are stationary at the sampling location. Location is important due to prevailing climatic conditions and use of sampling devices in remote locations and where topography is severe is almost impossible. Where the disease is in the canopy of trees, using existing spore sampling technologies is almost impossible.

Project status Development

Project start-completion date

Start: January 2007
Completion: December 2008

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	design and development of a lightweight, compact and on-the-go spore sampling device
2.	installation of this equipment on a remotely controlled aircraft that can traverse a predetermined path

Project leader Dr Kirsty Bayliss, Murdoch University & Dr Troy Jensen, QDPI&F

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr Kirsty Bayliss	MU	20
Dr Troy Jensen	QDPI&F	50
Dr Les Zeller	QDPI&F	20
Dr Lynton Vawdrey	QDPI&F	10
Dr Gary Kong	QDPI&F	5
Mr Fritz Wagner	MU	10
Mr Bill Macleod	DAFWA	10
Total in-kind		**125**

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$10000
Travel & Accommodation	$10660
Operating costs	$28000
Total Operating Budget	**$48660**

End-users/Output This project is a scoping study to determine the potential of using an unmanned aerial vehicle, fitted with a spore trap, to detect and monitor spores of plant pathogens. We aim to develop a sampling system that will have the ability to spatially monitor fungal spores and protocols to interpret their spatial distribution. This tool will greatly enhance the ability to detect new incursions of fungal pathogens and to enable more accurate delimiting of distribution.

CRC PLANTbiosecurity

Project: CRC30039

Fruit Fly Area Freedom

Prove and effectively manage area freedom from fruit flies

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Collect evidence to validate that a dynamic and strategic trapping system will provide the same or higher level of confidence as the current static and passive grid system in areas free from Queensland and Mediterranean fruit flies

What is the biosecurity problem? Fruit fly area freedom is managed using traps in expensive, passive but inefficient fixed grid systems covering orchards and towns. Undetected incursions lead to breeding populations and loss of markets for months or years.

Project status Recommended for approval

Project start-completion date

Start: December 2006
Completion: December 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Quantitative data validating that the new trapping system provides the same or higher level of confidence as the current fixed trap grid system in areas free from Queensland and Mediterranean fruit flies, and in areas of low prevalence
2.	Comprehensive external review of methods and data to validate the scientific basis for equivalence of systems for regulatory purposes
3.	A manual detailing new trap placement methods based on knowledge of host phenology and mating sites attractive to fruit flies at various times of the year
4.	Data in a format that can be utilised by the proposed simulation model project

Project leader Dr Francis de Lima, DAFWA

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr Francis de Lima	DAFWA	20
Dr Olivia Kvederas	NSWDPI	30
tbd	DPIVIC	20
tbd	SARDI	20
Ms Tracey Vinnicombe	DAFWA	10
Total in-kind		**100**

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$94872
Travel & Accommodation	$10000
Operating costs	$48916
Total Operating Budget	$153778

End-users/Output The users of new information to better manage area freedom from fruit fly will be government bodies (State departments of Agriculture & NAQS), responsible for detecting incursions of fruit fly, and fruit growers who are battling endemic fly populations. Outputs from this project will take two forms: a list of guidelines for unmapped areas and, secondly, computer-simulated placement of traps in fully GIS mapped areas. The latter will be achieved in collaboration with CRCNPB project CRC30021, which aims to development a surveillance simulation platform for Biosecurity managers and researchers in Australia.

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CRCNPB PROGRAM 4

Impact Management Research

The Impact Management Program is improving the effectiveness and efficiency of EPP incursion management by enhancing predictive simulation systems that optimise EPP incursion response strategies and develop a capacity to manage the threat of enhanced virulence of EPPs. The Program will investigate developing enhanced disinfestation technologies that maintain markets and drive the capture of both new markets and new opportunities in existing markets, and will develop and implement novel control and containment strategies for EPP incursion management that minimise negative economic, social and environmental impacts.

Project: CRC40005

Rice Blast

Project: CRC40006

Russian Wheat Aphid

Project: CRC40007

Predictive Economic Model

Project: CRC40016

Pathogen Eradication Strategies

Project: CRC40024

Insect Eradication

Project: CRC40035

Risk Management Processes

Project: CRC40005

Rice Blast

Survey of Australian rice blast races and cultivar susceptibility

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Determine the risk that Australian isolates of *Magnaporthe grisea* represent to the Australian rice industry.

What is the biosecurity problem? Australian isolates of *Magnaporthe grisea* are known to occur but the risk they represent to the Australia rice industry is not known. These isolates are currently not present in the rice growing regions of Australia.

Project status Approved

Project start-completion date

Start: March 2006
Completion: November 2007

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Determine the variability and the pathogenicity of the isolates of *M. grisea* collected during the project surveys.
2.	Test the susceptibility status of our main rice cultivars and advanced breeding lines to the rice blast isolates present in our region.
3.	Collaborate with international experts in the molecular determination of races collected in these surveys.

Project leader Dr Ric Cother, NSWDPI

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr Ric Cother	NSWDPI	20
Dr Vincent Lanoiselet	CSU	40
Dr Gavin Ash	CSU	10
Assoc Prof Karen Gibb	CDU	5
Mr Matthew Weinert	DAFF	5
Total in-kind		**80**

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$0
Travel & Accommodation	$23,313
Operating costs	$3,237
Total Operating Budget	**$26,550**

RIRDC are a co-investor in this project.

End-users/Output The main output of the project is defining the susceptibility status of the main rice cultivars grown in Australia. These findings will be discussed with the Australian rice industry as the main end-user. The focus with industry will be to help understanding of the risk posed by isolates of rice blast disease, particularly in relation to their advanced breeding lines. This will help in the rice industry's level of preparedness and ensure that its principal strategy of resistant varieties remains viable.

CRC PLANTbiosecurity

Project: CRC40006

Russian Wheat Aphid

Evolution of Russian wheat aphid virulence and resistance sustainability

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Improved level of preparedness for, and stable, sustainable resistance to, the Russian wheat aphid.

What is the biosecurity problem? Russian wheat aphid has invaded all major wheat growing regions of the world except Australia. In order to ensure that Australia's breeding strategy has the capacity to provide resistant wheat lines, it is necessary to understand the mechanisms underlying virulence.

Project status Approved

Project start-completion date

Start: August 2006
Completion: December 2008

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Develop an improved level of preparedness for Russian wheat aphid incursions into Australia.
2.	Develop a strategy for Australian wheat breeders to achieve sustainable and stable resistance to Russian wheat aphid, reducing the need for insecticides.

Project leader Dr Owain Edwards, CSIRO

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr Owain Edwards	CSIRO	15
Mr Mike Grimm	DAFWA	5
Dr Gerald Reeck	KSU	10
Total in-kind		**30**
Postdoctoral	CRCNPB/CSIRO/KSU	100

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$63,310
Travel & Accommodation	$15,000
Operating costs	$25,000
Total Operating Budget	**$103,310**

GRDC are a co-investor in this project.

End-users/Output The main output of this project is to understand what level of risk is posed by genetic changes in the Russian wheat aphid. The findings will be discussed with the Australian grains industry as the main end-user. The focus with industry will be to help understanding of the risk posed by the Russian wheat aphid, particularly in relation to their breeding program. This will help in the wheat industry's level of preparedness and ensure that its principal strategy of resistant varieties remains viable.

CRC PLANTbiosecurity

Project: CRC40007

Predictive Economic Model

Development of an economic model as a key component of a national predictive simulation system

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Availability of an economic model to assess the cost/benefit of different incursion responses.

What is the biosecurity problem? Effective and efficient management of EPP incursions requires the ability to assess the likely success and associated costs and benefits of alternative responses to an incursion. Despite having one of the most advanced biosecurity programs in the world, Australia has some weaknesses in its analytical capability to undertake this assessment — either proactively in advance of an incursion or during an eradication response.

Project status Approved

Project start-completion date
Start: July 2006
Completion: June 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Develop an economic module for incorporation into the predictive simulation system.
2.	Assess the effect and value of education campaigns both before and during EPP incursions.

Project leader Ms Lisa Elliston, DAFF

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Ms Lisa Elliston	DAFF	20
Dr Steve Beare	DAFF	10
Dr David Cook	CSIRO	20
Dr John Mullen	NSWDPI	10
Dr Lynn Garrett	USDA	10
Total in-kind		**70**
Postdoctoral (to be appointed)	CRCNPB/DAFF	100

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$98,800
Travel & Accommodation	$7,500
Operating costs	$35,000
Total Operating Budget	**$141,300**

End-users/Output The main output of the project is development of an economic model to improve incursion management. The module will be incorporated into an existing predictive simulation system which is currently managed by DAFF (who will be the main end-user). Once the new economic module is incorporated and validated, the existing system will be greatly enhanced and will lead to improved high-level government decision-making once an incursion occurs.

CRC PLANTbiosecurity

Project: CRC40016

Pathogen Eradication Strategies

Optimising eradication strategies for emergency plant pest incursions on perennial crops

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Availability of alternative eradication strategies for emergency plant pest incursions on perennial crops.

What is the biosecurity problem? The current strategy for eradication of an EPP is based partly on the removal of whole affected plants, followed by burning and/or burial; however, this strategy may incur significant costs to industry and the community when perennial species are involved. Alternative strategies need to be developed and validated to meet eradication goals while minimising economic and social impact.

Project status Approved

Project start-completion date
Start: July 2006
Completion: June 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Performance of due diligence on current eradication strategies using responses to citrus canker, fireblight and banana freckle as pilots.
2.	Development of a research and development model system that features identification of endemic pathogens with similar biology and epidemiology to high priority target EPPs and a system for the validation of eradication strategies in countries where the EPP is endemic.
3.	Development and evaluation of alternative eradication strategies for high priority EPPs affecting industries based on perennial species.

Project leader Dr Mark Sosnowski , SARDI

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr Mark Sosnowski	SARDI	40
Dr Trevor Wicks	SARDI	5
Dr Brendan Rodoni	DPIVIC	20
Dr Shane Hetherington	NSWDPI	10
Dr Mike Cole	DAFF	10
Mr Andrew Daly	NTDPIFM	10
tbd	QDPI&F	10
Total in-kind		**105**
Research Officer (Dr Mark Sosnowski)	CRCNPB/SARDI	40

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$72,827
Travel & Accommodation	$15,000
Operating costs	$15,000
Total Operating Budget	**$102,827**

End-users/Output The project will result in alternative strategies to eradicate incursions of priority EPPs. The viticulture industry has been selected as an initial pilot with a focus on developing alternative pruning techniques to remove the EPP but allow enough residual plant material to ensure grapevine regeneration. This approach will be extended to the industry through field trials (initial trial site has been established in Northern Victoria) and demonstration days in consultation with industry. To identify further industry/disease opportunities and to improve end-user involvement, an industry reference team has been formed comprising: Mr Andrew Green (Citrus Board SA), Dr Shane Hetherington (NSWDPI), Ms Christine Horlock (QDPI&F), Ms Alison Mackie (DAFWA), Dr Prue McMichael (Scholefield Robinson Horticultural Services), Mr Trevor Ranford (Apple & Pear Assoc. SA), Mr Bill Washington (DPIVic), Mr Stephen West (NTDPIFM), & Dr Peter Whittle (QDPI&F).

CRC PLANTbiosecurity

Project: CRC40024

Insect Eradication

An integrated approach to the eradication of arthropod EPPs

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Eradication of EPP insect incursions while minimising negative economic, environmental and social impacts.

What is the biosecurity problem? Eradication of arthropod EPP incursions has often relied on destructive technologies such as crop removal and broad spectrum pesticide application; however, this strategy may incur significant costs to industry, the environment and the community. Alternative strategies need to be developed and validated that meet eradication goals while minimising economic and social impact.

Project status Approved

Project start-completion date

Start: December 2006
Completion: December 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Data (trial results and literature review) to develop a program for integrated eradication of light brown apple moth
2.	Scoping study to determine potential for non-invasive strategies for eradication of Tortricid and other arthropod EPPs
3.	Enhanced capacity to effectively eradicate insect EPP incursions which provides a high degree of success while minimising negative economic and social impact.

Project leader Mr Bill Woods, DAFWA

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Mr Bill Woods	DAFWA	30
Mr Greg Baker	SARDI	10
Mr David Williams	DPIVIC	5
Mr Ian Lacey	DAFWA	20
Mr Phil Lawrence	DAFWA	10
Mr Ernie Steiner	DAFWA	20
Dr Max Suckling	HRNZ	5
Ms Andrea Stephens	HRNZ	10
Mr Lloyd Stringer	HRNZ	10
Dr Ashraf El-Sayed	HRNZ	5
Total in-kind		**125**

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$75,000
Travel & Accommodation	$12,000
Operating costs	$9,000
Total Operating Budget	**$96,000**

End-users/Output The project will result in alternative strategies to eradicate incursions of priority EPPs. Light brown apple moth has been selected as an initial pilot with a focus on developing alternative techniques to remove the pest. The pest is relevant to a range of industries, including apples and pears and the developed techniques will be extended to the industry through field trials and demonstration days in consultation with industry. The pest is also a problem for trade and it is intended to involve Biosecurity Australia as an end-user in the development of documentation to support changes/enhancements to protocols that might arise from the research.
To further assist with end-user involvement, an industry reference team will be formed at the commencement of the project. The reference team from CRC40016 currently comprises: Mr Andrew Green (Citrus Board SA), Dr Shane Hetherington (NSWDPI), Ms Christine Horlock (QDPI&F), Ms Alison Mackie (DAFWA), Dr Prue McMichael (Scholefield Robinson Horticultural Services), Mr Trevor Ranford (Apple & Pear Assoc. SA), Mr Bill Washington (DPIVic), Mr Stephen West (NTDPIFM), & Dr Peter Whittle (QDPI&F).

CRC PLANTbiosecurity

Project: CRC40035

Risk Management Processes

Design and development of risk management processes for the movement of samples during an EPP incursion.

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective The project will map the process for movement of EPP samples through standard mail systems during an incursion. The critical control points to manage identified risks will be determined and recommendations for R&D to address identified gaps will be developed.

What is the biosecurity problem? An EPP incursion will require the distant, rapid and ongoing movement of samples from the initial site of entry. This process involves inherent risk and R&D is required to underpin development of processes to manage risk.

Project status Approved

Project start-completion date

Start: September 2006
Completion: March 2007

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Report mapping critical control points for sample movement of EPPs and recommendations of R&D needs to address any deficiencies in this process.

Project leader Dr Alan McKay, SARDI

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr Alan McKay	SARDI	10
Dr Nancy Kelly	NSWDPI	10
Dr Sharyn Taylor	SARDI	5
Ms Barbara Hall	SARDI	5
Dr Andy Pointon	SARDI	5
Total in-kind		**35**

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$39,500
Travel & Accommodation	$4,500
Operating costs	$6,000
Total Operating Budget	**$50,000**

End-users/Output The project will provide the government agencies and industry involved in incursion management with clear recommendations on the management of identified risks associated with the movement of EPP samples. The movement of samples occurs between field and the laboratory, between laboratories and often involves interstate movement.

CRC PLANTbiosecurity

CRCNPB PROGRAM 5

Education and Training

The Education and Training Program will provide future plant biosecurity specialists through the training of PhD candidates and Honours students. To help attract the future plant biosecurity specialists, a schools education program will be developed, aimed at both the primary and secondary school levels. Development and delivery of training courses to increase the knowledge and skill of staff within the Plant Biosecurity industry is ongoing. The Education and Training Program also supports the development of a postgraduate curriculum to provide formal qualifications in Plant Biosecurity.

Project: CRC50002
Lettuce Aphids

Project: CRC50003
Ascochyta Wind Tunnel

Project: CRC50008
Terrestrial Observation Predictive Systems

Project: CRC50011
Ordguard Community Engagement

Project: CRC50017
Detection in Pathogen Mixtures

Project: CRC50026
Citrus Canker Fingerprinting

Project: CRC50027
Scarab Beetle Barcoding

Project: CRC50029
Taxonomy of Phytophthora Citricola

Project: CRC50028
Fusarium Head Blight Characterisation

Project: CRC50033
Hosts of Phytophthora ramorum

Project: CRC50034
Bayesian Surveillance Systems

Project: CRC50037
Fire Blight Diagnostics

Project: CRC50038
Epiphyas Revision

Project: CRC50002

Lettuce Aphids

Biotic factors affecting the spread of a small wind-dispersed insect

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective To develop an understanding of how insect biology, population density and structure, topography, landscape structure and host availability interact to influence dispersal.

What is the biosecurity problem? Effective management of biosecurity threats of exotic pests requires the understanding of the movement of the pests concerned. Movement range and pattern differ with pest species. For small insects like aphids, movement is mainly through wind and human activity. The distance that small insects disperse is influenced by several factors including insect biology, population density and structure, topography, landscape structure and host availability. Understanding how these interact to influence dispersal is critical in determining the size of quarantine zones.

Project status Approved (PhD)

Project start-completion date
Start: December 2006
Completion: December 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Determine the role that host distribution plays in incidence and spread, and compare lettuce aphid to other species to determine whether there is a generic basis to dispersal.
2.	Quantify the seasonal flight patterns and contrast with what is known for other aphid species in Australia.
3.	Estimate the probability and extent of inter-host movement and compare lettuce aphid to other species to determine whether there are generic rules.

Project leader Dr Jianhua Mo, NSWDPI & Dr Mike Keller, UA

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr Jianhua Mo	NSWDPI	25
Dr Sandra Macdougall	NSWDPI	10
Dr Mike Keller	UA	10
Dr Mallik Malipatil	DPIVIC	5
Dr Cathy Young	TASDPIW	5
Total in-kind		**55**
PhD (to be appointed)	CRCNPB/UA	100

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Stipend	$24,000
Travel & Accommodation	$5,500
Operating costs	$6,500
Total Operating Budget	**$36,000**

End-users/Output This project will deliver a new PhD graduate with skills in entomology and pest epidemiology, available for immediate employment within the Plant Biosecurity community, thus increasing Australia's capability to respond to and manage EPPs.

CRC PLANTbiosecurity

Project: CRC50003

Ascochyta Wind Tunnel

Biotic factors affecting the spread of an air-borne/splash-borne fungus

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective To develop an understanding of how biotic factors affect the dispersal of rain-splashed asexual spores (conidia) and wind-borne sexual spores (ascospores).

What is the biosecurity problem? Once an exotic fungal pest has been introduced to a new area (such as via seed or soil) establishment and further spread are influenced largely by the spore dispersal pattern. Long-distance dispersal via wind-borne spores is a common feature of fungal pests, as is short-distance dispersal via rain-splash of spores. Studies that identify the link between environmental factors and spore dispersal can assist in assessing the potential disease risk for agrogeographical zones. Ascochyta species of pulse crops are already within Australia and have rain-splashed asexual spores (conidia) and wind-borne sexual spores (ascospores). These fungi provide an opportunity to study the relationship between the environment and spore dispersal, and to develop risk assessment strategies for exotic pests with similar spore dispersal patterns.

Project status Approved (PhD)

Project start-completion date
Start: March 2006
Completion: March 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Identify key factors influencing the short-distance (rain-splashed) and long-distance (wind-borne) distribution of spores of exotic foliar pests of annual field crops, using Ascochyta blight as a model.
2.	Determine effect of rainfall, temperature, wind, landscape and host susceptibility on spread of conidia and disease from artificially-inoculated plants placed in crop.
3.	Using controlled conditions, determine the effect of rain and wind on spore dispersal for pests that spread via rain-splash or wind.
4.	Identify potential disease risk for different agroecological zones.

Project leader Dr Eileen Scott, UA & Dr Jenny Davidson, SARDI

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr Eileen Scott	UA	5
Dr Jenny Davidson	SARDI	10
Dr Kevin Moore	NSWDPI	5
Dr Moin Salam	DAFWA	10
Dr Dani Shteinberg	ARO	5
Total in-kind		**35**
PhD (Mr Steven Coventry)	CRCNPB/UA	100

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Stipend	$24,000
Travel & Accommodation	$0
Operating costs	$12,000
Total Operating Budget	**$36,000**

End-users/Output This project will produce a new PhD graduate trained in Plant Pathology, with specific skills in plant disease epidemiology. The graduate will be available for immediate employment within the Biosecurity industry, increasing Australia's capability to respond to disease outbreaks.

CRC PLANTbiosecurity

Project: CRC50008

Terrestrial Observation Predictive Systems

Postgraduate training in terrestrial data assessment

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Enhanced capacity of Australia's plant industries to respond to future EPP incursions by development of the capacity to provide comprehensive and relevant 'real time' terrestrial data.

What is the biosecurity problem? Despite Australia having one of the most advanced biosecurity programs in the world, it has some weaknesses in its analytical capacity to assess the most effective responses (alternative strategies) to EPP incursions and their associated economic costs either proactively or during an eradication response. In order to effectively validate/evaluate contingency plans that would be utilised in response to an EPP incursion, it is important that a detailed source of relevant terrestrial data is available for the predictive simulation system. At present, a limited amount of historical data can be sourced but there is no capacity to provide 'real time' data that includes all relevant factors. The NASA Terrestrial Observation System (TOPS) program has the potential to greatly enhance the capacity of Australia's plant industries to respond to future EPP incursions by providing this data source.

Project status Approved (PhD)

Project start-completion date
Start: October 2006
Completion: October 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Train an Australian Postgraduate (PhD) candidate in GIS and ecosystem and socio-economic modelling to contribute to the validation and evaluation of contingency plans.
2.	Evaluate the NASA Terrestrial Observation System (TOPS) for use in incursion management in Australia.
3.	Identify opportunities for additional funding through NASA and other US funding sources, with a particular focus on enhancing international collaboration.

Project leader Dr Simon McKirdy, CRCNPB

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Mr John Weiss	DPIVIC	50
Dr Simon McKirdy	CRCNPB	10
Dr Steve Beare	DAFF	10
Ms Lisa Elliston	DAFF	10
Mr Rob Emery	DAFWA	10
Prof Mike White	USU	10
Total in-kind		**100**
PhD (Mr John Weiss)	CRCNPB/DPIVIC/USU	100

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Stipend	$24,000
Travel & Accommodation	$12,000
Operating costs	$41,000
Total Operating Budget	**$77,000**

End-users/Output This project will deliver a new PhD graduate trained in the use of GIS technologies, ecological modelling, and simulation and assessment of EPP incursions. The graduate will be available for immediate employment within the Biosecurity industry, increasing Australia's capability to predict and respond to EPPs using advanced technologies. If the NASA TOPS program is validated as being a useful monitoring system, this may also provide wider industry benefits that may have some commercial application.

CRC PLANTbiosecurity

Project: CRC50011

Ordguard Community Engagement

Community engagement in biosecurity: the OrdGuard case study

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Greater regional community engagement in plant biosecurity.

What is the biosecurity problem? The success of industry Biosecurity is dependent on the engagement of not only industry representatives but also the entire community. Regional areas of Australia are particularly vulnerable if sectors of the community do not appreciate and engage in plant biosecurity.

Project status Approved (PhD)

Project start-completion date
Start: February 2006
Completion: January 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Identify existing biosecurity education and networks in the region.
2.	Analyse stakeholder groups and devise an incursion alert and intervention model.
3.	Identify a process for moving the models into the communities involved.
4.	Run the models possibly as case studies with their own formative participatory evaluation processes.
5.	Evaluate the whole project using formative data and provide a summative product that identifies failures, risks and bottlenecks, and documents change.

Project leader Assoc Prof Karen Gibb, CDU; Prof Ian Falk, CDU & Mr Lachlan Dobson, OG

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Assoc Prof Karen Gibb	CDU	5
Dr Allan Arnott	CDU	5
Prof Ian Falk	CDU	5
Mr Noel Wilson	DAFWA	10
Dr David Hall	NSWDPI	5
tbd	DAFF	5
Mr Lachlan Dobson	OG	10
Total in-kind		**45**
PhD (Mr Paul Royce)	CRCNPB/CDU	100

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Stipend	$24,000
Travel & Accommodation	$0
Operating costs	$15,000
Total Operating Budget	**$39,000**

End-users/Output This project will produce a new PhD graduate with skills in community engagement and education in relation to Biosecurity issues. The graduate will be immediately employable within the Australian plant biosecurity industry to assist in community awareness and communication. The end-users of this project will be the OrdGuard Regional Biosecurity plan and other industry Biosecurity plans.

CRC PLANTbiosecurity

Project: CRC50017

Detection in Pathogen Mixtures

Novel approaches to surveillance monitoring for EPP pathogens

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Availability of tools for plant pathogen recognition to support rapid response to disease threats.

What is the biosecurity problem? The development of tools for pathogen recognition enabling rapid response has been listed as one of the top issues to improve Australia's preparedness to deal with emerging disease threats.

Project status Approved (PhD)

Project start-completion date
Start: July 2006
Completion: June 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Develop methodology for DNA detection of airborne pathogens from spore traps using known model systems.
2.	Develop methodology for monitoring exotic and unknown pathogens in spore traps (using community analysis DNA methods such as T-RFLP).
3.	Develop and evaluate alternative eradication strategies for high priority EPPs affecting industries based on perennial species.

Project leader Dr Jenny Davidson , SARDI

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr Jenny Davidson	SARDI	10
Dr Kathy Ophel-Keller	SARDI	10
Dr Eileen Scott	UA	5
Dr Deb Hailstones	NSWDPI	5
Ms Diana Hartley	CSIRO	5
Total in-kind		**35**
PhD (to be appointed)	CRCNPB/UA	100

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Stipend	$24,000
Travel & Accommodation	$0
Operating costs	$16,000
Total Operating Budget	**$40,000**

End-users/Output This project will deliver a new PhD graduate trained in Plant Pathology with specific skills in pathogen detection and monitoring. The graduate will be available for employment within the Australian plant biosecurity system, enhancing Australia's capacity for pathogen recognition and enabling rapid responses to EPPs.

CRC PLANTbiosecurity

Project: CRC50026

Citrus Canker Fingerprinting

Characterisation of citrus canker isolates and validation of new diagnostic methods

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Increased future capacity of Australia's Plant Biosecurity system.

What is the biosecurity problem? Citrus canker is a highly contagious plant disease. Most citrus species and cultivars are susceptible. An outbreak of this exotic bacterium, *Xanthomonas axonopodis* pathovar *citri*, occurred in Australia during 2004–05 on a property near Emerald, Queensland. This outbreak and the social, economic and environmental impacts of this disease highlight the importance of diagnostics as a means of plant biosecurity.

Project status Approved (Honours)

Project start-completion date

Start: February 2006
Completion: December 2006

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Validation of new PCR primers for citrus canker.
2.	Training of honours student in plant biosecurity related research.

Project leader Dr Deb Hailstones, NSWDPI

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr Deb Hailstones	NSWDPI	5
Dr Nerida Donovan	NSWDPI	5
Prof Lester Burgess	USYD	10
Total in-kind		**20**
Honours student (Mr Jonathon Terlich)	CRCNPB/NSWDPI	100

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Stipend	$5,000
Travel & Accommodation	$0
Operating costs	$0
Total Operating Budget	**$5,000**

End-users/Output This project will result in an Honours graduate with skills in pathogen diagnostics, who will be employable within the plant biosecurity sector. New and improved methods for identification of the citrus canker pathogen will also be produced. The project will also provide a future PhD candidate for the CRCNPB.

CRC PLANTbiosecurity

Project: CRC50027

Scarab Beetle Barcoding

Development of a DNA barcoding system for the identification of Australian insect species: a case study of scarab beetle larvae in NSW

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Increased future capacity of Australia's Plant Biosecurity system.

What is the biosecurity problem? Molecular diagnostics often are needed to identify larval insects or adult members of a species complex. However, different (non-compatible) methods are applied to different taxa, hence the need for a universal diagnostic method for all insects. DNA barcodes provide a potential solution. This case study will implement DNA barcoding for scarab beetles, testing the broader utility of the method.

Project status Approved (Honours)

Project start-completion date

Start: February 2006
Completion: December 2006

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Development of a universal DNA-based identification system for EPP insects.
2.	Training of honours student in plant biosecurity related research.

Project leader Dr Andrew Mitchell, NSWDPI

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr Andrew Mitchell	NSWDPI	10
Dr Tom Weir	CSIRO	10
Mr Gus Campbell	NSWDPI	5
Total in-kind		**25**
Honours student (Ms Kelly Rigg)	CRCNPB/NSWDPI	100

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Stipend	$5,000
Travel & Accommodation	$0
Operating costs	$0
Total Operating Budget	**$5,000**

End-users/Output This project will result in an Honours graduate with skills in insect diagnostics, who will be employable within the plant biosecurity sector. New methods for identification of insects will also be assessed. The project will also provide a future PhD candidate for the CRCNPB.

CRC PLANTbiosecurity

Project: CRC50028

Fusarium Head Blight Characterisation

Aetiology and epidemiology of the Fusarium head blight epidemic in wheat in 2005 in north-west NSW

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Increased future capacity of Australia's Plant Biosecurity System.

What is the biosecurity problem? Fusarium Head Blight (FHB) of wheat is a relatively new problem, and so far has only caused severe epidemics (in 1999 and 2005) in NSW. The problem is that we do not have accurate data on the relative importance of the Fusarium species involved, all of which are mycotoxigenic.

Project status Approved (Honours)

Project start-completion date

Start: February 2006
Completion: December 2006

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Develop a surveillance strategy for species causing FHB and related diseases, and the distribution of the "new" population of *F. graminearum*.
2.	Develop an understanding of the role of ascospore dispersal in the epidemiology of the disease and recommendations for FHB management.

Project leader Mr Len Tesoriero, NSWDPI

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Mr Len Tesoriero	NSWDPI	5
Prof Lester Burgess	USYD	5
Total in-kind		**10**
Honours Student (Mr Phillip Davies)	CRCNPB/NSWDPI	100

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Stipend	$5,000
Travel & Accommodation	$0
Operating costs	$0
Total Operating Budget	**$5,000**

End-users/Output This project will result in an Honours graduate with skills in plant pathology, who will be employable within the plant biosecurity sector. The project will also provide a future PhD candidate for the CRCNPB.

CRC PLANTbiosecurity

Project: CRC50029

Taxonomy of *Phytophthora Citricola*

Taxonomy, biology and pathology of a Phytophthora citricola*-like pathogen*

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Increased future capacity of Australia's Plant Biosecurity System.

What is the biosecurity problem? Numerous *Phytophthora* species represent a serious threat to Australia's plant industries and natural ecosystems. The capacity to identify the introduction of a new species of *Phytophthora* and to understand the potential spread is not well understood. The detection of a potential new species of the soil-borne plant pathogen *Phytophthora* in Western Australia provides an opportunity to expand the current skills base in this area. Preliminary studies suggest that the pathogen may be related to *Phytophthora citricola*; however, further work is required to confirm this. The project will train an Honours candidate with the focus specifically on the diagnostics aspect, with some preliminary investigations into methods of control.

Project status Approved (Honours)

Project start-completion date
Start: February 2006
Completion: December 2007

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Train an Australian graduate in traditional and molecular taxonomy for EPPs.

Project leader Dr Kirsty Bayliss, Murdoch University

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr Kirsty Bayliss	MU	10
Assoc Prof Giles Hardy	MU	5
Mr Mike Stukely	CALMWA	5
Total in-kind		**20**
Honours student (Ms Melissa Bexley)	CRCNPB/MU	100

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Stipend	$5,000
Travel & Accommodation	$0
Operating costs	$0
Total Operating Budget	**$5,000**

End-users/Output This project will result in an Honours graduate with skills in traditional and molecular taxonomy, specifically for identification of plant pathogens. The graduate will be employable within the plant biosecurity sector. The project will also provide a future PhD candidate for the CRCNPB.

CRC PLANTbiosecurity

Project: CRC50033

Hosts of *Phytophthora ramorum*

Susceptibility of Australian plant species to Phytophthora ramorum, *an emerging potential threat to Australian plant industries and ecosystems*

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Assess the susceptibility of Australian plant species, grown and sold as ornamentals within parks and gardens and provide valuable data on the susceptibility of these plants to *P. ramorum.*

What is the biosecurity problem? There are many Australian plant industries and ecosystems where climatic conditions are similar to that found in the USA and Europe which support *P. ramorum* disease development. If introduced into Australia, this pathogen has the potential to have a significant impact on the nursery, horticulture and forestry industries, and become a major ecological threat in areas with susceptible hosts and conducive climates. To prevent the introduction of *P. ramorum* into Australia, the potential host range and their role in transmission of the disease needs to be understood. This information will allow Australian regulators to develop appropriate quarantine protocols for nursery trade and determine the risk posed by the pathogen to the nursery and horticultural industries and to some extent the forest industries, and natural ecosystems.

Project status Approved (PhD)

Project start-completion date
Start: January 2007
Completion: December 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Improved knowledge to assist with determining the risk that *P. ramorum* poses to the nursery, horticultural and forest industries and native forest ecosystems.
2.	Improved knowledge when targeting plant species for surveillance to enable early detection and incursion management.

Project leader Assoc Prof Giles Hardy, MU

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Assoc Prof Giles Hardy	MU	10
Assoc Prof Bernie Dell	MU	5
Dr Daniel Huberli	MU	5
Dr Phillip O'Brien	MU	10
Ms Alison Mackie	DAFWA	5
Dr Ian Smith	UNIMELB	5
Dr Darren Kriticos	ENSIS	5
Dr Clive Brasier	UKFR	5
Dr Joan Webber	UKFR	5
Dr Matteo Garbelotto	UC	5
Total in-kind		**60**
PhD student	CRCNPB/MU	100

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Stipend	$24,000
Travel & Accommodation	$0
Operating costs	$6,000
Total Operating Budget	**$30,000**

End-users/Output This project will deliver a new PhD graduate trained in plant pathology, with specific skills in the identification of a recognised EPP and its biology and epidemiology. The graduate will be immediately employable within the plant biosecurity industry, increasing Australia's capability to detect and manage new incursions. The susceptibility of Australian horticultural and native plant species to the EPP, and its potential spread will also be determined.

CRC PLANTbiosecurity

Project: CRC50034

Bayesian Surveillance Systems

Surveillance system evaluation and optimisation for emergency plant pests

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Assess the statistical and modelling tools available to evaluate surveillance systems and to develop a surveillance system evaluation methodology to measure the effectiveness of early warning, area freedom and response surveillance. The project will determine the sensitivity of surveillance systems to detection sensitivity, risk area analysis and uncertain epidemiological characteristics of spread and reproduction and optimise surveillance systems by using epidemiological knowledge

What is the biosecurity problem? Despite the biosecurity resources invested in surveillance programs, there are no accepted tools for evaluating the quality of surveillance with respect to the spatial epidemiology of invading pests. Surveillance implicitly underpins claims of plant health status for geographic areas. Our ability to manage eradication and containment programs, plant movement risks and early detection has been hampered by difficulties in interpreting what our surveillance is telling us. Quantitative surveillance analysis techniques based on epidemiological risk can provide a framework for measuring the value of data produced by surveillance systems and provide a methodology for assessing surveillance options.

Project status Approved (PhD)

Project start-completion date

Start: December 2006
Completion: November 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	A methodology for negotiating area freedom related trade based on surveillance and risk assessment.
2.	Surveillance optimisation strategies developed for EPP early warning surveillance.
3.	A spatially integrated analytical approach to surveillance evaluation to optimise EPP control options

Project leader Dr Kerrie Mengersen, QUT

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Mr Mark Stanaway	QDPI&F	100
Dr Kerrie Mengersen	QUT	10
Dr Grant Hamilton	QUT	5
Dr Anthony Clarke	QUT	5
Dr Simon Barry	DAFF	5
Dr Peter Whittle	QDPI&F	5
Total in-kind		**130**
PhD Student (Mr Mark Stanaway)	CRCNPB/QUT/QDPI&F	100

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Stipend	$24,000
Travel & Accommodation	$0
Operating costs	$6,000
Total Operating Budget	**$30,000**

End-users/Output This project will result in a new PhD graduate trained in statistical techniques to guide and interpret surveillance emergency pest surveillance programs. The graduate will be immediately employable within the plant biosecurity industry, increasing Australia's capability to undertake EPP surveillance.

CRC PLANTbiosecurity

Project: CRC50037

Fire blight diagnostics

Enhanced specificity of fire blight diagnostics for improved incursion response.

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Identify new gene targets for enhanced diagnostics of *Erwinia amylovora* (Ea) and validate new tests on Australian and internationally grown fire blight hosts.

What is the biosecurity problem? Existing diagnostic protocols for the detection of *Erwinia amylovora* (Ea) have been found to be unreliable under Australian conditions. The preferred PCR test used by research labs around the world is based on the amplification of a plasmid consistently associated with the fire blight pathogen. This project will link with the Ea genome sequencing project and identify a chromosomal-based region of the bacterial genome that will detect all strains of Ea and not cross-react with closely-related but saprophytic bacterial species.

Project status Approved (PhD)

Project start-completion date

Start: January 2007
Completion: December 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Develop a new diagnostic test based on the identification of unique chromosomal DNA sequences from Ea that is accepted internationally.
2.	Identify new genetic information of endemic bacteria that can potentially confound diagnostic testing for Ea.
3.	Increase the confidence in incursion response through improved specificity of diagnostic tests.

Project leader Dr Brendan Rodoni, DPIVIC

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr Brendan Rodoni	DPIVIC	10
Dr Jo Luck	DPI	10
Dr Mark Gibbs	ANU	10
Dr Ric Cother	NSWDPI	10
Total in-kind		**40**
PhD candidate	CRCNPB/ANU	100

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Stipend	$24,000
Travel & Accommodation	$10,000
Operating costs	$25,000
Total Operating Budget	**$59,000**

HAL are a co-investor in this project.

End-users/Output A validated and globally accepted diagnostic test for the detection of Ea will improve accuracy and response times that will enhance the management of a fire blight incursion. The diagnostic protocol will be made available to diagnostic labs in Australia to support biosecurity programs nationally. The project has been supported by apple and pear growers through HAL. This project will deliver a new PhD graduate with skills in pest diagnostics, available for immediate employment within the Plant Biosecurity community, thus increasing Australia's capability to respond to and manage EPPs.

CRC PLANTbiosecurity

Project: CRC50038

Epiphyas revision

Clarifying the taxonomy of the light brown apple moth group.

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Train a Lepidoptera systematist in classical and novel taxonomic methods and develop easy-to-use and reliable identification tools for economically important *Epiphyas* species, sequenced to identify larvae and produced in consultation with the industry. An inventory of Australian *Epiphyas* species will be created.

What is the biosecurity problem? Inadequate taxonomic knowledge about the genus *Epiphyas* with ca 40 named and ca 20 unnamed species could and has been used to hinder market access for Australian fruit. A revision of *Epiphyas* would remove this threat and provide molecular means for reliable larval identification, impossible to do at the moment.

Project status Approved (PhD)

Project start-completion date
Start: January 2007
Completion: December 2009

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	A Lepidoptera systematist trained in classical and novel taxonomic methods.
2.	Protection of the Australian horticultural industry from export disruptions resulting from possible quarantine barriers imposed on the pretext of ignorance about the taxonomy of the genus *Epiphyas*.
3.	Ability by industry to reliably and easily identify all economically important *Epiphyas* species, both adults and larvae, based on sequence information.
4.	A sound taxonomic base for the entire genus *Epiphyas* for future applied research, and confirmation that the majority of *Epiphyas* species, especially the so far unknown species, are of no economic concern

Project leader Dr Marianne Horak , CSIRO

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Dr Marianne Horak	CSIRO	20
Dr Andrew Mitchell	NSWDPI	10
Mr David Williams	DPIVIC	5
Ms Cassie Wesley	NSWDPI	5
Prof Michael Crisp	ANU	10
Dr John Trueman	ANU	5
Dr Margaret Williams	TASDPIW	5
Mr Ian Lacey	DAFWA	5
Total in-kind		**65**
PhD candidate	CRCNPB/ANU	100

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Stipend	$24,000
Travel & Accommodation	$5,000
Operating costs	$6,000
Total Operating Budget	**$35,000**

End-users/Output The project will provide a greater taxonomic knowledge of the genus *Epiphyas*, a group of insects that currently poses serious threats to market access for Australian fruit. This project will deliver a new PhD graduate with skills in entomology and pest diagnostics/taxonomy, available for immediate employment within the Plant Biosecurity community, thus increasing Australia's capability to respond to and manage EPPs.

CRC PLANTbiosecurity

CRC PLANTbiosecurity

COOPERATIVE RESEARCH CENTRE FOR NATIONAL PLANT BIOSECURITY

CRCNPB PROGRAM 6

Delivery and Adoption

The Delivery and Adoption Program will transfer outputs developed by the Centre's Research and Education Programs to its industry end-users – agribusiness, producers and the Australian and State Governments. As part of this function, research projects in this Program will focus on improving our ability to deliver plant biosecurity tools, knowledge and technology to industry, with an emphasis on improving communication of plant biosecurity issues. Communication plays a fundamental role in industry's ability to build awareness and effect change for improved biosecurity, and research in this Program will focus on developing improved strategies to increase awareness, engagement and collaboration in plant biosecurity.

Project: CRC60036

National Communication Strategy Framework

Project: CRC60036

National Communication Strategy Framework

Assessment of a national plant biosecurity communication strategy and a biosecurity planning framework for emerging industries.

Preparedness and Prevention Research

Diagnostics Research

Surveillance Research

Impact Management Research

Education and Training

Delivery and Adoption

Project objective Assessment of the critical components of a national plant biosecurity communications strategy and development of a framework for biosecurity planning for Australia's emerging plant industries.

What is the biosecurity problem? Recent assessment of past plant biosecurity communication activities has identified that they may not have been as effective as anticipated. Limited research has been undertaken to assess the most effective strategy to communicate the importance and to engender engagement in protecting both Australia's plant industries and its valuable native flora. Australia has a number of emerging plant industries and it is critical that they participate in the biosecurity planning process. However, the existing framework for biosecurity planning has been developed for Australia's existing plant industries. An assessment is required of the suitability of the existing framework for emerging industries.

Project status Approved

Project start-completion date

Start: July 2006
Completion: August 2008

Project outputs The following table outlines the outputs for this project.

OUTPUT	DESCRIPTION
1.	Assess the critical components of a successful national plant biosecurity communications strategy.
2.	Determine the suitability of the existing plant biosecurity planning framework for Australia's emerging plant industries
3.	Develop biosecurity planning framework for Australia's emerging plant industries.

Project leader Mr Kyle Thoms, PHA

Project resources This project requires the following resources:

NAME	ORGANISATION	PERCENTAGE (FTE)
Mr Kyle Thoms	PHA	10
tbd	PHA	10
Ms Sue McKell	CRCNPB	10
Mr John Botha	DAFWA	10
tbd	DAFWA	10
tbd	QDPI&F	10
Total in-kind		**60**

Project budget This project has the following budget for the 2006-2007 financial year:

ITEM	AMOUNT
Employee costs	$45,000
Travel & Accommodation	$2,500
Operating costs	$2,500
Total Operating Budget	**$50,000**

End-users/Output The communication package will support the delivery of biosecurity messages to stakeholders by identifying more effective communication strategies. The biosecurity planning framework for emerging industries will be utilised by PHA and RIRDC to ensure the level of preparedeness of these important new industries is maximised.

CRC PLANTbiosecurity

Appendix 1. *Commonwealth Agreement - Outcomes, Outputs & Milestones*

Commonwealth Agreement – Outcomes, Outputs & Milestones								
CRCNPB Program	C'with Outcomes	Commonwealth Outputs		Commonwealth Milestones		Completion Date	CRCNPB Project	Milestone fully addressed by CRCNPB Projects
Preparedness and Prevention	Prevention	1.1	Knowledge to underpin decisions on risk of entry, establishment and spread for Emergency Plant Pests.	1.1.1	Establish Program End-User Group including PHA and Biosecurity Australia	Dec-05	Participants Committee	✓
				1.1.2	Review biosecurity plans prepared by the plant industries with the Steering Committee to identify key issues to be explored quantitatively.	Mar-06		×
				1.1.3	Analysis of risk perception in communities and industries completed.	Jun-09	CRC10010	×
		1.2	New risk assessment, economic and complex system models for biosecurity.	1.2.1	Select biological systems to develop models to predict the spread of different functional groups of emergency plant pests.	Mar-06	CRC50002 CRC50003	×
				1.2.2	Risk assessment models based on complex systems theory/economic modelling further developed and validated.	Dec-09	CRC10001 CRC10010	✓
				1.2.3	The most robust system for emergency plant pest prioritisation determined.	Dec-09	CRC10010 CRC10018	✓
				1.2.4	The influence of climate change on emergency plant risk assessment determined.	Dec-10		×
				1.2.5	Field testing of new models completed.	Jun-12		×
		1.3	More efficient and effective responses to Emergency Plant Pests through better understanding of their biology and epidemiology.	1.3.1	Gaps in knowledge requiring research about selected emergency pests identified.	Jun-06	CRC50002 CRC50003	×
				1.3.2	Complete research on the biology and epidemiology of selected species to better manage Emergency Plant Pests.	Jun-11	CRC50002 CRC50003	×
Delivery & Adoption		D1.1	New models utilised to combine comparative risk analysis and risk assessment to predict threats.	D1.1.1	Apply risk communication to biosecurity and deliver through the education program.	Dec-07	CRC10010 CRC10011	✓
				D1.1.2	Risk assessment models based on complex systems theory/economic modelling delivered to state agencies for testing and validation.	Jun-09	CRC10001 CRC10010	✓
				D1.1.3	New models of risk prediction delivered to agencies for use on selected emergency plant pests.	Jun-12	CRC10001 CRC10010	✓
		D1.2	Establish End-User Advisory Group for each Research Program to prioritise, monitor and advise on delivery.	D1.2.1	Identify key stakeholders and representatives for each research program.	Mar-06		✓
				D1.2.2	Determine priorities and establish projects.	Mar-06		✓
				D1.2.3	Develop project progress evaluation system to enable establishment and monitoring of priorities.	Mar-06	Workshop	✓
		D5.1	Effective communication and delivery strategy operational.	D5.1.1	At least one training workshop conducted.	Jun-06	Workshop	✓
				D5.1.2	Information resources such as training manuals developed for outputs of Program 1.	Jun-12	CRC60036	×

Commonwealth Agreement – Outcomes, Outputs & Milestones

CRCNPB Program	C'with Outcomes	Commonwealth Outputs		Commonwealth Milestones		Completion Date	CRCNPB Project	Milestone fully addressed by CRCNPB Projects
Diagnostics	Identification	2.1	Comprehensive, world-class diagnostics for emergency plant pests available through national and international databases.	2.1.1	Priorities and agreements on data standards, diagnostics and databases established through international workshops.	Jun-06	CRC2012	✓
				2.1.2	Formal agreements for CRCNPB as contributor for data entry to national and international databases and managing organisations. Data quality control/validation protocols established and network of CRC collaborators established.	Jun-08	CRC2012	✓
				2.1.3	Comprehensive diagnostic data sets for emergency pests and pathogens submitted to accessible national and international databases.	Jun-12	CRC20012	✓
		2.2	New robust, cost-effective diagnostic tools for accurate identification of specific Emergency Plant Pests and pathogens developed, improved and made available.	2.2.1	Workshops to identify priority diagnostics completed.	Dec-06	Workshop	✓
				2.2.2	New robust, cost-effective technology based on existing IP evaluated.	Jun-09	CRC50017 CRC20030 CRC50037	✓
				2.2.3	Suite of new technology novel tools and innovative enabling technology developed, validated and made available.	Jun-12	CRC50017 CRC20030 CRC50037	✓
		2.3	Innovative technology to underpin surveillance and rapid, early detection of emergency plant pests developed and validated.	2.3.1	Protocols established for extraction and processing of nucleic acids, proteins or metabolites from survey samples for molecular diagnostic assays.	Jun-07	CRC50017 CRC20030	✓
				2.3.2	Enabling technology for diagnostics for priority threats (including DNA, molecular diagnostic data and microarray analysis technology) developed and tested.	Jun-12	CRC20004 CRC20030 CRC20031	✓
				2.3.3	Sensitive, microarray 'first screen' technology validated and, where appropriate, commercially delivered.	Jun-12	CRC20030	✓
		2.4	High-speed, ready access to diagnostic services, protocols and expertise.	2.4.1	Network of facilitators, protocols and experts identified and data submitted to coordinating bodies.	Dec-10	CRC20025	✓
				2.4.2	Virtual diagnostic facilities established, functional and accessible.	Dec-11	CRC20025	✗
Delivery & Adoption		D2.1	Comprehensive, world-class diagnostics for emergency plant pests available through national and international databases.	D2.1.1	Priorities and agreements on data standards, distance diagnostics and databases established through international workshops.	Jun-06	CRC20012	✓
				D2.1.2	Formal agreement for CRCNPB as contributor for data entry to national and international databases and managing organisations. Data quality control/validation protocols established and network of CRC collaborators established.	Jun-08	CRC20012	✓
				D2.1.3	Comprehensive diagnostic data sets for emergency plant pests and pathogens submitted to accessible, national and international databases.	Jun-12	CRC20012	✓
		D2.2	Delivery of diagnostic tests to end-users.	D2.2.1	Licensing agreement executed with company for commercial tests or agreement reached with participants for non-commercial tests.	Jun-08	CRC20004 CRC50017 CRC20030	✓

Commonwealth Agreement – Outcomes, Outputs & Milestones

CRCNPB Program	C'with Outcomes	Commonwealth Outputs		Commonwealth Milestones		Completion Date	CRCNPB Project	Milestone fully addressed by CRCNPB Projects
Delivery & Adoption	Detection			D2.2.2	Marketing of test availability to producers and delivery of first test to industry.	Jun-08	CRC20004 CRC50017 CRC20030 CRC20031	✓
				D2.2.3	Production of laboratory manual and training of relevant staff.	Jun-12	CRC20004 CRC20025 CRC20030	✓
		D5.1	Effective communication and delivery strategy operational.	D5.1.1	At least one training workshop conducted.	Jun-06	Workshop	✓
				D5.1.3	Information resources such as training manuals developed for outputs of Program 2.	Jun-12	CRC60036	✗
Surveillance		3.1	Develop technically sound, cost-effective surveillence procedures that are linked to information databases, GIS datasets and other technologies, to capture all relevant survey data required to accurately define Australia's plant health status and detect emergency plant pests.	3.1.1	Evaluate and enhance data collection for emergency plant pest surveys through assessment of hand-held tablet and pocket PC sample devices and other relevant technologies.	Dec-07	CRC30014	✓
				3.1.2	Evaluation of remote sensing for detecting the presence and spread of emergency plant pests and their hosts.	Dec-08	CRC30015	✓
				3.1.3	Development of auto-reporting traps and systems to detect and transmit the presence of emergency plant pests in remote areas and other selected applications.	Jun-09	CRC30023	✓
				3.1.4	Development of generic precision surveillance simulation tools for selected emergency plant pest groups.	Dec-11	CRC30021 CRC30032	✓
				3.1.5	Evaluate the usefulness of urban surveillance in the early detection of emergency plant pests.	Jun-10		✗
				3.1.6	Develop national standards and methodologies for recruiting and training surveillance staff.	Jun-10	CRC30020	✓

Commonwealth Agreement – Outcomes, Outputs & Milestones

CRCNPB Program	C'with Outcomes	Commonwealth Outputs		Commonwealth Milestones		Completion Date	CRCNPB Project	Milestone fully addressed by CRCNPB Projects
Delivery & Adoption	Response	D3.1	A new generation of world-class and cost-effective surveillance tools and methodologies developed for emergency plant pests of national importance.	D3.1.1	Current surveillance practices and methodologies benchmarked against our leading trading partner e.g. USA, NZ and Japan.	Nov-07	CRC30009 CRC30014	×
				D3.1.2	Transparent national surveillance standards agreed for emergency plant pests of national significance.	Jun-08	CRC30009 CRC30015 CRC30020 CRC30022 CRC30023 CRC30032	✓
				D3.1.3	Competency standards defined for surveillance staff involved in national surveillance networks.	Jun-09	CRC30020	✓
				D3.1.4	Surveillance prediction tools developed and incorporated into national surveillance networks.	Jun-11	CRC30021	✓
				D3.1.5	Cost-effective surveillance protocols for emergency plant pests of national importance accepted by major trading partners.	Jun-12	CRC30009 CRC30015 CRC30022 CRC30023	✓
		D5.1	Effective communication and delivery strategy operational.	D5.1.1	At least one training workshop conducted.	Jun-06	Workshop	✓
				D5.1.4	Information resources such as training manuals developed for outputs of Program 3.	Jun-12	CRC60036	×
Impact Management		4.1	Tools to underpin optimal response strategies, area freedom protocols and pre-emptive crop management strategies. Capacity to evaluate and validate incursion response strategies through predictive simulation system.	4.1.1	Identify the modelling and pre-emptive tools needed to fill knowledge gaps.	Jun-06	CRC40007	✓
				4.1.2	Develop economic module of predictive simulation system incorporating national cost benefit analysis methodology.	Jun-08	CRC40007	✓
				4.1.3	Incorporate socio-economic factors into economic module.	Jun-07	CRC40007	✓
				4.1.4	Develop terrestrial observation module of predictive simulation system.	Jun-08	CRC50008	✓
				4.1.5	Develop scientifically sound protocols for strategies utilised in incursion management.	Jun-08	CRC40035	✓
				4.1.6	Predictive simulation system developed incorporating biological, geographical, social and economic factors.	Jun-10	CRC40007	×
		4.2	Capacity to respond to new virulence in emergency plant pests.	4.2.1	Develop understanding of varying virulence in high priority emergency plant pests.	Jun-06	CRC40005 CRC40006	✓
				4.2.2	Virulence determinants identified for at least two high priority emergency plant pests.	Jun-10	CRC40005 CRC40006	✓
		4.3	Enhanced disinfestation technologies for both imported and exported plant produce.	4.3.1	Detailed review of non-chemical disinfestation technologies completed.	Jun-06	Review	✓
				4.3.2	Effectiveness of non-chemical disinfestation technologies assessed.	Jun-08		×
				4.3.3	Improved non-chemical disinfestation technologies implemented.	Jun-12		×
		4.4	Scientifically validated hygiene science strategies for incursion response.	4.4.1	Assessment of secure packaging for EPPs completed.	Dec-06	CRC40035	✓
				4.4.2	Validated hygiene science strategies made available for incursion management.	Jun-10		×

Commonwealth Agreement – Outcomes, Outputs & Milestones

CRCNPB Program	C'with Outcomes	Commonwealth Outputs		Commonwealth Milestones		Completion Date	CRCNPB Project	Milestone fully addressed by CRCNPB Projects
Delivery & Adoption	Education & Training	4.5	Novel control/containment strategies developed.	4.5.1	Crop destruction technologies for perennial tree/vine crops evaluated.	Jun-08	CRC40016 CRC40024	✓
				4.5.2	Crop destruction technologies for annual crops evaluated.	Jun-10	CRC40024	✓
				4.5.3	Evaluate non-destructive strategies for control/containment.	Jun-10	CRC40016 CRC40024	✓
		D4.1	Tools to underpin surveillance and response delivery.	D4.1.1	Tools to underpin surveillance and response delivery developed.	Dec-10	CRC50005 CRC50006 CRC50007 CRC50009 CRC50024	✓
				D4.1.2	Manuals prepared and training workshops held to communicate results to appropriate agencies.	Dec-10	CRC50006 CRC50009	✓
				D4.1.3	Tools and models implemented and incorporated in operational processes of industry and government.	Dec-12	CRC50005 CRC50006 CRC30009 CRC50016 CRC50024 CRC40035	✓
		D5.1	Effective communication and delivery strategy operational.	D5.1.1	At least one training workshop conducted.	Jun-06		✗
				D5.1.5	Information resources such as training manuals developed for outputs of Program 4.	Jun-12	CRC60036	✗
Education & Training		5.1	At least 32 PhD graduates with the following characteristics: • Specific PhD training in Plant Biosecurity. • A broad understanding of the Plant Biosecurity Industry. • Certified formal training in IP Management and Commercialisation, and in Business Acumen.	5.1.1	Recruitment of full-time Education Officer.	Sep-06		✗
				5.1.2	Development of an Education and Training Plan.	Dec-06		✗
				5.1.3	First 16 PhD students recruited.	Dec-06	CRC50002 CRC50003 CRC50008 CRC50011 CRC50017 CRC50033 CRC50034 CRC50037 CRC50038	✗
				5.1.4	First 16 completed compulsory course work.	Dec-07	CRC50002 CRC50003 CRC50008 CRC50011 CRC50017 CRC50033 CRC50034 CRC50037 CRC50038	✗
				5.1.5	Second 16 PhD students recruited.	Jun-10		✗
				5.1.6	Second 16 PhDs completed compulsory coursework.	Jun-11		✗
				5.1.7	First cohort submitted PhD theses.	Dec-10		✗
				5.1.8	Second cohort submitted PhD theses.	Dec-12		✗
		5.2	Provide short courses and vocational training undertaken.	5.2.1	First short courses and vocational training developed.	Jun-06		✓
				5.2.2	First short courses and vocational training undertaken.	Dec-06		✓

Appendix 2. *CRCNPB - Programs, Actions & Projects*

CRCNPB – Programs, Actions & Projects							
CRCNPB Program	CRCNPB Actions		CRCNPB Projects				
			Description		Start	Completion	2005-2006 / 2006-2007 / 2007-2008 / 2008-2009 / 2009-2010 / 2010-2011 / 2011-2012
Preparedness & Prevention	A1.1	Develop knowledge to underpin risk analysis decisions on entry, establishment and spread of emergency plant pests.					
	A1.2	Develop new risk assessment models for biosecurity.	CRC10001	Early warning of pre-emergent emergency plant pest threats.	Dec-06	Nov-09	
			CRC10010	Enhanced risk analysis tools	Nov-06	Nov-09	
	A1.3	Devise more efficient and effective responses to emergency plant pests through better understanding of their biology and epidemiology.					
Diagnostics	A2.1	Develop and validate comprehensive diagnostic and taxonomic reference data and link to national and international reference collections and databases.	CRC20012	A National Diagnostic Database for EPPs	Dec-06	Jun-09	
	A2.2	Develop new, robust, cost-effective diagnostic tools for accurate identification of emergency plant pests.	CRC20004	Enhancing the detection of *Tilletia indica*, the cause of Karnal bunt	Mar-06	Jun-09	
			CRC20030	Molecular analysis systems	Feb-07	Dec-09	
	A2.3	Develop innovative high-throughput technology to underpin large-scale surveillance and early detection of emergency plant pest incursions.					
	A2.4	Develop high speed and ready access to best available diagnostic services, protocols and expertise.					
			CRC20025	Improved EPP identification through a web-based remote microscope system	Dec-06	Dec-07	
			CRC20031	Detection of *Phytophthora kernoviae* and *P. ramorum*	Oct-06	Apr-07	

CRCNPB – Programs, Actions & Projects

CRCNPB Program	CRCNPB Actions		CRCNPB Projects				
				Description	Start	Completion	2005-2006 / 2006-2007 / 2007-2008 / 2008-2009 / 2009-2010 / 2010-2011 / 2011-2012
Surveillience	A3.1	Develop technically sound and cost-effective surveillance procedures.	CRC30020	Selection and training of quarantine and/or surveillance staff	Jan-07	Dec-09	
	A3.2	Develop surveillance procedures that are linked to information databases, GIS datasets and other technologies.	CRC30021	Development of a surveillance simulation platform for Biosecurity managers and researchers in Australia	Jan-07	Dec-09	
			CRC30009	Contingency plans for emergency plant pests of the grain industry	Jan-06	Oct-08	
	A3.3	Develop surveillance technologies that capture all the relevant survey data required to acurately define Australia's plant health status, including confirmation of pest-free areas, and detect emergency plant pests.	CRC30014	Using PDA technology to provide a national system for rapid and secure Plant Biosecurity surveillance data capture	Sep-06	Sep-08	
			CRC30015	Scoping study to ground truth the usefulness of hyperspectral imaging for the detection of a range of EPP plant pathogens	Nov-06	Nov-08	
			CRC30022	Enhancing surveillance capability and horticultural exports with improved long-term female fruit fly trapping systems	Dec-06	Dec-09	
			CRC30023	Smart traps for improved surveillance	Jan-07	Dec-09	
			CRC30032	Scoping Study - Using a remotely controlled aircraft to spatially monitor spores	Jan-07	Dec-08	
			CRC0039	Proove and effectively manage area freedom from fruit flies	Dec-06	Dec-09	
Impact Management	A4.1	Develop tools to underpin optimal response strategies, area freedom protocols and pre-emptive crop management strategies, including the capacity to evaluate and validate incursion response strategies through predictive simulation systems.	CRC40007	Development of an economic module as a key component of a national predictive simulation system.	Jul-06	Jun-09	
	A4.2	Develop capacity to respond to new virulence in emergency plant pests.	CRC40006	Evolution of Russian wheat aphid virulence and resistance sustainability	Aug-06	Dec-08	
			CRC40005	Survey of Australian rice blast races and cultivar susceptibility	Mar-06	Nov-07	
	A4.3	Develop enhanced dis-infestation technologies for both imported and exported plant produce.					
	A4.4	Develop scientifically validated hygiene science strategies for incursion response.	CRC40035	Design and development of risk management processes for the movement of samples during an EPP incursion	Sep-06	Mar-07	
	A4.5	Develop novel control/containment/recovery strategies.	CRC40016	Optimising eradication strategies for emergency plant pest incursions on perennial crops	Jul-06	Jun-09	
			CRC40024	Non-invasive eradication technologies for anthropod EPP incursions	Dec-06	Dec-09	

CRCNPB – Programs, Actions & Projects

CRCNPB Program	CRCNPB Actions		CRCNPB Projects				
			Description		Start	Completion	2005-2006 / 2006-2007 / 2007-2008 / 2008-2009 / 2009-2010 / 2010-2011 / 2011-2012
Education & Training	A5.1	To support Honours candidates and up to 32 PhD candidates.	CRC50002	Biotic factors affecting the spread of a small wind-dispersed insect.	Dec-06	Dec-09	
			CRC50003	Biotic factors affecting the spread of an air-borne/splash-borne fungus.	Mar-06	Mar-09	
			CRC50008	Postgraduate Training in Terrestrial Data Assessment	Oct-06	Oct-09	
			CRC50011	Community engagement in biosecurity - the OrdGuard case study.	Feb-06	Jan-09	
			CRC50017	Novel approaches to surveillance monitoring for EPP pathogens	Nov-06	Oct-09	
			CRC50026	Characterisation of citrus canker isolates and validation of new diagnostic methods	Feb-06	Dec-06	
			CRC50027	Development of a DNA barcoding system for the identification of Australian insect species: a case study of scarab beetle larvae in NSW	Feb-06	Dec-06	
			CRC50028	Aetiology and epidemiology of the Fusarium head blight epidemic in wheat in 2005 in north-west NSW	Feb-06	Dec-06	
			CRC50029	Taxonomy, biology and pathology of a Phytophthora citricola like pathogen	Feb-06	Dec-07	
			CRC50033	Susceptibility of Australian plant species to Phytophthora ramorum, an emerging potential threat to Australian plant industries and ecosystems	Jan-07	Dec-09	
			CRC50034	Surveillance system evaluation and optimisation for emergency plant pests	Sep-06	Aug-09	
			CRC50037	Enhanced specificity of fire blight diagnostics for improved incursion response	Jan-07	Dec-09	
			CRC50038	Clarifying the taxonomy of the light brown apple moth group - revision of the genus Epiphyas	Jan-07	Dec-09	

CRCNPB – Programs, Actions & Projects

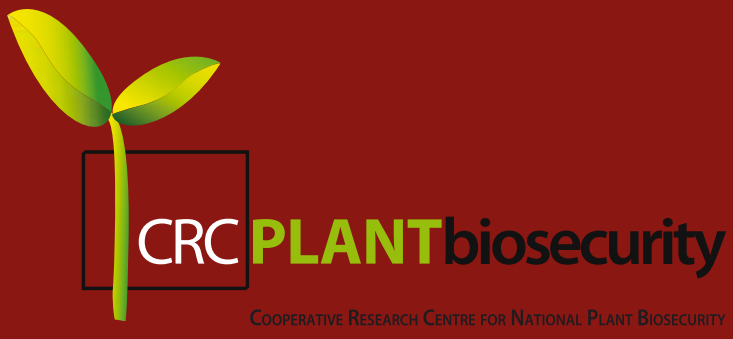
CRCNPB Program	CRCNPB Actions		CRCNPB Projects											
			Description		Start	Completion	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012
Education & Training	A5.2	Provide specific training for PhD and Honours candidates in plant biosecurity, a broad understanding of the plant biosecurity industry, and certified formal training in IP management, commercialisation, and business acumen.											
	A5.3	Deliver short courses and vocational training for the plant biosecurity community which includes industry, neighbouring countries and technology end-users.											
	A5.4	To support the development of a national undergraduate curriculum in plant biosecurity.											
	A5.5	Develop biosecurity coursework for vocational training.											
Delivery & Adoption	A6.1	Deliver an effective communication strategy.	CRC60036	Assessment of a national plant biosecurity communication strategy and a biosecurity planning framework for emerging industries	Nov-06	Aug-08		←	→				
	A6.2	Utilise models to combine comparative risk analysis and risk assessment to predict threats.											
	A6.3	Deliver comprehensive, world-class diagnostics data on emergency plant pests through accessible national and international databases.											
	A6.4	Deliver diagnostic tests to end-users.											
	A6.5	Utilise a new generation of world-class and cost-effective surveillance tools and methodologies for emergency plant pests of national importance.											
	A6.6	Deliver tools to underpin surveillance and response.											
	A6.7	Establish an end-user advisory group to prioritise, monitor and advise on delivery.											
	A6.8	Develop strategies and protocols for community education and engagement in plant biosecurity systems.											

Appendix 3. *Project Status Key*

Project Status	Description
Approved	Board approved project.
Approved (PhD)	Board approved PhD project.
Approved (Honours)	Board approved Honours project.
Recommended for approval	Project recommended for approval by the Science Committee to the Board.
Recommended for approval (PhD)	A PhD project recommended for approval by the Science Committee to the Board.
Recommended for approval (Honours)	An Honours project recommended for approval by the Science Committee to the Board.
Development	A project under development and consideration by the Science Committee.

Appendix 4. *Organisation Abbreviations*

Abbreviations	Organisation
ARO	Agricultural Research Organisation, Israel
ANU	The Australian National University
CALMWA	Department of Conservation and Land Management, Western Australia
CDU	Charles Darwin University
CRCNPB	Cooperative Research Centre for National Plant Biosecurity
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSU	Charles Sturt University
DAFF	Commonwealth Department of Agriculture, Fisheries and Forestry
DAFWA	Department of Agriculture and Food, Western Australia
DPIVIC	Department of Primary Industries, Victoria
ENSIS	[Joint venture between Australia's CSIRO Forestry and Forest Products (FFP) and New Zealand's Scion (formerly Forest Research)]
GRDC	Grains Research and Development Corporation
HAL	Horticulture Australia Ltd
HRNZ	The Horticulture and Food Research Institute of New Zealand Limited
KSU	Kansas State University
MU	Murdoch University
NSWDPI	New South Wales Department of Primary Industries
NTDPIFM	Northern Territory Department of Primary Industry, Fisheries and Mines
OCPPO	Office of the Chief Plant Protection Officer
OG	OrdGuard
PHA	Plant Health Australia Ltd
QDPI&F	Queensland Department of Primary Industries & Fisheries
QUT	Queensland University of Technology
SARDI	South Australian Research and Development Institute
SBL	Saturn Biotech Limited
SCU	Southern Cross University
TASDPIW	Tasmania Department of Primary Industries and Water
UA	The University of Adelaide
UC	University of California
UKFR	Forest Research, United Kingdom
UNIMELB	The University of Melbourne
USDA	United States Department of Agriculture
USU	Utah State University
USYD	The University of Sydney


CRC PLANTbiosecurity
Cooperative Research Centre for National Plant Biosecurity