



Invasive Animals CRC

Extension Proposal (2012-2017)

Australia is experiencing one of its worst outbreaks of pest animals with widespread mouse plagues, swelling rabbit numbers due to increased food availability and Rabbit Haemorrhagic Disease (RHD) resistance, expanding carp populations post-floods and increasing livestock losses to wild dogs and pigs. Also escalating is public concern for animal welfare and the withdrawal of many chemical control tools around the world. The impact of this chronic and cross-sectoral threat to our food security by undermining agricultural productivity is estimated at more than \$1 billion per year. The environmental impact of pest animals is a suite of mammal and bird extinctions, continuing impact on 100's of threatened species, and to act as a major barrier to their efforts to adapt to climate change.

Australia needs a permanent research institute to continue the discovery and delivery of world-leading controls for invasive animals that are humane, cost-efficient and ecologically appropriate. An 'extension' to the Invasive Animals CRC under the Federal Science Department's (DIISR) CRC Program (Round 14 currently underway) or as an Australian Government New Policy Proposal will provide us with the opportunity to transform into an enduring organisation, ultimately self-financed and dedicated to innovative national research and training. This will avoid exposing Australia's agricultural and natural resource managers to the risk of having inadequate technologies against pest animals to protect our national biodiversity assets and long-term food security.

The IACRC is now seeking a five year extension in order to:

- (1) complete its research on one of our key technologies – Australia's first carp biocontrol agent - while releasing others currently in the regulatory pipeline
- (2) build on our work through new innovative research
- (3) enable better uptake of our work by institutions and communities through targeted research into effective engagement and
- (4) transition to a new and sustainable national organisation.

Current IA CRC innovation track record

Innovations to be delivered through this Invasive Animals CRC by 2012 include:

Rabbits

National cost: \$206 million/yr and impact on 156 threatened species

Value proposition: Increase effectiveness of rabbit biocontrol and conventional control

- ▶ Discovery of the endemic benign virus (RCV-A1) impeding Rabbit Haemorrhagic Disease (RHD) in temperate regions of Australia
- ▶ Evaluation of new RHD virus strains to boost its effectiveness as a biocontrol agent.
Estimated impact: \$0.987 billion over 15 years
- ▶ New freeze-dried method to efficiently distribute RHDV.
Estimated impact: \$7.8 million/yr

Wild dogs and foxes

National cost: \$48.5 million/yr (dogs), \$21.2 million/yr (foxes) and impact on 76 threatened species (foxes)

Value proposition: Increase effectiveness of wild dog and fox control through regional nil-tenure approaches, develop a new class of humane toxin with antidote, and enable wide use of new bait delivery systems

- ▶ New humane toxin (PAPP) for wild dogs and foxes backed up by Bluehealer antidote for working and pet dogs
Estimated impact: \$1.1 million/yr
- ▶ National demonstration that regional nil tenure wild dog control works
- ▶ New rapid scat DNA detection technique to identify foxes and other predators (integral to Tasmanian fox eradication program)

Carp and new pest fish

Value Proposition: Increase effectiveness of integrated carp management in the Murray Darling Basin

- ▶ Discovery of carp breeding hotspots and movement patterns that can be used to enable targeted carp control
- ▶ New sex pheromone carp attractant
- ▶ Initial evaluation of Australia's first potential carp biocontrol agent (Koi herpes virus)
- ▶ World first production of daughterless carp
- ▶ New pest fish rapid response system

Feral pigs

National cost: ~\$100 million/yr and impact on over 20 threatened species

Value proposition: Increase effectiveness through improved baits and toxins

- ▶ World's first manufactured feral pig bait, with improved target specificity (PIGOUT)
Estimated impact: \$0.28 million/yr
- ▶ New humane toxin for feral pigs (HOG-GONE) with target specific bait delivery system (HOG-HOPPER), backed up by Bluehealer antidote for working and pet dogs
Estimated impact: \$1.88 million/yr

Further information

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**“TOGETHER CREATE
AND APPLY SOLUTIONS”**

IA CRC Extension Value Proposition

The proposed extension of the Invasive Animals CRC will continue the close collaborative work between industry, research, and extension organisations. This will fully deliver those key technologies that will be ready for adoption after 2012, as well as new technologies that overcome major outstanding problems. The impact of just one of these technologies — the approval and roll-out of any new safe and effective strains of rabbit calicivirus — will benefit Australia by almost \$1 billion over 15 years.

The five year outcomes will include: (1) no new vertebrate pests established in Australia (2) recovery of key land and water regions after humane control of rabbits, wild dogs and carp (3) new social networks and institutional 'architecture' around pest animal control (4) prediction and control of emerging outbreaks (especially mice) and (5) an enduring entity for research, training and support of pest animal control across Australia.



Our well-established and highly regarded research team will deliver these outcomes through enabling more effective strains of Rabbit Haemorrhagic Disease Virus (RHDV) to be released to boost existing rabbit biocontrol, a new platform technology to enable accelerated in-vitro production of novel lethal RHDV strains, Australia's first carp biocontrol agent (Koi herpesvirus), coordinated DNA-based detection systems, a new humane rodenticide, a new management paradigm for effective regional and peri-urban wild dog control and a cross-cutting institutional and community engagement program.

Importantly, the research program will also be a major instrument to implement key targets and actions in the *Australian Pest Animal Strategy* and *Australia's Biodiversity Conservation Strategy 2010 – 2030*. Indeed, a Prime Ministers Science Council expert group found that pest animal biocontrol was one of the three most cost-effective ways to protect Australia's biodiversity.

Programs and key outputs

The IA CRC extension program will be delivered through four programs:

1. **Land:** Products and Strategies to manage land pests impacting on agriculture, urban areas and biodiversity. The focus will be on developing a national incursions response system, and strategic landscape scale approaches to rabbit and wild dog control.
2. **Inland waters:** Products and Strategies to detect new pest fish incursions using new environmental DNA techniques, particularly tilapia, and complete the science to enable release of Australia's first carp biocontrol agent – Koi herpesvirus.
3. **Community engagement:** Ensuring availability and adoption of new products and capacity to manage pests: by understanding and influencing policies and social drivers in pest animal control; encouraging cooperation: and overcoming economic and social barriers.
4. **Commercialisation:** Developing a new rodenticide, and fertility control agents for kangaroos and wild horses.

This structure places increased focus on adoption related research, education and training.

The extension program is outlined in more detail on the next two pages.

A unique and high impact \$72M collaboration – only \$19.7M/ 5 yrs more needed to ensure delivery

The IA CRC extension is a focussed collaboration of 26 participants that have committed to invest over \$52M; a testimony to the outstanding track record of the Invasive Animals CRC to date and the importance of the developing novel solutions for end-users. Collaborators include two industry SMEs, three industry Research and Development Corporations, ABARES, MDBA, CSIRO, seven State governments, six universities, and investment of \$4M by four international agencies in the US, UK and NZ. We will also engage leading German, Italian and French institutions in key projects. We have the support of the national Vertebrate Pests Committee, and national and state agricultural and conservation groups.

The Invasive Animals CRC needs a further \$19.7M over five years (\$3.94M/yr) in Commonwealth co-investment to enable its \$72M R&D program to deliver a new suite of high impact products.

IACRC output	Outcome / Impact	End users	Lead participants
Land Pest Products and Strategies			
<i>Outcome 1: No new vertebrate pests established in Australia</i>			
<i>1.1 National incursions response system and enabling technologies</i>			
Incursion response decision support system and tools (including pathway analysis and risk modeling)	Nationally coordinated, efficient and effective response to new invasive animal incursions	Vertebrate Pests Committee, Commonwealth and State agencies	Vertebrate Pests Committee, Commonwealth and State agencies, University of Adelaide, University of Queensland, NZ Landcare Research
New phone and web mapping technology for pest management	Stronger community involvement in citizen science mapping, such as FeralScan	Farmers and other land managers, NRM and community groups	NSW Department of Industry & Investment
<i>1.2 Technologies and strategies for long-term Tasmanian fox incursion response</i>			
Next generation invasive carnivore detection tools, techniques and strategies <ul style="list-style-type: none"> • Next generation DNA and other detection techniques • Detection thresholds through telemetry and detection probability analysis • Risk and long term strategic planning 	Optimal strategy to eradicate foxes from Tasmania. Avoided impact to 78 native species and Tasmanian sheep industry	Tas Department of Primary Industries, Parks, Environment and Water (DPIPEW) Other States impacted by an invasive carnivore incursion	Tas DPIPEW, University of Canberra
<i>1.3 Forecasting and adaptive management and planning</i>			
Macroecological modeling to assess potential patterns of biological invasion under extreme weather events and climate change, and determine most cost-effective pest management strategies	Strategic forecasting and planning to enable pre-emptive invasive animal management in priority regions	Old DEEDI, Commonwealth, state and regional agricultural, land management and environment agencies	CSIRO, University of Queensland, Qld DEEDI
<i>Outcome 2: Landscape recovery after pest animal control</i>			
<i>2.1 Landscape control</i>			
<i>Rabbits</i>			
<i>RHD Boost</i> regulatory approval, release and monitoring	<i>RHD Boost</i> strains found to be effective released as part of a government agreed integrated rabbit control implementation plan. Reduced rabbit impacts over two-thirds of Australia; 5.3M km ² between 2014 and ~2024. Net Present Value \$987M. Increased populations of some 156 threatened plants and animals, 9 of which are critically endangered	Private and government land managers	NSW Department of Industry & Investment, CSIRO, Meat and Livestock Australia, Australian Wool Innovation, State agencies
<i>RHD Boost</i> vaccine			
<i>RHD Accelerator</i> – platform technology for ongoing selection for improved RHDV strains	Effective <i>RHD Accelerator</i> strains selected and applied as required to maintain impacts. Reduced rabbit impacts over two-thirds of Australia; 5.3M km ² from ~2022+. Net Present Value \$78.9M. Increased populations of some 156 threatened plants and animals, 9 of which are critically endangered	Private and government land managers	CSIRO, Australian Wool Innovation, Meat and Livestock Australia
Comprehensive RHD resistance model	Strategic knowledge to maintain RHD as an effective biocontrol agent in Australia	State government agencies, Vertebrate Pests Committee	University of Canberra, CSIRO, Biosecurity SA, Qld DEEDI, Institute of Zoo and Wildlife Research (IZW), Berlin Germany
Rabbit Decision Support System and National Facilitator	Strategic, efficient and effective implementation of new and existing rabbit control methods. Net Present Value \$28.2M.	State government agencies, regional and NRM groups	Biosecurity Victoria, ACT ESDD, NZ Landcare Research, Meat and Livestock Australia
<i>Wild dogs</i>			
Impacts of wild dogs on agro-ecosystems	Determination if the regional control of wild dogs influence populations of (i) quolls, foxes and cats, (ii) threatened native prey species, and (iii) a sample of other non-threatened native prey species. This will enable improved strategic wild dog management in sheep and cattle regions of Australia	State government agencies, regional and NRM groups	University of New England, NSW Department of Industry & Investment, Biosecurity Queensland, Australian Wool Innovation, Meat and Livestock Australia
Wild dog co-management policy solutions	Determination of the legislative and policy incentives for and barriers to effective strategic co-management of wild dogs. Improved policy formulation for wild dog management across Australia	State agencies, Vertebrate Pests Committee, agricultural industry groups	NSW Department of Industry & Investment, Biosecurity Queensland, Australian Wool Innovation, Meat and Livestock Australia

IACRC output	Outcome / Impact	End users	Lead participants
Limiting the Source: Peri-urban wild dog management	Improved understanding of the ecology of peri-urban wild dogs in coastal eastern Australia, and the most appropriate and effective management strategies and product mix. Reduced wild dog impacts in peri-urban areas.	State agencies, NRM bodies and local councils	NSW Department of Industry & Investment, Biosecurity Queensland, numerous local councils
National wild dog facilitator	Increased adoption of regional nil-tenure wild dog management and integrated use of existing and new wild dog products and techniques. Net Present Value \$6.7M.	State agencies, NRM bodies and local councils	Biosecurity Queensland, Australian Wool Innovation

Inland Pest Products and Strategies

Outcome 1: No new vertebrate pests established in Australia

1.1 Pest fish incursion detection technologies

Single species environmental DNA detection technology using tilapia as a model pest species	Pest fish detection tool to support national incursions response system. Efficient and accurate field surveillance technique to detect tilapia at low densities. Government agencies better enabled to contain tilapia spread and prevent invasion of both Gulf catchments and Murray Darling Basin (MDB) – some 50% of MDB is at risk. Avoided impacts to native fish species – overseas fisheries have declined by 67-80% following tilapia invasion.	State fishery agencies, particularly in Qld and NSW	Qld DEEDI, MDBA
Multispecies environmental DNA pest fish detection technology	Pest fish detection tool to support national incursions response system. Efficient and accurate field surveillance technique to detect national and state priority pest fish at low densities. Reduction in current \$1M/yr surveillance costs.	State fishery agencies	University of Canberra, MDBA

Outcome 2: Catchment recovery after carp control

2.1 Catchment control

Koi herpesvirus (Cyprinid herpesvirus-3)	Expected 80% reduction in the carp population over most of the Murray-Darling Basin (1M km ²). (80-95% carp population reduction in 2 yrs when KHV introduced to Indonesia). Increased water quality, river and wetland ecological health and native species.	State fishery agencies	CSIRO, NSW Department of Industry & Investment (fisheries), NZ Dept. of Conservation, MDBA
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Community Engagement: institutional, policy and adoption processes

Outcome 3: New social networks and institutional 'architecture' around pest animal control

Facilitation of collective action	Improved agricultural productivity from accelerated adoption of pest animal control strategies and technologies	State government agencies, regional and NRM groups, land managers	University of New England, Pennsylvania State University
Triggers for effective action	Improved agricultural productivity from accelerated adoption of pest animal control strategies and technologies	State government agencies, regional and NRM groups, land managers	University of New England, Pennsylvania State University
Reduction of legal and institutional impediments	Improved agricultural productivity from accelerated adoption of pest animal control strategies and technologies	Vertebrate Pests Committee, State government agencies, regional and NRM groups, land managers	University of New England

Commercialisation

Outcome 4: Prediction and control of emerging outbreaks (especially mice)

New humane rat and mouse toxin (and mouse outbreak response system)	More efficient and sustained control of mouse outbreaks by enabling local preparation of grain based baits. Reduced impact of mice to grain producers	Grain producers, households	Grains R&D Corporation, Animal Control Technologies, University of Queensland, Connovation, US Department of Agriculture, UK Food and Environment Research Agency
New pest bird toxin	Reduced impact of starlings on intensive agriculture, particularly piggeries that currently lose up to 20% of their stock feed	Intensive agriculture, particularly piggeries, WA Department of Agriculture	Animal Control Technologies, Connovation, US Department of Agriculture
Registration of GonaCon™ as a fertility control agent for kangaroos and wallabies	Better managed peri-urban and urban kangaroo and wallaby populations through a long lasting injectable fertility control. Reduced social issues and controversy associated with kangaroo management	ACT government, urban and peri-urban councils, golf course managers	ACT ESDD, US Department of Agriculture (USDA)
Phage peptide fertility control platform technology using wild horses as model species	Species specific fertility control that can be applied to better and humanely manage those species where lethal control is not socially acceptable	Vertebrate Pests Committee, State land management agencies	University of Newcastle, University of Queensland
Oral delivery of fertility control	More efficient delivery of fertility control agents than darting or injectable methods	State government agencies, councils, cattle producers	CSIRO, USDA, UK Food and Environment Research Agency, NZ Landcare Research

