



Industry &
Investment

Primary Industries' Science & Innovation Strategic Directions working paper

OCTOBER 2009

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Title: Primary Industries' Science & Innovation Strategic Directions working paper

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For updates to this publication, check <http://www.dpi.nsw.gov.au/research/key-publications>

Published by Industry & Investment NSW

First published October 2009

ISBN

Acknowledgements

Disclaimer

The information contained in this publication is based on knowledge and understanding at the time of writing (October 2009). However, because of advances in knowledge, users are reminded of the need to ensure that information on which they rely is up to date and to check the currency of the information with the appropriate officer of Industry & Investment NSW or the user's independent advisor.

Job No: or TRIM reference:

File reference: TRIM INT06/995

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INTRODUCTION

The primary industries sector is changing. The global financial crisis, world-wide food shortages, rising food prices, a changing climate, other environmental issues, skill shortages and increasing biosecurity threats are issues at the forefront of the modern primary industries sector.

The Department of Industry and Investment (Industry & Investment NSW) was created on July 1, 2009 to assist in building a diversified state economy that creates jobs. We aim to attract investment to NSW and support innovative, sustainable and globally competitive industries through our strong technical knowledge and scientific capabilities. We do this through effective partnerships with our industry sectors and by linking them to our state's knowledge and skills capacity.

Industry and Investment NSW is realigning its Science & Innovation resources to better face the challenges ahead. Key priority areas that the department will be focusing its resources into include:

PRODUCTIVITY AND FOOD SECURITY

The Cutler Review on Australia's Innovation System [2008] identified food security as a key global challenge and added that Australia has the opportunity to continue to drive agricultural productivity and yields through its research. According to the Food and Agriculture Organisation (FAO) global food output must have increased by 75 per cent by the year 2025, and it must have doubled by 2050 to meet expected demand. This means primary producers globally need an annual productivity improvement of 1.8 per cent to achieve this. Strong and targeted R&D and the effective uptake of technology and best practice by primary producers are the keys to achieving this target. Industry & Investment NSW believes research is vital for maintaining our long-term productivity and food security, and, our capacity to export.

CLIMATE AND WATER

Building on more than two decades of research and extension in coping with climatic impacts, Industry & Investment NSW – Primary Industries is well placed to assist the primary industries sector, the NSW government and the wider community to understand and adapt to the likely localised impacts of a changing climate. The importance of soil health to farming and forestry systems cannot be overstated. Soils and forests are emerging as key resources for carbon sequestration. Further research in understanding soil behaviour, its capacity to store carbon, and effective mechanisms to maintain soil health is an area Industry & Investment NSW – Primary Industries anticipates will become increasingly important.

Water resources will be under increasing pressure from population growth, greater urbanisation, and competing industry uses. Agriculture in NSW uses 70 per cent of the managed water resources of the State. As such, water use efficiency, an increased understanding of catchment hydrology, and its interaction with farming and forestry systems will be key areas of research.

BIOSECURITY

Given the increased capacity for people and livestock and produce to travel globally quickly and cheaply, and thereby inadvertently spread disease, biosecurity is emerging as a key issue. Pests and disease have the capacity to change and spread quickly and interact with increasing complexity with control strategies. The potential for animal diseases to cross to humans is now more likely than in the past. Rapid diagnosis and response are key indicators of success in the face of a biosecurity threat. Cost-effective management of existing pests and diseases can minimise their impacts and proof of freedom from many pests and diseases underpins market access for agricultural products. Research to underpin this capacity will be a priority.

FISHERIES AND ECOSYSTEMS

There is increasing recognition of the importance of understanding systems holistically in regard to natural resource management. With all our fish, rivers, estuaries and coastal waters and more than 2.5 million ha of forest land owned by the people of NSW, managing of these resources for immediate economic and recreational advantage as well as for long-term stewardship is vital and a core activity of the NSW government. In a future in which these stocks and ecosystems face greater environmental and anthropogenic pressures, scientific research to underpin their effective management will continue to increase in importance.

KEY QUESTIONS our research is aimed at answering include:

- How can primary industries help the community mitigate increased climatic risk?
- How do we ensure NSW primary industries remain resilient, productive and environmentally sustainable under increasing challenges of climate variability and water security to secure our food supplies and export opportunities?
- How can primary industries reduce risks and increase options to respond to biosecurity threats?
- How can we increase the evidence base for sustainable multiple use approaches to aquatic and terrestrial ecosystems?

INDUSTRY & INVESTMENT NSW'S SCIENCE AND INNOVATION

AN OVERVIEW

NSW primary industries operate in a highly challenging environment: they are exposed to strong international competition, climatic variability and numerous physical and biophysical threats. Innovation plays a central role in ensuring that NSW primary industries are sustainable and competitive.

Industry & Investment NSW (I&I NSW – Primary Industries) is the largest provider of science and research services within the NSW Government. The Primary Industries Division undertakes strategic science which underpins the growth, sustainability and biosecurity of primary industries in NSW. This generates a significant multiplier impact on the economy when a whole-of-chain approach is taken and delivers substantial environmental and community returns.

I&I NSW – Primary Industries has a unique research capacity across a very wide range of disciplines. Our scientists work has been ranked in the top 1% of world research in various fields.

I&I NSW – Primary Industries' science and research capability is strongly enhanced by partnership investment from research and development corporations and Cooperative Research Centres, industry organisations, universities, other government agencies and catchment management authorities.

Science and Innovation (S&I) has over 700 scientists and technicians working on more than 900 projects at any one time in collaboration with Commonwealth and State departments, Cooperative Research Centres, universities and industry groups. In 2007/08 external partners contributed over \$59 million (to a total of \$100 m) towards these projects.

In all its research outcomes S&I aims to achieve outcomes which meet the needs of primary producers and the community (health impacts), and, long-term natural resource management.

THE ROLE OF SCIENCE AND INNOVATION

Our Science & Innovation:

- provides strategic science to enhance the growth, sustainability and biosecurity of NSW primary industries;
- undertakes research and development of products and technologies;
- advises on research and science policy and issues;
- coordinates research investments, fosters alliances and cooperative ventures for the benefit of primary industries in NSW;
- develops innovative solutions and technologies;
- underpins creative solutions to enhance public policy.

PRIORITIES

Industry & Investment NSW regularly reviews its research priorities to ensure that they reflect the latest priorities of government, the public and the State's primary industries. Our most recent review has identified key research priorities in response to global, national, state and industry sector issues. They reflect the Department's areas of strength and are consistent with internal and external reviews, national research priorities, and industry priorities. The priority areas are:

1. Productivity and Food Security
2. Climate and Water
3. Biosecurity
4. Fisheries and Ecosystems

INDUSTRY DEVELOPMENT

Industry & Investment NSW's research programs actively target barriers to profitability and sustainability in a broad range of industries including the following commodity areas:

- Beef cattle
- Dairy cattle
- Wool and sheepmeat
- Pastures
- Cereal, broadleaf and pulse crops
- Tropical and temperate perennial horticulture, including citrus
- Grapes and wine
- Field and greenhouse vegetables
- Commercial and recreational fisheries and marine aquaculture
- Forests

These programs operate within the broader context of I&I NSW's industry development activities which integrate research, development, extension, biosecurity, policy development and analysis, and legislation.

PRODUCTIVITY AND FOOD SECURITY

KEY QUESTIONS

- How can primary industries break through barriers to increase productivity and provide even greater benefits to the NSW state and regional economies?
- What improvements can be made to production and processing of food to secure access to plentiful and healthy food for NSW consumers?
- How can primary industries reduce the environmental footprint of food production?
- Can increased agricultural productivity compensate for the likely increases to production costs associated with carbon accounting, climate variability, and water shortages?

BACKGROUND

- NSW is regarded as food secure with a high capacity for food export. However, it faces a complex array of challenges such as global warming, biosecurity and increasing production costs. These could impact on our food security with implications for trade and our ability to meet domestic demand for some produce.
- Food security is a key global challenge and Australia has the opportunity to continue to drive agricultural productivity and yields through its research.
- NSW consumers are now more actively involved in the debate about how our food is produced and how our raw materials are used.
- In 2007/08 I&I NSW - Primary Industries undertook 426 projects with productivity or food security as the key outcome.

I&I NSW WILL UNDERTAKE RESEARCH TO

- Develop and implement adaptable farming systems
- Develop and evaluate germplasm with desirable traits to increase productivity over a wider range of environments
- Explore technologies to increase cost-effectiveness of high quality food production
- Identify and enhance attributes of foods, feeds, and their production systems that contribute to the health and wellbeing of humans and animals

CLIMATE AND WATER

KEY QUESTIONS

- How can we increase our understanding of carbon in farming and forestry systems to maximise management and policy options which support a profitable primary industries sector and carbon sequestering?
- Which technologies can be used to protect and enhance the productive capacity of soils for primary industries?
- How can NSW primary industries adapt to ensure social, economic and environmental sustainability under changing climate scenarios?
- How can we assist ruminant livestock industries to capitalise on pressure to reduce methane emissions?
- How do we maximise returns from primary industries use of water while maintaining ecosystems and communities?

BACKGROUND

Climate

- Industry & Investment NSW – Primary Industries has more than two decades of research into coping with a variable and changing climate.
- I&I NSW – Primary Industries can inform the effectiveness of governmental climate change mitigation strategies.
- Forests NSW is one of the few agencies in the world that has properly developed sophisticated carbon accounting procedures to support its emissions trading business. This lends the agency credibility and allows it to approach industries such as construction to explain the benefit of using wood under an Emissions Trading Scheme.
- I&I NSW – Primary Industries has the capacity to develop technologies which can help farmers and foresters mitigate production of greenhouse gases from their own and other sectors.

Water

- Irrigated produce generates about 80% of agricultural profits in NSW
- The efficient use of water is coming under increased scrutiny with greater urbanisation, an increasing population and environmental stress
- Soil-based problems cost Australia over \$2700 million annually
- Healthy soil can lead to increased water use efficiency and better productivity outcomes
- Soil has the potential to sequester a significant proportion of NSW's carbon emissions
- In 2007/08 I&I NSW – Primary Industries participated in 121 projects with water use efficiency, greenhouse gas mitigation or climate adaptation, or soil health as a key outcome.

I&I NSW WILL UNDERTAKE RESEARCH TO

- Increase water and energy efficiency of irrigation systems
- Assess the optimum combinations of land use systems that provide balance between water inputs and outputs to prevent dryland salinity
- Protect productivity and sustainability of agricultural soils
- Help primary industries adapt to climate changes and climatic extremes
- Understand the carbon life cycle in farming and forestry systems and products
- Develop options to mitigate greenhouse gas emissions

BIOSECURITY

KEY QUESTIONS

- How can we detect new biosecurity threats (animal and plant diseases and pests, invasive animals and weeds) in NSW and demonstrate our freedom from them to our trading partners?
- How can we improve our capacity to mount rapid and effective responses to biosecurity incursions before they become established?
- How can we effectively manage endemic biosecurity problems cooperatively with industries, the community and other agencies, to minimise their impacts*?
- How can we develop integrated management systems that protect market access and reduce reliance on chemical use?
- How can we continue to improve the efficiency and effectiveness of surveillance regimes across Australia?

**Impacts may be on human and animal health; livestock, crop, forestry and fisheries productivity; market access for our primary products; and NSW's unique biodiversity.*

BACKGROUND

- Threats to primary industries' productivity, human health, forests and our unique biodiversity brought about by pests, diseases and invasive plant and animal species are constantly evolving and emerging.
- Research is integral to identifying and responding to these threats.
- It is expected that climatic impacts will exacerbate the incidence of many pest and disease incursions.
- The 2007/08 Equine Influenza (EI) outbreak demonstrated the risk of exotic disease entry due to increased international movement. The outbreak emphasised the importance of:
 - a strong analytical and diagnostic capability at a State level, and,
 - the continued need to maintain and develop a cutting edge research capability focused on animal and plant biosecurity.
- Biosecurity is vital in ensuring primary producers' access to export markets.
- In 2007/08 I&I NSW - Primary Industries undertook 217 research projects with biosecurity as the key outcome.

The development of rapid diagnostic tests for equine influenza (EI) allowed Industry & Investment NSW's virology laboratory at Elizabeth Macarthur Agricultural Institute to process over 130,000 samples during the EI response program, and up to 2500 in a single day, providing unprecedented flexibility and responsiveness.

I&I NSW WILL UNDERTAKE RESEARCH TO

- Safeguard primary industries, food safety and human health against zoonotic diseases such as Avian Influenza and exotic diseases in plants and animals through early detection by surveillance and accurate diagnosis and cost-effective control or eradication
- Protect primary industries from plant and animal pests, disease and animal invasive species already present in Australia
- Reduce use of antibiotics, insecticides and pesticides to protect human health, food safety and the environment

FISHERIES AND ECOSYSTEMS

KEY QUESTIONS

- How do we determine the health of fish populations and ecosystems?
- How do we determine the sustainability of fishing and forestry practices?
- How do we assess, and mitigate against, threats to aquatic biodiversity and habitats?

BACKGROUND

- Industry & Investment NSW – Primary Industries is uniquely positioned to maximise the community benefits produced from the natural resource base in an ecologically sustainable manner.
- The rivers, estuaries and coastal waters of NSW are wholly owned by the Crown and are managed by the NSW Government on behalf of the public.
- Over 2.5 million hectares of the State’s terrestrial ecosystems are managed by State Forests on behalf of the public of NSW (who own the land) for their timber resources as well as the native biodiversity they support.
- In 2007/08 I&I NSW – Primary Industries undertook 157 projects with management of fisheries, aquatic ecosystems or forest ecosystems as the core outcomes.

I&I NSW WILL UNDERTAKE RESEARCH TO

- Assess the population and status of key finfish and aquatic invertebrate species
- Develop and assess commercial and recreational fishing technology to improve selectivity and reduce unwanted catch
- Monitor, evaluate and restore aquatic biodiversity and habitats
- Monitor and manage aquatic threatened species and pest species
- Measure and maximise biodiversity in planted and native forests

SCIENCE SUPPORT

These priority areas are supported through accredited laboratories, animal ethics management, economic analysis, biometrics services, database coordination, and management of the portfolio and strategic issues. This ensures I&I NSW's research is relevant, performed to a high standard and is accountable. Science support also ensures that resources are in place to respond to disease and chemical residue emergencies.

RESEARCH CENTRES AND LOCATIONS

Primary Industries Science & Innovation investment is focused on key Centres of Excellence supported by a network of smaller research stations which are strategically located across NSW and linked with the industries and communities that co-invest in their R&D.

SCIENTIFIC COLLECTIONS

National resources of immense quarantine and diagnostic significance are housed in scientific collections across NSW. Physical specimens and historical records of plant genotypes, soils, rocks, minerals, fossils, forestry woods, fish, insects, mites, fungi and bacteria as well as living cultures of fungi and bacteria mean that in a changing environment I&I NSW – Primary Industries has the capacity to quantify and respond to change. The fossil reference collection forms the basis for dating rock strata in NSW which has been cross-referenced to mining and aquifer research.

COOPERATIVE RESEARCH CENTRES

Cooperative Research Centres (CRCs) are collaborations between researchers and business including large and small enterprises, industry associations, universities and government research agencies. They build critical mass in research ventures between end-users and researchers which tackle clearly-articulated, major challenges. CRCs pursue solutions to these challenges that are innovative, of high impact and capable of being effectively deployed.

I&I NSW – Primary Industries is currently involved in 11 CRCs:

- Australasian Invasive Animals
- Australian Seafood
- Beef Genetic Technologies
- Cotton Catchment Communities
- Desert Knowledge
- Future Farm Industries
- Internationally Competitive Pork Industry
- Irrigation Futures
- National Plant Biosecurity
- Sheep Industry Innovation, and,
- Sustainable Forest Landscapes.

ALLIANCES

Alliances of various kinds exist with a number of state agencies, commercial partners and universities. Examples include: EH Graham Centre for Agricultural Innovation (with Charles Sturt University), Primary Industries Innovation Centre (University of New England), Centre for Coastal Agricultural Landscapes (Southern Cross University), Centre for Animal & Plant Biosecurity (University of Sydney), Broken Hill Exploration Initiative (Primary Industries and Resources South Australia and Geoscience Australia), Agriculture Genomics Centre (CSIRO Plant Industries, Functional Centre Plant Genomics), Barley Breeding Australia (four State governments and GRDC), Animal Genetics and Breeding Unit (UNE), National Wine

and Grape Industry Centre (Charles Sturt University, Wine and Grape RDC and NSW Wine Industry Association), and, FutureDairy (Sydney University, Dairy Australia and DeLaval).

CONTRACTED RESEARCH

I&I NSW – Primary Industries has 12 Rural Research and Development Corporations as investment partners:

- Australian Pork Limited
- Australian Wool Innovation
- Cotton R&D Corporation
- Dairy Australia
- Fisheries R&D Corporation
- Forest & Wood Products R&D Corporation
- Grains R&D Corporation
- Grape & Wine R&D Corporation
- Horticulture Australia Limited
- Land & Water Australia
- Meat & Livestock Australia
- Rural Industries R&D Corporation

with major investment also from:

- Australian Centre for International Agricultural Research
- BioFirst
- National Action Plan for Salinity and Water Quality
- Natural Heritage Trust
- NSW Recreational Fishing Trusts
- Murray–Darling Basin Authority, and,
- a number of Commonwealth Government programs.

PRIMARY PRODUCER CONSULTATION

Primary producers actively participate in research programs through involvement in advisory panels, project steering committees and as partners in participatory research.

A critical component of the I&I NSW – Primary Industries research model is the integration of research and extension in a statewide network of advisory and education specialists working alongside research scientists. Research outcomes can be delivered through cross-discipline teams, ensuring that they meet the needs of community, industry and government.

NSW MINISTERIAL ADVISORY COUNCIL ON PRIMARY INDUSTRIES SCIENCE

An external point of reference is provided by the NSW Ministerial Advisory Council of respected scientists and industry leaders. Its role is to advise on stakeholder science and research needs, alignment of the I&I NSW research portfolio, strategies to ensure uptake of research outcomes, research impact, and reinvestment strategies.