



NSW DEPARTMENT OF  
PRIMARY INDUSTRIES

# Systems Research

The Systems Research branch of the Science and Research Division uses a holistic systems approach to underpin profitable and sustainable primary industries.



## Aquatic Ecosystems

This unit is responsible for research into:

- **Freshwater biodiversity & habitats:** monitoring the condition of riverine systems; distribution, abundance and genetics of freshwater threatened & pest species; impacts of pest species and control techniques; evaluating fishways; active restoration of in-stream habitats; freshwater fish stocking.
- **Marine biodiversity & habitats:** monitoring resource condition; evaluation of floodgates & other barriers in estuaries; mapping of seabed habitats; distribution and abundance of marine and estuarine threatened & pest species; impacts of pest species and control techniques; evaluating effectiveness of marine protected areas.
- **Ecosystem function:** quantitative assessments of the functioning of aquatic systems; connectivity between systems; evaluating ecosystem-based management; modelling. The current focus is on ecosystem modelling for coastal NSW and a freshwater project in the Philippines.

## Key research collaborations

Many inland projects are collaborative ventures with the Murray-Darling Basin Commission, Australian Centre for International Agricultural Research (ACIAR) and other government agencies in NSW, Victoria, South Australia and Queensland. Other freshwater work is done for Catchment Management Authorities (CMAs) or State Water. Fish pest projects are managed through the Invasive Animals Cooperative Research Centre. Coastal work often involves partnerships with other NSW agencies. Ecosystem modelling is done collaboratively with CSIRO.

**Universities** include Griffith, Sydney, Macquarie, Newcastle, Southern Cross and Wollongong.

## Northern Farming Systems

This unit conducts research in the areas of:

- **Development and adoption of more sustainable dryland farming practices:** overcoming sub-soil

constraints; monitoring distribution and diseases; disease management packages; systems to prevent deep drainage; overcoming constraints to adoption of sustainable practices.

- **Development and adoption of more sustainable practices for irrigated cotton:** soil and water management; management of sodic sub-soils; minimising greenhouse emissions; management packages to reduce crop losses; pesticide resistance; integrated pest, disease and weed management.
- **Economic benefits and costs of achieving sustainable farming systems:** economic benefits and costs of implementing changed practices; economic analysis and whole farm models; economic impacts of DPI R&D in conservation farming and reduced tillage.

## Key research collaborations

**R&D fund providers:** ACIAR; Grains R&D Corporation (GRDC); Cotton R&D Corporation (CRDC); Rural Industries R&D Corporation (RIRDC); Land and Water Australia (LWA); Meat and Livestock Australia (MLA); Australian Wool Innovation (AWI); and the Cotton, Weeds and Beef CRCs. Government agencies from NSW, Queensland, South Australia and the federal government plus CMAs and CSIRO.

**Universities:** Sydney, Western Sydney, Southern Cross, New England and Queensland plus the Primary Industries Innovation Centre (a partnership between NSW DPI and the University of New England).

**International:** Rothamsted Research, Cambodian Agricultural R&D Institute, International Centre for Agricultural Research (ICARDA) in the Dry Areas.

## Pastures and Rangelands

There are three teams within the Pastures and Rangelands unit.

- **Pastures in mixed farming systems:** addresses issues associated with the role of pastures in profitable and sustainable mixed farming systems on the tablelands and slopes. Projects are aimed at amelioration of unfavourable soil conditions, particularly acidity and

salinity, physiological adaptation and evaluation of superior germ plasm, development of innovative production systems (including pasture cropping and alley farming) and grazing management of native pastures in the high rainfall zone. Projects are conducted in northern, central and southern environments.

- **Pastures in dairy production systems:** addresses issues associated with management of the feed base and seasonal risk in the dairy industry. Projects focus on the critical issue of water use efficiency of forage species (the dairy industry is a major user of irrigation water), the potential of species and ecotypes to contribute to the annual forage production cycle, and aspects of pasture establishment. Guidelines for seasonal risk assessment are also being developed to assist short to medium term feed management decisions.
- **Sustainable rangelands:** includes research aimed at progressively refining the basis for 'tactical grazing' and 'precision pastoralism', including the matching of forage supply and demand, critical thresholds for species utilisation, and seasonal risk assessment. There is a strong emphasis on the potential of pasture growth modelling to provide both paddock-level projections of forage growth potential and regional-level assessment of land degradation hazard. The unit also addresses some basic issues associated with genetic variation and delineation of provenance in native species.

#### Key research collaborations

**R&D fund providers:** GRDC; MLA; AWI; LWA; RIRDC; Dairy R&D Corporation; NSW Dairy Industry Development Company; Salinity CRC, Desert Knowledge CRC; Stipa Native Grass Association; Central West Farming Systems; Central West Conservation Farming Association; plus Queensland Government agencies, CSIRO and various CMAs.

### Southern Farming Systems

This unit conducts research in four areas.

- **Irrigated farming systems:** optimising the profitability of rice based farming systems in the Murrumbidgee and Murray Valleys – research concentrates on nitrogen management, water and soil management and plant physiology.
- **Central farming systems:** includes research into the profitability and sustainability of dryland farming systems in central NSW. Research concentrates on optimising the management of alternative crops to rotate with wheat (barley, pulses and canola) in these systems and the management of soils in these systems, particularly issues such as sodicity and dryland salinity. Research also covers the role and benefits of precision

agriculture in central western NSW cropping systems.

- **Southern farming systems:** includes research into the profitability and sustainability of dryland farming systems in southern NSW, particularly the management of soils – nutrition, sodic and acid soils, also on filling feed gaps in mixed farming enterprises with grazing cereals, pastures and alternative crops.
- **Organic farming systems:** provides management packages for organic farmers across a range of agricultural industries in NSW.

#### Key research collaborations

**R&D fund providers:** GRDC; ACIAR; RIRDC; AWI; MLA; Murrumbidgee CMA; CRC Rice; CRC Salinity; CRC Cotton; FarmLink; CSIRO.

**Universities:** Charles Sturt, La Trobe.

### Wild Fisheries

This unit involves research in three areas.

- **Fisheries technology:** develops and tests commercial and recreational fishing gear to improve selectivity and reduce unwanted catches; develops by-catch reduction devices; assesses recreational fish hook mortality; estimates impacts of fishing gear on the selectivity and mortality of key species; provides management advice on fishing gear regulations.
- **Fisheries biology:** investigates the life history characteristics (age, growth, reproduction, movements, habitat-relationships) of key fish and invertebrate species; does population modelling and provides advice on effects of fishery management regulations on key species.
- **Fisheries assessments:** responsible for assessing the exploitation status of key finfish and invertebrate species; assesses population-scale impacts of commercial and recreational fisheries; samples and surveys commercial and recreational catches; provides scientific advice on levels of total allowable catches and resource assessments of key species.

#### Key research collaborations

Fisheries R&D Corporation, NSW Recreational Trust Funds, Australian Research Council.

### Key contacts

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