

# Integrating science to support sustainable agriculture



**Sustainable livestock solutions: the CSIRO Lansdown Droughtmaster herd has provided the industry with improved beef quality and land management options.** CSIRO

**CSIRO's new Agricultural Sustainability Initiative looks at ways landholders can shift their approach to farming and reduce their impact on the environment.**

It's no news that Australian farmers are struggling to keep up with the challenges of globalisation, volatile markets, increasing costs and fussier consumers. There is also pressure to meet changing expectations of what agricultural lands can deliver – not only food and materials but also biodiversity and ecosystem services such as carbon storage.

And let's not forget climate change, with its prospect of a drier, hotter climate for much of Australia, with less water available for irrigation.

What is required of our

land managers are not local, short-term responses, but 'transformational shifts' in their approach to farming – for example, changing the mix of agricultural production systems in high-rainfall zones and the drier margins.

Dr Peter Carberry, one of the theme leaders from CSIRO's new Agricultural Sustainability Initiative (ASI) – which involves eight CSIRO divisions and business units<sup>1</sup> – says a series of such shifts will be required of our agricultural industries to meet challenges such as the introduction of new technologies, climate change,<sup>2</sup> land degradation, biodiversity conservation, globalisation and changing rural demographics.

'Agriculture is important to the Australian economy

– 75 per cent of the country is under agriculture, so we need to look at the productivity and environmental performance of land management systems in an integrated fashion,' says Dr Carberry.

'Adoption of new technologies has allowed our farmers to increase productivity by an average of 3 per cent a year for the past two decades.

'But we've had these gains without paying too much attention to environmental performance. Now we are at the toughest point in the history of Australian agriculture. We are looking at transformational land use, not business-as-usual.'

The ASI has identified seven priority research areas:

- reducing greenhouse gas emissions from farms and increasing carbon storage
- assessing northern Australia's land and water resources to support new investment in agriculture
- farming 'smarter' to maintain the high productivity gains of recent years
- adapting farming systems to reduced irrigation water availability
- supporting environmental stewardship initiatives for biodiversity conservation
- investigating soil health as a foundation for sustainable agriculture
- transforming high-rainfall zone agriculture for sustainable food production and environmental outcomes.

Dr Mark Howden, an ASI Theme Leader until his recent move to the Climate Adaptation Flagship, says CSIRO researchers are developing a more integrated approach to opportunities from reducing net greenhouse gas emissions and increasing carbon sequestration.

'We're looking at greenhouse gas reductions across the entire value chain. This is one of the ASI's aims: to increasingly understand whole-of-value-chain impact in achieving multiple goals – water use efficiency, biodiversity, carbon sequestration and efficient production.

'Adapting to the impacts of climate change is a growing concern for many agricultural industries and natural resource management groups in Australia.'

The ASI has focused another research theme – 'Agro-Ecosystem Function and Prediction', led by Dr Peter Thrall – on the science characterising dynamic feedback processes between natural and managed elements of rural landscapes. By bringing a quantitative, systems approach to understanding the processes and interactions that drive agro-ecosystems, the ASI will provide a foundation for the sustainable contribution of agriculture to the economy.

'This includes looking at new agri-industries, like agroforestry and zero tillage for carbon sequestration and the additional ecosystem services they can provide,' notes Dr Thrall.

As part of this systems approach CSIRO, through ASI, will also be able to rationalise and extend predictive modelling and decision support systems developed by different research divisions for various industries – viticulture, rice, sugar, dairy and cotton, to name a few.

The three scientists agree that in the past, CSIRO was not well placed to contribute to land use policy in Australia. But entities such as the ASI are now looking at how science can have an input into policy and work with government on reforming the way we manage the land to meet the big challenges ahead.

● **Mary-Lou Considine**

<sup>1</sup> CSIRO Sustainable Ecosystems, CSIRO Plant Industry, CSIRO Livestock Industries, CSIRO Entomology, CSIRO Land and Water, CSIRO Textiles and Fibre Technologies, CSIRO ICT Centre and CSIRO Forest Biosciences.

<sup>2</sup> Agriculture accounts directly for 22% of national greenhouse gas emissions, with additional emissions along the value chain.