Assessing the economic benefits of maintaining natural capital on farms

Background

The Australian Government and the Commonwealth Scientific and Industrial Research Organisation (CSIRO) are working together to build evidence and decision-support tools to assist Australia's farming community to manage long-term production viability and profitability under a changing climate.

This includes this ground-breaking collaborative project running to June 2018, which will develop the science methods for assessing the economic benefits of biodiversity conservation and managing natural capital on farms. The project will assess the likelihood and extent to which land managers who maintain or invest in improving the health of their native pastures may enhance resilience to future climate impacts and realise productivity gains and profits over the long-term.

The project, supported by extensive CSIRO modelling capability, will provide:

- A new scientific method for assessing the agricultural productivity and profitability benefits of biodiversity conservation that accounts for past management
- An assessment of the benefits of biodiversity conservation to agricultural productivity and profitability within two Australian native pasture grazing systems
- Two farming systems models which link native pasture condition with profitability and which identify the payoffs and risks from improving biodiversity outcomes within native pasture grazing systems
- Improved understanding of the relationships between grazing and native pasture composition
- Guidance on how this foundational method may be developed and transferred to a range of different production environments.

The management challenge for Australian farmers under climate change

Maintaining the financial and productive sustainability of farming enterprises has always been a challenge in Australia's historically variable weather. This will become even more challenging under forecast climate change and maintaining viable and sustainable agricultural systems may require changes to current farm management.

Image credit: CSIRO

Despite the challenges of variable weather, there is emerging evidence that many Australian agricultural managers maintain profitability, whilst still ensuring the persistence of a rich assemblage of biodiversity on their farms. This evidence also suggests that maintaining biodiversity and natural capital may increase or maintain agricultural productivity over the long term, even through times of drought. If this is the case, then it may be that these biodiversity friendly farm-practices could help to make farms more resilient under long-term climate change and also reduce production risk and variability in the short-term.

Conversely, many farmers may have already lost biodiversity, natural capital and condition on their farms. In such instances, biodiversity conservation activities and management interventions to rebuild farm resilience may require some sacrifice of short-term productivity. Determining how long it takes for managers to see a return on investment from these decisions is a key consideration. Good information on this is essential for managers to weigh up these trade-offs and make decisions that best suit their circumstances and future plans.

Why choose native pasture grazing systems as case studies?

Because Australia is so climatically, agriculturally and environmentally diverse, with many different localised adaptations in agricultural systems, assessment methods need to be tailored to specific agricultural systems and environments. As the grazing of native vegetation is Australia's most extensive land use, covering almost 55% of the continent, the project will first concentrate on

building evidence and assessment methods within two of Australia's most extensive native vegetation grazing systems – the south-east temperate grassy woodlands, and native grasslands within Queensland reef catchments.

How the CSIRO will model agricultural, climate and ecological systems

Describing the ecology

Descriptive ecosystem models, called state and transition models (S&TMs), will allow the project to describe the ecological condition of grazed native pastures. The models distil expert understanding of the dynamic characteristics, processes and complex feedbacks of different grazing systems. Evidence suggests that past management has changed the natural capital and biodiversity of native pastures. We define differences in native pasture in terms of condition states. We use S&TMs to understand the types of management that might have contributed to those condition states occurring and to suggest the changes in future management which could lead to increase or further decrease of condition.

Modelling grazing productivity

The differing productivity attained from native pastures in a range of condition states will be represented using established farming system models (GRAZPLAN, GRASP and NABSA). This will be combined with our best understanding of how long systems will take to respond to any management changes. These models allow us to evaluate the effect of farm management changes on productivity and natural resource condition under weather variability and climate change.

Accounting for climate change

Understanding how management may affect future profitability and pasture condition requires modelling the farm system under a range of future climates. To do this we use 30 years of historical weather patterns adjusted by three of the most commonly used midrange climate projections.

Linking productivity to profitability and sustainability

We aim to model the role of pasture condition in the sustainability and long-run profitability of farm systems. This involves extending existing models of farm productivity to consider the changes in pasture condition over time. However changes in the condition of pastures depend on interactions of management with weather.

Therefore we apply the models across multiple years using likely weather patterns (current and adjusted for future climates), native pasture condition states, and changes in farm management practices. Linked with economic models, it is possible to simulate gross and cash margins to identify the likely long term profitability and sustainability of the farming enterprise.

Combining outputs of the profitability models with the descriptive S&TM models will allow us to map the opportunities available to agricultural managers for investing in their own native pasture and biodiversity capital into the future. Understanding how native pasture is likely to respond to changes in management concurrently with changes in climate will help identify a range of potential future pathways for grazing systems, and research and policy development needs that may enable desirable pathways.

How land managers and government will be able to use this information

By showing how maintaining natural capital on farms can provide economic benefits for agricultural managers, including identifying the timeframes and the potential costs associated with delivering these benefits, this project will help land managers decide when to invest in biodiversity conservation and manage their farms for enhanced productivity. It will also help governments decide what forms of assistance may be most helpful to land managers adapting their farm management practices.

You can help

The project involves a series of workshops with land managers to understand pasture dynamics, calibrate and review models, and evaluate results. If you are a grazing land manager, and would like to be involved in this research please contact us through the below email address.

Australian Government
Department of the Environment and Energy

CONTACT US
t 1300 363 400
+61 3 9545 2176
e csiroenquiries@csiro.au
w www.csiro.au

FOR FURTHER INFORMATION
CSIRO Land and Water
Stuart.Whitten@csiro.au

Department of the Environment and Energy
Fiona.Dickson@environment.gov.au