Scaling productive and regenerative agriculture

Mainstream farming methods have enabled substantial increases in yields, delivering affordable food to the world’s growing population. However, agriculture continues to have significant climate, environmental and other consequences. Scaling productive and regenerative agriculture can reduce and potentially reverse these costs. This could also improve farm profitability and resilience by: improving efficiency, rehabilitating natural capital and ecosystem function, lowering dependency on inputs, and potentially diversifying farm income sources, such as to include carbon and ecosystem service payments.

Major advancements in agricultural productivity can be achieved as a result of improved land management practices and technologies. These can reduce resource use, inputs and environmental impacts of agriculture, while increased productivity can in theory allow more land to be set aside for conservation. Practices such as no-till cropping and controlled traffic farming have already been widely adopted, while emerging technologies include utilisation of remotely collected data to inform land management and inputs, on-farm autonomous equipment and variable-rate technology, new genomics insights and tools, and a range of improvements in breeding, feeding and pasture practices.

Many practices aim to go beyond reducing negative impacts, creating positive environmental effects for agriculture, such as regenerating soil health and increasing biodiversity on farms. In pursuit of these outcomes, farmers are implementing a mix of practices designed to mimic natural systems, including: replacing synthetic chemicals and fertilisers with organic substitutes, avoiding/minimising tillage, eliminating bare soil, e.g. through cover crops, fostering plant diversity, encouraging water percolation into the soil and integrating livestock and cropping.

A range of labels are applied to the technologies, practices and approaches along this spectrum, including ‘sustainable intensification’ (focused on producing more on less land and with less inputs), ‘organic’ (focused on avoidance of synthetic inputs) and ‘regenerative’ (focused on improving ecological function). In reality the distinctions are not clear and many land managers have adopted a mix of practices.
AUSTRALIAN CONTEXT

Agriculture accounts for over half of Australia’s land use. It supports 85,000 farm businesses, over 250,000 jobs, and underpins thousands of regional communities. Australian agriculture is strongly export oriented, with around two thirds of Australian produce exported. It is a major global player in some agricultural commodity markets, including wheat, beef and sheep. Certified organic agriculture represents a very small but growing share of agricultural land, and there is a growing cohort of farmers focused on ‘regenerative’ approaches.

Australia has historically high productivity, but is extremely vulnerable to climate risk

- Australian farmers have achieved historically high levels of productivity growth, and there is strong technology and innovation capability within Australia’s agricultural research and development sector.
- However, agriculture is already experiencing significant climate impacts. It is highly vulnerable to future impacts – including more frequent and severe fires, heatwaves, droughts, floods, changing water availability, frost risk and biosecurity – with up to 50 per cent reduction in productivity predicted.
- In addition, improvements in productivity do not necessarily mean improvements in profitability for farmers.

Australian agriculture has demonstrated an ability to rapidly adopt improved land management practices

- Most Australian farmers have already adopted a range of improved land management practices such as no-till cropping, precision agriculture and controlled traffic farming.
- There is a small but increasing cohort of ‘regenerative’ farmers pioneering, experimenting, refining and sharing a range of regenerative agricultural practices adapted to the Australian landscape, although the evidence base for some practices remains limited, especially in relation to yields, costs and profitability.

Further improvements are needed to address the sector’s environmental impacts, which include:

- Twelve per cent of Australia’s greenhouse gas emissions, mainly through livestock emissions, deforestation and fertiliser application, with significant additional emissions related to agriculture and food that are counted in other sectors, such as fertiliser manufacture.
- Almost three quarters of all freshwater consumption, around 12 billion litres per year.
- Contribution to poor water quality due to chemical and soil runoff, and the resulting impacts on marine environments including the Great Barrier Reef – noting that industry efforts have begun to reduce impacts.
- Ongoing land clearing for agriculture in some areas.
- Deterioration of soil health, including up to 50 per cent acidification of cropping and intensive grazing lands, an estimated 40-60 per cent total loss of soil since European arrival.

The longer term implications of COVID-19 are unpredictable

- There is no immediate or direct impact on domestic food security, but increased global food insecurity is likely and could impact Australia in unpredictable ways, e.g. World Food Programme is projecting acute food insecurity for up to 265 million people globally.
- Disruption to export markets could occur, including potential decrease in demand for some products especially wine, seafood and red meat, and potential increase in border restrictions.
- Farming enterprises may experience disruptions to long global supply chains for fuels, agrochemicals and equipment, limitations on seasonal migrant workforce for harvesting, or shutdowns of processing and manufacturing operations due to outbreaks.

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i Note: this source applies only to land under organic agriculture, as there are currently no reliable statistics on the extent of land under regenerative agriculture more broadly in Australia.

ii For example, via Project Cane Changer.
CURRENT STATE OF PLAY

Key action areas for scaling productive and regenerative agriculture for Australia include:

- **USE PUBLIC FINANCE** to incentivise productive and regenerative farming, including levies, financial incentives and public procurement.

- **SHARE INFORMATION** through open source networks and training tailored to specific farmer contexts.

- **INCREASE R&D** spending and innovation for productivity and regeneration.

- **ENGAGE BUSINESS** and investors to establish business models that value natural capital in productive landscapes.

The table below outlines the current state-of-play for each action area, including major current and proposed initiatives.

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<th>KEY ACTION AREA</th>
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| **USE PUBLIC FINANCE** | • Public finance to date focused on greenhouse gas emissions, primarily via Climate Solutions Fund (formerly Emissions Reduction Fund). Majority of funding has gone to regrowth of native vegetation on farming properties.
|                 | • National Agriculture Ministers have committed to develop a national strategy for climate and agriculture, which may include additional financing mechanisms. |
|                 | • National Landcare Program provides $1.1 billion over 6 years, which can be applied to land restoration on agricultural land. |
|                 | • Queensland’s $500 million Land Restoration fund supplements carbon incentives, rewarding farmers for carbon farming projects that deliver additional environmental, social and economic benefits. |
|                 | • The $3.9 billion Future Drought Funding package signals the intention to deliver environmental outcomes. This is part of the broader National Drought Response, Resilience and Preparedness Plan, which supports farmers and rural communities prepare for and manage through drought. |
|                 | • There a range of state, territory and local government programs, such as the Victorian Agriculture Infrastructure and Jobs Fund, and the ACT NRM Sustainable Agriculture Program. |
|                 | • Other mechanisms are under consideration, e.g. the Agriculture Biodiversity Stewardship Pilot Program, and a potential large-scale national land and environment investment fund. |

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iii Based on the Growing Better report.

iv Many of the actions noted below do not explicitly promote particular technologies or practices. Sustainability-focused initiatives (e.g. tree planting, carbon incentives) can support a range of different approaches, especially if they are outcomes-based. Emerging practices may face different barriers and require dedicated forms of support, which will be investigated further in the course of the Land Use Futures program.
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| SHARE INFORMATION THROUGH OPEN SOURCE NETWORKS AND TRAINING TAILORED TO SPECIFIC FARMER CONTEXTS | - Strong role played by peer-to-peer farmer networks including grower groups and farming systems groups. Proposed Regional Resilience Hub Network to strengthen and build upon these networks.  
- Natural Resource Management groups are also trusted and have played a significant role, but are subject to variable funding.  
- Dramatic reduction in government funding for ‘extension’ since 1990s, and shift to privatisation of farmer advisory services. Corresponding concern about the affordability, independence and reliability of these services. |
| INCREASE R&D SPENDING AND INNOVATION                | - Rural R&D for Profit program invested $750 million in 2017-18, focused primarily on productivity outcomes, but these can intersect with environmental or social outcomes. Climate Research Strategy for Primary Industries aiming to further integrate climate considerations. Current funding for the Rural Research and Development Corporations ends in 2022.  
- Strong momentum behind agtech research and development via technology hubs and research facilities.  
- Private sector investment has been the biggest driver of R&D investment growth in agriculture. |
| ENGAGE BUSINESS AND INVESTORS                       | - Business models for investment in natural capital on farms relies significantly upon carbon markets, both voluntary and compliance. Various enhancements to carbon markets under consideration, alongside investigation of the development of new environmental markets e.g. for ‘ecosystem services’.  
- Corporate social responsibility and preserving social license to operate also operate as a significant business driver for management of natural capital, including through implementation of industry association-led sustainability strategies (e.g. Meat and Livestock Association Carbon Neutral 2030 plan), industry Best Management Practice standards and increasing use of Sustainable Development Goals as a framework for sustainability strategies and reporting.  
- New techniques and tools, including digital tools, for measuring, reporting and certifying sustainable practices and outcomes on farms being adopted, and some financial institutions and value chain players are investigating improved monitoring and reporting of natural capital through their supply chains, but these tools remain immature and highly contested. |

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v Extension refers to the application of new, scientific knowledge to agricultural practices through farmer education activities, including via information-sharing networks, industry consultants and capacity-building programs.
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FOR MORE INFORMATION

The Land Use Futures program is working to adapt the global transitions to reflect Australia’s unique national and regional circumstances, and identify key actions to accelerate the transition. This paper is the first step in that process.

Find out more about Land Use Futures by visiting our website: www.climateworksaustralia.org/project/land-use-futures

The Land Use Futures program is led by ClimateWorks Australia (working within the Monash Sustainable Development Institute), Deakin University and CSIRO.

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We wish to acknowledge the valuable and generous contributions of input and feedback to this paper by our expert reviewers. We could not have produced this paper without the input of these contributors, however ClimateWorks takes full responsibility for the content, including any errors or omissions.

Published by ClimateWorks Australia
Melbourne, Victoria, July 2020
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ClimateWorks Australia is an expert, independent adviser, committed to helping Australia and our region transition to net zero emissions. It was co-founded through a partnership between Monash University and The Myer Foundation and works within the Monash Sustainable Development Institute.