



Australian Government

# National Soil Action Plan 2023 to 2028

Department of Agriculture, Fisheries and Forestry





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#### Acknowledgement of Country

We acknowledge the Traditional Custodians of Australia and their continuing connection to land and sea, waters, environment and community. We pay our respects to the Traditional Custodians of the lands we live and work on, their culture, and their Elders past and present.

#### Walangkura (Jackson) Napanangka, Pintupi people

*Untitled 2009*

National Gallery of Australia, Kamberri/Canberra

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# National Soil Action Plan 2023 to 2028

Department of Agriculture, Fisheries and Forestry



# Minister's foreword

Every Australian depends on our soil. Soil plays an important part in our environment, economy, food, infrastructure, health, biodiversity and communities. It provides an estimated value of \$930 billion to our economy and is central to our high-quality agricultural products and industries. Preserving and supporting healthy soil through effective soil management is a critical part of a climate smart, productive and sustainable agriculture sector. The health of our soil also impacts water and air quality, human health and plays a vital role in resilience to climate change and natural disasters.

Our management of soil must consider soil security. Soil security is a concept that brings together the services and value that soil provides and articulates how soil must be cared for to ensure

it can continue to support us. Soil is a non-renewable resource and a national asset. A national approach to protecting, improving and maintaining soil is critical if we are to achieve soil security.

The National Soil Action Plan for 2023 to 2028 sets out 4 priority actions to strengthen our soil health to drive long-term benefits for the productivity, resilience and sustainability of our agriculture sector and the environment. It provides opportunities for new partnerships, innovation and approaches and will build the foundation for targeted future actions.

The Australian Government's commitment to the National Soil Action Plan 2023 to 2028 is demonstrated by the \$20 million it is providing to partner with state and territory governments to

address the priorities of the action plan. We are also providing \$36 million under the Climate-Smart Agriculture Program of the Natural Heritage Trust to support a national soil monitoring program, continue the work of the regional soil coordinators, support the National Soil Community of Practice and enhance the Australian National Soil Information System to support stakeholders to make evidence-based decisions to improve soil health.

We need all hands on deck working together to protect our soil and improve soil health – all levels of government, the research community, industry groups, private companies and not-for-profit organisations. We also need land managers, including farmers, First Nations peoples, park and reserve managers, mining and land developers to work together to take action.

I particularly recognise the unique and enduring connection First Nations people have to their land, sea and Country. Improving the focus of First Nations perspectives as the priorities of the action plan are implemented will share and increase our understanding of important traditional knowledge in soil management and support better outcomes for Australia's soil. Agriculture Ministers across the country also recognise the value of First Nations land management knowledge and have agreed to explore and identify opportunities to increase meaningful involvement of First Nations people in agriculture, fisheries and forestry.

I look forward to continuing to work in collaboration with all who care for our soil.

**Senator The Hon. Murray Watt**  
Minister for Agriculture,  
Fisheries and Forestry



# Summary

The fundamental role soil plays in assuring food and fibre production, human and environmental health, biodiversity, food security and climate change adaptation and resilience is recognised globally.

The National Soil Strategy 2021 to 2041, released in May 2021, was a milestone in acknowledging the importance of soil and the need for a national approach to protecting and managing this vital resource. The strategy sets out how Australia will value, manage and improve its soil. It presents a national vision and shared goals and objectives for soil management. The National Soil Action Plan 2023 to 2028 – the first under the 20-year strategy – will help to build the foundation for subsequent plans. The action plan sets out priority actions that have been committed to by the Australian and state and territory

governments in partnership with the soil science and research community, not-for-profits, regional Natural Resource Management organisations, industry bodies and the private sector to focus on soil protection and improvement efforts over the next 5 years.

The action plan provides a nationally consistent direction while enabling partners to respond to local, regional, and national soil management challenges in a manner that is suited to their circumstances.

In this first 5-year period, it is important that partners build on, improve and create foundational networks, relationships, systems, frameworks, skills and knowledge that will help reach the 2041 strategy vision to see soil recognised and valued as a key national asset by all stakeholders.

Over the life of the action plan, it is expected that partners will look for opportunities and develop measures which align to the stated priorities. This is a dynamic document; new initiatives and activities will be introduced and evolve as it is implemented.

The action plan focuses on 4 priority actions:

1. Develop an agreed national framework to support the measurement, monitoring, mapping, reporting and sharing of soil state and trend information, to inform best practice management, decision making and future investment in soil.
2. Partners to develop a holistic policy and strategy approach where soil function is recognised, valued, and protected for the environment,

economy, food, infrastructure, health, biodiversity, and communities.

3. Accelerate the adoption of land use and management practices that protect soil and improve soil state and trend.
4. Identify and develop the soil workforce and capabilities needed to meet current and future challenges for Australia and the region.

We will work with all partners to the action plan to facilitate a coordinated and collaborative approach to its implementation.

We will conduct a review of the priorities for the next action plan in 2027.

# Contents

<b>Minister's foreword</b>	<b>iv</b>
<b>Summary</b>	<b>vi</b>
<b>Introduction</b>	<b>1</b>
National Soil Action Plan	2
An important foundation	2
Developing the action plan	3
<b>Priority action 1</b>	<b>7</b>
Statement of commitment	7
<b>Priority action 2</b>	<b>9</b>
Statement of commitment	9
<b>Priority action 3</b>	<b>15</b>
Statement of commitment	15
<b>Priority action 4</b>	<b>19</b>
Statement of commitment	19
<b>Roles and responsibilities</b>	<b>21</b>
Australian Government	21
States and territories	22
<b>Partner statements of support</b>	<b>23</b>
Department of Agriculture, Fisheries and Forestry	23
Department of Climate Change, Energy, the Environment and Water	24
New South Wales	24
Victoria	24
Queensland	25
South Australia	26

Western Australia	26
Tasmania	27
Northern Territory	27
Australian Capital Territory	28
CSIRO	28
Soil Cooperative Research Centre	29
Soil Science Australia	29
Natural Resource Management Regions Australia	30
National Farmers' Federation	30
Grains Research Development Corporation	31
Meat and Livestock Australia	31

<b>Glossary</b>	<b>32</b>
-----------------	-----------

<b>References</b>	<b>33</b>
-------------------	-----------

## Figures

<b>Figure 1</b> Pathway to 2041	5
<b>Figure 2</b> The relationship between soil security and other vital services	12

## Boxes

<b>Box 1</b> Four National Soil Action Plan 2023 to 2028 priorities	6
<b>Box 2</b> How Traditional Knowledge can help improve soil health and contribute to better soil management	17



# Introduction

## National Soil Strategy vision

Australia's soil is recognised and valued as a key national asset by all stakeholders. It is better understood and sustainably managed, to benefit and secure our environment, economy, food, infrastructure, health, biodiversity, and communities – now and in the future.

Soil is an integral part of the Australian landscape. It supports us all, no matter where we live, and provides essential ecosystem and production services that contribute to Australia's economic, environmental and social wellbeing.

The [2021 State of the Environment Report](#) (Williams et al. 2021) describes an overall decline in both the state and trend of natural capital in Australia's land environments, including soil, and highlights how a renewed focus on landscape recovery can reverse some of these declines. Soil conservation and practice changes are helping to reverse degradation in some eroded production landscapes. Management practices that restore soil function have been adopted locally but are not yet widespread.

The report also acknowledges that Australian soil is vulnerable to degradation because it is deeply weathered, old and

nutrient poor. Intervention to prevent and address soil degradation is an important investment in Australia's future soil health and security. Targeted interventions to maximise soil and ground cover, minimise soil disturbance and feed soil organisms will improve soil condition over time and support soil health. Best-practice approaches will differ depending on location, degree of degradation, soil type, past and present land use and desired soil health improvement.

The strategy, developed by the Australian and state and territory governments, in consultation with key soil stakeholders, outlines a national approach to address challenges facing Australian soil and to guide its sustainable use in the future.

The goals and objectives of the strategy will be implemented by a series of 5-year action plans.

## National Soil Action Plan

The strategy outlines the need for collaboration and coordination by all levels of government, industry, research institutions, communities, networks and land managers. It also recognises the need for practical, place-based activity to meet the challenges posed by highly variable conditions, soil uses and local objectives.

This first 5-year action plan focuses on 4 agreed priority actions. Through these priorities, it provides the framework to focus and guide efforts of partners over the next 5 years. The action plan allows for all partners to respond to local, regional and national challenges in a way that is appropriate for the soil challenges they face.

The action plan presents the priorities and commitments of the partners. New initiatives and activities which contribute to implementation of the priority actions can be introduced over the life of the action plan. As they are

developed and implemented, they will be included on an action plan webpage hosted by the Australian Government Department of Agriculture, Fisheries and Forestry (department). The webpage will provide a continuous update of activities happening under the priority action areas with an opportunity for interested stakeholders to subscribe for updates.

## An important foundation

The action plan sets out 4 foundational priority actions for valuing, managing and improving Australia's soil condition for monitoring soil trend and achieving long-term soil security.

The priority actions will build and strengthen the frameworks, networks, systems, relationships, research, innovation and skills development needed to ensure the 20-year vision of the strategy is met. Each priority action contributes to multiple objectives and goals of the strategy.

## Developing the action plan

The plan has been developed in consultation with key soil stakeholder groups. Between October 2021 and November 2022, we consulted over 300 stakeholders with contributions from state and territory governments, the National Soils Advocate and regional natural resource management (NRM) organisations, as well as environment, conservation, farming, science and research groups. Government agencies and non-government organisations responsible for supporting and leading Aboriginal and Torres Strait Islander land management were also consulted, including the National Indigenous Australians Agency and the Indigenous Carbon Industry Network. Peak industry bodies and non-government organisations with an interest in soil also provided comments, including Soil Science Australia, the Cooperative Research Centre for High Performance Soils, the National Farmers' Federation and Soils for Life.

Two governance committees played a key role in the development of this action plan and have made a significant contribution to identifying the nationally agreed path forward for Australian soil.

## National Soil Strategy Implementation Steering Committee

The National Soil Strategy Implementation Steering Committee (NSSISC) was established in 2021 to provide advice to the then Department of Agriculture, Water and Environment on implementation of the strategy. Members include the National Soils Advocate, representatives from state and territory governments, NRM Regions Australia, soil organisations and experts and rural research and development corporations and bodies. The NSSISC will continue to monitor progress and lead the development of subsequent plans.

## National Action Plan Working Group

The National Action Plan Working Group (NAPWG) was established in 2021 to support the development of the action plan. Members include the Office of the National Soils Advocate, representatives from state and territory governments, NRM Regions Australia, soil experts and rural research and development corporations and bodies. The NAPWG engaged with stakeholders in their jurisdictions to facilitate workshops, fora and surveys. They provided advice and input to the department on the drafting of this action plan.

## Public consultation

Public consultation occurred between September and November 2022, with the department also meeting state and territory counterparts and key soil stakeholders to seek feedback on proposed priority actions. There were over 130 responses to the draft plan from farmers, NRM organisations, the soil carbon sector, agronomists, government agencies, researchers and academic institutions and soil advocacy groups. State and territory governments discussed the issues of importance in their jurisdictions and how the action plan could align with their own programs and strategies to meet the objectives of the strategy. Consultation showed strong support for the action plan and a nationally agreed approach to achieving the objectives of the strategy.

## Reporting and review

The department will report to the NSSISC on progress of the action plan against the priority actions in each jurisdiction through an annual report. The action plan will be subject to a 5-yearly review to incorporate new or emerging soil-related priorities. The first review will take place in 2027 and findings will inform the development of the 2028 to 2033 action plan. Progress and new activities that contribute to the priority actions will be promoted on the action plan website.

## Engaging stakeholders

All partners to the action plan will have an important role in communicating the priority actions in close collaboration with stakeholders. The Australian Government will use existing networks, including Landcare, NRM bodies and groups, agricultural research and industry groups, Rural Research and Development Corporations, Cooperative Research Centres, soil research and other advocacy groups and the existing Soil Extension Community of Practice network to communicate the action plan priorities and how stakeholders can be involved. State and territory governments will engage with local and regional groups through existing natural management networks and encourage new partners to participate in the action plan by aligning their activities with the priority actions.

Effective and continued collaboration between all stakeholders and, where appropriate, formal partnerships will be crucial to the action plan's success.

## First Nations stakeholders

We note there is further work to do to better include First Nations stakeholders in efforts to address the challenges facing Australian soil and to guide its sustainable use in the future. Through the consultation process, stakeholders indicated there is a need to better understand and include First Nations perspectives in soil action and activities. There is an opportunity to improve the focus on First Nations perspectives in the next steps of the partnership over the course of this action plan and also in the development of future action plans. We will explore these opportunities as the action plan is implemented.

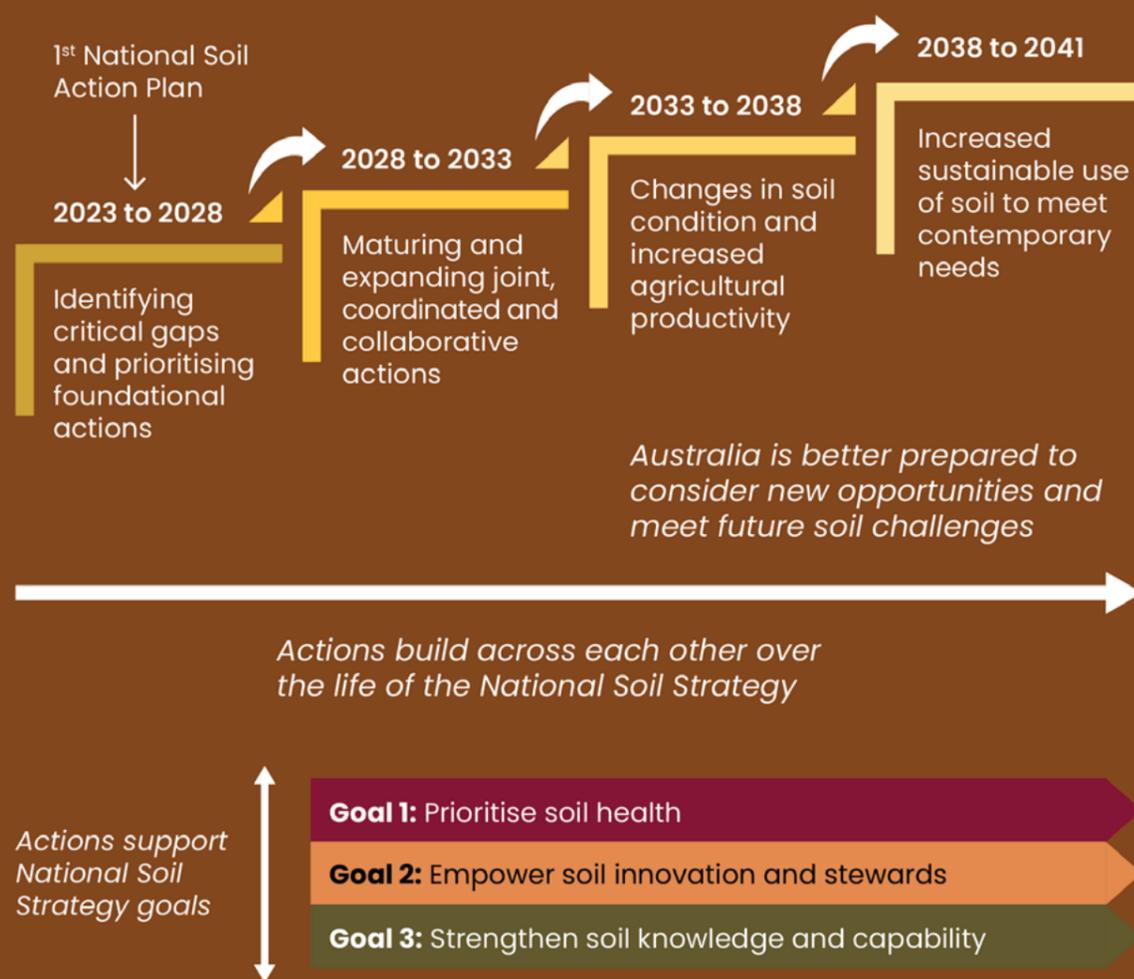
Figure 1 Pathway to 2041

# Pathway to 2041

## Stepping stones to achieving our vision

### National Soil Strategy vision:

Australia's soil is recognised and valued as a key national asset by all stakeholders. It is better understood and sustainably managed, to benefit and secure our environment, economy, food, infrastructure, health, biodiversity, and communities – now and in the future.



## Priority actions

### The first 5 years

Over the next 5 years, Australian and state and territory governments working in partnership with industry, research and non-government organisations and communities will play a role in ensuring Australia's soil supports sustainable agricultural productivity, food security, the environment, climate and disaster resilience and emissions reduction targets.

Four priority actions will focus national efforts on those areas that require early attention to provide the necessary base for achieving longer term outcomes. As the first 5-year action plan under the strategy, it is crucial that this plan responds not only to identified needs, such as accelerating the adoption of land use practices that protect and improve soil, but also strengthens the knowledge, relationships, frameworks, systems and tools that will support future action.

### Box 1 Four National Soil Action Plan 2023 to 2028 priorities

1. Develop an agreed national framework to support the measurement, monitoring, mapping, reporting and sharing of soil state and trend information to inform best practice management, decision-making and future investment in soil
2. Partners to develop a holistic policy and strategy approach where soil function is recognised, valued and protected for the environment, economy, food, infrastructure, health, biodiversity and communities
3. Accelerate the adoption of land use and management practices that protects soil to improve soil condition trends
4. Identify and develop soil workforce and capabilities needed to meet current and future challenges for Australia and the region



# Priority action 1

Develop an agreed national framework to support the measurement, monitoring, mapping, reporting and sharing of soil state and trend information, to inform best practice management, decision making and future investment in soil.

## Statement of commitment

Partners to the action plan commit to developing a national framework which will support the measurement, monitoring, mapping, reporting and sharing of soil state and trend information.

By 2028 we will:

- develop a strong governance framework for soil information nationally to ensure soil information is collected and managed to agreed standards

- increase our knowledge of Australian soil through ongoing soil investigations and mapping programs
- ensure existing and new soil data and information is publicly accessible through the Australian National Soil Information System (ANSIS) – subject to privacy and permission levels – to inform future soil investment
- establish a national agreed set of soil health indicators for soil monitoring to report on national soil state and trends to provide the foundation for future national environmental and natural capital reporting
- promote and embed ANSIS as Australia's national soil data system to inform best practice soil management and assist decision-making.

## Why this is a priority

Despite several soil monitoring programs at various scales, Australia does not have a nationally agreed approach to the measurement, monitoring and reporting on soil state and trends. It also lacks an accepted supporting framework to collect and share soil information to enable decision-making, the determination of investment priorities and contribute to reporting at multiple scales – internationally, nationally, and at state, territory, regional and local levels.

A nationally agreed framework for collecting soil information will increase Australia's capacity to monitor important changes in the state and function of soil and will help to inform decisions from property scale to continental scale to drive measurable improvements in soil condition.

Central to this approach and framework will be the identification of a consistent set of soil health indicators that will help to define common soil health 'language' to help us understand the relative condition of different soil across different landscapes.

A national framework with common soil health indicators will help to define baseline measurements on soil state and condition nationally and, with ongoing, consistent monitoring, will build understanding of the impact of land management practices and a changing climate on soil state and trends over time. This information will inform decisions on soil use and capacity for different land uses, prioritise soil investment decisions and enable identification of soil change trends.

The framework will also need to consider the soil information needed across jurisdictions, land uses and soil types at the regional and local level to support best practice soil management and evidence-based policy and program design. Partnerships and streamlined data-sharing arrangements will be important to this. It will also be important for agricultural industries to be engaged as they examine how soil health indicators can be incorporated into their sustainability and reporting frameworks.

Soil monitoring efforts under the framework will need to be underpinned by a strong shared understanding of which soil characteristics to measure, when, where and for what purpose, to facilitate comparison and maximise information usability. Monitoring could also accommodate new areas of focus over time, such as known or emerging soil characteristics of interest for future sustainability or soil pollutants of concern.

The activities under this priority will build on the extensive collaborative work on soil information and management undertaken by groups such as the [National Committee on Soil and Terrain \(NCST\)](#), the [Soil CRC](#) and the National Collaborative Research Infrastructure Strategy-enabled [Terrestrial Ecosystem Research Network \(TERN\)](#). For example, the NCST can bring its extensive knowledge in soil systems and standards, monitoring, expert validation and developing soil products to building the indicators and framework.



# Priority action 2

Partners to develop a holistic policy and strategy approach where soil function is recognised, valued, and protected for the environment, economy, food, infrastructure, health, biodiversity, and communities.

## Statement of commitment

Partners to the action plan commit to support the development of holistic policies and strategies where soil function is recognised, valued, and protected for the environment, economy, food, infrastructure, health, biodiversity, and communities. Government partners have a particular responsibility to ensure they are working across portfolios to advocate and influence related policy positions to recognise and value soil.

By 2028 we will:

- acknowledge the critical importance of soil and its contribution when developing key public policies and strategies, including agriculture, climate change resilience, adaptation and mitigation and human and environmental health
- improve the alignment and integration of soil policies and strategies across different levels of governments
- improve soil advocacy
- Consider the need for measures to protect, restore and better manage soil whenever opportunities to review existing or develop new related Commonwealth and state and territory legislation arise
- strengthen action on soil globally through the UN Food and Agricultural Organisation's (FAO) [Global Soil Partnership](#) (GSP) and other international soil advocacy efforts.

## Why this is a priority

Soil provides essential ecosystem and food production services that support and contribute to Australia's economic, environmental and social wellbeing, yet soil is not sufficiently considered in public policy objectives.

Soil will also play an increasingly important role with a changing climate and a projected rise in the number of natural disasters. We need to bring an urgency to understanding the impacts of climate change and the challenges and opportunities that will bring to soil management.

Recognising the importance of soil and the need for better soil management practices is the first step to improving its condition. Improving our soil also provides opportunities for adaptation, mitigation and increasing resilience to climate change, reinforcing the need for policy integration across sectors. Improving our soil can also help to build

sustainable agricultural productivity and support the sector to achieve its long-term production goals.

To address existing and future soil challenges, a holistic policy approach is required by all levels of government which recognises the role and value of soil and takes measures through deliberate, methodical planning to protect and restore it.

Internationally, the role of soil and the need to restore and conserve limited soil resources is gaining greater recognition, with a growing number of countries moving to integrate soil within national policy frameworks, including developing their own national soil strategies. Beyond policy frameworks, countries and organisations are also increasingly working towards the adoption of legislation which aims to protect soil. For example, the European Union is expected to adopt the [Soil Health Law](#) in the second quarter of 2023.

Australia is signatory to and has ratified 3 international conventions which contain provisions on the protection of soil:

1. United Nations Framework Convention on Climate Change
2. United Nations Convention to Combat Desertification
3. United Nations Convention on Biological Diversity

Australia is also a party to the World Heritage Convention and the Ramsar Wetlands Convention.

Addressing soil issues are essential for the preservation and protection of natural sites in Australia inscribed on the World Heritage List and for effective conservation of natural wetlands. Through the UN FAO, Australia is also an active member of the GSP, which is an organisation of governments whose purpose is advocacy and awareness-raising to increase collective global efforts to protect soil. Australia is also a member of the Coalition of Action for Soil Health.

Valuable lessons can also be drawn from and integrated with Aboriginal and Torres Strait Islander cooperative partnerships, such as the [Indigenous Ranger Program](#) which combines traditional ecological knowledge with land conservation training. Respectful use of Indigenous knowledge, recognition of Indigenous knowledge rights and Indigenous and non-Indigenous knowledge systems working together will lead to positive change. (Williams et al. 2021).

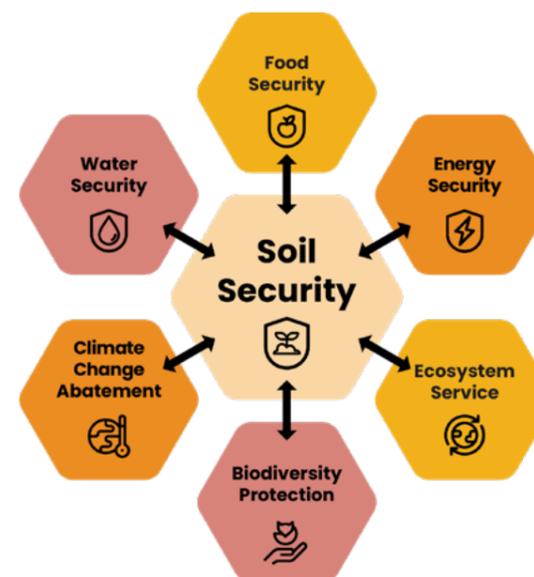
Australia's experience with catchment-scale management of natural resources across jurisdictions, such as in the Murray Darling Basin, the Australian Alps, national parks and elsewhere show the benefits of having aligned, complementary policies to manage finite natural resources to deliver a range of services and avoid unintended consequences.

To improve the protection of Australia's soil, we can use the lessons learned and build on past efforts of previous programs, such as the 1983 National Soil Conservation Program, the precursor of today's nationally integrated frameworks such as the [National Landcare Program](#) and the National Dryland Salinity Program from 1993 to 2004, amongst others.

### Economy

Food and fibre grown in Australian soil makes up a significant component of Australia's gross agricultural production, which in 2021–22 reached \$85 billion (ABARES 2022). Our economy is, therefore, intrinsically tied to our soil and having soil security. Soil security is the term used to describe the crucial role that soil plays in other crucial securities such as water security, biosecurity, food security, biodiversity and adaptation and resilience to climate change. All these aspects affect the health of our economy.

**Figure 2** The relationship between soil security and other vital services



Source: McBratney et al. 2014

### Environment

Soil underpins a range of functions (or ecosystem services) critical to environmental health. For example, it plays an important role in groundwater health and the carbon cycle. Environment legislation, planning policies, codes of practice and environment and

socio-economic impact assessment processes need to recognise that soil is an environmental asset in its own right and manage the effects of land uses that impact soil and the environment at all scales, from individual land parcels to catchments and landscapes.

### Food

Australia enjoys the enviable position of being a net food producer, which contributes to our way of life and national security. Healthy and productive soil is essential to Australia's and our region's food security and ability to continue as a significant food-producing nation and exporter of quality food and fibre products that contribute significantly to our exports and economy.

Agricultural and trade policies that incentivise and reward good soil management and stewardship will encourage landholders and land managers to improve their soil and help to ensure Australian producers can continue to grow the food Australia and the world needs.



### **Infrastructure**

Australia's growing population and increasing infrastructure requirements will create pressures on soil which has high conservation values or are less suited and more costly for construction. This soil may also be contaminated from legacy activities or unstable, such as acid-sulphate or saline soil, or previously excluded from development due to natural hazards such as landslip.

Our increasing infrastructure footprint is also removing agricultural land for production and affecting the health of the environment. Our planning policies need to ensure a holistic approach is applied to manage the risks these changes pose to the health of our land and waters and the loss to regional and national food production.

### **Health**

Human and environmental health is linked to the health of our soil. Increasing community concerns in relation to soil pollution, accumulation of chemicals in soil and airborne dust needs to be addressed by effective policy responses that value and protect soil.

Soil health can also affect the resilience of plants and crops to pests and diseases and, therefore, the amount of chemical and other inputs required. The benefits of improved soil health, combined with integrated pest management, is a new area of focus which offers potential to reduce farming inputs and management costs. The role of soil-borne viruses and its impact on environmental and human health is also important and may drive the need for new or improved biosecurity measures.

### **Biodiversity**

Soil is the foundation for many terrestrial ecosystems and the plants, animals, insects and microbes it supports. Damaged, degraded or polluted soil can affect ecosystem health and productivity. Surrounding and distant ecosystems may also be affected by runoff from soil erosion or increased flooding. Our understanding of the importance of soil biodiversity is also growing. Ongoing research into the importance of soil biota will help us to understand its link to ecosystem health and the maintenance of productive agricultural systems.

### **Communities**

Productive soil provides the foundation for agricultural and economic production that sustains our regional and rural

communities. Ongoing, focused soil programs that help to build resilience to natural disasters and drought will invest in the health and future of our rural and regional communities.

Soil also provides a connection for communities in cities and towns through open natural spaces and opportunities for food production. Soil also holds importance for Aboriginal and Torres Strait Islander culture and Traditional Ecological Knowledge. Continuing education by governments and partners with stakeholders and communities about soil and supporting communities of practice for improved soil management will help to ensure soil is better valued and protected in the future.



# Priority action 3

Accelerate the adoption of land use and management practices that protect soil and improve soil state and trends.

## Statement of commitment

Partners to the action plan commit to support measures that accelerate the adoption of land use and management practices that protect soil and improve soil state and trend.

By 2028 we will:

- increase the number of land managers with access to extension activities, information and decision-making tools that support and demonstrate the benefits of improving land use practices for soil health
- share approaches that have been effective in increasing the adoption of land management practices to improve soil health and resilience to the impacts of climate change

- ensure regional NRM plans and strategies at the local and state level are consistent with the action plan and align to its priorities
- review the investment framework for soil research and make suggestions to better target government investment toward programs and projects that align to action plan priorities
- engage a broader set of agricultural and rural industries on their role in helping to achieve this priority.

## Why this is a priority

Changes to land use and management practices take time, often over years and sometimes decades. If we are to meet existing and future soil challenges, it is essential that information and effective learning opportunities about improved land use and soil management practices are available and focused on the needs of the users and landholders.

## Decision-making tools and techniques

Exploring and promoting affordable, simple and evidence-based methods to quantify the financial and other benefits of investing in improvements to soil health will support land management, sustainable agriculture and strategic investment decisions.

Land managers need integrated information relevant to their soil type, climate and farming system. They need a fundamental understanding of their soil's properties so that they can also understand how soil functions and behaves in different climatic regimes.

Tools and techniques that can readily assess soil nutrient levels, soil carbon, and/or changes to soil structure resulting from changing land use practices and climate will help to drive and accelerate change to practices that protect soil. These tools and techniques will provide part of the information that land managers need to consider solutions to their land management problems that protect and enhance soil. For example, tools that can provide affordable,

accurate soil carbon measurements may support landholder decisions to invest in practices that build and protect soil carbon for soil health and resilience.

Adopting these practices can also enable landholders to participate in carbon markets or certify farm products as carbon neutral. This can help generate additional returns on investment from changing practices to increase soil carbon, in turn diversifying farm income and promoting healthier soil that supports productivity and resilience.

## Peer-to-peer learning and demonstration

Facilitating a soil stewardship mindset and encouraging innovation among land managers is central to pursuing the goals of the strategy.

Harnessing the potential for innovation and collaboration among soil stewards requires a robust system of networks and partnerships for knowledge-sharing. For example, ensuring that peer learning and training networks can support effective stewardship across all soil types, conditions and capacities.

Knowledge transfer includes extension and adoption to translate scientific research into pragmatic tools, techniques or technologies that can be applied in real-world situations. There is an ongoing need for effort to facilitate uptake of land management practices that halt or reverse soil degradation. Effective soil extension and adoption programs can benefit from incorporating fundamental and applied soil science, as well as Traditional Ecological Knowledge (where culturally safe, appropriate and with consent), to better adapt land management practices in a changing climate.

**Box 2** How Traditional Knowledge can help improve soil health and contribute to better soil management

First Nations peoples have a connection to Country and unique relationship with Australia's natural environment. Using Traditional Ecological Knowledge, First Nations peoples have cared for Country for generations through practices to improve soil health, protect Australia's biodiversity, adapt to a changing climate and identify biosecurity threats to the environment. The 2021 State of the Environment report (Williams et al. 2021) emphasised the critical importance of Traditional Ecological Knowledge in caring for Country:

'Indigenous knowledge of Country and management practices provide a valuable approach for caring for the environment for all Australians. As Indigenous peoples' lands and seas are returned to their care, so are cultural management practices ... Indigenous Australians are the first scientists, technologists, engineers and mathematicians (STEM), and many respectful and reciprocal collaborations with other scientists are shaping a pathway for our nation's future.'

We need to better understand Traditional Ecological Knowledge in soil management practices. Engaging respectfully in 2-way research and learning to explore whether concepts could be shared to better protect and improve our soil is important. The [Our Knowledge, Our Way guidelines](#) note that following the knowledge governance and protocols of Traditional Owners are vital to positive experiences in using and sharing that knowledge, as is the respect and recognition of rights of ownership by Aboriginal and Torres Strait Islander people of their cultural and intellectual property. Many national, regional and local guidelines formulated by Aboriginal and Torres Strait Islander people and specific Traditional Owner groups can help partners support positive experiences in knowledge sharing. Relationships between people underpin positive experiences in knowledge sharing.



Soil communities of practice that are inclusive, collaborative, cooperative and share and respect participant knowledge and experience will remain important to achieving knowledge-sharing and uptake. These communities will benefit from engaging with a diverse range of experience and knowledge, including women in agriculture, Aboriginal and Torres Strait Islander land managers, youth, the elderly and culturally and linguistically diverse communities with relevant experience and roles.

**Research focused on the needs of producers and land users**

Working together under the action plan, we will seek to identify areas where research, innovation and commercialisation can make the most gains toward accelerating practice change and realising improvement of Australia's soil condition, soil health and long-term soil security. This can help to guide government initiatives, avoid duplication and focus investment. We can also assist in building opportunities to link research and entrepreneurs to potential

investment, from the financial sector, private sector and government.

Innovation to drive practice change can include research, demonstration and commercialisation across a broad spectrum of essential services and products, including:

- techniques for measurement, mapping and modelling of soil health indicators
- traditional ecological knowledge in soil management
- restoration approaches
- improved farming practices
- improved peri-urban and urban design practices
- new products and techniques to increase soil health or reduce fertiliser use
- digital platforms to help provide real-time decision-making support in soil management
- engagement and outreach approaches.



# Priority action 4

Identify and develop the soil workforce and capabilities needed to meet current and future challenges for Australia and the region.

## Statement of commitment

Partners to the action plan commit to addressing the soil workforce and capabilities needed to meet current and future challenges for Australia and the region.

By 2028 we will:

- better promote the range of opportunities and careers in soil
- review soil education in the Australian curriculum and identify opportunities for new soil education programs
- assess the gaps, barriers and incentives for improving the soil workforce's knowledge and capacity and develop the scope of work required to address this workforce issue

- develop long-term, field-based, on-the-job soil training employment programs for recently graduated tertiary students
- understand new and emerging agricultural and environmental activities and the implications for soil workforce requirements by working closely with relevant organisations, including [Soil Science Australia](#) (SSA) and the [Agribusiness Job and Skills Council](#)
- support programs such as the [SSA Certified Professional Soil Scientist](#) and [Registered Soil Practitioner](#) programs to increase the pool of accredited trained soil scientists and programs, including the Soil Science Challenge, to address fundamental soil knowledge gaps
- support the capabilities needed in our region to improve soil management for human and environmental health, food security and climate adaptation through the GSP Pacific Soils Partnership, the Pacific Community and South Pacific Regional Environment Program.

## Why this is a priority

To generate and maintain healthy soil that drives economic, environmental and social outcomes, there is a need to maintain and continue building soil expertise and capability. We will need a workforce with expertise and skills across the spectrum of services and products engaged in soil health, including research, agronomic advice, outreach services, project management, geographic information system/spatial monitoring, soil sampling and laboratory technicians, producers of agricultural products and land managers. This workforce will take time to grow and will need to recognise the importance of knowledge acquired through on-the-ground experience combined with formal skills acquisition through the vocational education and training and higher education sectors.

Laying the foundation in this first 5 years will improve our understanding of what future skills and expertise profile is required to support the action plan. This will enable better understanding of where there might be a need to focus curriculum, training and employment opportunities. This could

include efforts to ensure soil skills are included in broader agriculture workforce discussions and increase the accessibility of professional development and upskilling opportunities, including to make these more equitable and accessible across locations and sectors.

Continued investment by governments, universities and the research sector into fundamental soil science and research will increase Australia's soil knowledge and contribute to coordinated, national succession planning in soil science as a discipline. This will be particularly important over the first 5-year timeframe of this action plan and help to support career pathways and opportunities for future soil professionals.

Facilitating strong, interdisciplinary, well-connected soil expertise will assist all sectors to connect soil management to other landscape features like water and biodiversity, access new markets and reduce the impacts of soil degradation on businesses and communities.



# Roles and responsibilities

## Australian Government

The Australian Government is committed to a climate smart, sustainable agricultural sector as it is key to the industry's future. Well-managed soil will help us to meet our goals for increased production, environmental health and our challenges in relation to climate change. The Australian Government will provide leadership through the strategy and action plan and drive the change needed to improve soil management by collaborating and building strong partnerships with stakeholders. We also recognise that partnerships are crucial.

In addition to the partner commitments made under the priority actions, the Australian Government will:

- continue to provide secretariat and governance support to the NSSISC with a revised terms of reference to move to oversight of the implementation of the action plan
- review the progress of the action plan quarterly and publish progress reports annually to monitor and review progress against the plan and amend it as required

- host a National Soil Action Plan portal on the department's website which highlights and promotes work underway to address the action plan's priorities and provide a regular e-newsletter for subscription
- make large volumes of soil data publicly available, easily accessible and usable through continued support for ANSIS and assist stakeholders to use this data to make confident evidence-based decisions
- drive partnerships with state and territory governments through funding for bilateral agreements to support the implementation of programs and initiatives under the action plan
- design and deliver a new national soil monitoring program. Data collected will be consistent and made publicly available on ANSIS and support stakeholders to make evidence-based decisions to improve soil health at a range of scales
- continue to support the Regional Soil Coordinators program and the national soil Community of Practice, which will facilitate soil extension services and promote soil knowledge-sharing and innovation for more effective and sustainable land management practices.

## States and territories

State and territory governments will play a key role in leading change in their jurisdictions and ensuring soil activities are delivered effectively and efficiently to achieve local, regional and state-based outcomes.

In addition to the partner commitments made under the priority actions, state and territory governments will:

- participate in relevant fora to direct, design and support soil priorities under the action plan
- monitor the performance of soil activities in their jurisdiction, including their contribution towards the action plan
- provide information required to assist the department in monitoring and reporting on the action plan
- continue to pursue resourcing to better address soil priorities.



# Partner statements of support

## Department of Agriculture, Fisheries and Forestry

The Department of Agriculture, Fisheries and Forestry's vision is for 'A more sustainable and prosperous Australia through biosecurity, production, and trade'. We know that careful management of soil as a national asset is central to achieving this vision and we know that progress on soil management and protection can only occur through partnership. We will continue to lead the implementation of the action plan through strong partnerships, evidence-

based decisions and strategic action. We will expand the range and depth of our relationships with soil stakeholders, including engaging First Nations groups, in the development of future action on soil. We will further develop our already strong partnerships with key organisations working on international soil initiatives affecting our region. We will also ensure other government portfolios are aware of the importance of soil health to their priorities so they can take action to address issues, leading to improvements to the environment, society and economy.

## Department of Climate Change, Energy, the Environment and Water

The role of the Department of Climate Change, Energy, the Environment and Water in progressing the action plan is guided by our purpose to:

- drive Australian climate action
- transform Australia's energy system to support net zero emissions while maintaining its affordability, security and reliability
- conserve, protect and sustainably manage our environment and water resources through a nature positive approach
- protect our cultural heritage
- contribute to international progress on these issues.

We are investing in research, development and outreach to promote agriculture and land management practices, including those that improve soil condition, reduce emissions and support climate adaptation and resilience, productivity, and social and environmental benefits. Our work in threatened species protection and recovery, delivering on-ground biodiversity and natural resource management activities and waste management all aid soil health. We are supporting carbon and nature repair markets and certification schemes that incentivise and recognise the contribution of improved land management towards net zero emissions and nature positive outcomes. Our environmental information initiatives align with the action plan's aim of improving access to data to support decision-making.

## New South Wales

The NSW Department of Primary Industries will work closely with all relevant NSW agencies to support the Australian Government's implementation of the National Soil Strategy and welcomes the opportunity to work in collaboration with others to contribute to priorities of the action plan. Through our existing state-based activities and partnerships with industries and communities, we will develop and promote best soil management practices to preserve the health and productivity of soil, which is a significant natural asset for NSW.

## Victoria

The Victorian Government Department of Energy, Environment and Climate Action (DEECA) is committed to improving and protecting soil. Ongoing access to soil and land that is well-suited to agricultural productivity is important for Victoria's agricultural future and will become more important as pressures of producing more food with less water in a more variable climate grow. The [Victorian Agriculture Strategy](#) backs a stronger, more innovative and sustainable agriculture sector and our [Protecting Victoria's Environment – Biodiversity 2037](#) recognises that protecting natural capital, including soil, will increase the resilience of key sectors of the economy.

In partnership, DEECA delivers a range of innovative soil-related programs to monitor, manage and improve soil condition, productivity and land health, whilst increasing availability and access of soil data and land use mapping. For example, DairySoil, a new project within our DairyFeedbase 23-28 program co-funded by Dairy Australia, the Gardiner Foundation and Agriculture Victoria, aims to improve nutrient and water use-efficiency, build the rhizosphere, reduce reliance on synthetic fertiliser and economically use recovered nutrients from dairy manure. The National Soil Strategy and action plan, developed in consultation with government, industry, community and First Nations stakeholders align to Victoria's intent to improve soil condition and sustainability. DEECA looks forward to working with the Commonwealth, other jurisdictions, industry, universities, catchment groups and others where Victorian priorities align with the action plan to make progress on the 2023 to 2028 action plan.

## Queensland

Queensland's soil is a precious, non-renewable resource that supports and contributes to the state's economic, environmental and social wellbeing. The Queensland Government, primarily through its Departments of Resources, Environment and Science, and Agriculture and Fisheries, has many innovative programs supporting sustainable land use and management that protect and maintain the health of our soil and environment. This is achieved through our leading soil scientists, collaborative partnerships and adoption of new digital technologies for monitoring, analysing and mapping soils. The action plan's multifaceted approach, encompassing data delivery, education and awareness campaigns, landowner support programs, research and innovation and policy advocacy captures the complexity and interconnectedness of soil health. This emphasises the need for collaboration between all partners to exchange knowledge, share best practices and drive innovation in soil management and use. By working together, we can create a sustainable future for our nation and the generations to come.

## South Australia

Soil is vital for South Australia's economic, environmental and social wellbeing. South Australia has a broad soil community of practice encompassing all those who have an interest in sustainable, productive and profitable soil management. Members of this community of practice continually research, develop, adapt, implement and advance technologies, systems and practices that improve soil health. South Australia's Department for Environment and Water's renowned soil and land data base and Department of Primary Industries and Region's facilitation of knowledge and information sharing through its programs and networks, support the state's soil community of practice. The community of practice is critical to delivery of the action plan and South Australia plans to strengthen and progress collaboration, innovation and the sharing of expertise, experience, knowledge and information by formally establishing an SA Soils Data Bank and a State Soils Knowledge Network.

## Western Australia

The Government of Western Australia is committed to sustainably managing our soil and land resources to provide ecosystem services and economic returns to landholders and the wider community. Our 10-year Soil Health Strategy (2021-2031) identifies key priorities, including adopting best practices in farming and pastoral systems, investigating innovative farming systems to improve soil health, tracking soil health status and condition, developing policies to inform land managers and conserving soil and landscapes for future growth.

Western Australia's landholders, community and industry's soil and land management priorities are aligned with the National Soil Strategy, reflecting our commitment to sustainable land management practices and protection of its unique soil and biodiversity. By partnering with and following the Australian Government's action plan, Western Australia is committed to ensuring that its land use practices are environmentally responsible and socially and economically sustainable, maintaining the health and productivity of its soil for future generations.

## Tasmania

Tasmania is renowned for its diverse soil and landscapes, from highly productive red volcanic cropping soil to globally significant carbon-rich organic soil in the Tasmanian Wilderness World Heritage Area. The Department of Natural Resources and Environment Tasmania (NRE Tas) is the lead agency in Tasmania for soils data storage and management, standards and mapping, which support our primary industries sector and fosters stewardship between community, stakeholders, industry and Government. NRE Tas welcomes the priority actions in the National Soil Action Plan and will contribute to the action plan by continuing to:

- participate in national collaborations, including the National Committee on Soil and Terrain and its working groups
- undertake enterprise suitability mapping – projecting which crops can be grown where, now and under future climate change
- improve soil vulnerability mapping – identifying areas at risk from degradation through inappropriate land management
- capture and review historical soil data
- progress development of soils database upgrades (Natural Values Atlas) and contributions to the Australian National Soil Information System.

NRE Tas looks forward to continuing to collaboratively progress the mutual strategic priorities identified in the action plan.

## Northern Territory

The Department of Environment, Parks and Water Security (DEPWS) has outlined its priorities for soil management through its Strategic Plan 2021–2024. Actions relating to soil management include:

- undertaking and promoting scientific assessment of land, water and biodiversity
- supporting landowners and managers to implement sustainable land management practices
- undertaking strategic, integrated assessments of the environment to inform sustainable development and conservation management
- supporting economic growth by providing advice and authorising the use of natural assets
- developing and contemporising legislation and policy that supports environmental protection
- enhancing data and information management systems to maximise their integrity and value

Knowledge of our soil landscapes are critical to achieving our strategic vision of a healthy, resilient and productive environment. In 2022–23, new Northern Territory Government funding was allocated to the territory-wide Regional Ecosystem and Landscape Mapping (REALM) program. REALM complements other existing programs which includes ongoing engagement in strategic land use planning, regulatory functions and supporting soil research and development. These programs will enable DEPWS to continue to work collaboratively with the Australian Government, other jurisdictions, industry and research institutions to make progress against the action plan.

## Australian Capital Territory

The ACT Government's priorities for enhancing and protecting soil and landscapes are captured in its draft Caring for Dhawura Ngunnawal: A natural resource plan for the ACT. Challenges identified in the plan include soil acidity and loss of soil carbon on farms and the impacts of climate change on soil and groundcover on farms and on the conservation estate. The draft ACT NRM Plan sets targets and actions for addressing these challenges and building soil, vegetation and landscape resilience in the face of climate change. The plan aims to build land manager skills, knowledge and capacity to prepare and adapt to protect the soil and natural resource base of the ACT. The ACT Government supports the 4 National Soil Action Plan priorities, with actions 2 and 3 aligning very closely to actions and targets outlined in the draft NRM Plan. The ACT Government welcomes the national focus on soil and the partnerships that are forming through the National Soil Strategy and the National Soil Action Plan.

## CSIRO

As Australia's national science agency, CSIRO's purpose is to solve our greatest challenges through innovative science and technology. We work with industry, governments and the research community to turn science into solutions, focusing on issues that matter the most: our quality of life, sustainability, the economy and our environment. Our vision is to create a better future for Australia. The National Soil Action Plan will enhance the resilience, sustainable use and value of our environments through improved soil management. This is vital to food and fibre production and for building and maintaining a healthy environment. CSIRO is committed to collaborating with partners through research and innovation to improve soil management in Australia and internationally.



## Soil Cooperative Research Centre

The mission of the Soil CRC is to contribute new knowledge, tools and practices to help Australia's farmers better manage their soil in order to improve the profitability, sustainability, resilience and wellbeing of the agriculture sector. Established in 2017 with funding from the Australian Government and from its participants, Soil CRC brings together 39 organisations (8 universities, 4 state government agencies, 7 industry bodies and 20 farmer groups) to deliver collaborative soil research and adoption programs.

Our research focuses on soil performance metrics, new products for soil fertility and function, integrated soil management solutions and the economics and adoption of soil stewardship. Through our education activities, we are supporting the studies of over 50 PhD students who will contribute to the future soil research capability so integral to this strategy. Through its investment and its delivery, Soil CRC is active in supporting all 4 priority actions of the action plan and we will ensure that all future investment and delivery by Soil CRC continues to do so.

## Soil Science Australia

Soil Science Australia (SSA) is the peak professional body for soil scientists and people who work with and are interested in soil. SSA has membership across all areas of soil science, representing soil scientists at all stages in careers, ranging from student members at the beginning of their soil science careers, through to honorary and retired members who have a wealth of soil science and land management knowledge. SSA's mission is to promote the importance of soil and

soil science in Australia, build a strong, collaborative soil science community and advance the professional capability of soil scientists. SSA aims to do this through advocacy, outreach, education and training. SSA strongly supports priorities 1, 2, 3 and 4 of the National Soil Action Plan. SSA will continue to work in partnership with the Department of Agriculture, Fisheries and Forestry and other organisations in the National Soil Action Plan in:

- developing and promoting a nationally consistent approach in the collection of soil information
- communicating the best available science, on-ground practices and Traditional Knowledge in land management for the protection of soil function
- providing extension, education, training and upskilling opportunities for those engaged in soil and land management activities
- professional recognition of soil knowledge in land management through accreditation programs such as the Certified Professional Soil Scientist and Registered Soil Practitioner.

SSA is committed to ensuring that soil education, skills, knowledge and expertise in the workforce can meet and address the challenges in the sustainable use and management of soil into the future.

## Natural Resource Management Regions Australia

Natural Resource Management (NRM) Regions Australia is the national peak body for Australia's 54 regional NRM organisations. The NRM sector is unique in that it covers all of Australia, delivering integrated catchment management programs at a regional level. Regional NRM organisations facilitate delivery of diverse initiatives to manage natural and cultural resources and to build resilience in our landscapes, freshwater systems, and marine environments. This relies upon healthy and productive soil and the relationship between soil, water and biodiversity.

Regional NRM organisations are actively involved in soil conservation, research and extension projects across the country, guided by our regional NRM plans that identify soil as a critical natural asset. The NRM sector contributes substantially to the delivery of National Soil Action Plan priority 3, supports and can contribute to priority 1 and relies on priority 4 to build knowledgeable and experienced soil practitioners across rural and regional Australia.

We look forward to working with the Australian Government and our partners to deliver on the aspirations of the National Soil Strategy.

## National Farmers' Federation

The National Farmers' Federation is the national representative body for the farm sector. Soil health, in all of its definitions, is critical to the ongoing and improving sustainability of Australian agriculture. As members of the inaugural steering committee, the NFF recognises the detailed consultation and engagement undertaken to produce the National Soil Action plan. The 2023 to 2028 priorities, once delivered, will form a substantial platform for ongoing implementation. The future of agriculture is intrinsically linked to healthy soil. Outcomes from the ongoing delivery of this strategy can only improve agricultural sustainability and underpin the ongoing delivery of the NFF 2030 Roadmap which includes farmers continuing to embrace sustainable farming methods as part of a coordinated national framework that drives productivity and profitability, while recognising and rewarding environmental stewardship.

## Grains Research Development Corporation

The Grains Research and Development Corporation (GRDC) has outlined its priorities for soil and land management through its 5-year Research Development & Extension Plan (2023-2028). Three key challenges include:

1. optimising the productive capacity of soil through improved management practices and accelerating the adoption of amelioration, mitigation and tolerance solutions to overcome the impact of soil constraints to harness existing potential
2. reaching new production frontiers through step-changes in soil productivity by unlocking the chemical, biological and physical productivity of soil
3. securing growers' ability to continue to farm into the future through sustainable and responsible production systems that ensure future generations can thrive.

For GRDC, priorities 1, 3 and 4 of the action plan are of particular importance. As we develop initiatives and invest in RD&E to address these key challenges, we remain committed to working in partnership and actively seeking opportunities to make progress against the priorities of the action plan.

## Meat and Livestock Australia

Meat and Livestock Australia (MLA) has developed a review of soil research and extension opportunities to guide investment priorities across its business units to ensure the sustainability and future prosperity for red meat producers. Livestock enterprises cover more than 50 percent of the Australia's landscape and the industry's sustainability is reliant on maintaining the natural capital of its production systems and owes a duty of care to ensure that investment in soil stewardship is a priority issue. Therefore, the MLA investment strategy touches on most facets of the red meat value chain with 4 themes of investment identified that align with 3 of the 4 pillars of the action plan:

1. overcoming regional constraints with a focus on reducing the impacts of acidification, erosion, dryland salinity and soil organic depletion
2. optimising soil carbon storage and soil health
3. managing soil impacts from extreme events on soil function and health
4. safeguarding natural capital to leverage market access.

Fundamental to MLA's strategy is working with the advisory sector and producer networks to strengthen soil extension and adoption pathways and ensure that the industry has the tools and knowledge to monitor soil health and realise opportunities.

# Glossary

Term	Definition
<b>soil condition</b>	Soil condition can be defined as the capacity of a soil to function within land use and ecosystem boundaries to sustain biological productivity, maintain environmental health and promote plant, animal and human health (Doran 2002).
<b>soil degradation</b>	Soil degradation is defined as a change in the soil health status resulting in a diminished capacity of the ecosystem to provide goods and services for its beneficiaries (FAO 2023).
<b>soil health</b>	Soil health is the capacity of soil to function as a living system. Soil health can vary across different geological conditions, ecosystems and land uses. Soil health can influence elements such as plant and animal productivity, water and air quality and plant and animal health. Healthy soil maintains a diverse community of soil organisms that support other important services, such as help to control plant disease, insect and weed pests, form beneficial symbiotic associations with plant roots, recycle essential plant nutrients and improve soil structure which can have positive repercussions for water and nutrient holding capacity with flow-on effects to increase crop production (FAO 2008).
<b>soil health indicators</b>	Soil health (and/or soil quality) indicators are defined as 'measurable soil attributes that influence the capacity of soil to perform agriculture production or environmental functions.'  Soil health indicators selected often cover key physical, chemical, hydrological and biological properties of soil. Monitoring of soil health indicators will signal whether soil health is declining, staying the same or improving (Stevenson 2022).
<b>soil security</b>	Soil security is the ability of soil resources to produce food, fibre and fresh water, contribute to climate mitigation and resilience, biodiversity conservation and support prosperous communities and economies (McBratney et al. 2014).
<b>soil stewardship</b>	Soil stewardship is a concept recognising that soil is a finite resource and that current generations have a responsibility to manage or 'steward' soil on behalf of future generations.

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