



Australia's National  
Science Agency

# Drought Resilience Mission

Progress update

March 2022



# Australia needs an integrated national approach to drought resilience

Despite recent flooding rains in some parts of Australia, the next drought is coming. More frequent, severe and prolonged droughts are predicted for many parts of Australia, and rainfall will generally be lower across Southern Australia.

This challenge requires new responses to improve Australia's preparedness and resilience before the next drought. Greater preparedness and resilience will move Australia on from treating drought as a crisis.

It comes from the actions taken before, during and whilst recovering from drought.

Now is the time to act.

A broad perspective that considers the needs of different stakeholders is required to build economic, environmental and social resilience against drought.

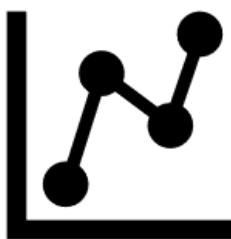
Australia's national science agency, CSIRO, launched the Drought Resilience Mission in September 2021. CSIRO is working with government, industry, community, research and investment partners to address the pressing national challenge we face from more frequent and severe drought cycles in Australia.

## The Drought Resilience Mission has a goal to reduce the impacts of Australia's droughts by 30 per cent this decade

Three main work packages have been identified to achieve the goal of the Drought Resilience Mission:



**On-farm innovation**



**Regional resilience**



**Policy enablement**

The Drought Resilience Mission has invested in exploratory projects, as well as worked with partner investments to investigate ways to reduce the impacts of future droughts and build drought resilience.

We will grow our collaborative work with aligned partners to develop and implement science-based solutions that create change on-farm, in regions, and provide the information to support policy that improves Australia's resilience and prosperity leading into, during and in recovery from droughts.

# Recent achievements

## **Making climate data accessible for farmers**

In partnership with the Australian Government's Future Drought Fund, CSIRO and the Bureau of Meteorology released the second prototype of the Climate Services for Agriculture Platform in December 2021. The platform enables farmers to see historical and future climate that could impact their farm, based on their location and what they produce. The prototype is available at [Climate Services for Agriculture](#) and is explained in [this video](#).

## **Driving water banking initiatives**

To explore options for increasing water security for agriculture, we completed an assessment of water banking opportunities for the National Water Grid Authority and an analysis of likely costs of water banking.

## **Building community drought resilience**

We developed a framework for assessing community resilience to drought and are working with the Australian Government's Future Drought Fund to assist the development of 23 regional drought resilience plans, with more to follow.

## **New on-farm solutions**

We developed scenarios to test novel de-stocking strategies based on animal genetic or performance data. This will feed into the development of a tool that will enable producers to make critical decisions on livestock. We established field-based experiments to demonstrate the benefits of a new breed of wheat (long-coleoptile) designed for planting when there's low soil moisture at sowing. Early learnings were recently publicised by the Grains Research Development Corporation.

## **Engagement with drought hubs**

We are developing ongoing engagements with the eight Drought Resilience Adoption and Innovation Hubs and developing channels of information exchange that support and enable the translation of science into practice.

## **Supporting policy response**

We are working with the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) and the Department of Agriculture, Water and the Environment to establish a Drought Early Warning System to support policy decisions as drought conditions develop.

*More details of work being undertaken in each of the three work package areas follows on pages 4-12.*

### **Join our Mission**

We invite ideas and engagements from all partners and investors interested in improving Australia's drought resilience.





# On-farm innovation



Our on-farm innovation work package is focused on further developing partnerships across the agricultural innovation system and deploying technologies, tools and practices at scale.

When implemented, these developments will improve agricultural productivity, profitability and sustainability going into, during and in recovery from drought.

Collaborative relationships are also being developed with the Regional Drought Resilience Adoption and Commercialisation hubs.



## On-farm innovation

Australia has a dry and extremely variable climate that leads to large annual differences in production, income and profitability. We seek to help primary producers reduce the effects of these swings that are predominantly driven by rainfall.

Dryland and irrigated cropping research teams have engaged producers, consultants and grower groups to explore new farming system innovations and strategies with potential to reduce the impact of unpredictable rainfall using experience from recent droughts.

### **Maintaining livestock herd performance through the drought cycle**

In livestock production systems, stocking rate is a key decision producers need to make as drought develops. Loss of improved herd genetics when livestock producers drastically destock in response to drought can have major economic impacts for farm businesses. Commercially available genomic tools now provide a measure of the genetic value of individuals in the herd, allowing genetic merit to be considered when selecting animals to sell. However, estimates of the long-term economic costs/benefits of destocking based on the traditional pregnancy status and age versus the genetic merit of individual animals are not currently known.

We are using simulation modelling to help Australian producers identify likely optimal destocking and restocking strategies during drought events that allow genetic merit to be considered. We are adapting the Crop Livestock Enterprise Model (CLEM) to explore the different strategies being generated in consultation with industry. We are developing these ideas in an Australian Government Future Drought Fund project with the University of New England. Contact: [Sabine.Schmoelzl@csiro.au](mailto:Sabine.Schmoelzl@csiro.au) or [Brad.Hine@csiro.au](mailto:Brad.Hine@csiro.au)

### **Soil water data informing grain cropping decisions**

In grain cropping systems we are exploring the value of soil water sensor information to planting and harvesting decisions. Soil water could be better managed to improve returns from the water that is available to grain crops. This becomes particularly important in drought years where there is greater risk of low production, low ground cover, greater soil degradation or loss, and reduced economic returns. The information produced will help growers determine if, and when, to harvest for grain or biomass/hay to maximise profits to growers and minimise soil degradation or losses. This work will contribute to supporting evidence-based decision making by grain growers in times of drought.

For more information, contact: [Lindsay.Bell@csiro.au](mailto:Lindsay.Bell@csiro.au)



## Long coleoptile wheat could boost yields

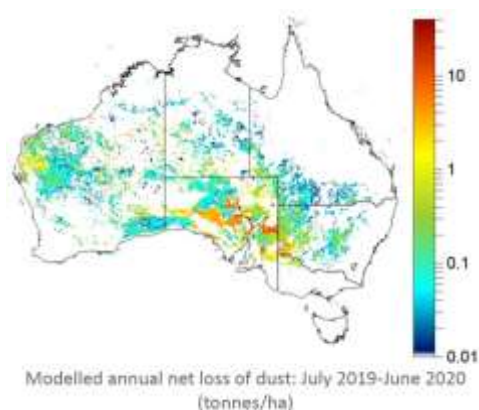
Growers and consultants nominated successful early crop establishment under variable seasonal conditions as critical to improving business resilience. We are investigating novel agronomic innovations to facilitate early sowing. One example is the use of crop varieties with genetic traits (long coleoptiles) allowing them to emerge from deeper in the soil where there is moisture, rather than waiting for the increasingly unreliable autumn rainfall for sowing.

The potential for the long coleoptile trait to improve establishment and yields is being demonstrated in field trials, Early learnings from multi-site, multi-system assessment of new long-coleoptile genetics for deep sowing of wheat - GRDC. More information is available here, contact: Greg.Rebetzke@csiro.au.

## Dust forecasting and hindcasting

Loss of groundcover, which is exacerbated by drought, leads to dust in the atmosphere and soil loss. Airborne dust can be transported hundreds of kilometres, causing dust storms, low visibility, poor health outcomes for animals and humans, and deposition of dust onto surfaces. Hindcasting using our model shows where hot spots of loss are likely, allowing us to engage with industry to develop strategies to reduce soil loss.

Knowledge of when and where dust storms are likely to cause problems (forecasting) – even at short lead times – is beneficial. We developed a new dust model that estimates the current geographical extent and flux of soil lost, where it travels to and is deposited, and the total number of days per year that population centres experience air quality issues due to dust. Using decadal weather predictions, we aim to develop the capability to continue forecasting potential dust loss for the years ahead. For further information, contact: Kathryn.Emmerson@csiro.au.



## Information to aid risk sharing

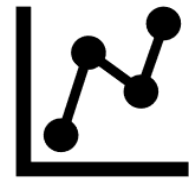
Adapting new farming systems alone will not reduce financial losses in the worst of years, so we are using our modelling tools and analytics to underpin the development and adoption of market-based risk sharing strategies.

By engaging with industry, we are exploring how yield variation in one location can be presented so that growers and insurers understand the risks. This is relevant to other risk sharing instruments such as external investment, marketing, and new options and hedging approaches. We are working with the Bureau of Meteorology to evaluate the use of private weather stations to assess weather monitoring on a denser grid potentially extending observations close to more farmers. New risk instruments could utilise this capability and provide the agricultural sector with tools and capability to manage climate variability. For more information, contact: Mike.Williams@csiro.au.





# Regional resilience



The focus of the regional resilience work package is to develop partnerships with regional communities to co-design and implement technologies, tools and policies at scale that improve regional resilience going into, during and in recovery from drought.

Potential benefits include improved community resilience, increased regional water security, and a reduced need for government and charitable assistance through the drought cycle.



# Regional resilience

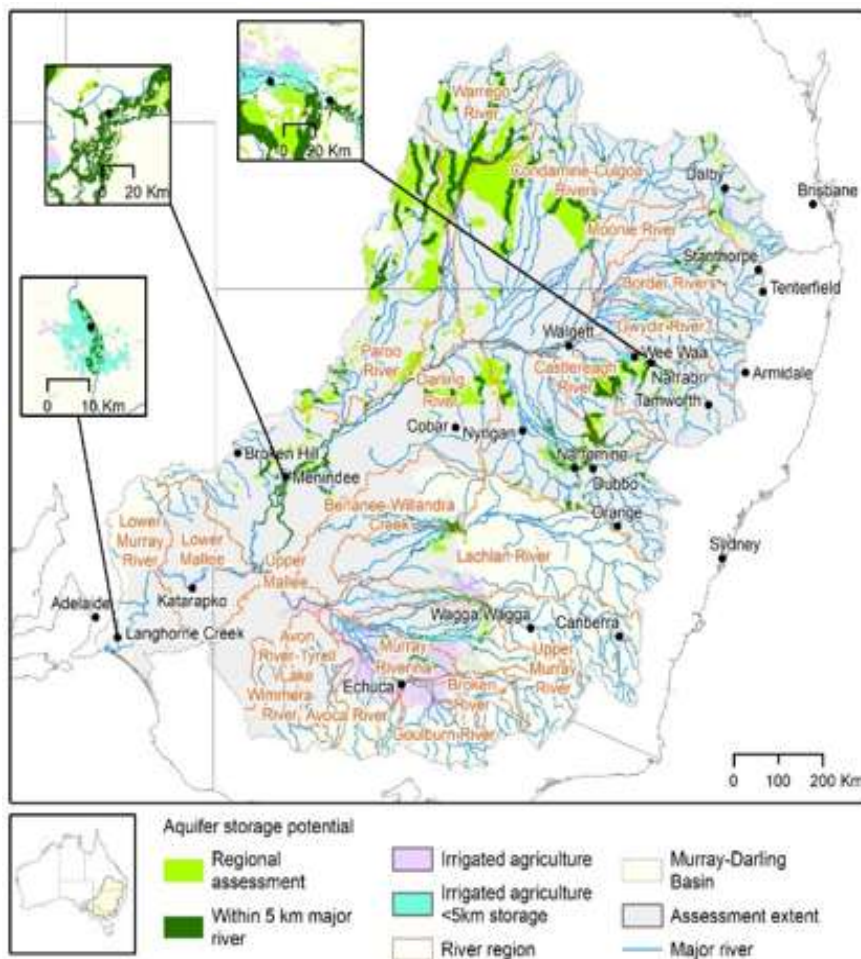
## Increased regional water security

Regional communities are affected economically, socially and directly by the threat of running out of water. Many Australian towns approached day zero – the day they would run out of water – in the last drought. Some towns did run out of water, impacting their ability to operate due to expensive water cartage.

We are working with local communities to address the problems of water security and regional resilience more broadly. For example, we are pursuing water banking to store water in underground aquifers when there is water available, to be withdrawn later in times of drought.

We recently assessed the opportunity for the equivalent of eight Sydney Harbours worth of usable water storage in aquifers within the Murray Darling Basin, located within five kilometres of a major water course.

We are also investigating how water banking and portable de-salination could help agricultural industries and analysed the costs of different forms of managed aquifer recharge in agriculture. We are currently seeking to develop consortia of users and regulators to collectively progress the regulatory environment and establish demonstration sites. For more information, contact [Declan.Page@csiro.au](mailto:Declan.Page@csiro.au).



Aquifer storage potential in the Murray Darling Basin



## Increasing community resilience

We have been discussing our approach to resilience thinking and practice in the context of drought and the utility of CSIRO's Resilience, Adaptation Pathways and Transformation Approach (RAPTA) for design, implementation and assessment of resilience plans to the Federal Government Department of Agriculture Future Drought Fund team. We have also been adapting RAPTA for drought preparedness through engagement and an alliance of grower groups, local councils and others in drought affected regions to develop science-based transition planning. This involves collaborative research to identify the current state and trajectory of community wellbeing and resilience, identify future scenarios and develop innovative economic transition options and pathways, and create key business cases for implementation to set the resilience plan in motion. We have been working with FarmLink, Temora Council, Charles Sturt University, the Western Australian Growers Group Alliance, and the Birchip Cropping Group to explore opportunities to work together on building rural communities' resilience in drought affected regions.

We are providing independent assessment of Regional Drought Resilience Plans (RDRPs) being developed by rural regions under the Future Drought Fund Regional Drought Resilience Planning Program – a collaboration between the federal and state governments. Further information available [here](#).

We will be deploying an extensive experience of the application of RAPTA and recent learnings with partners to assess the drought resilience plans and provide feedback to regions. In addition, we will develop detailed guidelines for drought resilience plan assessment. Twenty-three RDRPs are expected in the first year of the three-year RDRPs Assessment project. For more information, contact:

Yiheylis.Maru@csiro.au.



# Policy enablement



The focus of the policy enablement work package is to partner with governments to provide analysis and insights, as well as useful platforms, technologies, and tools that inform policy development.

Through the National Drought Agreement and establishment of the Future Drought Fund, the Australian Federal Government has re-enforced its aim to move from responding to drought as a crisis to encourage preparedness.

These developments will help deliver enhanced economic, environmental, and social resilience throughout drought cycles.



## Policy enablement

### National Drought Map

The National Drought Map was established in 2019 and some of the recently added data layers include soil characteristics, bush fire boundaries and pastoral lease boundaries. Data layers are now curated for target user groups.

We have also been working with the Department of Agriculture Water and Environment to plan the future uses of the map. For more information contact [Ana.Belgun@csiro.au](mailto:Ana.Belgun@csiro.au)



National Drought Map

### Climate Services for Agriculture program

Working with the Department of Agriculture, Water and the Environment and the Bureau of Meteorology through the Future Drought Fund, we are building the Climate Services for Agriculture Platform.

Guided by end users input and feedback, the second prototype was delivered in December 2021. The website provides historic and future climate information on a 5 km grid across Australia.

The program will support users to make decisions based on the risks and opportunities of future climate. A short video showcasing the progress to date is available [here](#). For more information, contact: [Graham.Bonnett@csiro.au](mailto:Graham.Bonnett@csiro.au)





# More information and to get involved

The Drought Resilience Mission welcomes ideas and engagements from all interested partners and investors.

For more information on the Mission and how to become involved, please contact us on the details below.

We look forward to meeting with partners and investors at the following upcoming events:

- Future Drought Fund Science to Practice Forum 2022  
7-9 June. Visit: [Science to Practice Forum - DAWE](#)
- AgCatalyst 2022.  
Discover what CSIRO's working on nationally and regionally to prepare our agriculture and food sectors for a challenging future.  
22-23 November 2022 at Luna Park, Milsons Point Sydney. Visit: [AgCatalyst 2022 - CSIRO](#)

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