

A large, spreading tree with a thick trunk and many branches stands in the center of a vineyard. The sun is low on the horizon, creating a warm, golden glow across the scene. The vineyard rows stretch out behind the tree, and the foreground is filled with tall grass.

Report for The Legatus Group

Emerging themes for drought response and climate change resilience

21 February 2020



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Revision	Revision Details	Author	Approved by	Date Approved
V1.0	Draft	Julian Marchant, Mark Siebentritt, Andy Chambers	Mark Siebentritt	21 February 2020
V2.0	Final	Julian Marchant, Mark Siebentritt, Andy Chambers	Mark Siebentritt	5 March 2020

Executive Summary

The Central Local Government Region (CLRG) trading as the Legatus Group (LG) includes some of South Australia's most productive farming land. Over the past three years, all 15 councils in the CLRG have suffered from reduced rainfall and drought. As of January 2020, all councils are eligible for drought relief funding through the Drought Communities Program administered through the Australian Government. The Northern and Yorke Alliance comprises the LG, Regional Development Australia (RDA) Yorke and Mid North, The Northern and Yorke Natural Resources Management Board and associated project partners - RDA Barossa, Light, Gawler, Adelaide Plains and RDA Far North who are seeking to develop a collective funding bid to attract resources for increasing the resilience of the community and farming businesses in preparing for and responding to drought. This will include through the Future Drought Fund which will be administered by the Australian Government Department of Agriculture, Water and Environment.

This report includes information from a stakeholder scan, feedback from a stakeholder workshop held on the 13th February and information from regional adaptation plans and a climate vulnerability assessment. The aim of this report is to collate key pieces of information about plans and projects that have occurred within the region in the past, identify past priorities and identify gaps that have not been addressed by drought or climate change works since 2011.

A gaps analysis found opportunities for investment in the following areas:

- Business planning and strategic planning
- Mental health, well-being and resilience
- Water
- Science communication and story telling
- Integration of natural resources management with sustainable farming
- Succession planning
- Research and extension

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1 Introduction

1.1 Context

The Central Local Government Region (CLRG, the region) is located in South Australia, extending approximately 305 kilometres¹ from the food bowl of the northern Adelaide Plains in the south to the pastoral districts of the Flinders Ranges in the north, bounded to the west by Yorke Peninsula. The region is a diverse and rich farming area with horticulture, grape and wine production, broadacre, wool, livestock and pastoral farming prospering within the region.

Land use changes quickly throughout the region. The northern end of the region (Flinders Ranges, Orroroo and Carrieton, Mount Remarkable, Peterborough) experience higher temperatures and reduced rainfall and are predominantly utilised as pastoral lands and sheep grazing². The southern and central areas are hubs of grape and wine production, horticulture, wool and broadacre farming. Drought has had a significant effect on all CLRG districts.

There is a strong correlation within the CLGR between higher productivity farming lands, employment, education and entrepreneurship. The region has an aging workforce³.

Responding to drought has been a priority for councils in the CLGR in South Australia over the past three years. The Legatus Group, which represents 15 councils in the CLGR in South Australia intends to apply for funding for drought relief programs to aid farming businesses and communities in the region respond to drought. All 15 of the councils have experienced drought conditions over the past three years and are eligible for the Future Drought Fund available through the Australian Government Department for Agriculture, Environment and Water. Funding is available from July 2020.

Future Drought Fund projects will:

- Help farms and communities be more prepared to respond to the impacts of drought
- lift the productivity and profitability of the agriculture sector
- enhance the health and sustainability of Australia's farming.

Funding may include the following types of projects:

- Restoring native vegetation for soil or water regeneration
- Financial and business planning for primary producers to improve ability to manage through lower income periods caused by drought
- Training and information for primary producers in areas such as finance and business planning, managing climate risk and sustainable stock management
- Training and information on local climate variability and advice on climate risk applied to specific locations
- Research in drought resilience
- Improving data on fodder and impacts from drought, including market trends.

A longer-term issue identified by the region that will impact primary production is climate change. This has been assessed through numerous studies, including the 2011 climate vulnerability assessment.

¹ Nature Maps 2020, available online: <http://spatialwebapps.environment.sa.gov.au/naturemaps/?locale=en-us&viewer=naturemaps>

² Bureau of Meteorology weather observations (Hawker, Quorn, Clare, Kadina), available online: <http://www.bom.gov.au/sa/observations/map.shtml>

³ Balston, J.M., Billington, K., Cowan, H., Hayman, P., Kosturjak, A., Milne, T., Rebbeck, M., Roughan, S., Townsend, M. (2011). Central local government region integrated climate change vulnerability assessment. Central Local Government Region of South Australia, Crystal Brook, SA. pp.189.

1.2 Purpose

The Legatus Group are exploring partnering with Natural Resources Northern and Yorke, Primary Industries and Regions South Australia, Regional Development Australia – Yorke and Mid North and associated project partners Regional Development Australia – Barossa, Gawler, Light, Adelaide Plains and Regional Development Australia Far North to develop a collective Drought Communities Programme bid.

The objectives of this report are to:

- outline past priorities and projects in the region that have focused on adapting to drought and climate change through building individual and community resilience;
- identify gaps in past projects, plans and works; and
- describe opportunities for projects to be included in the drought relief funding application.

For the purposes of this document, resilience is described as the ability of individuals, farmers, agricultural businesses and communities to prepare for, respond to and recover from adversity brought about as a result of drought.

Information was gathered from the following sources for this report:

- Yorke and Mid North Regional Climate Change Action Plan
- The South Australian Primary Industries Drought Resilience Program
- The Central Local Government Region Integrated Climate Vulnerability Assessment - 2030 report
- The Legatus Group Strategic Plan 2018 - 2028
- CSIRO State of the Climate Report 2018.

1.3 The complexity of drought

Drought is a regular occurrence in the Australian landscape and as such, drought should be planned for as part of any business strategy. Drought is likely to be more regular, longer in duration and broader in area⁴. As such, all businesses within the CLGR should be planning for drought before, during and after drought.

Drought impacts the productivity and profitability of farms. It also affects businesses, communities and regions, with less money spent in rural regions.

Drought has significant environmental and social impacts. Stress caused as a direct result of drought affects the well-being of individuals, businesses and communities⁴. Land may suffer, and good management practices that degrade land are put in place to drive profits and income. This eventually leads to a reduction in the quality and quantity of natural capital and ensures that recovery is harder and lengthier⁴.

Peer-reviewed literature and advice from farmers representative groups shows that preparing for drought rather than responding to it is the best approach⁴. As such, this report focuses on establishing gaps in research and implementation and providing general themes that could be pursued in an application for drought funding.

⁴ Australian Government, Drought in Australia, Coordinator-General for Drought's advice on a strategy for drought preparedness and resilience, available online: https://www.agriculture.gov.au/sites/default/files/documents/advice-long-term-strategy-drought-preparedness-resilience_1.pdf

2 Regional priorities

The 2011 *Central Local Government Region Integrated Climate Vulnerability Assessment - 2030* report (The Climate Vulnerability Assessment) identified a range of environmental, economic and social risks for the region. The Climate Vulnerability Assessment utilised a triple bottom line approach whereby risks and opportunities were categorised across economic, social and environmental capital. Following on from this assessment, Regional Adaptation Plans were developed by the South Australian Department for Environment and Water for every region in the state. Regional adaptation plans were developed for the southern CLGR, including the Barossa Council, Adelaide Plains Council and the Light Regional Council and the Yorke and Mid North region, which included the remaining 11 CLRG councils.

Key risks posed by drought and listed in the Climate Vulnerability Assessment were as follows:

- **Health** - Human mental and physical health is vulnerable to climate change. Direct effects of this vulnerability can range from life-threatening heatstroke in the very young and the very old, and a significant reduction in productive capacity in people of intermediate age, through to greatly increased expressions of heat induced confusion and dementia, and episodes of mental instability in vulnerable individuals. Indirect effects can include depression and suicide amongst those affected by drought, increased vector borne disease (e.g. Ross River virus) and food borne disease caused by heat induced breakdown of food storage and handling cool-chain. Other direct effects include dust menace, and indirect effects such as the exacerbation of existing poor health conditions. Rural communities suffer from higher incidences of mental health problems, partly due to specific circumstances and partly due to barriers encountered when seeking effective care.
- **Agricultural production** - All sectors of agricultural production are expected to be impacted by climate change. Cereal production is the most valuable commodity produced in the Central Local Government region. Wool production in the study region was worth \$55 million in the 2005/06 financial year. Livestock for meat and products was worth \$316 million to the Central Local Government Region in the 2005/6 financial year. Horticulture was worth about \$92 million to the Central Local Government Region in 2011 and may increase by half this amount again in the near future. Winemaking and grape production directly accounted for 10% of gross regional product in the 2006/07 financial year. Indirectly, the industry accounts for a larger proportion again when transport, packaging, bottle making, engineering and tourism associated with the industry are included.
- **Tourism** - Tourism based on the region's landscapes, beaches, national parks and excellent food and wine experiences provides an important source of income for the region. A deterioration of natural landscapes and the viability of food and wine production due to lower rainfall, erosion of beaches due to sea level rise, and an increased frequency and intensity of heatwaves and bushfires present significant threats to existing tourism activities. While the tourism sector has a medium degree of vulnerability over the period to 2030, vulnerability for particular activities and regions may be significantly higher over more distant horizons (e.g. wine based activities in the Barossa and beach activities in the Yorke Peninsula).
- **Education** - Education is important to enable people to make well-informed, long term, sustainable decisions about climate change (WHO 2003). Poor education levels reduce the ability of communities to reach out for, and effectively apply, the information and technology that is available about the challenges that climate change will bring. Even a well-resourced and focussed community can be severely hampered by a lack of ability to access and apply the information they need (Mowling, Balston et al. 2009). Education levels in the study region are lower than for the comparable State averages. As improved education can be directly correlated with both better health and greater adaptive capacity, it is important to attempt to increase education levels throughout the region. Options to increase education in the region may also assist to retain younger people, which would have a beneficial effect on social networks and would reduce vulnerability overall.

- **Landscapes vulnerable to erosion and dryland salinity** - Wind erosion and dryland salinity are major issues in the plains and on Yorke Peninsula while water erosion is a more significant threat in the ranges. The root cause of many of these issues is the clearance of vegetation and subsequent degradation of the soil cover and intensive farming. Warmer and drier conditions are likely to change the soil's capacity to support vegetation and dependent fauna.
- **A sense of belonging** - A sense of belonging is one of the key social assets of rural communities and can reduce vulnerability to any change that disrupts social fabric, as drought and other climate change related phenomena can.

The Yorke and Mid North Regional Climate Change Action Plan

Information gathered through the development of the Climate Vulnerability Assessment was used to generate a regional climate change action plan (RCCAP). The RCCAP listed priorities for the region, based on the known and predicted effects of climate change. The focus of the RCCAP was to define the risks and list actions that will increase the adaptive capacity of individuals and communities to respond to climate change. This included events such as drought.

The Yorke and Mid North RCCAP listed several priority projects and actions. The focus areas range from governance, water resources management, biodiversity, industry and workforce development and community development and emergency management. A focus of the adaptation strategy was building community education and engagement through a regional sustainability centre. Through this, there was an aim to empower the community and grow resilience. Aiding this cause was the preparation of a community engagement strategy and whole of region carbon reduction strategy. The sustainability centre was intended to provide information on locally relevant adaptation strategies and technologies and seek to partner with an industry group.

The broad themes for climate action are described below:

- **Agriculture**

Past drought resilience priorities have focused on increasing the productivity and profitability of farming communities through demonstrating best sustainable practice and aiming to upskill individual farmers through group education. These sessions have delivered information that is relevant to farmers who are wishing to improve farm practices and increase yields whilst minimising expenses.

Past priorities have focused on the long-term sustainability of the various agriculture sectors through research and development, demonstration trials and locally hosted training, such as workshops and field days. The agricultural bureaus, funding bodies, peak bodies and locally based research and development/demonstration providers offer multimedia, audio and written media to convey information to their broader audience. Demonstration trial sites, crop walks and field days are offered as a way of engaging farmers in authentic learning experiences.

A range of agronomic trials investigating the effects of heat, temperature and reduced rainfall on farming systems have been conducted since 2011. Groups such as the Hart Field Day Site, The Upper North Farming Systems and Northern Sustainable Soils have been active in the delivery of local trials, the collection of data and promotion of practices and research to this region's communities. These groups are supported through funding and promotion offered by organisations, such as the AgExcellence Alliance, Grains Research and Development Co-ordination and Primary Producers SA. There is evidence of significant collaboration between different agricultural organisations to achieve a common goal with research often funded through multiple bodies and conducted through other providers.

- **Fire**

The Northern and Yorke contemporary fire regime is categorised by large infrequent bushfires which burn intensely over summer⁵. The impact of fire on the region has been

⁵ 2016 Yorke and Mid North Regional Climate Change Action Plan – Summary

significant. Prioritising fire monitoring, prevention and response has been a theme for the region, particularly since 2011. Three large fires have occurred in the region (Pinery, Bundaleer and Yorke Peninsula) since December 2013. Over this time, seven of the eleven CLGR councils have had to respond to fire. This has increased stress for volunteers involved in the Country Fire Service, local government and state government agencies, such as Natural Resources Northern and Yorke and Primary Industries and Regions South Australia. Councils from within CLGR have provided resources to other council areas that have been impacted by fire, such as the Adelaide Hills Council in responding to the 2019/2020 Cuddlee Creek Fire and the Kangaroo Island Council in response to the Ravine Fire in 2019/2020. The fire regime continues to be monitored by NRM with fuel reduction burns and fire ecology planning occurring within the region⁶. The aging population base, increased demand on volunteer fire fighters and other volunteer organisations is an area that needs further attention. The NRM Strategic Plan cites increased fuel loads through a reduction in the amount of fires (both prescribed burns and bushfire) and an extended bushfire season due to a warming climate as increasing pressure on flora and fauna systems⁵.

- **Biodiversity/conservation**

From a governance perspective there is a focus on aligning Natural Resources Northern and Yorke with PIRSA, RDA – Yorke and Mid-North and local councils to ensure that the delivery of works, community engagement and promotion of drought related biodiversity, conservation and natural resources management projects are maximised. A strategic NRM plan for the region is developed and renewed every ten years and a business plan is renewed every four years. The strategic plan outlines guiding principles in regional NRM planning, monitoring and reporting. 500 bushland condition monitoring sites are located within the region⁵. A key focus of this is actively engaging communities in works and planning. Several Landcare groups and Friends of Parks groups exist within the region, with activities focussed on revegetation, conservation, habitat creation and biodiversity. Structured monitoring of fauna within the CLGR occurs on an ad hoc basis according to specific project goals and funding. The Legatus Group Strategic Plan 2018 – 2022 lists ‘work together to manage the sustainability of communities within their natural environment’ as a strategic priority⁷.

- **Water**

Water is a vital asset for agriculture, community and the environment. For many farmers in the region, they are reliant on rainfall. Other sectors such as the grape and wine sector, are primarily reliant on water sourced from the Murray Darling Basin and to a lesser extent on groundwater, surface water and community wastewater management schemes. Access to acceptable quality water and accessing enough water to sustain farms is a driving priority for the region. The reliance of certain sectors of agriculture on the Murray Darling Basin is unsustainable and alternative sources need to be found. The Department of Environment and Water monitors the salinity and water level of particular aquifers within the region and has done so since the 1970s⁵. The focus of groundwater monitoring is at high value sites like Baroota and Clare where water quality risk is highest. Salinity of groundwater is often correlated with extended periods of below average rainfall, as occurs through drought times. Poor irrigation practices can further exacerbate groundwater salinity levels.

Major catchments within the CLGR are managed through a river management plan. 14 surface water monitoring sites are recorded throughout the region⁵. The monitoring of permanent pools within the CLGR occurs on an ad-hoc basis according to funding and project focus. Water from rivers and ephemeral pools is primarily used for watering stock.

⁶ Government of South Australia, Natural Resources Northern and Yorke Strategic Plan 2019-2029.

⁷ Legatus Group Strategic Plan 2018-2028

Water Allocation Plans, that dictate the use and take of water are in place for Clare Valley, Baroota, Barossa and the northern Adelaide Plains⁵.

Options for future expansion of water supply include increased use of treated effluent and stormwater, desalination of existing groundwater or sea water or the extension of the mains water supply lines in an efficient and integrated manner across the whole region (Tonkin Consulting 2005). These options ensure that the region has considerable adaptive capacity regarding the utilisation of recycled water in towns, with a focus on stormwater management³.

- **Well-being**

It is difficult to determine well-being within the CLGR. Readily available indicators as to what well-being means and how it can be measured have not been employed. What does a successful well-being program look like? The impact of agronomy groups, such as agricultural bureaus, Upper North Farming Systems and Mid North Young Guns, no doubt play a crucial role in the delivery of information, communication and engaging farmers in social outings. The impact of how much this improves an individual's well-being is no doubt varied and unknown. Whilst many organisations promote the services of mental health providers, there is no evidence of any of the listed stakeholders offering drought specific well-being counselling or service.

Well-being and resilience programs have previously been run in the region through both the Yorke and Mid North and the Barossa Light Gawler Adelaide Plains RDA.

- **Financial literacy and business planning**

The education and upskilling of farmers has been supported to some extent by particular agricultural groups. This training has been offered via indoor workshops on a sporadic basis. It is recognised that farmers will often engage specialists to seek financial advice and specific farm planning advice. For those farmers who do not have the financial means to access specialist advice, the role of agricultural bureaus and agricultural bodies as communicators of information is key. Of note is the business planning, coaching and development services offered through the Barossa Light Gawler Adelaide Plains RDA, B2B Program.

There has been a series of support workshops that occur post emergency. An example of this is the Disaster response for business workshop after the 2015 Pinery Fire.

³ Balston, J.M., Billington, K., Cowan, H., Hayman, P., Kosturjak, A., Milne, T., Rebbeck, M., Roughan, S., Townsend, M. (2011). Central local government region integrated climate change vulnerability assessment. Central Local Government Region of South Australia, Crystal Brook, SA. pp.189.

3 Gap analysis

3.1 Method

Stakeholder and project scans were conducted of the CLGR to establish relevant stakeholders and to determine the drought focused projects/trials that existed within the region (Appendix A). The results of the analysis are summarised in Appendix A in the following tables:

- **Table A.1.** A website scan of CLGR identified stakeholder's involvement to 'help farms and communities be more prepared to respond to the impacts of drought', as outlined on the Drought Communities Programme website
- **Table A.2.** A website scan of CLGR identified stakeholder's involvement to 'lift the productivity and profitability of the agriculture sector' and 'enhance the health and sustainability of Australia's farming sector'
- **Table A.3** Projects identified through the stakeholder scan that help farmers to life the productivity and profitability of the agriculture sector as outlined on the Australian Government Drought Communities Programme website
- **Table A.4** Projects identified through the stakeholder scan that 'help farms and communities be more prepared to respond to the impacts of drought'
- **Table A.5** Projects identified through the stakeholder scan that 'enhance the health and sustainability of Australia's farming'

Following the scan a workshop was conducted on the 13th of February at the Legatus Office in Clare. Attending the workshop were stakeholders from the Legatus Group, Natural Resources Northern and Yorke, Primary Industries and Regions SA, Regional Development Australia Yorke and Mid North and Regional Development Australian Barossa Gawler Light Adelaide Plains. Information gathered from the workshop has been collated in this report, including identified gaps and common themes.

3.2 Findings

Historical focus on agronomy services

The services and products offered through the region's identified stakeholders shows that there is a focus on agronomy trials and workshops that lift the productivity and profitability of the agriculture sector and in many regards, enhance the health and sustainability of Australia's farming. The Future Drought Fund category that is not addressed well through agronomic research and development and the communication of knowledge is to help farms and communities be more prepared to respond to the impacts of drought.

Whilst some projects/trials/workshops focus on farming in reduced rainfall scenarios, there are limited organisations and projects that help farmers and communities to respond to the impacts of drought and even less that prepare farmers and communities for the impacts of a changing climate.

Drought resilience and adaptation projects in the CLGR have primarily been delivered through agricultural organisations. The focus of these projects has been on improving the productivity of farms, demonstrating and sharing information and data related to either reduced rainfall, increased heat, changes in practice due to weather conditions or the impact of heat stress and reduced rainfall on yield.

Three projects had a focus on the capture and storage of weather data and soil moisture data for particular areas. Since 2011 there has been an increase in the number of weather stations across the region and the variety of data captured through weather stations and soil moisture probes.

Three time of sowing trials have been conducted over this time, researching heat and frost stress, seasonal conditions and yield loss. Six trials researched water use efficiency, while three trials/workshops demonstrated ways of managing crops or stock in dry conditions. One workshop delivered information aimed at improving the resilience of farm businesses under risk and uncertainty. This was the only trial or workshop to mention resilience. One trial specifically mentioned responding to climate variability. A further fifteen trials covering a range of topics including sustainable land management, controlled traffic in low rainfall zones and crop sequencing were identified.

Access to services across the region

The communities that are well connected to the grape and wine and cropping sector in the southern and central areas are well supported both through exposure to research and development and access to social capital, social support networks, data and information. The farmers in marginal areas, particularly through the pastoral districts have a reduced access to farming bodies and therefore the associated benefits of shared knowledge, research and development and social support. The areas experiencing the greatest effects of drought, have reduced access to support and training.

Financial support and business planning

The Rural Financial Counselling Service employs 120 rural counsellors across Australia to assist with business planning⁴. There are five dedicated officers for the Yorke Peninsula, Southern Flinders, Mid North and Upper North, Upper North and Southern Flinders and Lower North, Barossa and Eastern Eyre Peninsula. Offices are based in Clare and Ardrossan. Many stakeholder organisations provide some form of financial support, through grants or funding for drought affected properties and businesses. This support appears limited in nature and not necessarily financially sustainable. The need to attract funding that is medium to long-term and sufficient enough to support farmers and rural communities affected by drought is critical to the long-term productivity of farms in the region.

Many farmers may seek business and financial advice from agronomists and accountants. There appears an opportunity to offer a free service or training on general advice regarding the banking sector and its interactions with agriculture and farming and long-term business planning as it relates to drought and building financial resilience in dry times.

Integrated and extended training

There is a lack of evidence of integrated and long-term training in business management, financial literacy, scenario planning, water use and natural resources management, health and well-being and on-farm support for many farmers throughout the region. The ability of farms already financially stressed to respond well to drought and to access training and services that can improve management and practices is reduced via this. There is an opportunity to offer long-term training that occurs regularly and covers a range of business, well-being, natural resources management and climate data specific to drought conditions and focused on particular sectors and locations. Reichstein⁸ notes that farmers learn in a variety of ways and any extension effort should include a variety of learning and delivery methods. The 'Living Smart'⁹ model may be adopted, whereby participants hear from experts in a particular field for two to three hours per week. The course covers a range of topics relevant to drought and resilience. The participants pay a small fee to encourage commitment to the training. The fee is returned to the participant upon completion of the course.

Water conservation and use

Water quality and quantity is measured throughout various locations in the region. The data collected through monitoring in most cases is publicly available through the Water Connect website and Natural Resources Northern and Yorke. Water availability and the effect of drought on water quality information is not readily available and easily interpreted. There may be scope to develop a communications strategy that encompasses the essential knowledge that farmers need to know when in drought and facing reduced water availability or reduced water quality. This strategy could be tailored for different agricultural sectors, scenarios and locations utilising recent data and skilled communicators.

Weather vs climate data

Australia's climate has warmed by over 1°C since 1910¹⁰. There has been a decline in April to October rainfall of 11% in South East Australia since the 1990s¹⁰. In the interests of long-term planning, it is critical that farmers have a thorough understanding of weather systems, climate and climatic trends. This is key to planning and developing strategies for farming in reduced rainfall scenarios and

⁸ Reichstein (2017), 'How Farmers Learn', pp3., available online: [Chris%20Reichstein%20NUFFIELD%20REPORT_FINAL.pdf](#)

⁹ Living Smart website, available online: <https://livingsmart.org.au/>

¹⁰ CSIRO & Australian Government, Bureau of Meteorology (2018), State of the Climate, pp. 3.

¹¹ Upper North Farming Systems website, available online: <https://unfs.com.au/>

developing resilience in individuals. A training program that increases knowledge of climate, weather and is accompanied by strategies to adapt to this are vital.

Since 2016, 16 new weather stations have been placed throughout the mid-north broadacre farming region to capture soil moisture information and weather data¹¹. Localised weather stations, although useful for those within close proximity to the stations are limited in use for farmers located further away. Weather data is a useful decision-making tool. More weather stations could be funded and placed in the grazing and pastoral areas to provide up to date information that may ultimately help in on farm decision making.

Mentoring, transition and succession planning

The projects and training offered through agricultural organisations, tend to focus on farm practices and the management of farm inputs and do not seek to upskill farmers through extended education programs. There appears to be a lack of delivery or support for farmers who may be considering a transition into another career or succession planning and mentoring. Many younger farmers have not experienced long-term drought conditions and there appears to be a knowledge loss as older farmers transition to retirement.

Community consultation

The Flinders Ranges Council appears to be the only stakeholder seeking community input into determining where grant funding is best spent. In other organisations there appears to be a top-down approach to managing funding and determining how money will be spent.

Integration of sustainable practices with natural resources management

The Department of Environment and Water and Natural Resources Northern and Yorke are the primary bodies dedicated to planning, monitoring, conducting and reporting on natural resources management within the region. Agricultural groups, peak bodies, farmers, volunteer organisations and Landcare groups play a vital role in natural resources management through the region.

Projects occurring through the region are varied and cover various environmental assets including temperate plains ecosystems, coastal ecosystems, surface water, groundwater, marine ecosystems, arid plains and ranges ecosystems, temperate ranges ecosystems, soils for agriculture, permanent grazing and saline ecosystems and interaction between people, industry and fire on these systems. Major issues for the region are water quality and quantity, erosion, soil pH, fire risk, dryland salinity, loss of biodiversity, species loss and marine abundance and diversity.

PIRSA investment has focussed on addressing the continued productivity and profitability of the agricultural industry. Whilst agronomy trials focus on increased productivity and profitability of farms and farming regions, there appears to be a lack of a landscape scale approach to managing natural resources from most stakeholders and agricultural bodies. Many agricultural groups encourage sustainable practices in regard to input use, agricultural practice and agricultural systems and many groups do not incorporate natural resources management, holistic management and regenerative farming. There is a need within the region to engage farmers in landscape scale solutions to complex and challenging drought scenarios. Landcare groups and volunteers across the region are important in the protection of landscapes.

Well-being and mental health

Farmers are intimately linked with every other aspect of their lives as their financial and physical well-being is intertwined with the success of their business and land. A 2016 study¹² found that farmers work longer hours, are less likely to take vacations and are less likely to retire than people in other occupations. The same study found that farmers who lived remotely reported worse mental health than other non-farm workers in the same geographic area. This was regardless of financial hardship, drought worry, or recent adverse events. Farmers are half as likely to visit a general practitioner or mental health professional compared to non-farm workers¹².

The importance of agricultural organisations, not only as leaders in agricultural practice, but as crucial social and support networks for farmers is clear. However, there is a lack of research to understand

¹² Brew, B., Inder, K., Allen, J., Thomas, M., Kelly, B., 'The health and wellbeing of Australian farmers: a longitudinal cohort study, BMC Public Health, available online: <https://d-nb.info/1116253720/34>

and quantify the benefits of these services and programs from a mental health and well-being perspective. Many of the local agricultural organisations link farmers to well-being programs and organise programs that focus on mental health and wellbeing. Peak agricultural bodies list mental health organisations and their contact details on their websites but offer little in regard to support. Regional Development Australia Yorke and Mid North offered wellbeing and resilience training in Clare in 2018. There is an opportunity to source providers of mental health services, such as PERMA training that focuses on well-being and positive psychology and through before and after surveying can quantify change within individuals and communities¹³. Regional Development Australia Yorke and Mid North offered wellbeing and resilience training in Clare in 2018.

4 Emerging themes

4.1 Demonstration projects

Agriculture is the thriving heart of the region. Farmers in the region have largely been proactive in the formation of groups and bodies that drive continuous improvement in the agricultural industry and demonstrate the benefits of new, emerging and scientifically rigorous technologies and practices. Support for this important research and communication role, has traditionally been well supported by funding bodies. The focus of this work has largely been on improving specific practices and not necessarily on whole of farm management or focussed on sustainable practices that have both on-farm benefits and benefits for land and systems beyond the farm. Holistic management of grazing properties is listed as critical in responding to climate change¹³. Biodiversity is mentioned by Fischer *et al.* (2006) as key to enhancing the resilience and a system's capacity to recover from external pressures, such as drought or management mistakes. Landcare groups, volunteers and Natural Resources Northern and Yorke have been active in projects improving biodiversity and land management outcomes.

Gaps

There is an opportunity to deliver regenerative farming demonstration trials that incorporate sustainable agriculture, holistic management and natural resources management across the management of farms and regions. Farmers are the largest land managers within the region and as such, should be involved in the long-term planning of farming in reduced rainfall conditions. One gap identified through this report, is the low number of trials that have focussed on farming in reduced rainfall conditions. There were not any trials found through this assessment that specifically mentioned drought. It is recommended that drought resilience is increased through the demonstration of leading practices in soil management, water management and biodiversity in drought scenarios. This information is best delivered in collaboration with several other themes. This is discussed further in section 5.

Studies show that targeting farmers who adopt holistic management practices (as discussed in this section and Section 5) view their properties in very different ways and can make better informed decisions¹⁴. Farmers who have high adaptive capacity should be identified and targeted first. There is an opportunity to focus on farm management from a systems perspective. Utilising existing research in this field, such as the research conducted through the 'sustainable farms' program run through Australian National University, is one way to introduce new systems and ideas to the region. There is a need to demonstrate and encourage practices that not only have direct profitability impacts but also help to promote better decision making and ensure the long-term productivity and health of land in drought times.

Future projects

Future projects may include:

- Regenerative farming training to assess soil carbon and build productive soils. Training is offered through groups, such as Regenerative Australian Farmers
- A focus on learning from other regions that have experienced drought and had successful models of managing farm businesses during this time
- Integrated projects that demonstrate better models for land management.
- A demonstration farm that can showcase the on-farm benefits of managing land in a regenerative capacity, such as Managing pasture in long -term drought scenarios, Assessment of land carrying capacity in drought times, Improving water efficiency, water capture and storage and water budgeting and Minimising erosion and dryland salinity in long-term drought.

¹⁴Sherren, K., Fischer, J., Fazey, I., 'Managing the grazing landscape: Insights for agricultural adaptation from a mid-drought photo-elicitation study in the Australian wheat belt.' *Agricultural Systems*, Vol. 106, Issue 1. Feb 2012 pp 72-83.

4.2 Succession planning

Succession planning, estate transfer and the transition of farmers has traditionally been a private affair, with little evidence of support or tools offered through providers to help with transition. Research indicate that communication of succession planning within small business in Australia is poor.

Andrew Beattie of Pro Advice Pty Ltd, notes that for the main farmer, who is usually male:

- 30-40% have not discussed succession with their spouse
- 50-63% have not spoken (about succession planning/estate planning) to farm based children
- 82% have not spoken to their daughter in-law (about succession planning/estate planning)¹⁵

It is also noted that there is evidence that a lack of formal succession planning can increase stress and reduce the productivity of the farm¹⁴. There is a lack of evidence of drought specific support combined with resources for farmers in the region who may not be able to keep the farm financially viable and as a result are forced to transition to another career or forced to transfer the management or sale of land to another party. Several peak bodies offer resources and information regarding succession planning. This is not information that is incorporated into any formal education or training. Rural financial counselling operates within the region, however, the outcomes of their function are not publicly available.

Gaps

There is potential for the development of a training program and supporting resources or to secure the services of a provider to incorporate proven methods of reducing stress and complications around succession planning or the transition of farmers into other areas of the workforce. Mentoring of younger farmers who may not have experienced the effects of drought is needed. Drought has large influences on cash flow, profitability, business risk and business management. It also has a large impact on the regenerative capacity of land. Those farmers who have established frameworks and have planned for drought have increased ability to manage the land and business in a more sustainable manner in times of drought. As such, it is critical that information and experience from previous droughts is incorporated into current farm management.

Future projects

Succession planning, mentoring and transition sessions may be incorporated through formal training and informal social settings, such as in the following scenarios:

- A mentoring program organised through a particular peak body or multiple peak bodies and operated through local agricultural bureaus, Landcare groups and agricultural extension groups. This work may be facilitated by NRM, local government or private business.
- Formal succession planning to identify what works well, what are expected difficulties and how drought and reduced rainfall will impact farms during times of succession planning. This program should encourage farmers to be proactive in succession planning and not wait until death, injury or when someone has “had enough”.
- Services that outline the course of action, if drought results in the need to sell the farm or estate and a farmer must transition to another career. This should be coupled with other drought and farming information and not a stand-alone package.
- Succession planning to be discussed as part of a broader strategic plan. See the Business scenario planning

4.3 Business innovation planning

There are a number of resources available online through peak bodies that provide information to help farm businesses develop strategic plans, including a vision, key objectives and an implementation

¹⁵Beattie, A (2014), Succession planning – the do's and don'ts of family succession, available online at: <https://grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2014/08/research-update>

plan. There is also advice offered regarding understanding a bank's approach to farm business. As with succession planning, business scenario planning is traditionally a service that has been filled by agronomists and accountants. Some farmers have the economic means to pay for this service and others do not. There is little information on available low cost or free training to assist farmers in developing strategies in ensuring their business is prepared for and can respond to the effects of drought and the expected changes associated with a warming climate. Research indicates that when people are under stress they may experience cognitive overload and experience difficulty in making decision¹². It is for this reason that planning should occur outside of peak stress times. Farming associations and groups have offered training in this field in the past, however, not within the past five years and this was primarily offered as a service to women and farmers spouses, daughters and daughter-in-law.

Gaps

This report found that there are not many low cost or free services of providers offering support or training for farms wanting to develop long-term strategic plans that incorporate business scenario planning and the inevitability of drought and responding to drought. The importance of businesses having a clear vision of their property and having options at their disposal to prepare for and respond to drought are critical in building business resilience. A recurring theme has been the gap that exists between the banking sector and farm businesses. Farmers may not necessarily understand what banks are looking for when assessing a farm business profitability and viability.

During times of drought, farmers may need to seek other forms of income. The *Drought in Australia*⁴ literature recommends that farms develop other forms of income. This may include carbon farming, tourism and on-farm green energy options, such as solar and wind farms. Carbon farming has additional on-farm benefits of improved soils, biodiversity and increasing the ability of land to respond to drought⁴.

Future projects

In order to help with the long-term resilience and viability of farm businesses within the region, there needs to be a focus, not just on the delivery of agronomic services and demonstration of farm services but planning of well run businesses that are expecting and prepared for reduced rainfall and drought. The following are suggested programs that could be run to upskill knowledge within the community.

- Tailored workshops and programs utilising specialist knowledge from leading agricultural consultants and services that lead farmers through strategic planning (incorporating succession planning) for farm business. Included in this should be a focus on history, values, planning and the expected risks associated with climate change and drought.
- Bridge the gap between banking and agriculture. A formal series of workshops co-delivered by banking staff and business specialists that convey information about the banking sector processes, expectations, access to finance and risk to farmers. The workshops are to be incorporated into a broader business planning training program.
- Identify banks who are willing to develop a partnership and help deliver information or train a facilitator to deliver information to the community. A focus should be on a bank's view of drought and the long-term risks and opportunities of climate change.
- Consider programs that provide supplementary income to farms, such as carbon farming, environmental stewardship, tourism and renewable energy. Options, such as farm stays, events, bush walking, on-farm experiences are popular tourism experiences.

4.4 Mental health, well-being and resilience training

Mental health services are available throughout the region. Many of these services can be accessed via phone or online. Health services are located within larger regional centres and often include mental health services. Information about multiple services operating within the region is available through many of the identified stakeholder's websites. There are some community driven programs that are proactive in addressing mental health through exercise and social programs. Regional Development Australia Yorke and Mid North offered wellbeing and resilience training in Clare in 2018. Many of these programs are focussed on general well-being. Agricultural research and development and communication bodies play a key role in social cohesion and connecting farmers to one another. The well-being value of this is unknown.

Gaps

Creating resilient communities which can prepare and respond well to drought requires innovation, training and resilient individuals. A well-being and resilience program that can track changes in resilience over time would equip individuals and communities with skills in overcoming adversity, positive psychology and resilience. There is an opportunity to further support community driven initiatives that support well-being in rural communities. Of note, was the lack of prevention services or programs. Many of the services offered are for those who are already suffering mental health issues. A particular focus should be placed on utilising existing long-term research, such as the 'Sustainable Farms Initiative' run by the Centre for Mental Health Research at Australian National University.

Of note is the need to focus health services towards 'remote' individuals and communities, rather than 'regional' communities. Brew *et al.* (2016)¹² found that farmers in remote areas report poorer mental and physical health compared to non-farming rural counterparts. In regional areas, farmers are no different to non-farm workers.

The need to seek community feedback in the design of treatments and prevention programs. This ensures that programs reflect local issues and challenges.

Future projects

Increasing the resilience of communities to the effects of drought and the ability of communities to respond to drought requires resilient individuals. Part of increasing resilience lies in business planning. The following are suggested programs that could be adopted:

- There is an opportunity to source providers of mental health services, such as PERMA + training that focuses on well-being and positive psychology and through before and after surveying can quantify change within individuals and therefore communities¹⁴
- Support grassroots community well-being initiatives through RDA and local government community development programs
- Liaise with external research bodies, such as Professor Philip Batterham from the Centre for Mental Health Research at the Australian National University¹⁵. Use existing research to define trends for farming communities that may apply to the CLGR.
- Focus well-being programs in the areas that need it most, noting that remote areas are more likely to need the greatest assistance.
- Incorporate well-being and resilience training as part of broader drought resilience training. This may include partnering with specialist providers, such as the National Centre for Farmer Health.
- Source leaders and well-regarded groups in the community to promote and participate in well-being and resilience programs.

4.5 Sharing /communicating stories and data

The collection and communication of data and stories can be powerful tools to encourage behaviour change and the adoption of new strategies. Data for agricultural trials has traditionally been captured and stored by research and development teams. There is a huge amount of data gathered through trial work, however, there is limited recent data on responding to drought and reduced rainfall conditions. The communication of data has been controlled to some extent by those who understand and can interpret the data. Largely trial work has been communicated to farmers through the 'seeing is believing' model and events, such as field days, crop walks, demonstration trials etc. The communication of stories is less prevalent with peak bodies and conferences offering opportunities for some to share their story and knowledge. Most agricultural groups utilise social media to share information and events through photos, video and commentary.

¹⁴ South Australia Health and Medical Research Institute, Well-being and resilience centre', available online: <https://www.wellbeingandresilience.com/>

¹⁵ Sustainable Farms Initiative, Centre for Mental Health Research, Australian National University, available online: <https://rsph.anu.edu.au/research/projects/sustainable-farms-initiative-0>

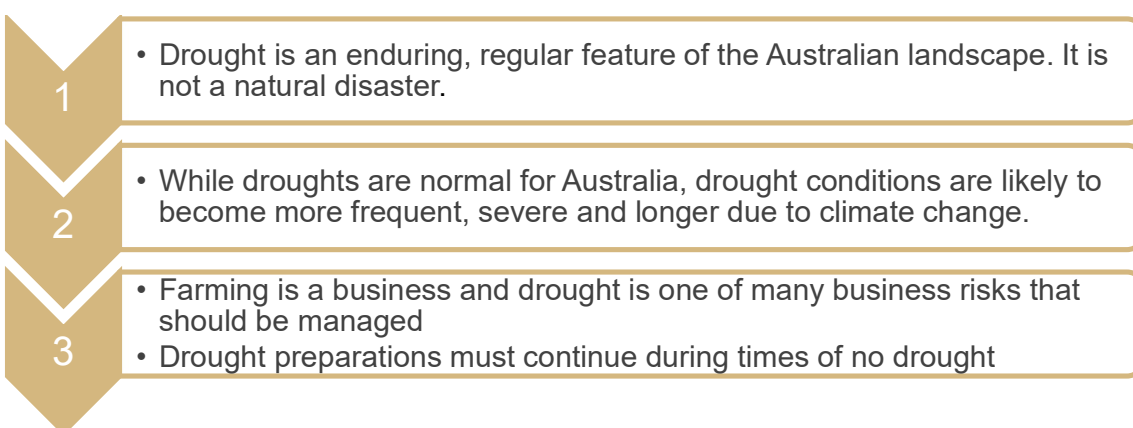
Extension officers employed through the public and private sector play a key role in disseminating information throughout the region. The communication of research and experience from agricultural groups, agronomists, volunteers, NRM and PIRSA employees has been significant in supporting farmers to transition to more economically, socially and environmentally responsible practices.

The use of websites and social media to communicate information is inconsistent between organisations and ineffective in some instances. Some groups, such as Mid-north young guns, utilise social media on a consistent basis to promote the work that they are doing and to promote events. Whilst this platform is used for simple messaging, it is very effective at conveying this. More complex data can be made available to the public in other forms.

Gaps

It is essential that the communication of key messages are consistent and regularly repeated to farmers and communities. Figure 1 lists suggested messaging that needs to be transparent and underpin messaging to all stakeholders. Communication should be consistent beyond drought and support the need for long-term planning and planning for drought in non-drought times.

Figure 1. Strategy foundations as listed in the Australian Governments 2019, 'Drought in Australia – Coordinator-General for Drought's advice on a strategy for drought preparedness and resilience'.



Sharing stories, particularly of successes, failures and learning is important. There is scope to support influential agricultural groups in developing multimedia and written case studies that tell stories about preparing for drought, responding to drought, learning from drought scenarios and developing a narrative around how farmers are learning to thrive in the CLGR despite of drought. Data is often localised and not necessarily readily available to the public. There is scope to collate data from a number of sources, find trends and patterns and communicate this information through farming networks. Communication should be distributed through several sources and channels including local media, face to face farm visits and credible online channels.

Research shows that trusted advisors are highly influential⁴. Government can focus on the delivery of messaging through trusted advisors and developing packages and skills training that targets the education of trusted advisors. This 'train the trainer' model can increase the spread of messaging and communication and can enable farmers to take action.

There is a need to better communicate key messages, stories and data. A scan of stakeholder websites conducted as part of writing this paper, showed that the communication of information is inconsistent between organisations and often difficult to find on stakeholder websites. Information needs to be readily accessible. It is recommended that a dedicated website be developed to convey drought specific information, collated from a number of key stakeholders into one location.

Future projects

Stories can make data interesting and relevant to farmers. The following are suggestions on ways to communicate large amounts of data and personal experiences through stories

- Capture stories through agricultural groups and Landcare groups regarding the challenges of drought, ways that farmers are building resilience and successes and challenges of farming in dry conditions. Promote the stories through social media channels, websites, community noticeboards, local media etc.
- Partner with research and development groups to access and interpret large data sets relating to reduced rainfall and drought. Utilise the data to develop themes, trends and patterns. Develop stories based on these themes and communicate to farming groups.
- Through NRM and PIRSA networks, identify leaders and early adopters within the sector. Develop demonstration trials around drought related management of stock and crops.
- Develop a 'train the trainer' model that targets trusted advisors in the region.
- Share water related information and data. Data on groundwater quality and quantity and the effect of drought on this, should be readily communicated through the integrated workshop model and case studies. Understanding water better is critical to its responsible management and use and its long-term sustainability.
- Develop a drought specific website. Data, stories and information sought from other stakeholders can be stored here. The website could be used to promote events, opportunities, services, products, guides and good news stories.

4.6 Water

Major water sources are monitored regularly throughout the region. Surface water and groundwater supply and quality are monitored through the Department of Environment and Water, Natural Resources Northern and Yorke. Rainfall and soil moisture are monitored through weather stations and the Bureau of Meteorology. Knowledge around the management of water and the interactions of water and drought are well understood by Natural Resources Northern and Yorke. This information is not necessarily equally understood by farming groups. Water information should be communicated to relevant stakeholders.

Gaps

Water sensitive urban design (WSUD) is common practice in the urban setting. WSUD is not well adopted throughout the region. Fourteen Water Sensitive Urban Design (WSUD) projects are listed by Water Sensitive SA within the CLGR region¹⁶. These projects are limited in their distribution to Barossa Council, Light Regional Council, Yorke Peninsula Council and the District Council of the Copper Coast. Two of these projects has been initiated since the 2011 Climate Vulnerability Assessment, with the remaining twelve projects predating 2011. Nine of these projects are listed as community wastewater management schemes, where the water is used to irrigate crops, such as Lucerne and grape vines or used to irrigate turf for sports fields and golf courses. One project is for the purpose of flood mitigation and environmental flows, whilst only two projects utilise stormwater runoff. A long-term strategy to reduce the reliance of grape and wine production on water sourced from the Murray River is required.

Further research is required to better understand the relationship between rainfall and change in landuse. Andrich and Imberger (2013)¹⁷ found that the loss of significant vegetation as a result of urbanisation and land use change in South-West Western Australia resulted in significant changes in

¹⁶ Water Sensitive SA, WSUD Projects webpage, available online: <https://www.watersensitivesa.com/wsud-projects/>

¹⁷ Andrich, M.A., Imberger, J., 'The effect of land clearing on rainfall and fresh water resources in Western Australia: A multi-functional sustainability analysis', The International Journal of Sustainable Development and World Ecology, 20(6), available online: https://www.researchgate.net/publication/263071328_The_effect_of_land_clearing_on_rainfall_and_fresh_water_resources_in_Western_Australia_A_multi-functional_sustainability_analysis

rainfall over inland areas. There is potential to run water specific training that is incorporated into a broader training program. Landscape hydrology could be incorporated into this training.

Future projects

Water is essential to the long-term viability of farming in the region. The following are possible projects that could be undertaken to better harness and use water:

- Increase the use of WSUD to capture, store and clean stormwater and wastewater.
- Investigate the use of wastewater and community wastewater management schemes (CWMS) as suitable water for the irrigation of spaces within towns as greening and cooling mechanisms or as irrigation for pasture or suitable crops.
- Investigate the log reductions required and suitable water quality technology needed to utilise CWMS water for use in watering pasture or crops.
- Investigate the use of recycled water from the Northern Adelaide Irrigation Scheme for use in watering of grape vines in the Clare Valley.
- Incentivise farmers to capture rainwater through schemes that utilise water storage and capture.
- Investigate aquifer storage and recharge for low rainfall zones.
- Incorporate weather and climate information into water related education programs.
- Landscape hydrology training incorporated into a broader training program.

4.7 Cross cutting themes

Integrated training program

Integrated training programs that utilise a variety of delivery methods and cater to different learning styles, tailored to different sectors and locations could be developed. Increasing the resilience of individuals and communities requires the upskilling of the community in a range of skillsets that extend beyond agronomy and individual farm management.

Information should not be delivered in a standalone manner. Information should be communicated to farmers and the broader community as a multi-disciplinary program that covers a range of topics that are relevant to resilience building in drought conditions and relate to long-term planning.

As previously mentioned, farmers learn in different ways and the training program should reflect this, offering training and skill development through field and workshop-based experiences, including local knowledge, knowledge from outside the region and specialist skills. The community and program will benefit from the opportunity to provide feedback on delivery and content of the program.

The goals of this training should be clear and transparent for all participants. Ideally, survey data would be collected that allow for program evaluation.

There is scope to develop a pilot program and run this program in a particular district. Participants provide feedback on the success of the program. Necessary changes are made to the program prior to running the program in other districts.

Essential to the success of this program is the recognition that the issues that each council area faces will be different. The program could be tailored to the key issues within each particular council region and delivered in collaboration with trusted and influential farming groups.

Programs that incorporate well-being, natural resources management, demonstration sites and business planning are needed to address the complexity of issues that arise due to drought. This is key to increasing community resilience and noted in The City Resilience Framework.

There is an opportunity to adopt programs and tailor these programs to districts of the CLGR. Regenerative agricultural principles and knowledge could make up a significant portion of training. However, it is noted that this training needs to be attractive, relevant, organised and tailored to those who are not usually able to access training whilst also attracting those who are willing and able to make changes.

Training needs to help those in the greatest need, whilst also supporting those who have the financial and personal ability to change.

Figure 2. A model of integrated learning.



An Integrated learning program delivered through a variety of communication channels, trusted advisors, demonstration sites/demonstration farm and in partnership with others

Long-term planning

The medium to long term climate forecast for south-eastern Australia, predicts a reduction in rainfall, an increase in intensity of rainfall events and a change in rainfall timing¹⁰. Coupled with this is an expected increase in evaporation¹⁰. As a result, it is essential that farmers are looking well into the future when conducting business planning, strategic planning and reviewing their activities. Farmers need to be preparing for a new scenario where rainfall may be greatly reduced to what it is now.

Water and soil health are critical to farming's long-term sustainability in the region. All water capture and reuse possibilities need to be investigated. There is potential to better use wastewater as irrigation for numerous crop types. What might water reuse look like in 2050?

Key to long-term planning is knowing more about what to expect in the future and preparing for it now. Climate education across the district is needed to ensure that individuals can respond to a drier future. Farmers need to understand and appreciate the risks and adaptation opportunities available to them.

It is noted that a long-term (20 year) study conducted by the Australian National University, under the 'Sustainable Farms' banner has gathered data on:

- biodiversity and ecosystem services in production landscapes
- links between farmer mental health and
- natural resource management and estimating the value of natural assets for farm profitability and financial resilience, and identifying financial tools to support farmers¹⁷

Regional scale planning, data harvesting and understanding

The management of the land needs to be broadened beyond an individual farm. Too many of the agronomic trials and funding models focus on improving the productivity and profitability of individual farms through better practices, better varieties of crop and stock and more understanding of the

¹⁷ Sustainable Farms website, available online: sustainablefarms.org.au/research

application of inputs. These trials do not offer data relating to the management of landscapes, nor do they often include natural resources management practices, a holistic management point of view or incorporate regenerative agricultural principles.

Farmers rely on yield data and crop/stock quality data to assess the quality of their farms and businesses. There is a need to look beyond this data and the need to gather data on soil quality, water quality and quantity and land management at a regional or sub-regional scale. What is the mental health or resilience score of a particular community? How does this compare to other communities? What is the value of ecosystem services within this area? How much does it value add to soil health, water quality or pollination services?

There is potential to partner with research organisations to gather information on the value of ecosystem services, the link between water and land use and the role of regenerative agriculture and holistic management in supporting the resilience of individuals.

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Appendix A

Stakeholder and project scans were conducted of the CLGR to establish relevant stakeholders and to determine the drought focused projects/trials that existed within the region. The results of the scans are summarised below. The results of the scan are presented to align with the objectives of the Drought Communities Programme. The project list does not include information nights or events that appeared to lack training, such as public meetings.

Table A1. A website scan of CLGR identified stakeholder's involvement to 'help farms and communities be more prepared to respond to the impacts of drought', as outlined on the Drought Communities Programme website.

	Education and skill development offered locally (workshops, events, field days, crop walks)	Indirect education provided (web or paper based) - Fact Sheets, data, videos, podcasts, links to funding, other resources	Evidence of collaboration with other organisations	Help farms and communities be more prepared to respond to the impacts of drought						
				Farm planning support (s)/training (T)	Business support/financial planning	Farm exit strategy	Helps farmers and communities respond to the impacts of drought	Prepares farmers and communities for the impacts of a changing climate	Community consultation	Income support available
Hart Field Day Site	Y	Y	Y							
GRDC	Y in partnership	Y	Y	Y (S)	Y					
Upper North Farming Systems	Y	Y	Y	Y (T)	Y					
Ag Excellence Alliance		Y	Y	Y (T)	Y		Y			
PIRSA	Y	Y	Y	Y (S)	y		Y	Y		Y
YP Alkaline Soils Group	Y									
Northern Sustainable Soils	Y		Y	Y (T)			Y	Y		
South Australian Grains Industry Trust	Y in partnership	Y	Y				Y			Y for farming groups
Natural Resources Northern and Yorke	Y	Y	Y	Y (T)				Y		Y
RDA - Yorke and Mid North	Y		Y		Y					Y
RDA Barossa			Y						Y	
Nelshaby Ag Bureau	Y		Y	Y (T)			Y			

	Education and skill development offered locally (workshops, events, field days, crop walks)	Indirect education provided (web or paper based) - Fact Sheets, data, videos, podcasts, links to funding, other resources	Evidence of collaboration with other organisations	Help farms and communities be more prepared to respond to the impacts of drought						
				Farm planning support (s)/training (T)	Business support/financial planning	Farm exit strategy	Helps farmers and communities respond to the impacts of drought	Prepares farmers and communities for the Impacts of a changing climate	Community consultation	Income support available
Point Pass Ag Bureau	Y		Y	Y (T)			Y			
Laura Ag Bureau	Y	Y	Y	Y (T)			Y	Y		
Clare Valley Wine and Grape Association	Y		Y	Y (T)						
Legatus		Y	Y				Y	Y		
Primary Producers SA	Y	Y	Y							
SA No Till Farmers Association	Y	Y	Y							
Society of Precision Ag Australia		Y						Y		
Mid North Young Guns	Y	Y	Y	Y (T)	Y		Y	Y		
Mid North High Rainfall Zone	Y	Y								
Yaka - Moorundie Landcare Group	Y	Y	Y				Y	Y		
Agricultural Bureau of South Australia	Y	Y	Y	Y (T)			Y	Y		
Meat and Livestock Australia		Y	Y				Y	Y		
Grain Producers SA		Y	Y							
Horticultural Coalition of SA										
Livestock SA	Y	Y	Y	Y (T)			Y			
South Australian Dairy Association							Y			
Wine Grape Council South Australia	Y	Y	Y					Y		
Barossa Improved Grazing Group	Y	Y	Y	Y(T)			Y	Y		
Barossa Grape and Wine	Y	Y	Y	Y(T)			Y	Y		

	Education and skill development offered locally (workshops, events, field days, crop walks)	Indirect education provided (web or paper based) - Fact Sheets, data, videos, podcasts, links to funding, other resources	Evidence of collaboration with other organisations	Help farms and communities be more prepared to respond to the impacts of drought						
				Farm planning support (s)/training (T)	Business support/financial planning	Farm exit strategy	Helps farmers and communities respond to the impacts of drought	Prepares farmers and communities for the Impacts of a changing climate	Community consultation	Income support available
Australian Forest Producers Association SA										
Barossa Council										
Light Regional Council		Y					Y	Y		
Adelaide Plains Council										
Clare and Gilbert Valleys Council		Y					Y			
Wakefield Council										
Goyder Council										
Barunga West Council		Y								
Copper Coast District Council		Y								
Yorke Peninsula Council		Y								
Port Pirie Regional Council		Y								
Northern Areas Council		Y								Y
Peterborough District Council							Y			Y
Orroroo Carrieton Council										Y
District Council of Mount Remarkable										Y
The Flinders Ranges Council									Y	
Bute Ag Bureau	No website									
Paskeville Ag Bureau	No website									
South Hummocks Ag Bureau	No website									
Artherton Ag Bureau	No website									
Appila Ag Bureau	No website									
Saddleworth/Waterloo Ag Bureau	No website									

Table A2. A website scan of CLGR identified stakeholder's involvement to 'lift the productivity and profitability of the agriculture sector' and 'enhance the health and sustainability of Australia's farming sector'.

	Lift the productivity and profitability of the agriculture sector					Enhance the health and sustainability of Australia's farming.			
	Agronomy support	Succession planning	Financial planning	Access to weather and/or soil moisture data	Risk management	Better social support network	Health, WHS and wellbeing	Reduces environmental impact of agricultural activities through NRM	Encourages best sustainable practice
Hart Field Day Site	Y			Y	Y		Y	Y	
Grains Research and Development Co-ordination	Y				Y		Y		
Upper North Farming Systems	Y	Y		Y		Y	Y	Y	Y
Ag Excellence Alliance	Y		Y					Y	
Primary Industries and Resources South Australia (inc. Rural Solutions)	Y								Y
YP Alkaline Soils Group	Y			Y		Y			
Northern Sustainable Soils	Y					Y	Y		Y
South Australian Grains Industry Trust	Y			Y - funding provided	Y				Y
Natural Resources Northern and Yorke					Y		Y	Y	Y
Regional Development Australia - Yorke and Mid North									Y

	Lift the productivity and profitability of the agriculture sector					Enhance the health and sustainability of Australia's farming.			
	Agronomy support	Succession planning	Financial planning	Access to weather and/or soil moisture data	Risk management	Better social support network	Health, WHS and wellbeing	Reduces environmental impact of agricultural activities through NRM	Encourages best sustainable practice
RDA - Barossa, Gawler, Light, Adelaide Plains									
Nelshaby Ag Bureau	Y					Y			Y
Point Pass Ag Bureau	Y				Y	Y			Y
Laura Ag Bureau	Y				Y	Y			Y
Clare Valley Wine and Grape Association									
Legatus									Y
Primary Producers SA									Y
SA No Till Farmers Association	Y				Y	Y			Y
Society of Precision Ag Australia	Y				Y				Y
Mid North Young Guns	Y				Y	Y	Y	Y	Y
Mid North High Rainfall Zone	Y					Y			
Yaka - Moorundie Landcare Group	Y					Y		Y	Y
Agricultural Bureau of South Australia	Y				Y	Y		Y	Y
Meat and Livestock Australia	Y				Y				
Grain Producers SA							Y		
Barossa Improved Grazing Group	Y			Y	Y	Y		Y	Y

	Lift the productivity and profitability of the agriculture sector					Enhance the health and sustainability of Australia's farming.			
	Agronomy support	Succession planning	Financial planning	Access to weather and/or soil moisture data	Risk management	Better social support network	Health, WHS and wellbeing	Reduces environmental impact of agricultural activities through NRM	Encourages best sustainable practice
Barossa Grape and Wine	Y			Y	Y	Y		Y	Y
Horticultural Coalition of SA									
Livestock SA	Y								Y
South Australian Dairy Association									
Wine Grape Council South Australia					Y	Y	Y	Y	Y
Australian Forest Producers Association SA									
Barossa Council									
Light Regional Council									
Adelaide Plains Council									
Clare and Gilbert Valleys Council									
Wakefield Council									
Goyder Council									
Barunga West Council									
Copper Coast District Council									
Yorke Peninsula Council									Y
Port Pirie Regional Council									
Northern Areas Council									

	Lift the productivity and profitability of the agriculture sector					Enhance the health and sustainability of Australia's farming.			
	Agronomy support	Succession planning	Financial planning	Access to weather and/or soil moisture data	Risk management	Better social support network	Health, WHS and wellbeing	Reduces environmental impact of agricultural activities through NRM	Encourages best sustainable practice
Orroroo Carrieton Council									
Peterborough District Council									
District Council of Mount Remarkable							Y		
The Flinders Ranges Council									
Bute Ag Bureau									
Paskeville Ag Bureau									
South Hummocks Ag Bureau									
Artherton Ag Bureau									
Appila Ag Bureau									

Table A3. Projects identified through the stakeholder scan that help farmers to life the productivity and profitability of the agriculture sector as outlined on the Australian Government Drought Communities Programme website

Organisation	Project	Time period	Education and skill development offered locally (workshops, events, field days, crop walks)	Indirect education provided (web or paper based) - Fact Sheets, data, videos, podcasts, links to funding, other resources	Evidence of collaboration with other organisations	Lift the productivity and profitability of the agriculture sector				
						Agronomy support	Succession planning	Financial planning	Access to weather and/or soil moisture data	Risk management
Upper North Farming Systems	Implementation of 16 weather stations across the Upper North Farming Region of SA	2019 - ongoing	Y	Y	Y	Y			Y	Y
Upper North Farming Systems	Barley TOS trial – frost/heat stress effects	2019 - 2022	Y	Y	Y	Y				Y
Upper North Farming Systems	Warm and Cool Season mixed Cover Cropping trial for sustainable farming systems in SE Australia	2019-2022	Y	Y	Y	Y				
Upper North Farming Systems	Yield prophet in the upper north - heat shock	2011-2017	Y	Y	Y	Y				
Upper North Farming Systems	Upper North TOS and yield loss from frost/heat stress	2016-2019	Y	Y	Y	Y				Y
Upper North Farming Systems	Application of controlled traffic in low rainfall zone	2014-2019	Y	Y	Y	Y				Y

Organisation	Project	Time period	Education and skill development offered locally (workshops, events, field days, crop walks)	Indirect education provided (web or paper based) - Fact Sheets, data, videos, podcasts, links to funding, other resources	Evidence of collaboration with other organisations	Lift the productivity and profitability of the agriculture sector				
						Agronomy support	Succession planning	Financial planning	Access to weather and/or soil moisture data	Risk management
Upper North Farming Systems	Rural Business Management 101, women series - sus ag	2016-2017	Y	Y	Y	Y				Y
Upper North Farming Systems	Profit and Risk Management, low rainfall collaboration project	2011 – 2014	Y	Y	Y	Y				Y
Upper North Farming Systems	Profitable sequencing in the low rainfall areas of SE Australia - break crop	2011 - 2016	Y	Y	Y	Y				Y
Upper North Farming Systems	Perennial pasture for soil carbon stocks in cereal zones	2012 - 2015	Y	Y	Y	Y				Y
Upper North Farming Systems	Efficient Grain Production compared with N2 Emissions	2012 - 2015	Y	Y	Y	Y				Y
Upper North Farming Systems	UNFS Weather Station - NDVI, Canopy Temp sensor, Leaf wetness sensor,	Ongoing	Y	Y	Y	Y				Y

Organisation	Project	Time period	Education and skill development offered locally (workshops, events, field days, crop walks)	Indirect education provided (web or paper based) - Fact Sheets, data, videos, podcasts, links to funding, other resources	Evidence of collaboration with other organisations	Lift the productivity and profitability of the agriculture sector				
						Agronomy support	Succession planning	Financial planning	Access to weather and/or soil moisture data	Risk management
Hart Field Day Site	Does temperature affect variety and N decisions?	2018	Y	Y	Y	Y				
Hart Field Day Site	Wheat grain yield response to elevated temperature and nitrogen	2017	Y	Y	Y	Y				
Hart Field Day Site	Can soil organic carbon be increased in a continuous cropping system in the low to medium rainfall zone?	2017	Y	Y	Y	Y				Y
Hart Field Day Site	Managing stubble and fertiliser to increase soil carbon	2015	Y	Y	Y	Y				Y
Hart Field Day Site	Canola growth and development - impact of ToS and seasonal conditions	2014	Y	Y	Y	Y				Y
Hart Field Day Site	Disease dynamics in a changing farm environment	2013	Y	Y	Y	Y				
Hart Field Day Site	Improving water use efficiency – reducing soil evaporation	2012	Y	Y	Y	Y				Y

Organisation	Project	Time period	Education and skill development offered locally (workshops, events, field days, crop walks)	Indirect education provided (web or paper based) - Fact Sheets, data, videos, podcasts, links to funding, other resources	Evidence of collaboration with other organisations	Lift the productivity and profitability of the agriculture sector				
						Agronomy support	Succession planning	Financial planning	Access to weather and/or soil moisture data	Risk management
Hart Field Day Site	Improving water use efficiency – crop rotations	2012	Y	Y	Y	Y				Y
Hart Field Day Site	Managing crop growth and water use	2012	Y	Y	Y	Y				Y
Hart Field Day Site	Improving water use efficiency	2011	Y	Y	Y	Y				Y
Hart Field Day Site	Improving water use efficiency – reducing soil evaporation	2011	Y	Y	Y	Y				Y
Hart Field Day Site	Managing crop growth and water use	2011	Y	Y	Y	Y				Y
Mid North Young Guns	Dealing with a dry start	2019	Y	Y	Y	Y				Y
Stockport Agricultural Bureau	Innovative sustainable land management at Stockport	2013-2015	Y	Y	Y	Y				Y
Ag Bureau of South Australia	Improving the resilience of farm businesses under risk and uncertainty.	2013-2015	Y	Y	Y	Y				Y
Ag Bureau of South Australia	Responding to climate variability	2012-2013	Y	Y	Y	Y				Y

Organisation	Project	Time period	Education and skill development offered locally (workshops, events, field days, crop walks)	Indirect education provided (web or paper based) - Fact Sheets, data, videos, podcasts, links to funding, other resources	Evidence of collaboration with other organisations	Lift the productivity and profitability of the agriculture sector				
						Agronomy support	Succession planning	Financial planning	Access to weather and/or soil moisture data	Risk management
Barossa Improved Grazing Group	Soil moisture monitoring project	Current	Y	Y	Y	Y			Y	Y

Table A.4. Projects identified through the stakeholder scan that ‘help farms and communities be more prepared to respond to the impacts of drought’.

Organisation	Project	Help farms and communities be more prepared to respond to the impacts of drought						
		Farm planning support (s)/training (T)	Business support/financial planning	Farm exit strategy	Helps farmers and communities respond to the impacts of drought	Prepares farmers and communities for the impacts of a changing climate	Community consultation	Income support available
Upper North Farming Systems	Implementation of 16 weather stations across the Upper North Farming Region of SA	Y				Y		
Upper North Farming Systems	Barley TOS trial – frost/heat stress effects	Y			Y			
Upper North Farming Systems	Warm and Cool Season mixed Cover Cropping trial for sustainable farming systems in SE Australia	Y			Y			
Upper North Farming Systems	Yield prophet in the upper north - heat shock	Y			Y			
Upper North Farming Systems	Upper North TOS and yield loss from frost/heat stress	Y			Y			
Upper North Farming Systems	Application of controlled traffic in low rainfall zone	Y			Y			
Upper North Farming Systems	Rural Business Management 101, women series - sus ag	Y			Y	Y		
Upper North Farming Systems	Profit and Risk Management, low rainfall collaboration project	Y			Y			

Organisation	Project	Help farms and communities be more prepared to respond to the impacts of drought						
		Farm planning support (s)/training (T)	Business support/financial planning	Farm exit strategy	Helps farmers and communities respond to the impacts of drought	Prepares farmers and communities for the impacts of a changing climate	Community consultation	Income support available
Upper North Farming Systems	Profitable sequencing in the low rainfall areas of SE Australia - break crop	Y			Y			
Upper North Farming Systems	Perennial pasture for soil carbon stocks in cereal zones	Y						
Upper North Farming Systems	Efficient Grain Production compared with N2 Emissions	Y						
Upper North Farming Systems	UNFS Weather Station - NDVI, Canopy Temp sensor, Leaf wetness sensor,	Y			Y			
Hart Field Day Site	Does temperature affect variety and N decisions?	Y			Y			
Hart Field Day Site	Wheat grain yield response to elevated temperature and nitrogen	Y			Y			
Hart Field Day Site	Can soil organic carbon be increased in a continuous cropping system in the low to medium rainfall zone?	Y			Y			
Hart Field Day Site	Managing stubble and fertiliser to increase soil carbon	Y						
Hart Field Day Site	Canola growth and development - impact of ToS and seasonal conditions	Y			Y			
Hart Field Day Site	Disease dynamics in a changing farm environment	Y			Y	Y		

Organisation	Project	Help farms and communities be more prepared to respond to the impacts of drought						
		Farm planning support (s)/training (T)	Business support/financial planning	Farm exit strategy	Helps farmers and communities respond to the impacts of drought	Prepares farmers and communities for the impacts of a changing climate	Community consultation	Income support available
Hart Field Day Site	Improving water use efficiency – reducing soil evaporation	Y			Y			
Hart Field Day Site	Improving water use efficiency – crop rotations	Y			Y			
Hart Field Day Site	Managing crop growth and water use	Y			Y			
Hart Field Day Site	Improving water use efficiency	Y			Y			
Hart Field Day Site	Improving water use efficiency – reducing soil evaporation	Y			Y	Y		
Hart Field Day Site	Managing crop growth and water use	Y			Y			
Mid North Young Guns	Dealing with a dry start	Y			Y			
Stockport Agricultural Bureau	Innovative sustainable land management at Stockport	Y			Y			
Ag Bureau of South Australia	Improving the resilience of farm businesses under risk and uncertainty.	Y			Y			
Ag Bureau of South Australia	Responding to climate variability	Y			Y			
Barossa Improved Grazing Group	Maximising soil moisture in variable climate	Y			Y	Y		
Barossa Improved Grazing Group	Revegetation demonstration to manage watercourse erosion	Y			Y	Y		

Table A.5. Projects identified through the stakeholder scan that ‘enhance the health and sustainability of Australia’s farming’

Organisation	Project	Enhance the health and sustainability of Australia's farming.			
		Better social support network	Health, WHS and wellbeing	Reduces environmental impact of agricultural activities through NRM	Encourages best sustainable practice
Upper North Farming Systems	Implementation of 16 weather stations across the Upper North Farming Region of SA	Y			Y
Upper North Farming Systems	Barley TOS trial – frost/heat stress effects				Y
Upper North Farming Systems	Warm and Cool Season mixed Cover Cropping trial for sustainable farming systems in SE Australia				Y
Upper North Farming Systems	Yield prophet in the upper north - heat shock				Y
Upper North Farming Systems	Upper North TOS and yield loss from frost/heat stress				Y
Upper North Farming Systems	Application of controlled traffic in low rainfall zone				Y
Upper North Farming Systems	Rural Business Management 101, women series - sus ag				Y
Upper North Farming Systems	Profit and Risk Management, low rainfall collaboration project				Y
Upper North Farming Systems	Profitable sequencing in the low rainfall areas of SE Australia - break crop				Y
Upper North Farming Systems	Perennial pasture for soil carbon stocks in cereal zones				Y

Organisation	Project	Enhance the health and sustainability of Australia's farming.			
		Better social support network	Health, WHS and wellbeing	Reduces environmental impact of agricultural activities through NRM	Encourages best sustainable practice
Upper North Farming Systems	Efficient Grain Production compared with N2 Emissions				Y
Upper North Farming Systems	UNFS Weather Station - NDVI, Canopy Temp sensor, Leaf wetness sensor,				Y
Hart Field Day Site	Does temperature affect variety and N decisions?				Y
Hart Field Day Site	Wheat grain yield response to elevated temperature and nitrogen				Y
Hart Field Day Site	Can soil organic carbon be increased in a continuous cropping system in the low to medium rainfall zone?				Y
Hart Field Day Site	Managing stubble and fertiliser to increase soil carbon				Y
Hart Field Day Site	Canola growth and development - impact of ToS and seasonal conditions				Y
Hart Field Day Site	Disease dynamics in a changing farm environment				Y
Hart Field Day Site	Improving water use efficiency – reducing soil evaporation				Y
Hart Field Day Site	Improving water use efficiency – crop rotations				Y
Hart Field Day Site	Managing crop growth and water use				Y

Organisation	Project	Enhance the health and sustainability of Australia's farming.			
		Better social support network	Health, WHS and wellbeing	Reduces environmental impact of agricultural activities through NRM	Encourages best sustainable practice
Hart Field Day Site	Improving water use efficiency				Y
Hart Field Day Site	Improving water use efficiency – reducing soil evaporation				Y
Hart Field Day Site	Managing crop growth and water use				Y
Mid North Young Guns	Dealing with a dry start				Y
Stockport Agricultural Bureau	Innovative sustainable land management at Stockport				Y
Ag Bureau of South Australia	Improving the resilience of farm businesses under risk and uncertainty.				Y
Ag Bureau of South Australia	Responding to climate variability				Y
Barossa Improved Grazing Group	Bushfire recovery	Y		Y	Y
Barossa Improved Grazing Group	Engaging the community	Y	Y	Y	Y