



final report

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Prepared by: Kate Reardon-Smith, Shahbaz Mushtaq, David Cobon
and Ben Allen
University of Southern Queensland (USQ)

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Prioritisation of strategies to manage climate variability especially drought

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Abstract

Livestock industries underpin the prosperity of many rural families and regional communities in Australia. They are also critical players in the management of natural resources in these regions. Yet these industries frequently face significant challenges in the face of climate variability, market volatility and uncertainty associated with government policy, all of which can place significant pressure on the finances, health and well-being of individual producers and have flow on impacts on land condition and local communities. It is increasingly recognised that a coordinated multi-sector approach to innovation and adaptation is required to meet the complex sustainability challenges faced by agricultural producers in many parts of Australia.

Multi-participant collaborative partnerships and processes—such as those integral to co-innovation (Rossing *et al.*, 2010; Klerkx *et al.*, 2012; Botha *et al.*, 2014; Turner *et al.*, 2016) and design-led systems thinking/innovation (Bucolo and Matthews, 2010, 2011) approaches, for example—have been proposed as a way to more effectively address the complex issues faced by agricultural producers. Such approaches bring together a range of stakeholders in order to both better understand the issues and identify and enable solutions which better address needs and build capacity to enhance the sustainability of agricultural production systems.

The project reported in this document is Phase 2 of a three phase investigation to develop a regional framework which will be effective in supporting and enhancing adaptation to climate variability, especially drought, in the Australian red meat and wool production industries. Using a multi-stakeholder participatory process throughout, the three phase research program works with rural communities to identify and target critical issues associated with managing livestock production systems, particularly in the face of climate variability, and develop and enhance adoption of innovations to enhance the sustainability of regional livestock enterprises.

Phase 1 of this program was a national scoping project aimed at identifying the RD&E needs of four different livestock production systems and regions around Australia in relation to risk, adaptation and resilience associated with climate variability and particularly drought. It surveyed a variety of stakeholders across the regions (central Queensland, northern Victoria, south-western Western Australia and north-western Western Australia) and captured a broad range of issues faced by livestock industries, as well as attitudes and responses in relation to both risk and the adoption of new information, technologies and practices (Mushtaq *et al.*, 2016).

Importantly, the information derived from the Phase 1 project provided a valuable starting point for the multi-stakeholder process undertaken in Phase 2—a pilot project which worked with two rural communities (Longreach and Charleville) in Queensland to (i) identify critical issues specific to the livestock production industries and sustainability in their region; (ii) better understand the underlying drivers of these issues; and (iii) prioritise relevant R&D needs to better target advice and support to enhance regional sustainability in livestock industries.

Outcomes from this Phase 2 project indicate significant support from the regional communities of Charleville and Longreach for a stakeholder-engaged multi-sector collaborative ‘co-innovation’ approach to R&D to build understanding and to develop and implement effective targeted innovations/solutions which enhance both industry and regional sustainability. On this basis, a further Phase 3 project is proposed (and strongly recommended); this report concludes by outlining the objectives, implementation approach and anticipated outcomes—including the estimated return on investment (ROI)—of this Phase 3 project.

Executive Summary

This report details the results of a pilot multi-sector/stakeholder 'co-innovation' pilot project, conducted in conjunction with producers and associated stakeholders from the Longreach and Charleville communities. This project was the second phase of a larger three phase investigation to develop a regional framework to better support and enhance adaptation to climate variability, especially drought, in the Australian red meat and wool production industries. Using a multi-stakeholder participatory process throughout, the three phase research program aims to work with producers and rural communities to identify and target critical issues associated with managing livestock production systems, particularly in the face of climate variability, and develop and enhance adoption of innovations to enhance the sustainability of regional livestock enterprises.

This Phase 2 pilot project ran two facilitated multi-sector stakeholder workshops to:

- re-engage with the central Queensland (Longreach) community to report the findings of the Phase 1 scoping study and collect feedback on the R&D themes identified through that process;
- engage with stakeholders in south western Queensland (Charleville) to inform them about the R&D themes identified by the Longreach community and identify key similarities and differences between the regions;
- better understand the issues, barriers and potential solutions to enhancing the sustainability/resilience of livestock production systems in each region;
- identify key R&D needs for inclusion in a larger Phase 3 project proposal; and
- identify key stakeholders who might then participate in a full strategic multi-sector coinnovation/design-led systems (Phase 3) project to enhance the sustainability/resilience of livestock production systems in each region.

The R&D themes identified in the Phase 1 scoping study were endorsed by the Longreach workshop participants, some (but not all) of whom had contributed in the Phase 1 project. Key actors within the community who might contribute to a more detailed co-innovation process and potential projects which could be developed and implemented through a larger Phase 3 project were identified.

Participants in the Charleville workshop reviewed and revised the R&D themes developed for the Longreach region to ensure their relevance to south-western Queensland livestock production systems. The R&D themes were endorsed with significant additions to encompass the different fodder systems in the mulga lands. This outcome reinforced the importance of working with local stakeholders to ensure that innovations are regionally-targeted and relevant and so more likely to be adopted and to contribute to adaptation and enhanced sustainability/resilience in regional livestock production systems and associated rural communities.

In terms of the workshop process, working with multi-sector stakeholder groups is both novel and challenging; however, there are significant benefits in gaining multiple and contextualised perspectives on issues—a key aspect of co-innovation approaches. The process of running the workshops was itself open to adaptation, with feedback and reflections on the Longreach workshop informing how the subsequent Charleville workshop was run. Further such workshops will continue to benefit from the experience gained through this project.

Outcomes from this project indicate the significant potential value of multi-sector systems innovation/co-innovation approaches in which stakeholders collaborate to build understanding and to develop and implement effective targeted innovations to enhance both industry and regional sustainability. This is particularly likely to be the case in rural Australia given the significant interdependence of rural producers and regional townships (i.e. the productivity and profitability of regional livestock production industries are integral to the wellbeing of entire communities and the sustainability of these communities in turn supports the wellbeing of producers).

In both its conceptualisation and implementation, this project recognises the co-dependence of regional livestock production industries and rural communities. The Phase 2 Pilot Project has confirmed the interest of producers and associated stakeholders in the Longreach and Charleville regions/communities to engage in a process to collaboratively identify and develop regionally-targeted solutions. There is also significant potential for the proposed Phase 3 project to be both viable and successful in delivering enhanced skills (i.e. capacity) and uptake of solutions (i.e. tools, practices) that are seen by producers to be appropriate to local conditions. Based on clear indications of the Desirability, Feasibility and Viability of this approach, we strongly recommend proceeding with the proposed Phase 3 project in order to build on the collaborative processes initiated in the Charleville and Longreach regions.

The overarching objectives of the Phase 3 project would be to co-design, test and implement regionally targeted R&D innovations to enhance the drought risk resilience and sustainability of the livestock production industries. Specifically, the project would:

- work with the communities of Longreach and Charleville to identify and promote effective targeted operational and strategic decision making and technical developments (information, frameworks, tools, skills) to reduce exposure to drought risk within these regions, increase the sustainability (productivity and profitability) of regional livestock (red meat and wool) production systems, and enhance the wellbeing and resilience of regional communities;
- work with local producers to develop innovative effective targeted on-farm business management practices that assist them to better plan and manage for climatic variability, especially drought risk;
- contribute to developing a whole of industry systems approach to building resilience to Australia's variable climate; and
- provide critical insights to inform State and Federal drought management policies.

Expected outcomes of a Phase 3 co-innovation project include:

- improved climate/drought risk decision making and management;
- improved land condition;
- significant positive impact on the productivity and profitability of regional livestock producers and on the well-being of regional livestock producers and members of rural communities;

- increased sustainability of livestock production enterprises and industries;
- increased resilience to climate variability and risk in rural communities;
- significant reduction in the negative impacts of drought, including the need for financial support, within regional livestock industries and rural communities;
- improved regional drought risk adaption capacity;
- improved processes for effectively engaging multi-sector stakeholders actors in co-innovation projects;
- improved processes for delivering industry wide outcomes;
- significant return on investment with preliminary economic analysis indicating that a 5 year \$2.5 million Phase 3 co-innovation project delivered in the central western and south western Queensland livestock production regions will deliver an estimated Net Present Value of \$17.01 million; an Internal Rate of Return of 145%; and a Benefit Cost Ratio of 8.1; and
- significant additional value through leveraging concurrent investments in other related projects.

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1 Background

Across Australia, livestock industries underpin the prosperity of many rural families and communities and are critical players in the management of natural resources. Yet these industries frequently face significant challenges due to climate variability, market volatility and uncertainty associated with government policy, all of which can place significant pressure on the finances, health and well-being of individual producers and have flow on impacts on land condition and local communities.

Climate records and modelling for regional Australia indicate significant and increasing seasonal and longer term climate variability (Love, 2005; Alexander and Arblaster, 2009; Australian Bureau of Meteorology (BoM) and CSIRO, 2011; Intergovernmental Panel on Climate Change (IPCC), 2014; Stone, 2014). Such evidence reinforces the need for agricultural sectors to focus on building capacity to manage risk by developing robust and pragmatic adaptive management options and supporting their adoption by producers. Producers that are adaptive to changing conditions are expected to both minimise their exposure to risks associated with drought and climate variability and be better able to take advantage of more favourable conditions (Kingwell, 2006; Stokes *et al.*, 2008). A coordinated multi-sector approach to innovation and adaptation is increasingly recognised as the currently best available approach to meeting the complex sustainability challenges faced by agricultural producers, both in Australia and more broadly (Bucolo and Matthews, 2010; Bucolo *et al.*, 2012; Dogliotti *et al.*, 2014; Botha *et al.*, 2014; Turner *et al.*, 2016).

This document reports on Phase 2 of a planned three phase investigation to develop an effective regional framework to support and enhance adaptation to climate variability, especially drought, in the Australian red meat and wool production industries. Using a multi-sector/multi-stakeholder participatory process throughout, the three phase research program works with selected rural communities to identify and target critical issues associated with managing livestock production systems, particularly in the face of climate variability, and to develop and enhance adoption of innovations to enhance the sustainability of regional livestock enterprises and, by association, regional communities.

Phase 1 of this program was a national scoping project aimed at identifying the R&D needs of four different livestock production systems and regions around Australia. It surveyed a variety of stakeholders in central Queensland, northern Victoria, south-western Western Australia and north-western Western Australia and captured a broad range of issues faced by livestock industries and associated rural communities, as well as attitudes and responses in relation to risk and adoption of new information, technologies and practices (Mushtaq *et al.*, 2016). Information from that project informed the multi-sector/multi-stakeholder workshop process undertaken in Phase 2 of the program—a pilot project which worked with two rural communities (Longreach and Charleville) in Queensland to (i) identify critical issues specific to the livestock production industries and sustainability in their region; (ii) better understand the underlying drivers of these issues; and (iii) prioritise relevant R&D needs (to be addressed in Phase 3) to better target advice and support to enhance regional sustainability in livestock industries.

This purpose of this document is to report on the outcomes of the Phase 2 workshops and to provide an assessment of the participatory co-innovation approach implemented in Phase 2. These findings

and resulting recommendations are designed to feed into a proposal for a larger Phase 3 project, which will further progress the R&D priorities generated in Phase 1 and Phase 2 (Figure 1).

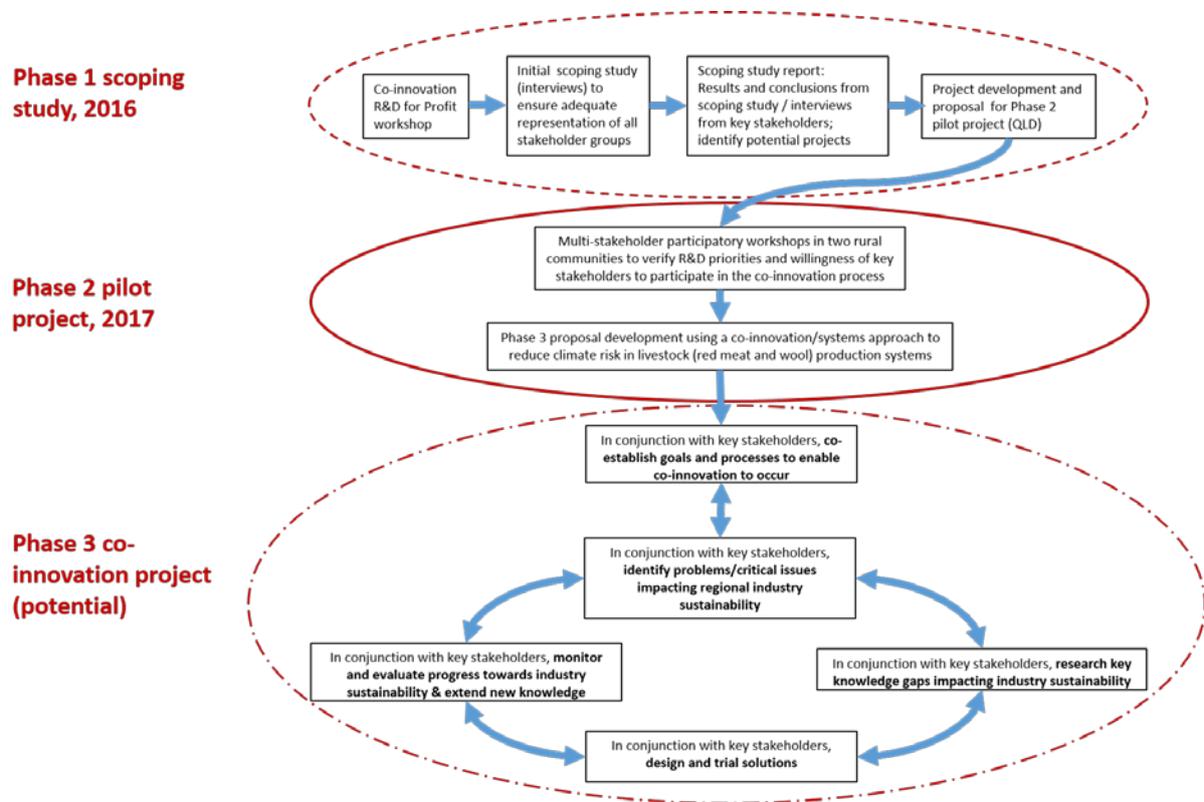


Figure 1 Conceptual diagram outlining key steps in the process of developing a full proposal for a Phase 3 'co-innovation for sustainability' project

1.1 Phase 2 project aims

Specifically, the Phase 2 pilot project aims were to:

- re-engage with the central Queensland (Longreach) community to report the findings of the Phase 1 scoping study and collect feedback on the R&D priorities identified through that process;
- engage with stakeholders in south western Queensland (Charleville) to inform them about the Phase 1 R&D priorities identified and endorsed by the Longreach community and identify key similarities and differences between the regions;
- better understand the issues, barriers and potential solutions to enhancing the sustainability/resilience of livestock production systems in each region;
- identify key R&D needs for inclusion in a larger Phase 3 project proposal; and

- identify key stakeholders who might then participate in a full strategic multi-sector coinnovation/design-led systems (Phase 3) project to enhance the sustainability and resilience of livestock production systems in each region.

In all instances, stakeholders in the project included not just producers, but people from these regions and communities who were both informed about and concerned with producer and community resilience and wellbeing.

1.2 Phase 2 project deliverables

- A review of the literature around co-innovation in relation to managing a variable climate and how the process can be scaled up to address complex industry practice change issues.
- Clear identification and agreement of a key problem producers and the regional community agree to collaboratively work on in a potential MDC project in relation to adoption of best management practices in managing a variable climate, including expected impact to industry using the co-innovation process.
- A preliminary understanding of the benefits of cluster fencing as a strategy to enhance enterprise and community resilience.
- A report detailing the stakeholder engagement and workshop process, key findings (issues, goals and potential strategies) identified in each of the workshops, and RD&E gaps.

2 Theoretical background

2.1 Design-led thinking, systems innovation & co-innovation

Multi-participatory approaches, such as ‘design-led thinking’ (Bucolo and Matthews, 2010) ‘design led innovation models’ (Bucolo and Matthews, 2011), ‘problem driven iterative adaptation’ or PIDA (Andrews *et al.*, 2012, 2015) and ‘co-innovation’ (Rossing *et al.*, 2010; Klerkx *et al.*, 2012; Botha *et al.*, 2014, 2017) are aimed at developing innovative integrated solutions to address complex dynamic ‘wicked’ problems, such as those which occur in agricultural production systems (Bouma *et al.*, 2011; Sayer *et al.*, 2013).

Design-led systems thinking, deriving from business management contexts, represents a generic approach to addressing complex management problems by engaging the full value chain (Zsidisin and Ritchie, 2009; Bucolo and Matthews, 2010, 2011). PIDA has been developed to enhance planning and implementation of international development projects and to better ensure effective on-ground change in complex settings involving multiple agents and/or socio-economic contexts (Andrews *et al.*, 2012, 2015). Both advocate active participatory engagement in problem identification and solution development and an iterative process which enables continual monitoring, evaluation and redesign to achieve desired outcomes.

Co-innovation approaches represent a process for implementing design-led systems thinking/systems innovation which has been previously adopted and achieved significant on-ground benefit in a range of agricultural settings (Klerkx and Nettle, 2013; Coutts *et al.*, 2014, 2017). Such approaches provide valuable conceptual frameworks and systematic methodologies which involve bringing together multiple stakeholders with different roles, skills and experiences from across a business supply chain with the goal of facilitating innovative and/or adaptive solutions (Knierim and Prager, 2015). They provide opportunity for collaborative experiential learning and an iterative adaptive approach to problem solving. In agricultural contexts, while multiple stakeholders are involved, primary producers are the key motivators at the core of the approach, involved in project development, execution and implementation, as indicated in Figure 2.

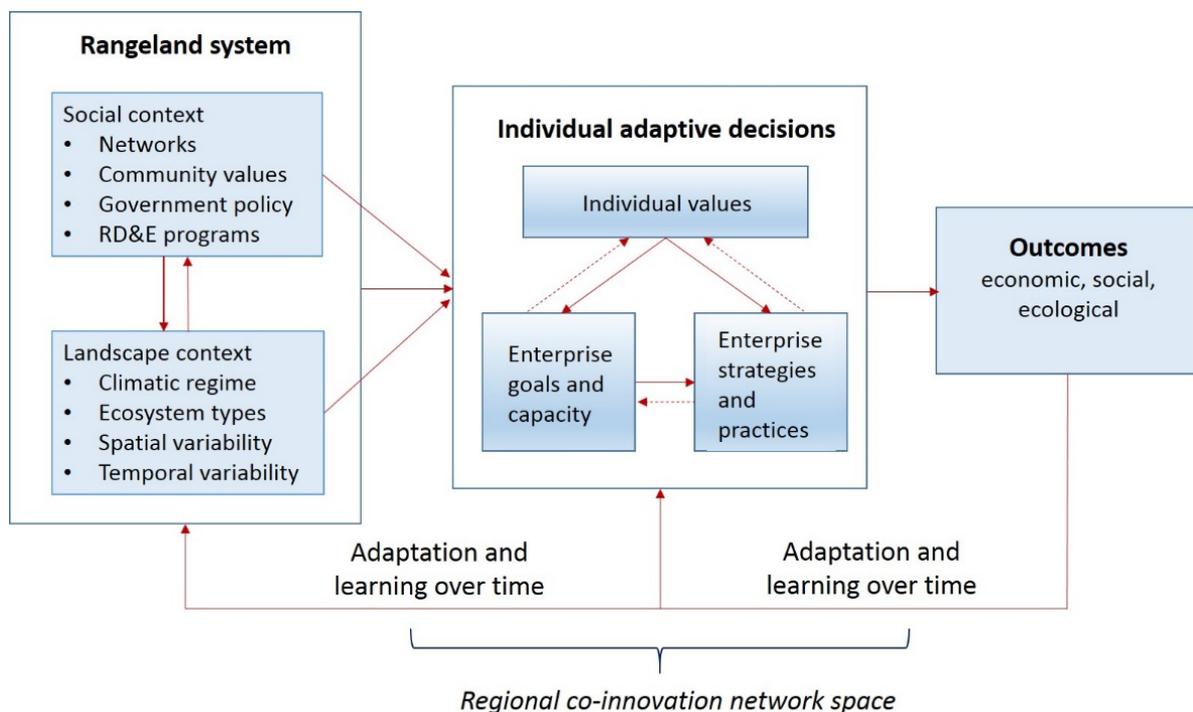


Figure 2 Adaptive decision making framework for rangeland management (adapted from Lubell *et al.*, 2013)

Nevertheless, 'co-innovation' (*sensu* Klerkx *et al.*, 2012; Botha *et al.*, 2014) has not been without its challenges (Botha *et al.*, 2014; Turner *et al.*, 2016). For example, engaging with multiple stakeholders can add to costs and slow things down, while multiple mindsets can be an obstacle in developing a shared vision (Botha *et al.*, 2014; Turner *et al.*, 2016; Coutts *et al.*, 2017); in some instances, conflict management may be required (Coutts *et al.*, 2017). However, participants in these processes have also acknowledged significant value in an approach which is context-specific and adaptive and which results in improved understanding (Coutts *et al.*, 2017).

There is a significant need for coordination, collaboration and integration in the knowledge and innovation systems dealing with drought in Australia (Jeff Coutts, pers. com.). Recent developments in participatory approaches such as co-innovation and design-led systems thinking offer an enabling framework to do this, using adaptive multi-sector stakeholder-driven processes to develop strategies

that match stakeholder needs and behaviours. Starting by gaining a thorough understanding of the problem, they progress to understanding the production system—i.e. the people, organisations, finances, resources, rules and existing knowledge of the system. The multidisciplinary group then works together to develop and iteratively test and evaluate innovations. End users (i.e. landholders/managers/producers) participate throughout the innovation and evaluation process and, as a result, are much more likely to adopt the final innovation. Approaches with dedicated resources (e.g. public investment), stakeholder engagement (particularly of landholders/managers), and integration, coordination and cooperation across the stakeholder network are likely (and reported) to have a greater chance of success (Knierim and Prager, 2015).

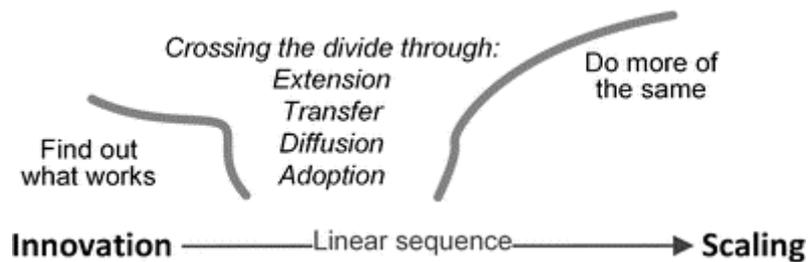
2.2 Scaled-up systems innovation

Scaling up of co-innovation and design-led thinking approaches beyond the regional community level will entail different groups of collaborators (e.g. representative producers from a number of regions; representatives from NRM regional bodies and other relevant NGOs; livestock industry decision-makers; policy-makers from the agricultural, natural resources, environment, health and social security sectors; relevant specialist researchers). While membership of these groups will differ, the process of collaborative engagement—to identify key issues, knowledges and knowledge gaps, solutions and resource requirements to achieve effective and sustainable innovation—remains essentially consistent across scales.

Design-led innovation/co-innovation at scale will require:

1. A structured approach which is conceptualised and planned, with appropriate timeframes, from the outset.
2. A focus on the ‘how’ (i.e. the process of scaling) as much as the ‘what’ (i.e. the innovation to be scaled) by identifying appropriate pathways (e.g. partnerships) to achieve the project goals (Figure 3).
3. A well-defined value chain in which the actions and actors (i.e. stakeholders, institutions) needed to effect transformation and scaling up of impact—to facilitate effective planning, identification of potential trade-offs (i.e. winners, losers, etc.) and mitigation of negative environmental and social impacts—are clearly identified will.
4. Clearly identified roles of partners in public-private co-innovation partnerships.
5. Monitoring & Evaluation (M&E) as an integral part of the scaling up process.
6. Sharing, cross-learning and formalising learnings—of both failures and successes—between value chains (Pretty, 1998; Bessant *et al.*, 2003; USAID, 2014; Wigboldus *et al.*, 2016).

(a)



(b)

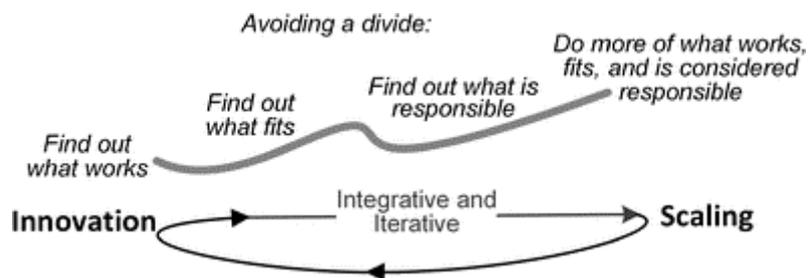


Figure 3 Scaling up as (a) a linear process; and (b) an iterative integrated process (after Wigboldus et al., 2016)

3 Phase 2 project approach & findings

The Phase 2 pilot project took an iterative adaptive approach to design and test a multi-stakeholder systems innovation process applicable for use in Australian red meat and wool producing regions, working with two rural communities in Queensland's Central West (Longreach) and South-west (Charleville).

It used a participatory workshop process to establish consensus around issues relevant to managing climate risk in the two regions. Both workshops were facilitated by Dr Gerry Roberts (GRConsulting, Longreach: <https://gerryroberts.com.au/>), an experienced agricultural consultant and workshop facilitator, working in conjunction with researchers (David Cobon and Drs Shahbaz Mushtaq, Ben Allen and Kate Reardon-Smith) from the University of Southern Queensland and Jane Wightman and Dr. Sam Bucolo from MLA.

Building on the findings of the Phase 1 scoping project, the Phase 2 project was itself both iterative and adaptive, with the workshop team reflecting on the process used in the first workshop (Longreach) and using the learnings gained from that experience to improve the process for the second workshop (Charleville).

3.1 Workshop locations

Workshops were conducted in two major Queensland livestock production regions (Figure 4). These were:

- Workshop 1: Longreach in central-western Queensland (held in the DAF conference room on Thursday 12th October, 2017) and
- Workshop 2: Charleville in the south-west (held at the Mulga Country Motor Inn on Tuesday 31st October 2017).



Figure 4 The location of the two Queensland livestock production regions (Longreach and Charleville—circled) involved in this study. (Adapted from: https://commons.wikimedia.org/wiki/File:Queensland_roads.svg).

3.1.1 Characteristics of the regions

Longreach, in Queensland's central west region, is approximately 600 km inland from the east coast of Queensland. The town sits not far from the Thompson River, a major inland river system flowing southwest through inland Queensland and part of the Lake Eyre Basin. Livestock production is predominantly based on the extensive Mitchell grass (*Astrebla* spp.) downs country, on relatively fertile cracking clay soils (DoE, 2008a). Rainfall is summer dominant, averaging 444 mm per annum, but with a lowest recorded total annual rainfall of 106.8 mm (2002) to a highest recorded total of 1026.5 mm (1950). Average maximum summer temperatures are 36–37°C with 47.3°C, in January 1990, the highest on record (BoM, 2017).

The town of Charleville is in south-western Queensland on the banks of the Warrego River in the northern Murray-Darling Basin. Dominant vegetation types in the region are mulga (*Acacia aneura*) shrublands and eucalypt (*Eucalyptus* spp.) grassy woodlands, with woody thickening a significant management issue (DoE, 2008b). Mulga, being leguminous and protein rich, has traditionally offered additional value as drought fodder but state tree clearing legislation currently imposes restrictions on its harvesting/'pulling' (Charleville landholders, pers. com.). Rainfall is summer dominant and averages 492 mm per annum, although recorded annual rainfall totals have varied from a minimum 206.4 mm in 1946 up to 1133.8 mm in 2010 (BoM, 2017). Average maximum summer temperatures are 34–35°C with 46.4°C, in January 1973, the highest on record (BoM, 2017).

Both regions support a range of livestock enterprises which include beef cattle, sheep (meat and wool) and goats. Both regions have also, in recent years, seen the funding and construction of predator proof multi-property 'cluster fences' (Allen, 2016) to enable more effective control of wild dogs (hence, predation on livestock) and native herbivores (hence, total grazing pressure/TGP).

3.2 Workshop participants

In total, 79 individuals from the two regions were contacted, of which 29 attended the workshops¹. These included producers (approximately 38% of all workshop participants) and associated livestock industry and community stakeholders including financial institutions/advisors; NRM and industry managers; extension officers; consultants; agribusinesses; and local government personnel.

The selection of participants was based on:

- key stakeholders identified by contacts in regional QDAF offices and Meat & Livestock Australia (MLA); and
- a snowball technique (chain referral sampling) based on people suggested by other stakeholders (Atkinson and Flint, 2001).

¹ Thirty-one of those who were contacted but unable to attend expressed interest in the project.

3.2.1 Characteristics of the workshop participants

Workshop participants were initially advised of and invited to the workshops by email, with follow up phonecalls where possible/necessary. Table 1 provides details of the numbers invited and attending each of the workshops; those who were unable to attend, but expressed interest in the project and requested follow up communication, are also noted.

Table 1 Numbers of stakeholders from the Longreach and Charleville regions invited to and attending Phase 2 Pilot Project workshops

Workshop location	Invited	Attended	Interested but unable to attend
Longreach	41*	12	15
Charleville	38	17	18

* including all those from the Longreach region who were interviewed as part of the Phase 1 scoping study

Table 2 provides a breakdown of the self-identified roles of the workshop participants by workshop location. Of those attending the Longreach workshop, 42% (5 of 12) identified as producers, while others represented a range of consultants to the industry, community based organisations and local and state government agencies. Similarly, participants in the Charleville workshop were drawn from across the community, with 35% (6 of 17) directly involved in livestock production.

Table 2 Self-identified role of workshop participants. A number of participants nominated more than one role.

Industry sector	Longreach*	Charleville*	Total
Producers	5	6	11
Agricultural service provider	1	9	10
Agricultural researcher	1	0	1
Agricultural consultant	0	2	2
Extension professional	1	5	6
Financial professional	1	1	2
Health professional	0	0	0
Other	2	2	4

* from information provided by 10 of 12 workshop participants in Longreach and 15 of 17 in Charleville.

Across the two regions, participants who identified as producers were involved in beef, sheep (meat and wool) and goat production (Table 3).

Table 3 Numbers of workshop participants who identified as producers by region and livestock industry sector*.

Industry sector	Longreach	Charleville	Total
Beef cattle	5	6	11
Sheep – meat	2	0	2
Sheep - wool	4	1	5
Goats	1	2	3

* many producers were involved in more than one of these industries; hence, numbers differ from those in Table 2.

Across the two regions, participants who identified as producers were responsible for livestock production enterprises with a total area of 205 358 ha and a total of 6 090 head of cattle, 24 300 head of sheep and 2 280 head of goats (Table 4).

Table 4 Property areas and numbers of livestock reported by workshop participants who identified as producers by region and livestock industry sector. Values are means with range (min–max) in parentheses.

	Longreach	Charleville
Area (ha)	17 907 (8 350–30 000)	19 304 (6 000–35 250)
Cattle	630 (150–1 000)	490 (40–1 000)
Sheep (wool/meat)	6 075 (2 000–15 000)	0
Goats	-	1 140 (200–2 280)

In total, five of the 11 producers involved in the two workshops were part of multi-property ‘cluster’ wild dog exclusion fencing projects; this included four of five producers at the Longreach workshop and one of six producers at the Charleville workshop. Of the total area and livestock numbers reported by producers at the workshops, cluster fenced properties represented 47.98% of the area, 33.66% of total head of cattle and 98.95% of total head of sheep/goats reported (Figure 5).

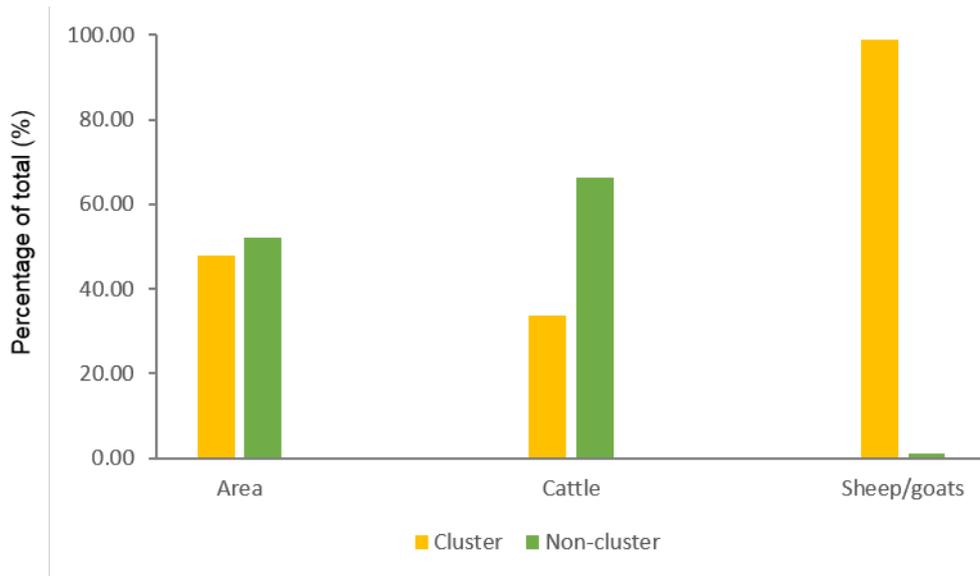


Figure 5 Proportion of total property areas and numbers of livestock (cattle and sheep/goats) reported by workshop producer participants (both workshops) by involvement/non-involvement in cluster fencing projects.²

Workshop participants reported having lived in their regions for periods of between 0.2 and 56 years. Of these, livestock producers reported, on average, longer periods than non-producers (Figure 6).

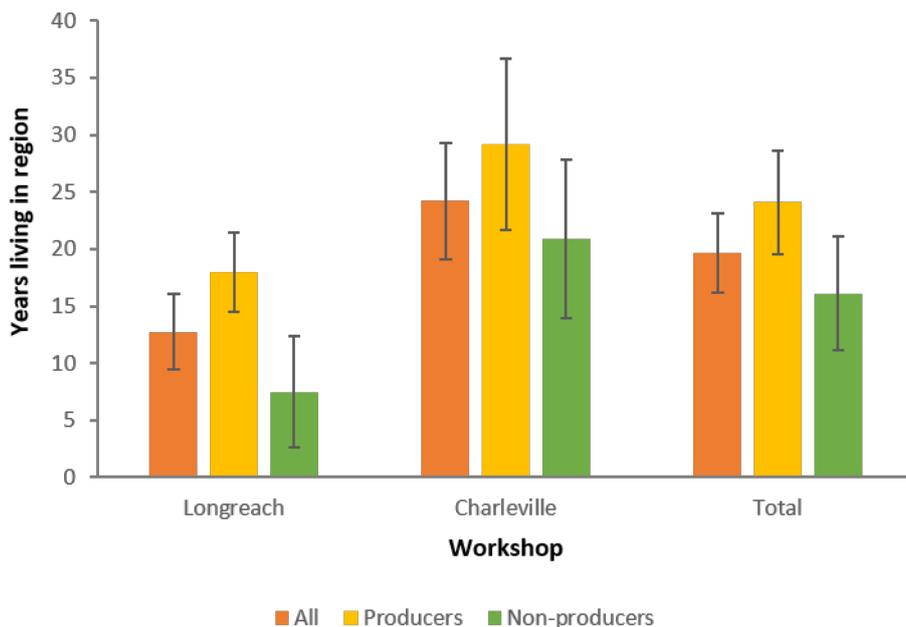


Figure 6 The average number of years workshop participants reported having lived in the regions, by workshop region and producer/non-producer group. (Error bars are standard error).

² A 2017 map of registered cluster fences in Queensland is available at: <https://www.sheepcentral.com/wp-content/uploads/2017/04/Queensland-wild-dog-cluster-fence-map-March-2017.jpg>.

3.3 Workshop details

The research and development (R&D) priorities identified in the Phase 1 scoping project for the Longreach (central west Queensland) region (Table 5) were presented in both the Longreach and Charleville workshops.

Table 5 R&D priorities for the Longreach region identified in the Phase 1 scoping study

R&D Theme	Key R&D Priorities
1. Pasture management and total grazing pressure - decision support	<ul style="list-style-type: none"> • Key indicators and thresholds for pasture quantity and quality & land condition • Timing of key decisions and/or decision points based on key indicators • Protocols and tools for monitoring and evaluation of key indicators • Assessing total grazing pressure (livestock & non-domestic herbivores) • Assessing/addressing biosecurity threats – BMPs • Tools & support for timely decision-making - decision support framework • Managing total grazing pressure (livestock & non-domestic herbivores) – BMPs
2. Forecasts – provide producers with the confidence and capability to sell or agist livestock early before pastures degrade, stock lose weight & prices decline	<ul style="list-style-type: none"> • Accuracy and lead-time of Nov-Mar rainfall (summer rainfall areas) • Skill testing of GCMs at seasonal scale • Testing of multi-year forecast systems • Cyclone forecast systems • Forecasts of upper or lower tercile rainfall for the wet season • Forecasts of start and end of wet season
3. Integrating livestock, finance, business and marketing management	<ul style="list-style-type: none"> • Whole farm analysis of pasture condition/productivity, environmental factors, herd dynamics, red meat production, profit, transport and taxation to meet (and compare) different market specifications • BMPs • Engaging better with the marketplace
4. Building social networks, health & wellbeing	<ul style="list-style-type: none"> • Tools and support for physical and mental health • Personal/professional development • Planning for the future • The role of peer to peer learning and industry champions in facilitating adoption of new technologies and practices
5. Decision making for better management of drought and recovery	<ul style="list-style-type: none"> • Identifying key drought indicators and thresholds • Tools and support for making key economic and environmental decisions – BMPs • Early decision making with confidence • Monitoring and reporting of drought and drought recovery (of natural resource/pasture condition? stock numbers? financial? other?) • Better understanding and application of hydrological, hydro-illogical and hydro-psychological cycles • Different types of pastures or crops to suite the climate situation

3.3.1 Longreach workshop program

The Longreach workshop program (Table 6) was designed to report back to the Longreach community on the results of the Phase 1 scoping study and to elicit information/insights from participants to:

- collect feedback on the R&D priorities identified for the Longreach region (Table 5);
- better understand how we might achieve a more favourable state for livestock production systems in the region;
- identify key players who might then participate in a full co-innovation project; and
- identify key areas for RD&E inclusion in the larger Phase 3 project proposal.

Table 6 Workshop program, Longreach

Session	Focus	Detail/tools
1.	Welcome & introductions	Participant background proforma
2.	Workshop purpose, objectives & roadmap	Presentations (JW & GR)
3.	What does managing the effects of climate variability mean?	Facilitated discussion
4.	Social networks – local, regional and beyond	Small group social mapping exercise
5.	Results from Phase 1 scoping study	Presentation (DC)
6.	Priority R&D issues for the Longreach region	General discussion
7.	What is the current state of things for producers/industry in the Longreach region?	Small group CATWOE ³ exercise
8.	Where do we want to be in 5, 10 or more years?	Small group CATWOE exercise
9.	What might stop us achieving that?	Small group 5 WHYS ⁴ exercise
10.	What needs to change and how can change be supported?	Small group 5 HOWs ⁵ exercise
11.	How do we engage broader community endorsement of this process/these ideas?	General discussion
12.	Workshop evaluation	Participant feedback proforma

³ CATWOE (Clients, Actors, Transformation, Weltanschauung/World view, Owner, Environmental constraints) analysis (Smythe & Checkland 1976, Mirijamdotter & Bergvall-Kåreborn 2006)—a structured approach to identifying and thinking about issues/problems and solutions.

⁴ An iterative interrogative technique used to identify the root cause of a particular problem (Semler 2004)

⁵ Used to determine an effective solution to the root cause of the problem (Q-1 International, 2015)

3.3.2 Longreach workshop results

Key points from the Longreach workshop are presented below.

1. Climate variability

Key comments from the discussion on climate variability in the Longreach region included:

- *There's a lot of information, talk and commentary about climate; it's confusing to know who is an authority.*
- *The biggest thing is what it does to your mind and how it impacts on things at home.*
- *The succession of droughts in western Queensland has adversely affected the reputation of western Queensland as drought stricken country.*
- *Climate variability is a key driver of the economy, town and wider area and the single biggest influencer in terms of population migration and general atmosphere in the town. It affects opportunities right across the board in all aspects of life in this area.*
- *You need to be in a position to take advantage of opportunities at the time.*

2. R&D priorities

The R&D priorities for the region identified in the Phase 1 scoping study (Mushtaq *et al.*, 2016) were endorsed by the workshop participants. The following additional points were made with regard to government policy and forecast quality:

- *Government policy currently rewards people for poor decision making.*
- *People who destock early are ineligible; people who wait to make a decision, run down pasture and have to sell cattle at poor prices are rewarded.*
- *There are big differences in the accuracy of forecasts for different regions of Australia.*

3. CATWOE exercises

When asked 'How would you describe what seems to be the main way/s that people think about climate variability now?' the range of responses included:

- *a reality check*
- *no such things as an average [year] and it's definitely not 1974.*

Some responses indicated that climatic factors pose significant existential challenges within the region:

- *lack of control*
- *stressful*
- *pessimism*
- *expensive*
- *risky*
- *more of an exit/succession decision now.*

Other responses acknowledged the need to view climate variability as an inherent part of the regional environment in which they operate:

- *acceptance that climate is changing*
- *survival*
- *business sustainability*
- *adapting and modifying business operations*
- *diversification necessary.*

When then asked 'What are the circumstances in which rural businesses operate out here (the business situation; regulations; policies; etc.)?', again, responses varied.

- *heat, dust & flies!*
- *seasonal fluctuations*
- *increased risk of land degradation*
- *vegetation management constraints*
- *drought policies*
- *poor and unreliable internet*
- *delays in getting parts*
- *labour supply (e.g. attracting/retaining workers; visas)*
- *distance from markets, education, specialist health care etc.*
- *increased risk of health problems (e.g. Q fever; mental; physical)*
- *high risk and low returns on capital*
- *general declining terms of trade*
- *global competition*
- *external perceptions of conditions*
- *resilience of businesses and people*
- *carbon markets.*

The future CATWOE activity (Table 6, Item 8) identified a number of management practices that would help in achieving future sustainability:

- diversification, on- and off-farm
- improved use of data management technology/systems (e.g. live weight data saleable)
- fences and enhanced TGP management to give greater flexibility
- improved water management systems
- greater uptake of decision support tools and new technologies
- new risk management methods
- innovative business and investment models/methods.

4. 5 Whys/Hows

The small group 5 Whys exercise (Table 6, Item 9) was focused on identifying the root cause of barriers to innovation; the 5 Hows exercise identified possible solutions to enable the Longreach community to overcome these barriers.

Key barriers identified were:

- inability to service debt

6. Workshop evaluation

Workshop participant feedback and project team reflections on the Longreach workshop are available in Appendix A1.

Feedback from participants in the Longreach workshop was largely positive with some valuable suggestions made about the workshop content and program, especially the length of time available for in-depth discussion of topics raised. These observations concurred with the project team reflections on the workshop and were used in planning for improved delivery of the subsequent Charleville workshop. A particularly positive/innovative aspect of the workshop was seen as the opportunity to engage with stakeholders from a variety of backgrounds.

Importantly, the majority of workshop participants indicated that they would be both willing to participate in a future co-innovation project and to discuss this with other stakeholders in the local/regional community. In addition, a number of people who were invited to the workshop but unable to attend also expressed interest in the co-innovation concept and asked to be kept informed about future opportunities to participate.

3.3.3 Longreach workshop synthesis

Participants in the Longreach workshop endorsed the R&D priorities developed from the Phase 1 scoping study (Mushtaq *et al.*, 2016). They actively engaged in discussion about climate variability and its impact on livestock enterprises and the local rural community; the community network mapping exercise; and the CATWOE exercise. The workshop participants were challenged to think differently about the fundamental barriers to change in the 5 Whys exercise and at times found it difficult to understand the purpose of the exercise. On reflection, the research team believed a more extensive explanation was required beforehand. In addition, it was suggested that a positive strengths based approach (Padesky and Moonie, 2012) may be a more productive energising approach.

There were a number of suggestions for future projects, including business planning skills and financial literacy. Potential innovations included income diversification (e.g. farm tourism, outcomes based environmental stewardship payments) and niche marketing opportunities (e.g. green labelling). Several participants were also keen to explore technological innovations to support on-ground resource and livestock monitoring and decision-making and to facilitate their adoption and ongoing use through a regional technology hub—an idea that is already being considered and discussed within the local community. Should this idea become a reality, there would be a number of R&D areas that could be explored in conjunction with such a development.

In addition, the advent in recent years of a number of cluster fencing projects in the region represents a significant opportunity to investigate a range of issues around livestock and TGP management through feral and native predator and competitor management, as well as broader impacts on enterprise productivity/profitability, landscape condition and community resilience. Workshop participants spoke positively about the benefits of the regional 'cluster fencing' investments made in recent years, including increased capacity (within fenced areas) to manage total grazing pressure and predation on livestock and the potential for changes in enterprise mix (e.g. increasing sheep numbers). In terms of broader community impact, immediate benefit had

been realised by local suppliers where a condition for external funding included that fencing materials and equipment be locally purchased; however, a number of participants also mentioned that a (perhaps unanticipated) negative outcome of the fencing was a level of tension between producers inside and outside property clusters.

3.3.4 Charleville workshop program

The Charleville workshop adopted a process similar to, but informed by feedback from participants and team members about, the earlier Longreach workshop.

The Charleville workshop program (Table 7) was designed to:

- engage with a new group of stakeholders in south western Queensland (Charleville) to inform them about and collect feedback on the priorities identified by the Longreach community;
- identify key R&D priorities for the Charleville region;
- understand for the Charleville community how a more favourable state for livestock production systems in the region might be achieved;
- work with the community to identify key players who might then participate in a full strategic multi-stakeholder coinnovation/design-led systems project; and
- identify key areas for RD&E inclusion in the larger Phase 3 project proposal.

Table 7 Workshop program, Charleville

Session	Detail	Purpose
1.	Welcome & introductions	Participant background proforma
2.	Workshop purpose, objectives & roadmap	Presentations (JW & GR)
3.	Results from Phase 1 scoping study for Longreach	Presentation (KRS)
4.	Current R&D issues for Charleville’s rural industries and those who work with them	Small group discussion to identify issues relevant to Charleville–based on the Longreach R&D priorities
5.	Prioritise the R&D themes for the Charleville region	Collation of participant votes (3 each)
6.	For the top R&D themes, what might the ideal/improved future state look like and what actions/support are needed to get there?	Small group discussion
7.	What might stop us achieving such improvements?	Demonstration of the 5 WHYs exercise (SB) followed by small group 5 WHYs/HOWs discussion
8.	Which organisations are part of the Charleville rural industry system?	Small group social network matrix
9.	Which organisations or individuals might be active partners in a community project?	General discussion
10.	Workshop evaluation	Participant feedback proforma

Major differences in the running of the two workshops included:

- more in depth discussion and ranking of the R&D priorities, given the regional differences in both vegetation and livestock production systems between Charleville and Longreach;
- time spent explaining the benefits and process of working with multiple stakeholders in a community to develop integrated solutions to issues which accounts for different perspectives and addresses multiple needs;
- time spent demonstrating the different perspectives and concerns of stakeholders that might lead to constraints on decision-making and barriers to innovation/adaptation; and
- using a structured matrix approach to list the various organisations and actors working/operating in different spheres (livestock production, NRM, health, financial, social) and at different scales (local, regional, state, national) that influence and support the livestock production industries in the Charleville region.

3.3.5 Charleville workshop results

Key points from the Charleville workshop are presented below.

1. R&D themes

The R&D themes for the Longreach region, developed in the Phase 1 scoping study and endorsed by the Longreach workshop participants (this project), were presented to the Charleville workshop participants. Charleville participants endorsed the original list, and also nominated a number of additional priority R&D issues relevant to livestock production and grazing land management systems in south-western Queensland (Table 8).

Table 8 R&D themes and priority issues for the Charleville region

R&D Theme	R&D Priorities - Longreach	Additional R&D Priorities - Charleville
1. Pasture/fodder management and total grazing pressure - decision support	<ul style="list-style-type: none"> • Key indicators and thresholds for pasture quantity and quality & land condition • Timing of key decisions and/or decision points based on key indicators • Protocols and tools for monitoring and evaluation of key indicators • Assessing total grazing pressure (livestock & non-domestic herbivores) • Assessing/addressing biosecurity threats – BMPs • Tools & support for timely decision-making - decision support framework • Managing total grazing pressure (livestock & non-domestic herbivores) – BMPs 	<ul style="list-style-type: none"> • Management of vegetation thickening (woody weed and canopy cover management) • R&D into sheep nutrition to increase access to the protein in mulga (as goats can) • Goats - their impact on total grazing pressure and preferred species • Pasture management regimes for different pasture performance with winter rain as opposed to summer rain • TGP - non-domestic herbivores a priority (kangaroos, carrying capacities, legislative restrictions)

R&D Theme	R&D Priorities - Longreach	Additional R&D Priorities - Charleville
<p>2. Forecasts – provide producers with the confidence and capability to sell or agist livestock early before pastures degrade, stock lose weight & prices decline</p>	<ul style="list-style-type: none"> • Accuracy and lead-time of Nov-Mar rainfall (summer rainfall areas) • Skill testing of GCMs at seasonal scale • Testing of multi-year forecast systems • Cyclone forecast systems • Forecasts of upper or lower tercile rainfall for the wet season • Forecasts of start and end of wet season 	<ul style="list-style-type: none"> • Accuracy and lead-time of Nov-Mar rainfall (summer rainfall areas) doesn't really apply for the Charleville region • Cyclone forecast systems are not relevant as these systems don't reach Charleville; however, rain events are important. • Different forecasts and knowledge of how to use them (i.e. European model vs BoM) • Forecasts of the start and end of the wet season are not a high priority, though may be important for GLM BMPs • no faith/confidence that improved forecasts will yield on ground benefits; greater value in educating farmers to analyse and use their own data (i.e. historical rainfall data for individual properties)
<p>3. Integrating livestock, finance, business and marketing management</p>	<ul style="list-style-type: none"> • Whole farm analysis of pasture condition/productivity, environmental factors, herd dynamics, red meat production, profit, transport and taxation to meet (and compare) different market specifications • BMPs • Engaging better with the marketplace 	<ul style="list-style-type: none"> • Engaging better with the marketplace, including increased capacity to use technologies to assist in this activity • Use of technology to apply to all dot points • Ability to diversify • Co-ops for marketing (buying and selling) opportunities
<p>4. Building social networks, health & wellbeing</p>	<ul style="list-style-type: none"> • Tools and support for physical and mental health • Personal/professional development • Planning for the future • The role of peer to peer learning and industry champions in facilitating adoption of new technologies and practices 	<ul style="list-style-type: none"> • Succession planning • Value proposition for producers to employ private consultants • Social licence to produce/farm – PR to urban society to build knowledge and understanding around issues such as tree clearing • Make working in primary industry more inviting and keep those with experience in the region (e.g. address issues such as burn out) • Tax breaks for community services • Continued funding for suitable trained professionals – ongoing, not just when disaster happens • Collaborative style counselling around social activities (e.g. craft, quilting, painting) – getting groups together instead of individual counselling focus
<p>5. Decision making for better management of drought and recovery</p>	<ul style="list-style-type: none"> • Identifying key drought indicators and thresholds • Tools and support for making key economic and environmental decisions – BMPs 	<ul style="list-style-type: none"> • Identifying key drought indicators and thresholds (e.g. feed budgets); set your dates and stick with it (i.e. having faith to stick to your initial plans) • Trusted relationships (consultants, government staff, financial institutions)

R&D Theme	R&D Priorities - Longreach	Additional R&D Priorities - Charleville
	<ul style="list-style-type: none"> • Early decision making with confidence • Monitoring and reporting of drought and drought recovery (of natural resource/pasture condition? stock numbers? financial? other?) • Better understanding and application of hydrological, hydro-illogical and hydro-psychological cycles • Different types of pastures or crops to suite the climate situation 	<p>to better enable sound decision making.</p> <ul style="list-style-type: none"> • more R&D into different types of pastures and crops adapted to our soil and climate conditions • Time management to ensure critical tasks are undertaken (e.g. quadrats, worm counts, nutrient assessment/supplementation) • opportunities for off farm income required because farming is not profitable • town decline (Longreach: 40% of community government-funded) • carbon farming • vegetation management act & regrowth/tree clearing • SW Drought and Disaster Group Collective to be consistent like Western Qld Drought Committee – keeping it local • Inviting regional stakeholders to collaborative strategy meetings – different perspectives
6. NEW: Review of outdated government property size (i.e. recommended living area) advice*		<ul style="list-style-type: none"> • Property titles were developed in the 1940s (Soldier Settlement Blocks) and regional eco mapping is based on 1960s data. There has been a lot of canopy thickening since then that has reduced carrying capacity

*renamed and hereafter: 'Viability and management of production systems in landscapes subject to woody thickening'

2. Ranking of R&D themes

Charleville workshop participants were asked to vote for their top three R&D themes (i.e. each participant had three votes). These were then collated to identify the highest priority R&D themes for the Charleville region (Table 9). The highest ranked R&D theme was 'Decision making for drought management and recovery' (31%), closely followed by 'Pasture management and TPG decision support' (27%). 'Integrated livestock, finance, business and marketing management' and 'Building social networks, health and well being' each received 16% of the votes.

Table 9 Results of voting to rank R&D themes in terms of their priority for the Charleville region

Rank	R&D Theme	Votes
1	Decision making for drought management and recovery	14
2	Pasture management and TGP decision support*	12
3	Integrated livestock, finance, business and marketing management*	7
3	Building social networks, health and well being*	7
5	Viability and management of production systems in landscapes subject to woody thickening	5
6	Seasonal climate forecasts	0

* R&D priorities selected for group discussion below

3. 5 Whys/Hows

Three of the six R&D themes listed in Table 9 were selected by the small groups for discussion using the 5 Whys/Hows process at the workshop. Key points raised in these discussions (by R&D theme) included:

(a) Pasture management and TGP decision support (ranked second; Table 9)

Issues:

- State vegetation laws are not applicable in the Charleville region
- Vegetation (mulga)/fodder management is heavily regulated
- Restrictions on kangaroo management
- Low kangaroo harvest efficiency
- Restrictions on access to water resources for irrigation

Ideal state:

- Sustainability with carrying capacity doubled and biodiversity maintained
- Profitable farming enterprises without the need for off-farm income
- Simpler vegetation classification system
- Increased capacity to manage predators and TGP with fencing.

(b) Integrated livestock, finance, business and marketing strategies (ranked equal third; Table 9)

Issues:

- Producers lack trust in BoM forecasts, hence confidence in using these in decision making
- Producers lack understanding of the drivers of seasonal variation
- Government agencies lack the funds, suitable training and tools, time and capacity to properly engage with and advise producers
- Bank policies are restrictive and focused on debt recovery, and regional managers have insufficient resources and flexibility/authority to always meet producers' needs

- Agents may lack the training/tools and capacity to always get the best value for their clients, particularly in poor seasons
- Better planning and decision making for stocking/destocking/marketing

Ideal state:

- Producers have the skills to plan (production and finances) correctly according to the climate outlook
- R&D is conducted locally to demonstrate the relevance and value of BMPs/innovations
- Producers are well informed and aware of new developments
- Producers know their country and engage in proactive planning and decision-making
- Information on local and overseas markets' requirement and prices is readily available
- Government policy on livestock marketing incorporates new and different ways of marketing livestock
- Producers have cost-effective marketing strategies

(c) Building social networks, health & wellbeing (ranked equal third; Table 9)

Issues:

- Producers' business and mental state are closely linked.
- Good networks and relationships (socially, and with NRM agencies, agents and banks) are important.
- DAF and NRM organisations find it hard to keep good staff and maintain networks with producers, especially under adverse conditions when producers may be less willing to engage/attend workshops and adopt advice; programs are more difficult to deliver; and continued funding for projects and positions may be at risk.
- Lack of IT skills and confidence in using new technologies may undermine the effectiveness of new forms of communication with producers.

Ideal state:

- Everyone has access to, and the skills and knowledge to use, new forms of communication.
- Service providers use the most effective means of communicating with producers.
- Strong social links exist within the industry.
- There is strong commitment to maintaining local services and experienced personnel within regions/local areas.
- Producers recognise the value of attending workshops etc.

4. Social mapping

The social mapping exercise identified organisations at local/regional, state and national scales that actively interact with stakeholders in livestock production industries around Charleville (Table 10). These organisations are potential collaborators in future projects.

Table 10 Social structure identified by workshop participants for the Charleville community at local, regional, state and national scales

Scale	Livestock production	NRM	Health	Financial	Social
Local	Local stock & station agents (e.g. Landmark, Elders, CRT, Western Rural) AgForce AWN FutureBeef Vets Ray White DAF	SW NRM Leading Sheep Council DNRM DAF Fishing club Landcare	RFDS Qld Health CWATSICH RFDS Lifeline Doctors Hospital Social workers Anglicare CatholicCare Charities	Local banks (big 4 & others) RFCS QRAA Lifeline Accountants	Local charities Lifeline RAFS Aussie Helpers Rotary Lions Neighbourhood centre Churches Sports clubs Arts & craft groups Scouts/guides Performing arts Show Society
Regional	AgForce FutureBeef AWN MLA QDAF Leading Sheep AWI GDL Consultants	Col Paton NRM groups (SWNRM, QMDC, DCQ, CA) Landcare	RFDS Lifeline Qld Health SW Health hospitals Specialists Surgeons Maternity	RFCS QRAA QRIDA Leichhardt group	Big Red Bash
State	AgForce AWN QFF Local member (Ann Leahy) DAF MLA AWI CCA LBN Biosecurity Qld	DNRM EHP EPA	Qld Health Charities	QRRR Bush agribusinesses RCS Carbon traders	
National	AW National DAWR Centrelink DAF MLA AWI CCA Federal government	Federal government	Federal government Charities	Carbon traders	

5. Workshop evaluation

Workshop participant feedback and project team reflections on the Charleville workshop are available in Appendix A2. The 5 Whys exercise worked well this time around, although both participants and the workshop team again felt that more time was required to complete the task in full.

Again, feedback from workshop participants was largely positive and the opportunity to engage with stakeholders from a variety of backgrounds and to gain a broader perspective of issues was seen as a particularly valuable aspect of the workshop.

A majority of participants in the workshop again indicated that they would be both willing to participate in a future co-innovation project and to discuss this with other stakeholders in the local/regional community. A number of local and regional stakeholders who had been invited to the workshop but were unable to attend on the day also expressed interest in the co-innovation concept and asked to be kept informed about opportunities to participate in the future.

3.3.6 Charleville workshop synthesis

The Charleville workshop was particularly valuable in highlighting the need to individually engage with regional communities to identify the specific regional issues faced by producers and other stakeholders in that region. While the Charleville community largely endorsed the broad R&D themes identified for the Longreach region, there were significant differences in the more detailed R&D issues identified. Given its different geographic location, the influence of climatic drivers around Charleville differs from those influencing the Longreach region; so, therefore, does the value of particular climate information. In addition, significant differences in the dominant vegetation systems supporting the livestock industry underpin key differences in the issues and R&D priorities identified for each region. For example, the issue of mulga management and associated tree clearing legislation was a novel and major focus of discussion at this workshop.

There was again significant interest in building financial and business planning skills and in technological innovations and the capacity to use these. Significantly, most participants wanted to see locally developed, trialled and implemented innovations plus the business case for their adoption, as well as innovations around opportunities for diversification and niche marketing.

Cluster fencing in the region similarly represents an opportunity to investigate issues around livestock and TGP management through feral and native predator and competitor management, and also the social impacts of these fencing projects. One producer at the workshop who was within a fenced cluster reported increased capacity to incorporate goats into her production system and was keen to develop irrigated pasture cropping pending water availability.

3.4 Phase 2 pilot project synopsis

The two multi-stakeholder workshops conducted as part of this Phase 2 pilot study were held in Longreach and Charleville, Queensland, and attended by red meat and wool producers plus a range

of other stakeholders from these regional communities, many of whom play an important role in supporting livestock producers and all of whom are affected in some way by the state of the livestock production industries in their region. Importantly, with low population numbers and the need for off-farm income, many people—including a number of those attending the workshops—occupy multiple roles in these communities and individual workshop participants frequently represented both producer and service industries and/or other community groups.

The workshops were reasonably well attended by people from a range of community sectors, with indication of significant interest in the outcomes from others who were invited but unable to attend. Participants actively engaged in the workshop activities and all made significant contributions to discussions, and provided important critical feedback on the workshop process (Appendix A). The workshop facilitation team gained important insights through the project into both the broad (Queensland) industry R&D priorities plus the specific issues and R&D priorities for each region.

The two workshops conducted in this Phase 2 project significantly built on the findings of the earlier Phase 1 scoping study. The key R&D themes were confirmed and added to and a number of project ideas within these were identified. Conducting the workshops in two different regions also confirmed the need for regionally-focused innovation/co-innovation. Given the different geographic locations of the two regions, the influence of climatic drivers substantially differed, as did perceptions of the value of particular climate information. Significant differences in the dominant land types/vegetation systems supporting the livestock industries in the two regions also contributed to key differences in the issues and R&D priorities identified for each region. Grazing land management around Longreach, which sits in the Mitchell grasslands of central Queensland, is focused on sustainable pasture management. On the other hand, livestock producers around Charleville, in the mulga shrublands of south west Queensland, are able (within restrictions imposed by state tree clearing legislation) to pull mulga for drought fodder but, in good seasons, need to deal with significant woody regrowth which constrains the productivity of groundcover vegetation and to conform with state vegetation management policy and legislation. Consequently, the Charleville workshop resulted in significant amendment of the R&D priorities developed for the Longreach region to better reflect the local situation.

The process of working with multi-sector stakeholders was a novel experience for the workshop team and facilitator; hence, the workshops were also seen as an opportunity for the iterative development of an effective collaborative workshop process. Learnings from the Longreach workshop were used to improve the processes later used in the Charleville workshop. Workshop participant and facilitation team feedback on both workshops, as well as the Phase 2 project M&E report (Appendix D), will be further used to inform co-innovation processes implemented in the future (e.g. a Phase 3 proposal/project). In particular, the process of inviting participants to workshops is likely to improve as the project team builds a network of stakeholders in the regions and also becomes better known to those stakeholders. Stakeholders need to be convinced of the value to be gained from attending workshops and similar events. While this will develop over time, future workshops would also benefit from the sharing of information (e.g. agenda, aims, background information) about each activity.

3.5 Potential R&D projects identified from Phase 2 project workshops

Several potential research projects emerged from discussions at the Phase 2 pilot project workshops in Longreach and Charleville. These represent a starting point for the proposed Phase 3 project, which would revisit these to identify those that community and policy groups believe most important to take forward. These include:

1. Develop return on investment value propositions to support change:

a. For producers

- Adoption of existing information (e.g. SCFs) and support tools/software in grazing land management (feed budgets, stocking/destocking) and marketing decision-making
- Seeking advice from professionals (e.g. financial/business and other consultants)
- Workshop attendance/participation
- Building strong social learning networks

b. For policy makers

- Investigating stewardship payments (e.g. payment for ecosystem services/PES), taxation and other incentives (e.g. cluster fencing) to facilitate sustainable land condition and ecosystem service delivery (e.g. landscape function; biodiversity conservation outcomes on grazing lands) on leasehold and private tenure
- Drought support to enhance regional sustainability

c. For industry

- Industry sustainability with more productive and profitable producers
- Industry social licence to operate
- BMP certification and green labelling
- Niche marketing opportunities
- Local trials demonstrating the relevance (and value) of innovations
- Good story telling to build public (and landholder) confidence through the media

2. Proactive pasture management

- Developing effective monitoring programs for outcomes based evaluation of land and pasture condition, total grazing pressure/TGP and biodiversity values which could feed into a PES system (above) if/when developed
- Better use and integration of climate and marketing information in decision making
- The role/s of BMP certification, green labelling and niche marketing
- Moving from a focus on optimising livestock production to optimising land condition, with meat/wool/hides (sheep, cattle, goats, kangaroos) as saleable commodities
- Practice change to accommodate potential for outcomes based payments (e.g. stewardship, PES, carbon sequestration) as additional income streams

3. Collaborating with banks, financial counsellors and government to:

- Understand and build financial literacy
- Investigate opportunities and barriers to diversification of on- and off-farm investment
- Investigate opportunities to enhance risk spreading

4. Facilitating digital solutions to:

- Close the gap between digital solutions developers and users
- Develop and support the implementation of monitoring and stock management tools/systems (e.g. internet of things)
- Develop and support innovative marketing opportunities
- IT capacity building (training and support)
- Innovative livestock data storage and analysis tools.

3.6 Phase 2 Pilot project conclusions

In conclusion, the Phase 2 Pilot Project indicated that a number of producers and associated stakeholders in the Longreach and Charleville regions/communities were both ready and willing to engage in a process aimed at identifying a number of specific 'wicked' problems currently limiting their sustainability—and, hence, resilience—and working collaboratively to identify and develop regionally-targeted solutions. Given this, the potential for a viable and successful Phase 3 project would appear to be substantial, resulting in enhanced skills (i.e. capacity) and uptake of solutions (i.e. tools, practices) that are seen by producers to be appropriate to local conditions.

The technical feasibility of the proposed Phase 3 project (outlined in Sections 7 and 8) is also high. Design-led thinking and co-innovation approaches, which are systems-focused, collaborative and regionally-informed, have been successfully implemented elsewhere (e.g. the Primary Innovation program in New Zealand (Botha *et al.*, 2014) and the Major Integrated Projects (MIPs) currently

underway in the Wet Tropics and Burdekin regions (Queensland Government, 2017). Such projects have worked closely with farming communities to identify, trial and evaluate a number of management actions, increase capacity for practice change and achieve on-ground outcomes. While it will be necessary to review and customise these approaches to fit the target groups and regions, the Phase 3 project will be mentored by personnel experienced in these and other participatory approaches and their application in agricultural contexts. This will ensure that there is effective learning from previous applications, but also understanding of where and how the approaches need adjustment to ensure the Phase 3 project works effectively with local and regional stakeholders to meet its key objectives.

4 Recommendations for a Phase 3 R&D project

The findings of both the Phase 1 scoping study (Mushtaq *et al.*, 2016) and this Phase 2 pilot project, endorsement by regional community stakeholders (including producers), the strong recommendations in the independent M&E report on the Phase 2 pilot project (Appendix D) and further consultation with industry, government and other researchers all point to the value in progressing to a larger Phase 3 co-innovation project.

A Phase 3 project would aim to deliver effective innovation through enhanced uptake of regionally-targeted adaptive practices and tools to boost drought and climate resilience for primary producers, specifically in the grazing livestock (red meat and wool production) industries. It would work with the Longreach and Charleville communities to further develop and deliver community-led innovation to enhance drought risk management and improve the productivity and profitability of the regions' livestock production industries and the sustainability of the Longreach and Charleville communities.

In addition, the project would develop a protocol (framework and tested process) for regional co-innovation to inform future projects aimed at building resilience to climate variability and risk in other regions. It would also provide recommendations for scaling up co-innovation at the industry/systems level and potentially scaling out to other sectors.

4.1 Phase 3 R&D project objectives

Key objectives for the proposed Phase 3 project include that it will:

- deliver significant return on project investment through enhanced productivity and profitability of regional livestock (red meat and wool) producers by:
 - identifying and promoting, in collaboration with regional stakeholders, effective regionally-targeted strategic and operational decision making and technical innovations (information, frameworks, tools, skills) to reduce exposure to drought risk within the Charleville and Longreach regions; and
 - developing, in collaboration with regional stakeholders, innovative effective regionally-targeted on-farm business management practices that assist producers to

better plan and manage for climatic variability, especially drought risk, within the Charleville and Longreach regions;

- contribute to developing a whole of industry systems approach to building resilience to Australia’s variable climate; and
- provide critical insights to inform State and Federal drought management policies.

4.2 Phase 3 R&D project implementation

Phases 1 and 2 of this R&D program have identified a number of R&D priorities and potential projects for the Longreach and Charleville regions; however, R&D conducted in the proposed Phase 3 project, if implemented, will necessarily continue to be guided by the regional stakeholder/co-innovation groups.

Overall, the project would employ an iterative adaptive cycle (Figure 8) in collaboration with the Longreach and Charleville regional stakeholder communities.

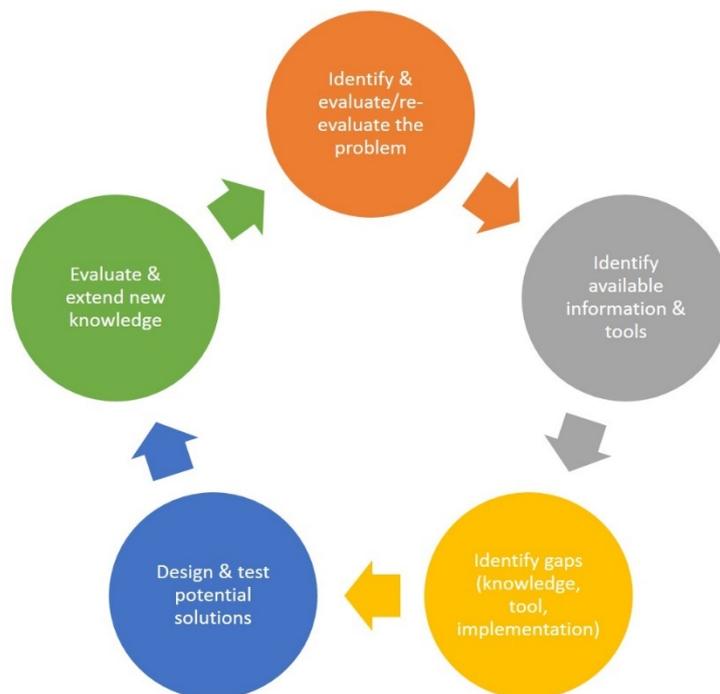


Figure 8 The proposed iterative adaptive co-innovation cycle

The key to co-innovation would be the collaborative framework within which the project is implemented (Figure 9). For each region and R&D theme to be addressed, the project would seek to establish a co-innovation team comprising (i) a representative community reference group (i.e. the ‘problem and solution owners’ who desire change); (ii) a key policy influencer (KPI) group which can effectively influence the viability of the project; and (iii) and the R&D research team which will

determine the feasibility of the project. We envisage that the project will involve multiple co-innovation cycles, with monitoring and evaluation of learning an integral component at each stage. This framework will effectively define the co-innovation space for each selected R&D theme; within this space the project would begin with a working problem, but the solution space will be largely unknown at the outset and will evolve over time.

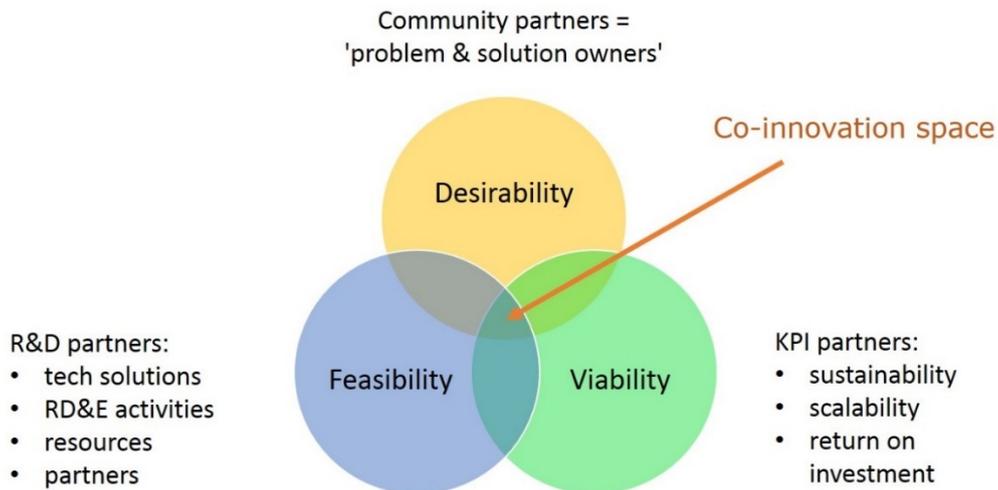


Figure 9 Proposed co-innovation structure

In general, the makeup of the project partners would potentially be as follows:

- community partners would ideally comprise, at minimum, representatives of core community stakeholder groups relevant to the R&D theme, but may be open to additional participants;
- KPI partners would comprise key personnel from local government, state government (e.g. QDAF), NGOs (e.g. regional NRM organisation, RFDS) and industry (e.g. MLA, AWI); and
- R&D partners would be made up of relevant researchers from the partners listed in the project proposal (e.g. USQ, QDAF, QDSITI, MLA, AWI) with the option to contract external researchers where skills gaps are encountered.

Meetings between the partners would likely occur on a quarterly basis. These meetings would be facilitated by an independent facilitator (e.g. Gerry Roberts). Ideally, the community partners would be motivated to meet on a more regular basis and be key to driving the process/initiating change.

Table 11 outlines the structure of the proposed co-innovation systems approach by R&D theme. While this overall structure might be replicated across the two regions, it would also necessarily differ in detail as R&D priorities (themes and projects) to be targeted by the project would vary between the regions.

Table 11 Potential structure of the co-innovation systems – listed by R&D priority – for a Phase 3 implementation project (NB. R&D themes are listed alphabetically and no ranking is implied)

R&D priority	Benefit	Key policy influencer (KPI) group members	Relevant scale of implementation (L: local, R: regional, S: state, N: national)	Potential stakeholders engaged in the co-innovation process (a.k.a. community reference group)	Comments on the level of influence on research impact	Likely level of interest in the research (H/M/L)	Level of influence on the research (H/M/L)
Building social networks, health and well being	Resilient individuals and families enjoying high levels of health and well-being based on abundant opportunity for frequent positive interactions, social activity, community cohesion and mutual support. Extended impact/benefit through engaging future generations of decision makers.	MLA; AWI; LGA; RFDS; Lifeline; livestock producer group rep/s (e.g. Cattleman’s Union; cluster fencing project group); local Chamber of Commerce; Department of Education; Department of Families.	L–R	Producers; LGA personnel; community health & social welfare personnel (e.g. RFDS, hospitals, health professionals, Lifeline); community service groups (e.g. Rotary, Lions); community arts, environment and sporting groups; church groups; schools; TAFE/Ag colleges; relevant government agency personnel; banks/other financial institutions; et al.	Effective local community envisioning and planning based on active engagement with/involvement of a diversity of local stakeholders to identify needs/issues, critically evaluate suggestions and strategically facilitate (fund/plan/implement) solutions.	H	H

R&D priority	Benefit	Key policy influencer (KPI) group members	Relevant scale of implementation (L: local, R: regional, S: state, N: national)	Potential stakeholders engaged in the co-innovation process (a.k.a. community reference group)	Comments on the level of influence on research impact	Likely level of interest in the research (H/M/L)	Level of influence on the research (H/M/L)
Improved decision making for drought management and recovery	More profitable, sustainable and resilient livestock and other rural businesses and communities due to enhanced capacity to make timely well-informed cost-effective business (i.e. livestock and resource management, investment and marketing) decisions. Extended benefit through engaging future generations of decision makers.	MLA; AWI; LGA; DAF; DSITI; NRM group CEO; RFDS; livestock producer group rep/s (e.g. Cattleman's Union; cluster fencing project group); value chain organisation.	L-R	Producers; DAF & DSITI RD&E personnel; ag & financial consultants; regional NRM group personnel; ag merchandising; LGA personnel; schools; TAFE/Ag colleges; banks/other financial institutions; accountants; et al.	Effective local producer/community engagement to identify needs/issues, critically evaluate suggestions and drive adoption/implementation of regionally targeted needs-based decision support information, tools and training; benefit relies on willingness and capacity (i.e. stakeholder trust and confidence) to use information/tools.	H	H
Improved seasonal climate forecasts (SCFs) and capacity to use these in decision making	Enhanced capacity to make timely well-informed pasture and livestock management and marketing decisions. Extended benefit through engaging future generations of decision makers.	MLA; AWI; ICACS (BoM; UK Met Office; WMO); LGA; DAF; DSITI; NRM group CEO; livestock producer group rep/s (e.g. Cattleman's Union; cluster fencing project group); value chain organisation.	L-R	Producers; DAF & DSITI RD&E personnel; ag & financial consultants; regional NRM group personnel; ag merchandising; value chain providers (abattoirs, saleyards, transport, marketing agents, export facilities,	While improved forecast skill is a technological challenge, producing useful SCF information must be customised for the region and informed by users (e.g. type and timing of critical decisions); benefit relies on willingness and	H	H

R&D priority	Benefit	Key policy influencer (KPI) group members	Relevant scale of implementation (L: local, R: regional, S: state, N: national)	Potential stakeholders engaged in the co-innovation process (a.k.a. community reference group)	Comments on the level of influence on research impact	Likely level of interest in the research (H/M/L)	Level of influence on the research (H/M/L)
				etc.); LGA personnel; schools; TAFE/Ag colleges; banks/other financial institutions; accountants; et al.	capacity (i.e. stakeholder trust and confidence) to use this information.		
Integrated livestock, finance, business and marketing management	More diverse, sustainable and resilient red meat/wool industry value chain/s. Producers with access to higher value production and niche marketing opportunities plus diverse income sources/streams. Extended benefit through engaging future generations of decision makers.	MLA; AWI; LGA; DAF; DSITI; NRM group CEO; livestock producer group rep/s (e.g. Cattleman's Union; cluster fencing project group); value chain organisation; regional economic development advisory groups.	L–R–S–N	Producers; DAF & DSITI RD&E personnel; ag & financial consultants; regional NRM group personnel; ag merchandising; value chain providers (abattoirs, saleyards, transport, marketing agents, export facilities, etc.); LGA personnel; schools; TAFE/Ag colleges; banks/other financial institutions; accountants; et al.	Systems level innovation based on context specific information (i.e. informed and developed in conjunction with key stakeholders) to ensure issues are comprehensively and clearly identified and solutions are co-generated and critically compared and evaluated by engaging ag consultants, value chain advisors and using expert decision systems.	H	H
Pasture management and TGP decision support	More sustainable (productive and profitable) livestock enterprises and more resilient landscapes due to	MLA; AWI; LGA; DAF; DSITI; NRM group CEO; livestock producer group rep/s (e.g. Cattleman's Union;	L–R	Producers; DAF & DSITI RD&E personnel; ag consultants; regional NRM group personnel; ag	Producing useful decision support systems/tools and information informed by users (e.g. context, need);	H	H

R&D priority	Benefit	Key policy influencer (KPI) group members	Relevant scale of implementation (L: local, R: regional, S: state, N: national)	Potential stakeholders engaged in the co-innovation process (a.k.a. community reference group)	Comments on the level of influence on research impact	Likely level of interest in the research (H/M/L)	Level of influence on the research (H/M/L)
	enhanced capacity of producers to make timely well-informed pasture and livestock/TGP management and marketing decisions through the use of regionally targeted decision support information, technical support, demonstrations, costed examples and/or tools. Extended benefit through engaging future generations of decision makers.	cluster fencing project group).		merchandising; LGA personnel; schools; TAFE/Ag colleges; et al.	benefit relies on willingness and capacity (i.e. stakeholder trust and confidence) to use this information.		
Viability and management of production systems in landscapes subject to woody thickening	Sustainable livestock production systems in landscapes subject to woody thickening and subject to vegetation policy/management constraints. Extended benefit through engaging future generations of decision makers.	MLA; AWI; LGA; DAF; DSITI; EHP; NRM group CEO; livestock producer group rep/s (e.g. Cattleman’s Union; cluster fencing project group); regional economic development advisory groups; state & federal government agencies.	L–R–S–N	Producer; rural advisors/consultants ; banks/financial institutions; government agencies; DAF & DSITI personnel; ag & financial consultants; regional NRM group personnel; ag merchandising; LGA personnel; schools; TAFE/Ag colleges; et al.	Effective local producer/community engagement to identify and discuss needs/issues around the altered carrying capacity and function of landscape/production systems that have undergone state shifts in terms of woodland structure (i.e. woody thickening).	M	M

Research projects within the Phase 3 project would be designed to address the R&D priorities identified by the local communities (e.g. Section 6.1). To assist local communities to prioritise projects, project options could be costed and assessed within a multi criteria decision analysis (MCDA) framework (Köksalan *et al.*, 2011) in terms of their relative contributions to the productivity and profitability of the regional livestock industry; environmental costs and benefits; and socio-economic costs and benefits over relevant time frames. MCDA provides an objective process which enables tradeoffs between different goals to be identified and the relative value of alternative solutions assessed (Azapagic and Perdan, 2005a,b); where insufficient detail is available to run a robust analysis, this may also indicate additional important knowledge gaps that need to be filled.

A critical review of the research literature and other reports/documents relevant to each research priority would be conducted to ensure that current knowledge and knowledge gaps are identified and that any new research is well targeted and focused on delivering new knowledge. While development of new approaches (i.e. processes, tools, technologies, practices) might occur where necessary in collaboration with each of the regional co-innovation teams involved in the project, available tools etc which would be of benefit but are currently underutilised would also be identified. This would ensure that local needs are met and that key stakeholders are invested in the outcomes, while the project would build, wherever possible, on previous R&D investment. In particular, the project would focus on building confidence and capacity in decision making at the production system level.

Figure 10 provides an example of how the project might take a systems view of livestock production to design more integrated approaches to decision-making whereby (i) a variety of information systems and tools/technologies are incorporated; and (ii) around which a targeted decision-making strategy relevant to the local context and a specific enterprise might be developed.

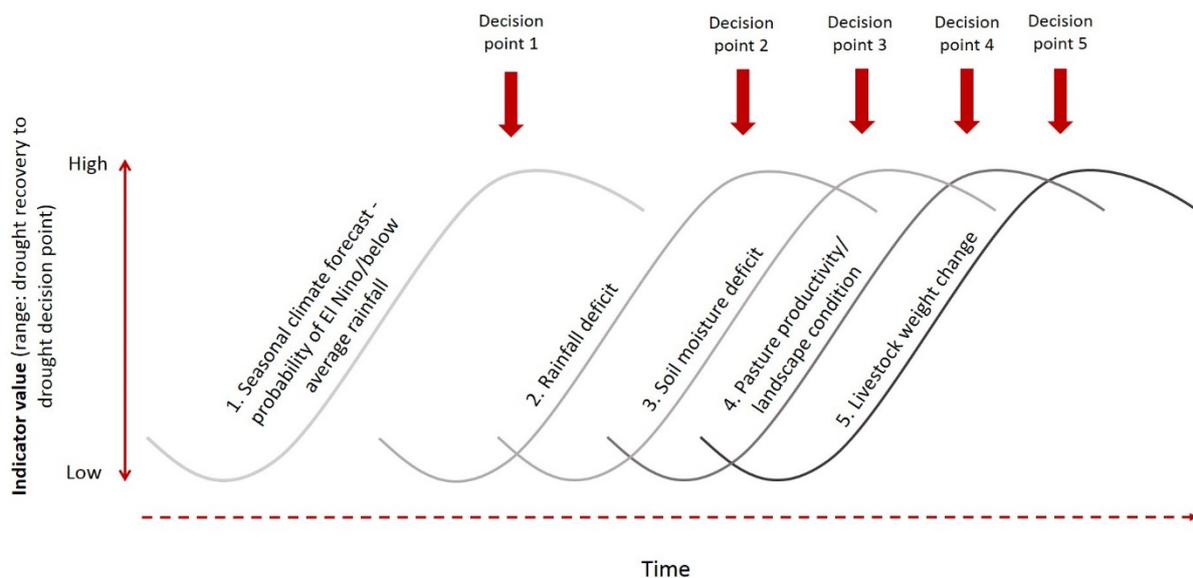


Figure 10 An integrated decision-making framework indicating multiple decision points, informed by data, along a drought progression/intensification timeline. Each decision is based on different indicators, each of which signifies a critical threshold or tipping point as drought progresses; they are represented in the same figure to indicate that they are potentially sequential (but lagged) decisions to be made if and as drought progresses.

The types of information informing decisions varies at each of the decision points identified in Figure 10 include:

- **Decision point 1:** early decisions are based on the SCF and probability of below average rainfall.
- **Decision point 2:** decisions here are based on rainfall received and triggered by passing some predetermined threshold (e.g. lowest tercile/decile of historical); this links to a comment at the Charleville workshop about the need for producers to know how to use their own data.
- **Decision point 3:** decisions here are based on monitoring of soil moisture content/deficit, which provides an early indicator of impending decline in pasture condition; soil moisture deficit is a consequence of rainfall deficit, but may vary across the property depending on soil type/clay content and land zone.
- **Decision point 4:** decisions here are informed by on-ground pasture/groundcover condition monitoring (and feed budgets) and/or remote sensed pasture productivity (EVI/NDVI) trends; changing direction of pasture productivity trend is a response to changes in soil moisture.
- **Decision point 5:** Decisions here are informed by livestock response (reduced weight gain/weight loss) to pasture decline. This is probably the current decision point used by many producers, but is likely to coincide with significant market price decline, and will be too late if the market has tanked; pasture degradation by this time is also likely to impact post-drought recovery.

In an integrated decision-making framework such as this, the types of decisions made might include: to start monitoring other indicators (i.e. those informing later decision pts 2–5) more closely and revise strategy/tactical plan (decision point 1); move stock within property boundaries; provide feed supplements; switch to feed lotting; destock (move stock to less impacted properties/agistment); sell x% of the herd at certain decision points (decision points 2–5). Market information (domestic price dynamics; export market requirements) will also play a part in these decisions. At the larger temporal scale, the overarching decadal (7–11 year) wet-dry cycles experienced in regional Queensland (Queensland Department of Science, Information, Technology and Innovation, 2017) also point to the need to strategise at this scale, whereby higher levels of productivity and profitability through a run of better years is seen as an opportunity to invest in such a way as to offset the potential for reduced cash flow through the subsequent (and to some degree predictable) period of drier than average years. Each of these decisions will be influenced by the trust the decision maker has in the tools and information associated with the various indicators; their confidence in making these decisions; and the business and family contexts in which such decisions are made.

Extension of on-ground approaches/processes/networks/tools and practices developed through the R&D phases would be an integral aspect of the regional co-innovation process, as the stakeholder groups will own both the process and the outputs. Part of the R&D might be to develop extension processes/methodologies and tools to assist producers to implement relevant existing/new on-

ground tools and practices developed through the R&D phases of the project, but again these would be developed in collaboration with local stakeholders. Active extension of the Phase 3 R&D project would also be aimed at higher (sector/industry/policy) levels and would focus on sharing the processes and findings of the Phase 3 project to enhance (i.e. scale up) its value more broadly. Overall, the project would take a strategic and operational planned approach to ensuring its beneficial impact to regional and broader livestock production industries, as outlined in Appendix B: 'The Phase 3 project pathway to impact'.

5 Benefits of a co-innovation approach to the livestock industry

There is significant potential benefit to be realised through industry stakeholders, researchers and policy makers working closely in collaboration with producers and allied services to develop a systems-based understanding of the social, economic and ecological elements of regional livestock production systems. Decision support tools, processes, networks, technologies, services and practices designed through an iterative co-innovation process are more likely to specifically address local needs and enjoy increased levels of uptake due to their greater applicability to local conditions; enhanced perceptions by local producers of their relevance to decision-making; and 'ownership' of both the problem/s and solution/s. Increased adaptive capacity due to increased capacity to make and implement timely and effective decisions is likely to promote increased resilience and contribute to the sustainability of regional production systems and communities.

5.1 The value proposition of a Phase 3 project

A preliminary economic analysis (Appendix C) indicates that a \$2.5 million investment in a five year Phase 3 co-innovation project delivered in the central western and south western Queensland livestock production regions will provide considerable benefits through the enhanced adoption of co-developed regionally targetted drought risk management decision support systems, information, tools and skills.

Using a number of assumptions about engagement and adoption (Appendix C) including a conservative estimate of the value of risk reduction of \$10 per Adult Equivalent⁶ or AE (McLean *et al.*, 2014), the economic analysis indicates significant return on investment:

- a Net Present Value (NPV) of \$17.01 million;
- an Internal Rate of Return (IRR) of 145%;
- and a Benefit Cost Ratio (BCR) of 8.1.

Even at a very low estimated value of risk reduction of \$6.00 per AE (McLean *et al.*, 2014), the estimated NPV would be \$9.36 million with a BCR of 4.4 (Table 12).

⁶ A 2.25 year old 450 kg *Bos taurus* steer at maintenance, grazing on a 7.75 MJ diet and walking 7 km a day (McLean and Blakeley, 2014).

Table 12 Sensitivity analysis based on different 'value of risk reduction' scenarios

Economic evaluation indices	Value of risk reduction (\$/AE)*	Net Present Value (NPV) (\$million)	Internal Rate of Return (IRR) (%)	Benefit Cost Ratio (BCR)
Base case scenario	10.00	17.01	145%	8.1
S1	16.35	29.15	230%	13.8
S2	6.00	9.36	82%	4.4

* Value of risk reduction to average producers based on McLean *et al.* (2014)

5.2 Additional leveraged value from other R&D projects

In addition, the proposed Phase 3 project would leverage significant research investment (totalling \$26.649 million) in a number of other projects currently being conducted by/through partnerships with the University of Southern Queensland (USQ). These include:

- *Producing enhanced crop insurance systems and associated financial decision support tools* (2017–2021)—funded (\$1.08m) by the Queensland Government Climate and Drought Adaptation Project (DCAP)
- *Northern Climate Adaptation Program* (2017–2021)—funded (\$8.0m) by the Queensland Government Climate and Drought Adaptation Project (DCAP), Meat and Livestock Australia (MLA), MLA Donor Company (MDC) and University of Southern Queensland (USQ)
- *Forewarned is forearmed: equipping farmers and agricultural value chains to proactively manage the impacts of extreme climate events* (2017–2022)— total value \$13.5m; funded by the Rural Research and Development (R&D) for Profit (RRfP) Program (Round 3)
- *Improved use of seasonal forecasting to increase farmer profitability* (2015–2018)— total value \$3.7m; funded by the Rural Research and Development for Profit (RRfP) Program (Round 1)
- *Exploring profitability and resilience through novel livestock and pasture adaptation to future climates* (2017–2020)—funded (\$199,000) by Meat and Livestock Australia (MLA)
- *Cluster cleanout: Permanent eradication of wild dogs within fenced areas* (ends June 2018)— funded (\$70,000) by Queensland Feral Pest Initiative through Quilpie Shire Council
- *Economics of cluster fencing* (PhD project)—funded (\$100,000) by Centre for Invasive Species Solutions (CISS)

Other project partners (DAF and DSITI) are also delivering projects which will add significant value to investments in the proposed Phase 3 project. These include:

- *The inside edge for graziers to master Qld's drought prone climate*

- *Do we really know our baseline climate? Using palaeoclimate data to plan and prepare for extreme events and floods in Qld*
- *Enabling drought resilience and adaptation: A program of social research and knowledge support*
- *Delivering integrated production and economic knowledge and skills to improve drought management outcomes for grazing systems*
- *Use of BoM multi-week and seasonal forecasts to facilitate improved management decisions in Qld's vegetable industry*
- *GrazingFutures: Promoting a resilient grazing industry.*

In addition, the project would leverage other industry investments to achieve MLA 2020 Strategic objectives in Pillar 4 Profitability and Productivity ('By 2020 improvement in total factor productivity of 0.5% for northern Beef 1.75% southern beef and 0.5% sheepmeat') and the AWI 2016–19 Strategic Plan objectives to 'Promote adoption of best practice management', 'Mitigate impact of climate change on wool production' and 'Ensure industry is recognised as leaders in sustainable farming'.

The Phase 3 project would also provide a unique opportunity to gain an integrated understanding of the tradeoffs and synergies associated with investments, by industry and regional stakeholders, into large scale innovations such as cluster fencing.

6 Phase 3 innovation and significance

In both its conceptualisation and implementation, the proposed Phase 3 project would recognise the co-dependence of regional livestock (red meat and wool) production industries and rural communities and the need to identify relevant regionally targeted and 'owned' solutions to locally defined issues. As such, it would represent a significant departure from the business as usual approach to RD&E.

Adopting a design-led systems co-innovation approach, the project would be (i) informed by the application of such approaches in other sectors; and (ii) customised as needed to best meet the needs of the current project and regional context/s. The overall project approach would be iterative and adaptive, with regular monitoring and evaluation of project activities and outcomes and revision of the project design and implementation to ensure that changes were made where needed in order to deliver the desired results. Co-innovation approaches—with multi-stakeholder groups (i.e. local producers and associated service, community, industry and government agencies) coming together to identify relevant issues and potential solutions and thereby drive the RD&E aspects of a project—have proven more likely to result in regionally focused/targeted solutions. Indications are that they also enhance the uptake of innovations which specifically address the local issues identified and are owned by the co-innovation group/community.

Key policy influencer groups—higher level stakeholders with the capacity to direct programs and influence policy—would play a critical role in driving change by ensuring that local and regional stakeholder issues drive R&D, that R&D is directly reported back to community stakeholders and that industry and policy makers are an integral part of the adaptive loop.

The key innovations underpinning the proposed Phase 3 project are (i) the devolving of responsibility for the R&D problem and solution spaces to local producers and communities, and (ii) the systems context in which both challenges/issues/barriers are identified and solutions are developed. Iterative design-led thinking is critical to ensuring that innovation is a true collaboration between producers, industry service providers, community, researchers and policy makers. The significance of this approach is that it is more likely than conventional top down innovation approaches to deliver both innovations/solutions specific to local needs and increased levels of adoption and, hence, greater benefit to the productivity, profitability and sustainability of regional livestock industries and the resilience and well-being of producers and rural communities.

Expected outcomes of a Phase 3 co-innovation project include:

- improved climate/drought risk decision making and management
- improved land condition
- significant positive impact on the productivity and profitability of regional livestock (red meat and wool) producers, hence ROI from project investment
- significant positive impact on the well-being of regional livestock producers and members of rural communities
- increased sustainability of livestock (red meat and wool) production enterprises and industries
- increased resilience to climate variability and risk in rural communities
- significant reduction in the negative impacts of drought, including the need for financial support, within regional livestock (red meat and wool) industries and rural communities
- improved regional adaption capacity based on system design/co-innovation
- improved processes for effectively engaging multi-sector stakeholders actors in co-innovation projects
- improved processes for delivering industry wide outcomes for both the red meat and wool production sectors.

7 Summary and conclusions

Australia has one of the most variable climates in the world and drought, in particular, can have significant impacts on the agricultural sector and especially the livestock production industries

operating across large areas of regional Australia. Statistical analyses of climate records, in combination with predictive modelling, indicate a shift in climate over recent decades and significant future potential for increasing drought risk and impact. RD&E projects developed to assist livestock (red meat and wool) producers in climate risk decision making do not always achieve the expected levels of adoption of new risk management tools and practices; these innovations have tended to be 'topdown'—conceptualised, designed and developed by experts for delivery at scale i.e. at the industry-wide level, with often only limited success in terms of the levels of adoption/uptake by individual producers. Design-led systems innovation thinking and co-innovation processes offer approaches which encompass the complexity of decision making in livestock production systems faced with extreme climate variability.

This report documents Phase 2 of a three-phase co-innovation project in which multi-stakeholder workshops were conducted in Longreach and Charleville in Queensland central west and south-west (respectively) livestock production regions to identify regional R&D priorities and the level of stakeholder interest in engaging in a larger co-innovation project to reduce drought impacts, increase the sustainability of livestock production systems and enhance regional community resilience. Regional R&D priorities were identified and endorsed and stakeholder interest confirmed in progressing to a larger systems innovation design and implementation project. This larger project (i.e. the proposed Phase 3 project) would build on the findings of the earlier phases to continue to work with these communities to effectively deliver and implement co-designed innovations which would enhance industry sustainability and build regional resilience to climate variability, and particularly drought.

At the larger scale, by trialing and customising co-innovation processes for the Australian livestock (red meat and wool) production industry, the project would facilitate similar projects in other regions, providing a basis for significant scaling of impact. Successful delivery of the project outcomes would also inform government drought and agricultural policy.

8 Acknowledgements

We thank the participants in each of the workshops for their active engagement in workshop activities; the valuable insights and ideas they brought to the workshop discussions; and their commitment to working towards sustainable futures for their communities and, in particular, the livestock industries that both support and rely on these. We would also like to acknowledge the assistance of those individuals who provided us with contacts in each of the workshop locations, including Gerry Roberts and David Phelps for the Longreach workshop, and Nicole Sallur and Jane Wightman for the Charleville workshop. Special thanks go to Gerry Roberts, Jane Wightman and Sam Bucolo for their enthusiasm for the project, valuable insights and assistance in planning and running the workshops.

9 Bibliography

- Alexander, L.V. and Arblaster, J.M. (2009). Assessing trends in observed and modelled climate extremes over Australia in relation to future projections. *International Journal of Climatology* 29, 417–435. <http://onlinelibrary.wiley.com/doi/10.1002/joc.1730/full>
- Allen, L. (2016). Threats and opportunities: Managing wild dogs within livestock production ecosystems. *Nature New South Wales* 60(1), 22–23. <https://search.informit.com.au/fullText;dn=520566395237188;res=IELAPA>
- Andrews, M., Pritchett, L. and Woolcock, M. (2013). Escaping Capability Traps Through Problem Driven Iterative Adaptation (PDIA). *World Development* 51, 234–244. <http://www.sciencedirect.com/science/article/pii/S0305750X13001320#b0240>
- Andrews, M., Pritchett, L., Samji, S. and Woolcock, M. (2015). Building capability by delivering results: putting Problem-Driven Iterative Adaptation (PDIA) principles into practice. In: Whaites, A., Gonzalez, E., Fyson, S. and Teskey, G. (eds.) *A Governance Practitioner's Notebook: Alternative Ideas and Approaches*. Paris France: OECD. <https://bsc.cid.harvard.edu/publications/building-capability-delivering-results-putting-problem-driven-iterative-adaptation>
- Ash, A., McIntosh, P., Cullen, B., Carberry, P. & Smith, M.S. (2007). Constraints and opportunities in applying seasonal climate forecasts in agriculture. *Australian Journal of Agricultural Research* 58(10), 952–965. <http://www.publish.csiro.au/cp/ar06188>
- Atkinson, R. & Flint, F. (2001). Accessing hidden and hard-to-reach populations: snowball research strategies. *Social Research Update* 33(1), 1–4. <http://citizenresearchnetwork.pbworks.com/f/accessing+hard+to+reach+populations+for+research.doc>
- Australian Bureau of Meteorology and CSIRO, 2011. Climate Change in the Pacific: Scientific Assessment and New Research. Volume 1: Regional Overview. Volume 2: Country Reports. Canberra ACT, Australia: Australian Government. <https://www.pacificclimatechangescience.org/wp-content/uploads/2013/08/Climate-Change-in-the-Pacific.-Scientific-Assessment-and-New-Research-Volume-1.-Regional-Overview.pdf> (accessed 12 Jan 2018)
- Azapagic, A. and Perdan, S. (2005a). An integrated sustainability decision-support framework. Part I: Problem structuring. *International Journal of Sustainable Development & World Ecology* 12(2), 98–111. <http://www.tandfonline.com/doi/abs/10.1080/13504500509469622>
- Azapagic, A. and Perdan, S. (2005b). An integrated sustainability decision-support framework. Part II: Problem analysis. *International Journal of Sustainable Development & World Ecology* 12(2), 112–131. <http://www.tandfonline.com/doi/abs/10.1080/13504500509469623>
- Bessant, J., Kaplinsky, R. and Lamming, R. (2003). Putting supply chain learning into practice, *International Journal of Operations & Production Management* 23(2), 167–184. <http://www.emeraldinsight.com/doi/full/10.1108/01443570310458438>

Botha, N., Klerkx, L., Small, B. and Turner, J.A. (2014). Lessons on transdisciplinary research in a co-innovation programme in the New Zealand agricultural sector. *Outlook on Agriculture* 43(3), 219–223. <http://journals.sagepub.com/doi/abs/10.5367/oa.2014.0175>

Botha, N., Coutts, J., Turner, J.A., White, T. and Williams, T. (2017). Evaluating for learning and accountability in system innovation: Incorporating reflexivity in a logical framework. *Outlook on Agriculture* 46(2), 154–160. <http://journals.sagepub.com/doi/abs/10.1177/0030727017707406>

Bouma, J., van Altvorst, A.C., Eweg, R., Smeets, P.J.A.M. and van Latesteijn, H.C. (2011). The role of knowledge when studying innovation and the associated wicked sustainability problems in agriculture. In: Sparks, D.L. (ed.) *Advances in Agronomy*. Academic Press. Pp. 283–312.

Bucolo, S. and Matthews, J. (2010). Using a design led disruptive innovation approach to develop new services: practising innovation in times of discontinuity. *Proceedings of the 11th International CINet Conference: Practicing Innovation in the Times of Discontinuity*. (pp.176–187). Zurich, Switzerland: CINet. <https://core.ac.uk/download/pdf/10901325.pdf>

Bucolo, S. and Matthews, J.H. (2011). Design Led Innovation : exploring the synthesis of needs, technologies and business models. In *Proceedings of Participatory Interaction Conference 2011, Sønderborg, Denmark*. <https://eprints.qut.edu.au/40355/>

Bucolo, S., Wrigley, C. and Matthews, J. (2012). Gaps in organizational leadership: linking strategic and operational activities through design-led propositions. *Design Management Journal* 7(1), 18–28. <http://onlinelibrary.wiley.com/doi/10.1111/j.1948-7177.2012.00030.x/full>

Bureau of Meteorology (2017). *Climate statistics for Australian locations*. Melbourne Vic., Australia: Bureau of Meteorology (BoM). Available at: http://www.bom.gov.au/climate/averages/tables/cw_044021_All.shtml (Charleville) and http://www.bom.gov.au/climate/averages/tables/cw_036031_All.shtml (Longreach)

Coutts, J., White, T., Blackett, P., Rijswijk, K., Bewsell, D., Park, N., Turner, J.A. and Botha, N. (2017). Evaluating a space for co-innovation: practical application of nine principles for co-innovation in five innovation projects. *Outlook on Agriculture* 46(2), 99–107. <http://journals.sagepub.com/doi/abs/10.1177/0030727017708453>

Coutts, J., Botha, N., Turner, J., Aenis, T., Knierim, A., Riecher, M.C., Ridder, R., Schobert, H. and Fischer, H. (2014). Evaluating a co-innovation policy initiative in New Zealand. In *11th European IFSA Symposium, Farming Systems Facing Global Challenges: Capacities and Strategies, Proceedings, Berlin, Germany, 1–4 April 2014* (pp. 110-119). International Farming Systems Association (IFSA) Europe. https://www.couttsjr.com.au/wp-content/uploads/2014/07/IFSA2014_CouttsTurnerandBotha.pdf

DoE (2008a). *Mitchell grass downs bioregion*. Canberra, ACT: Department of Environment (DoE). Available at: <https://www.environment.gov.au/system/files/resources/a8015c25-4aa2-4833-ad9c-e98d09e2ab52/files/bioregion-mitchell-grass-downs.pdf>

DoE (2008b). *Mulga lands bioregion*. Canberra, ACT: Department of Environment (DoE). Available at: <https://www.environment.gov.au/system/files/resources/a8015c25-4aa2-4833-ad9c-e98d09e2ab52/files/bioregion-mulga-lands.pdf>

Dogliotti, S., García, M.C., Peluffo, S., Dieste, J.P., Pedemonte, A.J., Bacigalupe, G.F., Scarlato, M., Alliaume, F., Alvarez, J., Chiappe, M. and Rossing, W.A.H. (2014). Co-innovation of family farm systems: A systems approach to sustainable agriculture. *Agricultural Systems* 126, 76–86. <http://www.sciencedirect.com/science/article/pii/S0308521X13000280>

Dowd, A.-M., Marshall, N., Fleming, A., Jakku, E., Gaillard, E. & Howden, M. (2014). The role of networks in transforming Australian agriculture. *Nature Climate Change* 4(7), 558–563. <https://www.nature.com/articles/nclimate2275>

Eastwood, C.R., Chapman, D.F. & Paine, M.S. (2012). Networks of practice for co-construction of agricultural decision support systems: case studies of precision dairy farms in Australia. *Agricultural Systems* 108, 10–18. <http://www.sciencedirect.com/science/article/pii/S0308521X11001831>

Greiner, R., Puig, J., Huchery, C., Collier, N. & Garnett, S.T. (2014). Scenario modelling to support industry strategic planning and decision making. *Environmental Modelling & Software* 55, 120–131. <http://www.sciencedirect.com/science/article/pii/S1364815214000218>

Head, B.W. (2014). Evidence, uncertainty, and wicked problems in climate change decision making in Australia. *Environment and Planning C: Government and Policy* 32(4), 663–679. <http://journals.sagepub.com/doi/abs/10.1068/c1240>

IPCC, 2014: Summary for policymakers. In: Field, C.B., Barros, V.R., Dokken, D.J., Mach, K.J., Mastrandrea, M.D., Bilir, T.E., Chatterjee, M., Ebi, K.L., Estrada, Y.O., Genova, R.C., Girma, B., Kissel, E.S., Levy, A.N., MacCracken, S., Mastrandrea, P.R. and White, L.L. (eds.) *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)*. Cambridge, UK: Cambridge University Press. 32pp. https://www.ipcc.ch/pdf/assessment-report/ar5/wg2/ar5_wgII_spm_en.pdf (accessed 12 Jan 2018)

Kingwell, R. (2006). Climate change in Australia: agricultural impacts and adaptation. *Australasian Agribusiness Review* 14, paper 1. ISSN 1442-6951. Available at: <http://www.agrifood.info/review/2006/Kingwell.htm>

Klerkx, L. & Nettle, R. (2013). Achievements and challenges of innovation co-production support initiatives in the Australian and Dutch dairy sectors: A comparative study. *Food Policy* 40, 74–89. <http://www.sciencedirect.com/science/article/pii/S0306919213000213>

Klerkx, L. Van Mierlo, B. & Leeuwis, C. (2012). Evolution of systems approaches to agricultural innovation: concepts, analysis and interventions. In I. Darnhofer, D. Gibbon and B. Dedieu (eds.) *Farming Systems Research into the 21st Century: The New Dynamic*. Springer, Dordrecht, Netherlands, pp. 457–483.

Knierim, A. & Prager, K. (2015). Agricultural Knowledge and Information Systems in Europe: Weak or strong, fragmented or integrated? PRO AKIS.

http://proakis.hutton.ac.uk/sites/www.proakis.eu/files/AKIS_characterisation_briefing_final.pdf

Köksalan, M., Wallenius, J. and Zionts, S. (2011). *Multiple Criteria Decision Making: From Early History to the 21st Century*. Singapore: World Scientific.

Love, G. (2005). Impacts of climate variability on regional Australia. In: *ABARE Outlook Conference Proceedings (National Agricultural and Resources Outlook Conference Proceedings), Climate Session Papers*. Australian Government Department of Agriculture, Fisheries and Forestry, Canberra. Pp. 10–19.

Lubell, M.N., Cutts, B.B., Roche, L.M., Hamilton, M., Derner, J.D., Kachergis, E. and Tate, K.W. (2013). Conservation program participation and adaptive rangeland decision-making. *Rangeland Ecology and Management* 66(6), 609–620. <http://www.bioone.org/doi/full/10.2111/REM-D-13-00025.1>

McLean, I. and Blakeley, S. (2014). *Adult Equivalent Methodology: A Methodology to Accurately and Consistently Calculate Cattle Grazing Loads in Northern Australia*. (B.NBP.0779). Sydney NSW, Australia: Meat & Livestock Australia.

Meinke, H. & Stone, R.C. (2005). Seasonal and inter-annual climate forecasting: The new tool for increasing preparedness to climate variability and change in agricultural planning and operations. *Climatic Change* 70, 221–253. <https://link.springer.com/article/10.1007/s10584-005-5948-6>

Mirijamdotter, A. and Bergvall-Kåreborn, B. (2006). An appreciative critique and refinement of Checkland's soft systems methodology. In: Strijbos, S. and Basden, A. (eds.) *In Search of an Integrative Vision for Technology: Interdisciplinary Studies in Information Systems*. Boston MA, USA: Springer.

Mushtaq, S., Cobon, D., Pudmenzky, C., Kath, J. & Reardon-Smith, K. (2016). *Scoping Study in Support of a Co-Innovation R&D For Profit Proposal*. B.GFB.0003 report prepared by the University of Southern Queensland for the Meat and Livestock Australia Limited (MLA), Sydney NSW, Australia.

Nederlof, S., Wongtschowski, M. and van der Lee, F. (2011). Putting heads together. Agricultural innovation platforms in practice. Bulletin 396, Development, Policy and Practice. Amsterdam: KIT. <http://www.bibalex.org/Search4Dev/files/417494/363104.pdf> (accessed 8 Jan 2018)

O'Reagain, P.J. & Scanlan, J.C. (2013). Sustainable management for rangelands in a variable climate: evidence and insights from northern Australia. *Animal* 7(S1), 68–78. <https://www.cambridge.org/core/journals/animal/article/sustainable-management-for-rangelands-in-a-variable-climate-evidence-and-insights-from-northern-australia/50740ACC5637A6B0D64BECAE9F0A46D6>

Padesky, C.A. and Mooney, K.A. (2012). Strengths-based cognitive-behavioural therapy: a four-step model to build resilience. *Clinical Psychology & Psychotherapy*, 19, 283–290. <http://onlinelibrary.wiley.com/doi/10.1002/cpp.1795/full>

Pretty, J.N. (1998). Supportive policies and practice for scaling up sustainable agriculture. In: Roling, N.G. and Wagemakers, M.A.E. (eds.) *Facilitating Sustainable Agriculture: Participatory Learning and*

Adaptive Management in Times of Environmental Uncertainty. Cambridge UK: Cambridge University Press.

Q-1 International (2015). *5 Why & 5 How – Root Cause Analysis*. Quality-One (Q-1) International. Accessed 18/12/2107 at: <https://quality-one.com/5-why-5-how/>

Queensland Department of Science, Information, Technology and Innovation (2017). *Queensland's extended wet and dry periods*. Brisbane QLD, Australia: Queensland Department of Science, Information, Technology and Innovation (DSITI). Available at: <https://www.longpaddock.qld.gov.au/queenslanddroughtmonitor/droughtresearch/wetdryposter.pdf> (accessed 6 Feb 2018)

Queensland Government (2017). *Major integrated projects in Wet Tropics and Burdekin*. <https://www.qld.gov.au/environment/agriculture/sustainable-farming/reef-major-projects>

Rossing, W.A.H., Dogliotti, S., Bacigalupe, G.F., Cittadini, E., Mundet, C., Aguayo, V.M., Douthwaite, B., Alvarez, S., Cordoba, D., Lundy, M. & Tehelen, K. (2010). Project design and management based on a co-innovation framework: towards more effective research intervention for sustainable development of farming systems. In *Building sustainable rural futures: the added value of systems approaches in times of change and uncertainty*. 9th European IFSA Symposium, Vienna, Austria, 4–7 July 2010. (pp. 402-412). BOKU-University of Natural Resources and Applied Life Sciences. <https://www.cabdirect.org/cabdirect/abstract/20133409809>

Sayer, J., Sunderland, T., Ghazoul, J., Pfund, J.-L., Sheil, D., Meijaard, E., Ventera, M., Boedihartonoa, A.K., Day, M., Garcia, C., van Oostenj, C. and Buck, L.E. (2013). Ten principles for a landscape approach to reconciling agriculture, conservation, and other competing land uses. *Proceedings of the National Academy of Sciences (PNAS) USA* 110, 8349–8356. <http://www.pnas.org/content/110/21/8349.full>

Semler, R. (2004). *The seven-day weekend: Changing the way work works*. New York NY, USA: Penguin.

Smyth, D.S. and Checkland, P.B. (1976). Using a systems approach: the structure of root definitions. *Journal of Applied Systems Analysis* 5: 75-83.

Stokes, C.J., Howden, S.M, Gifford, R.G, Meinke, H., Bange, M., McRae, D., Roth, G., Gaydon, D., Beecher, H.G., Reinke, R., Crimp, S., Park, S., Inman-Bamber, G., Webb, L., Barlow, E.W.R., Hennessy, K., Whetton, P.H., Booth, T.H., Kirschbaum, M.U.F., Battaglia, M., Stone, G., Cobon, D., Ash, A., McKeon, G., Miller, C.J., Jones, R.N., Hobday, A.J. and Poloczanska, E.S. (2008). *An Overview of Climate Change Adaptation in Australian Primary Industries – Impacts, Options and Priorities*. Report prepared for the National Climate Change Research Strategy for Primary Industries. Canberra ACT, Australia: CSIRO. https://www.csiro.au/~media/OnA/Files/AgAdaptationReport_CAF_PubTech%20Standard.pdf

Stone, R.C. (2014). Constructing a framework for national drought policy: the way forward – the way Australia developed and implemented the national drought policy. *Weather and Climate Extremes* 3, 117–125. https://eprints.usq.edu.au/25836/2/Stone_WCE_v3_PV.pdf

Turner, J.A., Klerk, L., Rijswijka, K., Williams, T. and Barnard, T. (2016). Systemic problems affecting co-innovation in the New Zealand Agricultural Innovation System: Identification of blocking mechanisms and underlying institutional logics. *NJAS - Wageningen Journal of Life Sciences* 76, 99–112. <http://www.sciencedirect.com/science/article/pii/S1573521415300087>

USAID (2014). *Scaling Up the Adoption and Use of Agricultural Technologies*. Report on the Global Learning and Evidence Exchange (GLEE), Bangkok, Thailand, January 7-9, 2014. United States Agency for International Development (USAID).

https://agrilinks.org/sites/default/files/resource/files/ScalingUpAgTechGLEEReportThailand2014_0.pdf

Wigboldus, S., Klerkx, L., Leeuwis, C., Schut, M., Muilerman, S. and Jochemsen, H. (2016). Systemic perspectives on scaling agricultural innovations. A review. *Agronomy for Sustainable Development* 36, 46. <https://link.springer.com/article/10.1007/s13593-016-0380-z>

Zsidisin, G.A. and Ritchie, B. (2009). Supply chain risk management—developments, issues and challenges. In: Zsidisin, G.A. and Ritchie, B. (eds.) *Supply Chain Risk. A Handbook of Assessment, Management, and Performance*. Springer. Pp. 1–11.

10 Appendix A Workshop feedback and reflections

A1 Longreach workshop

Key comments from **Longreach workshop participants** included:

- *Issues and needs all easy to identify but follow-up needs to happen*
- *A lot of the information and data is pre-existing; it would be good to review local information - or provide questions prior - to gain a more considered response to the new ideas*
- *Topics and issues have been the same for decades*
- *Confirmed what we were already thinking*
- *Opened my mind and thought process*

Participants' insights gained from the workshop included:

- *A variety of learning from different people's points of view*
- *Accessing a business consultant to review a grazing business*
- *Community desire to work together*
- *Keep looking outside the box*
- *The collaboration of resources available across various departments and groups*
- *The range of ideas*

Feedback from participants on the workshop process included:

- *the social networks mapping was overly complex - suggest forget colours, cluster similarly sticky notes and only draw arrows between the clusters*
- *more consideration and time (needed) ... could be given more time by pre-populating issues based on existing local info*

Key comments from the **workshop facilitation team** included:

- *Climate variability is an important issue the community are willing to put time and energy into.*
- *It was valuable ... to see the goodwill of people in the community and the energy and hope that new ideas/innovations that [may] genuinely contribute to increased ... opportunity can generate.*
- *I was impressed by the interconnectedness of people in the community and the number of hats different people wore/roles people took on in the community. There was also a lot of energy in the room and willingness to engage in discussions about what they valued about the local region and also what they hoped for/envisaged as possible (positive) futures for the region.*
- *There was also realism in terms of the constraints the region faces, but innovations such as cluster fencing projects and the RAPAD network appear to be having significant and positive effects on people's sense of hope for the future of the region.*
- *Service providers to rural industry are interested in the co-innov approach even without fully understanding it, which suggests they understand their role with rural industry operates at different level Full time landholders are less interested in the concept than service providers.*

- *Service delivery participants seemed to understand they have a role in the industry to promote innovation and importantly they have the time and charter to be involved.*
- *CATWOE – provided a common starting point that was grounded in participants' understanding of the local rural industry.*
- *the mix of people was quite good – despite earlier concerns, given the tight timeframe, that numbers were low and perhaps not representative enough. In the end, we actually had a reasonable number of people there – from a range of organisations including a number of producers.*

Key suggestions from the workshop facilitation team included:

- *Profile of attendee organisations (should be considered) at the invitation stage*
- *Need to invite health, education etc as they play a big role in rural communities*
- *a new title is needed for the workshop*
- *the invitation [needs] to be clearer what the workshop is about*
- *[consider using] a strengths based approach to empower participants*
- *Identify and invite the actors/potential actors [in the community]. Unless ... other areas are totally different, ... the research team can have confidence that service providers will ... attend. The research team can put less emphasis on getting landholders into ... other initial workshops although it would seem prudent to have at least some representation from the full time grazier community*
- *The level of engagement and interest in developing opportunities that will deliver broad benefit to the region (where primary production supports local townships and townships support primary producers) indicates the likely success of any communityidentified, -led and -driven project.*
- *This project needs to ... ensure it gets as much info from the two communities as possible about what they want to do in the next project, so a solid proposal can be submitted.*
- *Need to be clear on what end result we are aiming for by the end of the workshop. Make sure the project ideas from the w'shop are validated by community members who were not there. What process do we use to ensure we do this effectively? Need to see if we can work with the workshop participants so they are willing to validate the workshop findings not just leave it up to the project team.*
- *5 why's?? I was left asking what did it achieve? CV session – was it necessary?*
- *Spent too long on the state of play. Need to spend more time on what are the gaps (issues/challenges) that need to be filled and how do we fill them*
- *The group I sat with seemed to struggle with the barriers (5-hows/whys) exercise ... I'd like to see the workshop take a more positive approach to imagine/discuss what's possible rather than what gets in the way of what's possible (which is also important but may be better looked at later on when we need to choose between different potential projects).*
- *CATWOE – Actors phase listed everyone possible and it pretty much made it impossible to meaningfully show system links. Next time I think we need to define of the myriad who are fundamental to the system or have a role of significance or are potential contributors.*
- *need to seek others to join the team for future work e.g. bankers*

- *the workshop flowed pretty well, but we need to rethink the networking exercise, to make it more relevant to the desired outcomes of the workshop and also to not spend so much time discussing the barriers to adoption/innovation.*

A2 Charleville workshop

Key comments from the Charleville **workshop participants** included:

- *An excellently managed fun program - very thought provoking*
- *Fantastic to have so many perspectives. No producers though (or very few) – remember all the others are being paid to attend. Consider compensating producers as we are still speaking on their behalf.*
- *Having been in drought and after many meetings, being involved in different programmes - a lot of the information/issues was already known, problems in what has been delivered identified etc.*
- *More emphasis/target on getting producers to the workshop. For example: only one stand alone producer*
- *lack of representations for landowners*
- *Not sure how useful this was. I believe the issues have been raised before. Need action rather than continually working out what they are.*
- *Scoping study revealed what those of us who have been working in the region the past years have known - \LOCAL\ works*

Feedback from participants on the workshop process included:

- *More time - very powerful discussions but only scratched the surface. Kept getting distracted to solve the problem but should've spend more time on the why.*
- *The format did not really allow for feedback or what has been done, what works, what doesn't.*
- *Worked well, kept moving along. Instructions on what to do clear*

Participants' insights gained from the workshop included:

- *Better understanding of local priorities*
- *Climate = 3 good years out of every 9!*
- *Importance of management strategies suitable to conditions and discipline to adhere to same.*
- *Applying the 5 "Why's" ... and how that drills down to the common problem*
- *The importance of working out the why, and the bigger picture - seeing all the different perspectives.*

Responses to the question "What would you most hope could be achieved through a subsequent project?" included:

- *Change*
- *Better planning*

- *Better coordination regarding pasture management and climateforecast training*
- *Farmers equipped to better manage Mulga lands into the future*
- *Local research and tools for producers.*
- *R&D into local problems, and possible solutions*
- *Improved producer attitude to info sharing and technology/research uptake*
- *Sustainable industry to showcase to City Australia*
- *Support for rural communities, better understanding.*
- *Some actual action on these issues. They keep being identified without action. Attendees need to get feedback on progress of project. If there is no progress, why bother!*
- *That strategies to manage climate change are effective and applies to the region – what happens at Longreach is different to Charleville*
- *Producers need to take responsibility for their own future and direction*

Key comments from the **workshop facilitation team** included:

- *The discussion around the priorities from the first phase scoping project was valuable, given that the issues for the Charleville region do differ in certain respects from those around Longreach, and there were some valuable additions to the list/s.*
- *The mapping exercise was more effective at Longreach than Charleville due to time constraints*
- *The networking exercise was only partly successful. More time was needed for this; the results needed to be displayed so that everyone could reflect on and discuss whether anything was missing etc. and also how these groups interact (It would have been especially interesting and very useful to know whether they already work together on projects).*
- *Attention to the outputs of the workshop rather than a schedule of activities ensured the focus was more squarely on those.*
- *Good presence, and enthusiastic participation, in short time team was able to extend key issues*
- *the mix of people was quite good ... we had a reasonable number of people there from a range of organisations including a number of producers, though only one who identified as a wool producer. This was ... in part the result of a number of people wearing multiple hats; only one person was solely a producer.*
- *It was good to learn exactly what the Charleville community are really interested in*
- *Engagement in the processes and level of discussion was at a sufficiently high level to know that those who were in the room were active in contributing while in the room*
- *the role playing exercise was effective and I think they would have taken away the idea that you really need to look deeper into issues and to realise/understand that there are differing priorities for different sectors of the community and that this often adds to the complexity of finding solutions etc. in complex community systems.*

Key suggestions from the workshop facilitation team included:

- *Additional time on getting the group to prioritise and draw out new information would have been helpful*

- *All ok in my view, except time was a bit short, I wish we could have more time on 'Why' and discuss a bit more on Solution Space.*
- *without the time/opportunity to collate and discuss the information, I think the social networks exercise probably didn't give people any real insights into the connections within the community/region and I'm not sure they would have seen the point in making the lists of organisations*
- *Given that the main issue was time constraints, it would be better to run such workshops over 1 full day/two half day sessions and to keep front of mind the (planned) outcomes*

Key insights for the workshop facilitation team included:

- *It's really important for participants to describe the problems from their perspective and for them to think about how they can be part of the solution. If you only look at it from a producer's point of view, all the brick walls to solving the problem don't become apparent until the project gets underway. The 5 whys is very important to help uncover the real problem.*
- *As in Longreach, the multiple hats people wore/roles people took on in the community was apparent.*
- *Climate tools are of virtually no interest to the group – they want practical on-ground support*
- *It would be good to know more about the experiences of other co-innovation projects in dealing with the variability (particularly in attitude and focus) between different communities/regions.*

11 Appendix B The Phase 3 project pathway to impact

Impact Summary

Impact goal: to develop and use a co-innovation approach to identify, evaluate and then propose a range of interventions aimed at increasing the resilience to climate variability, especially drought, and sustainability of regional livestock (red meat and wool) production industries and associated rural communities in central west and south-west Queensland.

To achieve this goal, the project would:

- work with local producers from the livestock (red meat and wool) production industry and associated stakeholders (e.g. consultants, advisors, service industries, government agencies, community groups etc.)—the community partners (Table 11)—to identify issues, potential solutions and R&D projects which will develop improved regionally targeted information and communication systems, tools and capacity to enhance adoption of cost-effective farm- and system-level interventions to enhance the environmental sustainability of these industries and local communities in the regions; and
- work with the stakeholders in each region to implement, evaluate and enhance a regionally-targeted and industry-relevant co-innovation process that will be scalable to other regions/industry sectors.

Engagement with livestock producers and other stakeholders: The Phase 3 project would build on the work already done in these regions through the Phase 1 and 2 projects. It would continue to work closely with stakeholders who have already participated in the Phase 1 scoping study and the Phase 2 pilot project workshops, as well as others who have expressed an interest in the process/project. It would also seek to actively engage other willing participants and groups identified through the social network mapping activities conducted in the Phase 2 workshops.

Pathway to Impact

The recommended Phase 3 project has four core impact objectives. These are to:

1. employ co-innovation/design-led systems thinking processes, in collaboration with the communities of Longreach and Charleville, to identify and promote effective targeted strategic and operational decision making, networks, collaborations, technical developments (information, frameworks, processes, tools, skills) that assist to reduce exposure to drought risk within these regions;
2. Co-develop innovative effective targeted on-farm business management practices that assist producers to better plan and manage for climatic variability, especially drought risk;
3. contribute to developing a whole of industry systems approach to building resilience to Australia's variable climate; and
4. provide critical insights to inform State and Federal drought management policies.

Impact track record: The proposed project partners provide world-leading capabilities in the area of climate risk management. The team, which would potentially include research organisations (USQ), state government agencies (DSITI and DAFQ), key industry bodies (MLA, AWI), local partners (local NRM groups, LGAs) and consultants, has generated (and continues to generate) important industry relevant research outputs and impacts. This team would therefore be perfectly placed to provide the technical expertise and network facilitation needed to ensure the success of the project and to help scale up the impact of this program by engaging a range of stakeholders in the co-designed research and shared learning that underpins the project. It has:

- considerable experience in the study regions and is trusted by farmers as an information broker and in the delivery of cost-effective targeted research outcomes—factors which will be important in quickly building rapport with other regional stakeholders and in enabling the testing of ideas on the ground and support for longer term impact evaluation;
- proven ability to turn complex information into practical guidance to both support business decisions and inform policy; and
- a track record of working with the livestock industries and peak industry bodies (AWI, MLA and MDC) and delivering world class outcomes and outputs.

Activities

To achieve impact goals and objectives, the project would:

1. Work with regional producers and communities to establish co-innovation partnerships and processes for co-innovation, informed by critically reviewed examples of implementation and expert advice from e.g. Jeff Coutts *et al.*
2. Work with regional producers and communities using co-innovation/design led thinking processes throughout the project. This will identify key R&D issues and prioritise research actions. The process will also ensure the project progresses toward achieving the jointly agreed objectives.
3. Facilitate input from relevant experts/expert groups to ensure understanding and feasibility
4. Take part in quarterly regional co-innovation group meetings in each community to facilitate communication and knowledge exchange and identify and address emerging issues
5. Set up a group Moodle/Facebook page to share information between the regional co-innovation groups and research partners
6. Produce a six-monthly project report to record group progress and keep project partners informed
7. Engage with industry and policy makers to raise awareness, identify emerging issues and enable feedback

8. Publish original research and synthesis papers in high impact factor peer-reviewed academic journals, and present at academic and stakeholder conferences to raise awareness and facilitate knowledge exchange.

Resources

The total anticipated resources that would be required to deliver the project will be in the region of \$2.5 million. Project partners will need to provide \$0.5 million cash and \$0.5 million in in-kind (staff time and other in-kind) over a 5 year period. The project will also seek matching funds from MDC.

About 10% (\$250,000) of the resources will be spent on specific impact extension activities to engage and support partners (producers and other project stakeholders) in working together to trial regional solutions.

12 Appendix C The value proposition for a Phase 3 project

A risk reduction valuation approach (e.g. Covey *et al.*, 2007) was used to test the value proposition for the Phase 3 project. The economic analysis is based on the two key premises that the Phase 3 project will provide considerable benefits through improved drought risks management practices by:

- Making climate sensitive decisions (i.e. proactive pasture management, stock management and marketing) with confidence due to improved capacity (regionally targeted information/communication systems, tools and skills);
- Upscaling practice change through a comprehensive extension and capacity building program targeted to regional needs—improved adoption and uplifting individual capabilities and motivations.

The economics assessments are based on McLean *et al.* (2014) who have analysed beef industry performance for both average and the top 25% of producers under highly variable seasonal (rainfall) conditions after disaggregating the impact of management. Results for Central West and South West Queensland show that, while the performance (i.e. productivity, profitability) of both average and top producers fell during drought (<30% percentile for summer rainfall) years, top producers were better able to reduce the impact of drought on their businesses than was the average producer. Average producers experienced a bigger shift in the cost of production and profit per AE (Adult Equivalent⁷) than top performers; during drier years, top producers lost \$35.25 per AE compared with average producers who lost \$51.60 per AE – a difference of \$16.35 per AE.

This difference in the performance of top and average producers could be explained in terms of better risk management strategies (e.g. ability to seek and properly cost agistment; better understanding of the critical number of breeders to retain for timely post drought recovery; capacity to quarantine capital raised from the sell down process for use in the herd rebuilding phase), improved climate information and greater capacity, knowledge and adoption of practices by top producers (McLean *et al.*, 2014).

Key assumption for the economic analysis

Based on the number of beef/sheep farms (755) in the target regions (Central West and South West Queensland) during 2015–16 (Department of Agriculture and Water Resources, 2018) and average herd size in northern Australia of ~1,500 AE (Australian Competition and Consumer Commission, 2016), the project will:

- engage with and improve the capacity and profitability of 50 producers in the target regions; engagement may be directly with producers or indirectly through enhanced capacity of consultants/advisors;
- improve the capacity and profitability of 15% of producers (112) in these target regions after improved communication and adoption of regionally targeted information, tools and skills (10% adoption is predicted by White *et al.* (2015) over the course of a 5 year ‘Managing

⁷ A 2.25 year old 450 kg *Bos taurus* steer at maintenance, grazing on a 7.75 MJ diet and walking 7 km a day (McLean and Blakeley, 2014).

Climate Variability Program’ project using the ADOPT methodology (Kuehne *et al.*, 2017); however, since this project is co-designed with producers and regionally targeted and implemented, we expect higher adoption rates than those predicted for national projects designed at higher levels and for ‘top-down’ delivery (e.g. Chave *et al.*, 2012); and

- improve the capacity and profitability of 30% of producers (244) in the target regions within 5 years of completion of the project with improved communication and adoption of regionally targeted information, tools and skills.

The value of improved risk reduction for an average producer is \$10/AE—a conservative estimate to accommodate a variety of factors, based on McLean *et al.* (2014).

Key results

Preliminary analysis of the project (Table 13) suggests that it may be expected to generate \$17.01 million of NPV, 145% IRR and BCR of 8.1 within 15 years of its inception; this analysis suggests that the project is highly feasible and will generate considerable return on investment.

Table 13 The value proposition of a Phase 3 co-innovation project to better manage drought risk in livestock (red meat) production systems based on the assumptions outlined above

Economic evaluation indices	Unit	Value
Net Present Value (NPV)	\$million	17.01
Internal Rate of Return (IRR)	%	145%
Benefit Cost Ratio (BCR)	ratio	8.1

Sensitivity analysis

The results of the sensitivity analysis (with different assumptions about the value of risk reduction to average producers) indicates that the project remains viable even at relatively low values (Table 14).

Table 14 Sensitivity analysis based on different ‘value of risk reduction’ scenarios

Economic evaluation indices	Value of risk reduction (\$/AE)*	Net Present Value (NPV) (\$million)	Internal Rate of Return (IRR) (%)	Benefit Cost Ratio (BCR)
Base case scenario	10.00	17.01	145%	8.1
S1	16.35	29.15	230%	13.8
S2	6.00	9.36	82%	4.4

* Value of risk reduction to average producers based on McLean *et al.* (2014)

References

- Australian Competition and Consumer Commission (2016). *Cattle and beef market study —Interim report*. Canberra ACT, Australia: Australian Competition and Consumer Commission. Available at: https://www.accc.gov.au/system/files/1128%20Beef%20and%20cattle%20report_D08.pdf (accessed 10 Jan 2018).
- Chave, M., Ozier-Lafontaine, H. and Noël, Y. (2012). Towards agricultural innovation systems: designing an operational interface. *Outlook on Agriculture* 41(2), 81–86. <http://journals.sagepub.com/doi/abs/10.5367/oa.2012.0090#articleCitationDownloadContainer>
- Covey, J., Loomes, G. and Bateman, I.J. (2007). Valuing risk reductions: testing for range biases in payment card and random card sorting methods. *Journal of Environmental Planning and Management* 50(4), 467–482. <http://www.tandfonline.com/doi/abs/10.1080/09640560701401986>
- Department of Agriculture and Water Resources (2017) *Farm survey data for the beef, slaughter lambs and sheep industries*. Canberra ACT, Australia: Department of Agriculture and Water Resources. Available at: <http://apps.daff.gov.au/MLA/mla.asp> (accessed 9 Jan 2018).
- Kuehne, G., Llewellyn, R., Pannell, D., Wilkinson, R., Dolling, P., Ouzman, J. and Ewing, M. (2017). Predicting farmer uptake of new agricultural practices: a tool for research, extension and policy. *Agricultural Systems* 156, 115–125. <https://www.sciencedirect.com/science/article/pii/S0308521X16304541>
- McLean, I., Holmes, P., Counsell, D., Bush AgriBusiness P/L and Holmes & Co. (2014). *The Northern beef report. 2013 Northern Beef Situation Analysis*. B.COM.0348. Sydney NSW, Australia: Meat & Livestock Australia Limited. Available at: <https://www.mla.com.au/research-and-development/search-rd-reports/final-report-details/Productivity-On-Farm/The-Northern-beef-report-2013-Northern-beef-situation-analysis/234> (accessed 10 Jan 2018).
- White, B., Chudleigh, P. and Hardaker, T. (2015). *Economic Impact Assessment of Prospective Investment in Phase V of the Managing Climate Variability Program*. Brisbane Qld, Australia: Agtrans Research.

13 Appendix D Independent Evaluation Report



MLA / AWI / USQ

Prioritisation of strategies to manage climate variability especially drought

February 2018



ACKNOWLEDGEMENTS

This report is made possible because of the willingness of the workshop participants and the project team to provide feedback on their experience and insights. The project team also fully assisted in providing material and contacts for the evaluation process.

Dr Jeff Coutts

Coutts J&R
www.couttsjr.com.au
February 2018

KEY FINDINGS & RECOMMENDATIONS



Summary of Findings

Purpose

The purpose of this report is to provide an evaluation of the pilot project - *Prioritisation of strategies to manage climate variability especially drought.*

This pilot project is Phase two of three phases. It is described in the proposal as *an essential stage in developing a project proposal (stage three) to develop a regional framework to support and enhance adaptation to climate variability, especially drought, in central and southern western Queensland red meat and wool producing region.*

The project used a participatory workshop process to begin to establish consensus around issues relevant to managing climate risk in two regional locations in Queensland.

Methodology

The project evaluation used a range of data sources. These were:

- Provision and analysis of workshop participant feedback sheets and project team workshop reflection sheets;
- Post-workshop interviews with five participating stakeholders and informal discussions with others; and
- Review of the project report document and addressing the objectives and deliverables of the project.

Findings

OVERALL

The workshops **achieved their aim of feeding the findings from Phase 1 back to the region**, expanding the engagement of stakeholders in the project development, and further exploring the steps forward.

The feedback from participants indicated that despite some frustration at more ‘talk’ rather than action, they **personally gained from the experience of participation** and many were willing to be involved in follow-up actions and activities addressing the issues discussed.

Opportunities for a more significant follow-on Phase 3 of the project have been fleshed out in some detail. Some extra one-to-one engagement with already engaged individual stakeholders may be required to firm up the practical approach taken in the next Phase.

It is important to **provide feedback and progress to those who were engaged** and to follow up the consultative Phase with direct action.

PARTICIPATION

A strong effort was made by the project team to invite a mix of stakeholders (79 invitations) and both workshops had a reasonable mix of different groups while having less producers than may have been preferred.

The short lead time and use of email invitations rather than telephone or face-to-face contacts were seen as limiting involvement - especially of producers. It was positive to see the interest expressed by a number of invitees who could not come.

Those who did attend were in a position (some with multiple hats) to provide **very useful and informed feedback** on the findings of the previous workshops, delve deeper with further insights and point to the future.

The mix of stakeholders also reflected the participative approach needed for co-innovation.

WORKSHOP AIMS

The workshop purpose was clear and reasonably addressed in the process. It was evident that participants cooperated with the process and contributed as best as they could.

An issue for a number of participants was about the **(lack of) perceived extra value for the region that came out of the workshop.** Some had strong feelings that these issues were already well-documented and another discussion about them was not progressing solutions.

The response from a relative newcomer to the region indicated the **value such interactive approaches can provide in developing a shared understanding and building relationships.**

WORKSHOP PROCESS

There was a **general satisfaction with structure and process of the workshop** itself, the facilitation and the exercises which held some interest and benefit to the individuals participating (avg. rating 7.5/10).

There were **only minor comments made about possible improvements** – e.g. the need for more feedback time (indicating an interest in the discussions).

It was obvious that the **workshops were well planned, well facilitated and had an appropriate process** to explore and capture what was intended. Outcomes were limited by the time that could be spent and the mix of stakeholders involved.

WORKSHOP OUTCOMES

It is clear the **workshops delivered on the aim of feeding back the results of the first Phase in the region**, gaining some agreement that the key issues were captured and then digging deeper into these issues and introducing more. As noted, this was not enough for some participants who saw it as too much going over old ground rather than progressing actions on the issues that had emerged. However, most were positive about the process and discussion around it.

There was some **good progress in exploring the networks and groups who could and should be engaged in tackling issues raised.** There were also gains made towards some level of commitment from most workshop participants in being part of any future steps. It was a good outcome to have half of the participants wanting to be involved (with some provisos) and most of the rest indicating a 'maybe' response. This promises a good base from which to build.

This Phase was also **successful in further developing thinking around priorities, issues and potential focus areas.** The report teased out the project areas in some detail – looking at objectives, aims, structures and benefits. The table (table 11) on possible structures, stakeholders and influences is particularly useful in thinking about the co-innovation approach to the issues highlighted.

PARTICIPANT RESPONSES AND IMPACTS

The experience of **being involved in the workshops had an impact on participants' understanding** and highlighted opportunities independent of higher level project outcomes and whether another Phase would occur.

This is an important insight into the benefits of the process of co-innovation – even with question marks by some participants about the value of 'rehashing' known needs.

Tools such as the **'5 Whys' and the extra understanding and networking around issues were 'take-aways'**, as were potential actions such as improving networking and sharing of information about information and sources of assistance. Intention to share information gained is a further positive community outcome emerging from the process.

The activity itself had a **positive impact on most participants** with potential broader impacts for their communities.

Learnings

1. Local people want to be engaged and involved in these types of projects
2. Groups such as those from health and banking also have a role in being engaged in projects addressing property-level issues
3. Long lead times, entry through local people and face to face invitations are important in gaining participation – especially from property owners
4. Bringing people together to discuss issues and share insights adds to the collective understanding and can in itself prompt individual and community benefits
5. There is a time, however, to act to build interest, commitment and demonstrate that earlier input has resulted in tangible approaches to addressing issues raised – at least at an initial level

Recommendations

1. Provide a summary of the workshop outputs and steps going forward to stakeholders who participated in workshops and those who were invited but unable to attend and indicated interest.
2. Further explore the detail of the next Phase individually with local stakeholders who were engaged in Phases 1 and 2 to bed down the focus, structure and best engagement approach in the next Phase.
3. Regardless of the progress of the next Phase, make efforts to run one or more key activities in the region in consultation with locals which addresses one or more of the issues raised. One possibility is 'Grazing Fundamentals' – also aimed at the service sector.

There is an over-riding message from the project reporting and evaluation that there is a significant need for a *more comprehensive approach to enhancing adaptation to climate variability and especially drought in the region* and there is evidence of strong community interest and support in engaging in this process.

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BACKGROUND

Purpose

The purpose of this report is to provide an evaluation of the pilot project - *Prioritisation of strategies to manage climate variability especially drought*.

The Key Evaluation Questions (KEQs) were:

1. To what extent did the pilot project undertake planned activities?
 - a. What were the enablers?
 - b. What were the barriers/obstacles and how were they dealt with?
2. How effective was the process – including the workshops undertaken – in achieving the aims and objectives of the sub-project?
 - a. What was the participation level/representation at the workshops?
 - b. How well did the workshop approach work in arriving at the workshop aims?
 - c. What evidence was there of learning/modifications impacting on the second workshop?
 - d. How did workshop participants respond to the workshop and how were their expectations managed?
 - e. What are the potential impacts on/actions of participants if the next Phase of the project does not go ahead?
3. How satisfactory were the outputs from the pilot project in meeting the information needs?
4. To what extent were the outcomes achieved?
5. What has been learned through the project process?

Context

This pilot project being evaluated is Phase 2 of a three Phase pilot. It is described in the proposal as *an essential stage in developing a project proposal (stage three) to develop a regional framework to support and enhance adaptation to climate variability, especially drought, in central and southern western Queensland red meat and wool producing region*. The proposal notes that it uses a *co-innovation process throughout the three-stage pilot, the ultimate aim is to achieve adoption of best management practices in relation to managing a variable climate (especially drought)*.

The project used a participatory workshop process to begin to establish consensus around issues relevant to managing climate risk in two regional locations in Queensland. Its aims were to:

- re-engage with the central Queensland (Longreach) community involved in the Phase 1 scoping study, to report on the findings of that project and collect feedback from participants;
- engage with a new group of stakeholders in south western Queensland (Charleville) to inform them about the priorities identified by the Longreach community and identify key similarities and differences;
- better understand for both communities how we might achieve a more favourable state (i.e. to move from the current situation to a more desirable state) relevant to livestock production system;
- work with these communities to identify key players who might then participate in a full strategic multi-stakeholder co-innovation/design-led systems project; and
- identify key areas for RD&E inclusion in the Phase 3 project proposal outlined above.

The pilot project objectives were given as:

1. Prioritisation of current issues, goals and potential strategies to affect the adoption of best management practices in relation to managing a variable climate, by engaging with community members at two locations in central and south west Queensland (e.g. Longreach, Charleville). In this process attitudes and capacity for change using the CATWOE (Clients, Actors, Transformation, Worldview, Owner, Environmental constraints) framework will be identified.
2. Community networks mapped by engaged community members at two locations in central and south west Queensland (e.g. Longreach, Charleville).
3. Understand participants' perceptions of the forces/properties which stimulate growth, development, or change (dynamics) within the regional rangeland system(s) and the role and challenges of adaptive decision-making.
4. Understand participants' perceptions of the role of innovations such as cluster fencing in relation to managing a variable climate.
5. A critical review of the literature around co-innovation theory and practice in relation to managing a variable climate and recommendations on how the co-innovation process can be scaled up to address complex industry practice change issues.
6. Clear identification and agreement of a key problem producers and the regional community agree to collaboratively work on in a future MDC project in relation to best management practices to manage a variable climate. Including expected impact to industry using the co-innovation process (via modelling) and which current RD&A projects stage 3 can link with (e.g. DCAP).
7. Initial plan developed with producers and the regional community specific to the RD&E required to co-develop and test regionally relevant solutions within an adaptive management framework leading to development of best management practices in relation to managing a variable climate.
8. Report on the project process, results, outcomes and requisite RD&E.

The project's desired outcomes were:

1. An engaged community at two locations in central and south west Queensland (e.g. Longreach, Charleville) due to their involvement in discussing and prioritising current issues, goals and potential strategies to effect desired and locally relevant change in managing a variable climate.
2. Preliminary understanding of the benefits of cluster fencing as a strategy to enhance enterprise and community resilience.
3. Improved understanding of community attitude to and capacity for change.
4. Informed and enhanced industry and community commitment to working collaboratively using a co-innovation process.
5. Informed plan for full implementation (stage three of the pilot) of the co-innovation process across central and south western Queensland's red-meat and wool producing regions.
6. Initial understanding of the potential use of the co-innovation process in larger interstate projects focussed on finding long term solutions to complex problems.

Deliverables were:

1. A review of the literature around co-innovation in relation to managing a variable climate and how the process can be scaled up to address complex industry practice change issues.
2. Clear identification and agreement of a key problem producers and the regional community agree to collaboratively work on in a potential MDC project in relation to adoption of best management practices in managing a variable climate, including expected impact to industry using the co-innovation process (via modelling).
3. A report detailing the stakeholder engagement and workshop process, key findings (issues, goals and potential strategies) identified in each of the workshops, and RD&E gaps.

Evaluation methodology

The Monitoring and Evaluation Framework used for this project is included in the appendices. The evaluation process was undertaken using the following approaches:

- **Participant feedback sheets:**
Were developed by Coutts J&R based on the workshop purpose and process. These were completed by participants at the end of the workshop with results entered into an online collation system (YourDATA). Summaries were generated from the Longreach workshop to guide changes to the Charleville workshop. There were 21 responses from the two workshops (12 Charleville and 9 Longreach)
- **Pilot project team reflections:**
Project team members were provided with a reflection sheet to comment on process and insights from the workshops.
- **Review of pilot project report and outputs:**
Were reviewed for quality and alignment with project requirements.
- **Interviews:**
Were undertaken with five regional participants to gain their reflective feedback on the project, the workshops and their expectations. Informal discussions were held with two MLA staff who attended the Charleville workshop.

FINDINGS

Workshops were conducted in two major Queensland livestock production regions:

Workshop 1: Longreach in the central-western district (held in the DAF conference room on Thursday 12th October 2017);

Workshop 2: Charleville in the south-west (held at the Mulga Country Motor Inn on Tuesday 31st October 2017).

Participants



Key Evaluation Questions (KEQ):

- **1:** To what extent did the pilot project undertake planned activities?
- **1a:** What were the enablers?
- **1b:** What were the barriers/obstacles and how were they dealt with?
- **2a:** What was the participation level/representation at the workshops?

Section summary

Getting producers (without other hats) along to such meetings (as in non-technical without direct benefits) is always a challenge – especially considering the distances, challenges facing them on their properties and short lead time. Despite the observation that there was a need to make better use of locals to invite and encourage participation, the project team made a strong effort to invite a mix of stakeholders (79 invitations) and both workshops had a reasonable mix of different groups – while including less producers than may have been preferred. It was positive to see the interest expressed by a number of those invited who could not come.

Those who did attend were in a position (some with multiple hats) to provide very useful and informed feedback on the findings of the previous workshops, delve deeper with further insights and point to the future. The mix of stakeholders also reflected the participative approach needed for co-innovation.

Participant details

The following details were reported about the workshop participants:

Workshop location	Invited	Attended	Interested but unable to attend
Longreach	41	12	15
Charleville	38	17	18

Industry sector	Longreach ⁺	Charleville*	Total
Producers	5	6	11
Agricultural service provider	1	9	10
Agricultural researcher	1	0	1
Agricultural consultant	0	2	2
Extension professional	1	5	6
Financial professional	1	1	2
Health professional	0	0	0
Other	2	2	4

Industry sector	Longreach	Charleville	Total
Beef cattle	5	6	11
Sheep – meat	2	0	2
Sheep - wool	4	1	5
Goats	1	2	3

	Longreach	Charleville
Area (ha)	17,907 (8,350–30,000)	19,304 (6,000–35,250)
Cattle	630 (150–1,000)	490 (40–1,000)
Sheep (wool/meat)	6,075 (2,000–15,000)	0
Goats	-	1,140 (200–2,280)

It was noted that *in total, five of the 11 producers involved in the two workshops were part of cluster fencing projects; this included four of five producers at the Longreach workshop and one of six producers at the Charleville workshop. Of the total area and livestock numbers reported by producers at the workshops, cluster fenced properties represented 47.98% of the area, 33.66% of total head of cattle and 98.95% of total head of sheep/goats reported. Workshop participants reported having lived in their regions for periods of between 0.2 and 56 years. Of these, livestock producers reported, on average, longer periods than non-producers.*

Participant feedback on participant mix

There were two mentions in the feedback sheets on the lack of producer involvement (2 mentions) *...more emphasis/target on getting producers to the workshop. For example: only one stand-alone producer* (meaning that they had other roles as well as being a producer). In the post-workshop participant interviews, this was raised again in relation to the Charleville workshop where it was noted that it was difficult to get producers along – especially at such relatively short notice and where there were no immediate learning benefits for the producers attending. Comments were made about other workshops held in the region...two months ago there was a DAF workshop...*only a handful of producers attended*. The point was made that there was need to link in with locals well before such workshops to get interest and participation. It was noted by an informant that email invitations were used (sourced locally) *...which aren't the best means in the west...* and that direct phone or face-to-face approaches were more effective.

There was a general agreement, that apart from the relatively small numbers of producers, the mix from service providers and support agencies was good and fit for purpose. Team members were quite happy with the mix of participants (7.2 avg./10) and very happy with their level of participation and interaction (8.0 avg./10). It was noted that many participants wore multiple hats – including some with properties.

Workshop Aims



Key Evaluation Questions (KEQ):

- **2b:** How well did the workshop approach work in arriving at the workshop aims?
- **2c:** What evidence was there of learning/modifications impacting on the second workshop?



Evaluative Comment:

The workshop purpose was clear and reasonably addressed in the process. It was evident that participants at the workshop cooperated with the process and contributed as best as they could. The fundamental issue for a number of participants was about the extra value for the region that came out of the workshop. Some had strong feelings that these issues were already well-documented and another discussion about them was not progressing solutions. After the first Phase, some were looking for the follow-up action, while others were left wondering what clear steps were going to be taken after their extra insights into the identified issues. The response from a relative newcomer to the region indicated the value such interactive approaches can provide in developing a shared understanding and relationship building.

Aims

The Longreach workshop program was described as having been designed to report back to the Longreach community on the results of the Phase 1 scoping study and to elicit information/insights from participants to:

- collect feedback on the R&D priorities identified for the Longreach region;
- better understand how we might achieve a more favourable state for livestock production systems in the region;
- identify key players who might then participate in a full co-innovation project; and
- identify key areas for RD&E inclusion in the larger Phase 3 project proposal.

The Charleville workshop program was designed to:

- engage with a new group of stakeholders in south western Queensland (Charleville) to inform them about and collect feedback on the priorities identified by the Longreach community;
- identify key R&D priorities for the Charleville region;
- understand for the Charleville community how a more favourable state for livestock production systems in the region might be achieved;
- work with the community to identify key players who might then participate in a full strategic multi-stakeholder co-innovation/design-led systems project; and
- identify key areas for RD&E inclusion in the Phase 3 project proposal outlined above.

Participant feedback

Overall, the workshops were seen to be quite useful in terms of identifying issues and needs in the region (7.0 avg/10. Longreach more useful at 7.9; Charleville less at 6.8/10 n=21). Comments included:

- Topics/issues/discussions well established/been around a while – need for action (5 mentions)
e.g. *Not sure how useful this was. I believe the issues have been raised before. Need action rather than continually working out what they are; Issues and needs all easy to identify but follow-up needs to happen.*
- Need for local data/information (2 mentions)
e.g. *A lot of the information and data is pre-existing, it would be good to review local information)*
- Benefit of hearing other perspectives (2 mentions)
e.g. *Am new to my role and Charleville so was useful, especially hearing views from other sectors.)*
- Insightful/interesting (2 mentions)
e.g. *Opened my mind and thought process.*

Project team respondents were quite happy overall with the workshops and what they had achieved (7.5 avg./10 n=10). There was general feedback that the participants engaged in the process with one team member commenting that this...*suggests the purpose made sense to them.* It was observed that *the discussion around priorities from the first scoping project was valuable.* Mention was made that the networking exercise (determining who to include) was only partially completed and more could have been done on priorities and *where to from here.* The '5 Whys' was seen as a particularly useful tool that worked well in looking more deeply at underlying issues.

Some post-workshop feedback from participants questioned the value of the workshop. One commented *...I was of two minds – there was some value on talking through these but if someone walked into my office a year ago, I could have given them the same list then.* Another said...*when I was driving away I remember thinking 'what has this achieved, what is coming out of it?'*. Another participant, however, was very positive...*in my role, it was very worthwhile...making/strengthening connections...got a lot out of the discussion...listening to producers about the mechanics of running their properties.*

Workshop Process



Evaluative Comment:

There was a general satisfaction with the structure and process of the workshop itself. Although the networking exercise was seen as a little complex and incomplete, the facilitation and the exercises were felt to have held some interest and been of benefit to the individuals participating. This perception was reinforced with participants rating the usefulness of workshop components in the area of a solid 7.5 avg./10. There were only minor comments made about the need for more feedback time (indicating an interest in the discussions). It was obvious that the workshops were well planned, well facilitated and had an appropriate process to explore and capture what was intended. Outcomes were limited by the time that could be spent and the mix of stakeholders involved.

The process

It was noted that the Charleville workshop adopted a process similar to (but *informed by feedback from participants and team members*) the earlier Longreach workshop.

Major differences reported by the project team in the running of the two workshops (Charleville compared to Longreach) included:

- more in-depth discussion of the R&D priorities, given the regional differences in both vegetation and livestock production systems between Charleville and Longreach;
- time spent explaining the benefits and process of working with multiple stakeholders in a community to develop integrated solutions to issues which accounts for different perspectives and addresses multiple needs;
- time spent conducting a role-playing exercise to illustrate the different perspectives and concerns of stakeholders that might lead to constraints on decision-making and barriers to innovation/adaptation; and
- using a structured matrix approach to list the various organisations and actors working/operating in different spheres (livestock production, NRM, health, financial, social) and at different scales (local, regional, state, national) that influence and support the livestock production industries in the Charleville region.

Participant feedback on process

The workshop process was seen to have worked quite well (7.9 avg./10 n=21. The average rating was almost the same for both workshops). Comments on what could have been improved included:

- Structure/process worked well (3 mentions)
e.g. *Worked well, kept moving along; Instructions on what to do clear.*
- Engagement/drive waned (2 mentions)
e.g. *Lost a bit of engagement by the end.*
- More time for feedback/discussion (2 mentions)
e.g. *More time - very powerful discussions but only scratched the surface.*
- Start earlier (1 mention)
- More input from others (1 mention)
- Social networks map overly complex (1 mention)

Usefulness of workshop elements (rating out of 10, n=21):

- Hearing back from the scoping study results about R&D priorities for the region - 7.6 avg.
- Identifying regional issues, goals and barriers - 7.5 avg.
- Identifying ideas of what could possibly be done locally in the future - 7.3 avg.
- Social Network mapping - 6.8 avg.

Comments included:

- More time/focus needed on 'Identifying ideas of what could possibly be done locally in the future' (3 mentions – e.g. *This is the most important and could be given more time, by pre-populating issues based on existing local info*)
- Lack of rain main barrier (1 mention)
- Lack of landholder representation 'identifying regional issues' (1 mention)

Post workshops interviews indicated participants were positive about the process and the facilitation. Positive comments were made about the interactivity and the exercises undertaken (e.g. role play; 5 whys) ...*got people thinking*. There was one comment about the *undue influence* the project team had on small group discussions.

Team reflections on the process were:

- **Longreach:** The project team was generally positive about the process, pace and the interactive nature of the workshop. They had spent some time as a team in planning to ensure the best possible process. Strong interest was noted in the reporting of the Phase 1 findings and a couple of exercises were highlighted that could be modified for the Charleville workshops e.g. the '5 WHYS' and the mapping exercise. There was a suggestion that a stronger focus on what was possible might be useful (rather than just the problems) although identifying gaps and issues remained important.
- **Charleville:** Following the Longreach workshop, the team completed individual reflections on what worked and what could be improved and made modifications based on that feedback and the different context of the Charleville workshop. The project team felt that the Charleville workshop process worked even more effectively with the changes made from the Longreach experience. A comment was made that the networking exercise needed more time and the 'where to from here' could have been developed further.

Workshop Outcomes



Key Evaluation Questions (KEQ):

- **KEQ3:** How satisfactory were the outputs from the pilot project in meeting the information needs?
- **KEQ 4:** To what extent were the outcomes achieved?



Evaluative Comment:

It is clear that the workshops delivered on the aim of feeding back the results of the first Phase in the region, gaining some agreement that the key issues were captured and then digging deeper into these issues and introducing more. As noted, this was not enough for some participants who saw it as too much going over old ground rather than progressing actions on the issues that had emerged – although most were positive about the process and discussion around it.

There was some good progress in exploring the networks and groups who could and should be engaged in tackling issues raised – and in gaining some level of commitment from most workshop participants in being part of any future steps. It was a good outcome to have half of the participants wanting to be involved (with some provisos) and most of the rest indicating a ‘maybe’ response. This promises a good base from which to build.

This Phase also did further develop thinking around priorities, issues and potential focus areas. The report teased out the project areas in some detail – looking at objectives, aims, structures and benefits. The table (table 11) on possible structures, stakeholders and influences is particularly useful in thinking about the co-innovation approach to these highlighted issues. It is important for the project report (or a summary) to go back to the project participants, so they can see how the data was used and to gain an understanding of the thinking behind steps going forward.

Further development and decisions need to be made from the information gathered and analysis provided post-acceptance of the report. There is a clear message about coming back with something more tangible and action-oriented targeted at one or more of the issues raised as a basis for gaining interest, buy-in and on-going engagement of stakeholders in exploring further options and solutions.

Reported outcomes

The key desired outcomes from the Phase 2 workshops were captured under the ‘Aims’ section above:

- better understand for both communities how we might achieve a more favourable state (i.e. to move from the current situation to a more desirable state) relevant to livestock production system;
- work with these communities to identify key players who might then participate in a full strategic multi-stakeholder co-innovation/design-led systems project; and
- identify key areas for RD&E inclusion in the Phase 3 project proposal

The project report concluded: *The Phase 2 Pilot Project indicated that a number of producers and associated stakeholders in the Longreach and Charleville regions/communities were both ready and*

willing to engage in a process aimed at identifying a number of specific ‘wicked’ problems currently limiting their sustainability—and, hence, resilience—and working collaboratively to identify and develop regionally-targeted solutions. Given this, the potential for a viable and successful Phase 3 project would appear to be substantial, resulting in enhanced skills (i.e. capacity) and uptake of solutions (i.e. tools, practices) that are seen by producers to be appropriate to local conditions.

The workshops gathered information in the following areas:

- Climate variability
- R&D Priorities
- CATWOE exercises
 - current thinking about climate variability
 - circumstances in which rural businesses operate
 - management practices that would help in future sustainability
 - barriers to innovation
 - social mapping

Priority areas from both workshops were summarised in the project report under the following headings:

1. Pasture/fodder management and total grazing pressure - decision support
2. Forecasts – provide producers with the confidence and capability to sell or against livestock early before pastures degrade, stock lose weight & prices decline
3. Integrating livestock, finance, business and marketing management
4. Building social networks, health & wellbeing
5. Decision making for better management of drought and recovery
6. NEW: Review of outdated government property size (i.e. recommended living area) advice

The priorities were then prioritised further in the Charleville workshop (each participant had three votes) as shown in the following table:

Rank	R&D Priority	Votes
1	Decision making for drought management and recovery	14
2	Pasture management and TGP decision support	12
3	Integrated livestock, finance, business and marketing management	7
3	Building social networks, health and well being	7
5	Viability and management of production systems in landscapes subject to woody thickening	5
6	Forecasts	0

It was explained that *three of the six R&D themes... were selected by the small groups for discussion using the 5 Whys/How process at the (Charleville) workshop* to dig deeper into the needs. Each area was explored under ‘issues and ideal state and included:

- Pasture management and TGP decision support
- Integrated livestock, finance, business and marketing strategies
- Building social networks, health & wellbeing

Potential areas to address were identified as:

1. Develop return on investment value propositions to support change

2. Proactive pasture management
3. Collaborating with banks, financial counsellors and government (to develop financial literacy and opportunities)
4. Facilitating digital solutions

The report drew from the Phase 1 and 2 findings to recommend the following objectives for a Phase 3 project:

A larger Phase 3 co-innovation project proposal is recommended, based on the findings of the Phase 1 scoping study, this Phase 2 pilot project and further consultation with industry and researchers.

The Phase 3 project will aim to deliver effective innovation through enhanced uptake of regionally-targeted adaptive practices and tools to boost drought and climate resilience for primary producers, specifically in the grazing livestock (red meat and wool production) industries. It will work with the Longreach and Charleville communities to further develop and deliver community-led innovation to enhance drought risk management and improve the productivity and profitability of the regions' livestock production industries and the sustainability of the Longreach and Charleville communities.

In addition, the project will develop a protocol (framework and tested process) for regional co-innovation to inform future projects aimed at building resilience to climate variability and risk in other regions. It will also provide recommendations for scaling up co-innovation at the industry/systems level and scaling out to other sectors.

Key objectives proposed for the proposed Phase 3 project were:

- *Deliver significant return on project investment through enhanced productivity and profitability of regional livestock (red meat and wool) producers by:

 - *identifying and promoting (in collaboration with stakeholders) effective regionally-targeted strategic and operational decision making and technical developments (information, frameworks, tools, skills) to reduce exposure to drought risk within the Charleville and Longreach regions; and*
 - *developing (in collaboration with stakeholders) innovative effective regionally-targeted on-farm business management practices that assist producers to better plan and manage for climatic variability, especially drought risk within the Charleville and Longreach regions;**
- *Contribute to developing a whole of industry systems approach to building resilience to Australia's variable climate; and*
- *Provide critical insights to inform State and Federal drought management policies.*

The report went on to:

- propose a collaborative implementation processes (action learning/co-innovation);
- propose a framework around each of the potential R&D areas;
- outline the benefits of the approach to the industry;
- calculate the value proposition for investment;
- show how value could be leveraged from related R&D projects; and
- project possible outcomes that could derive from implementation.

Participant feedback on outcomes

Participants proposed some outcomes that they would like to see from a subsequent project and most were (potentially) interested to be a part of achieving these outcomes.

Desired outcomes of a subsequent project

- New research/understanding gains (6 mentions – e.g. *Application of effort to address cause of barriers; Better understanding of climate van; Keep new information coming*)
- Increased producer knowledge/skills/practice change (4 mentions – e.g. *improved producer attitude to info sharing and technology/research uptake; increase producers' knowledge/understanding of finance traps/risks etc.*)
- Improved planning/coordination (2 mentions – e.g. *Better coordination regarding pasture management and climate forecasting training*)
- Establishment of new structures/hubs/services (2 mentions – e.g. *Establishment of an AgTech innovation hub*)
- Locally targeted R&D (2 mentions – e.g. *R&D into local problems, and possible solutions.*)

Almost half of respondents (47%) wanted to be involved in activities associated with a subsequent project. Of the rest, 42% *maybe* wanted to be involved and 10% did not want any involvement.

Comments from those who wanted to be involved included:

- Desire to provide input/direct involvement for organisational/personal reasons (4 mentions – e.g. *Organisational involvement and personal interest; As a producer and Regional Manager for AgForce it would be important to have direct involvement*)
- Networking benefits/collective experience (2 mentions – e.g. *Improved networking opportunity and opportunity to learn.*)
- Opportunity to observe process (1 mention)

Comments from respondents who indicated they *maybe* wanted to be involved included:

- Dependent on time constraints/commitment (4 mentions – e.g. *This would depend upon the commitment and time frame required*)
- Dependent on project scope/goals/planned outcomes (2 mentions – e.g. *It would depend on the outcome and the scope of the project and how likely it would be to benefit producers in the region.*)

Project team members reflected on the implications for a future project, highlighting the need to ensure that all major stakeholders (e.g. also health) were involved in the next steps and be part of creating the solutions. This should not be outsiders dropping in new tools or desktop solutions.

In the post-workshop participants interviews, there was general uncertainty about what would or could happen next. One person suggested that training activities are best undertaken when people are out of drought...*more receptive then...*and that initiatives needed to be locally based. When asked about the next steps, another participant said...*they just want rain...rain!* Another pointed out the frustration with climate apps and charts that were unreliable and not practically helpful in planning. One participant suggested that the next step was to look 'post-farmgate'...*need to bring people into the region by value adding to primary production.* A further insight was that individuals who had been involved to date and shown interest could be involved in further developing options for actions. This may include starting with existing products and holding training opportunities like 'Grazing Fundamentals'.

A key piece of feedback from the workshops about their outcomes was that the next step needed to go beyond talking about needs to actually doing something to address one or more of the issues raised.

Participant Responses and Impacts



Key Evaluation Questions (KEQ):

- **KEQ 2d:** How did workshop participants respond to the workshop and how were their expectations managed?
- **KEQ 2e:** What are the potential impacts on/actions of participants if the next Phase of the project does not go ahead?



Evaluative Comment:

The experience of being involved in the workshops had an impact on participants' understanding and highlighted opportunities independent of higher level project outcomes and whether another Phase would occur. This is an important insight into the benefits of the process of co-innovation – even with question marks by some participants about the value of 'rehashing' known needs. Tools such as the '5 Whys' and the extra understanding and networking around issues were 'take-aways' as were potential actions such as improving networking and sharing of information about information and sources of assistance. The intention to share information gained is a further positive community outcome emerging from the process. The activity in itself had a positive impact on most participants with potential broader impacts.

Participant feedback on capacity gains

The Key Evaluation Questions above relate to the 'stand-alone' learning, benefits and motivation gained by workshop participants – developing their capacity to engage more effectively in another Phase – and/or developing their individual or community capacity to act independently even if there was no follow-on Phase. Participants gave the following feedback on capacity gains made as a result of attending the workshop.

Significant insights gained by participants as a result of the workshops included:

- The 5 Why's (5 mentions – e.g. *The 5 Why's and how that drills down to the common problem; Applying the 5 "Why's"*)
- Range of different ideas/perspectives/opinions (5 mentions – e.g. *A variety of learning from different people's points of view; Opinions of group were shared*)
- Collaborative opportunities (2 mentions – e.g. *The collaboration of resources available across various departments and groups.*)
- Local priorities (2 mentions – e.g. *Better understanding of local priorities.*)

Suggested actions respondents (or wider community) could act on independently of the project:

- Improved/more social networks/groups (7 mentions – e.g. *Build better social networks; Support other groups and community groups as a strategy to improve resilience; Work on 'local' disaster management group*)
- Improved/continued delivery/awareness of available information/resources (5 mentions – e.g. *Understanding climate information that is out there; Target method of communication to audience; Assisting in marketing and supplying information to assist in decision making*)

Respondents were quite likely to share ideas/discussions from the workshop with others (7.5 avg. n=21). The people respondents would most likely share with included:

- Work colleagues/peers/staff (9 mentions)
- Clients/landholders/producers (8 mentions)
- Family/Friends/Neighbours (5 mentions)
- Local government/council (2 mentions)

Other comments relating to the workshop or the issues raised included:

- General positive comments (5 mentions – e.g. *nice afternoon; productive day; thank you for your time and effort; important to run these sessions*)
- Suggestions/issues (4 mentions – e.g. *need for continued communication on developments; still unclear of opportunities and way forward; need for more producer involvement*)

As noted earlier, at least one participant new to the region described how the experience had provided a better understanding of property issues and management and a number referred to the value of (re)connecting with people with common areas of interest/concern.

When project team members were asked to reflect on new insights they learned from the workshops, responses included:

- *people needed on-ground support...not (just) climate tools;*
- there was evidence of interconnectedness, energy and celebration of positives – while acknowledging negatives;
- there is value in gaining a range of perspectives on the same problem – not only from producers themselves;
- the interconnectedness and multiple hats worn within the communities; and
- it's not so much the droughts and floods in themselves, it's about knowing what's coming and how to deal with it.

Learnings



Key Evaluation Questions (KEQ):

- **KEQ 5:** What has been learned through the project process?

This phase of the project has provided further learning about the needs of the region as well as about what works best in engaging with the local community to address these needs.

On the content side, the original issues were endorsed with extra insights – and some further issues were introduced (e.g. Review of outdated government property size - i.e. recommended living area). The ‘5 Whys’, was a tool that was used successfully to explore the causes and barriers in some of the key issues selected. These content insights are addressed in detail in the project report.

On the engagement side, learnings included:

- Local people want to be engaged and involved in these types of projects
- Groups such as those from health and banking also have a role in being engaged in projects addressing property-level issues
- Long lead times, entry through local people and face to face invitations are important in gaining participation – especially from property owners
- Bringing people together to discuss issues and share insights adds to the collective understanding and can in itself prompt individual and community benefits
- There is a time, however, to act to build interest, commitment and demonstrate that earlier input has resulted in tangible approaches to addressing issues raised – at least at an initial level

APPENDICES

Project Team Reflection Sheet

Prioritisation of Strategies to Manage Climate Variability Workshop Longreach 12/10/17

This sheet is for feedback from the project team from your reflections about the workshop

1. Overall, how happy were you with the workshop and what it achieved?

Not happy 0 1 2 3 4 5 6 7 8 9 10 Very happy

Comments on your rating:

2. How happy were you with the mix of people at the workshop and their participation?

Mix: Not happy 0 1 2 3 4 5 6 7 8 9 10 Very happy

Participation: Not happy 0 1 2 3 4 5 6 7 8 9 10 Very happy

Comments:

3. From your perspective, what worked well (and why)?

4. What didn't work well – and what would you change?

-
-

5. What was an important insight that you gained from the workshop?

6. What implications does this have for a future project?

-
-
-
-

7. Please make any other comments:

Participant Feedback Sheet

Prioritisation of Strategies to Manage Climate Variability Workshop Longreach 12/10/17

Thanks for providing this feedback. It will help us to better understand what came out of the workshop for you and how we can improve further workshops.

1. Overall, how useful did you find the workshop in terms of identifying issues and needs for your region?

Of little use 0 1 2 3 4 5 6 7 8 9 10 Very useful

Comments on your rating:

2. How well did the workshop process (the activities and discussion and general approach) work for you?

Not well 0 1 2 3 4 5 6 7 8 9 10 Worked very well

What could have improved it?

3. Specifically, how useful did you find the following elements:

Social Network mapping Low 0 1 2 3 4 5 6 7 8 9 10 High

Hearing back from the scoping study results Low 0 1 2 3 4 5 6 7 8 9 10 High

Developing R&D priorities for the region Low 0 1 2 3 4 5 6 7 8 9 10 High

Identifying regional issues, goals and barriers Low 0 1 2 3 4 5 6 7 8 9 10 High

Please comment on any of the above:

4. What was the most significant insight that came out of the workshop for you?

5. What (if anything) could you – or the wider community – act on even without further support from this project?

6. What would you most hope could be achieved through a project funded by MLA/AWI to address these issues?

-
-

7. Would you want to be involved in activities associated with such a project? Yes / No / Maybe

-

8. What other comments do you have about the workshop or the issues raised?

-

Thanks for your feedback!

Detailed Participant Feedback

Feedback Summary	
Participant Feedback Sheet	21 responses from 2 workshops (12 Charleville and 9 Longreach)
	<p>Overall the workshops were seen to be quite useful in terms of identifying issues and needs in the region (7.0 avg. n=21). Comments included:</p> <ul style="list-style-type: none"> • Topics/issues/discussions well established/been around a while – need for action (5 mentions – e.g. <i>Not sure how useful this was. I believe the issues have been raised before. Need action rather than continually working out what they are; Issues and needs all easy to identify but follow-up needs to happen</i>) • Lack of producer involvement (2 mentions – e.g. <i>More emphasis/target on getting producers to the workshop. For example: only one stand alone producer.</i>) • Need for local data/information (2 mentions – e.g. <i>A lot of the information and data is pre-existing, it would be good to review local information</i>) • Benefit of hearing other perspectives (2 mentions – e.g. <i>Am new to my role and Charleville so was useful, especially hearing views from other sectors.</i>) • Insightful/interesting (2 mentions – e.g. <i>Opened my mind and thought process.</i>)
	<p>The workshop process was seen to have worked quite well (7.9 avg. n=21). Comments on what could have improved it included:</p> <ul style="list-style-type: none"> • Structure/process worked well (3 mentions – e.g. <i>Worked well, kept moving along. Instructions on what to do clear.</i>) • Engagement/drive waned (2 mentions – e.g. <i>Lost a bit of engagement by the end.</i>) • More time for feedback/discussion (2 mentions – e.g. <i>More time - very powerful discussions but only scratched the surface.</i>) • Starter earlier (1 mention) • More input from others (1 mention) • Social networks map overly complex (1 mention)
	<p>Usefulness of workshop elements (n=21):</p> <ul style="list-style-type: none"> • 7.6 avg. Hearing back from the scoping study results about R&D priorities for the region • 7.5 avg. Identifying regional issues, goals and barriers • 7.3 avg. Identifying ideas of what could possibly be done locally in the future • 6.8 avg. Social Network mapping • Comments included: <ul style="list-style-type: none"> ○ More time/focus needed on 'Identifying ideas of what could possibly be done locally in the future' (3 mentions – e.g. <i>This is the most important and could be given more time, by pre-populating issues based on existing local info</i>) ○ Lack of rain main barrier (1 mention) ○ Lack of landholder representation 'identifying regional issues' (1 mention)
	<p>Significant insights gained as a result of the workshops included:</p> <ul style="list-style-type: none"> • The 5 Why's (5 mentions – e.g. <i>The 5 Why's and how that drills down to the common problem; Applying the 5 "Why's"</i>) • Range of different ideas/perspectives/opinions (5 mentions – e.g. <i>A variety of learning from different people's points of view; Opinions of group were shared</i>) • Collaborative opportunities (2 mentions – e.g. <i>The collaboration of resources available across various departments and groups.</i>) • Local priorities (2 mentions – e.g. <i>Better understanding of local priorities.</i>)
	<p>Suggestions actions respondents (or wider community) could act on independently of the project:</p> <ul style="list-style-type: none"> • Improved/more social networks/groups (7 mentions – e.g. <i>Build better social networks; Support other groups and community groups as a strategy to improve resilience; Work on 'local' disaster management group</i>) • Improved/continued delivery/awareness of available information/resources (5 mentions – e.g. <i>Understanding climate information that is out there; Target method of communication to audience; Assisting in marketing and supplying information to assist in decision making</i>)
Desired outcomes of a subsequent project:	

	<ul style="list-style-type: none"> • New research/understanding gains (6 mentions – e.g. <i>Application of effort to address cause of barriers; Better understanding of climate van; Keep new information coming</i>) • Increased producer knowledge/skills/practice change (4 mentions – e.g. <i>improved producer attitude to info sharing and technology/research uptake; increase producers' knowledge/understanding of finance traps/risks etc.</i>) • Improved planning/coordination (2 mentions – e.g. <i>Better coordination regarding pasture management and climate forecasting training</i>) • Establishment of new structures/hubs/services (2 mentions – e.g. <i>Establishment of an AgTech innovation hub</i>) • Locally targeted R&D (2 mentions – e.g. <i>R&D into local problems, and possible solutions.</i>) • Actual action/tangible benefits (2 mentions - <i>Actual tangible economic benefit from a project.</i>) <p>Almost half of respondents (47%) wanted to be involved in activities associated with a subsequent project – 42% maybe want to be involved and 10% did not want any involvement.</p> <ul style="list-style-type: none"> • Comments from respondents who wanted to be involved included: <ul style="list-style-type: none"> ○ Desire to provide input/direct involvement for organisational/personal reasons (4 mentions – e.g. <i>Organisational involvement and personal interest; As a producer and Regional Manager for AgForce it would be important to have direct involvement</i>) ○ Networking benefits/collective experience (2 mentions – e.g. <i>Improved networking opportunity and opportunity to learn.</i>) ○ Opportunity to observe process (1 mention) • Comments from respondents who may be involved included: <ul style="list-style-type: none"> ○ Dependent on time constraints/commitment (4 mentions – e.g. <i>This would depend upon the commitment and time frame required</i>) ○ Dependent on project scope/goals/planned outcomes (2 mentions – e.g. <i>It would depend on the outcome and the scope of the project and how likely it would be to benefit producers in the region.</i>) <p>Respondents were quite likely to share ideas/discussions from the workshop with others (7.5 avg. n=21) – the people respondents would most likely share with included:</p> <ul style="list-style-type: none"> • Work colleagues/peers/staff (9 mentions) • Clients/landholders/producers (8 mentions) • Family/Friends/Neighbours (5 mentions) • Local government/council (2 mentions) <p>Other comments relating to the workshop or the issues raised included:</p> <ul style="list-style-type: none"> • General positive comments (5 mentions – e.g. <i>nice afternoon; productive day; thank you for your time and effort; important to run these sessions</i>) • Suggestions/issues (4 mentions – e.g. <i>need for continued communication on developments; still unclear of opportunities and way forward; need for more producer involvement</i>)
<p>Project Team Reflection Sheet</p>	<p>10 responses from 2 workshops (4 Longreach and 6 Charleville)</p> <p>Project team respondents were quite happy overall with the workshops and what they had achieved (7.5 avg. n=10)</p> <p>Respondents were quite happy with the mix of participants (7.2 avg. n=10) and very happy with their participation (8.0 avg. n=10).</p>

Monitoring and Evaluation Framework

The Monitoring and Evaluation Framework was based on Key Evaluation Questions (KEQs) relevant to the purpose of the pilot phase. These are shown in the table below together with the information needed to answer these KEQs and hence the data collection method to be used.

Key Evaluation Questions	Information needed	Method of data collection
<p>1. To what extent did the pilot project undertake planned activities?</p> <p>a. What were the enablers?</p> <p>b. What were the barriers/obstacles and how were they dealt with?</p>	<ul style="list-style-type: none"> • Details of the planned activities and what was actually undertaken. • Details of factors influencing participation. • Details of actions taken. 	<ul style="list-style-type: none"> • Analysis of project documents and final report • Reflection sheets of team members • Discussions with project team
<p>2. How effective was the process – including the workshops undertaken – in achieving the aims and objectives of the sub-project?</p> <p>a. What was the participation level/representation at the workshops?</p> <p>b. How well did the workshop approach work in arriving at the workshop aims?</p> <p>c. What evidence was there of learning/modifications impacting on the second workshop?</p> <p>d. How did workshop participants respond to the workshop and how were their expectations managed?</p> <p>e. What are the potential impacts on/actions of participants if the next Phase of the project does not go ahead?</p>	<ul style="list-style-type: none"> • Details of the project process • Changes made after the first workshop • Participant numbers and demographics at each workshop • Participant views on process and activities • Facilitator's and project team's views on process • Impact on participant's thinking and response to content and process 	<ul style="list-style-type: none"> • Analysis of project documents and final report • Feedback sheet for participants • Reflection sheets of team members • Discussions with project team • Post-workshop interviews with a selection of participants
<p>3. How satisfactory were the outputs from the pilot project in meeting the information needs?</p>	<ul style="list-style-type: none"> • Details of the outputs produced in relation to those contracted? • The extent to which they were comprehensive/useful were these for purpose? 	<ul style="list-style-type: none"> • Analysis of project report • Informal discussions with MLA staff
<p>4. To what extent were the outcomes achieved?</p>	<ul style="list-style-type: none"> • The extent to which the results clearly demonstrate the level of need and interest in a third phase of the project. 	<ul style="list-style-type: none"> • Analysis of project report • Post workshop interviews with a selection of stakeholder participants.
<p>5. What has been learned through the project process?</p>	<ul style="list-style-type: none"> • Details of what helped and hindered the process and buy-in from participants. 	<ul style="list-style-type: none"> • Analysis of project documents and final report • Feedback sheet for participants • Reflection sheets of team members • Discussions with project team • Post-workshop interviews with a selection of participants