Stage One Report: Detailed Scoping Research Findings and Themes

This report contains detailed 'Scoping Research Findings and Themes' for the PhD research titled **'Researching Transition Design in Practice:** *How might the uptake of regenerative agriculture in NSW be increased, by design?***'**

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1. Research overview

This section provides an overview of the research.

The long-term viability of farming and the health of our soils are very close to my heart. In my research I have learned about the potential Regenerative Agriculture holds in forming a more sustainable agricultural production system – and in mitigating climate change - and so I am undertaking a project to **design for the uptake of Regenerative Agriculture in NSW.**

The objective of my research is to explore what constitutes a Transition Design practice for addressing the wicked problem of agricultural sustainability. I am not a farmer or agronomist. I was originally trained in graphic design, and I have been using design approaches for innovation, strategy, organizational transformation and social change for more than 12 years now. I am researching how the 'backpack' of skills that I have apply – and what else is needed – to form a Transition Design practice. In order to research the practice of Transition Design, I need to undertake a project. The preliminary literature review led me to ecosystem services as a topic. However, feedback in preliminary interviews suggested there was a more direct route to sustainability: I was encouraged to focus on Regenerative Agriculture. Through this process of testing and iterating my topic, I have identified a project focused on 'designing' for the uptake of Regenerative Agriculture among graziers and mixed grazing-cropping operations in NSW.

The end goal of this project is to facilitate and support industry stakeholders to identify, develop and test their ideas (systemic, strategic 'interventions') to increase the uptake of Regenerative Agriculture. By supporting others in their changemaking efforts through this Transition Design project, I will be able to research Transition Design practice.

This research aims to contribute to the growing practice base and framework for Transition Design and will also explore Transition Design in an untested context (agriculture). To form a Transition Design practice that is fit for this project, I will need to 'bricolage' methods from the theory and practices of a number of disciplines, including Transition Design. In order to facilitate analysis and reflection on practice, the project will be documented as a case study.

I acknowledge my bias: As a researcher and Transition Design practitioner I am actively working for change rather than researching as a 'neutral' external party. My objective is to enable more widespread uptake of forms of agriculture that result in regeneration. I am not attached to specific practices, but rather to a broader goal of agricultural sustainability – and I interpret that to mean an agricultural system that is viable, produces profitable, quality food and fiber, and can be sustained for many, many generations to come. For me, this also means regenerating ecology, farm financial health and community, family and farmer mental wellbeing – because these are linked. This includes a focus on soil health, water quality and precious ecosystems. I want to be clear that I hold no judgement of any practices that a farmer may use because I trust that farmers hold a deep sense of stewardship and are constantly seeking to do well for the land, crops, animals and families they care for.

To-date, this research has been informed by a literature review, preliminary interviews, a phase of scoping research and a round of feedback from participants.

In January 2019, in preparation for the Stage One Assessment for my PhD research, I undertook a phase of scoping fieldwork to assess the validity of a research project to design for the uptake of Regenerative Agriculture. I also wanted to begin to understand the barriers and opportunities for increasing uptake. After completing Stage One Assessment, I drafted this report and shared it with the original participants from November 2019 for their review and feedback. The feedback that I have been given so far has been incorporated into this document.

The scoping research was conducted as semi-structured interviews. As of February 2020, I have spoken with 43 people, of whom 37 agreed to documented interviews (the rest were 'chats' and are not documented, according to ethics requirements). I visited 13 properties, of which 9 used regenerative methods. Participants included:

- 8 well-known and well-published practitioners of regenerative practices
- 4 regenerative farmers with well-established practices
- 5 farmers transitioning or interested in transitioning to Regenerative Agriculture
- 1 ecological farmer and natural sequence farming practitioner
- 2 conservation farmers. By way of definition, conservation farmers take a conventional approach but with an additional focus of moisture retention in the soil through inputs and ground cover (stubble). Neither recognized the term 'Regenerative Agriculture'
- 4 extension officers - three were advocates, one was skeptical of regenerative approaches
- 7 consultants (a mix of agro-ecology, environmental advisory, extension, researchers and independent consulting) six of whom were advocates and one curious
- 1 farm equipment sales agent
- 1 fertilizer sales agent
- 4 people from different parts of the supply chain, including a butcher, a soil data researcher, a retired soil specialist and ecological farmer, and a retired ecological farmer and entrepreneur
- 5 researchers and academics, two of whom are now organic farmers
- 1 educator

During the scoping phase, a number of opportunity areas were identified for further discussion. To support stakeholders to identify and progress these opportunity areas and any interventions, it is expected that project activities will include some supplemental research to better understand how farmers transition properties, workshop(s) with stakeholders who are interested in increasing the uptake of Regenerative Agriculture, and (a limited amount of) 'design consultation' support from myself.

2. The situation in NSW (2019)

This section discusses drought and bushfire conditions in NSW from January 2019-February 2020.

By the end of 2019, drought conditions in Western NSW were described as some of the worst in recorded history (~400 years). According to the NSW Department of Primary industries DroughtHub (Figure 1), March 2019 saw "99.5% of NSW experiencing drought conditions". Farmers in these areas have been experiencing drought from as early as 2017. The lack of rainfall has been exacerbated by higher than average evaporation rates and wind.

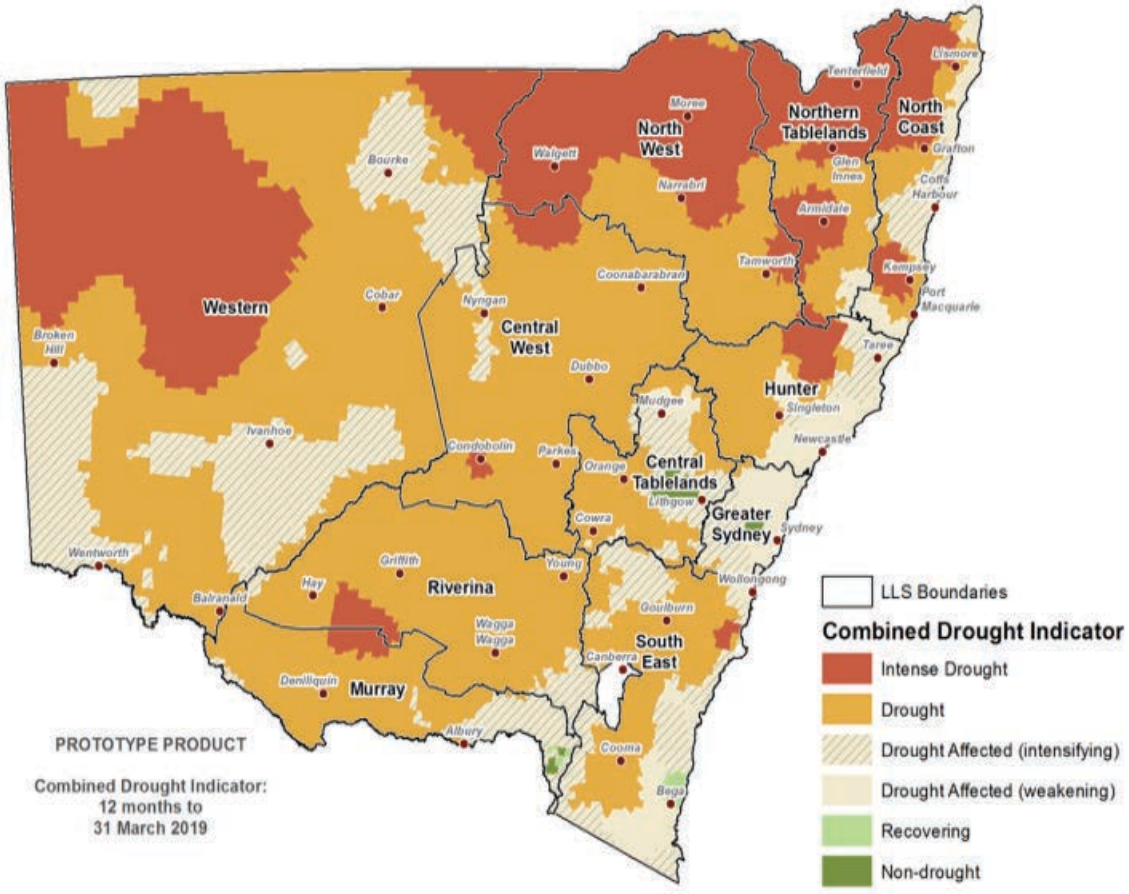

Figure 1. Verified NSW Combined Drought Indicator to 31 March 2019. Source: NSW Department of Primary Industries DroughtHub

As I drove through the South East, Central Tablelands, Hunter, North West, Central West and Riverina areas in January 2019 to conduct scoping research, I observed stressed lands, a lot of bare red earth (a red flag for regenerative ag proponents) and dust storms that forced cars to pull over until they had passed for lack of visibility on the roads.

Roadside photo: Dust storm outside of Condobolin. January 2019.

Participant's farm photo: Dust storm near Nyngan, NSW. January 2019.

On this drive through NSW, 50 – 300km from the coastline at any given point, a look across fence lines revealed that not all approaches to managing property fare the same, particularly in drought. Some properties I visited, although exhibiting some drought-related stress, were

showing plenty of new green growth. Other properties looked astonishingly lush, with deep green plants, glossy healthy stock and even wetlands. Regenerative farmers were running stock at significantly lower levels than normal, so it is true that there was reduced pressure on the land, but I was told that the case for others as well. However, many of these farmers still had anywhere from 6 to 12 (or more) months of feed available without additional rain at their current stocking rates. Unlike others, they weren't purchasing in feed– which puts farmers at risk of running a financial loss. They were using very little or even no chemicals, such as fertiliser, pesticides and herbicides, so their input costs were limited or nil. And most reported turning a profit, as of January 2019, in a drought. I saw firsthand the resilience described in the literature.

Driving through NSW in January 2019 was a tour through many farms without ground cover or that had been ploughed. I have to be careful in discussing this because, in observing a property without context, accurate conclusions cannot be drawn about the management. However, in order to maintain the soil/nutrient cycle, bare earth is typically something regenerative agriculture tries to avoid; ground cover is the rule because soil is considered a valuable asset. Ground cover prevents the erosion of topsoil (due to rain or wind), builds soil and is an important contributor to soil biology.

As one participant described, *"Even the Department of Ag are not recommending ploughing anymore. Zero tilling is a step in the right direction but certainly not ploughing. In the last two years of drought – the way they grow kills everything – half of these farms had nothing on them to begin with. 'Keep the land dead until you're ready to put a crop on it' is not the terminology but that's what [the farmers are] advised to do. From November until June. When you look at that cropping country it's a biological desert. Thirty years ago, agronomists advised: 'remove all the animals'. That in itself was a real disaster. [First, it] stops a form of income. They're wonderful nutrient recyclers and half of the reason the nutrient cycle is crashing is because animals have been removed. And it's entrenched in them now that animals cause soil compaction, but they're blaming the wrong thing: it's the lack of root mass and ground cover. For cropping people another big problem is that they've removed all their animal infrastructure – no fences, no sheep or cattle yards. It can be done without animals but they need to totally change what they do with multi-species cover crops to drive the soil ecology"* (116 Regenerative Farmer).

The following photo series shows images of regenerative agriculture in different parts of NSW.

Photo: Regenerative agriculture – grazing. Cows headed into the next pasture after a few days in one pasture. South East region, NSW (122 Regenerative Farmer). January 2019.

Photo: Same as above – the fresh 'salad bar' (122 Regenerative Farmer). January 2019.

Photo: Same as above (122 Regenerative Farmer). January 2019.

Photo: Same as above (122 Regenerative Farmer). January 2019.

Photos: From the same property as above, a comparison of paddocks. Photo at left: after 3 days grazing. Photo at right: ready to eat. Although other photos from this property may have looked like the cows didn't leave anything green, there was actually a lot left. The objective is to avoid grazing the grass down so far that it can't recover. (122 Regenerative Farmer). January 2019.

Photo: Regenerative agriculture – grazing. Visitors on a non-rotation day? Curious cows come to see what the fuss is about. Central West region, NSW (125 Regenerative Farmer). January 2019.

Photo: Same curious cows as above. Central West region, NSW (125 Regenerative Farmer). January 2019.

Photo: Same property as above, thigh deep grass in a resting paddock. Central West region, NSW (125 Regenerative Farmer). January 2019.

Photo: Regenerative agriculture – resting paddock. South East region, NSW (124 Regenerative Farmer). January 2019.

Photo: Regenerative agriculture, same property as above. This was once an erosion gully. South East region, NSW (124 Regenerative Farmer). January 2019.

Photo: Regenerative agriculture – resting paddock, same property as above. South East region, NSW (124 Regenerative Farmer). January 2019.

As at November 2019, the NSW DroughtHub reported worsening conditions for many parts of NSW, and this intensified through January 2020 as seen in Figure 2 below:

- "Prolonged drought conditions and an unfavourable three-month rainfall outlook continue to provide challenging hydrological and agronomic forward scenarios. The current circumstances indicate that the management of the current drought event will likely be required into 2020."
- Whereas the drought has weakened marginally in some areas (Western, Riverina, Murray and South East areas), "the intensity of the drought event [has increased] across northern, the far west and Central West areas of NSW".
- "The failed 2019 winter recharge of soil and hydrological systems, combined with the poor start to spring continues to impact feed and water availability, while low summer crop potential persists for much of the state. Given that the rainfall outlook is poor relative to requirements, it is expected that widespread pressure will continue for the foreseeable future while productive capacities remain limited and drought management continues".

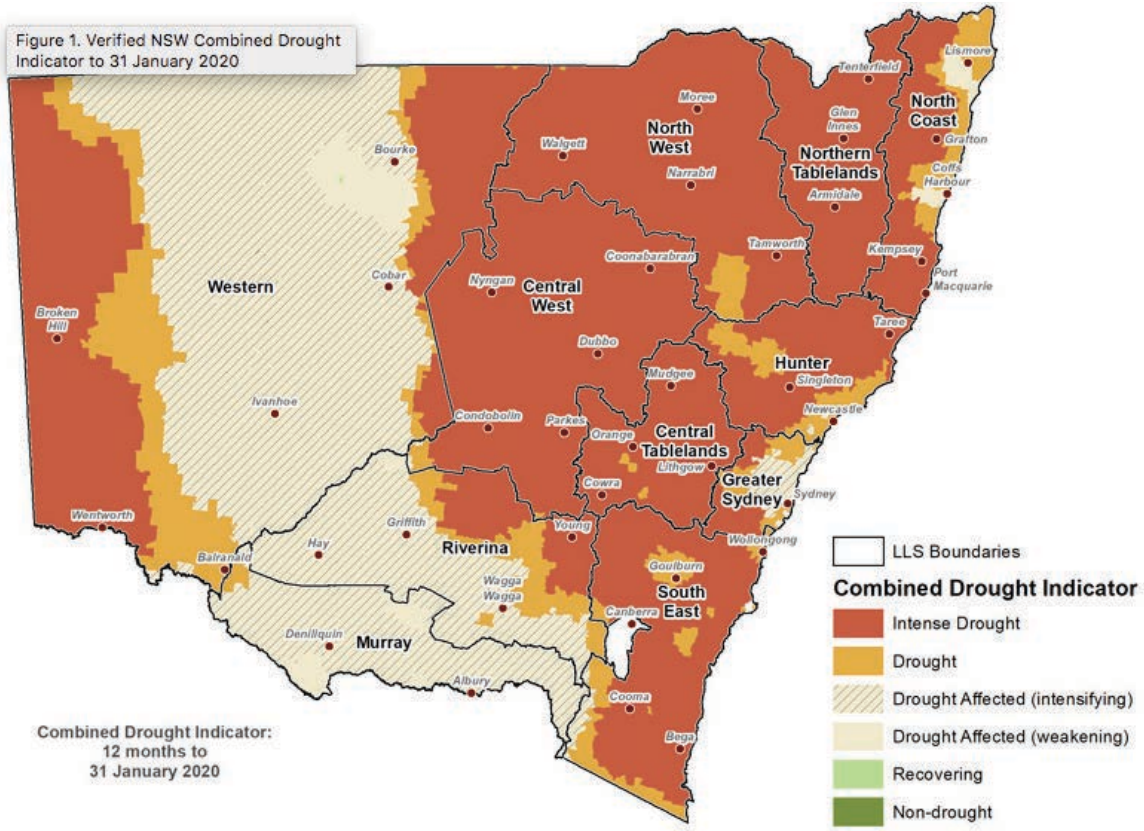

Figure 2. Verified NSW Combined Drought Indicator to 31 January 2020. Source: NSW Department of Primary Industries DroughtHub

The 2019-20 bushfire season reached extreme and catastrophic fire danger quite early in the season*: "As of 18 November, 1,650,000 ha (4,100,000 acres) [had] been burnt, more than the past 3 fire seasons in total. 476 homes [had] been destroyed since the start of the bushfire season"* (https://en.wikipedia.org/wiki/2019–20_Australian_bushfire_season). New Year's eve saw horrific, devastating fires down the south coast and into Victoria on a scale that shocked the world. February 2020 saw a continuation of fire season and then some very welcome rain.

3. What is Regenerative Agriculture?

This section presents the definition(s) and descriptions of Regenerative Agriculture that were understood from the literature review and scoping research. I am not an expert in agriculture. I have taken an ethnographic approach in listening to different stakeholders and then a design approach for synthesising themes. This exploration of the definition of Agriculture brings together the many viewpoints and attempts to make sense of them.

The first round of feedback on this paper conveyed that I was a little light on in some areas of my original exploration of the definition of Regenerative Agriculture, and so this version of this document includes an expanded exploration of the definition – complete with caveats as to the risks of establishing a definition. The sense I get is that a good definition of Regenerative Agriculture will itself be consistent with the principles of regeneration – for instance, not too limiting or tightly prescriptive to constrain proliferation, diversification and (further) innovation; useful and practical enough to enable application; works with nature and complex systems; creates spaces for many niches together with repeating patterns that benefit bigger systems so that all can thrive (etc).

There is opportunity for further work in this space if stakeholders are interested in collaborating to establish consistency in the framing and messaging for Regenerative Agriculture in order to set a shared platform for increasing awareness and uptake of regenerative approaches.

Research context – the popularisation of the term 'Regenerative Agriculture'

This research is based on the potential and the urgency many see for regenerative agricultural principles and practices to underpin our agricultural production system. *Participants have expressed that our society has an urgent need to reduce the negative impacts that farming has on our environment and hold a vision in which, ultimately, our agricultural production system is regenerative*. As asserted by Richard Perkins in the preface to his 2019 book, 'Regenerative Agriculture: A Practical Whole Systems Guide to Making Small Farms Work':

> *"We believe it is possible to meet all our human needs whilst restoring soils, ecosystems and communities. We see it is possible anywhere on the planet. We already have all the technologies and knowledge necessary. We even now have all the decision-making and planning processes needed to accomplish that whilst accounting for the complex systems we must work within."*

This research is focused on Regenerative Agriculture in New South Wales (NSW, Australia), and specifically regenerative management practices for grazing and mixed grazing and cropping. This was a pragmatic choice in terms of focus because a number of innovators and early adopters live in NSW, and there is much land here dedicated to grazing and mixed grazing and cropping (particularly in the box gum grassy woodland biome that stretches from southern Queensland through New South Wales to Victoria). From the information I have available at the time of this writing, as well, I gather that regenerative practices are currently most commonly used in Australia for commercial grazing (cattle and sheep) and mixed grazing-cropping operations, while

there is a growing effort to practice regenerative approaches in cropping (e.g. large scale broadacre cropping) in this country as well.

Although I have a focus on grazing in NSW, it is important to acknowledge the diverse application of Regenerative Agriculture, the long history of regenerative practices outside of NSW, beyond grazing and long before modern agriculture, the breadth of terms that have been used in this space.

Regenerative practices are currently being applied, adapted and evolved around the world in horticulture, broadacre cropping, intensive cropping, dryland or irrigated cropping, perennial dry land agriculture, agroforestry, mixed farming systems that have grazing and cropping, and grazing (and more).

Accordingly, reader please note that the definition(s) of Regenerative Agriculture discussed in this research covers the broadest application of regenerative agriculture practices (e.g not just applicable to grazing).

Regenerative practices have been used by Indigenous people for millennia. As agriculture industrialised, Indigenous practices were overtaken in many parts of the world – though not everywhere. There are still pockets of Indigenous farming practices in parts of the world. Meanwhile, a small number of farmers began to give up on industrial practices as their land became more and more degraded and they needed a different approach that didn't require the ever-increasing expenses of more and more chemicals with smaller and smaller returns. They also rejected the pressure to constantly grow (and acquire the neighbor's property) in order to be seen as the most successful producer. As a result, there are a number of practices that have been in use for 20-50 years and are becoming more common and well-known, for instance organic, Holistic Management and permaculture practices.

There many practices and several terms that are closely related to the term 'regenerative agriculture', though in the past five years or so 'regenerative' has become the most prevalent term. "*A lot of organic feel they're already regenerative…and so they're using the term 'regenerative organic agriculture…but the term 'Regenerative Agriculture' is [now] the overwhelming term [that is used]. It has superseded [a number of other terms]"* (129 Agroecologist and Extension Consultant). This includes terms like 'biological farming', which is considered a "part of agroecological farming" (Johns 2018).

Agroecology is sometimes used interchangeably with Regenerative Agriculture but "loosely defined, agroecology often incorporates ideas about a more environmentally and socially sensitive approach to agriculture, one that focuses not only on production, but also on the ecological sustainability of the production system…At its most narrow, agroecology refers to the study of purely ecological phenomenona within the crop field, such as predator/prey relations, or crop/weed competition" (Altieri, 2018). Some participants reasoned that Regenerative Agriculture could be described as "applied agroecology" (135 Ecological manager and NSF practitioner).

As an example of the many related terms that may be used, the Development Fund put forward this description of agroecology:

> *"Sustainable agriculture, ecological agriculture, agroecology are used intermittently according to the context but all refer to agriculture that centres on food production that makes the best use of nature's goods and services while not damaging these resources. Further, these terms reflect:*
>
> - *the application of ecology to the design and management of sustainable agroecosystems,*
> - *a whole-systems approach to agriculture and food systems development based on traditional knowledge, alternative agriculture, and local food system experiences,*
> - *linking ecology, culture, economics, and society to sustain agricultural production, healthy environments, and viable food and farming communities"* (Development Fund /Utviklingsfondet, 2011).

Within the last ten years, agroecological approaches have begun to get a fair amount of attention and backing from global organisations. Stapper explains that *"At a global scale, UN agencies (FAO, UNCTAD, UNEP, IAASTD) have released reports during the past decade supporting agroecological farming as the way to achieve the UN Sustainable Development Goals and feed the world, without a need for genetic modification"* (Johns 2018). This runs counter to the conventional agriculture argument that 'we have to feed the world', which is put forward in defense of the use of synthetic chemicals by many people who are skeptical of regenerative approaches (emphasis added, discussed in the section on 'Barriers').

There may something about the term 'regenerative' that lends to its adoption, although that will not be explored in this research. Participants carefully offered their sense that the term is somehow friendlier, more inclusive, and a goal that many people can get behind, relate to and remember – a 'broad church'; meanwhile they felt that other terms (like anything with 'eco' in it) can put people off. The term stretches across many dimensions – for instance, some have begun to talk about regeneration as a philosophy for living life as well as a fundamental that can underpin our agriculture.

Origins

The book Drawdown, edited by Paul Hawken, provides the following explanation of the origins of Regenerative Agriculture: *"The Rodale Institute has been the cornerstone of organic farming in the U.S. since its founding in 1947. Based on the writings and observations of Sir Albert Howard, the godfather of organic agriculture, the Institute publishes, promotes, and conducts extensive ongoing research into organic methods of agriculture. The 333-acre farm in Kutztown, Pennsylvania…was purchased in 1971 by Robert Rodale, the son of founder J. I. Rodale. The land was played out and exhausted, an inspiration to Rodale to develop regenerative agriculture – systems of farming that*

are productive but which also increase the capacity for productivity in the future by restoring soil health. He proposed, and the Institute practices, methods of farming that require no external sources of fertility...and certainly no chemicals" (2017, p 54).

As regenerative practices began to spread to Australia, the banner was carried by a few innovators and early adopters, such as the Regrarians, who began using the term 'regen ag' in the late 2000's.

The term 'Regenerative Agriculture' became an umbrella term for practices that seek the same result: to steward the regenerative capacities of land - the self-organising properties of life – to ensure the capacity for future production as well as for the long-term resilience and viability of the food and fiber systems, ecosystems and communities that sustain us.

Definitions

Regenerative Agriculture: Agriculture that achieves production through regeneration.

This definition I offer is an attempt to synthesise many different definitions while staying true to a singular principle and intention that I have heard expressed by participants: any effort that seeks to support Regenerative Agriculture should in itself be regenerative. To illustrate this point, through discussions with more than four dozen Regenerative Agriculture stakeholders and in reading some of the foundational literature, I have heard the refrain that any definition of Regenerative Agriculture needs to be a 'broad church' (rather than a cult) that leaves room for innovation while being very specific about how results are achieved. In Regenerative Agriculture, the ends and the means are the same: regeneration - and regeneration is the basis of production. From there we can delve into the philosophy, characteristics, principles and ever-evolving practices of Regenerative Agriculture, as follows.

Beyond the circles of people practicing Regenerative Agriculture and even among those familiar with the approaches, it is not always clear what Regenerative Agriculture means, how it works, or what a farmer is doing differently. One participant relates an ongoing experience of hearing others define Regenerative Agriculture as if it's a "shopping list" of practices (135 Ecological manager and NSF practitioner). Clarity will be critical as more and more people look to transition to regenerative practices, but a warning note has been sounded by a number of participants, cautioning a too-tight definition of Regenerative Agriculture. The concerns are that, if we tightly circumscribe Regenerative Agriculture, it will not leave room for a diversity of practice, it will not invite future innovation and it will be reduced to a small set of practices that can only be adopted in some areas by some practitioners – and this would work against the goal of re-setting the foundations of our agriculture.

Because of these concerns, in discussing definitions I have focused first on underpinning philosophy, principles and outcomes, and then followed with examples of practices. That being said, I do not deny the validity and urgency of the need for clarity among people seeking to support and/or transition to Regenerative Agriculture. In this research, however, I am holding a

hypothesis that knowledge and support for *how* to assemble a regenerative practice and transition a property is at least as vital, if not more so, than clarity of definition.

A number of definitions of Regenerative Agriculture can be found in a quick search online. Many of the definitions of Regenerative Agriculture that appear online and in practitioner literature describe the philosophy, characteristics, and outcomes: **a holistic approach to building soil health, increasing biodiversity, capturing carbon, improving the water cycle and promoting ecosystem functionality – managing the five landscape functions.** It is worth noting that this is a paradigm shift from conventional agriculture.

Here is a sampling of definitions:

- "Regenerative agriculture is a conservation and rehabilitation approach to food and farming systems. It focuses on topsoil regeneration, increasing biodiversity, improving the water cycle, enhancing ecosystem services, supporting biosequestration, increasing resilience to climate change, and strengthening the health and vitality of farm soil" (https://en.wikipedia.org/wiki/Regenerative_agriculture)
- "Regenerative Agriculture is a system of farming principles and practices that increases biodiversity, enriches soils, improves watersheds, and enhances ecosystem services. Regenerative Agriculture aims to capture carbon in soil and aboveground biomass, reversing current global trends of atmospheric accumulation. At the same time, it offers increased yields, resilience to climate instability, and higher health and vitality for farming and ranching communities. The system draws from decades of scientific and applied research by the global communities of organic farming, agroecology, Holistic Management, and agroforestry." (www.regenerativeagriculturedefinition.com)
- "Working to support the environment rather than degrade it, regenerative agriculture is a holistic farming approach that focuses on developing the biology and fertility of soils as the basis of the entire farm ecosystem." (www.woolmark.com)
- "Regenerative agriculture describes land and livestock grazing management techniques that seek to sequester carbon and restore healthy eco-system processes" (https://www.google.com.au/amp/s/amp.abc.net.au/article/11112832).
- "Regenerative agriculture practices restore degraded land. They include no tillage, diverse cover crops, on-farm fertility (no external nutrient sources required), no or minimal pesticides or synthetic fertilizers, and multiple crop rotations, all of which can be augmented by managed grazing. The purpose of regenerative agriculture is to continually improve and regenerate the health of the soil by restoring its carbon content, which in turn improves plant health, nutrition, and productivity" (Hawken, ed. 2017, p 54).
- "Regenerative agriculture describes farming and grazing practices that, among other benefits, reverse climate change by rebuilding soil organic matter and restoring degraded soil biodiversity – resulting in both carbon drawdown and improving the water cycle. *Specifically, it is a holistic land management practice that leverages the power of*

photosynthesis in plants to close the carbon cycle, and build soil health, crop resilience and nutrient density" - @kisstheground, Instagram (emphasis theirs)

- "Regenerative Agriculture is about managing to allow measureable improvements over time in ecosystem function and biological diversity, driven mostly by the self-organizing ecosystem, towards a social, ecological and financial goal" - a definition that David Marsh, Mark Gardener, Sue Ogilvy, and Rachel Lawrence have used, with the caveat that is it a dynamic, working definition.

Some of these definitions place emphasis on remediation, improvement and conservation. For many early adopters, transition to Regenerative Agriculture was prompted by a crisis – a failure of conventional agriculture – which put their properties in dire need of financial and ecological remediation. Some felt that Australia is challenged at a broad scale to address landscape degradation and dehydration. Regeneration framed as remediation can raise defensiveness and put people off, however, as some farmers feel affronted by the idea that their property requires remediation – whilst proponents reasoned that farming by definition takes away from (degrades) a property and makes remediation constantly necessary.

Beyond the remediation aspects, however, proponents stressed the generative and productive aspects of Regenerative Agriculture as well. They describe regenerative agriculture as **working with nature** and the self-organising properties of life; facilitating the regenerative capacity of land, plants and soil. Rather than conserving what exists and leaving it alone, **Regenerative Agriculture seeks to stimulate and benefit from nature's ability to regenerate**. The approach focuses on land management practices that protect, activate and cultivate nature's ability to grow, replenish, balance and heal (such as a plant's reaction to being grazed) – in favour of what farmers seek to produce. *It achieves the goals of conservation and production simultaneously.*

The definition *and* goal of Regenerative Agriculture is contained in the name: **an agriculture that achieves production through regeneration.** One might speculate that having the goal contained in the name has helped the term become so popular – it is a goal many people can get behind.

I have heard it summed in one (rather provocative) query:

"Are you for regeneration? …If not, then you're for degeneration." (136 Educator & Consultant).

The question can be applied holistically, as the wellbeing of each of these are linked:

- Is your land regenerating?
- Is your community regenerating?
- Is your family regenerating?
- Are you regenerating? (136 Educator & Consultant).

To summarise, Regenerative Agriculture works by stewarding the regenerative capacity of land – working *with* nature. This means taking a whole systems approach to feeding the soil, stimulating biology and facilitating landscape functions so that we maintain the conditions and complex adaptive systems required for life (including mental wellbeing, family and

community). It means basing our agriculture *within* the proliferating, self-organising properties of life -- *because life begets life.*

Holistic management of the five landscape functions

Participants stressed that the cornerstone of regenerative approaches is holistic management. Holistic management is about **learning to work *with* the complex adaptive systems of nature**. To manage holistically is both a goal to strive for and an approach that is critical to making Regenerative Agriculture work; managing land holistically facilitates regeneration.

From what I understand, the term was coined by Allan Savory and others who developed 'Holistic Management' (HM) practices (sometimes used interchangeably with Holistic Resource Management (HRM) and Holistic Planned Grazing (HPG)), including training, books and other materials. I wish to offer all due credit and respect to Allan Savory and others who have worked with him, like Stan Parsons, for the application of holistic thinking in modern agriculture. However, as one participant pointed out, holistic thinking has been around for a long time*: "Aboriginal people have had [holistic thinking] for tens of thousands of years. They had a universal lore. Social principles. Economic principles. Environmental principles"* (103 Environmental & Sustainability Advisor). Furthermore, there are a number of other practices, like Permaculture, that stress holistic thinking as well. Accordingly, for the purpose of this research I will refer to Holistic Management as pioneered by Savory et al as 'HM' and then will use the terms 'holistic thinking', 'holistic management', 'managing holistically', 'whole systems' and/or 'whole systems approach' to describe this fundamental holistic principle of regenerative forms of agriculture.

There is a core set of elements (or principles) that are necessary for *managing holistically* in order to facilitate regeneration, and I will use Massy's (2017) framing and terminology - the '*five landscape functions'* - for these elements. Massy and many of the participants in this research emphasise the importance of farmers having the 'ecological literacy' to 'read' the five landscape functions:

1. **Solar cycle:** *Maximising photosynthesis and sequestering carbon - also referred to as the carbon cycle***.** The goal is to increase the flow of energy and capture of carbon – within the carrying capacity of the land. A few measures related to this principle are percentage of ground cover, biomass of plants and soil organic carbon - relevant to what can be expected for that soil type.

2. **Water cycle:** *Hydrating the landscape.* The goal is to remediate the water cycle where there are signs that the natural function has been disturbed: erosion channels, salinization, degraded riparian (waterway/watershed) areas, loss of topsoil during light or 'normal' rains. One goal is also to slow down the movement of water (e.g. rain) through a landscape in order give the land a chance to retain rainfall while decreasing the likelihood of destruction (e.g. through flash flooding). Measures associated with this principle include: a decrease in erosion, decrease in loss of soil during rain/storm events, increase in

water infiltration rates (e.g. decrease in the amount of time it takes for the soil to absorb rainwater), visible signs of plants, shrubs and trees holding the walls of waterways in place, evidence of water slowed down in the landscape where appropriate (e.g. with leaky weirs and plants), recharge of groundwater resources and aquifers, and more.

3. **Soil/mineral cycle**: *Building soil, soil biology and nutrients (also known as the nutrient cycle).* The goal is to build biologically active, living soil that produces healthy and nutrient dense plants and animals. In his book *Dirt to Soil*, Gabe Brown offers five keys to soil health: 1) limited disturbance 2) armour - keep the soil covered at all times 3) diversity of plants and animals 4) living roots and 5) integrated animals (e.g. for cropping operations) (2018). Measures associated with this principle include: soil compaction, soil structure, colour, and smell, root depth and structure, water infiltration rates, numbers of organisms (e.g. number of worms and soil insects) and level of activity in the soil, presence of mycorrhizal fungi and a healthy plant rhizosphere, biomass of plants, nutrient density of plants and animals, etc.

4. **Biodiversity***: Increasing the diversity of plants, animals (and people) in the landscape*. The goal is to continually increase biodiversity as it is a recognized factor in healthy, dynamic, resilient and productive ecosystems *and* communities. Measures include counting the number of species of grasses (including native grasses), plants, flowers, trees, insects, and bird life, etc.

5. **Social/human factor**: *Connecting people, communities, economics and ecology for the resilience of all. Also known as human ecology*. Based on the knowledge that the mental models and paradigms we operate within drive ecological, agricultural and human life outcomes, the goal is to build social, personal, financial, economic, biological and ecological connection in order to improve the resilience of all. Similar to how Permaculture offers the permaculture principles as a way of living life, the term 'regenerative' has begun to be extended to how we live life. Measures may not be the right term here, but indicators of the potential for the social/human factor to contribute to regeneration include farm financial health and profitability, farmer mental wellbeing, incidence of farmer suicide, thriving communities, reliance on local products and relationships, robust community dialogue inclusive of multiple perspectives, attitudes of continual learning among farmers, deliberate approaches to decision-making, monitoring the outcomes of decisions that have been made and shifting decisions if outcomes are not in line with goals, intentional approaches to succession, and more.

Practitioners emphasized that managing the five landscape functions holistically is vital because these functions are interconnected and work together – all five are required for regeneration. Proponents believe that managing these five functions holistically – the carbon cycle, the water cycle, the soil/nutrient cycle, biodiversity and the social/human factor – is the foundation of a scalable approach to sustainable, regenerative agriculture.

Although there is no one fixed definition or set of principles – which may be important in order to leave room for diversity and permutations in practice – there is alignment around core elements of Regenerative Agriculture. Proponents take different angles depending on their perspective. For instance, Perkins would describe the 'core tenets' with a permaculture emphasis, but you can see that there is still consistency: *"**Regenerative agriculture can be scaled up or down to virtually any level, in virtually any climatic zone, and yet at the heart of it the core tenets remain the same**: capture carbon and sequester it back into our soils; reinvigorate local economies whilst restoring the pride back into land stewardship, and reignite the passion we all share for real food whilst stimulating neighbourhood and community connections."* (Perkins 2019) (emphasis added).

Examples of practices

There is no one set of methods that comprise regenerative agriculture – rather it is a holistic 'system of farming practices and principles'. This is important as it means Regenerative Agriculture is a flexible system of practices that can be adapted, and is open to constant innovation and improvement. In order for Regenerative Agriculture to truly be 'scaled up or down to virtually any level, in virtually any climatic zone', it cannot be circumscribed by a small set of practices. However, this has pros and cons. It means that there is flexibility for farmers to form their own practices, but it also means that simple instructions are elusive and it may not be clear to farmers how to transition their property.

Some participants leaned on the principles. As a participant described, for any given property *"management will be different but not the principles…Management should reflect the principles"* (103 Environmental & Sustainability Advisor). That being said, beyond a (growing) number of proponents, these principles (landscape functions / elements) are not necessarily well-understood. "Everyone…doesn't seem to be clear on the principles. They all argue on the management side. The principles don't change. These stay exactly the same across the whole damn world. People always get caught up in the details. Don't. As long as they're applying the principles, they're getting the point. As long as you're bringing it back to the basics" (103 Environmental & Sustainability Advisor).

However, principles are not enough to make a practice or to enable a transition. As a result of the complexity and fogginess some people perceive around the terminology, Regenerative Agriculture gets associated with specific practices (such as HM) - or, in trying to make a start, people seek a prescription. This is tricky because a prescription of practices will not work for every farmer let alone for all graziers within a single biome.

In order to understand what is meant by the term 'Regenerative Agriculture', examples of practices need to be provided. One thread in the discussion sees a need for farmers to be able to start somewhere, and some proponents felt that if farmers new to regenerative practices could see regeneration on their property they would be encouraged to continue on the journey. *If I understand correctly,* each of the below practices could be a starting point for someone interested

in regenerative practices – but the application needs to be based on a careful reading of the landscape.

Practices used in Regenerative Agriculture for grazing and mixed grazing and cropping include but are not limited to:

- **Continual ground cover** (to maximise photosynthesis and build soil) - accomplished through grazing management, multi-species cover-cropping and pasture cropping methods, such as those being explored by practitioners like Colin Seis (Massy 2017, p 194-202) and being promoted in America by innovators like Gabe Brown and Joel Salatin. There is a saying among practitioners that 'bare soil is dead soil'. As one proponent observed, *"[Conventional] agriculture bares ground whereas regenerative agriculture covers it up"* (120 Holistic Management consultant). A note of caution: ground cover requires at least some moisture. As one proponent explained, "[if a property gets] below 12 inches of rainfall, cover crops are very risky" and "continuous cover still requires a bit of moisture as well" (142 Agroecologist, Educator & Consultant). (Note: continuous ground cover and cover crops are not the same thing.)
- **High-density cell grazing and rotation** in planned (but flexible) cycles over periods of time in a way that maximises the plant and land's ability to regenerate itself. This means animals are moved into a new pasture (a cell) in line with the optimal growth cycle of the plant, as plant growth is stimulated by grazing at certain time and to a certain extent. Sub-dividing land into small pastures (e.g fifty x 10-20 acre pastures rather three to four 300-400 acre pastures for 1500 acre farm) is a common practice *where feasible* as it mimics the behaviour of wild herds, who cluster, eat, defecate and trample in a small area and then move on every few days – building soil and stimulating the plant growth cycles. In this approach, herd density is significantly greater than with set stocking/continuous grazing. Optimal herd size is dependent on many factors, may require some experimentation, and can be adjusted for the result the farmer is seeking. These methods were pioneered by Allan Savory (HM) and Stan Parsons (Grazing/Ranching for Profit). This approach concentrates animal waste into a small area, optimising natural fertilisation. High-density cell grazing typically requires an investment in farm infrastructure, including fencing and water points.
- **Improving the water cycle, watersheds, and retention of water in the landscape** – this is done through a range of methods that may include remediating drainage gullies/channels and riparian/watershed areas with approaches pioneered by Peter Andrews and Tony Coote; keyline systems and contour lines developed by P.A. Yeomans and others like Ron Watkins (Massy, p 120-140)
- **A range of planting techniques, preferably no-till (**Zero tillage or direct drilling) **but also low-till**; Bruce Maynard's "no kill cropping" approach (Massy, p. 203-211)
- **Low Stress Stock Handling** – to work with animals efficiently and safely but also to improve meat quality (because stress hormones are not present). Low stock stress handling encompasses a range of techniques, including: yard design and animal instincts,

low stress stock handling, stress-free stockmanship, and self-herding and behavior modification. These methods layer upon one another, and can mean less infrastructure and human management is required. (https://www.lss.net.au/index.htm)

- **Natural pest control** – is achieved through the use of companion plants or sacrifice crops to increase insect biodiversity, attract unwanted insects to other crops, or to attract specific predatory insects that can combat unwanted insects. Increased soil health also improves plant resilience, making them less susceptible to insect attack. Permaculture and organic farming offer detailed knowledge for this practice.
- **Integration of compost, green manures, naturally-derived fertilisers and inoculants** – to build soil biology. Examples include Di and Ian Haggerty's seeds, which are microbiologically coated in liquid 'ecology fertiliser' developed from vermi-juice (worm juice) sourced from Rachelle Armstrong (nee Maddock) at NutriSoil and Rhonda Daly's healthy compost (Massy, 355-371). Other examples include biodynamic methods using soil preps informed by the work of Rudolf Steiner in Germany in the mid-1920s. For an example of the use of compost with soil, refer to the 'carbon farming' work of John Wick in the US. https://www.marincarbonproject.org
- **Permaculture principles, practices and approaches to design** – Permaculture was developed by Bill Mollison and David Holmgren for horticulture and has been typically practiced on a home or small-farm scale or as principles underpinning larger operations. A number of participants in this research and proponents of Regenerative Agriculture in literature referred to how Permaculture has influenced their thinking, informed how they design the layout of their properties and think holistically about the human, social and ecological dimensions. Permaculture has a set of principles, which some proponents prefer over HM principles.
- **Diversification** – In addition to trying to improve the biodiversity present on a property through management approaches, farmers can also build diversity into their business model. In these cases, farmers seek to diversify the farm's products rather than rely on productivity from a handful of plant or animal types. This creates robustness and resilience through unpredictable weather, pest and economic events.
- **'Whole-farm' strategic planning** - Whether using the frameworks provided by Stan Parsons and Resource Consulting Services (RCS), Allan Savory's Holistic Resource Management, or the Potter Farm Planning Scheme (or others), regenerative farming often involves long-term strategic planning for the farm and the family. Holistic planning stresses stepping back and setting goals and values for the farmer's lives – together with the whole family. This helps farmers make decisions in-line with their goals, maximise return on investment, support succession and learn from their decisions. For the day-to-day, the planning and assessment tools enable farmers to gauge the number of months of feed present on the farm so that rotations and risk can be managed optimally based on estimated rainfall and plant growth cycles. (Interviewee 107, Regenerative Farmer)

With all of these possibilities in the mix, how do you know you're practicing Regenerative Agriculture? This may be a rabbit hole, counterproductive to the goal of supporting transition. Many of the participants who are working to support farmers to transition take a broad and tolerant view in order to be encouraging of any step toward transition. From that perspective, perhaps a better question is: **Are your practices regenerative?** One proponent suggested a quick test for practices, ***"If a practice is not expanding the plant biomass and/or biodiversity, then it probably fails a regen tag.*** *It could still fit a 'Sustainable' tag that is laudable and useful. [But regenerative agriculture is about] building more than where you are starting from"* (114 Regenerative Farmer). Another approach is to increase the biology in the soil, also referred to as increasing the microbial activity, the presence of mycorrhizal fungi and **soil organic carbon**. The goal is not *"going for utopia"* but rather looking for increases that are appropriate within the carrying capacity of that landscape while being practical: *"if we have a bare paddock then add one plant and then 10 plants [that's a big difference] but once we have 250 plants an extra plant is worthwhile but there are diminishing returns"* (114 Regenerative Farmer).

Benefits of regenerative approaches

The benefits of regenerative agriculture are described as follows, summarised from Massy (2017), a recent longitudinal study published by Ogilvy, et al (2018), and the scoping research:

<u>Ecological viability</u>

- Amount of carbon and number of biological organisms (soil biology) in the soil are increased; Carbon is sequestered in the soil
- Plants and animals are grown within the natural carrying capacity
- Limited or no use of chemicals/oil-derived products means that chemically-related ecological harm is not a by-product of the farming method
- Biodiversity is increased, not decreased
- Use of natural methods for fertilising, minimising unwanted plants (weeds) and managing pests works with biology to enhance the land's natural capabilities
- The methods ensure the land retains its ability to regenerate
- The landscape and the ecosystem retain the functions required for viable farming and communities (also referred to as *ecosystem services*)

<u>Social viability</u>

- Profitable farms mean that money and/or time is available to spend in and on community
- Farmer mental health is not just improved; regenerative farmers report more free time, increased happiness and enjoying farming again
- Farming becomes more enjoyable and safer for families and for farmers (for instance, children can't be around chemicals that are sprayed and numbers of farmers have been harmed by chemicals); the land looks and feels healthier by comparison.

- Farming becomes more attractive as a profession

Financial viability

- Fewer inputs mean lower costs and overhead investments
- Focus on profitability rather than just productivity (revenue) means there is money left to protect the farm in down times and invest
- For those who diversify their revenue streams, risk is reduced as compared to only operating in one market

STORY: One farmer's story of a transformation from risk of suicide to farmer of the year

The following story was shared by a farmer who had the first-hand experience of working with another farmer who had been at risk of suicide.

"[I ran a] 'Farmer-to-farmer' workshop through Landcare. I got $5K or something, 8-10 years ago - I applied for a grant to do it as a pilot exercise through the rural counseling service." [The way the program worked was that the farmer gave a 2-hr Powerpoint in town and then the farmers] "had to turn up or they wouldn't get their funding. [In the first session there was a] lot of the arm folding. By the end they were relaxed, happy, wanting to know 'Is this true?' I had photographs, this is me. Phase 2: come have a look. We had a busload. Everyone turned up here to see the place. Seeing is believing. Phase 3 was one-on-one. I think there were eight. I got half. That was the harder part. By the end of the second phase – at the woolshed – the wives came, more women than blokes – desperate for their husbands to wake up and see. The thing that really got me: they were in tears. And they brought me to tears. One farmer said, 'I was about to shoot myself.' There was no end. And you've opened the door. It was probably the most emotional day I've ever been through. Because it's about life and death. The next phase was to go see their place and I did. But by then this guy wasn't available. He was hiding. Because I was a farmer…If I was a white-coated expert? No way, he'd be dead. I didn't even talk about farming when I saw him. I talked to my daughter [before I went] – she had training in social science – how to approach him, to approach the situation. Don't go in guns blazing, she said. Find out where did he come from? His family. Why don't we have a cup of tea. Get to know the wife, kids. I said I'd like to see a map of your farm. The wife got the map out. They had a few lines drawn. So I thought: this is good. Let's go for a drive. There was a huge great bulldozer sitting there. D9. And bare ground. Hard, compacted. They were ripping the ground. Why? To make it softer? He asked 'You mentioned the water cycle?' I asked, what do you reckon the bulldozer is worth? $150K. You could redevelop your whole property for that. I did mine for less than that. Two years later he won the Landcare award for farmer of the year. And he was on a suicide mission. So there you go. But people can do that. [This is] job creation. Let's train people to do that. They have to have training to do that. They have to know the game. They have to have the confidence to tell them to sell their bulldozer – to turn the farm around by selling the bulldozer. But if his wife wasn't there, he wouldn't have been there. She got him to the woolshed. He wouldn't have gotten there himself" (107 Regenerative Farmer).

The role of Regenerative Agriculture in mitigating climate change

Regenerative agriculture is also regarded as having benefits beyond agriculture: because the approach sequesters carbon in the soil it has benefits for mitigating climate change. This is the opposite of the dominant agricultural paradigm, which disrupts the carbon cycle and releases carbon into the atmosphere.

In research, Regenerative Agriculture has been identified as a promising and practical approach to sequester carbon and mitigate or even reverse human influences on climate change. In 'Drawdown', the contributors sought to answer the following question, *"Do we know what we need to do in order to arrest and reverse global warming?" (Hawken, ed. 2017,* p x). Extensive research for 'Drawdown' resulted in ranking Regenerative Agriculture as #11 among 80 solutions that have been identified for their potential to avoid or remove greenhouse gases. The book has this to say about Regenerative Agriculture, in comparison with conventional agriculture:

> *"As you will see from the data at the back of this book, no other mechanism known to humankind is as effective in addressing global warming as capturing carbon dioxide from the air through photosynthesis. When converted to sugars with help from the sun, carbon produces plants and food. It feeds humankind, and through the use of regenerative agriculture, it feeds the life of the soil. Regenerative agriculture increases organic matter, fertility, texture, water retention, and the existence of trillions of organisms that convey health and protection to the roots and plant itself. Practicing regenerative agriculture addresses all common concerns about fertility, pests, drought, weeds, and yield.*
>
> *To better appreciate regenerative agriculture, it is helpful to understand what conventional agriculture is, as the dominant farming practice in the world today. It involves photosynthesis too, but does not prioritize capturing soil carbon. Conventional agriculture treats the soil as a medium to which mineral fertilizers and chemicals are added. The soil is plowed, tilled, cultivated, or disked two or more times a year. Herbicides clear the weeds, insect infestation is treated with pesticides, and blight or rust is sprayed with fungicides. Lack of water is compensated for with irrigation, which can cause salinization of the soils. Plowing and tilling release carbon from the soil, and little or none of the carbon from the plants is sequestered"* (Hawken, ed. 2017, p 54). (Emphasis added)

An advisor I interviewed emphasized that *"[because it sequesters carbon], regenerative agriculture is one of the only known ways we can restore and heal our land in the rapidly changing climate that we've got. We don't have another solution to reverse desertification…"* (103 Environmental & Sustainability Advisor). The advisor described it as one of three major strategies to mitigate and potentially reverse climate change: renewable energy, carbon farming and regenerative agriculture. The summary of these points from that interview is reflected in Figure 3.

Figure 3: 'Climate change mitigation: Reversing how humans impact the Earth, known strategies', described by 103 Environmental & Sustainability Advisor and illustrated by Michelle Miller.

To temper this perspective, the advisor also flagged that 'Drawdown' emphasizes that ALL of the strategies named in the book are critical to reducing and reversing the emission of greenhouse gases into the atmosphere (Hawken, ed. 2017). *"Everyone gets emotional conformational bias – and the Drawdown book is a good example. Regen ag is listed as number 11. So, it's crucial but it's not the most crucial. If we don't apply all of these [strategies] then we'll fail"* (103 Environmental & Sustainability Advisor).

As another word of caution, a large percentage of farmers do not believe in climate change, and therefore are not likely to be swayed by the argument that Regenerative Agriculture has the potential to mitigate the human effects on climate change. Getting paid for carbon sequestration is a different discussion and is covered in Section 7 under 'Policy mechanisms, incentives and governance'.

<u>The role of Regenerative Agriculture in protecting ecosystem services</u>

Ecosystem services is the concept that our environment provides 'services' that our economy, as well as life itself, relies on. These services are the 'gifts' of nature we may take for granted and typically do not pay for, such as fresh water. They have an intrinsic value to our society, and there is an argument that the protection of ecosystem services should be incentivised, and that practices which compromise ecosystem services should be disincentivised. On one hand, there is a concern that anthropomorphizing the gifts of nature with the term 'services' will further perpetuate misuse, and on the other hand there is a concern that if we don't place a value on the existence of these services then they will be compromised beyond what management approaches can protect.

Wikipedia provides the following explanation:

> *"Ecosystem services are the many and varied benefits that humans freely gain from the natural environment and from properly-functioning ecosystems. Such ecosystems include, for example, agroecosystems, forest ecosystems, grassland ecosystems and aquatic ecosystems. These ecosystems, functioning properly, provide such things like agricultural produce, timber, and aquatic organisms such as fishes and crabs. Collectively, these benefits are becoming known as 'ecosystem services', and are often integral to the provisioning of clean drinking water, the decomposition of wastes, and the natural pollination of crops and other plants.*
>
> *While scientists and environmentalists have discussed ecosystem services implicitly for decades, the Millennium Ecosystem Assessment (MA) in the early 2000s popularized this concept.[1] There, ecosystem services are grouped into four broad categories: provisioning, such as the production of food and water; regulating, such as the control of climate and disease; supporting, such as nutrient cycles and oxygen production; and cultural, such as spiritual and recreational benefits. To help inform decision-makers, many ecosystem services are being assigned economic values."* https://en.wikipedia.org/wiki/Ecosystem_services

Whereas there are many factors that contribute to how well the landscape is able to retain its ecosystem functions, such as water and forest management, how agriculture is practiced is a key determinant in the retention of ecosystem services because of the sheer size of land mass occupied by agriculture. This is the role that Regenerative Agriculture plays: one outcome of regenerative practices is often the protection of functioning ecosystem services.

Promoting and incentivising ecosystem services is not precisely straightforward or accepted, as might be inferred from the Wikipedia explanation. One participant, experiencing dust storms, discusses: *"More ecosystem services, no dust. There aren't markets for those things, why not? They're not valued as important, why not? Is there a place for regen ag producers for creating cleaner air, etc.? So many people have died… Make the link clearer: Ground cover equals less wind erosion - which causes illness and sickness in people in Sydney. It's affecting me now. Houses, gardens. It impacts people economically, socially, as well as their health"* (120 Holistic Management consultant).

Please refer to the section on 'Incentivising ecosystem services' for further discussion

Concerns about conventional agriculture

Proponents of Regenerative Agriculture expressed their concern over key characteristics of the dominant paradigm of agriculture (e.g. conventional agriculture). My research has not explored the central philosophy of conventional agriculture, and so I can only describe it in the way that proponents of Regenerative Agriculture perceive it:

- **Reducing and simplifying the ecological system and number of species,** thus decreasing biodiversity. This is most visible in monoculture cropping but is common in grazing as well. Proponents of Regenerative Agriculture observe the effect of conventional approaches as reducing or simplifying landscapes as well as biodiversity, and they attribute this to a production focus (e.g. focus on production to the exclusion of other goals, like profitability and long-term viability). This approach or mindset is described as reductionist. Some proponents of a holistic approach would say that it can be appropriate to take a reductionist approach in their practice at times – as long as it fits within the broader, holistic picture.
- **Controlling unwanted plants or insects with chemicals** - As plants and insects adapt to chemicals over time, farmers have to continually increase inputs (at an increasing cost) to control nature. Meanwhile, the pressure of high productivity together with chemical application depletes the capability of plants and land to regenerate, compromising long-term or ongoing viability of farming on that property. At the same time, the use of chemicals is unsustainable in the long term because reserves of inputs like phosphorus are steadily being depleted while other natural sources of phosphorus (such as human and food waste) are being disposed rather than reused. These chemicals are also linked to adverse health effects for humans, animals and plants (Levin and Greenfield, 2018).
- **Reducing the regenerative capacity of land**. As an example, a common approach to grazing involves set stocking, in which animals graze in large pastures for long periods of

time. The concern is that the animals eat (favoured) plants until those plants are damaged past the point of regeneration and, without frequent rotation, the land is not given time to recover. As a result, proponents fear that the capacity of these lands to regenerate is severely diminished or compromised. There is concern as well that this may trap the farmer in the paradigm of feeding animals (as opposed to being able to eat feed grown on the property). The biological health, nutrients and resilience present in the soil, plants, animals and landscape is eroded over time, and the land is not able to regenerate itself in the same ways as before.

- **Inadvertently reducing the capacity of soil and land to retain water**. It is common practice to clear large sections for fields and pastures. It is also common to till, which disturbs soil structure, and then to leave rows of stubble after harvest – but with limited (living) root mass. Each of these practices disturbs and degrades the structure in the soil. When soil loses its ability to absorb water properly, rain rolls across the surface of the landscape without being absorbed as thoroughly as it could be. In heavy rains the water also takes the top soil with it, as opposed to the water being absorbed into the top soil – thus having the exact opposite effect that soils and crops need in order to be nurtured. Over time, water shears across the land, and when it dries hard pan is formed. The dominant approach is for hard pan to be ploughed in order for the soil to be used again, and every instance of ploughing damages soil structure. In some places, erosion channels and gullies form, which means that water drains into these gullies quickly and rushes out of the property, which is one cause of flash flooding. Precious top soil, nutrients, and minerals are further stripped from the land, in addition to creating a safety hazard for people and animals. On my trip I observed farms that had erosion gullies as big as 2 metres deep and 6 metres wide that were a by-product of conventional farming practices. As a result, the water that is available is not captured and stored in the land - and the effects of drought are worsened.
- **Diminishing the quality of the soil.** The most precious resource other than water, the soil, is depleted through these approaches. In conventional agriculture, it is felt that soil is treated as a medium to be 'added to' rather than an asset to be protected, nourished and grown. Meanwhile, the methods used in conventional agriculture speed up the processes of soil erosion and salinification (emergence of salt in topsoil, rendering it unproductive). This compounds the scarcity of water.
- These characteristics, and more, are seen to result in **compromised landscape and ecosystem functions**.
- **Focusing on short-term productivity above all else**, at the expense of allowing the land to regenerate. There is the concern that a production mindset drives choices that impact the viability of farming long-term. The financial structure of the model is not self-perpetuating. The ever-increasing costs of chemicals combined with the high cost of capital-intensive equipment and the financial expectation of increasing productivity and revenues, means that farms grow bigger and bigger with fewer and fewer employees, eroding communities and meaning that spouses and children cannot make a living on the

land – their income is required to supplement the income of the farm in order to be viable. One farmer highlights the inherent contrast between the economic model and the NSW climate, describing it as “running fixed enterprises in the most variable climate on earth” (122 Regenerative Farmer).

- **Increasing stress for farmers**. It is perceived that conventional farming is labour-intensive and stressful for the few people working, putting great pressure on farmer’s mental health. This is exacerbated in difficult times like drought. With few family members and people working on the land and communities shrinking, farmers are further isolated and deprived of support, meanwhile carrying enormous pressure. The rates of farmer suicide and mental health issues is perceived to be alarming by communities. By contrast, it is common for regenerative farmers to report comparatively lower effort required and a better quality of life and mental health (Ogilvy, et al 2018).

(Summaries from scoping interviews and Massy, p. 364-367).

4. Summary of Mindset Shifts

This section discusses the mindset shifts that are a part of transition to Regenerative Agriculture.

Proponents described how transitioning to Regenerative Agriculture is as much, if not more so, a shift in mindset as it is a shift in practice. This is perhaps the biggest barrier and the biggest opportunity of all.

The following mindset shifts were described by proponents:

- **Managing holistically.** One fundamental mindset or philosophical difference between regenerative agriculture and conventional agriculture is holistic thinking. Managing holistically in order to work with the complex adaptive systems of nature is both a goal to strive for and an approach that is critical to making Regenerative Agriculture work.
- **Viewing soil as a primary asset to invest in and protect.** Valuing soil structure, soil biology and the retention of water in the soil. Healthy soil is a major factor in plant and animal health. The health of the soil and ground cover is seen as the basis of a farm's viability: *"In a drought if there's no green leaf there's no farm. You have no production, no factory*" (125 Regenerative Farmer). Another proponent took it further, describing how investing in soil is seen as 'banking money', *"There is a guy putting a large amount of money in to get regenerative ag happening with [big name in Australian politics] and some other big guys. A lot of these guys are wanting to park their profits. In the past it would be seen as frittering money away. You are either building assets or... [But they're saying], 'we are going to bank our money into the soil – so our other businesses can then pull that money out of the soil later'"* (124 Regenerative Farmer).
- **Improving soil structure, quality and water retention** through biology rather than chemicals. Utilising animal and plant materials and waste to do this job. *"What we do with [microbiologist, soil biology researcher] is build a compost specific to that paddock. Full chemical analysis and full biological analysis in a paddock. [We did] soil tests and changed our calcium and magnesium ratios by putting out compost teas (specifically designed). It changed our pH and killed all our weeds (as a side effect). For calcium/magnesium we add lime and develop the organisms that process that lime. There is no scientific evidence that incorporating lime changes your pH. It is the biggest con that the agronomist sells. What's the chemical formula for lime – calcium carbonate – but when it gets wet it gasses off as co2…What's left is a salt. In these soils!? It's an absolute joke. Absolute nonsense. The reason they put it on – gypsum is better – [is because they are] trying to get some structure that holds air and allows bugs back in – soil biology. It has nothing to do with the chemical properties. There is a Chinese Proverb that says 'Soil is the mother of all things'. And Ana Primavesi in Stubble over the Soil says, 'The people who neglect their land destroy themselves'"* (125 Regenerative Farmer).
- **Stimulating biology and biological systems** rather than breaking things down into constituent parts or chemicals – working with complexity and seeing nature as complex systems; trying to build ever more complexity into the ecosystem

- **Measuring quality and not just quantity (e.g. productivity**), through measures like nutrient density in soil, plants/produce and animals
- **Promoting landscape and ecosystem functions** (such as water and solar cycles). Acknowledging that landscape and ecosystem functions must be present for agriculture as well as human communities to work well, and be sustainable. Expecting that a property will contribute to, not reduce, landscape and ecosystem functions.
- **Increasing native species and biodiversity.** Layering complexity rather than continually driving simplification. Amplifying but not exceeding nature's capacities
- **Treating rain as an opportunity**, rather than an expectation
- **Accomplishing conservation AND production** - Seeing conservation as the result of a regenerative approach, which simultaneously achieves production
- **Seeing "weeds" as a sign of needs in the landscape** – looking for what needs to be grown or nurtured
- **Decreasing and stabilising inputs and efforts**, rather than continually increasing inputs and efforts. Ideally eliminating synthetic/chemical inputs altogether.
- **Focusing on profit (a return on investment**) as the primary measure rather than productivity (volume regardless of profit; quantity that could send the soil health or landscape functions backward)
- **Connecting to the spiritual** – Holistic thinking links to beliefs and values, and this connects to spirituality. Some people (including some proponents) are put off by the more esoteric concepts of holism. Despite some aversion, the spiritual dimension remains part of the conversation: *"Through the social ecology course, I learned about complexity and how we need to work with and manage for it. Knowledge of whole systems is important in that. But holism sticks around because it provides something fundamental that people need. In this world, there is a need for connection to the spiritual. In working holistically, we can find that connection back to everything around us, and that connection to the spiritual dimension that is missing. Connection to the spiritual is a basic human need – that's why holism doesn't go away"* (135 Ecological manager and NSF practitioner).
- **Respect for the traditional owners and custodians of the land** – for some practitioners, taking a regenerative approach has led them to get to know more of the history of their land, meet their Aboriginal neighbours and local community, and see and appreciate the traditional owners and custodians of the land in ways they had not previously.
- **The farmer's pride and joy** – all of this adds up to a completely different mindset as to what success is – it redefines what a farmer takes pride in. This represents a complete paradigm shift, discussed further in the section below 'A paradigm shift in mindset: A whole new pride and joy'.

The following story of transition provides a glimpse into the mindset of farmers practicing Regenerative Agriculture:

"According to Mary E. White, it was twice as dry and four times as windy 18,000 years ago -- and [Aboriginal] people lived through that. The plants know how to deal with conditions much more extreme than they are currently. Because of evolution – they've adapted. Whether the climate [further out west becomes our climate] – the plants know how to change. I've come to the view: we need to lessen our interventions and allow for natural processes to take place. The natural world is always trying to move to a more complex state – if not it's because of our interventions. We are intervening with grazing and we're giving long periods of rest to allow natural processes to express themselves.

We don't have any machinery anymore – we sold all our equipment. We didn't have a lot – we weren't big in cropping. We had a tractor and the gear we needed. Never owned chemical spraying or harvesters – that was all contracted. The tractors & cultivation gear – sold. Used [the money] to put into [our] water scheme and fencing and reduce debt. Diverting the former chemical and inorganic fertilizer budgets for two years paid for the water and fencing infrastructure. We don't use any of that anymore.

As soon as we started practicing holistically we went into a 9-year drought then in 2006 we had a bushfire that burned 1/3 of the property…Challenging times. 2006 was the driest of the nine dry years. We destocked by 30% immediately and for the rest of 2006 we were shearing and selling until we were totally destocked in November 2006. This combined with several small falls of rain meant we were confident to purchase a large mob of ewes for $5 a head in a collapsed market, which began the process of rebuilding our livestock capital.

We spent absolutely nothing on feeding. We used to reduce by 30% and then feed. I calculated [if we had done that] we would've spent half a million dollars but instead we weren't going backward, we didn't have that expense. So effectively our livestock capital was in our bank account" (122 Regenerative Farmer).

A paradigm shift in mindset: A whole new pride and joy

As I listened to the perspectives of the proponents, I observed that there was another significant mindset shift that was not precisely articulated: Regenerative Agriculture involves redefining the farmer's pride and joy. For me, this is symbolized by the thistle.

As shared in one of the previous stories, for farmers practicing conventional agriculture the thistle is a weed to be eradicated as quickly as possible. Success is eradicating weeds. A thistle is a an embarrassment, a failure. Success is clean and tidy paddocks and fields. By comparison, for farmers practicing regenerative agriculture, weeds are information – a signal of the health of the soil and what it may need – not a sign of failure. The thistle is a sign post that reads, 'under renovation', marking out the land for protection, keeping it from being used so that it can heal. The attitude toward thistles out in the paddock and the relationship with weeds is symbolic of the different mindsets. The discussion around weeds is more complicated than this, but the thistle remains an icon of very different mindsets.

Photo: Thistle in a paddock. South East region, NSW (123 Researcher – Alternative Methods). January 2019.

Regenerative Agriculture requires a new mental model for success, and that can take some time to 1) understand and 2) translate into practice. One interviewee throws his hands up, *"The inconvenience is the thought process. You've got to overcome not just your own thoughts but also the social. I've given up on all that. I don't try anymore. I go down to the pub. I know a builder with a golf course. I've only just now got him to think that you've got to give paddocks a rest"* (127 Regenerative Farmer).

One regenerative farmer I interviewed shared a revealing story of a conversation over the fence with the neighbour. The neighbour, discussing the drought, remarked to the regenerative farmer, *"you're lucky you haven't had the drought we've had."* The interviewee remembers being astonished, trying to understand how his neighbour could possibly think that the weather conditions were so different over the fence. But he went away and thought about it. After more than 15 years of work, the remediation work on the land has formed beautiful wetlands flowing with clear water that provides a home to aquatic and bird life, usually year-round. He has improved soil structure and moisture retention (minimising evaporation) through plant cover, root density and biological inputs. Leaf material ensures that moisture is harvested from the air in the form of dew every morning. As a result, this regenerative farmer has significantly more water available to the landscape, soil, plants and animals on his property at any given time than the neighbour. Upon reflecting, the regenerative farmer concluded that the neighbour was right: He

doesn't have the same drought even if he does have the same amount of rain (124 Regenerative Farmer).

The implication of this, however, is profound and profoundly painful: drought is made worse by our mindset and model for working with the land. Noting other factors, like access to water sources, many proponents shared this same conclusion that the variability in resilience to drought between properties is a direct result of land (mis)management. As painful as it is, this is also an opportunity. If this conclusion is correct then we can improve Australia's drought resilience by changing our mindset.

Proponents acknowledged that changing mental models is no small feat. Proponents admitted that they themselves had been "slow learners", taking one, two decades to finally hear and put into practice what people had been telling them, with many emphasizing the role of crisis in their transition. The implication is that this research must design for the significance of this mindset shift and how long it can take to transition mindsets. However, there was an optimistic sense that, *"For people that give it a good crack, not a lot of people go back"* (117 Regenerative Farmer, in transition).

5. Barriers to Transition

Participants discussed numerous barriers they face in the transition to Regenerative Agriculture, which are outlined in this section. These findings are represented through a mix of direct quotes and anecdotes from proponents of Regenerative Agriculture as well as participants who are skeptical of Regenerative Agriculture (noted small sample size).

"We have to feed the world"

Those who were skeptical of Regenerative Agriculture (or more sustainable forms of agriculture if they weren't aware of the term) discussed their concern that Australia has to 'feed the world' (in particular, China), as a reason for not switching to other forms of agriculture. They see chemically-based, productivity-oriented conventional agriculture as the only way to meet this challenge in a competitive market. As a counterpoint, recent and ongoing research has begun to overturn the notion that chemicals are required in agriculture:

> *"There has long been a conventional wisdom that the world cannot be fed without chemicals and synthetic fertilizers. However, the U.S. Department of Agriculture is now running trials on farming methodologies that eschew tillage and chemicals. Evidence points to a new wisdom: The world cannot be fed unless the soil is fed. Feeding the soil reduces carbon in the atmosphere. Soil erosion and water depletion cost $37 billion in the United States annually and $400 billion globally. Ninety-six percent of that comes from food production. India and China are losing soil thirty to forty times faster [than] the U.S.*
>
> *Regenerative agriculture is not the absence of chemicals. It is the presence of observable science – a practice that aligns agriculture with natural principles. It restores, revitalizes, and reinstates healthy agricultural ecosystems. Indeed, regenerative agriculture is one of the greatest opportunities to simultaneously address human, soil, and climate health, along with the financial well-being of farmers. It is about biological alignment -- how to live and grow better food in ways that are more productive, safer, and more resilient"* (Hawken, ed. 2017, p 55) (Emphasis added).

For over a decade now, contrary to the conventional stance, UN agencies (FAO, UNCTAD, UNEP, IAASTD) have been advocating agroecological approaches as the way we can 'feed the world' without genetic modification and while meeting UN Sustainable Development Goals (Johns 2018).

"Where's your data? Glyphosate is good science"

Those who were skeptical of Regenerative Agriculture often shared a belief that 'glyphosate is good science', and expressed their perception that there was not enough independent evidence behind regenerative agriculture. The counterargument that proponents voiced is a concern that the science used by conventional agriculture is *"chemical science or plant physiology… Modern ag is…a multidisciplinary field – plant science, animal science, physics, soil science – a multidisciplinary field. The one field [of science] that industrial ag doesn't do well is ecology. It's the integrative field of*

science. That brings these all together. [And] that's the problem with industrial ag [and the science behind it]: most the time it doesn't include ecology within its approach" (129 Agroecologist and Extension Consultant). Proponents have expressed concerns that science and agricultural research as fields have become too linear and mechanistic, promoting reductionist thinking that tends to oversimplify complex adaptive systems and overlook the ecological. The works of Jon Lundgren in the US and Gwen Grelet in NZ are examples of some of the efforts to better reflect the ecological, regenerative and systemic in science and agricultural research.

Research methods unsuited to regenerative methods

Proponents expressed frustration with the lack of sufficient findings as to the validity of practices such as rotational grazing. As an agroecologist explained, *"The people doing the research are all trained in standard ag research"*, which tends to look for chemical science, plant physiology, etc. but not necessarily the ecology – which is where the impact of agriculture on the landscape and functioning of ecosystems becomes clear. Methods for testing ecology are available and *"there are plenty of ecologists who use this approach – just a not a lot of ag researchers had the ability to do these kinds of research"* (129 Agroecologist and Extension Consultant).

"It won't work for me"

Proponents reported being challenged by the assertion that regenerative practices were 'fine for them' but that they wouldn't work for others. One interviewee who is currently experimenting with transition illustrated this reservation, explained in the call out box below.

Vested corporate interest in continuing the conventional agriculture model

Proponents felt that the conventional model hinges on selling something and making money off farmers rather than what may be best for the land. *"I equate agronomists to doctors. Have you ever left a doctor's office without a script?"* (124 Regenerative Farmer). *"The big end of town is strongly connected to high input, high tech infrastructure, and at that large multi-national business level… But their business model is struggling because farmland use is high and potential for growth and expansion is limited…The big multi-national players have a very VERY strong interest in maintaining and expanding conventional agriculture."* (126 Organic Farmer and Academic)

The farmer's pride

Proponents talked about how changing practices is perceived to be admitting that you have been doing something wrong: *"The top barrier in my opinion is lacking the open mind to see your current management differently. It requires an acceptance that what we have been doing is harmful to nature, family and profit. That's a hard thing to admit to yourself"* (148 Regenerative Farmer). Regenerative practices unwind the legacy of many families, *"It's a social driver rather than an economic, logistical or practical driver of behaviours, attitudes and habits. We've got a fair bit of tame the land, pioneering spirit still left in the Australian psyche – particularly at the direct management level of natural resources. So, if you come in with an alternative view, such as 'how will we make it more diverse?' People understandably might feel that we are undoing what they and their forebears have done"* (114 Regenerative Farmer).

The complexity of transition: 'Not sure this approach is going to work for me'

One farmer that has adopted some Regenerative Agriculture methods and is experimenting with others provided an example of how challenging it can be to navigate the choices and advice in a transition: *"We have a weed here that are a monoculture and no grasses grow – we have reverted to a disc plough to get rid of them. We're hoping perennial pasture – it would incorporate native – would allow it to regenerate. But sub-tropical bambatsi – it's very dear to buy. We've got a mix of Lucerne, clover, others so far. Why? They're coming into the framework of consideration because they are perennial. And they tend to be from other places, southern Europe and… they're getting a pretty wide level of acceptance. Bambatsi handles flood inundation and [we had] devastated pastures. You would've thought a flood would kick things into gear but it didn't. [So we're not convinced].*

We've come here – no farming as such for some period of time – 5 years or more. The regeneration of native grasses just hasn't happened and it should have. We have monocultures of vegetation – the argument is that they are colonizing. In a lot of these areas it was hard to muster stock and move stock. Height and density. Hard getting motorbikes in. We've undertaken to improve by trying to get rid of some of these bushes. In the other property there is a different soil type – we get a woody weed that can get massive, 6-8 foot high. I'm just not seeing the results that these people are describing in some respects. We have seen some natives re-emerge at the other property but I've got mixed thoughts. I know the stuff that we've got here doesn't seem to do it for the stock. In this drought we had maybe 90% coverage with vegetation but the cattle were going backward on it and we were feeding. We fed for 6 months before we sold. It was either buy more feed or get rid of them. Because of the breeding group we got a pretty fair deal. Happy to embrace those ideas but want to see them work. On those bus trips – and plain as plain could be on one side productive and neighbor's side terrible. But we haven't had same response and we've given it a fair go. The alternative is high input and I'm not fond of that either. Every time I take the tractor out it's thousands of dollars. I'm seeing a lot of this country being non-productive. Bush – the cattle don't eat it. Thousands of acres that aren't producing and we have to do something. We had oats and it gave stock something to eat. At both places – the farming practices have allowed us to control woody regrowth. But you can see it coming through again. And I'm not confident to allow what the regen farmers say - to allow the species to colonise and then the good stuff will come through. We had areas of pine with nothing growing underneath. We can't afford to wait too long for that stuff to happen. If that means a bit of tillage and sowing stuff down then that's what we'll do."

Unlike a number of farmers, this farmer is fairly convinced by the ideas of regenerative agriculture, but perceives that a pure regenerative approach would be natives plants only and holds an objection to this: *"I've been sufficiently impressed by…did Holistic Management course at one stage. And we have adopted some of that – the rotational grazing, the cells and laneways. On a personal, social level – we do what they advocate – sitting down and talking about plans. That's been picked up. The idea we balk at is the idea that native grasses will get the job done. I think it was looking at and describing conventional agriculture against holistic/natural agriculture. And I'm entirely empathetic. I would like to go down that path. Low input.*

…With native grasses it would be nice if they could grow enough stock – cattle. Cattle love the native grasses and tend to eat them before anything else. But natives will be grazed out first. The rotation will help to stop things happening. But I'm thinking we have to introduce species to be sustainable. And then we cut down on farming. I think native rye is a good option for us. I know someone who is doing that over his whole place and I don't agree with that either but it seems to be working for growing to feed his stock" (118 Farmer in transition).

Peer pressure and the social unacceptability of Regenerative Agriculture

It is common to hear farmers practicing Regenerative Agriculture tell stories of ridicule, bullying and ostracism (Massy 2017). As one interviewee shared, *"We've had previous board members who wouldn't turn up to a conference we were running because [a well-known practitioner] was speaking. He is challenging the status quo, but I wouldn't have thought he was offensive! Then there's the whole running with the pack to make sure… because there's a big penalty for not conforming"* (110 Extension officer).

One consultant talked about this dynamic at length:

> *"There is real social unacceptability of the regenerative approach or natural farming. It almost pits neighbours against neighbours. To me, if you are able to explore the social blockages, why it hasn't been taken up, that would be helpful. It's also rattled the cages of state government extension servicers, local Landcare, DPI and technical sales people - of which there are a lot.*
>
> *Incredibly strong well-resourced departments are undermining it. It's a threat. No wonder it's almost become an underground movement. I think to explore why is there so much negativity – when a farmer does something different on his farm – would be helpful. When a farmer doesn't take traditional best practice advice and still achieves as good or better outcome, why does that agent see it as criticism? There is a lot stuff bound up in it. For the sales guy – it's their livelihood. You can see it at the moment – people have ground cover and others have bare ground. And it probably drifts into where there are change agents…We can no longer look to government for the lead. We're looking for those positive deviants. Where are they in agriculture? We don't have many of them because it's such a tough social environment. I can't recall a time when there's been so few private farm consultants in NSW. We could be some of the few left. These are some of the questions that are important to look at"* (120 Holistic Management consultant).

Despite the reputation of farmers for being independent, there seems to be a significant amount of peer pressure to do what everyone else does, "*Being a good farmer is tidiness...going with the pack. Not stepping outside the main group identity in your district"* (129 Agroecologist and Extension Consultant). The social pressure is isolating and farmers have reported having to develop a very tough skin in the face of criticism from judgmental neighbours and community members.

Neighbours may be resistant

Proponents told stories of how neighbors wouldn't take up what a regenerative farmer was doing. *"Of the people who have been to the Holistic Management course, there are people who are innovators and it's their nature to be looking for something edgy and new. And there are people at the other end and they're desperate, going backward – it's breaking their heart and sending them bankrupt. And so, they're trying anything. So, the big research question – if you want a really deep research question…I can take you places where it's obvious [that regenerative practices are]*

working and you can go to the other side of the fence and it's a moonscape. [The regenerative ag farmers] will tell you they're financially way better off, carrying 2-3 times the stock, making money, stress free, happy, confident. I'm thinking of one guy in particular who is very successful. He is well-known and well liked, but he has fallen out with some of his neighbours…The neighbour had spent an awful lot on feeding his stock. At the end of the time [the stock] were worth the same amount of money as when the guy started but he will NOT admit that it was a mistake. 'It's alright', the neighbor says [to the regenerative ag farmer], 'you got rain'. People have accused this [regenerative] farmer of trucking fertilizer in overnight. If it's obvious – one [property is] good and one's not – why doesn't the farmer with the moonscape drop over with a carton of beer? Why doesn't that happen?" (109 Extension officer).

Some participants noted that this dynamic is not necessarily the case in sectors where collaboration is more common, such as sugar cane and cotton, but it *seems* to be a theme in sectors where there is direct competition between neighbours, e.g. in grazing.

<u>"It's hard to go green when you're in the red"</u>

Proponents suggest that the cost of transitioning to regenerative agriculture is not insurmountable, but it is a risk. The fear and the pressure are a real barrier, as one researcher shared: *"[The farmers say to me], 'This is how my family has been doing it – pesticides, herbicide and good seeds'. But it's classic marketing and indoctrination based on reductionist thinking rather than holistic. What stops some people is 'how do I get from a to b' [with regenerative ag]? They say to me 'It's hard to go green when I'm in the red. I feel trapped'…Farmers are very proud. They don't want handouts. Charity. Sympathy. None of them want to see their crop fail or shoot their animals due to starvation. That's what can lead to depression, family breakdown and potentially suicide. [We have] got to prevent farm families from going into a downhill mental spiral that they get to that point. If the government spent money on education and training to transition rather than bail out…"* (123 Researcher).

<u>The financial attraction of conventional farming</u>

Farmers are typically opportunistic. Rain and other circumstances aren't always a given, but if farmers are ready they can take advantage of a major financial upside, *"Our only prospect [for cropping] is irrigation. Unless someone sprays you out, as long as you have the percentages, and if you have a good crop then the chances are pretty high. That's the attraction. It's a good way of earning some money"* (118 Farmer in transition). Furthermore, we have cultural behaviours and norms that incentivize a focus on revenue: it's *"heroic to be profit makers"* (102 Regenerative Farmer and Author).

<u>A full regenerative solution for broadacre is not there yet</u>

Many farmers are experimenting with regenerative approaches for cropping in Australia, but from what can be understood from this research, the methods aren't there for every type of land (Massy 2017).

<u>It's not clear how to adopt Regenerative Agriculture</u>

As discussed in the call out box above in this section, transitioning to regenerative agriculture is not straightforward and it takes some experimenting, which creates a barrier to adoption for some.

I have come across stories from participants as well as in literature of farmers having immersed themselves in the information that is available but still not being sure where to begin, as shared by this participant: *"I am very interested in regen ag and have spent time attending conferences and talks and reading a lot about different methods and different examples across different farming enterprises. Your research strikes a chord with me because I am yet to have anyone tell me where to begin, what the financial impact will be and how long it will take to see change and balance the ledger both environmentally and financially. There is a lot of research and practice in the more arid areas of Australia, but it's not something that is easily translated to a cooler, higher rainfall area [like where we live]"* (137 Ethical and Sustainable Farmer). It is also unclear if work has been undertaken to revegetate, repair riparian areas and improve biodiversity – as this farmer and their family have been doing – at what point they begin to identify as practicing Regenerative Agriculture or as using regenerative approaches.

One Senior Land Services Officer described how some are willing to experiment, whereas others are looking for a more prescriptive approach: *"A lot of those practices do take trial and error to get things right on their patch. There is a proportion that do want a recipe that they follow. They just want to implement it. They want to go to the local sales rep at Elders or Landmark and buy it off the shelf. Whereas there are the others that want to do trial and error and adjust it. There's not a flat-out simple way of operating. Even with conservation farming, using tines and discs – it's quite variable. It takes a staged approach – you can't just go from plowing to tilling – you might have to go through deep rip… Trial and error, how long to do tines. It's not easy, so that's definitely a big barrier"* (110 Extension officer).

Advisors are also seeing partial transitions, which risk not getting the outcomes of regenerative agriculture, *"What's tending to happen in this area people are moving away from complete set stocking to a few more paddocks and rotating. But if you were a purist you wouldn't call that rotational. It's sort of the same because it's about pasture subdivision but it doesn't include the planning and high densities"* (109 Extension officer).

Reasons farmers do not adopt innovation in general and in NSW are also well-researched (Guerin 2000; Baumber 2012; Cross & Ampt 2017). What is less well understood is how to promote change, including accelerating the uptake of specific methods such as regenerative farming. There are some examples in Australia of taking a psychology-based approach to change, e.g. in the case of sugar cane farming in Queensland, which serve as inspiration and a starting point (Pickering and McIntosh, 2018) (refer to the case study at the end of section 7). There is also evidence to suggest that communities of practice can increase the uptake, and there are precedents for example in the of use of native grasses (Cross & Ampt 2017) and in peer groups e.g. for Holistic Management.

Figure 4: Map of the System in Focus – the Agricultural Production System, by Michelle Miller.

6. Opportunity Areas

This section presents the opportunities that emerged during the scoping research.

I asked two primary questions to test the validity of my research. One, I wanted to know if it was worthwhile pursuing a project to increase the uptake of regenerative agriculture. From the proponents of regenerative agriculture, I heard a resounding 'yes'. The next question, using the systems map in Figure 4, I asked participants to help identify the biggest barriers to the uptake of regenerative agriculture, and what workshop and/or initiative topics might be useful.

Discussion of opportunities to increase transition to Regenerative Agriculture

This research is dedicated to understanding how proponents might increase the uptake of regenerative agriculture and, where possible, to support proponents to progress any ideas and/or initiatives they might have. To that end, in the scoping research I sought proponents' perspectives on the opportunities to address barriers or increase uptake. This section provides an overview of the opportunities that were identified by proponents, under the following themes:

- Connection to land
- Learning from Aboriginal ways of knowing
- Developing a shared framing of Regenerative Agriculture
- The farmer's knowledge base
    - *Learning to read the landscape* – ecological literacy
    - *Grazing within capacity*
    - *Setting holistic goals, monitoring and (re)planning*
- Assembling your own toolkit
- How the farmer adopts new practices and mindsets
    - *Support to develop a transition strategy*
    - *On the ground mentoring, support groups and consultants*
    - *Education and extension*
    - *Purpose-built training centres or hubs*
- Policy mechanisms, incentives and governance
    - *Subsidising education*
    - *Incentivising ecosystem services*
    - *Policy, incentives & funding (in general)*
    - *Carbon farming & carbon credits for regenerative agriculture*
    - *Drought policy*
    - *Increasing the use of technology to generate data that will support policy*
- Demand-side mechanisms
    - *Bionutrient pricing/labelling and provenance*
    - *The waste cycle*
- Roles of different people or groups to initiate transition
    - *Collaboration*
    - *Lobbying*
    - *The role of women*
    - *Advocating change*
- Taking a 'strategic extension' approach to change through capacity building that is informed by psychology (e.g. Bates model)
- Taking a positive and non-judgmental approach

Connection to land

Re-connecting to land was seen by participants as important for the mental health for both farmers and society at large. One participant drew an example from the construction of hospitals, *"It's the simplest thing and it's been tested a heap of times. Human [health] recovery rates are influenced positively by access to natural surroundings rather than fully man-made surroundings. Give people a view of a brick wall or trees – the opportunity to view or even immerse in vegetation versus something man-made and it leads to recovery rates that are markedly different. It is an example of how deeply we are wired as humans to connect to the natural world that we have co-evolved with"* (114 Regenerative Farmer). Participants discussed a range of concerns where they felt connection to land could help:

- There is concern that many farmers are suffering in their mental wellbeing, in particular due to the drought. *"Landscapes are getting worse and mental health is getting worse. That is the lived reality of rural areas as they continue to be simplified by the conventional agricultural approaches. Diversity can be impacted broadly or narrowly and in my backyard there is a small example. There are 50 or so magpies under [my] sprinkler right now. It's a temporary refuge in the extreme heat wave we've been having. There's a bit of joy for the humans that witness a small amount of creativity that is driving more diversity than could occur if we were not taking an active role in the landscape*" (114 Regenerative Farmer).
- Looking back on their days using conventional agriculture, many proponents described the mindset as *'what will I go out and kill today?'* vs *'what can I grow today?'*. They identified (re)connection to land as a way to shift the mindset, and as a relief.
- There was a sense among many participants that broader society has lost a connection to land, and therefore are not as mindful as they might be about what is happening to land. *"There is a very spiritual connection in all of that, getting back in nature, spending time in nature. Human psychology says 'if you care about something and you're connected to it, then you will care for it'. Urbanisation has killed us"* (103 Environmental & Sustainability Advisor).

Learning from Aboriginal ways of knowing

A handful of proponents mentioned that their perspective on land and sense of connection to land changed as their relationships with local Aboriginal people grew. They described how their perspective had changed when they took up regenerative approaches, but that getting to understand how their Aboriginal friends saw the land gave them a different perspective again. They could see the history on their lands, history that had been under their nose the whole time. They also developed a different sense of the land, and felt more deeply connected to it in ways they hadn't necessarily been before (102 author and regenerative farmer). This connection is deeply spiritual, *"there is a powerful circle of life philosophy in Indigenous culture"* (103 Environmental & Sustainability Advisor). Participants also spoke of learning from Aboriginal ways of knowing particular to farming. For instance, how farming is managed at an aggregate: *"Their*

firestick farming is much more organized than our whitefella farming" (127 Regenerative Farmer). Working with local Aboriginal groups, such as Land Councils, is also seen as a commercial opportunity by *"leveraging what they're doing with their story to create a story into a market. A culture story together with a food story. A lot of leveraging we can do with that"* (121 Independent Agricultural consultant).

Developing a shared framing of Regenerative Agriculture

As discussed in the section on 'definitions', what is meant by the term 'Regenerative Agriculture' can be unclear. However, there is a risk that, without clarity, Regenerative Agriculture may become associated with a limiting handful of practices rather than a form of agriculture that offers a viable alternative to conventional agriculture. Rather than looking toward a singular definition, it may be more useful to collaboratively develop a shared framing, set of messages and vision for Regenerative Agriculture among stakeholders.

The farmer's knowledge base

There were a number of skills and capabilities identified that are fundamental to regenerative approaches but are not typically taught for conventional approaches.

Learning to read the landscape – ecological literacy

"One of the concepts I have at the back of my mind is "land literacy". What you'll find is that farmers are good observers…They're…interested in natural systems – without the degree to give them a framework. The first thing we do in the condition assessment [is to provide a framework]" (109 Extension officer). With being able to read the landscape through knowledge of the five landscape functions, one proponent likens it to *"being able to diagnose an illness". "If you…have the literacy to read landscapes and [then you] start changing it - it completely changes perceptions once you understand those functions and why things happen* (102 Regenerative Farmer and Author).

A core skill set in reading the landscape in Australia in particular is understanding water: how water flows through and over landscapes, how water is held in the landscape, where remediation of riparian areas and water retention capacity is required, etc. Not only is it critical to retain as much water in the landscape as possible in the variable NSW climate, but it is also critical in order to avoid salination.

> *"We're losing resources (soil, nutrients, water) from the landscape through erosion, hence the need to slow surface water, and increase soil infiltration and storage. Australia's landscape stored water in the sub-surface, protected from evaporation, [and] this helped maintain and feed the open water expanses…The soil water-holding capacity has been greatly reduced in the broader landscape. The loss of soil organic carbon has exacerbated the soil's capacity to retain water for sustained plant growth. Infiltration has been greatly reduced due to compression of soils and reduced plants and litter to protect and build soil*

and microbial activity. As the soil profile dries, the capacity of the soil to bind salts is reduced, [as is] the soil's fresh-water lens that would normally push salt downwards to allow plants to thrive. Farm dams have to be better vegetated to stop evaporation from wind and sun. A small unprotected farm dam can potentially lose 70 percent [of its] water in summer. Water, plants and soil need to be managed in an holistic manner using nature's intended processes to rehydrate and regenerate landscape processes to build resilience." (123 Researcher, Alternative Methods).

Historical practices reveal the thinking behind 'putting in drains', but the risk is desertification.

> *"In [my area], they had been digging for gold and then in the 1880s they grew wheat. Boggy meadows had the best soil. [But that's] hard to plough for wheat so they put a drain in them. I've got a photo of the property that shows the erosion gully. Straight lines – nature doesn't create straight lines. It was 4 meters deep...A 4-metre drain is leaching all your fertility – at the water table. [The result is] boggy meadows leaching their fertility plus salt in all our meadows. This is a huge, huge risk to our farming operations in Australia. The whole Murray Darling is at risk of becoming salinated. We think: pump the salt out. South Australia put in big drains. No. Put the system where it should be. Fresh water goes across and salt stays down. [There are] a lot of biological reasons why the salt comes out. As the landscape dies all the salts that it would normally keep release – it's a compounding problem. Regenerative agriculture is a compounding build. To get nutrient density you have to understand all these processes. We buy a chemical…what's the solution? Another chemical. We've degraded the whole system and you get red dust on your windscreen. The chemical companies are not happy and a lot of people in my industry get ridiculed. It's bizarre that the industry hasn't cottoned onto this. But… humans seem to simplify stuff down. So, we end up with the lowest common denominator – desert"* (124 Regenerative Farmer).

Grazing within capacity – matching the livestock to the resource (e.g. grass)

Many of the proponents used what they saw as core skill sets for graziers to be able to make judgements about how to manage their land so that it retains the capacity to regenerate, as described by one farmer:

- Calculating grazing days and recovery rates – managing stocking rates based on variable growth rates in the variable climate (and rainfall) plus conservative estimates for the dormant season
- Managing within capacity – with ground cover
- Using grazing charts
- Understanding growth rates and timing rotation to optimize within the growth cycle
- Constantly assessing in dry times
- Using native grasses – for their resilience in the Australian climate.

Native grasses are valued for their adaptability to the climate, but the conditions have to be right for them to grow again:

"We've sown some native grasses. The season is getting dry and yet the natives will still make seeds – they have a conservative way of using moisture so that they'll have enough moisture to make seed even in a dry year. In a dry year they'll have their seeds flat on the ground rather than growing up – and they'll make seed twice a year. We've sowed some and have tossed some out at random. We'll harvest some, e.g. kangaroo grass, growing by the road and will dribble a bit about. A lot of these have native dormancy – they'll stay dormant until the season is right. Bought some from Colin Seis – one of the species is called cotton panic. Lovely fluffy seeds that look like cotton. When we had these storms, it was everywhere. They're more resilient to the climate.

There was 1 hectare of native grass in '99. We started to see wallaby grass after 1-2 years near the fence. The native parrots – they jump up on the fence and shake themselves off… I've got photos from when these front areas had no native grass and then a sea of wallaby grass. Talk about success. Made me feel wonderful. These seeds/plants that have evolved here now want to live here again. Heartbreakingly beautiful.

I think the agony that goes on in people's minds is that they think they've got to sow something to grow anything.

Some of the ones we got from Colin – when we're grazing them – the cows are sowing machines without petrol. That's quite exciting. Bucket on the handlebars of the bike. Have driven up and down, dribbling this stuff around, not expecting any result. So low cost - the seed is expensive but low cost when you're doing it like that. In a few years they'll germinate and…when the cattle go through there the cattle will take those seeds…it'll go through them and then they'll sow them for us. I had a few planted with a machine but no result for 3 years and that's the patience you've got to have. When the season is right they'll start to grow again. That's the patience. Patience and gratitude.

Are we trying to be a native grass farm? Or just trying to grow anything that will grow? My philosophy: manage what we've got and if natives grow then that's great. It took 10 years for it to start spreading itself but it's amazing how quickly it's spreading. Once you stop applying super-phosphate, the conditions move against the species that rely on it. They're still there but there are niches where other things can get a toe hold. We've had paddocks – northern hemisphere cool species – but now we have lots of natives popping up there. It tells me the conditions are swinging to where there are conditions they like. You can see in some of my photos where plants are starting to lean toward the fence. Leaning in ☺" (122 Regenerative Farmer).

Setting holistic goals, monitoring and (re)planning

Setting holistic goals, and monitoring and re-planning over the course of the year as conditions shift is one of the practices that Holistic Management (among others) stress, and a number of proponents described this as a key skill. The process begins with planning a family's goals, including succession, family goals, financial and property goals, etc. This is then followed up with a practice of monitoring and testing against assumptions in order to learn what actually happens

on farm. One proponent described why this is important in transition, *"You do have issues that come up in that transition phase. Underneath that you learn about the ecosystem process – [that's] what we're aiming to improve. [But you have] got to have the tools. That's our means. To implement, you apply the HM testing guidelines. [For instance], a marginal reaction [to a strategy] is an opportunity cost. [We're looking for the strategy that will] get the best return on investment. $1,000 spent on polypipe…will it give me a better return than fertilizer? Then the [HM] guidelines again – e.g. the tighter your animals in a paddock the better your result. But you also have to be out there with your grazing plan. Assume you could be wrong. Monitor and re-plan. That's just normal. We (farmers) are always conducting an experiment. But the problem lies in that we don't monitor and re-plan"* (107 Regenerative Farmer). [Author's note: It is worth observing that this practice has some parallels with design approaches. Design is known for practices like framing, synthesis and inventing new solutions. However, within design there is also a testing to learn (prototyping) process which provides the rigour required to keenly observe and assess what actually works in a context. The concept of monitoring and re-planning is a parallel skill to prototyping. Which also includes seeking to understand what's known, setting goals, designing a desired approach, experimenting, testing and iterating as you learn.

<u>Assembling your own toolkit</u>

Some participants expressed concerns that farmers new to regenerative practices – whether transitioning from conventional practices or new to farming altogether – might be challenged to take up several practices all at once (refer to section 'Examples of practice'). There was also some skepticism that a single property might use all or even most of these.

In practice, the farmers I have spoken with piece together their own toolkit – experimenting, fine tuning and assembling a set of practices <u>*over time*</u> in order to form their own holistic management approach that works for their properties and their own goals. This is critical to appreciate: No singular practice is used stand-alone, the toolkit chosen depends on the farmer's goals and it is built and honed over time. This excerpt from Perkins (2019), provides an example of how a toolkit is assembled, and how each of the practices inform one another:

> *"Whilst there are limited examples of profitable small diverse farms, we can draw from and integrate practices from other ecological design methodologies, as well as larger farming operations.* ***For me, there are three main legs to the stool I use in my work. Besides permaculture design, I rely primarily on holistic management [HM] and keyline design.***
>
> *As I would define it, permaculture design is the conscious and intelligent integration of regenerative agricultural ecosystems with socially just environments. Our aim is to produce fulfilling, stable and ethically sound livelihoods through whole systems management...To me, permaculture has always seemingly lacked a clear and effective decision-making matrix. As farmers, we are inevitably bound to dealing with complexity. Ecology, economy and social factors are all complex, and until recently there has not been a clear framework for making decisions based on a holistic context. Holistic management [HM] gives us this decision-*

making matrix, as well as specialised planning for the grazing of livestock and farm economy.

Keyline design presents an organising pattern for permaculture at the farm scale. It also gives us a topographic patterning for integrated farm layouts that work to optimise efficiency at all levels of the working landscape. Keyline also gives us specialised tools for rapid topsoil development on the field scale, as well as dedicated water harvesting and gravity irrigation tools. ***Any tool that works is worth including in our toolkits. Likewise, anything not suited to the context of the larger landscape can be discarded****. Farming is a very different occupation to simply meeting your own needs. As soon as economy or regulation become relevant, such as when producing for market, the toolkit needs to be quickly refined…Abstract theories and gross idealism only serve dreams. In the end, down-to-earth common sense is what usually works best."* (emphasis added)

There is opportunity to support farmers to deliberately piece together their own toolkit.

<u>How the farmer adopts new practices and mindsets</u>

Much of the discussion of opportunities to increase the uptake of regenerative agriculture focused on how farmers get exposure to, learn and then adopt new practices and mindsets. The conversation included: *support to develop a transition strategy*, *on the ground mentoring, support groups and consultants, education, extension, and purpose-built training centres/hubs.*

Support to develop a transition strategy

Transitioning to Regenerative Agriculture can be formidable because it's not just about switching to a new practice – it's about transitioning the entire management approach for a property. Without a detailed understanding of the conventional approach you are moving from and the regenerative approach you are moving to, it is difficult to envision the future management and even more tricky to set out a plan to move from one to the other. For some that represents a lifetime of knowledge!

Getting support for the development of a deliberate and detailed transition strategy, as well as support to make decisions at each step is one approach that has been used by some farmers in transition. This approach relies on the advice of a trusted mentor or independent consultant who supports the process of learning to read the landscape, making choices based on the goals of the family, detailed planning, and initiating remediation efforts, etc. Through this approach, transition can occur gradually over time or in parts: "*I am working with a guy whose son is taking over, and he wants to introduce species, rotational grazing. But he is held up by the idea. He knows what he does works well and is profitable so it's risky to change that. But the son wants to be more holistic. So, I'm encouraging them to work out which pieces they will manage more conventionally and more holistically. Productive paddocks you'll manage conventionally, do it. And do others low input HM…Have two farms operating side by side. That idea of making a transition and understanding what the transition will be like. Making a decision to go along the path and stay with that decision"*

(126 Organic Farmer and Academic). Over time the farmer builds their knowledge of the approaches and is able to feel comfortable with making management decisions.

On the ground mentoring, support groups and consultants

A number of proponents mentioned that it wasn't enough to go to a course, but that what really supported them through transition were the mentoring and support groups that are available. *"RCS has a keep in touch (KIT) group and the KIT days run every 2-3 months. It is sometimes organized to bring more people in to learn, join a course, then be a part of like-minded farmers (at the same level) [so they can] bounce ideas off one another. That's what I did. It was that KIT day that allowed me to progress, to move on"* (107 Regenerative Farmer).

Another proponent gave some specifics as to why the support groups are important: *"I made some horrible mistakes. Getting back to using those tools [from Holistic Management]. Grazing animals is about using animals to improve landscape function. I made a lot of really good mistakes, that could've been a really big hurdle. But the network of farmers [was] very good peer support. That's really key. It's business coaching. Everyone who is an elite sports person, they have coaches. Farmers don't have coaches. Peer support, individuals you work closely with – like the RCS exec link. Family farm boards. You really get down to tin tacks, you talk about the hard stuff. You turn up thinking you're going to talk about sheep. It was through the process that made me think about – pull my finger out…I had a girlfriend at the time. My board and other individuals said, 'Mate, what are you doing? She's a great chick, you've got all this stuff going on'. I did and the rest is history. That's not what you do at the pub. You go to these places to get your problems solved. Even just falling into that network of farmers is worth it – [it's] healthy to get other people's perspectives"* (128 Regenerative Farmer).

Another proponent discussed that it was important to do the mentoring and then the support group: *"One of the most successful [supports for transition] is mentoring programs. People often don't have the confidence to change. And the problem is that they go to a conference, or a workshop and they get excited. Then the neighbors give them a hard time for being a lunatic. And they need their hand held for at least 12 months - some sort of mentoring program. But then they need to be as quickly as possibly weaned off the mentor and put into a group that is self-supporting. Some of the education groups don't wean them off and it becomes a money-making scheme – they don't give them enough so they can be turned loose on the real world"* (116 Regenerative Farmer).

This danger of feeling like a money-making scheme as well as the challenge of the time commitment came through from a farmer who is in transition, *"I did the RCS approach. Picked up some ideas. They did want to progress it further. And it was at a financial cost. And I got the impression that they were a little too doctrinaire about what they were putting across. Almost as if…If you don't pick it up what's wrong with you. I was happy to. It's just I do 12-hour days, 7 days a week. So… commitments for me are a bit hard. Ad hoc. I'd find it tough to be committed to a group on a regular basis. The demands of running a place. Very hard to make commitments. On a continuing basis… I'd have to find it interesting and fun. Then you're a long way to getting there"* (118 Farmer in transition).

The mentors and support groups help to reinforce practices that are taught, such as monitoring and (re)planning discussed earlier in this paper. Transitioning to regenerative agriculture is not just about adopting practices, it is also about restructuring or fundamentally redesigning a land management system. This requires a significant amount of confidence in decision-making around very specific decisions. The peer groups are one of the known ways to build capability and confidence – the safety – for that level of decision-making:

> *"'Safe' usually happens in small groups of farmers who are in the same stage of learning – 'why don't you try this?' It's peer to peer review in a way. That mainly happens in those settings or forums where people can informally chat with one another and hear how someone else had made a change. Not just the feel good <u>but the specifics</u>. 'Where did you put your fences? How did you decide how many paddocks you need?' Pros and cons of using these kinds of management systems. You don't get that on a normal day. [A farmer] won't be able to make an informed decision – they don't have enough information – without this information. When people hear and see major decisions, it gives them confidence. Peers give them feedback and they haven't spent any money. It's hard to make a decision if you have to make a risk on $5,000, $20,000, $100,000"* (129 Agroecologist and Extension Consultant). (emphasis added)

These practices take time to learn. Among some proponents there was a sense that people who have had exposure to the ideas may take them away and dabble at them, but it is the dabbling that makes it likely a transition will not occur because they do not see the results of their efforts: *"Holistic Resource Management (HRM) parallels a Design and Program Logic (Theory of Change) or Program Theory – that's what you find when you look at the research when they're testing Holistic Management. They'll start off with info that says this Holistic Management (HM) thing doesn't work but farmers say it does, so let's rotate and see. But [that approach is flawed because HRM is] not prescriptive. It's decision-making. What's confounding for station managers is the adaptive decision-making of the farmer. He's going to plan, but he'll be constantly monitoring and will be like 'nah, a week is too long,' move them after 5 days, or leave them longer for a certain grass. He's not going to stick to a rigid plan. I haven't been promoting it for 15 years. When I was, the reality was that you had to do the 7-day course. It's a paradigm change. You're not going to experience the paradigm change from factoids presented to you. You can argue with those. Only half of the people who come out of the course end up being successful with it. Because of fear? Because it's uncomfortable? But you really do have to monitor. Some people do have the eye for it. But others need help"* (109 Extension officer).

Group programs are also an opportunity to bring together people who use different approaches in order to learn from one another and break down the 'us and them' dynamic, *"I think there's a place for a group-based program where you have a mix of farmers in a group (some conventional, some holistic) and you work with each of them with what they do on their property so they learn from each other. You've got to break down the them and us"* (126 Organic Farmer and Academic).

Consultants provide an independent option for farmers to get access to the support they need and to build out their toolbox of possible approaches. This role is often held in contrast to retail

agronomists (e.g. employees of fertiliser companies): "*You look at the retail agronomist and as soon as they put their Elders/Landmark shirts on [they] could be perceived as having to make the sale. [My work is] about creating a better margin. [Between my work and the retail agronomist, there are] fundamentally two different things driving the sale: building the profitability into the business vs having to sell. Growers perceive that independence as a positive thing…But the challenge for me is to make sure – because I am independent – that I attach myself to good science and stay relevant. A-grade science – soft and hard. People science – one big thing in ag. It's no good me having an abundance of knowledge stuck here but you're the one who's got to implement it. If I can't work with you to make that change, then my worth to you… The agronomy is the easy part. Like a set recipe. Sometimes you're a psychologist. People unload on you because it's been a shit week, month or year. For my growers I'm working with, it's been a really bad year so what's our opportunity? What have we learned? How do we position for next time? Where did we win? Where did we make mistakes and what can we make better? You're never going to get to a better place if you don't pull it all apart, put it into a strawman. It takes a fair amount of trust and honesty on both sides, which you won't get on day one sitting around having a cup of coffee. [And] sometimes it's just driving some positive"* (121 Independent Agricultural consultant).

Education and extension

For longer-term change, many of the participants talked about tertiary education, and even earlier, as an opportunity. *"Education, ag college… they don't often talk about regen ag. [Education is] where you get your values and beliefs and what we're sharing [in regen ag] is conflicting. [Changing that is] much longer term. But it needs to be a concept or way of thinking that's available to people as they're learning at high school. The ideas, methods. That an alternative or alternatives exist and they're not just for crazy way-out people"* (110 Extension officer). Furthermore, proponents stressed a mix of theory and practice, *"Academic alone, not good enough. Practical alone, not good enough. Narrow, broad, as a community we need both. Holistic and reductionist, we need both. I am an enthusiastic supporter of science research that continues to explore the natural world. These studies are the signposts that we can use to navigate our management actions. They alone are not either the reasons or real justifications for our applied actions"* (114 Regenerative Farmer). With respect to learning about regenerative agriculture earlier than university, in an Australian first, a New South Wales teacher has developed a project-based learning course that explores regenerative agricultural principles and practices for students in years 3 to 10 that has been adapted now by more than 50 schools in New South Wales, Victoria and Tasmania (including several based in major cities). According to the news story, *"Kate Spry created 'The Soil Story: The Road to Regenerative Agriculture' in response to a growing frustration over what she saw as misinformation about the role of agriculture in repairing soil erosion and combating climate change".* The story was reported on by the ABC News in May 2019 (https://www.google.com.au/amp/s/amp.abc.net.au/article/11112832).

Lack of a formal agricultural education is not uncommon in farming families, and proponents saw this as concerning, *"My biggest thing is education. People just don't get educated… [The neighbor] rang me – she's 5th generation and her father does what his father did. My reaction: If I [were a doctor*

and] were to adopt doing what I did in the 50's – I'd be in jail. It could kill you, man. They don't treat you with cocaine and Panadol anymore. A doctor continually advances his practice or he gets behind. Croppers are continually educated – they're more precise – they count how many seeds exactly they put in the ground. Exactly how much chemical on the ground – they have a tight fiscal policy. They've just got a thing. Their minimum spend is $15K on chemical spraying the paddock. Cropping is HUGE money. [The companies] give you 75% back if it isn't appropriate for that chemical to work for a certain period and it goes down and down as the period gets longer. You don't get that precision with grazing. Some of them work from dawn to dusk but I don't know what they do. I haven't seen any of them – neighbours – in the field. Next door neighbor – left school at 14 or 15…They control six thousand acres and not one of them is educated - in terms of going to an ag college. It's all education by trial and error. They're good workers…If I was going to buy a $1M property, I would want to know what I'm doing" (127, Regenerative Farmer).

With this being said, the education that is available doesn't always set up a career path to being a farmer, unlike in other fields, *"Back to the education side of it as well. What they identified there – it's true professionals – doctors (6-7 years), accountants, every position – [there is a] very clear line of sight and then you get a job. Farming…[there are] so many more hurdles, mom and dad's expectations. Succession expectation. I did a degree in rural science for 4 years. It was a great science-based course but bugger all practically. As far as being a farmer – there's not a clear career path."* (128 Regenerative Farmer)

Some participants expressed that what's available in extension currently doesn't go far enough to teach the depth of practice, *"Schools have been excellent (like HRM) but it's still kindergarten. Who takes that to the next level?"* (108 Farming industry entrepreneurs & former farmers). Meanwhile others are concerned that they're seeing a lack of appetite and a lack of funding for the more in-depth courses: "*The course this year will be a cut down on a Holistic Management Course. It will be focusing on quantifying feed on offer, matching to livestock and planning rotation. We do a bit of whole farm / property planning. Combines a couple elements. There is a curriculum that's been around a long time. What used to be a 7- to 8-day course we've cut down. What would be one day on soil, pasture, farm water, native grasses? There's a needs analysis [if] they want to know more over time"* (109 Extension officer).

As one proponent pointed out, *"There is no regen ag business diploma"* (128 Regenerative Farmer). [Author note: at the time of this writing it is understood that development is underway for a regenerative agriculture degree at Southern Cross University, to be launched in early 2020. Efforts have been made to establish an ecological agriculture degree through the Riverina TAFE (without success) and Charles Sturt University is offering a Master of Sustainable Agriculture. There is an ecological agriculture degree available through Massey University in NZ].

Purpose-built training centres/hubs

A number of proponents felt that the current education system would be too limited to be able to adequately teach regenerative methods, and many suggested purpose-built training facilities. For instance: *"If it were looked at from the perspective of the government… we could have*

apprenticeships, select apprenticeships, traineeships to be attached to people in this space. Supported learning. So that people around the country can go around, their expense paid and they learn alongside [someone like my partner]. Someone to translate what [my partner] is doing into a training program, write the curriculum. A bit of planning, a bit of money. Maybe ¼ million to ½ million dollars. Maybe a regenerative CRC – centre for research. You could have hubs. New England hubs, hubs in the Hunter. A massive education centre. Learning hubs where they could go out and get experience, live in blocks, go out, come back, it could work" (107 Regenerative Farmer - partner).

At least one proponent has already invested in a training centre, though they acknowledge that training alone is not enough: *"I've set up a training centre [locally]…fixing it up to be a centre for change. Slowly getting going. The NSF course is probably our biggest course…What I've found also – [an attendee from a retailer] came here and she got it but she went back and slipped back into what she was already doing (e.g. spraying). They come and think it's so great but… it's three steps forward and one step back. When the proverbial hits the fan you go back to the conventional techniques. The ag guys say, 'you have a fertility problem so put phosphate on'"* (124 Regenerative Farmer).

Policy mechanisms, incentives and governance

Policy mechanisms, including incentives and governance, were seen as a significant opportunity to create the conditions for farmers that would enable transition to be possible.

Subsidising education

From the interviews, there is a perception that there is less funding available currently for education than in previous years, and there was a sense among a number of proponents that there could be further subsidy for education. Lack of access to the education and/or lack of funds for education was perceived as a barrier and therefore enabler of transition, *"A lot of the education is there. The training exists. It's getting people through those courses…supporting farmers to get to the stage of going to those courses. Charlie Massey, the five landscape functions. Beekeeping, permaculture, whatever it is. It could be a financial hurdle. Education needs to be more accessible, not necessarily better. I'm not a fan of government subsidy but maybe if government would subsidise this…$10K for a one off? Maybe more courses of the same high quality to get people through"* (128 Regenerative Farmer). It was also perceived that government supported education can be a non-threatening way to support transition, *"I think governments have played a useful role in this in that there have been bus trips to various properties, showing different strands of – if you like – regenerative agriculture. And it brought people together without it being threatening"* (118 Farmer in transition).

Incentivising ecosystem services

As discussed in the section on 'The role of Regenerative Agriculture in protecting ecosystem services', 'ecosystem services' is the concept that our environment provides 'services' that our economy, as well as life itself, relies on. It is the idea that we can collaboratively manage how we impact the 'services' that the landscape provides such as water, temperature control, wind and

weather protection, climate regulation, etc. When our agricultural practices compromise ecosystem services, our agriculture is not sustainable.

At the moment, in how we monitor agriculture, it is not standard to assess the sustainability of our practices. Ecosystem services provides a way to link farming practice to the effects on the broader environment, to 'monitor with context'. One farmer described how incentives for ecosystem services – ecological results – could be developed:

> *"If I could be dictator for the day… I'd gear the system differently: instead of incentivizing damaging payments, incentives would be tied to ecological results. Across agriculture on the whole, currently there are very few incentives provided by government that are tied to beneficial impact of practices on our environment and community.*
>
> *If we want something to happen, what's the most effective thing we can do? Force or choice - those are the two directions we can take if we wish to change behaviours and outcomes. We can tell people not to do things – but if they want to do it, they'll keep doing it. We can tax something, like we tax cigarettes. But the most effective thing we can do is to incentivize what we want, and then let the market go for it. The market adapts quick smart if the settings are directed toward goals that benefit the widest possible base of interests. That's the government's role – to change settings. And governments are brilliant leaders and most effective when they commit to doing something over a longer time frame.*
>
> *As an example of current versus potential incentives for agriculture, the Australian Agricultural industry currently have diesel rebates provided to them by the community via Government payments (a rebate on farmer's fuel usage). The community is subsidising diesel use. The broader community can decide if those payments are leading to positive effects for both the people receiving the payments and all the external implications of those continuing as 'business as usual'. If that money was put toward incentivising things that capture carbon and build diversity as they go rather than use carbon, we could drive the ecological results we want. Incentivising ecological results would be a game changer – and the same amount of money would still be spent in the agricultural sector, e.g. we don't lose the funding, we redirect it toward practices that would strengthen community, environment and business in the long term. This approach also holds the possibility of giving everyone a positive result, no matter the scale.*
>
> *There are some considerations that would have to be taken in the design. To say 'bang, diesel is out tomorrow' – that's the worst you could do. But if we shifted the incentive funding over 10 years, industry can cope with gradual change but abrupt change is very disruptive and will always result in unanticipated commercial and personal costs.*
>
> *Any change will disproportionately – and negatively – affect some people. This is often the case for people living in the more remote areas. A change in diesel rebates would have a disproportionate effect on those living farther out, and so you would have to consider that in the design of the incentive so that they received adequate incentive funding to replace the lost diesel subsidy.*

Scale, impact and importance of a property or area would be part of the consideration. For instance, large properties are ecologically important at the state level, even nationally. Also, if we incentivize results rather than practices – people are disadvantaged when results occur that are out of their management influence (e.g. if we were measuring ground cover and it has been taken away by a wildfire then the groundcover measurement would reflect badly on the manager but in reality their actions may have been at the highest possible level of groundcover protection). So, we need to consider incentivising practices that drive towards our goals rather than just judging results otherwise you can lose the support of good managers who are experiencing bad results – particularly if the climate is changing quickly" (114 Regenerative Farmer).

Regulation to ensure ecosystem services remain in place and/or putting a price on ecosystem services was seen as a potential means to encourage (more) sustainable agricultural practices: *"Farms around the world are destructive [in the way that] we currently practice agriculture and this is evidenced by history as we have moved across the planet. The broader ecosystems support weather systems, water resources, communities. We're all just gold miners coming and going if we're not tied to our local landscapes and landscape function…"* At the same time, ecosystem services are a long-term play and proponents are not sure that's feasible in the political environment, *"Ecosystem services…have to be viewed over a longer time prism. In the modern view everything is in shorter and shorter cycles – we don't look in 100-year time frames or even 5 or 20 and this leads to a lack of suitable investment in strategies that are substantial in favour of 'quick fixes'* (114 Regenerative Farmer).

There is a sense as well that incentives for ecosystem funding could also help align practices for drought resilience, *"If we tied drought funding to ecosystem impacts we were having that would be a great feedback loop for us and for our communities"* (114 Regenerative Farmer).

One researcher described the commercial potential in ecosystem services, *"I spent quite a few years working on ecosystem services. Feel like it's an incredibly useful concept. People don't understand where their life support comes from. If you do x you will lose this and if you do y you will improve these services. It's very 'bright green' - [a 'financially green' practice - and] you can commercialise it and make it work. There are some ecosystem services that can be priced to make it work – as part of a market. But another challenge is that some ecosystem services cannot be priced. We have to work out which one is which"* (126 Organic Farmer and Academic).

Policy, incentives & funding (in general)

As compared with other countries, participants felt that Australia utilizes fewer subsidies than other countries, and this was generally seen as a good thing. There was a common perception that fewer subsidies helps insure that the agricultural production system is more financially viable in the long-term and more efficient because Australian farmers still have to compete in the international market.

Incentives were identified as a potential mechanism to enable transition, *"I tend to think about incentives because they are more efficient. I think they are more likely to get adherence as well. A*

drought is a great example. Great land managers should be making a lot of money. They may have bugger all animals or crops but if they can demonstrate to the community that they are doing something to protect the environment they should benefit because it is in the community interest for those practices to continue and expand regardless of the prevailing conditions. We're paying for the right result [because they are managing for the long-term viability of farming]. How do we keep good practices in the community that support long term community interests – biodiversity, natural function outcomes and don't just support business (corporate outcomes)? Farm management deposits (FMDs) are another example of taxpayer-funded schemes that skew outcomes toward corporate scale operations and distort the market. For farmers that have big years, it's a much bigger roller coaster. They have big incomes then little, [and so they can] put money aside in non-tax bearing deposits. The current drought shows who it's helping – the big end of town. [We should be rewarding] drought mitigation in good times as well as bad as opposed to supporting corporate outcomes that reduce the number of operating businesses across communities and landscapes" (114 Regenerative Farmer).

There are examples of government funds in place that do incentivise practices that are in line with regenerative agriculture practices, including fencing off riparian areas and providing funding for infrastructure, as one farmer relates, *"Another thing government has done – funds. We have established about 46 kilometers of riparian frontage on the river. We have an area of the creek that we have partially fenced off to establish a native area. Government have been useful in that regard. And in providing funding for a laneway system – a lane thru middle of property and water cells along the way and each cell services 3-4 paddocks. This minimises infrastructure and allows for rotation. If you have set grazing it's no good"* (118 Farmer in transition).

One farmer saw a call for incentives in some cases, such as where the incentive is to repair land degradation or in situations where a lot of cash is involved, but described incentives as risk as well, *"If you're asking farmers to do more than their duty of care then it's appropriate [to provide an incentive]. If land degradation is happening then all of society is involved – if we're eating food then we all have a hand in land degradation. If you're asking farmers to do things where a lot of cash is involved, [then it's] appropriate that society assists. That's land care, basically. The tricky thing when you're helping with cash – it's necessary – but it can switch people's thinking onto the cash rather than thinking about how they should manage land. It's appropriate to have some incentive, but there's a balance between having too little and too much – too much though creates a culture of dependence and may make people have their hand out rather than considering their relationship with the landscape. There has to be a balance between too much and not enough"* (122 Regenerative Farmer).

One proponent felt that farmers needed to have an initial interest already and some skin in the game, *"If you don't pay for it, you're very unlikely to do it. Except…when I did Holistic Management it was quite cheap, subsidized. If you're interested you'll do it. Someone told me: that's why consultants charge so much. If I didn't pay him, I wouldn't move those sheep"* (127 Regenerative Farmer).

It still may require a mindset change to take up funding, as one proponent describes, *"Funding I think is crucial to getting people on board. They won't take it. The people that take it are the people*

that probably don't need it. Except for me. The 6 landholders [near me], none of them have taken up funding. Why? 'We don't need it'. [On our property, we] hard fenced-off our riparian areas. [Local landholders asked], 'Why would you do that? We need access to the creek'. It has a gate. I can put in the sheep. 'But how will I move sheep from this side to the next'. Hello? Two gates. Put the sheep in the creek for a day. Funding is really good. Incentivising people to take up funding by reducing red tape" (127 Regenerative Farmer).

There were also concerns that policy could have long-lasting, unintended damaging effects, and there was a lingering sense among a number of participants that 'bottom up' tactics are more effective.

Despite the concerns about the types of incentives or funding approaches, a number of proponents emphasised that any investment for farmers is often quickly transferred out to community: *"Farmers are the biggest spenders. We get $1 in and we put $1 out. We don't hold onto it. That could be on anything. You increase your income to farmers you increase your GDP because we don't hoard it, we spend it. We get a bit of a windfall… [one station] – 16,000 acres – they don't even paint the front fence. You think, 'why aren't they doing that?' They're spending money on other things. Are all their buildings in apple pie order? Painted? Looked after? No. We're big spenders - with other people, for the benefit of the farm. The community benefits. [And] we need so much more money to come into the community"* (108 Farming industry entrepreneurs & former farmers).

Carbon farming & carbon credits for regenerative agriculture

As compared to the more common forestry-based approach to carbon farming, Regenerative agriculture is as yet an untapped method of sequestering carbon in the soil. *"We are carbon positive. [Another farmer] was involved in the research where they studied her carbon footprint. They talked about other farms: 'They're nearly carbon neutral isn't that fantastic!' But, hello…elephant in the room: she's sequestering more carbon than she's harvesting"* (124 Regenerative Farmer).

As discussed earlier in this paper, Regenerative Agriculture is seen as one of the most promising and practical approaches available to us to sequester carbon and mitigate or even reverse the human influences on climate change.

In March 2019, a farmer using regenerative practices became the first Australian farmer to earn carbon credits through the federal government's Emissions Reduction Fund, which earned him the 2019 Carbon Farmer of the Year award (https://www.abc.net.au/news/2019-09-08/dollars-from-dirt-the-farmer-making-money-from-healthy-soil/11486346). If farmers are able to receive carbon credits for regenerative practices, it may be a way to incentivise transition, as a carbon farming consultant shared, *"The agricultural model is based on production mode. Farmers don't know what to do to start planning and see the results, they can't afford 2-3 years break. Farmers don't have financial security because of drought. Carbon farming gives the financial incentive – it relaxes them – they can breathe… The agricultural industry needs to breathe…"* (103 Environmental & Sustainability Advisor).

Drought policy

At this point in time, drought policy is a highly sensitive subject and drought relief (as well as emergency bushfire relief) is in need for many. It is likely that criticism of drought relief policy will be unwelcome. As one consultant described, farmers can do everything right, but without rain they will still be doing it tough and there can be measures in place for that possibility, "*There need to be opportunities where you have a social license. Some [of my] clients had done everything right but it just didn't rain – and there has to be social support for that*" (121 Independent Agricultural consultant).

Proponents empathized with the hardship that many families are facing, though they held concerns that drought relief may be incentivizing land management practices that are not sustainable, *"But how do you stop bad producers from taking up drought relief? How many times do you see people with 100 poddy calves, 'Oh, I can't get rid of them, I have the best genetics in the world'. Only the top studs have that and [those producers] will keep [them] because they can afford to. I sold all my breeding ewes. They're not that good. I used to think they were. You have to change your paradigm. A good farmer, in the good times, will diversify. Diversifying…a lot of farmers buy the next door neighbour and go into debt. In the old days they'd buy a house in town, rent it out, pay it off, and buy another house - until they needed money then cash it out. It's easier to sell a house than to go broke. But most conservative farmers these days they want more land – more production. More income. It's really the other way. That property sold for $1.5 million and it's 960 acres. Unless you're really good at producing that's a lot of money to pay back. You'd need to make $100 thousand dollars a year PROFIT before living expenses"* (127 Regenerative Farmer).

One proponent described the drought situation as an opportunity to use relief funds to support farmer transition, *"We're in a perfect position now to say righto – instead of a handout: give you training in the methodology, what do you need to do, how you transition your business. There are too many farmers [where the property has been] handed down [and it is] not treated as a business. Ecological outcomes need to be part of [incentives and relief funding] – we need to be paid if we're doing the right thing"* (125 Regenerative Farmer).

Increasing the use of technology to generate data that will support policy

Although some of the more familiar regenerative practices have been used for over 20 years, there is limited accepted data attached to the practices. There is an opportunity for farmers using regenerative agriculture methods to collect data using the latest technologies: *"I think HRM could benefit from [benchmarking] and some of the technology. [One farmer I have worked with is] good. A lot aren't. [You can do] drone-based assessments of growth rates, broad-based benchmarking. [Look at the] paddocks from space. [Among proponents] there's a lot of woolly-headed thinking, wishful thinking, propping each other up – [you] round them up and they don't challenge your idea. [The] risk [is] that these become insular and – no one new. Whereas Farmers for Climate Action – it's a different beast. Large scale. Lots of people involved. Not just HRM's"* (126 Organic Farmer and Academic). Anecdotes like a story from Southern Cross University and the Regenerative Agriculture Alliance, which reported that *"soil-conscious farmers crashed an email system when they rushed for free soil carbon tests offered…in conjunction with National Regenerative Agriculture Day on February 14*" suggests that the ability to collect data and use that data to support farm management may be

welcomed by many (https://www.scu.edu.au/engage/news/lates-news/2019/farmers-hit-paydirt-with-free-soil-tests.php).

Data is important for farmers practicing regenerative agriculture to be able to demonstrate carbon sequestration: *"The impact of regenerative agriculture is hard to measure and model [for the purposes of the Drawdown book research]. Individual farms cannot use a cookie-cutter approach. Rates of carbon sequestration will vary considerable in quantity and amount of time required. The results, however, are impressive. Farms are seeing organic matter levels rise from a baseline of 1 to 2 percent up to 5 to 8 percent over ten or more years. Every percent of carbon in the soil represents 8.5 tons per acre. The growth adds up to 25 to 60 tons of carbon per acre*" (Hawken, ed. 2017, p55).

Demand-side mechanisms

Bionutrient pricing/labelling and provenance

A number of proponents mentioned the concept of bionutrient pricing or labelling for food as a way to encourage uptake of higher quality foods. They shared a perception that people tend to purchase on price, thinking that a lower price is better value. But when food has higher nutrient density, you need to consume less of it to get full, so the higher the nutrient density the better the value: *"A carrot grown organically – like [our] grandparents [would have done] has 20,000 parts per million (ppm) of carotene. The ppm from hydroponically grown: 81. A carrot 81 parts per million of carotene is mostly salt and water. People won't get enough carotene and they'll get sick. I bought some from Woolies – organic and conventional. The organics, I could still snap them. I could see the cells. And then the others were rubbery. The organic one tasted delicious. The other one tasted like chemicals and I didn't even want to give it to the chooks. People say, 'I can't afford to buy organic food' and I say you can't afford not to"* (124 Regenerative Farmer). Nutrient density pricing or labelling, like the introduction of cents per kilo labelling, is intended to help consumers better assess whether or not they are getting good value in their food purchases (109 Extension officer; 124 Regenerative Farmer; 125 Regenerative Farmer).

Bionutrient pricing/labelling was also seen as a way to help tell the story of provenance and traceability in food, which other industries (such as fishing) have found to be important in increasing the uptake of sustainably produced or harvested food.

The waste cycle

The waste cycle is an opportunity to close the loop between nutrients delivered to cities and then lost through rubbish collection and potentially even sewerage. Ensuring that nutrients flow out from farmland and back to farmland through the waste cycle is a commercial opportunity as well as a chance to build people's connection to land. *"We've got all this waste – and food waste is astronomical – if we could get that back into compost on our land…That would be a motivation for people in cities to regenerate our soils through waste. We're not doing it effectively. All our sewerage is a wonderful resource. It makes you cross how we're driven by the dollars in one sense but not in another. The first person who comes out with all this waste will be thinking how much money can I*

make out of it. That's a wasted resource that" (108 Farming industry entrepreneurs & former farmers).

Roles of different people or groups in transition

Collaboration

Collaboration was not seen as common among farmers: "*UQ did some research – something like 1200 farmers did a Myers Briggs – it was amazing to see those results. You realise why they don't collaborate. Those characteristics of farmers"* (120 Holistic Management consultant). If collaboration was occurring, it was thought to be likely due to financial incentives, e.g. for those selling to an international market there may be reasons to work together, whereas those selling to the local retail are in direct competition: *"The cotton industry does it better than everyone else. I grew dryland last year and the support was just brilliant. They're marketing their crop globally – it is what it is – we're not competing against each other. If you and I are Merino ram producers – we are competing and we don't want to share any of our IP. You're a competitor. Doing some stuff in Wagyu? We don't want to share, that's our competitive advantage. Different drivers across industry but all goes back to [one] driver: profitability"* (121 Independent Agricultural consultant).

If collaboration did occur, it was still seen as important to maintain independence, *"With communities it goes back to – people like to do their own thing. If you're dependent on someone and you have a falling out…in a rural area then there aren't a lot of other options. So, people stick to themselves. My neighbour and I are sharing resources. We share water. All my water flows to his dam so I use some of the water out of his well. He's growing [the same crop] as well but we use two different methods. … So we share, but maintaining independence is very important"* (105 organic farmer and academic). Collaboration that did occur fell into the category of practical in day-to-day problem solving and that was differentiated from the learning groups where farmers advised one another or larger-scale sector collaboration.

Lobbying

Some proponents felt there was an opportunity to improve lobbying among farmers with related approaches, such as organics and regenerative agriculture, as the groups are very small compared to other interests and also come across as fractured to government: *"[A group went into government] saying 'your policies are stopping organics'. Then [the government] says, 'you have a problem – you have too many splinter organisations'. Organics [have been] going 25 years and are still a fringe thing. I personally think we've hit a tipping point. [I have] a friend in Dubbo who says, 'you regen guys need to get your act together in marketing, through Facebook'"* (124 Regenerative Farmer). A consultant stressed how loss of connection to the city through communities and families has impacted how farming is perceived, and that this calls for increased lobbying, *"[We need] better lobbyists at the farm gate level to influence the lobbying at the social and political level. Agriculture sees itself as living in a vacuum. When there were family farms and cousins out in the city [we had] connectivity. We need to be doing stuff…that can influence to media, broader society,*

politics. Not coming to the table with cap out, poor farmer" (121 Independent Agricultural consultant).

The role of women

For a number of proponents, women were seen as important in the future of farming: *"One of the things I talk about – we need more women in agriculture. Us males just want to kill things. With bulldozers, plows and pesticides. Women just want to keep things alive. Women will keep things alive because of that nurturing approach. I've seen a lot of really good women farmers. In shearing sheds women are better than males because their attention to detail is a lot better than males. I tell a lot of young girls that the future is good in agriculture and that they need to tell the males to pull their head out. We need more talking, encouraging. Women need more confidence to take that next step. That's part of the problem. To make that happen we need women advisors, to see where the problems are. A lot of it is male ego"* (116 Regenerative Farmer). Women were also seen by a number of proponents as vital to the initiation of the transition process, *"The other thing…quite often it's the women that pick it up. The wives that are more in tune. There's a female contribution here that's really important. It does help break the ice. Throw in a different angle. They want to see their husbands happy. They're fed up with the whole scene. They say, 'I have to come back and bring my husband'"* (107 Regenerative Farmer).

Advocating change

One participant conceptualized my research as looking for a community of practice of change agents for Regenerative Agriculture: *"Like a community of practice (COP) of change agents?...There could be some potential for that community to involve extension people and some practitioners"* (109 Extension officer). That being said, the Regenerative Ag Alliance (RAA) was founded in 2018 as a collaboration between researchers and practitioners in regenerative agriculture, with an aim to *"improve the holistic health and wellbeing of Australian landscapes, farmers and communities through regenerative agricultural research, education and practice…The Alliance champions the large-scale adoption of regenerative agriculture to improve Australian landscapes and the resilience of the people they sustain"* (https://www.scu.edu.au/regenerativeag/).

A key in advocating for change is consistency of message, *"We try to get the early adopters to lead the community, to have that platform. An idea: you hear it once, you hear it twice, when you hear it 3-4-5 times you hear it as a thing. There needs to be the consistency of hearing the same messages over and over again. Getting as many early adopters on until you get to the early majority so that others will adopt"* (110 Extension officer).

At the same time, people wanting to transition are looking for the agents of change to be constantly looking to improve as well. There was some concern that early adopters have reached a plateau and are no longer pushing to learn, "*The self-appointed experts in regen ag are of mixed aptitude, attitude, skills and knowledge but the biggest question for me is…are they really learning? Those who have done various management strategies, many have reached that but have very much plateaued. They're personally comfortable, the feedback loop is great, but it is not leading to a continual improvement nor a desire to be additive to their sets of skills as the change that they have*

experienced personally could have been large and so they find it hard to take on even more considerations. Truly thinking in a 'holistic' viewpoint means understanding that the 'whole' under management is always expanding" (114 Regenerative Farmer).

Taking a 'strategic extension' approach to change through capacity building that is informed by psychology (e.g. Bates model)

An agroecologist and extension consultant described the opportunity to support transition to regenerative agriculture as undertaking 'strategic extension', with emphasis on the social nature of the change process and how an understanding of psychology facilitates change:

"To get [change] you've got to be strategic. Can't be random. Charles Massy's book is only sharing to [those who are already convinced]. To influence mainstream, you've got to get out of that world. I mainly work with farmers who are not in the regenerative agriculture space and we're trying to get them to think differently…Change is nonlinear. A + B + C doesn't equal change. You're looking for the things that trigger…

We do a lot of workshops, farm days, to try to get people thinking differently. You can't change if you don't think differently. Then when their minds are open it's about the tools, processes. The term we use is capacity building. In my work I have a model for capacity building based in psychology – Bates, four stages. First, engagement and awareness. Building an understanding of that new way of doing things – a new way to think – takes a different mindset. Once there are strong fundamental practice skills – management, practical skills, finance skills, crop techniques we go to the third stage. Once people have strong foundational skills – then they need to practice decision-making for change. You have to learn how to have new farming systems, or to develop them. Once they have confidence to make decisions they'll do it – you don't have to force them. Like learning a new instrument. Learn basic theory. Practice different skills. Don't force them. Once they have a basic understanding they can innovate and improvise and play music in different scenarios. Farming system change, step four: they innovate and adapt. That's when they get to new outcomes. That's extension really. If you go through those four stages, what emerges is a strong community of practice – they have the power to influence broader peers and industry as a whole. So, strategic extension is what I'm interested in – facilitating change on a broader scale" (129 Agroecologist and Extension Consultant).

To summarise, the model this agroecologist uses follows four stages of capacity building:

1. Engagement - Getting positive engagement or awareness of a different way of thinking
2. Building understanding around the topic
3. Practice skills – *"Often skills and understanding go through an iterative loop. I equate those two stages to education and learning.*
4. Decision-making ability – the ability to make confident decisions about the whole system, e.g. 'How do I completely restructure or redesign the management system?'; [they are] practicing making decisions on complex systems. *"Once people have got to that stage in a safe way they'll make a decision, a change".*

Queensland Cane Sugar Example: The (emerging) story of one industry's transition

The following case study was shared by a proponent, and it describes the journey of transition for an entire industry.

Background, context for transition and complications in the market

"The Sugar Cane Industry in Australia is quite unique and it's a big industry – in North Queensland – from north NSW to south of Cairns. It's unique because:

- *It's BIG geographically. In the scheme of things, it's up there.*
- *Because it is geographically a unique area it doesn't have a geographic spread like wool or dairy -so not a lot [of people] understand it.*
- *[It has a history beginning with the] First fleet. In 1860 [they held the] first commercial trial near Brisbane. Early on the cane industry used indentured labour which consisted on people "blackbirded" and taken from the South Pacific. After this ceased and many islanders were deported around the 1900, sugar cane then depended on migrant labour and family farms. Almost everywhere else in the world sugar cane was grown with slavery or indentured labour on plantations. So, for most of the industry's history sugar has been grown by family farms.*

On that background, from the 60's onward: Industrialisation. Large machines. Insecticides. [From the] 90's onward the yield of cane stared to drop all across the industry. It was concerning because the mills need volume – it's like milk, you've got to get it to the factory. The mills and the farms are tightly coupled. Harvest it and get it to the mill. Not like wheat. So then in the 70's and 80's industrial agriculture ramped up but the soil was collapsing. It was a major industry problem. They were losing yield despite new technology.

So whole industry spent millions, committed to a levy fund for an R&D fund. Joint-yield decline venture research. They started researching. Soil collapsing. Soil health. The sugar cane industry has done more research into soil health than others. So then the industry has to come up with a way to improve soil: they created best practice.

But farmers didn't change. That was the conundrum. Peak cane growers still thinking 1950s mills. [They were] not influencing farmers positively. The peak body was really conservative, and didn't want to change. They talked the talk but did not walk the walk. [One organization] who dominate 90% of the fertilizer market – co-wrote best practice of fertilizer use. This was a well thought out manual but it did not address the underlying issues of declining soil health.

The industry couldn't change, they were stuck in the industrial model. Then issues became prominent around the barrier reef. Climate change was stressing the system and cane farmers were put under the microscope.

Then [the industry] was deregulated (same as wool). The mills, farmer owned mostly, were sold to multi-nationals. So now they're working for the shareholder. Internationally the largest sugar growing by volume is owned by the Chinese, Tully. Some of the owners have a better reputation than others.

[To complicate matters] the price of sugar is now influenced by India. Not buffeted by extremes of trading. India – small scale farmers lots and important political power – they have protectionist agricultural policies put in place. They control the world price.

White sugar is considered a poisonous ingredient in California, now it's seen as the next tobacco. Getting to the point: imagine being a tobacco farmer in 1990. You wouldn't feel good about yourself. Also, the real price you get is going down but costs have gone up – the trade squeeze.

The [farmer] population is aging. Urban development is taking land. All this change going on. Australia cane have all that going on. Now they're blamed for wrecking the reef.

From limited uptake of best practices to getting traction

[Meanwhile], the industry identified how to fix the soil problem. They spent millions but there hasn't been any real change in practice. It's been really static with a lot of opposition - from people who are not cane people. On the ground lots of farmers were willing to listen. The conservative industry dominated and they couldn't express their view.

[Someone else working on this] had a soil health day. People were telling her, 'no, no one's interested'. Two sessions were packed out. Never seen anything like it. These weren't regenerative agriculture people, the die-hards.They were open to stuff. They had heard a bit about soil.

Industry got behind the eight-ball. Grassroots want to change. But their leadership has let them down and Sugar Research Australia is also pretty conservative. What has emerged: alternative networks and a community of practice. The industry bodies are now catching up with the progressive growers who are changing.

Only in the last year it's [changing]. Mainstream is asking for help. In 2014 I was the wierdo. I can't believe the amount of change.

Then last year – there's a particular region – there's the place to go to see the change – Ingham – Townsville & Cairns - where the regenerative agriculture forum is working at the regional scale with levy funded support. They have productivity boards paid for by farmers. It used to have an R&D scientist, project officers - depending on where you are average, or really good. The network in Ingham is really good – they've got trials growing on. World leading stuff. Fantastic team. There are other areas where the productivity board doesn't have money. The conservative farmer leadership hasn't encouraged change. Just last year I started to be engaged by conservative farmers. It has showed me there is a groundswell. Lots of projects, yes, but lots don't get traction.

The conversation happened kind of indirectly. The productivity board in Ingham wanted training for staff. A few people had come along to watch me. Farmers starting to give feedback on the day. Ingham was open to it. Leadership is progressive and dynamic, they want to change, and they have a strong community of practice. Now Sugar Research Australia – equivalent of GRDC – is coming. I had never talked to anyone from that organisation but met them at a field day sitting at the back. Never had engagement. Someone has invited me to extension [with the idea that] the industry can do extension better. That's the first time.

We're seeing the dynamics of those institutions evolve. The old world no longer viable. Their world is changing because they're no longer the big institute. The power dynamic is changing. Price, mills, yields, certainty. Enough young cane farmers. Social license is now a challenge. All certainties now being challenged. The whole basis of their power is being undermined.

Cane used to be really powerful politically. Southeast Queensland, that's where elections are now won and lost – (not north of Bundaberg) – now that's all gone too. All power dynamics have changed.

A tipping point

We started to break down some of the barriers. Over the last few years we have strategically delivered workshops, hands on trials. Got to the point where the extension team and farmer leaders have got engagement and we have reached a tipping point. To start off with there wasn't much engagement – the few guys doing it were isolated, ostracized. That's really shifted last 6-12 months – the community tipping point, it's become socially accepted.

Unless we think strategically about facilitating this change, it will happen but it won't be effective. The forces against change – industrial agriculture – unless that force is clearly understood – you've really got to look at the drivers of that type of agriculture. They reinforce the patterns.

The challenge is having a vision to go to. The conservative guys, it's hard to imagine a future that they're going to. Starting to draw a rich picture, what the possibilities are. No tillage. Grow 3-4 other crops. Make money. But that's so far on Mars. Beyond their imagination. Starting to build beautiful visions of the future so people can imagine it - but designing those pathways.

[To transition to regenerative agriculture, you've] gotta get more than just the regenerative agriculture crowd in. Bridge the gap to average farmers. [If you] want the movement to grow, it has to transform as it broadens."

(129 Agroecologist and Extension Consultant)

Taking a positive and non-judgmental approach

A few participants have stressed that one of the keys to change is to be positive, non-judgemental, non-threatening and social:

> *"Getting that social norm to achieve soil health…I don't talk about [the impact of the cane industry on] reef health or the loss of nitrogen in the soil. There are plenty of other products that are regulating. I would rather work on a more constructive approach: 'Be more profitable, more sustainable, better soil' etc. It just so happens that by building your capacity you are able to make a change…If you don't want people to change [then] scare the hell out of them.*

I know how good extension works. I could have come in with new ideas, but I didn't try to challenge the old paradigm. You're all suffering – you're not telling them anything they don't know. Trying to present info in a neutral non-judgmental way this is the key in how psychology is applied when challenging a paradigm. They were throwing money at protecting the reef. Half a billion. All of that money – to try to help farmers to change. Done by people in the old institute paradigm. They thought they knew the only way. You can't expect people to change from the inside. They don't know unless you help them with their paradigm.

Challenge people's understanding of soil in a non-threating way. We do this complex role play. It takes 2 hours. It works well. Farmers go: 'what the hell was that?' Trying to get engagement and acceptance.

Underneath it all you're building social connection, a social learning base, and peer to peer. That's how you influence beyond one setting. Humans are social. Unless you use that tactic, you won't get change." (129 Agroecologist and Extension Consultant)

The approach that this consultant described is an example of principles and practices already in place that illustrate how Transition Design could work. This research proposes to use this approach as a precedent, look for ways to build off of the work already in train, and draw out principles of designing for transition in the grazing industry from the accompanying sugar cane industry example. Refer to the above call out box for the sugar cane industry example.

Summary of prioritised opportunity areas:

From the scoping research, I came away with six potential threads to be tested – e.g. opportunity areas for further exploration in terms of what is needed most right now to support transition. These are the potential conversations that are being explored in the second phase of research. The seven are listed in order of most commonly mentioned:

- **Farmer transition** – understanding how to better support farmers in their efforts to transition to Regenerative Agriculture; understanding why farmers don't transition. This will depend on more in-depth research with farmers in transition.
- **(Re)designing education, extension and communities of practice** – looking at how to incorporate regenerative agriculture into ag education, supporting farmers to build a broad toolbox. as well as looking at the next steps and/or innovation in extension and communities of practice
- **Linking farmers to mentoring, support groups and consultants** – and potentially investing in the development of these resources; supporting different people or groups to initiate transition (e.g. leaders and key influencers)
- **Policy incentives** – (re)designing policy mechanisms, incentives and potentially governance to support Regenerative Agriculture

- **Taking a 'strategic extension' approach to change** – by building capacity in a way that is informed by psychology and takes a whole of sector view
- **Building public demand** – e.g. looking at media and social channels to influence public demand
- **Creating opportunities for connection to land** and learning from Aboriginal ways of knowing

These opportunities will be explored further in stage two.

Overall, more than one person told me: "This is exactly what we need right now".

That being said, many proponents wanted to make clear that they believe and respect that farming families love the land and have been doing their best: *"Most of our farming families love their land and want to look after that and they – mostly – recognize the mistakes of the past. But we are pushed by survival. We can't complain or bitch about it. We [just have to] keep pushing: keep learning"* (108 Farming industry entrepreneurs & former farmers). As one proponent described it, they believe there is a "*Green core in just about every farmer"* (126 Organic Farmer and Academic).

7. Next steps

The next stage for this research is anticipated to combine 1) some supplemental design ethnography to understand perspectives of farmers who are in transition or want to transition, 2) stakeholder workshops to explore opportunities and identify ideas (interventions) to progress further and 3) a limited amount of individualized design consultation to help participants progress their ideas. Next steps include:

- **Sharing back the data gathered so far** with previous participants and a small number of new participants
    - Get feedback on the scoping research report and explore, refine and prioritise opportunity areas – NOTE: one round of feedback from participants has been incorporated into this document
    - Better understand the perspective of others who have not fully transitioned to Regenerative Agriculture and who may be skeptical – NOTE: in progress
- **Inviting participation into the next phases**
    - Understand who is interested in participating further to progress ideas to increase transition, and in what ways they would like to participate
- **Making choices about the direction with participants** (co-creation) – also known as *'going with the energy'* – may involve -
    - Exploring the interest in workshop(s) with groups(s) of stakeholders
    - Developing (shared) principles of facilitating transition to Regenerative Agriculture from the insight of others who are facilitating change, e.g. using the sugar cane case study and other practices as a starting point
    - Developing a theory of change as to what is required for individuals and across the system to increase the transition to Regenerative Agriculture, e.g. to create a tipping point and to help change stick
    - Identifying ideas that participants would like to progress and developing these further

Overall plan

I have completed Stage One Assessment, and have moved into Stage Two, per the diagram below. Stage Two will take approximately two years and will include workshops, further in-depth research as needed, supporting the ideas that are developed, and documentation.

Preliminary Scoping & Literature Review

Includes fieldwork in western NSW in January 2019

May 2017- Aug 2019

Preparing, inviting participation and convening workshops

Further in-depth rese in western NSW as needed

Supporting experiments, movements & initiatives

Documentation

Sept 2019 –Aug 2021

Continued support for experiments, movements & initiatives

Final Workshops & Documentation

Thesis submission

PhD Completion

Estimated 2022/23

8. Scoping Research – methodology

This section describes the methodology used for scoping research.

Evolution and purpose of scoping research

In the first stage of my PhD research, after some exploration and testing of topics, I identified Transition Design (TD) as the form of design that I wanted to research. I was also interested in increasing the sustainability of agriculture, and so I sought out projects where Transition Design could be of use to agriculture in NSW.

As touched upon in the overview, my first line of research uncovered the emerging area of governance of ecosystem services, e.g. collaborative management of the 'services' that the landscape provides such as water, temperature control, wind and weather protection, climate regulation, etc. Preliminary research revealed that there were a few regions in NSW that might be ready for such an approach, but I needed to validate the feasibility of my research out in the field. I prepared research questions and materials for a phase of scoping research, and obtained ethics approval mid-2018.

My first handful of interviews didn't invalidate the idea of governance of ecosystem services, but they turned me to a more direct route to influencing sustainability in agriculture: the growing movement of regenerative agriculture. There are a number of regenerative practices that have been around for 20-30 years, and are becoming more widely accepted (noting that Indigenous peoples have been practicing holistic, regenerative forms of agriculture for millennia), but it remains unclear why more farmers have not transitioned their properties to what some believe is a more ecologically and financially sustainable approach. I was urged to take this question on as a focus.

With this shift, I went back to the ethics committee and obtained approval for a revised approach to scoping in early 2019.

The purpose of scoping research was to:

1. Validate and refine the PhD topic
2. Determine an appropriate region, agricultural sector(s), scale of agriculture and key stakeholders for research
3. Begin to get to know the region, key stakeholders and the transition challenge from their perspective
4. Build buy-in with key stakeholders
5. Inform the design of the full research project
6. (Re)focus the literature review and proposal in preparation for Stage One assessment

Scoping research approach: qualitative methodologies

Qualitative methods from sociological traditions and design practice were drawn upon to inform the scoping research. A detailed methods document can be provided upon request.

The following methods were utilised in the scoping research:

- Semi-structured interviews and generative tools
- Literature review
- Visualisation & system mapping
- Ethnographic approaches, e.g. photography

Participant recruitment

Participant contact details were obtained through the following methods:

- Follow up on personal contacts, participant referrals as well as the contacts of supervisors and other researchers
- Contacting community and government stakeholders based on information available online

The following strategies were used to recruit sufficient participants:

1. Begin with contacts that are already known to myself, my supervisors, fellow researchers and colleagues
2. Reach out to these contacts through the means provided (email or telephone). Determine if it is worth a conversation, or if another referral is required. Follow any referrals (snowball sampling).
3. Conduct online research to map out key stakeholders in local regions. Contact these stakeholders through the means provided. Follow any referrals (snowball sampling).
4. Line up preliminary conversations and/or interviews as appropriate.
5. Visit the regions identified over the course of a 20-day trip through regional NSW. Through snowball sampling, make additional contacts during this visit.
6. As needed, repeat this process until sufficient participants are obtained.

Participants / Research cohort

Initial scoping focused primarily on proponents of Regenerative Agriculture, including innovators and early adopters. Many of these people are actively working to influence the uptake of regenerative methods. Later I began to speak with more farmers who were interested in transition or actively transitioning. Participants were sought from the following cohorts:

- Farmers who have already transitioned to regenerative methods or mixed methods
- Farmers who are in transition

- Farmers who interested in transitioning to regenerative methods but may hold some skepticism and/or are facing a number of barriers
- Agriculture extension officers and consultants who are working to support transition
- Land care organisations
- Commercial organisations, such as insurers, banking and agricultural suppliers
- Research, science and technology development organisations
- Entrepreneurs and innovators who are proponents of regenerative methods
- Others deemed appropriate by interviewees

Interview set-up and format

- Participants were invited by email, phone-call or in-person introduction
- Participants were supplied with an information sheet and consent form (for signature)
- Semi-structured interviews and farm tour (if relevant) were conducted
- 1-1.5 hours was requested
- Interview commenced with a bit of time to get to know each other, an overview of the project, an overview of the interview purpose, format and topics, a reiteration of how the participant's data will be used, and a discussion of any questions that the participant may have

The interview question guide that was used for scoping research can be provided upon request.

Ethical risks and risk management approach

Although the scoping phase was deemed low-risk, there are ethical considerations remaining for the full research project: participant commitment of time; the increased exposure of the researcher as advocate; the ethics committee's perspective on the use of a design research approach; and the potential to approach the Aboriginal community to understand their wisdom with respect to transitions. The role of drought, bushfires and other conditions must also be considered in this research. Risk mitigation strategies have been identified and will (continue to) be managed through UTS standard processes and tools, including a research risk management plan and a fieldwork risk assessment. The following risks will need to be actively managed throughout the project:

Participant commitment of time – The extent of participation will be established together with participants through the consent process as an opt-in opportunity, with no requirement to participate for the full course of the proposed research.

Exposure of the researcher as advocate – The researcher and participants are looking to shift entrenched power, even if gently. Social Theory and social psychology will inform design activities, and a risk management plan will be followed.

Ethics for design research – Typically, ethics committees require that all research questions and instruments are developed prior to giving ethics approval to engage in research activities, which contrasts with a design approach that works iteratively and in collaboration with participants to develop the way forward. A design approach is still structured, but more organic and emergent. I am not yet sure of the precedents at UTS or other academic institutions ethics requirements for social design processes.

Potential to approach Aboriginal community – It has been suggested that Indigenous wisdom regarding transitions should be engaged. If and when the time is right, ethics approval will need to be sought for this aspect of the research.

Duration of drought, incidence of bushfires, and other environmental conditions – If conditions such as the drought and bushfires become too severe, there is a possibility that this research may be inappropriate to continue.

Outtakes

Photo: Weethalle silos

Photo: There’s gold in them hills

Photo: Men's Shed, West Wyalong

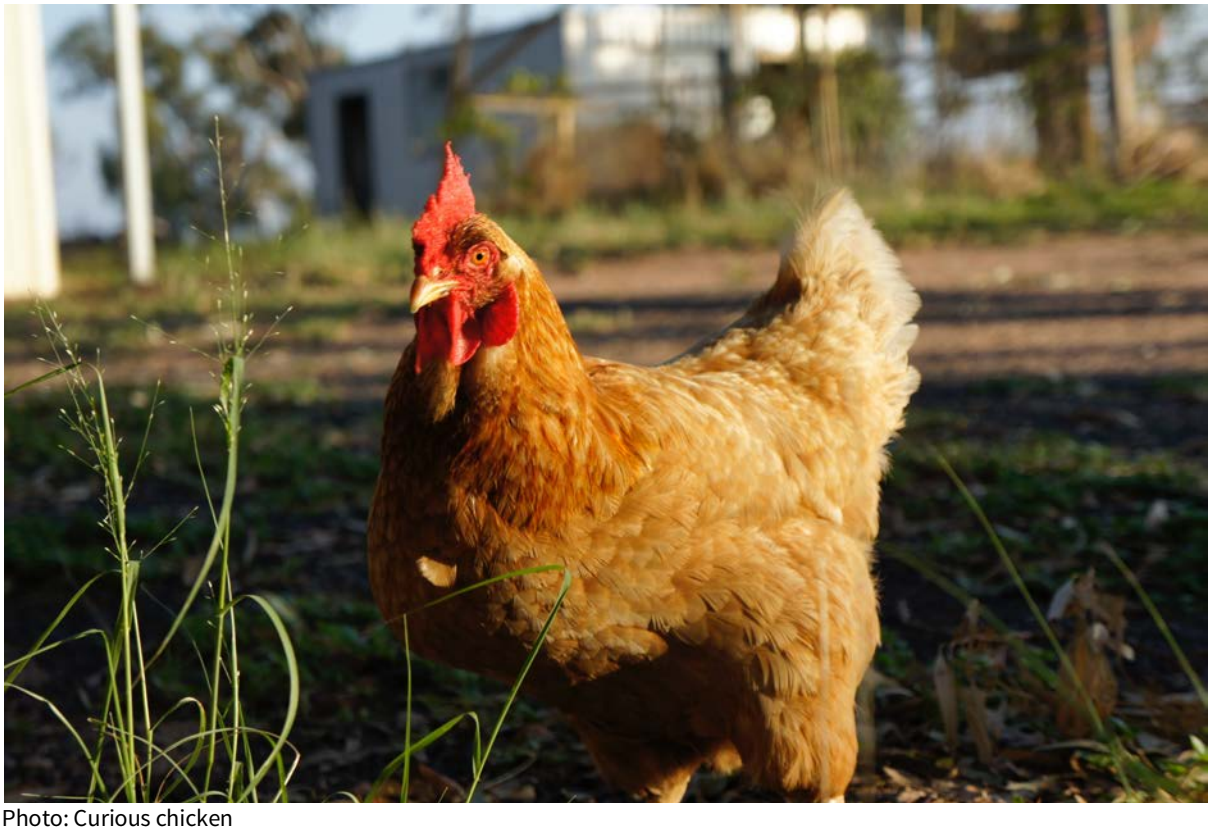
Photo: Curious chicken

Photo: Stay far away kangaroo

Photo: Farm ducks, very skeptical

Photo: Rainbow over Kandos

Photo: Office space, also known as ‘The Fish’

Photo: Greetings

Photo: Pelicans in Lake Cargelligo

Photo: DrinkIt Downs


Photo: The sheep literally standing in the way of my final drive home to Sydney

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