<u>Executive Summary</u>
What prevents the adoption of regenerative agriculture and what can we do about it?

Lessons from Participatory Modelling

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Executive Summary

Abstract

Australian agriculture faces a unique challenge in providing sufficient food for an island nation on limited arable land, while combating challenges of drought, fire, flooding, and desertification. While agriculture has traditionally conformed to intensive conventional methods, regenerative agricultural methods (RegenAg) are designed to attune agricultural practices to the natural design of earth's cycles and support systems. Past attempts to introduce these methods suggest their adoption hinges on a good understanding of biophysical processes, and also, crucially, on landholder attitudes, beliefs, perceptions, and values. If ignored, these attitudes, beliefs, perceptions, and values can become an obstacle for transitioning towards synergistic relationships with the land. 'Narratives', or the stories individuals tell themselves provide a way to both understand these attitudes and perceptions, and provide a format with which to communicate with stakeholders.

For researchers, educators, consultants, and trainers, combining narratives with Participatory Modelling (PM) processes can precede and accompany any effort to stimulate wider adoption of RegenAg. To provide a blueprint of how outreach for RegenAg might be attuned to people's belief systems and personal narratives, I report on a PM workshop conducted with RegenAg stakeholders in Australia, aimed at co-constructing a semi-quantitative conceptual model using Fuzzy Cognitive Mapping (FCM). The FCM was used to unpack stakeholder perspectives into a 'mental model' of the barriers and opportunities for adoption of RegenAg practices, and to identify actions that may be actioned to close the gap between the two. To promote a better understanding, communication and internalization of the outcomes represented by the model, I extracted the dominant narratives to highlight the complexity of the agricultural system and to better reveal what stories might lead to better outcomes. These methods and findings are relevant for those seeking to promote adoption of RegenAg in Australia, including landholders, non-profit and research organizations, and government officials. While RegenAg has made significant headway in Australia in the last decades, incorporating what can be learned from behavioral science presents an opportunity for grassroots conversations and community engagement to scale a transformative dialogue as we seek to regenerate the Australian landscape.

About This Project

This project was part of doctoral research undertaken at the University of Technology Sydney, examining how insights from the behavioral sciences—how people think, learn, and behave— might improve the design, facilitation, and evaluation of Participatory Modelling (PM) to drive better management of socio-ecological systems (SES), as exemplified by the adoption of regenerative agriculture in Australia. This project partnered with The Mulloon Institute (TMI) and the Mulloon Rehydration Initiative to conduct this research. **The Mulloon Rehydration Initiative is jointly funded through the Mulloon Institute and the Australian Government's National Landcare Program.** This project is the product of the expertise of RegenAg advocates, including academics, government officials, trainers, and landholders and gathered through a participatory modelling workshop held in July of 2020 and semi-structured interviews conducted through August 2020-January 2021.

Context: Regenerative Agriculture in Australia

In the last few decades, Australian farmers have seen enormous changes in their farm systems, but also in the social, economic, and political systems that govern the land across the country (Stafford Smith et al., 2007). Agriculture is inherently exposed to "multiple, simultaneous and inter-connected ecological, economic and social pressures" (Feola et al., 2015; Gosnell et al., 2019; Hacker et al., 2010; O'Brien and Leichenko, 2000; Oomen et al., 2016). To appropriately address these pressures, research suggests that we need an understanding of these ecological, environmental, and social factors, and we must understand the preferences and motivations of farmers (Jakoby et al., 2014). As such, it is necessary to grasp the concepts of thresholds and of non-linear trends in these complex, socio-environmental systems, and crucially, the role of the individuals within it, as it is their preferences and decisions that shape these farm ecosystems.

Regenerative agriculture (RegenAg) presents a solution to some of the issues facing Australian agriculture, and it presents a quandary. In contrast to conventional agricultural techniques which may focus on a mechanistic and reductionist approach to maximal production, RegenAg instead focuses on aligning with landscape function, regenerating biodiversity, and partnering with animals, microbes, and pollinators for a more holistic and resilient approach (Chapman, 2019; Gordon, 2020; Murphy, 2021). While there are many techniques, practices, and traditions within RegenAg, for this paper, I define RegenAg[1] as an "alternative form of food and fiber production, concern[ed] with enhancing and restoring resilient systems supported by functional ecosystem processes and healthy, organic soils capable of producing a full suite of ecosystem services, among them soil carbon sequestration and improved soil water retention" (Gosnell et al., 2019). Adoption of RegenAg practices in Australia has increased, but conventional farming techniques remain the dominant paradigm. Understanding individual perceptions about barriers and opportunities should perhaps precede and definitely accompany any effort to increase adoption of RegenAg. By considering how farmers on the ground make decisions, we can determine what patterns of thinking are dominant. If we understand those patterns, we can see how an individual decision-making process might block or shape potential solutions, and how framing different options might encourage more effective outreach and adoption (Eakin et al., 2019). In short, instead of starting with policy, I started with people.

Overview of Research

This project was part of doctoral research undertaken at the University of Technology Sydney, examining how insights from the behavioral sciences—how people think, learn, and behave— might improve the design, facilitation, and evaluation of Participatory Modelling (PM) to drive better management of socio-ecological systems (SES), as exemplified by the adoption of regenerative agriculture (RegenAg) in Australia as an example of one such system. There were two key aims: 1) to apply insights from behavioral science to improve the facilitation of PM and other participatory outreach methods; and 2) to understand the barriers preventing increased adoption of RegenAg and to devise education and outreach strategies to overcome those barriers. This project partnered with The Mulloon Institute to conduct this research, and drew from the expertise of RegenAg advocates, including academics, government officials, trainers, and landholders.

I initially interviewed RegenAg stakeholders to understand their experience with RegenAg, and what they saw as the key barriers to adoption from training farmers, conducting research, or observing their peers. This provided the basis for a PM

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[1] There are a number of conflicting definitions for regenerative agriculture, many of which are covered by Newton et al.(2020). I chose a definition that was deliberately broad to capture the variety of methods and techniques that stand in contrast to conventional agriculture.

workshop to bring together advocates of RegenAg in an effort to 'map' what stands in the way of increasing adoption in Australia, using fuzzy cognitive mapping. I then followed up with stakeholders to continue to refine the map and the collective understanding of RegenAg, culminating in the extraction of several narratives that capture various stories that are present in the Australian agricultural paradigm. As a result, I present the gaps, resource needs, and solutions identified by the stakeholders and the narratives, in the hopes of improving outreach and education campaigns in the RegenAg space. To do so, this research drew on several key areas of research, outlined below.

Human Behaviour

It was long assumed that giving people new facts meant new beliefs would emerge. However, advances in behavioral economics, psychology, neuroscience, and other fields exposed the myth of the all-knowing, hyper-rational human (Gintis, 2000; Lee et al., 2009; Thaler, 2018). Research in this space led to the awarding of Kahneman's Nobel Prize in 2002, and subsequent work by scholars like Thaler, Gigerenzer, Ariely, Cialdini, and others have suggested there are, at a minimum, limits to human 'rationality' (Ariely and Wertenbroch, 2002; Cialdini, 2003; Gigerenzer, 2011; Tversky and Kahneman, 1974).

Because of this innate 'wiring' of the mind, **information alone does not work in changing human behavior**. Despite our best intentions, our minds do not build a neat 'pros and cons' list as we are presented with new facts. This, in part, explains why the actions recommended by 'science' are often ignored, with climate change the most visible example (Glynn et al., 2017). Bringing facts and data to win the argument does not guarantee successful outcomes in the management of social and environmental systems. Unfortunately, people are not the rational decision-makers we wish we were.

As a result, researchers and educators must look at how the mind actually works, on its own and around others, to understand and to design research, education, and outreach accordingly. Left alone, natural human tendencies can lead to oversimplification and a misrepresentation of reality (Beratan, 2007; Gilovich et al., 2002; Levine et al., 2015). What is believed to be true, is rarely the whole truth (and sometimes, it is wildly off). Predictions can be wrong, probabilities wildly inaccurate, facts can be misinterpreted, statements can be taken as personal attacks, and individuals can feel alone and unheard in the middle of a crowded room. The nature of the human mind, and the dynamics that are created when people are placed in a room together therefore present certain challenges—but also certain opportunities if accommodated accordingly. The way we design and facilitate the interactions and the environment where such learning can happen matters. And it is encouraging that we can be proactive and deliberate in drawing from scientific research to do so.

Participatory Modelling

Systems thinking is understanding that a system is more than the sum of its parts and introduces concepts like emergence, feedback loops, non-linear behavior, and uncertainty that are crucial to manage complex systems (Checkland, 1981; Keen et al., 2005; Meadows and Wright, 2008). Meanwhile, computer simulation modelling allows us to explore solutions and scenarios in a safe 'virtual' environment—one that allows us to grapple with the 'complexity' of a system without actually intervening and experiencing real-life consequences (Epstein, 1996; Luna-Reyes et al., 2019). One method that combines both of these approaches is participatory modelling (PM). PM is an umbrella term for tools and methods where stakeholders (i.e., members of the system of interest) build the model with researchers (Kenny, 2017; Voinov and Bousquet, 2010). In effective PM exercises, participants are empowered to ask questions, find answers, and make key decisions in the model-building process.

What is less understood in PM is how to overcome the patterns of the human mind that pose a significant barrier to the sort of transformational and systemic change sought by practitioners, a barrier also faced by RegenAg advocates (Hamalainen, 2015; Voinov and Gaddis, 2017). Although the model produced during a PM process is useful, the increasing interest in the social engagement, negotiation, learning, and mediation that occurs 'around' the modelling effort stands to benefit PM, participatory research, and, in this instance, grassroots efforts to increase adoption of RegenAg. I explored the use of narratives as one way to address the challenge of communicating urge action and ownership of sustainable RegenAg practices (Eakin et al., 2019; Moezzi et al., 2017)

Research Findings

This research identified three key 'themes', with proposed applications to explore further in increasing adoption of RegenAg, specifically in delivering effective outreach and education to that effect. The work highlights increasing adoption of regenerative agriculture will require investment to break the 'reinforcing' structure of Australian agriculture, how narratives can be an effective tool in formal and informal research, and the necessity of using deliberate and proactive strategies to address the fear of stakeholders in individual and collective conversations.

Inertia and Reinforcement in the Agricultural Paradigm

The actions needed to increase adoption of 'RegenAg' need to break the current 'reinforcing' paradigm of conventional agriculture. Currently, business, government, the market, and social pressures seem to spiral down together in a race to the bottom, with few existing relationships in the system to incentivize a transformation. Understanding these complex forces highlights the need for coordinated actions at the institutional, social, and individual levels, across immediate and long timescales (decades). It is vital that RegenAg advocates find the messages and actions that overcome any paralysis of action in individuals and in communities (Polasky et al., 2020). Research suggests that:

- Institutions, mainly government, play a large role suggesting the dominant paradigm is one supportive of conventional agriculture.
- The system and the relationships between entities (government, business, and consumers) has the potential to reinforce and 'lock-in' conventional agricultural practices.
- Due to the lack of balancing relationships counteracting conventional agriculture, the system moves in a 'race to the bottom'.
- A number of barriers, including an up-front cost to convert to regenerative, debt levels, lack of resources, and ingrained view that environmental and economic outcomes cannot both be achieved, all suggest a transition to RegenAg is expensive. This expense may or may not reflect reality, particularly when considering the return on investment and resilience offered by many RegenAg practices, but the 'perception' of the expense seems to be important for those considering a transition.
- Without significant policies or actions to provide a balancing relationship, there is no obvious incentive to change. Climate change could be one incentive, as it presents a severe challenge to human society. However, its impacts are often unclear, disputed, or occur over the long-term. Without making the severe consequences of conventional agriculture (through impacts on climate change, biodiversity, human health, or something else) immediately apparent, it is difficult for RegenAg to generate enough urgency to 'break in' to the system.

- Key stakeholders in favor of RegenAg believe this to be true. How can those balancing relationships be introduced to the system?

- Determining where and how to value natural capital would be vital for those seeking to increase adoption of RegenAg. Such efforts may also address the difficulties of *"going green when you're in the red."*

The Power of Narratives

Communication with stakeholders can be improved by using the power of storytelling (narratives) to communicate research results in a clear and compelling way. Narratives and stories have been used for research in psychology, anthropology, sociology, health research, and climate and energy science. A narrative can be defined as "collecting and analyzing the accounts people tell to describe experiences and offer interpretation" (Overcash et al. 2003). Stories create a structure of 'meaning', and can be used to understand, rewrite, and shape beliefs (Baumeister and Newman, 1994; Luhman and Boje, 2001; McAdams and McLean, 2013). Narratives offer a practical way to communicate complexity, a device to collect and to understand counterarguments without becoming divisive, and a mechanism to urge action and ownership of the research findings. By collaborating with stakeholders to identify and validate patterns, I extracted 5 narratives from the collective model, each as a possible interpretation of the 'patterns' within the system that highlighted key variables and suggested possible solutions to pursue:

1. **Government First:** The culture and current paradigm is so enshrined in society that only the government has the resources and the ability to break us out of it. It is their job to protect the environment and future generations and they must act and do so quickly. Their investment in and provision of incentives for transitioning to RegenAg is the first step in creating a spill-on effect to the rest of the system.

2. **The Market Matters:** The combination of 'Consumer Demand for Cheap Food' and 'Vested Business Interests', along with the surrounding infrastructure can keep conventional agriculture in place by creating a system that seems to race to the bottom. As noted by one participant, the "consumer demand/expectations for 'brandless' cheap food commodities [is a] major hindrance" to the adoption of regenerative agricultural practices, as they tend to carry a higher up-front cost, and often necessitate premium pricing as a result. Shifting this demand to food more aligned with holistic and regenerative practices puts pressure on businesses and government to incentivize those practices further and provide the structures and policies needed to produce at scale.

3. **Pressured Communities:** Our communities have been conditioned to feel conventional agriculture is the only way, and this is present in our interactions with family members, neighbors, and peers in the agricultural world. As noted by one stakeholder, the supporting structures around agriculture (banks, agronomists, certain industry groups) also "have a lot invested in conventional farming" which strengthens this connection. Unless we can actively promote supportive mentors, community champions, community groups, and a solid evidence base, people will continue to avoid transitioning to practices viewed as 'unconventional', even 'radical'.

4. **Start with People:** We have to start from the ground-up in creating a cultural change, by capturing the hearts and minds of farmers through conversations, education, and outreach. This is where conversations and dialogue need to proceed, both in understanding where individual circumstances work against a transition to RegenAg, and in tailoring messaging to highlight if, where, and how practices of RegenAg might better align with the values and beliefs of farmers considering a transition.

5. **Community by Community:** As agriculture is often an area confined by ecological boundaries, we have to identify potential communities of farmers within watershed areas and provide incentives for individuals to change and for

communities to collaborate. This focuses on an organization-led charge to benefit from the emergence of social, economic, and environmental outcomes that arrive from economies of scale. That may include new marketing opportunities, or changes at the watershed scale allowing for improved production, or new social opportunities resulting from collaboration. Ideally, a permanent organization must undertake the work of identifying suitable communities, convincing the community to join, and to oversee the process of this change to totally transform existing farming operations into truly RegenAg farms.

The benefits of a single narrative is that it allows for a mechanism to reduce complexity, to understand a single story and not be overwhelmed by the complexity of the system and its interconnections. At the same time, the presence of multiple, at times conflicting, narratives provides a tool to prompt doubt, curiosity, and interest from those loyal to a singular narrative. Narratives thus allow for us to scale the discussion to the level most appropriate for the stakeholders at hand.

Addressing Fear through Considered Communication

Understanding the different fears that shape an individual's outlook on the world can help tailor education and outreach to make more of an impact. Addressing fear in its myriad of forms can be undertaken in the short-term to complement and to ultimately strengthen longer-term efforts to address social, market, and institutional forces.

- 'Fear of change', 'Fear of being different', and 'Fear of judgment from peers' were all mentioned in the workshop, suggesting fear plays a central role in the adoption of Regen Ag.
- Perceived threats (including unconscious or indeliberate attacks on someone's identity) can lock people into negative thought patterns that make learning very difficult, bordering on impossible (Kaplan et al., 2016; Nauroth et al., 2017).
- As educators or trainers, we can reduce (unseen) stress and (unspoken) fear by establishing our motive and intent clearly, and aligning that with a common interest of stakeholders (Druckman and Olekalns, 2008; Martinovsky, 2015). Building trust requires that others believe that personal interests will not supersede their own. For example, "I am not here to tell you what to do, I am here to learn with and from all of you", or a similar framing encourages a win-win focus for all parties on collaboration and learning.
- Building trust is valuable and the concept of 'psychological safety' means creating an environment where healthy argument is possible, and people can bring their best selves (Edmondson and Lei 2014).
- To create psychological safety (Edmondson 2018):
  - Establish a common purpose. "We are all here to learn" is a common and great starting point.
  - Present conflict as an opportunity for discovering things together from different perspectives.
  - Reframe failure. Finding points or perspectives of disagreement present an opportunity to learn, rather than a reason to quit. 'Winning' an argument is not the goal.
  - Humility and vulnerability prompt curiosity, which is crucial to getting others to be 'open' to dialogue, and ultimately to learning.

Future Directions

Advocates of RegenAg might often find themselves in conversations with people who openly oppose their positions or, at the very least, are skeptical of RegenAg. Every one of these conversations can be unique, as it may occur with different

individuals, in different settings, and at different points in their lives (both in experience, and in relation to other events in their life, i.e. haven't had coffee yet). And yet, it is critical to directly engage stakeholders, as adoption relies on the biophysical limits of the land they manage and it is a personal and social issue (Baumgart-Getz et al., 2012; Pannell et al., 2006; Prokopy et al., 2019; Triste et al., 2018). By further investigating the validity of the narratives and their implications, RegenAg advocates could identify additional actions to improve adoption and highlight additional barriers that were not apparent to research participants. In particular, blindspots could be illuminated from input from and conversations with the voices and perceptions from conventional agriculture. By facilitating conversations to understand different (and at times opposing) stakeholder groups, RegenAg advocates could focus on those actions and policies upon which there is both broad consensus and a sufficient evidence base to operate.

This research helped to explore the idea of what constitutes an ideal learning environment for outreach. Accounting for the identities, emotions, social dynamics and narratives that stakeholders bring with them leads to more effective education and communication. Identifying narratives can assist in that process, as it can effectively align the insights developed from a participatory exercise with the way the mind best assimilates information. This format of research is compatible with the existence of various (and sometimes competing) narratives—more than one may be present, and the 'priority' for any particular narrative may shift.

Taken together, the findings of this research have a number of important implications for RegenAg in Australia. In this case study, the co-construction of the FCM with stakeholders revealed the myriad of connections at play in the adoption of RegenAg in Australia, highlighting the reinforcing relationships that keep conventional agriculture as the dominant paradigm. To combat this, RegenAg advocates, practitioners, and educators must find a way to introduce 'balancing' relationships into the system, which will likely require coordinated efforts across sectors over the medium to long term. Such actions are necessary for RegenAg to play a greater role in Australia's agricultural paradigm, currently reliant on conventional agriculture with few internal incentives to change. The crisis of climate change and a degrading environment may be the ultimate reasons for change, but in the short-term, RegenAg advocates can also tailor communication, education, and outreach efforts to prompt transformative conversations and strengthen the grassroots dialogue for a healthier environment, healthier communities, and a healthier society.

Further Reading

The Call of the Reed Warbler by Charles Massy

Think Again by Adam Grant

Crucial Conversations by Kerry Patterson, Ron McMillan & Al Switzler

Influence and Pre-Suasion by Robert Cialdini

Thinking Fast and Slow by Daniel Kahneman

Behave by Robert Sapolsky

Predictably Irrational by Dan Ariely

The Fearless Organization by Amy C. Edmondson