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Global Vision, Leadership and innovation in Agriculture

Community-Centric Innovation and the Regenerative Farming Frontier

By Sam Lang

2016 Nuffield Scholar

Langsam1989@gmail.com

DairyNZ

beef+lamb new zealand

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Executive Summary

There is a new frontier of food and farming emerging. Its emergence is in part a response to the limitations and negative impacts of our current farm systems, and in part driven by a realisation that 'regenerative farming' is opening up a new world of possibility. Many of our current farming systems are being 'squeezed' by commodity market competition and volatility, rising costs, public scrutiny and regulation, plus potentially disruptive technologies that bring significant challenges to the ongoing viability of agricultural businesses - farming is becoming increasingly complex and the future less certain. Recent KPMG Agribusiness Agendas have identified these pressures and called for New Zealand agriculture to target high end consumers, focusing on product and environmental leadership and excellence. What is perhaps less emphasised is the **scale** of shifts required in our farm systems if we are to truly respond to our changing reality.

This report is a call for a new and additional 'approach' to agricultural development and innovation in New Zealand. As I travelled with Nuffield it became increasingly clear that regenerative farming not only full of opportunities, but shifting our farm systems and practises in this direction is both a positive and necessary response to our changing reality as farmers. Regenerative farming is a broadly defined system of principles and practises focused on biodiversity, soil health, ecosystem function, carbon sequestration, improving yields, climatic resilience and health and vitality for farming communities. A key feature of these farming systems is their high demand for knowledge and creativity in designing and managing the complex biological relationships that underpin their success, as opposed to conventional systems that are more dependent on inputs for control and management. This key distinction is where our current agricultural development and innovation system falls short in its potential to support regenerative farming. Our current system focuses on a "science-driven, linear, technology transfer-oriented approach to innovation" (Turner et al. 2015) that, while perhaps suited to more homogenous and input-oriented conventional farm systems, does not align well with the more holistic and high risk innovation demands of regenerative farming (that also offers less opportunities for agribusinesses).

The 'approach' to support the innovation of regenerative farming systems and practises needs to move beyond old dichotomies between 'top-down' and 'bottom-up' drivers of change, towards community-centric approaches guided by the knowledge, experience and creativity of farmers and rural communities, with the support of other actors (ie. government, policy, research, relevant businesses and organisations etc). Farmer and practitioner experiences of making or

supporting shifts towards regenerative farming, around the world, have formed the basis for the conclusions of this report. Community-centric approaches were observed to facilitate diverse participation and place equal value on local and external expertise, where everyone 'meets as equals' in a shared commitment to achieving community goals. In this manner, the diverse interests of communities and society can be acknowledged and incorporated into decision-making and action, with the potential to reconcile apparent conflicts within and between rural communities and wider society.

A community-centric approach to regenerative farming innovation is also a principle-led and prototyping approach. A principle-led approach is a shift way from 'recipe' farm systems that are often inappropriately applied, towards a focus on translating farming principles into the diverse contexts created by land, climate and farmer skills and aspirations. A prototyping approach tests possible solutions to complex settings with a fast-fail methodology, representing a new approach to learning that focuses on diverse teams, innovation and agile testing, guided by practitioners such as Otto Scharmer and Zaid Hassan. A community-centric approach engages actors from across the system on challenges at a range of scales, such as water quality management in a catchment or rural employment/livelihoods, to challenges on individual farms (ie. what trees to plant where) that may or may not be shared by other farmers. It recognises the inherent connectedness between individual and collection actions, utilising diverse participation and commitment to understand complex settings and develop solutions that are beyond the capacity of any individual.

Mangarara Station, where I now live and work, is committed to a regenerative farming vision and is confronted every day with the challenge (and excitement) of working towards it. We hope to build mutually beneficial relationships with many different people, from local farmers and community members, organisations, to regional and national policymakers, researchers, sector organisations and NGOs, entrepreneurs and businesses, software developers and generally any creative person who sees opportunities here to support what we are trying to achieve. There is a huge amount that we don't know, and therefore we must experiment based on existing knowledge, intuition and creative thought about what might be possible. It is essential that regenerative farming innovation is supported by the institutions and organisations whose mandates align with the potential value regenerative farming can generate. The opportunity for New Zealand (and other countries) is to collectively build more diverse, integrated and resilient landscapes, economies and communities that contribute positively to the future we want to create.

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To my fellow Nuffielders both in New Zealand and internationally, you're a great bunch and I continue to learn and grow thanks to your support, Finally to everyone who connected, hosted and were willing to be interviewed, thank you for your incredible generosity. I hope that this report might offer some value to continuing the great work you're all doing!

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Contents

1. Introduction: 8
1.1 Focus of this report 10
1.2 Regenerative Agriculture and the 'shift' 12
1.3 Research question 13
1.4 Structure of the report 13
2. Case study farmers 14
3. Thematic Analysis 18
3.1 Necessity & Possibility 18
3.2 Community-centric innovation & learning 21
3.4 'Flaws' in the system 26
4. Discussion: Supporting regenerative shifts across multiple planes 30
4.1 Principles and prototypes 30
4.2 How could this shift play out? A Mangarara Prototype 33
4.2.1 Community 33
4.2.2 Soils & Ecology 35
4.2.3 Technology, Infrastructure and Management 36
4.2.4 Business Models, Markets and New Revenue Streams 37
4.2.5 Not-From-Profit Resources 38
4.2.6 New Narrative 39
5. Conclusions 40
References 41
Appendix A: List of key visits and interviews 43

Background

It has been a privilege to be selected as a Nuffield Scholar and have the opportunity to meet and experience so many interesting and inspiring people and places. Two years ago I found myself starting out fresh as a shepherd for my uncle on a Central Hawke's Bay hill country farm, previously run by my grandparents, a place I've always considered home. Prior to this move I was working at the Environmental Protection Authority where I had been helping run the Board of Inquiry process for the Tukituki Catchment land & water plan. Observing that adversarial, legislative process dominated by lawyers and consultants, it was clear that New Zealand desperately needed to find better ways to make community decisions, rather than simply reverting to the courts. That was a good enough excuse to take a leap of faith into an uncertain future in agriculture.

My travels with Nuffield spanned seven months and 19 countries. My intuition from experiences to date suggested that major changes in our farming and food systems were approaching. I set out with the goal of better understanding the shifts of farmers who have been blazing new trails in farm system design and practise, in response to our rapidly changing world. I chose 'regenerative' farmers as case studies, assuming that their systems and practises would be very different from 'conventional' farmers, and admittedly I was naturally curious about this farming philosophy. While on this journey I came to realise that our 'approach' to supporting agricultural development and innovation ultimately underpins our pathway forward. This report integrates this realisation into two points of focus; the shift in approach needed to foster community-centric innovation in our farm systems and practises; and the principles of 'regenerative agriculture' that I found both logical and timely as a guiding compass for how we progress.

Since returning from my Nuffield travels I have joined the team at Mangarara Station, a 610ha hill country farm in Central Hawke's Bay committed to developing regenerative farming systems and practises appropriate to our climate, landscape and community - it only seems fair that I should practise what I'm preaching! My initial experiences of the short and long term challenges of working to this vision have helped ground my thinking. My experience of pastoral farming, and its dominance in the New Zealand landscape (particularly hill country farming) make it a strong focus of this report. However the majority of the farmers I visited overseas whose experiences helped shape this report were not pastoral farmers. The dual focuses of this report are therefore relevant to the broader New Zealand agricultural system and so this report has much broader relevance.

1. Introduction:

In recent years our traditional farming models have been increasingly squeezed on a number of fronts. Commodity market competition and price volatility, public scrutiny and increasing regulations, plus potentially threatening disruptive technologies coalesce to paint a complex picture that depicts an increasingly uncertain world for farmers and rural communities. In what direction might we adapt our farm and food systems in response to these changes? How might we need to evolve existing approaches or create new approaches to support these shifts?

Terms such as ‘disruptive’ have become common in agricultural media as technological leaps and business innovations threaten to displace traditional agricultural production (think synthetic proteins, 3D printed food, vertical farms). Heralding this wave of disruptive innovation as the ‘Gateway to Ag 2.0’, Rosie Bosworth, writing for Pure Advantage suggests that New Zealand could soon become the ‘Detroit of agriculture’ citing our current lack of participation in this new technology-driven frontier of food (Pure Advantage, 2016). The global benefits these innovations claim include more ethical, safe, environmentally responsible and eventually cheaper food choices. However questions remain about how fast these technologies will scale, how cheap their products will be, and how and when they will impact New Zealand producers. Some might argue that this is already happening, and certainly we shouldn’t be complacent. Whatever the eventual outcome I support the intent of efforts to displace ‘factory’ animal farming and input-intensive farm systems around the world that ultimately come with large social, ecological and economic costs that affect us all (ecosystem degradation, biodiversity loss, chemical contamination, greenhouse gas emissions etc). I’ve seen many and they leave a bad taste.

In New Zealand many of our pastoral systems are already under pressure to maintain viability in the face of increasing market volatility and downward price pressure as developing countries increasingly compete in our traditional commodity markets. Recent KPMG Agribusiness Agendas (KPMG 2015; 2016a; 2016b) have called for New Zealand agriculture to target high end consumers with quality products or risk being stuck in the commodity trap. They’ve also highlighted the increasing ‘social license’ pressures and regulation facing farmers as the New Zealand public become increasingly conscious of the negative impacts of well over a century of agricultural development that, while bringing many benefits to our country, has also resulted in

high rates of erosion, threatened native ecosystems, poor freshwater quality (in some areas), high per capita greenhouse gas emissions, increased flood risks etc.

Where some celebrate the imminent arrival of disruptive technologies and regulation to ‘solve’ agriculture’s environmental and ethical misdemeanours, these events could also generate negative side effects, including an accelerated decline of rural communities. New Zealand farmers could be forced to abandon their land if they can no longer compete with developing countries or new technologies. Furthermore the physical impacts of climate change alone might compromise the viability of much of our farmland, particularly land that is prone to erosion, floods, droughts or sea level rise. For the sake of our rural communities let’s hope these events leave a little breathing room for adaptation. However let’s also not be complacent as it appears there are a number of storms looming, each of which threatens conventional pastoral farming as we know it.

Who benefits if these storms come to pass? There are millions of hectares of pastoral land currently managed largely by farmers. There’s no argument that we could do better, but when it comes down to it, experienced and dedicated farmers are the people best placed to delicately manage the interests of New Zealand citizens in our pastoral landscapes (which include greenhouse gas emissions/sequestration, erosion control, flood risk reduction, biodiversity habitat, amenity, rural economy & community wellbeing, amenity etc). Putting historic mistakes and wrongs aside, the value to New Zealand for all this work is significant, and there is potential to deliver much more.

It’s clearly in the interests of all New Zealanders for our farming communities to survive and thrive. However as farmers we can and must do a better job of incorporating the interests of all New Zealand citizens into our farm systems and everyday practises. Both urban and rural citizens are complicit in producing our current situation - a lot of past agricultural development was driven by public policy. Rather than attenuating blame to poor performers, our focus must be on acknowledging our current situation and forging new pathways forward. This is going to require a different approach.

When looking to the future potential of ‘co-innovation’ for addressing the complex problems increasing facing the New Zealand Agricultural Innovation System (AIS) , Turner et al (2015) identify a number of “shortcomings of using a science-driven, linear, technology transfer-

oriented approach to innovation in New Zealand (i.e. lack of end-user involvement creates a low adoption of technologies, because these do not fit in farming systems and no effort is made to create an enabling context for adoption". They also find that our AIS has "three main blocking mechanisms related to three institutional logics: (i) competitive science in silos, (ii) laissez faire innovation, and (iii) science centered innovation." Turner et al. (2015) clearly highlight the challenges associated with an AIS that is often removed from the everyday practises of farmers and rural communities and therefore struggling to meet the complex challenges now facing these communities.

When it comes to incorporating public values into farm systems and practises (environmental performance, health and safety etc), the policy or regulation intended to achieve this is often created by people similarly removed from the context where policy or regulation takes effect. In both cases there has undoubtedly been a great deal of value created or protected via these institutional mechanisms, however it is increasingly clear that past and present approaches will fall short of delivering the change needed to respond and adapt to our rapidly changing world. Therefore the big question is how our current approaches need to change in order to support the shifts in our farm systems and practises required by our changing context. We cannot afford to suffer the social cost of another upheaval, like that of subsidy removal in the 80's, which delivered sudden and profound change as well as a large degree of pain for many farmers, although most farmers today would not go back.

1.1 Focus of this report

This report is a call for a new and additional 'approach' to agricultural development and innovation in New Zealand, an approach that I've come to see as essential but largely missing from our current agricultural organisations, institutions and communities.

As introduced previously, farmers are increasingly being asked to be more adaptive, more knowledgeable, more innovative and 'better'. Much like our farms and farmers, the approaches and practitioners currently employed to respond to these challenges are diverse and there appears to be a positive trend towards participatory extension and co-design or co-innovation as referred to by Turner et al. (2015). It is important to be clear on the distinction between most current innovation and extension approaches and the focus of this report. What we might call 'current system approaches' are typically institution-led, non-agile and defined by the status quo, maintaining significant inertia (resistance to change) within the structures and operations of

politics, national and local government, industry, sector organisations, NGOs, banks, agribusiness, media etc. In contrast the focus on this report attempts to move past the old dichotomy between top-down and bottom-up approaches to change, towards community-centric approaches that are guided by the experience, creativity and commitment of farmers and rural communities, with the support of other actors (ie. Government, policy, research, consultants, businesses, organisations etc).

> **A community-centric approach to agricultural development and innovation aims to create the space to utilise and grow the talents and passions of local people, for whom the outcomes have personal meaning. It treats communities as the primary source of knowledge (local wisdom) and creativity, alongside supporting involvement from other actors. In this way the false dichotomy between local and external expertise is eroded in favour of a meeting of equals, all with different roles and contributions to community goals. A community-centric approach also facilitates diverse participation which is essential if rural communities are to successfully integrate the interests of all society into future farm systems.**

A parallel focus of this report is 'regenerative agriculture' (also referred to as regenerative farming). As I travelled and witnessed the detrimental externalities of past and present agricultural systems, alongside the possibilities demonstrated by regenerative agriculture practitioners it became clear that a 'shift' towards regenerative agriculture was necessary. This philosophy and its broad principles naturally integrate the needs and values of all society. This shift requires extensive knowledge of biological, ecological, and human (incl. economic) systems, plus significant creativity in order to develop farm systems and practises that meet the broad interests of society. In particular, it is the innovation of these systems and practises on the frontier of this shift to regenerative farming that requires the community-centric approach advocated for in this report.

1.2 Regenerative Agriculture and the 'shift'

Regenerative Agriculture can be defined as follows:

> *"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 systems draws from decades of scientific and applied research by the global communities of organic farming, agroecology, Holistic Management and agroforestry."*
> *(www.regenerativeagriculturedefinition.com)*

This definition also contains four principles of Regenerative Agriculture (previously seven) which are as follows:

1. *Progressively improve whole ecosystems (soil, water & biodiversity)*
2. *Create context-specific decisions and make holistic decisions that express the essence of each farm*
3. *Ensure and develop just and reciprocal relationships amongst small stakeholders*
4. *Continually grow and evolve individuals, farms and communities to express their innate potential*

As readers will discover, some of the farmers profiled in this report manage their systems to organic or biodynamic certification standards. However I encourage readers not to get caught up in any existing preconceptions of these farmers, as they were typically acting above and beyond their requirements, of which I'm sometimes cynical. I found both farmers and farm systems to be defined more by the principles of regenerative agriculture, motivated by various factors such as productivity gains, health concerns, value-add opportunities, produce quality, financial resilience and moral drivers.

The 'shift'. This word is used because it implies more gradual transition with a direction in mind, as opposed to 'change' which is less direction-oriented and potentially more sudden. The intention here is to acknowledge that regenerative farm system design and practises are typically very knowledge intensive and locally specific, requiring a fundamentally different approach to innovation, development and management than many conventional farm systems.

1.3 Research question

As my travels continued I began to notice two things;

1. Regenerative farming principles and practises closely aligned with my pre-existing and evolving thoughts on the future direction for New Zealand pastoral farming. As a rule regenerative farmers were also extremely engaging, energetic and happy which naturally increased my curiosity.

2. Regenerative farmers were usually members of strong, supportive communities who shared knowledge, resources and co-developed ideas and opportunities. These communities appeared to be the primary source of positive action and change, where the institutions traditionally 'leading' the direction of agricultural development and innovation either took a back seat, or were invited into community discussions and projects as equals.

These two observations led to the realisation that developing regenerative farming systems would be a positive direction for New Zealand, and that 'innovative learning communities' (as we'll call them) are critical to its success. Therefore my research question became:

"*How can we support shifts to regenerative farming?"*.

1.4 Structure of the report

This report relies on the rich and compelling experiences and stories of the many farmers, researchers, consultants and community members I visited during my seven months of overseas travel - I hope I've honoured their stories and the generosity they showed me. Their stories are summarised in the Chapter 2.

Chapter 3 contains the thematic analysis of the many interviews I undertook which is broken into four themes plus sub-themes.

Chapter 4 is the discussion which highlights the need to shift our focus towards principles and prototypes, before providing an example of what a community-centric approach might look like, using Mangarara Station as a case study.

Chapter 5 is the conclusion.

2. Case study farmers

Jonny Greene - No-till Arable Farmer, Ireland

I met Jonny at a soils workshop run by the Irish research and extension body Teagasc. You could tell from the questions he was asking that he'd thought a lot about soil management and as we got chatting it turned out that he was one of very few no-till arable farmers in Ireland. Striking me as an interesting guy I asked if I could stop by his farm on my way north a couple of days later. Jonny farms near Kilkenny and took over the running of the farm from his father. He converted to no-till cropping motivated by a realisation that what he was doing couldn't continue long term, with increasing use and costs of chemicals being required with without any increased returns. In early 2015 Jonny got together with a few other arable farmers and founded a 'conservation agriculture' learning group which he now chairs, meeting six times a year and constantly in touch through a Whatsapp group chat. The group had grown quickly to over 25 members by the time I visited in March 2016.

Figure 1: Jonny Greene at his yard after a tour of some of his cover crops

Alex Brewster - Organic Sheep, Cattle & Egg Farmer and 2016 Nuffield Scholar, Scotland

I met Alex at the annual Nuffield scholars conference and took the opportunity to visit his Scottish upland sheep and cattle farm. Having returned to the farm in 1999, a large public subsidy drove their conversion to organics in 2002, followed by the establishment of a mail order meat business with other local farmers in 2004

Figure 2: Alex Brewster near the top of his upland sheep and beef farm, near Pitlochry

which lasted a few years. In 2006 Alex also introduced a free range egg business on top of their existing enterprise. Alex experienced significant frustration at their inability to make productive gains on the farm while markets continued to decline. An invitation to join a farmer-run learning group convened by a past Nuffield scholar rapidly advanced Alex's soil and pasture management knowledge and, while running a farm system significantly differently to his neighbours, he continues to observe large gains in pasture growth and livestock performance.

Digni van den Dries - Organic Arable/Vegetable Farmer, Netherlands

There appeared to be a lot of moving parts in Digni's production, packing and distribution operation when I visited on a sunny day in April. Digni's story begins as a conventional arable farmer, following his father who came onto the land post-WWII. Prior to 1990 Digni, already a relatively low-input farmer, was highly skeptical of organic farming. However his skepticisms were overthrown after visiting a particular organic farm visit while on a environmentally friendly arable course run by a university researcher. Inspired, Digni transitioned the family farm to organic production in 1990 and became heavily involved with other pioneering organic grower groups who shared their knowledge and lessons with each other, as well as inviting researchers to help study what they were doing. Modern organic arable and vegetable production was pioneered in the Netherlands in this era and Digni has continued to improve his systems, including customised tractors and machinery to minimise compaction and soil disturbance. Digni also founded the business 'BioRomeo' which markets and delivers organic vegetables from a collective of farms to mostly urban customers.

Figure 3: Digni showing how his customised machinery minimises tillage depth and compaction

Niels Clemmensen - Arable Farmer and Odderbaek Stream Society, Denmark

In 1998 Niels was elected to his local municipality, and became engaged in conversations about supposed local stream pollution, which didn't equate with his experience. Eventually employee from the municipality came to visit Neils' farm and pointed out that the pollution was in fact 'physical' in the form of sand (rather than nutrients or faeces) which eroded from fields and stream banks and smothered the bottom of his local stream. He also identified the unique biodiversity that still existed on Niels' farm and along the neighbouring stream, and suggested they could return fish to the stream if

Figure 4: Niels at the edge of one of his fields bordering the restored stream and new walking tracks

they could restore the breeding habitat of the insects that they feed on. What started with Neils inviting 10 of his neighbours soon became the Odderbaek Stream Society whose mission was to restore the health of the 26km stream running through their community. They also expanded their mission to include 40km of walking and cycling tracks along the stream. The project has since received the praise and attention of multiple government ministers and Niels has spoken about the project in the Danish Parliament. Niels says that the success of the project has 'inspired' many farmers who are now taking the initiative to reduce pollutions from their fields using a diversity of techniques.

Jen Seilern - Biodynamic Integrated Livestock & Cropping, Ontario, Canada

Six years ago Jen and Matthieus started farming by renting 300 acres off a retiring farmer. Jen was raised on a farm and Matthieus a trained mechanic, whose family friends 'the Hucks' were established biodynamic

Figure 5: Jen Seilern inspecting their pea crop while Matthieus harvests spelt

farmers not far from their newly rented land. Jen and Matthieus never considered anything other than organic farming - they didn't like the input-intensive methods of conventional farming or the dependence on big companies to purchase those inputs. Starting off on their 300 acres was a massive challenge and they were initially heavily dependent on their landlord, neighbours and community for advice, knowledge and equipment. Despite this they still struggled to find information, online or otherwise, to help them farm without antibiotics or hormones to keep their cattle healthy and growing or chemicals to manage their crops. Access to knowledge was one of their greatest challenges and Jen is now involved in organisations hoping to change this.

There case studies are only a small sample of the farmers, researchers, consultants and other actors that were interviewed as part of this research. Others are mentioned and introduced briefly throughout the report. A full list of interviewees can be found in Appendix A.

3. Thematic Analysis

Four overarching themes have emerged from the interviews and farm visits over seven months travel spanning 19 countries. The research approach was developed in collaboration with Patrick Aldwell (Lincoln University), Brennon Wood (Massey University), a number of past Nuffield scholars and others involved in our agricultural sector. The interview technique employed was largely unstructured and centered around the story-based experiences of farmers, practitioners and researchers involved in regenerative agriculture in some way. Interviews and meetings were recorded with a voice recorder as well as written notes. Where interviews or meetings were recorded, relevant material was later transcribed and collated electronically. Following the basic process outlined by Braun & Clarke (2006) in 'Using Thematic Analysis in Psychology', segments of each interview or meeting were coded into topics which, over a series of iterations, were grouped into the four overarching themes plus sub-themes presented below. While there are some key overseas farmers and other interviewees featured in this report, the insights from many conversations both overseas and in New Zealand have influenced the scope, analysis and conclusions of this report and helped ground my thinking in a New Zealand context.

The first three themes capture largely positive and forward-looking aspects of what drove or enabled shifts towards regenerative farming as experienced by the interviewees. The final theme mostly captures a critique of the status quo. So as not to exhaust readers with pages of evidence, the essence of each theme is simply described, supported by anecdotes from various interviews, to allow readers to decide whether it resonates with their experience of the world - otherwise each theme could be the subject of multiple PhDs.

3.1 Necessity & Possibility

'Necessity' and 'possibility' represent two contrasting yet parallel drivers of positive change observed in the interviews and farm visits. While they are treated separately below, none of the stories of necessity were absent the presence of stories of possibility. It appears that the two often go hand-in-hand when reflecting on the shifts experienced by the farmers in this report. This chapter will focus on the shifts of Digni van den Dries, Jonny Green and Niels Clemmensen who are three of our case study farmers, as well as Martin de Groot who is an organic dairy farmer in Ontario, Canada.

Necessity

Necessity stories frequently featured threats to the status quo, both real and perceived. In some cases this led farmers to seek out alternative possibilities which may have otherwise remained unexplored. For Digni van den Dries these threats included the unsustainable cost of public subsidies, loss of public trust and shifts in consumer preferences towards organic farming. At the time Digni was weighing up these factors, he was already a relatively low-input farmer and had a slightly negative perception of organic farming (for reasons not discussed).

Jonny Green was noticing that his arable operation was being pushed towards increasing use of chemicals, with increasing input costs yet stagnant margins. The realisation that these trends couldn't sustainably continue was his motivation for looking to an alternative way to farm.

Martin de Groot is a Canadian organic dairy farmer with a value-add ice cream business that runs from a small farm shop and sells wholesale throughout Ontario. Martin's shift towards organic farming (and eventually beyond) was pushed by his wife, however he initially resisted. It wasn't until he had young children and noticed his child pushing a toy truck full of pesticide coated seeds, accompanied by an increasing environmental concern that he decided that he needed to change.

Figure 6: Martin de Groot (left) with some local farmers, Gayl Creutzberg (2013 Nuffield Scholar), Ruth Knight (local consultant) and Jen Seilern. Martin was noting the positive impact of his tree shelterbelts and drought resilience of his maize due to his gains in soil organic matter content.

Possibility

While necessity stories were not uncommon, stories of possibility were far more prevalent and often enthusiastically told. The dominance of this theme suggests that having an awareness and/or belief in a better alternative is a necessary precursor to farmers changing their farm system design and practises. It was not so clear whether a sense of 'necessity' was as

significant a precursor to change and is an interesting point to reflect on where efforts are being made to convince farmers that they ‘need’ to change.

Sitting outside his bustling packing shed, Digni van den Dries described a pivotal moment of possibility while attending a university-led course on environmentally friendly arable farming. Despite having very strong reservations about organic farming, a course visit to a particular organic arable farmer completely “flipped” his view, seeing a “practical farmer making organic farming work”. Then convinced of both the practicality and benefits of this method of organic arable farming, Digni immediately began to transition his own farm, surrounding himself with other organic and transitioning farmers to learn and share lessons as they continued to develop and refine their systems.

At the time I visited Jonny Greene there were only three other ‘no-till’ farmers in Ireland. With limited local experience, Jonny relied a lot on internet and social media to build his knowledge and ideas about what was possible for his farm, eventually co-founding a new Irish farmer-driven learning group for arable farmers wanting to develop ‘conservation agriculture’ systems and practises (which typically focus on minimum/no tillage). This group had grown rapidly to over 25 people in little over a year and is highly active, meeting six times a year and constantly in touch via a Whatsapp group chat. Jonny’s case is an interesting example of a farmer who sought out a community of like-minded people defined not by geography but by their vision for their farms.

The restoration of the stream running adjacent to Neils Clemmensen’s farm was initially inspired by a man from his local municipality. As Niels walked along the newly created tracks alongside the stream, he described how the municipality man did a similar thing, describing the present and absent native biodiversity and suggesting that it was possible to restore fish to the stream. In Niels’ words “he was a fantastic salesman”:

> *"We have done [farm walks with the municipality man] a lot of times and it has changed my mind because I've learnt a lot about what's outside the field now that I never knew before because we never learn about it in the farming tradition"*

This sense of possibility appears to have become infectious:

"Many farmers are [now] inspired. This guy we just met here, he's on our board, he made wetlands too, and another farmer we just passed made a little lake. A lot of farmers are inspired to do things, asking how can we do this" – Niels Clemmensen

The evidence in this report suggests that efforts to drive change solely through necessity may be limited in their effectiveness if not preceded or complemented by viable alternatives to current systems and practises that can be adapted to individual farm and farmer circumstances. It highlights the importance for our agricultural communities and sectors to continuously question the status quo and push boundaries in search of 'better alternatives that work'.

3.2 Community-centric innovation & learning

A dominant theme was the positive experiences of interviewees who were involved in 'innovative learning communities' ('communities' in a broad sense of the term). Innovation, learning and even advocacy was often self-organising and led by the community themselves. Through shared understanding of local contexts, collective action took many forms, including learning groups, experiments or new organisations. The use here of the term 'community-centric' is intended to be distinct from 'farmer-driven', acknowledging the emphasis that many of those interviewed placed on full and diverse community involvement (beyond just farmers) to not only create broader legitimacy, but also as a source of creativity and shared ownership. In many cases, policy, research and other relevant organisations and institutions were involved with these communities, but by invitation and community mandate rather than being in the driving seat.

This chapter identifies a number of different elements that appear to work together to support effective community-centric innovation and learning, with supporting evidence.

Ownership, responsibility and equal meetings

What appeared as central to the effective functioning of innovative learning communities was a sense of both collective and individual ownership and responsibility for the outcomes of their work. This is clearly evident in the cases of both Digni van den Dries and Niels Clemmensen where the initial impetus for change was instigated by 'outsiders', yet the work was primarily owned and driven by members of their communities. Similarly, Jeffery Creque of the Carbon Cycle Institute in Northern California, attributes the ongoing success of the Marin Carbon

Project to its farmer founders and ongoing farmer directorship, despite significant involvement from Berkeley University, local NGOs and increasingly regional and state policy institutions.

Stephen Sherwood, a Wageningen University lecturer, 'Collectivo' activist and Ecuadorian farmer hosted myself and a colleague at his farm on the slopes of Ilaló volcano, Ecuador. He advocates the need to remove existing hierarchies and "see practises across horizontal planes", focusing on relationships and social networks (see Sherwood et al., 2014 or Sherwood et al., 2016 for more). Rather than being dependent on institutions or NGOs for driving and/or resourcing projects, Stephen says that efforts must be sustained by those whose interests truly align to the goals of community projects - the communities themselves. Finding "entry points where people become responsible and committed" is essential.

Karin Ecksvard, a Swedish 'Researching facilitator' has worked with many groups and communities over the years, including with a group of Swedish agroforesters referred to often during our conversation. Karin's insights speak for themselves to support the observations above:

> *"If it's going to be a sustainable shift it needs to start at the local level, because people don't like to be pushed or forced or, well that's not true.. but if we just talk about changing someone's way of farming or interacting with neighbours or, there has to be a will that comes from within to do that, otherwise it will never be something that stays in the long run. As soon as you take the pushing force away the person will change back again, so it has to sort of be an equal meeting, and I think that's the power relationships, that without these hierarchical powers, then it's possible to start having these true meetings where you can really discuss…"*

The Practitioner

The concept of 'practitioner' emerged in two forms. The first was as a connecting, facilitating and supporting practitioner with the capacities and experience to help 'hold' these diverse communities when they meet. The second is the concept where everyone who shows up in innovative learning communities does so as a 'practitioner', where their 'practise' is their everyday life. This concept of 'everyone as practitioner' is a step away from emphasising specialist expertise in agricultural development and innovation settings, acknowledging that everyone turns up as experts of their own daily lives, i.e. farmers as experts of their land, farm

system, personal aspirations and priorities, or researchers as experts in their fields but also as people who eat, drink, recreate and participate in their community and society.

The first concept of practitioner, the connectors, facilitators and supporters were present in many of the case studies and content of other meetings. These practitioners included:

- Alex Brewster's mate 'Blanchey', a past Nuffield Scholar who convened the technical grazing group that gave Alex the knowledge and confidence he needed to take the next step.
- Niels Clemmensen (as he tells the story) grew quickly into the role of practitioner, convening and driving their stream restoration project and advocating its benefits more widely. In fact, people visiting struggled to believe that Neils was a 'real farmer' because he knew so much about the ecology and biodiversity of the area (despite turning up in work clothes and in his tractor), *"It's only because I've been working so much with people that are looking at nature with different eyes".*
- Jonny Greene took the initiative alongside other farmers to establish and grow the conservation agriculture learning group that now meets regularly and maintains almost constant online contact to share ideas, ask questions and report on successes and failures.
- Jeffery Creque is a former Californian rancher with a PhD in rangeland ecology, both at the heart of the Marin Carbon Project he co-founded. Using his mix of skills and experience Jeff has also helped found additional organisations including the Alliance for Local Sustainable Agriculture (Marin) and the West Marin Compost Coalition.
- Other interviewees that also filled this practitioner niche themselves included; Jen Seilern (Ontario Ecological Farmers Network), Steven Townsend (UK), Stephen Sherwood (Ecuador Collectivo) and Karin Ecksvard (Sweden).

These practitioners were typically well connected, able to work across different parts of the system, trusted (based on local and/or earned legitimacy) and were often vested in achieving the same outcomes as the groups/communities they worked with. Considering these qualities it is not surprising that farmers themselves have the potential to perform well in practitioner roles.

In a similar vien, Laurens Klerx of Wageningen University specialises in knowledge and/or innovation brokers. He described them as follows:

"You need different types of brokers depending on the complexity. If you need information there's your good old adviser, when it becomes more complex you need to go to co-production and when it becomes really complex you need to foster an environment for innovation, also foster institutional change, you know in standards, in laws and different kinds of interactions..."

Klerx further described brokers as having 'street-cred', being open-minded, jack of all trades, provocative, able to cross boundaries and connect with different worlds but not taking an expert role. This description has similarities with that of the practitioner, but may be considered more removed from the local context and potentially more broadly connected.

The second concept of practitioner acknowledges the expertise of everyone who 'shows up' together, based on their every day experiences on the land, with their family, in their community, and through their work. This dynamic is critical when considering Karin Ecksvard's concept of 'equal/true meetings' introduced in the previous section, where she describes how removing hierarchies of expertise and representation can lead to greater commitment, recognising especially local expertise.

"...to get people [from institutions] to understand that they have to learn from the farmers, I think that's a major thing really, to understand that the farmers are the experts on their own systems, they are the ones who know how things work on their own farms, what's possible and not possible. They can of course get a lot of influence and learn and new ideas and so on but [farmers] are the experts of their own systems, not someone from outside." – Karin Ecksvard

Stephen Sherwood advocates a similar shift away from recognising external 'experts' as such, in favour of recognising 'actors' (ie. local farmers) as experts in their own context. Therefore when innovative learning communities meet, everyone turns up as a practitioner, prior status or who you represent count for nothing "you're only as good as your practise" (which could be farming, raising a family, chairing the school board, or as a local government CEO).

The presence of these capacities within active innovative learning communities identifies an important niche that should be considered when looking to support the shifts advocated in this report.

Negative social pressure

Interviewees commonly spoke of negative social pressure that they either experienced or observed when adopting farm systems and practises outside the norm in their communities. While not easily quantifiable, the impact of this social pressure was evidently significant for many. Jen Seilern (Ontario integrated biodynamic farmer) considered this negative pressure the biggest roadblock to farmers making shifts towards regenerative agriculture, although in her case it was easier coming into a new community that already had a large presence of biodynamic and organic farmers.

Martin de Groot recalled that even his close friends advised him not to shift to organic dairy. He suspected that they felt he was attacking their more conventional farming methods and despite remaining part of conventional sector bodies and boards he still found it tough socially. It wasn't until recently when he started providing free food and live music on Fridays as a community building initiative that neighbours and locals began to reconnect and visit his farm.

In contrast, Digni van den Dries and Hugh Williams (New York State biodynamic farmer) spoke positively of the highly engaged farmer networks they were members of early in their organic/biodynamic establishment phases. These stories highlighted the importance of open and supportive social networks, especially for farmers pushing beyond the norm. They also suggest a sensitivity within farming communities to criticisms of current farming systems and practises, and a need to find ways of hosting conversations that people may find difficult or challenging, particularly if the conversations challenge aspects of their identities.

Figure 7: Hugh Williams (right) visiting a young farmer who worked with and learned from Hugh for three years before leasing his own land.

3.4 ‘Flaws’ in the system

In conversations with interviewees, their positive experiences with regenerative agriculture were often complemented by a critique of the negative consequences and limitations of conventional agriculture (often referred to as ‘industrial agriculture’). Rather than attributing blame to individuals, criticism tended to be focused on the structures and incentives in ‘the system’ that they felt perpetuated negatives outcomes and blocked further shifts towards regenerative farming.

(*Note that ‘the system’ when referenced here refers to an encompassing definition of structural, institutional and sociological factors that influence all aspects of how farmers operate).

Loss of independent advice & research

The historic loss of public funding for independent agricultural research and advisory services in many countries was often considered a win for agribusiness companies at the expense of farmers & citizens. This view was shared by Phil Beard (Ontario extension), Steve Townsend (UK Consultant), Laurens Klerkx & Jorgen Primdahl (University of Copenhagen).

Jorgen Primdahl, Professor of Planning and Landscape, noted that many Danish farmers now consider private independent advice unnecessary or unaffordable, therefore becoming more reliant on advisors associated with companies selling products. Steve Townsend referred to the inappropriate incentives in the UK where many agricultural researchers are funded to develop the ‘industrial agriculture’ model, so are naturally less likely to question this model or look to alternatives. He correlates this as a symptom of the Margaret Thatcher era in the UK which resulted in large public research funding cuts, forcing researchers and universities to secure complementary commercial funding, thereby reinforcing the interests of ‘industrial agriculture’ throughout research and university systems.

In line with these comments was the observation that most of the regenerative farmers visited were not utilising public or commercial research or advisory services to any significant extent, tending to rely more on farmer-farmer knowledge sharing. There were a few exceptions, such as Digni van den Dries who describes having to ‘educate’ incoming researchers (assumingly from universities) before they became helpful to their self-organised organic discussion groups.

Townsend's critique of the UK research and advisory system is also echoed in academic literature by Sherwood "In fact, a growing body of literature points at science and development for both establishing and perpetuating much of the harmful organisation responsible for socio-environmental decline" (Sherwood et al., 2014).

Perverse agribusiness incentives

Many of those interviewed made a distinction about 'big' agribusiness in particular not being designed or incentivised to deliver in the long-term interests of farmers, rural communities or citizens (Brewster, Townsend, Seilern, Verhoeven, Sherwood). Alex Brewster spoke directly to this:

> *"I was reading a book yesterday, [the author] talks about nitrogen fertiliser coming in and guys using it to solve problems, because they haven't used the right rotation, that was in 1900. And at that point he said there was a negative to nitrogen because it destroys the biology of your soil. They knew that, he knew that, but that [knowledge] was never adopted. It's been 100 years and it's just capitalism in overdrive, big companies who have got a PR story, 'you need this, you saw the initial boost, your grass is really green, it looks good'. But is there feed value in it?"*

The incentive for 'big' agribusiness companies to identify or create demand for a product in order to drive profit was generally considered in conflict with farmers long-term interest and ability to determine their own future. Increasing reliance on product-inputs (ie. fertilizers, chemicals, seed) to 'control' production outcomes takes control over costs away from farmers. The alternative to input-derived 'control' of production is the knowledge-intensive management of biological relationships between soil, plants and animals, which is central to regenerative farming.

> *"[Matthieus] didn't like the idea that companies would tell you what to grow, how to grow, what to use, all this stuff…" - Jen Seilern*

While visiting the Wageningen University Rural Sociology team, Professor Han Wiskerke referred to the 'squeeze on agriculture' where farmers are becoming more dependent on increasingly unaffordable inputs while commodity prices stagnate or decline. Jonny Greene's experience is a good example of 'escaping the squeeze', where climbing input-costs with static returns was one of the key drivers for his move to no-till conservation agriculture practises.

Criticism of the perverse incentives associated with ‘big’ agribusiness did not scorn all agribusiness. In fact many farmers celebrated the smart design of their fencing equipment, machinery or soil amendments. However there was an overarching view that ‘big’ agribusiness companies, the research they fund and the products they promote, must be treated with caution if not skepticism. The obvious difficulty for regenerative farmers is the lack of science and information dedicated to both critiquing conventional systems and practises, and furthering alternative farm systems and practises (where there are less commercial opportunities and little public funding), hence the actions of farmers such as Digni van den Dries, Jonny Greene, Jen Seilern and Alex Brewster to join or convene groups of like-minded farmers, researchers and other actors. An extract from a blog produced by the NGO ‘Food Tank’ also makes this point:

> *“Contrary to what we often hear, it is not a lack of evidence holding back ecological alternatives in food systems. It is the mismatch between their huge potential to remedy the problems caused by industrial agriculture, and their much smaller potential to generate profits for agribusiness firms.” (Food Tank, 2016)*

(See the International Panel of Experts on Sustainable Food Systems (IPES-Food, 2016) latest report for more).

Disconnect

The increased distancing of relationships over recent decades is often recognised in the ‘rural-urban divide’. The same can be said of producers and consumers, but what about policy and farming practise? The following quote from Niels Clemmensen captures the disconnect:

> *“A lot of people from other municipalities that have been here say 'that's not legal' and we say 'can you tell me why?...' and they say 'we can't do that in our municipalities' but that's because they don't want to take a chance, and that's the system. We have done a lot of things here that are actually not legal, but we've had the Minister for Agriculture and the Minister for the Environment and a lot of people from the Government and ministries and they all say it's fantastic what we have done. No one says anything about how we have used our own rules. They can see when they are out in the field what is necessary to do to make the good result. But when they make the rules they are sitting inside and can't see what is going on outside in real life, there is a big distance between the people that make the rules and what happens outside."*

While this particular quote carries a note of anti-establishment, it's important to remember that the instigator of the Odderbaek Stream restoration project was a staff member from the local government (the 'municipality man') and Neils himself an elected local councillor. Rather than adhering to rules which conflicted with the municipality man's knowledge of how to achieve a positive outcome, he instead appeared to bend or break certain rules in favour of 'what worked'. This situation may resonate with many and rather than suggest that farmers should simply break rules they think impractical, it highlights the importance of inviting and welcoming policy makers into communities and the realities of rural life, as well as earning their trust that farmers and rural communities are equally committed to protecting and promoting the same interests as policy makers.

4. Discussion: Supporting regenerative shifts across multiple planes

The introduction outlined the emerging trends that threaten the livelihoods of rural New Zealand if we fail to respond in a way that acknowledges our changing realities. The stories and evidence in the analysis above collectively present a pathway of possibility, providing lessons and guidance for how we might progress an agricultural development and innovation pathway that holds promise for farmers, rural communities, New Zealand and global society. Through Nuffield I have witnessed glimpses of communities working effectively and collectively in pursuit of a regenerative vision. This vision holds promise for reconciling the apparent conflict between the diverse interests and values of farmers, rural communities and wider society, and reversing the trends towards economic, social and environmental hardship observed today.

The topic of this report is broad and the New Zealand and global landscape and society are very diverse. There is a risk of going to far by attempting to 'recommend' recipes for action for individuals, communities, organisations or institutions wanting to shift their approach to agricultural development and innovation to one that better supports regenerative farming. Therefore this discussion will be centered on my current experience of regenerative farming and it's challenges here at Mangarara Station. Whether these insights are relevant to other contexts will be up for other individuals and communities to interpret.

This discussion will first cover the need to focus on a principle-led and prototyping approach to supporting the development of regenerative farming. It will then move on to a vision what a new approach might look like on our farms and within communities, organisations, science and policy institutions, grounded in the context of Mangarara Station.

4.1 Principles and prototypes

Much of our farm system development and innovation in recent decades has relied on centralised development of new technologies or practises, followed by the 'extension' or 'transfer' of these technologies or practises to willing farmers. There are certainly different approaches to extension, including highly participatory approaches focused on co-production or co-design, all of which are undoubtedly valuable in the right situations. **However this report has identified that in order to support innovation on the frontier of regenerative farming,**

a community-centric approach is needed. Focusing on centralised development and extension of technologies and practises will be insufficient to support the shifts that this report calls for.

Overlaying copybook or ‘recipe’ farm systems over what are in fact highly diverse ecosystems and ‘people-systems’ has been partly responsible for some of the negative outcomes from our farming landscapes - ie. pastoral hill country that is eroding in many places, cultivating steep hillsides leading to losses of topsoil into waterways, nitrogen intensive farm systems in sensitive lake catchments, overworked and/or highly indebted farmers etc. While each ‘recipe’ may have certain contexts where is it entirely appropriate, there are many others where the costs to society of inappropriate farm systems and practises have become increasingly unacceptable. We need different horses for different courses.

Thankfully every other farmer I know already ‘gets’ this and all adapt their systems and practises to their land and themselves, to an extent. However their ability to so has been constrained by current perceptions around ‘what’s possible’ or ‘what works’. This situation is at least in part a result of decades of agricultural development and innovation which has focused on relatively simple, input-driven, low diversity farm systems.

Otto Scharmer, MIT Professor and author of ‘Theory U’ (2009) and ‘Leading from the Emerging Future’ (2013) describes how in complex settings like our current agricultural situation, we must respond by ‘prototyping’ possible solutions to our ‘emerging future’ that are as yet untested in our contexts of people, place and needs. Theory U is a framework for how to approach our learning about our complex and uncertain systems in a new way, so that we can continue to advance while acknowledging the unknowns and ‘blindspots’.

Zaid Hassan, author of ‘The Social Labs Revolution’ (2014) has developed a similar framework and processes that leverages Scharmer's work called ‘social labs’. He critiques that management and planning approaches that drive for certainty and predictability too far into the future most often fail, because their assumptions around implementation are untested, and resources are locked into particular outputs and programmes. Hassan argues for a new approach to strategy that incorporates diverse teams, innovation focus, agile testing and prototyping of ideas, co-ownership and direct involvement of affected communities/users to achieve a fast-fail methodology to developing solutions.

The challenge for our agricultural development and innovation system, which includes our farming communities, is to re-orientate away from recipe-style systems and practises, towards a principles based and prototyping approach that can be applied to both collective and individual contexts.

In essence requires two things:

1. **To shift our approach to agricultural development and innovation to one that is community-centric, leveraging the knowledge, creativity and commitment of rural communities as the primary source of innovation and change, utilising fast-fail prototyping methodologies; and,**
2. **To focus on the broad principles of regenerative agriculture (see Chapter 1.2) as a guiding compass for how we move forward.**

4.2 How could this shift play out? A Mangarara Prototype

Mangarara Station is committed to developing regenerative farm systems and practises that are appropriate to our context. Rather than trying to speak for any other person, community or place, it makes sense to articulate how a shift in approach might be experienced at Mangarara. The following section is therefore a description of a possible future for Mangarara where, in the absence of tried and tested methods that can achieve our goals, we are attempting to pioneer the designs and practises of a regenerative farm system, hopefully underpinned by a community-centric approach to the challenges and opportunities that regenerative farming presents.

Mangarara Station can be considered a prototype - a lens through which to imagine how the relationship between community-centric approaches and realising our regenerative vision might unfold.

At Mangarara Station we continue to observe soil erosion, volatile commodity markets, uncertainty around future regulation and increasingly unpredictable seasons with the added risk of destructive ‘weather bombs’. The vision for Mangarara is to combat these trends by reversing losses of our natural resources (soil, water, carbon), building a supportive base of customers through direct sales of our beef, lamb and pork, and overall building resilience across our ecological, social and economic foundations.

Our challenge, and one that applies to regenerative agriculture in general, is how to build the knowledge and human capacities and capabilities required to farm in this manner, and how to translate existing knowledge into the unique physical, economic and human context of this farm. This challenge undoubtedly requires different ‘supports’ and approaches to the agricultural development and innovation we’ve become familiar with in recent decades.

4.2.1 *Community*

Current trends suggest that what farmers ‘can and can’t do’ will increasingly be decided by local, regional and national governance bodies who can sometimes suffer from a lack of practical knowledge about farm systems and practises, and are also influenced by pressure from urban majorities of voters. An alternative way forward for our rural communities is self-determination, earned through action that demonstrates our commitment to acting in the interests of all.

At Mangarara we share responsibility with our neighbours and local community on issues including water quality, biodiversity habitat and local economy/community well-being. We have an opportunity to come together with our local community to better understand the challenges we face, the unique and shared circumstances of our community and our farms, and the possibilities and options that are available to us. We also have the chance to discover the different passions and talents of our community members in relation to these possibilities and options, and make best use of those passions and talents in the actions we take.

In order for such engagement to go well, people must show up with an open mind and willing to listen. It may be that trusted members of our community with extensive local networks take on the practitioner roles of organising and convening. There may also be a need for people with the experience or capabilities to take on secretarial and facilitative roles to ensure get the most out of the time when our community comes together.

To be of value the outcome of our community coming together must be action.

This may be preceded by a local vision, some goals to work towards and ideas about how to get there. People with different knowledge and skill sets from council's, research, business, community and sectoral organisations or policy institutions might be invited to assist with this work, but it should be owned and driven by our community. As Swedish action researcher/facilitator Karin Ecksvard puts it, we must “meet as equals”. From this position our community may be able to collectively negotiate with regional and national policymakers, demonstrating their commitment to ensuring the interests of all citizens are recognised and provided for, but retaining flexibility as to how they go about their work (self-determination).

‘Community’ is about acknowledging our connectedness as farmers, citizens, communities and society, as well as the separate nature by which our current governance systems operate. The point being made is that to effectively achieve Mangarara’s own goals with the freedom, flexibility and support we desire, we must concurrently work collectively with our neighbours, community, and broader society to incorporate their interests and earn the trust and license to do so.

Community is not just defined by geography or place. Non-local examples of community that Mangarara might be involved with could include hill country farmers throughout New Zealand banding together to co-create a proactive response to climate change mitigation and adaptation;

or perhaps participating in a community of farmers involved in agroforestry with the goals of sharing knowledge and attracting more resources and funding to develop agroforestry systems and practises. There is opportunity for many different communities to come together to earn greater control over the future of their livelihoods. Such collective action is also likely to generate a number of co-benefits, which will be covered in subsequent sections.

4.2.2 *Soils & Ecology*

Mangarara Station is a diverse landscape, featuring a large lake, carbon-rich peat soils with a water-regulating drainage system, and clay soils on gentle rolling to near vertical hills facing north, south, east and west. The challenge that this brings is designing a system that maximises carbon sequestration, water infiltration, habitat and food for native flora and fauna, shade and shelter for livestock, fosters healthy biologically active soils that can support a diversity of pasture trees and shrubs with minimal inputs, and creates value (directly through food, timber etc or indirectly as money) to support the livelihoods of many people – each part of system must be adapted and specific to its soils, slope and microclimate.

This challenge demands both diversity and depth of knowledge, attempting to 'plan' outcomes based on complex relationships between soil, climate, microbes, fungi, bacteria, insects, forages, trees, shrubs, livestock and management in order to achieve multiple outcomes. In this respect there is a large vacuum of knowledge at Mangarara and it will be necessary to engage people with a similar diversity and depth of knowledge to co-create and prototype different designs and management systems for each unique area of land.

These people could include farmers bringing local knowledge or knowledge and ideas from afar, specialists in soils, pastures, trees and/or livestock (including consultants and researchers), or generalists who can creatively weave many different elements together (which could often be farmers). While the interactions of these people with Mangarara could be one-on-one, going about this work in a more collaborative manner has more potential, creating the opportunity for integration and cross-pollination of ideas and knowledge which adds value beyond any immediate tasks. It is not realistic to expect all of these people to 'come to' Mangarara and we must invest in time off the farm helping convene and engaging in multiple formats including meetings, conferences, workshops, open days, 'farmer field labs', regenerative farming learning groups etc.

There is a huge amount that we don't know, and so we must experiment based on existing knowledge, intuition and creative thought about what might be possible.

We cannot wait for science to prove everything first and must 'wing it' to an extent. There is clearly a large role here for researchers to play, either working with farmers and communities to support and enhance their on-farm experiments, or taking direction from the needs of these communities to inform their research agendas. Enabling more of this kind of engagement between researchers, farmers and communities will require significant shifts in the centralised and private funding of our research institutes and universities, so it's equally important that our sector organisations and policy makers are engaged in this work.

4.2.3 *Technology, Infrastructure and Management*

It's one thing to know the end goal, but another thing to get there. There are many practical challenges associated with regenerative farming, in part because there has been little investment made to date in helping regenerative farm systems work (ie. keeping grass off fences without herbicide or significant labour). Furthermore as regenerative farm systems typically seek to reduce dependencies on external inputs where practicable, there is less commercial interest in developing solutions than with more conventional farm systems - exceptions might include fencing, small machinery and digital spatial/data technologies.

These practical challenges are an opportunity for anyone and everyone. At Mangarara we see opportunities for ecologists, biologists, climate scientists, hydrologists, soil scientists, horticulturalists, grassland experts, tree surgeons, beekeepers, mechanical designers, fencing technicians, landscape architects, engineers, programmers, data technicians, accountants, entrepreneurs, lawyers, policy makers, other farmers and many more to help develop and refine our systems and practices. Ultimately the most value lies in many of these people coming together alongside farmers to collectively understand both holistic and specific challenges and co-create cost effective solutions to overcome them.

As farmers, developing technologies, infrastructure and management systems to support regenerative farming can generate direct and tangible benefits, so we are willing to invest time, energy and resources. The benefits may be less clear for others, unless they are driven by a strong interest in regenerative farming or have ideas about particular solutions. **It is therefore essential that the involvement of many different actors can be supported by the organisations and institutions whose mandates align with the potential value**

regenerative farming can bring. This extends to anyone with an interest in agricultural production, healthy food, rural economy and community well-being (employment, poverty, crime, mental health etc), conservation, climate change, recreation, tourism… pretty much everyone. Alignment between institutions is also key considering the diversity of expertise required.

4.2.4 *Business Models, Markets and New Revenue Streams*

Mangarara Station recently launched a regional direct-to-consumer meat box with the goal of capturing more value from our beef, lamb and pork. The additional profits (hopefully) generated from this initiative will be re-invested in restoration of the land, as well as providing a financial buffer for experiments and trials that might otherwise be too financially risky. Mangarara has the advantage of targeting domestic consumers who are much easier to reach than international consumers, however this is a small market relative to New Zealand's food production. With little experience of starting and running businesses that venture beyond the farm gate, there are many lessons to be learned, and some the hard way. **Mangarara as a business must be profitable and create value, otherwise it is not regenerative.**

The trend towards New Zealand farms diversifying and value-adding brings new challenges to farm owners and managers. Fortunately there is a wealth of knowledge and experience throughout the agricultural sector and beyond, and therefore an opportunity for farmers to engage in mutually beneficial relationships with these people to help support regenerative shifts. The Sustainable Business Network 'Good Food Boost' is an example of such an initiative that Mangarara has been part of, but there is potential for a longer term exchange with the opportunity to learn alongside experienced business people and other farmers in similar positions. Cross-pollinating ideas and experience from within and outside the agricultural sector could lead to exciting new ventures.

The establishment and growth of markets for products that are produced regeneratively is an opportunity for farms such as Mangarara, businesses in the supply chain, sector organisations and policy makers (when looking international) to work together for mutual benefit. Domestic supply could quickly exhaust local demand for regenerative food, fibre and other products. In a world where local food movements are gaining momentum, a regenerative value proposition could be New Zealand's foot-in-the-door to affluent and conscientious international consumers.

While product premiums may go some way to securing additional value for farmers, there are also opportunities to quantify and reward farmers or partnering businesses/organisations for societal gains in things such as greenhouses gas sequestration, restoration of threatened ecosystems, flood risk reduction etc. Developing additional revenue streams will provide a more resilient foundation for farming families and rural communities, could open up new creative enterprises and drive an increased focus from farmers to undertake restoration work for the benefit of local, national and global society. For example, establishing native forest corridors using advance payments for voluntary carbon offsetting is something that Mangarara has been considering to accelerate the rate of restorative planting that we could otherwise afford.

New initiatives of this nature will require cooperation and coordination across multiple areas of the system. They will likely require additional and overlapping institutions and individual efforts to succeed. There is opportunity for collective and creative experimentation, especially between farmers and non-farmers bringing their diversity of skills and experiences to imagine and explore alternative business models, markets and revenue streams that can better support regenerative farming. The new relationships brokered and strengthened also provide opportunities for new partnerships that might otherwise not have been possible.

4.2.5 *Not-From-Profit Resources*

The long-term vision for Mangarara is of a landscape that looks remarkably different from today, with native blocks and corridors as well as integrated silvopasture and agroforestry systems that deliver shade, shelter, timber, fodder, nitrogen fixation, fruit, nuts, berries and many other services. **The critical opportunity is to create a more diverse, integrated and resilient landscape, economy and community.** This vision comes with a high resource demand, especially in the supply and planting of trees and new fencing to accommodate livestock integration. When the annual seedling planting number in the thousands then the annual costs of purchasing become significant (as would the labour cost required to propagate them on-farm). Added to that cost is the labour

Figure 8: A nine year old native restoration block on Mangarara Station, approximately 20 hectares funded by the Air New Zealand Environment Trust.

requirement for planting, as well as any temporary irrigation. While Mangarara's move to direct sales hopes to generate significantly more profit to fund this work, it is also a fundamental constraint to the pace of restoration.

There are opportunities for the rest of New Zealand to get involved in this venture. Where financial capital is a barrier, are individual New Zealanders, organisations or businesses willing to offer zero/low interest rate peer-peer loans to help regenerative farm such as Mangarara front these large capital investments? Or will they gift their time to help with propagation and planting? Are there people willing to establish or enter innovation grants or competitions aiming to lower the cost or increase the success of this work? There opportunities for creative, committed and diverse people come together and develop different models to support regenerative restoration work. While many farmers are wary of becoming too dependent on the state/government (as we might consider our European cousins), that said, a Land Restoration Encouragement Loan scheme might go some way to reversing the clearance of land driven by the development-oriented LDELs of the 1970s?

4.2.6 *New Narrative*

Binding together this new approach to agriculture and community is a new narrative and language that reflects a new outlook for Mangarara. The shift involves moving from competition to cooperation; productivity to holistic; symptoms to roots; short-term to long-term; money to value; experts to diverse practitioners; scarcity to abundance; dependencies to relationships; individual to collective; externalising to internalising; simple to complex; hierarchies to flat social networks; degrading to regenerating; desperation to aspiration; reactive to proactive; safety to pioneer.

This shift in narrative not only reflects a shift in approach, but also in mindset and what 'success' looks like. The precise nature and outcome of this shift, within ourselves, in our relationships, on our farms and in our communities, will be different for each person willing to embrace it.

5. Conclusions

The future for our farmers and rural communities is increasingly complex and uncertain. Significant shifts in our farm systems and practises - as well as business models and supply chains - may be imminent. This report has called for a shift towards regenerative farming as a direction that holds promise for creating more diverse, integrated and resilient landscapes, economies and communities. It has also called for a shift in our approach to agricultural development and innovation to support the necessary development and innovation on of regenerative farming systems and practises - the next frontier.

This report is not trying to argue the abandonment of existing approaches to development, innovation and change in our agricultural system. However it has identified some of the limitations of our current approaches and suggests that a system-wide shift towards community-centric innovation and fast-fail prototyping is necessary to support shifts to regenerative farming. Based on the experiences of regenerative farmers around the world and a number of experienced practitioners, community-centric approaches promise to deliver a currently neglected, but important, mode of innovation and adaptation in our rural communities.

At least in the near term, this shift will not be for everyone, yet there is a place for anyone who identifies with a regenerative vision. Rather than focusing on lifting the performance of ‘average’ performers, we must seek out examples of positive deviance - building relationships and partnerships with willing people and places that offer glimpses of possibility for what regenerative farming could be. Only when regenerative farming can demonstrate credible alternatives, in different contexts, will a broader shift be possible.

Finally an invitation for any curious or already thinking along the lines of this report, from New Zealand or overseas. The network of farmers and practitioners working in this space is slowly growing. One of our hopes for Mangarara Station is to provide a place for people to connect, experiment with ideas and test different practises and designs in our landscape - we have an open-gate policy and invite anyone interested to get in touch or come and visit (we will gladly pick your brains for ideas!). Some non-farming colleagues and I are also finding a diverse and receptive audience to some of our ideas around how we might begin to prototype community-centric innovation - again I invite anyone interested in this space to also get in touch.

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Appendix A: List of key visits and interviews

The following list identifies many of the key visits, meetings and interviews across seven months travel. A full list would be more than double this size.

Ireland:
Nuffield Contemporary Scholars Conference
Mary Delaney – 2014 Nuffield Scholar
Finola McCoy – 2014 Nuffield Scholar
Teagasc Soil Functions Workshop – Wexford
Jonny Greene – Conservation Agriculture arable farmer
Karen Brosnan – 2013 Nuffield Scholar

France:
Sarah Singla – 2011 Nuffield Scholar

Netherlands:
Wageningen University
- Rural Sociology Group; Hans Wiskerke, Dirk Roep, Henk Oostindie
- Knowledge, Techonology and Innovation Group; Laurens Klekx
- Communication, Technology and Philosophy; Stephen Sherwood

Frank Voerhoeven – Agricultural systems and policy consultant at Boerenverstand
Digni van den Dries – Organic vegetable grower and distributor
Jan Dirk – Remeker Farm

Denmark:
Jorgen Primdahl – Professor at Department of Geosciences and Natural Resource Management, University of Copenhagen
Egon Noe – Professor at Department of Agroecology and Environment, Aarhus University
Niels Clemmensen – Farmer, local councillor and founder of Odderbaek Stream Society

Sweden:
Stockholm Resilience Centre – Lisa Deutsch, Wijnand Boonstra, Luke Metelerkamp
Karin Ecksvard – Researcher and facilitator at Inspire Action & Research
Kristina Marquardt – Swedish University of Agricultural Sciences

UK:
Alex Brewster – 2016 Nuffield Scholar and upland sheep and beef farmer
Wallace Hendrie – Nuffield Scholar and Nuffield UK Chairman
Heather Wildman – 2013 Nuffield Scholar and extension/facilitation specialist
Phillip Hughes – 1999 Nuffield Scholar managing large organic estate with a farm shop, renewable energy and upcoming bioenergy projects.
David Walston – 2014 Nuffield Scholar and arable farmer focused on soil health

Steve Townsend – Soil First Farming consultant

(Global Focus Programme tour through Singapore, Indonesia, Japan, Israel, Netherlands, Washington DC, Illinois)

Ontario, Canada
Gayl Creutzberg – 2013 Nuffield Scholar 'Agriculture 3.0 – A New Paradigm for Agriculture'
Jen Seilern – Integrated arable and livestock farmer, six years in.
Martin de Groot – Mapleton's Organic Dairy, including value-add ice cream.
Phil Beard – Maitland Valley Conservation Authority

Hawthorne Valley, New York State
Hugh and Hanna Bail – Integrated biodynamic vegetable, horticulture, livestock farmers
Hawthorne Valley Land Conservancy
Willy - Integrated biodynamic vegetable and livestock farmer

Colorado
Sam Adams – National Conservation and Resource Service (NCRS)
Colorado State University – Professor Lou Swanson, Rural Sociology

California
Rob Bennaton – University of California Cooperative Extension Urban Agriculture Advisor
Loren Poncia – Stemple Creek Gass-fed
Ariel Greenwood – Grazier at Pepperwood Preserve
Occidental Art & Ecology Centre
Jeff Creque – Co-founder of the Marin Carbon Project and Director at Carbon Cycle Institute

Ecuador
Rio Muchacho Organic Farm
Stephen Sherwood – Farmer, research and active member of the 'Collectivo'
Pacho Gangotenga – Organic vegetable farmer, teacher and all-round guru

Uruguay
Adriana Bussoni – Universidad de la Republica de Uruguay, specialising in forestry and silvopasture
Roberto Zoppolo – Director Programa Investigacion at Institute Nacional de Investigacion Agropecuaria