STRATEGIES FOR CREATING AND IMPLEMENTING SUSTAINABLE CHANGE PROGRAMMES



2017 Kellogg Rural Leadership Programme Project Report Course # 35 – Eva Harr

EXECUTIVE SUMMARY

Water quality issues in New Zealand have become a top political issue, with the public demanding action be taken against the agriculture sector to ensure our rivers and lakes are returned to a *"swimmable"* state. Numerous policies and plans have been developed throughout the country to address these issues, with many regional councils creating rules which require farmers to operate at *"good management practice"* (GMP). For GMP to be effective in improving water quality, potentially thousands of farmers will need to make changes to their day to day farming practices over a sustained period of time. Programmes which are created to support the uptake of GMP by farmers need to ensure the changes become a normal part of the daily farming operation in order to improve water quality in the long-term. I have called these types of initiatives *Sustainable Change Programmes*.

This project has investigated the success (or not) of similar sustainable change initiatives introduced either here or overseas in order to identify the key factors which either enhance or hinder the success of these type of programmes. I have applied these key themes to critically assess two New Zealand case studies, which highlight different types of change programmes; the Motueka Integrated Catchment Management project and Synlait's Lead with Pride programme.

I found no single template will work for all people in all circumstances. Each programme needs to be tailored to address their specific issues or outcomes, the existing capability and knowledge of people involved, the anticipated timeframe to see the change and the resources available.

The most consistent theme I identified in sustainable change programmes was the need to build trust and allow the time to do this successfully. Programme organisers need to ensure farmers could trust the people they worked with, can trust each other and other stakeholders, they need to trust the information they were provided and they need to trust the tools being recommended as a *"solution"*. Without trust, there will be limited engagement and uptake of the desired changes. Every interaction with a participant is an opportunity to build, or lose, trust. Therefore, supporting multiple positive interactions between participants, implementers and key stakeholders will support the development of trust between all those involved. Investment in high quality people, who know how to deliver the message competently is a critical part of building trust.

The structure of the programme needs to be set up to best address the timeframes and community expectations for delivery. Mandatory or regulatory structures are often most effective for large scale, short term projects, which need a result quickly, but not a change in values. Whereas voluntary programmes tend to have higher rates of engagement, but poor participation and market driven programmes tend to have a balance of both.

Throughout the whole process, project developers and implementers need to constantly refer back to the people who are affected to ensure the project is focussing on the right issues, to collect the right information and to communicate everything in the most effective way.

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CONTENTS

Executi	ive Sur	nmary	i
Acknov	vledge	ments	ii
Table o	of Figur	ēs	. iv
1. Fo	orewor	d	1
2. Ba	ackgrou	und	2
2.1	Intro	oduction	2
2.2	Prob	blem	2
2.3	Solu	ition	4
2.3	3.1	International Context	4
2.	3.2	New Zealand Context	5
2.	3.3	BCI Context	6
2.4	Sum	imary and Aim	8
2.5	Rese	earch Approach	8
3. Fe	eatures	of Sustainable change Programmes	9
3.1	Mot	ivators for Participation	9
3.	1.1	Mandatory/Regulatory Approach	9
3.	1.2	Voluntary Approach	10
3.	1.3	Market Driven Approach	11
3.	1.4	Key Points to Note for Methods of Participation	12
3.2	Prog	gramme Structure to Maximise Engagement	12
3.	2.1	Key Points to Note for Programme Structure	14
3.3	Trus	st	15
3.	3.1	Trust in People	15
3.	3.2	Trust in Information	18
3.	3.3	Trust in Tools	19
3.	3.4	Key Points to Note to Build Trust	19
3.4	Farr	ner Diversity	20
3.4	4.1	Key Points to Note on Farmer Diversity	21
4. Ca	ase Stu	dies	22
4.1	Mot	ueka River Integrated Catchment Management (ICM) Project	22
4.	1.1	Background	22

4.1.2	Project Design	22
4.1.3	Project Outcomes	25
4.1.4	Factors Influencing the Motueka Integrated Catchment Management (ICM) Project	26
4.2 Syn	lait – Lead with Pride	28
4.2.1	Factors influencing the Sustainability of the Lead with Pride Programme	29
5. Conclus	ion and Recommendations	31
5.1 Rec	ommendations	33
Bibliography		36
Appendix 1 –	Lead with Pride Questionnaire and Response	45

TABLE OF FIGURES

FIGURE 1: CHANGES IN TOTAL NITROGEN IN NEW ZEALAND SURFACE WATERWAYS 1989-2007 (MINISTRY FOR THE	
ENVIRONMENT 2017)	2
FIGURE 2: EXAMPLES OF PERIPHYTON GROWTH (LEFT) (NIWA 2007) AND CYANOBACTERIA GROWTH (RIGHT) (MINISTRY	
FOR THE ENVIRONMENT 2017) IN NEW ZEALAND WATERWAYS	3
FIGURE 3: THE NITROGEN CYCLE ON A DAIRY FARM (DAIRYNZ 2017)	4
FIGURE 4: BCI AND AFIC COMMAND AREA 2017	7
FIGURE 5: KUBLER-ROSS STAGES OF GRIEF MODEL (KÜBLER-ROSS, WESSLER ET AL. 1972)	10
FIGURE 6: THE EXTENSION SPECTRUM (CAMPBELL AND JUNOR 1992)	14
FIGURE 7: FISHER'S (2013) CONCEPTUAL MODEL OF TRUST	15
FIGURE 8: AGE DISTRIBUTION OF NEW ZEALAND AGRICULTURAL INDUSTRY EMPLOYEES (STATISTICSNZ 2017)	20
FIGURE 9: MOTUEKA RIVER CATCHMENT LAND COVER (LANDCARE RESEARCH 2017)	22
FIGURE 10: STEPS IN THE COLLABORATIVE PROCESS (ALLEN AND KILVINGTON 1999)	23
FIGURE 11: KNOWLEDGE MANAGEMENT APPROACH TO RESEARCH USED IN MOTUEKA ICM PROJECT(BOWDEN, FENEMO	ЭR
ET AL. 2004)	24
FIGURE 12: ELEMENTS OF THE KNOWLEDGE MANAGEMENT LIFECYCLE (PHILLIPS, ALLEN ET AL. 2004)	25
FIGURE 13: POINTS TO CONSIDER WHEN CREATING A PROGRAMME	34
FIGURE 14: POINTS TO CONSIDER WHEN IMPLEMENTING A NEW PROGRAMME	35

1. FOREWORD

He aha te mea nui o te ao What is the most important thing in the world? He tangata, he tangata, he tangata It is the people, it is the people *Maori proverb*

I joined the Kellogg Rural Leadership Programme (KRLP) to guide my work as Environmental Manager for a group of Mid Canterbury irrigation schemes. The irrigation schemes I work with hold the first resource consents to be issued in New Zealand which limit collective nitrogen losses. While the concept of nutrient loss caps is pretty straight forward, their implementation requires the development of an Audited Self-Management (ASM) programme to co-ordinate shareholders to change their current on-farm management practices in order to minimise nutrient losses.

I quickly realised managing nutrients was not just an accounting matter, but a rather a retrospective judgement on who was a "good farmer", using a completely different set of parameters to measure success than traditionally used. An effective ASM programme therefore became a social exercise in assisting shareholders with changing how they thought they should farm and promoting alternative visions of what being a "good farmer" looks like in the future.

The concept of ASM collectives of farmers on this scale in New Zealand is reasonably novel, so I have had difficulty finding resources to help me structure the ASM programme in a manner which manages the social aspect effectively. Everything I have created to date has relied on my intuition developed through my previous compliance and extension experience.

Through this KRLP project, I hope to look to other successful initiatives to build upon the knowledge I have already gained in order to refine my own programme with BCIL and to assist others with the development of future ASM programmes.

2. BACKGROUND

2.1 Introduction

New Zealanders have become concerned about water quality, to the point where political parties campaigned to *make rivers swimmable again* during the 2017 general election (New Zealand Labour Party 2017, New Zealand National Party 2017). So important are clean rivers to New Zealanders, that a Newshub (2017) poll found voters ranked environmental issues, such as water quality, above education and just behind housing and health.

2.2 Problem

Between 1994 and 2016, freshwater quality in many New Zealand catchments has declined (Ministry for the Environment and Statistics NZ 2017). Levels of contaminants indicative of diffuse discharges generally increased, while levels of contaminants indicative of point source discharges, such as industrial or sewerage discharges, were generally found to decrease (Ballantine and Davies-Colley 2009, Ministry for the Environment 2017).



The key contaminants of concern for diffuse discharges are Nitrate-Nitrogen (NO_3^--N), Dissolved Reactive Phosphorus (DRP) and microbial pathogens from agricultural sources. While DRP concentrations were found to be improving in more monitoring sites than declining (Ministry for the Environment 2017), the opposite was true for NO_3^--N , particularly in catchments where there was a higher percentage of adjacent land in pasture (Figure 1) (Ballantine and Davies-Colley 2009).

Nutrients feed periphyton growth (Figure 2), which consume the oxygen in a waterbody and effectively suffocate the aquatic life within it (Drewry, Newham et al. 2006). In extreme cases, a type of periphyton, called cyanobacteria, can release toxins which can kill dogs and other animals who eat the algal mats or drink the water (Wood, Hamilton et al. 2009). Some rivers and lakes, such as Lake Rotoiti, have been classified as hypereutrophic due to the extent of algal blooms caused by anthropogenic sources of nutrients (Vincent, Gibbs et al. 1984).

Figure 1: Changes in Total Nitrogen in New Zealand Surface Waterways 1989-2007 (Ministry for the Environment 2017)



Figure 2: Examples of periphyton growth (Left) (NIWA 2007) and cyanobacteria growth (Right) (Ministry for the Environment 2017) in New Zealand Waterways

Nitrogen, phosphorus and sediments from agricultural land can be lost to surface waterways through runoff, where contaminants, such as fertiliser or animal waste on the paddock, are transported by rainfall or irrigation into waterways on the property.

As well as worrying trends in surface water contaminants, New Zealand groundwater quality measures between 1995-2006 show NO₃⁻-N concentrations levels exceeded Maximum Allowable Value (MAV) for safe drinking water standards in 4.9% of the sampled wells, and microbial pathogen level MAV were exceeded in 20% of sampled sites (Daughney and Wall 2007). The 2017 MFE water quality report indicated these trends have continued, with nitrate leaching increasing by 29% between 1990-2012 (Ministry for the Environment and Statistics NZ April 2017).

Farming practices are the dominant cause of elevated NO_3 ⁻-N levels in groundwater in New Zealand (Parliamentary Commissioner for the Environment 2012). Inputs of nitrogen from farming activities are easily mineralised by soil microbes through to Nitrate-N (NO_3 ⁻-N), which is then leached through the soil profile to ground water (Figure 3), particularly where soil water holding capacity has been exceeded. Some catchments are more susceptible to groundwater nitrate contamination than others, as the rate of leaching depends on the soil type, climate, irrigation, plant uptake, and the amount of nitrogen being applied to the soil through stock waste, feed, fertiliser (O'neill 1998).

Blue baby syndrome is a condition which can affect infants and has been linked with high concentrations of $NO_3^{-}-N$ in drinking water (World Health Organization 2004, Cameron, Di et al. 2013). Blue baby syndrome is a condition where nitrates are converted to nitrite in the stomach, irreversibly substituting oxygen in the haemoglobin and prevents effective transport of oxygen throughout the body (O'neill 1998, Cameron, Di et al. 2013). For this reason, the World Health Organisation recommend the safe level of nitrates in drinking water to be no more than 50 mgL⁻¹ (World Health Organization 2004). The same safe level has been adopted by New Zealand's Ministry of Health (Ministry of Health 2008).

High levels of nitrate in groundwater, particularly in rural areas where residents rely on shallow wells for drinking water, have therefore become a public health concern. The level of concern held by some public

figures is so great that the Canterbury Medical Officer of Health has publically spoken out against current farming practices (RNZ 2017).



Simplified nitrogen cycle

Figure 3: The Nitrogen Cycle on a Dairy Farm (DairyNZ 2017)

2.3 Solution

2.3.1 International Context

Stressors on the environment from diffuse agricultural nutrient discharges is not only a New Zealand issue. For example, in the Netherlands in the 1960s deteriorating water quality started to have an effect on the ability to use the water for drinking water purposes and impact on the fisheries industry (Warmer and van Dokkum 2001). Since then, the Dutch have introduced the Action Programme on Diffuse Sources (1997) and the European Union introduced the Nitrate Directive 1991 (European Commission 2017).

The objective of the Nitrates Directive is *"reducing water pollution caused or induced by nitrates from agricultural sources and - preventing further such pollution."* Each member state has since been required to identify and manage key Nitrate Vulnerable Zones (NVS) and enforce and report on the implementation of Good Agricultural Practice in these areas.

Other examples of international initiatives include Ontario's voluntary Environmental Farm Plans programme (Ontario Crop and Soil Improvement Association 2017) or Australia's National Landcare Programme (National Landcare Programme 2014).

These large scale initiatives have been subject of multiple academic studies and the success of the nutrient management programmes have been reviewed by governments, providing a rich source of data in understanding farmer behaviour relating to change initiatives relating to water quality over the long term.

2.3.2 New Zealand Context

The Ministry for the Environment (2017) identified discharges from the intensification of the agricultural sector as a key contributor to nutrient loads entering waterways. With more than 33,000 commercial farms in New Zealand in 2015 (StatisticsNZ 2015), each contributing to the degradation of water quality to some extent. Managing diffuse nutrient discharges is therefore a widespread and complex issue, involving co-operation and action from tens of thousands of individual farmers, who operate different farming systems, with varied operational goals and objectives.

In 2014, the New Zealand government issued a National Policy Statement for Freshwater Quality (NPSFW), requiring all regional authorities to implement changes which "maintain or improve" overall water quality as well as encourage "the adoption of best practicable option to prevent or minimise any actual or potential adverse effect on the environment of any discharge of a contaminant into freshwater or onto or into land in circumstances that may result in that (or, as a result of any natural processes from the discharge of that contaminant, or any other contaminant) entering freshwater" (Ministry for the Environment 2014).

With water quality requirements, such as the NPSFW, being a recent addition to the New Zealand regulatory framework, no preferred methodology had been established to guide Regional Councils in implementing the necessary changes to make improvements in water quality. In response to the NPSFW, in 2017, over 70% of Regional Councils were proposing new rules relating to agricultural land uses to meet water quality targets. To date, the approach by each council has varied, from introducing farm-scale nutrient limit caps¹, to requiring Good- or Best- Management Practice to be implemented², and/or encouraging the formation of catchment or collective groups to manage nutrients within their area³.

Such nutrient management programmes to improve water quality are not new to New Zealand, with Waikato Regional Council first introducing nitrogen capping and trading rules for agricultural activities the Taupo Catchment in 2005, with the aim to reduce the amount of nitrogen reaching the lake by 20% (Waikato Regional Council 2017). However, the new provisions under the NPSFW is the first time these types of provisions have been applied on a national scale.

Despite the complex and interpersonal nature of the actions needed to improve freshwater quality, very little work has been carried out by either Central Government or Regional Councils to identify effective methods of implementing the required changes. In general, the majority work done to date has been technical in

¹ For example, Environment Canterbury, Horizons Regional Council and Waikato Regional Council

² For example, Greater Wellington Regional Council, Taranaki Regional Council and Gisborne Council

³ For example, Environment Southland and Tasman District Council

nature, with numerous reports by scientists and advisory bodies describing the physical processes that take place to produce various water quality outcomes (e.g. Environment Canterbury 2017, Waikato Regional Council 2017).

Canterbury's Land and Water Regional Plan (LWRP) rules in particular have a strong focus on ensuring farmers undertake their activities in accordance with Good Management Practices⁴ (GMP). Good Management Practices to improve water quality was defined by a number of industry bodies and cover 27 areas of farming management, such as irrigation, fertiliser, effluent, and sediment control. Progress with meeting these GMPs in Canterbury is monitored through an auditing programme, which requires evidential proof the on-farm GMP activities were occurring. While many farmers already do some of the good practices, most will need to make changes, some significant, to their daily operations in order to meet the new requirements.

While the physical aspects of water quality in each region have received considerable attention, the social aspects have been largely ignored. Burton et.al. (2011) noted that sustainable change can only occur when intrinsic environmental values align with the desired activities to be implemented, whereas extrinsic motivators, such as financial incentives or strict regulation, were more likely to forestall any change in behaviour. With this in mind, regulatory requirements expecting farmers to implement GMP will be unlikely to result in the desired water quality outcomes unless the farmers are supported to adopt the intrinsic values the respective plans are intending to uphold. Programmes which assist long-term changes in values or behaviour are what I mean by *Sustainable Change Programmes*.

2.3.3 BCI Context

Canterbury's Land and Water Regional Plan (LWRP) was first notified in August 2012 and was one of the first planning documents in New Zealand to create rules which limited individual property nutrient losses. The LWRP introduced a limit of nitrogen losses to what occurred within the 2009-2013 seasons and work towards reducing the nutrient losses from approximately 8000 properties through the implementation of Good Management Practice (GMP). Due to the significant number of farmers affected, Canterbury Regional Council allowed irrigation schemes to apply for resource consent to aggregate the nutrient losses from their shareholders and manage these nutrients collectively.

Barrhill-Chertsey Irrigation Scheme (BCIL) is a new farmer-owned irrigation scheme, which started providing water in 2010 and now currently irrigates approximately 25,000 ha onto about 180 properties, covering approximately 60,000 ha between the Rakaia and Rangitata Rivers in Mid-Canterbury (Figure 4). BCIL is the first operative irrigation scheme to be issued a resource consent to manage the nutrient losses for a period of five years.

BCIL employed me in February 2015 to create and manage their Audited Self- Management (ASM) programme, with the aim to be a leader in this space in order to make the preparation for the renewal of the resource consent in 2018 simpler.

⁴ Good Management Practice as defined in the booklet:

http://files.ecan.govt.nz/public/pc5/MGM Technical Reports/Industry Agreed Good Management Practices MGM 201 5.pdf



Figure 4: BCI and AFIC Command Area 2017

The discharge consent BCIL is required to comply with sets out the key requirements to be reported against to ensure nutrients are being effectively managed. These include:

- Creation of an Audited Self-Management (ASM) document, setting out the scheme programme to achieve compliance with the resource consent.
- All shareholders required to prepare and implement a Farm Environment Plan to achieve Good Management Practice on-farm
- All Farm Environment Plans were to be audited
- Scheme nutrient losses to be reported annually to determine compliance with the consented nitrogen load limit.

Despite the technical nature of the discharge consent, I quickly discovered our shareholders were unprepared for the changes these requirements would have on their day to day operations. Implementation of *"Good Management Practice"* (GMP) required our shareholders to completely revise their businesses models, their personal priorities and their succession planning. Our shareholders were undoubtedly concerned about the level of detail BCIL needed to know about their businesses and the amount of control they had over the security of their water. I found myself needing to develop a sustainable change programme from scratch.

With this in mind, my priority moved from mere consent compliance to creating a programme to assist shareholders through the transition from individual farmers to collective nutrient managers. We found we

needed to work with them individually to create their Farm Environment Plans, provide plenty of information on what GMP looks like (repeatedly), and to regularly update them on these requirements to acclimatise them to the invasion of BCIL into their business. We also sought feedback from shareholders to understand what we could do better and to identify and address the support they needed.

Three years into the programme, shareholders have come to expect (and respect) our involvement with managing their nutrients, but we still have a long way to go to see how this acceptance translates into measurable improvements in water quality.

2.4 Summary and Aim

Nutrient enrichment of waterways in New Zealand from diffuse pollution sources is a complex and multifaceted issue, with many thousands of properties and individuals contributing a little bit to the enrichment of waterways nationwide. In order to achieve the desired community outcome of *"swimmable rivers"*, new solutions need to be developed to ensure each individual consistently makes the right choices on farm over a long period of time in order to improve water quality.

Fortunately, methods to assist individuals with implementing long term, sustainable change on farms have been used in New Zealand and internationally. However, to date little work has been conducted to bring together these experiences to assist others in creating and implementing these sorts of programmes.

The aim of this research project is to review national and international literature of various sustainable change programmes in the context of my own experience to identify the key features which either enhance or hinder change in order to develop guidelines for the creation and implementation of successful programmes on a large scale in New Zealand.

2.5 Research Approach

I used the general principles of Braun & Clarke's Thematic Analysis (2006) to identify key themes in the literature review and applying these ideas to two New Zealand case studies, to assess different approaches currently in practice. Two case studies have been prepared to assess existing initiatives against the themes identified in the literature.

The first case study relates to the Motueka Integrated Catchment Management (ICM) programme. The Motueka ICM project was initiated as a scientific study by Landcare Research and my case study has been prepared by summarising published academic literature available.

The second case study assesses Synlait's Lead with Pride (LWP) programme, which is a new, market driven initiative, and has not yet been evaluated in the literature. For Synlait's case study, I developed a questionnaire which targeted Synlait's approach around the key themes identified in the literature as key in successful behaviour change initiatives. The questionnaire and response can be reviewed in Appendix 1 – Lead with Pride Questionnaire and Response.

Throughout the exploration of the themes identified in the literature, I will also critically assess how the themes identified in my research impacted on my own experience with the development of the BCIL ASM programme.

3. FEATURES OF SUSTAINABLE CHANGE PROGRAMMES

Through this project, I have assumed programmes designed to improve water quality will be most effective where there is full participation and engagement by those who have an effect on waterways. I wanted to get a better understanding through the literature of the different sustainable change approaches available and how they have worked (or not) in other situations.

3.1 Motivators for Participation

3.1.1 Mandatory/Regulatory Approach

A regulatory or mandatory approach is often the most effective method to enact change in the short-term, as they tend to capture everyone and be enforced to ensure the outcomes are met (Bosch, Cook et al. 1995, Mills, Gaskell et al. 2016). These types of programmes are often initiated by local and national governments to address widespread issues, and can be politically motivated.

Overall, Mandatory/Regulatory approaches to programmes are most effective where a specific action by an individual is required, such as an upgrade in infrastructure. For example, metering of water takes throughout New Zealand was inconsistent between Regional Councils, with only about one third of water takes greater than 5 l/s measured (Ministry for the Environment 2016). There was limited information available to manage water at a national level, or to compare data between regions. The New Zealand government decided accurate water use data was important and introduced the Resource Management (Measurement and Reporting of Water Takes) Regulations in 2010, requiring all water takes greater than 5 l/s to have a water meter installed by 2016 and report the data collected. Regional Councils were then tasked with ensuring the regulations were implemented.

Nearly one year after the regulations have been fully implemented and most water takes have now been metered and reported on, providing consistent data to be used to improve management of water in New Zealand. For instance, the Canterbury Regional Council reported over 90% of the water takes in Canterbury complied with these requirements by April 2016 (Environment Canterbury 2016). It is unlikely water meters could have been installed nationwide and in a consistent manner without a national regulation requiring it to happen.

Over time, regulation can be effective in changing attitudes as noted by Buckley (2012) with Irish farmers under the Nitrates Directive, however acceptance of regulatory requirements do not necessarily equate to adoption of the values being promoted.

In general, engagement in mandatory/regulatory approaches tends to be low as the participants "do what they have to" or even "what they can get away with" rather than take on board the values the programme is trying to promote (Barnes, Toma et al. 2013). Regulatory authorities also tend to apply general rules over a widespread geographical area, which may or may not be relevant to a specific property, which can further disengage participants (Palmer, Fozdar et al. 2009).

Botha (2013) highlighted a high level of fear and anger over environmental regulation for Taupo farmers, which translated to little improvement on farm five years after the introduction of the nutrient management

rules in this area. Botha's research draws attention to the grieving process participants in a mandatory programme will more likely experience when regulations affecting their livelihood is introduced.

Kubler-Ross' (1972) description of the stages of grief provides a useful framework to understand the process a farmer may go through when mandatory environmental regulations are introduced. The first stage of grief is shock and denial, followed by anger, bargaining, depression and acceptance (Figure 5, (Kübler-Ross, Wessler et al. 1972) While the stages of grief model was initially developed to understand what feelings people may experience when facing death, it has also been found to be applicable to any significant life changing event, particularly where the affected person has a lack of choice.



Figure 5: Kubler-Ross Stages of Grief Model (Kübler-Ross, Wessler et al. 1972)

Many farmers will experience some or all of these stages when regulations are introduced, and any mandatory programme will face resistance unless significant support is provided to assist farmers through the process (Botha, Roth et al. 2013). Where there is insufficient or inconsistent support provided, the farmers will be unlikely to implement the necessary changes in the long term and the desired community outcomes are unlikely to be met (Smith, Glegg et al. 2007, Blackstock, Ingram et al. 2010).

3.1.2 Voluntary Approach

Voluntary programmes can be a useful method to improve environmental outcomes, while also providing flexibility and choice to participants (Alberini and Segerson 2002). Engagement of participants within voluntary programmes tend to be high, as their existing values often align with the values promoted by the programme (Blackstock, Ingram et al. 2010). However, participation tends to be low (Burton, Kuczera et al. 2008), particularly when there is no *"threat"* for not participating (Alberini and Segerson 2002). Examples of voluntary agri-environmental programmes in New Zealand include Beef+Lamb NZ's Land and Environment Plan, DairyNZ's Sustainable Milk Plans or Synlait's Lead with Pride programme.

Interestingly, while Moon and Cocklin (2011) noted financial incentives could improve participation in voluntary programmes, Dwyer et. al (2007) and Mills et.al. (2016) found financial incentives to be a poor predictor of sustainable long-term behaviour change. Participants motivated by financial gains will likely do what they have to in order to receive the reward, but unlikely to adopt the values the programme is trying to achieve. Once the programme is completed, they will most likely return to their previous behaviours (Mills, Gaskell et al. 2016).

The most successful predictor of long-term sustainable change in voluntary programmes, was the amount of education and support provided (Blackstock, Ingram et al. 2010).

Common barriers to participation in a voluntary programme include the time required and a lack of understanding of how the requested mitigations will improve the environment (Pahl, Weier et al. 2007). For example, Ahnstrom et.al. (2009) noted many farmers saw themselves as *"conservationists"* and stewards of the environment, but did not understand how their current practices had an impact. Where this attitude existed, the farmers were unlikely to voluntarily make changes as they did not appreciate how their actions related to the problem. Botha's (2013) observations also found a lack of ownership of an issue resulted in a poor uptake of mitigations with Lake Taupo farmers. In this instance, the reasons were often for lack of trust in the science, lack of connection between their actions with the environmental effect, or have sufficient peer support.

3.1.3 Market Driven Approach

Market-driven initiatives lie somewhere between voluntary and mandatory schemes. Participants generally do have a choice, but may struggle to sell their product unless they are part of the programme. Therefore, participants are more strongly motivated to be involved and engaged than with purely voluntary programmes. An example of a market-driven initiative is the NZGAP and GlobalGAP schemes.

The NZGAP and GlobalGAP programmes provide certification of food producers following the Hazard Analysis and Critical Control Points (HACCP) approach to food safety (New Zealand GAP 2017). The GAP programmes set and audit the standards for ensuring the quality of the food grown and the environmental and social impacts of the operation meet the expectations of the receiving customers. Food producers volunteer to participate in the GAP programmes, but will struggle to supply the major supermarkets in New Zealand, such as Pak N Save and New World, without NZ GAP certification (Foodstuffs NZ 2014), nor could they export their produce to Europe without achieving GlobalGAP certification (New Zealand GAP 2017).

Alberini et.al. (2002) noted companies with significant brand exposure were most likely to participate in market driven initiatives. Customer demands for transparency when paying a premium for products often mean these programmes are audited and well resourced (Campbell and Rosin 2008).

Agriculture Research Group on Sustainability's (2011) report on Zespri's kiwifruit quality standards found the standards formed part of the grower's perception of a *"good farmer"*, with uptake improving when orchardists participated in the development of the auditing standards. The combination of improved monetary gain and recognition by the wider community were found to be strong motivations in the adoption of the recommended good practices.

Method	Pros	Cons
Mandatory/Regulatory	Captures all who need to be targeted	Poor engagement or active dis- engagement of participants
	Tend to see change quickly	Often poorly resourced
	Best for straight forward changes	"One size fits all", no flexibility with rules
Voluntary	Programme more likely aligns with participant values	Can take time to build social capital
	Can result in sustainable long- term change	Poor participation
	Better model for complex issues	
Market-Driven	Strong incentives to participate and be engaged	May not align with participant values
	Will capture many who	May be difficult to demonstrate
	Often well resourced	quality if spread over a large geographical area

3.1.4 Key Points to Note for Methods of Participation

3.2 Programme Structure to Maximise Engagement

Two common structures of change initiatives are the *"top-down"* or the *"bottom-up"* methodologies. *"Top-down"* approaches tend to be authoritative and directive, where instructions are given and expected to be followed. A *"bottom-up"* approach assumes participants already know the solutions to their own problems and merely need coaching to identify the issues and clarify what they can do about it (Black 2000).

Mandatory programmes often use *"top-down"* approaches, particularly where wide-scale changes are needed. *"Top-down"* approaches are most useful for new technology, where the information is too new or complex to be within the realm of knowledge of those needing to implement it (Black 2000). Traditional extension programmes also tended to utilise a "top-down" approach, whereby the scientists completed the research, provided the information to an advisor, who then passed on the information to the farmer (Black 2000). There is often little room for feedback from those undertaking the activity, nor is there room to tailor the information for the context of the property (Black 2000).

In general, there has been a move away from the traditional *"top-down"* approach in extension as uptake is often poor, particularly where the information provided is too broad and not relevant to the specific situation faced by the farmer (Black 2000). In fact, Siebert et. al. (2006) noted arbitrary *"top-down"* approaches tended

to elicit negative response from farmers, who often felt disdain when required to make changes and were unlikely to participate in schemes where there was insufficient consultation.

Many farmers appreciate the hands-on, practical aspects of agriculture and enjoy problem solving (Dwyer, Mills et al. 2007). *"Bottom-up"*, collaborative processes are therefore engaging for a greater proportion of the farming community, rather than just telling them the answers. Black (2000) and Blackstock et. al. (2010) also note farmers were more likely to continue implementing the solutions which they have been involved in creating (Black 2000).

While *"bottom-up"* approaches can be effective for supporting sustainable, long-term change, there are limitations. Black (2000) noted *"bottom-up"* approaches are only useful where the participants already have the knowledge required in order to derive a clear and practical solution. Where there is new or unknown technology, or the issue is complex, more guidance may be required. Furthermore, effective *"bottom-up"* solutions often require sufficient time and resources to build social capital in order to facilitate the discussions required to identify the best solutions (Fenemor, Phillips et al. 2011).

Group consultation and formation of collectives were identified as a useful mechanisms to support the brainstorming required in a *"bottom-up"* approach, as the group can derive the proposed solutions at a community scale, while also building social capital and create a supportive environment for implementing the change (Blackstock, Ingram et al. 2010).

For group solutions, Marsh and Pannell (2000) noted participants often poorly represented the community, with wealthier and larger farms dominating and few women involved. Participants who were not involved may still be sceptical of the proposed mitigations developed by the group, particularly where they have not built up trust with the farmers representing their interests (Marsh and Pannell 2000).

"Bottom-up" approaches are often characterised by a trial and error iterative process. An iterative process allows the programme to evolve in response to participant feedback and incorporate new information, such as new technology or updated research. There is an assumption within the model that the first attempt will not be perfect and there is room for genuine consultation while it is being implemented (Burton and Paragahawewa 2011).

An example of an iterative process is Motueka's Integrated Catchment Management project (see Case Study 4.1) or programmes which support creation of audited, on-farm Environmental Management Strategies (EMS)(Rosin, Dwiartama et al. 2012).

An Environmental Management Strategy (EMS) is a management systems framework, which can improve efficiency, reduce risks, enhance compliance and improve profitability by providing users with a tool to assess their operation in an integrative manner (Carruthers 2011). Carruthers (2007), Paterson (2011) and Wilson et.al. (2009) recommend use of an EMS type system as a method of implementing a programme of continuous improvement, through a *Plan, Do, Check and Act* cycle (Carruthers 2011). The EMS is particularly useful where the issues are complex and management decisions need to be adapted as research and data becomes available (Carruthers 2011).

As environmental issues increase in complexity, extension programmes will need to shift away from just telling people what to do, to enabling them to think creatively and develop their own solutions (Black 2000). The Extension Spectrum (Figure 6⁵) is a graphical description of this process. "Top-down" approaches is largely effective at the technology transfer end of the spectrum, whereas "bottom*up*" methods is more about problem solving. Truly effective solutions need to be developed by participants, therefore their individual capability will need to be fostered. Education and personal development must therefore become the cornerstone of any change programme in order to achieve the desired community outcomes (Blackstock, Ingram et al. 2010).



Figure 6: The Extension Spectrum (Campbell and Junor 1992)

One educational theory which could be useful for developing capability within adults is Jensen's (2008) Brain-Based Learning, which describes seven steps to optimise the uptake of information by students, based on the sequence which makes most sense to the brain. The steps include:

- Pre-exposure
- Preparation
- Inspiration and Acquisition
- Elaboration
- Incubation and Memory Coding
- Verification and Confidence Check
- Celebration and Integration

Following a process such as this during all extension activities could assist with farmer uptake of ideas by building their knowledge and capability in the most efficient manner.

3.2.1 Key Points to Note for Programme Structure

- Know what needs to be achieved and expected timeframes
- Ensure the values of the programme are clearly communicated, where necessary
- Complex problems need complex solutions
- Human development needs to be at the centre of any long-term sustainable change

⁵ Special thanks to Ollie Knowles for letting me use this diagram!

3.3 Trust

3.3.1 Trust in People

"Information is ... unlikely to become knowledge unless the recipient trusts the informant" (Fisher 2013)

All change programmes must first understand people and the trust they place in their relationships with others. While water quality issues may seem to be a technical problem initially, programmes to improve to water quality will be unsuccessful unless the people contributing to the problem also contribute to the solution.

Fisher (2013) developed a *Conceptual Model of Trust* (Figure 7) based on her own research, and similarly Kasperson and Golding (1992), cited commitment, care, competence and predictability as cornerstones for the formation of trust. Where these values are met consistently, trust between individuals and organisations can be built, acting as a catalyst for passive information to be transformed into usable knowledge (Fisher 2013).



Figure 7: Fisher's (2013) Conceptual Model of Trust

All change programmes should, where possible, leverage existing trusted social networks (Mills, Ingram et al. 2008) or allow time for quality people to build the relationship between the parties (Allen, Fenemor et al.

2011). In fact Mills et.al. (2008) recommend up to 10 years to develop new schemes in order to build sufficient social capital and trust.

For any initiative which relies on group participation and engagement, building trust between members is essential (Allen, Fenemor et al. 2011). In the Motueka Integrated Catchment Management (ICM) project, agreement on the key catchment issues and identifying potential solutions could only occur once a significant level of trust had been built between the different stakeholders (see Case Study 4.1).

The desire to *"fit in"* or to maintain the esteem of peers is well known and studied through the evolutionary theory of commons (Richerson, Boyd et al. 2002), which investigates the reasons humans co-operate and form social structures, despite personal sacrifices in doing so. This effect can be capitalised by collectives and other groups, which can build on the existing social capital of a community (Barnes, Toma et al. 2013). Where the community sets the standards and expectations of behaviour, each individual member feels a sense of obligation to the other members of the group. Furthermore, uptake by members of the group can normalise the behaviour to be adopted, making it more likely others will take on board the changes being promoted (Yang and Sharp 2017).

Oreszczyn et. al. (2010) described the impact a "web of influencers" can have on a farmer's behaviour change, whereby much of the information they received and those most capable of influencing decisions can be found within existing networks. The "web of influence" is a trusted source of information for individuals and can act like informal feedback, highlighting normal behaviours and expectations.

Farmers frequently look to a trusted leader in their rural community when looking to implement changes in their farming practices. The trusted leaders are typically seen as "good farmers", and being a "good farmer" helps form a sense of self identity and pride within the community (Stock and Forney 2014). Where a trusted group of peers supports a particular behaviour change, and that behaviour becomes normalised, peer pressure from the group will increase the chance that the individual farmer will be more likely to implement that change in order to maintain their "good farmer" status (Blackstock, Ingram et al. 2010, McGuire, Morton et al. 2013).

Farm advisors are also seen as trusted leaders. Where a culture of trust between the advisor and participant has already been established, such as between neighbours or farm consultants, engaging and educating the advisor can be an effective method to improve outcomes (Klerkx and Jansen 2010). One-on-one knowledge transfer, either between peers or between a farmer and their advisor, was identified by Black (2000) and Fisher (2013) as an important method to deliver information. For a participant to accept the information, they will ultimately assess it's quality and form a judgment based on their level of trust with the person delivering the message (Dwyer, Mills et al. 2007).

Dwyer et. al. (2007) notes a participant's acceptance of a message from another person can depend on:

- the experience and practical knowledge of the advisor
- an ability of the advisor to clearly communicate issues in a way which is personally applicable to the participant
- advisor's familiarity of the farming systems being discussed
- the advisor being perceived by the participant as having a similar occupation and experience

The power of the messenger of knowledge was highlighted by Botha et al (2012). Botha (2012) found Taupo farmers' had high levels of trust with their farm consultants, but where the consultants were either not well informed or were unclear of (or didn't trust) the information they should pass on, the uptake of the desired mitigations by the Taupo farmers was low.

While it is essential for change programmes to foster the building of trust between all parties, it is just as essential to ensure any change programme to avoid fostering distrust. Fisher (2013), Botha (2013), De Vries (2014), Macgregor (2006), and Palmer (2009) noted high levels of distrust with government agencies where there was inconsistent messaging around requirements. For example, about 75% of farmers in the Lake Taupo catchment had not made any on-farm practice change between 2005-2009 as they were uncertain of the compliance standards (Botha, Roth et al. 2013), while MacGregor's (2006) interviewees showed a general attitude of apathy towards government regulation potentially due to the complexity of the bureaucratic process. Where positive relationships with government agencies were reported, the primary reason was due to farmer confidence in the staff they dealt with on a day to day basis (Palmer, Fozdar et al. 2009).

Poor communication of regulatory advice or rules, where the requirements were either not applicable to an area or impractical, also assisted with the development of distrust (Smith, Glegg et al. 2007, Fisher 2013). Where the requirements were not perceived to be connected to desired outcomes, the farmers felt the Government lacked sufficient knowledge and were unlikely to implement the changes as they did not trust they would work. These issues were exasperated where the relationship with the regulatory agency was inconsistent, infrequent and/or negative (Fisher 2013).

"There's no point in educating farmers over bio-security when you've got the upper levels, like the politicians and them, making decisions that are really contradictory to what we're going to do down here..." (Palmer, Fozdar et al. 2009)

Many behaviour change initiatives will rely on participants being honest with themselves and the programme leaders with actual practices being undertaken (Palmer, Fozdar et al. 2009). Palmer et. al. (2009) found many farmers were distrustful of government agencies and were concerned about repercussions if they reported infectious diseases in livestock. Therefore, change programmes need to ensure farmers feel safe to speak to advisors without repercussions in order to have a frank and honest discussion to find an appropriate solution.

In my opinion, some key features which seemed to result in higher levels of distrust include:

- Inconsistent and/or unclear requirements
- Generic and/or impractical advice
- Lack of knowledge by staff
- Poor existing relationships and communication
- Fear of retribution

3.3.2 Trust in Information

The actual or perceived quality of the information being promoted by a programme is also another key factor in determining whether or not a farmer will take on board the desired practice. Where there is insufficient evidence to convince farmers there of a problem, farmers are unlikely to uptake the actions needed to make improvements (Barnes and Toma 2012). For instance, Barnes and Toma (2012) surveyed over 540 dairy farms about their perceptions of climate change and their willingness to take voluntary action to reduce greenhouse gas emission and found over half were sceptical about the reported effects of climate change and these half were unwilling to engage with programmes to address the issue.

"I'd just have to look at the story and see how real it seemed to my situation at the time" (Moon and Cocklin 2011)

Furthermore, even if farmers do accept there is an issue, farmers need to be confident the data linking their actions to an environmental effect is robust and made sense to them. Moon and Cocklin (2011) noted even farmers who identified as *"conservationist"* were unlikely to adopt biodiversity practices where they did not accept their actions had an effect on the end outcome.

Another aspect of the use of trusted information to drive change is the use of benchmarking. Benchmarking is generally based on data metrics and KPIs and can provide independent feedback on progress and comparisons with peers and was identified as an effective method to provide feedback to individuals (Lokhorst, Hoon et al. 2014).

Benchmarking could be particularly useful to provide feedback on the success or failure of the actions of the participants. As mentioned earlier, engagement improves where participants trust there is an issue, their actions have an impact on that issue and the proposed alternatives will result in a meaningful improvement. Benchmarking and reporting on metrics in a format which addresses these issues is a useful method to build trust with participants in this area.

Examples of benchmarking in New Zealand is Zespri's dashboard, which reports water usage, sugar content and yields of kiwifruit back to growers so they can understand how they are performing in relation to their peers. In an ARGOS 2007 report (Rosin, Hunt et al.), greatest engagement in benchmarking came where the growers were able to provide feedback on the metrics they wished to measure themselves against. The benchmarking allowed premiums to be paid to the better growers, as well as increased social status within the group.

Provided the benchmarking metrics were verifiable, measureable and had real meaning, the feedback these provide to participants is very useful in encouraging behaviour changes.

3.3.3 Trust in Tools

In addition for farmers to trust the information provided, they must also have faith the time and effort required to implementing the recommended tools will result in the desired improvements to the environment (Bewsell and Brown 2011).

For example, OVERSEER[®] is a model used in New Zealand to assess nutrient transfers within farm systems and is now commonly used to predict fertiliser requirements and nutrient losses for a particular property. With the release of the National Policy Statement for Freshwater Quality (NPSFW) in 2014, many regional councils are using this tool to set limits for nutrient losses to groundwater and surface water and to improve the efficiency of fertiliser use.

Early studies of dairy farmer perceptions of using OVERSEER[®] found a general lack of trust in the tool (Bewsell and Brown 2011) to provide sufficiently accurate information to influence their management decisions. Trust in the model improved with on-going usage, as the users became familiar with the information required and were more confident with the data being used. However many farmers felt the assumptions made by the model and inherent uncertainty in the calculations meant the model was best used as a guide. This lack of trust was cited in the study as a primary reason not to implement the recommendations from the model and to only use it to meet regulatory requirements.

Furthermore, when used in regulation, the method of preparation, version changes and inherent uncertainty in the model results in variable calculations of nitrogen loss for the same system (Duncan 2014). As demonstrated above, farmers are unlikely to implement changes on farm where there is inconsistency or uncertainty in the regulatory requirements. In fact, Duncan (2014) suggests the regulatory emphasis on adherence to a nutrient cap calculated by OVERSER[®] will not result in actual change of practice on farm, but rather motivate farmer to manipulate the model to achieve the desired numerical outcome.

"What might have been clear-cut and easy to decide in terms of data inputs, definitions and input category choices in the past when the stakes were very low in comparison, suddenly become ambiguous and negotiable. This is not unlawful – it is a pragmatic response to 'rule by numbers'" (Duncan 2014)

3.3.4 Key Points to Note to Build Trust

- Allow time to build social capital and trust
- Support regular interactions with peers and trusted advisors
- Create a safe environment to encourage honesty
- Ensure trusted advisors are well informed
- Be consistent and practical
- Ensure the recommended tools and mitigations will result in desired outcomes
- Provide feedback of progress via trusted sources of information

3.4 Farmer Diversity

When creating any sustainable change programme, it is essential to recognise how the diversity of the farmer community and how closely a farmer's self-identity influences their decision making (Lokhorst, Hoon et al. 2014). Each individual farmer has their own personal and business values, with their own priorities and risk-acceptance profiles for their own reasons. Furthermore, each individual will come into the programme with their own specific education and experience, with a diverse ability to understand and/or accept the information being provided (Mills, Ingram et al. 2008).

Often, each of these aspects are closely linked to their own personal idea of what is a "Good Farmer", which is inherently linked to their self-identity (Burton, Kuczera et al. 2008, Burton and Paragahawewa 2011, McGuire, Morton et al. 2013). By requesting a change in behaviour, we are challenging their sense of self and belief that they are a "Good Farmer".

Any programme must therefore include multiple approaches to encourage participation and engagement, while also respecting how participation within such a programme will affect their personal identity as a farmer.

Furthermore, every farmer will have a different level of education, experience and access and/or capability around technology (Vanclay 2004). The 2013 New Zealand census found over 44% of agricultural employees were aged over 50 years old (StatisticsNZ 2017), with 31% of dairy farmers and 57% in the mixed livestock and grain farming systems (StatisticsNZ 2017).



Figure 8: Age Distribution of New Zealand Agricultural Industry Employees (StatisticsNZ 2017)

Many older farmers have extensive experience and knowledge around farming practices, but may be uncomfortable using modern tools, such as phone aps, and have a lower level of education compared their younger peers. In remote areas, there may also be issues with access to broadband and cell phone coverage.

From my experience, I have noted some older farmers may also be wary of making significant capital investments, as they may prefer to minimise debt as they look into retirement and consider the implications for succession planning. However, having a successor may also be a motivation for participating in a scheme as a way to ensure the long-term viability of the farming business (Wilson 1997).

3.4.1 Key Points to Note on Farmer Diversity

- Understand your group
- Provide one on one support
- Provide several different methods of information transfer

4. CASE STUDIES

4.1 Motueka River Integrated Catchment Management (ICM) Project

4.1.1 Background

The Motueka River Valley Catchment covers an area of 2,170 km² in the north west of the South Island, with a population of approximately 12,000 people, including the township of Motueka (Fenemor 2013). Land uses in the Motueka Catchment (Figure 9) varied from undeveloped Department of Conservation (DOC) Land, to forestry, to drystock and dairy, orchards and hops as well as the aquaculture industry, which is reliant on the water quality of the Motueka River where it flows into Tasman Bay. (Fenemor 2013). The Motueka River was also world renown for it's trout fishery.

The catchment was chosen for the Motueka Integrated Catchment Management (ICM) Project in 2000 as there was rapid economic growth in the area, with corresponding pressures on the environment, as well as



Figure 9: Motueka River Catchment Land Cover (Landcare Research 2017)

a diverse range of land use, water quality and quantity issues (Allen, Fenemor et al. 2011). The design of the Motueka ICM project was intended to demonstrate a collaborative, holistic approach to manage regional-wide resource management issues, with a *"ridge to the sea"* focus (Phillips, Allen et al. 2004), which could then be used as a useful template for managing water in other areas. The Motueka ICM project continued until 2011, when funding ceased.

The project was led by Landcare Research NZ Limited and primarily funded by the Foundation of Research, Science and Technology (FRST). Other key stakeholders included Crown Research Institutes (Cawthron Institute, GNS, and SCION), NIWA, Tasman District Council and community interest groups, including representatives from local Iwi (Phillips, Allen et al. 2010).

4.1.2 Project Design

Community engagement in the Motueka ICM process started two years prior to the initiation of the project through community meetings and follow up reports and discussions, creation of interest groups, and questionnaires (Bowden, Fenemor et al. 2004). By the time the ICM project

was formally launched in 2000, many of the key catchment issues had been identified. The key outcomes agreed by key stakeholders were (Fenemor 2013):

- 1. Fair allocation of water for competing land uses
- 2. Effective management of land uses within the catchment to maintain freshwater and marine water quality
- 3. Develop integrative tools to manage cumulative effects
- 4. Build human capital to facilitate community action

The collaborative approach used for this project was a three step process: 1. Entry and Contact 2. Knowledge Development and 3. Implementation and Review (Figure 10).



Figure 10: Steps in the Collaborative Process (Allen and Kilvington 1999)

Community Engagement

Step one of ICM process was considered to be the single most important factor in it's success (Phillips, Allen et al. 2010), as stakeholders needed to first build relationships based on trust and respect in order to successfully identify common goals and methods of achieving them.

Allen et. al. (2011) identified the Motueka Catchment as an area with high *"social connectivity"* due to the small and stable population, which had demonstrated a strong engagement in resource management issues prior to the initiation of the ICM project. Despite these advantages, most stakeholders had not participated

in a multi-stakeholder process before and the biophysical research team were based around the country, with few having any experience with engaging with the end users of their research.

To ensure on-going community engagement during the ICM project, Davie et. al. (2006) identified three key aspects of communication:

- 1. Formation of a local Community Reference Group (CRG) to provide a reference point for research
- 2. Method to disseminate research to resource managers and the community
- 3. Development of tools to promote continued stakeholder engagement in the process.

The CRG consisted of eight residents of varied interests (e.g. farming, horticulture, fishing and tourism), who met four to six times a year with researchers and policy makers. The CRG assisted researchers with identifying the key areas of concern in the community in which to target knowledge gaps. The researchers were then able to target their projects to address the concerns of the community and communicate the result back in ways which were most useful to them, particularly by utilising informal learning from social networks.

Finally, the ICM project developed and used models for engaging with local Maori (Harmsworth 2001) and evaluating team performance (Kilvington and Allen 2001). A combination of the models and multiple methods of contact with the wider community (Allen, Fenemor et al. 2011) enable on-going collaboration and engagement.

Knowledge Development

Phillips et. al. (2004) suggest the Motueka ICM project as an example of an iterative *Knowledge Management* (*KM*) process. The first three years consisted of largely research driven objectives, where the results were passed on to stakeholders. Over time, stakeholder understanding of the issues and challenges improved and they were able to contribute to discussions and theories to guide the direction of further research (Figure 11).







Figure 12: Elements of the Knowledge Management Lifecycle (Phillips, Allen et al. 2004)

Implementation and Review

The last phase of the project was the utilisation of the community driven research outcomes and turn them into practical actions to achieve the desired community outcomes for the catchment. One example of this last phase is the identification of the need to improve riparian planting along the river to improve water quality and create habitat which supports the trout fishery. Researchers worked with farmers in the catchment to identify practical and effective methods of planting and establishing riparian margins (Smaill, Ledgard et al. 2011) and created a series of Good Management Practice guides which could be used around the country.

4.1.3 Project Outcomes

The ICM project also identified, measured and reported a wide range of metrics to determine success (Phillips, Allen et al. 2010) as each stakeholder has their own outcomes they wanted to achieve. Fenemor's 2013 review of the ICM project 10 years after it's initiation (Fenemor 2013) found the key outcomes were achieved and through voluntary community action, rather than regulation. An example of the success of voluntary actions implemented due to this project was seen in the improvement of the water quality in the Sherry River.

Initial monitoring of water quality in the Motueka Catchment found high levels of *E.coli* from the Sherry River, where there were a number of dairy farms bordering the river. All landowners in the area were concerned about these results as they wanted to be able to swim and drink from the river. Further investigation found

E.coli to be higher downstream of river crossings, as a result of the common practice of cows crossing through the river twice a day for milking (Davies-Colley, Nagels et al. 2004).

The results of the investigation into the source of the *E.coli* was presented to the Sherry River landowners, who were then motivated to install culverts at all crossings, which saw a 50% reduction in *E.coli* contamination (Fenemor, Young et al. 2011). Furthermore, the Sherry River Catchment community recognised more work was required to achieve the water quality standards they wanted. Best Management Practices were developed for the catchment (Fenemor, Allen et al. 2013) and all major properties completed environmental plans, designed to achieve an overall reduction in *E.coli* of 80%. Voluntary actions included fencing waterways, riparian planting, and reticulation of stock water supplies.

4.1.4 Factors Influencing the Motueka Integrated Catchment Management (ICM) Project

In my opinion, the Motueka Integrated Catchment Management (ICM) project highlights best practice in the creation of a long-term, sustainable change programme. There are several key components which are likely to have supported the positive resource management outcomes in the Motueka Catchment, and should form an integral part in the development of any future regulation or programme, which are:

- 1. Long-term project, extending over 10 years
- 2. Strong culture of trust between stakeholders, with significant time spent building social capital between participants.
- 3. Catchment had a clear connection between land use activities and water quality and quantity issues
- 4. Project had a focus on developing the capability of stakeholders
- 5. Knowledge gaps were identified and research completed to assist decision making
- 6. Programme was permitted to evolve and standards could be developed as further information and research was undertaken
- 7. Water quality outcomes were clearly communicated to all stakeholders

Mills et.al. (2008) noted successful programmes should allow up to 10 years to foster these relationships, and should build upon existing networks where possible. The Motueka ICM project is a good example of how successful this approach can be, given enough time. By spanning the project over a period of 10 years, the Motueka ICM project had sufficient time to establish the social capital between stakeholders and build a high level of trust between the organisers, the stakeholders and the scientists in order to achieve the desired water quality outcomes through voluntary measures.

The Motueka ICM also highlights how important it is to have robust information available to support the development of capability and standards in a manner which will promote the uptake of these recommended activities. Bewsell and Brown (2011) found farmers were most likely to adopt practices when they were confident their activities would have a direct effect on the outcomes. This was seen in the Motueka ICM project in the Sherry River, where the source of high *E.coli* was identified, recommended actions were proposed based on this science, which gave the landowners adjacent to the river confidence to invest in the installation of culverts to mitigate these effects. Further monitoring of the river demonstrated to the landowners that these actions were effective, which further built trust by those landowners in the project as a whole. I would suggest this process may have been more difficult if the science was not available to support

the development of the recommended actions and provide the feedback of the implementation of those actions.

There are, however, some key factors to the success of the Motueka ICM project which will be difficult to replicate in other catchments in New Zealand. If you were to replicate this project elsewhere there are some things which will need to be considered:

- 1. Time
- 2. Small catchment, with existing, stable social networks
- 3. Direct correlation between land use and water quality outcomes

As could be seen in the 2017 elections, there is a strong public expectation for government agencies to do something to make water quality *"swimmable"* in New Zealand. For instance, in February 2017 the incumbent National Party set a target for ensuring all New Zealand rivers would be swimmable by 2040, which was heavily criticised for allowing too much time to the industries seen to be polluting the waterways. In response to this announcement, a popular freshwater lobby group proposed an alternative plan to improve freshwater quality⁶, which would have significant effects on agriculture if implemented. While time is an essential component for ensuring a sustainable outcome, many government regulators may face resistance by their constituents to take action much sooner than is ideal to achieve these outcomes.

Another factor which would assist with the success of the Motueka ICM project, but may not be applicable everywhere, is the highly motivated existing group of stakeholders. Motueka is a small town, with limited mobility, therefore the stakeholder group had high levels of existing social networks. In other areas around New Zealand, for instance in intensively populated cities, it will be considerably more difficult to engage all affected landowners and stakeholders, if at all. Regulations or projects designed to improve water quality need to consider these social aspects when creating these programmes.

Lastly, one major advantage of the Motueka ICM project was the direct correlation between land use activities and water quality. Botha et.al. (2013) highlights the importance with connecting farmer activities with water quality outcomes. There are other catchments in New Zealand where water quality is deemed to be under stress, but the correlation between specific land use activities and water quality are not as clear. For instance, in Mid- Canterbury, groundwater quality has declined over the past 20 years through a general intensification of farming and industrial activities. Effects on water quality through farming activities are not directly related to any one farm, or group of farmers, rather it is the accumulation of nutrient losses from farming over the entire Canterbury Plains over a significant period of time. While programmes in Canterbury can monitor groundwater quality, it is likely any positive results from improving on farm activities will take between 10-20 years to be seen in the groundwater, unlike in the Sherry River catchment, where improvements in water quality were seen within months of the installation of the stock crossing culverts. Any programme in a catchment where on-farm activities are not directly connected with water quality outcomes, needs to still ensure quantitative measurements are still undertaken and fed back to participants in order for them to have confidence their actions will have an effect.

⁶ <u>https://www.freshwaterrescueplan.org/the-plan/</u>

4.2 Synlait – Lead with Pride

Synlait Milk Limited's Lead with Pride programme was reviewed through a survey developed by myself to understand their programme in the context of the themes identified in the literature. There have been no scientific reviews of the programme to assess the effectiveness of the programme. Full details of the survey are listed in Appendix 1 – Lead with Pride Questionnaire and Response.

Synlait Milk Limited is a small, Canterbury-based milk supply company which specialises in exporting valueadded, high quality milk products, such as A2 infant formula, from about 200 suppliers. Synlait established their ISO IEC 17065 accredited Lead with Pride (LWP) programme in 2013 to produce an industry best practice milk product which could be traced from the grass, to the cow, to the can. The cornerstone of the LWP programme is to reward excellence and achieve best- or leading- industry practice for the four pillars; Environment, Animal Health and Welfare, Social Responsibility and Milk Quality. Synlait want to not just recognise and reward those who would meet all these standards anyway, but to encourage these practises and move the dairy farming "bell curve to the right".

Synlait currently has 47 certified "best" practice suppliers (Gold Plus) and 3 certified "leading" practice suppliers (Gold Elite). Suppliers who achieve "Gold Plus" or "Gold Elite" standards are paid a premium of up to \$0.12 per kgMS for the milk they produce. Collectively these 50 farms can supply sufficient milk to deliver a certified "best practice" milk product to market.

Development of the standards set by the programme are reviewed twice a year with farmer representatives, Synlait staff, and AsureQuality⁷ staff to discuss progress and effectiveness of the programme, with updates given to a stakeholder group once a year.

To maximise engagement by suppliers, Synlait provide a complete set of the expected requirements to be achieved and a records book to assist with the collection of the information needed to demonstrate the requirements are being met. Synlait also provides dedicated and highly qualified staff to assist suppliers on a one on one basis, and run focus days twice a year to support further education. All suppliers receive a monthly newsletter and access to a social media page to highlight successes and communicate good practice ideas. The one on one contact enables Synlait to treat each farmer differently, according to their individual needs. The frequent, positive contact with Synlait staff allows the development of the relationship and build trust over time.

Synlait's measure of success for the Lead with Pride programme is to have sufficient volume of "certified" milk to create a separate product stream, which is then purchased by a customer at a premium. With the 50 certified suppliers, there is currently sufficient volume to achieve this outcome, but work now needs to get started to market this product.

⁷ Accredited auditing authority

4.2.1 Factors influencing the Sustainability of the Lead with Pride Programme

Synlait's Lead with Pride programme is unique within New Zealand's dairy industry and is to be commended for investing the time, effort and resourcing to ensure the programme is a success.

The key factors of the programme which will enhance their success include:

- 1. On-going one on one support with stable, knowledgeable and experienced staff
- 2. Voluntary programme with clear incentives to participate
- 3. Holistic, whole farm approach
- 4. Clear objectives and targets to be met
- 5. Auditable outcomes developed with farmer representatives
- 6. Regular auditing and follow up ensure outcomes are being met and maintained
- 7. ISO
- 8. Creating a community of certified suppliers provides on-going support

One of the most positive aspects of the LWP programme is the on-going support provided by the company by competent and knowledgeable staff. Fisher (2013), Mills et. al. (2016), and Botha (2013) were just a few who indicated trust in people was the most significant factor in whether or not a farmer would take on board the message and values of a programme. The stable and constructive relationship between suppliers and Synlait staff will underpin the overall success of the programme.

The other factor which will enhance uptake of better practices by suppliers are the clear and auditable standards and incentives, which are reviewed by the company and farmer representatives. Black (2000) and Blackstock et.al. (2010) noted the need to have clear standards, which are relevant to the participants, preferably through including them in their development. By including farmer representatives with the on-going development of the LWP standards, Synlait will be more likely to improve their uptake.

From a marketing perspective, the ISO structure of LWP provides a robust, internationally recognised standard, which can be trusted by future customers to ensure the proposed standards are being met. Furthermore, by limiting LWP to Canterbury dairy platforms, there is less likelihood of the standards becoming irrelevant to the suppliers, which was highlighted by Palmer et.al (2009) as needing to be avoided to maintain supplier trust in the programme.

The final theme of the LWP programme which could be particularly useful for improving the long-term sustainability of the programme, is the creation of a LWP-certified supplier community. While a LWP community in it's infancy at the moment, Mills et.al. (2008) highlighted a strong correlation between participation in a group and participant uptake of the group's values and expectations. Synlait could also take advantage of Yang and Sharp's (2017) finding of the best practice *"contagion"*, whereby best practices are *"caught"* by neighbours.

I would strongly recommend Synlait continue with creating opportunities for LWP-certified suppliers to learn from each other, and participate in the development of the auditable standards to enhance the potential uptake of the behaviours and values the LWP programme is trying to foster. While Synlait's LWP programme includes many factors which enhance the potential for suppliers to make sustainable, long-term changes to their farming practices, there are a few areas which may be inconsistent with the literature, which could undermine the overall success of the programme. I would recommend Synlait reconsider the following aspects of the LWP programme to maximise the positive influence of the programme on their supplier's practices and ensuring overall success of the programme:

- 1. Drivers for uptake participation in LWP
- 2. Measurements for success of the programme
- 3. Have a clear process determining how standards for "best-" or "leading-" practices are set.

The primary reason for a supplier to become LWP certified is to earn the \$0.12/kgMS premium for their milk. While Moon and Cocklin (2011) suggest financial incentives improve the participation rates in voluntary programmes, Dwyer et.al. (2007), Mills et.al. (2016) and Burton (2011) found extrinsic motivators, like financial incentives, taxes or regulations, tended to be unsuccessful with imparting the values the programme was trying to promote. Furthermore, with only a 25% participation rate for Synlait suppliers, I question whether the financial incentive is currently sufficient to meet the long-term outcomes of the programme. If Synlait wishes to increase participation in LWP, I would recommend they re-evaluate the barriers and motivators of those who are not involved and tweak the incentives and communications with suppliers to address these issues.

One other area where I believe Synlait may be able to make improvements to encourage long-term, sustainable practice changes by suppliers is to re-assess how success is measured. Programmes where there are clear links between the farmer activities and desired outcomes are shown to have higher uptake of the required practices (Wilson 1997, Pahl, Weier et al. 2007). By measuring success solely on meeting marketing drivers, the farmers doing the work on-farm may not understand the tangible improvements their efforts are contributing too. I recommend Synlait re-consider their measurements for success of the LWP programme to include Key Performance Indicator's which highlight the specific collective outcomes achieved by the LWP-certified suppliers, and to ensure these success are communicated back to the participants.

The last factor which occurred to me, relates to ensuring the on-going marketing potential of the LWP programme. It was unclear to me how *"best-"* or *"leading-"* practice was initially defined in order to create the standards within each of the four pillars. I would recommend Synlait continue to work with national and international industry good organisations to ensure the standards being set meet consumer expectations of *"best-"* or *"leading-"*management practices.

Overall, Synlait's Lead With Pride programme has the foundations to ensure sustainable, long-term uptake of the industry best practices are being implemented by their LWP-certified suppliers and provides New Zealand dairy companies with an excellent example of how voluntary programmes can drive the changes the community wants to see.

5. CONCLUSION AND RECOMMENDATIONS

I have come to the conclusion that sustainable change programmes are not about KPIs, or data metrics, regulations or, indeed, water quality, but are in fact about people. Once we engage the hearts and minds of the participants in the programme, then the rest will follow.

Improving water quality to be "swimmable" is a complex issue and complex issues require complex solutions, collaborative thinking, and growth of human capacity. As seen with the Motueka ICM and Synlait Lead with Pride case studies, no one method is more successful than any other, provided the programme is tailored for the group needing to implement the changes. No single approach will be suitable for every circumstance, however this project has identified some common themes which should be considered in the development and implementation of these types of programmes to improve the chances of success.

The most consistent theme I identified was the need to build trust. Programme organisers need to ensure farmers could trust the people they worked with, can trust each other and other stakeholders, they need to trust the information they were provided and they need to trust the tools being recommended as a *"solution"*. Without trust, there will be limited engagement and uptake of the desired changes. Every interaction with a participant is an opportunity to build, or lose, trust. Therefore, supporting multiple positive interactions between participants, implementers and key stakeholders will support the development of trust between all those involved. Investment in high quality people, who know how to deliver the message competently is a critical part of building trust.

An essential component for any high-trust programme was therefore *time*. Sufficient time allows for the development of social capital, build trust between participants and organisers, create and communicate new technology and to invest in research. Development of social capital supports collaboration between key stakeholders to clarify the vision to ensure the project achieves targets the desired outcomes. The literature also identified a need to engage participants early on and enable their contribution at the development stage of any programme, where possible.

The next step is to identify the values of the community involved with the programme. Are they aligned with the goals and objectives of the programme, or is there a significant disconnect? It is useful to focus on the common goals of various stakeholders and identify and address knowledge gaps which may account of differences in values.

Any group of people will also have a diverse range of values, goals in life, ideas of success, capability and education. Organisers also need to understand the dynamics within their particular group, as well as key stakeholders who are involved with setting the expectations. Once the demographic of the group is identified, organisers need to ensure all key messages are delivered in a varied fashion in order to maximise the potential for improving capability.

Furthermore, it is also useful for creators of programmes to understand how much needs to be achieved, by when and also understand the existing capability of the group in order to develop a structure which is suitable for that particular context. For instance, a group of highly engaged, well-educated and technically savvy farmers may have the best results with a bottom-up, iterative process, whereas a group of farmers who are

closer to retirement and uninterested in change may need to have a more top-down approach. Where there is a large group to co-ordinate, it may be more appropriate to have something in between.

Expected timeframes and available resourcing is another consideration for organisers when establishing whether more regulatory, top-down approaches are more fitting than labour- and time-intensive collaborative or bottom-up approaches. Top-down approaches are often effective in the short term, but are less likely to result in enduring, sustainable change in participants. Alternatively, bottom-up or extension focussed programmes tend to build capability and have a greater likelihood of the values of the programme being accepted by participants, however these programmes need highly qualified people and tend to be much more expensive and time-consuming to implement.

Participants also need to understand what success looks like and the outcomes of the project need to be fed back to (ideally) show how the actions taken are achieving the desired outcomes. Feedback could include benchmark reporting of KPIs and monitoring results, by enabling discussions between peers or provide one on one support. The method of feedback needs to vary according to the needs of the group expected to make the changes.

The structure of a programme is another key consideration which will depend on what outcomes the organisers intend achieve through the programme. Synlait's Lead with Pride programme is focussed on engagement of suppliers, so it makes sense in their case to have a voluntary programme. However, when the New Zealand government wanted to collect standardised water usage data, then a mandatory approach was more appropriate. It is important to understand the drivers and barriers to participation and engagement when using these different methods to ensure the most appropriate structure is utilised for the programme.

5.1 Recommendations

Based on these key points, I recommend the following:

- 1. Sustainable change programmes need to consider who trust, values, diversity, expected timeframes, and measures of success
- 2. Project developers and implementers need to ensure they focus on the right issues, to collect the right information and to communicate everything in the most effective way

I have summarised these points in Figure 13 and Figure 14 in order to highlight some of the questions which need to be answered when creating and implementing a programme successfully.

I know I will use this information to reflect on what I have created for Barrhill-Chertsey Irrigation Limited and identify how I can improve my relationships with shareholders and enhance their engagement with the ASM programme.

He aha te mea nui o te ao What is the most important thing in the world? He tangata, he tangata, he tangata It is the people, it is the people *Maori proverb*



Figure 13: Points to Consider when Creating a Programme



Figure 14: Points to Consider when Implementing a New Programme

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APPENDIX 1 – LEAD WITH PRIDE QUESTIONNAIRE AND RESPONSE

Contact Details		
Company	Synlait Milk Limited	
Contact Name	Emma Brand & Mark Wren	
Contact Position	Environmental Advisor & LWP Manager	
Contact Details	emma.brand@synlait.com	
Programme Details		
What is Synlait's vision for their Lead with Pride programme?	To capture and prove best practise dairy farming over the four pillars of farming with our suppliers and to extract a value chain through to the customers in our markets. We want to not just recognise and reward those who would meet all these standards anyway, but to encourage these practises and move the dairy farming "bell curve to the right".	
When did the current programme start?	Launched Lead With Pride (LWP) 2013	
What prompted Synlait to initiate LWP?	There is a growing focus from consumers across the globe about where their products originate from. The program was developed so that we can prove that there has been good practice and policies in place right from the grass, cow, to can.	
How many properties and suppliers are involved?	We currently have 42 certified suppliers, 39 at the Gold Plus level, 3 at the Gold Elite level.	
Has Synlait attempted something like LWP before? If so, how does the current programme differ?	No	
What are the key values of Synlait's LWP programme?	Integrity, transparency, collegiality and commitment to continual improvement.	
What are the key principles of your approach to LWP?	The principles are aligning the program outcomes with the suppliers vision for their farm, to facilitate the progression through to certification and celebrate the achievement.	

Motivation		
Is the programme mandatory or voluntary?	Voluntary.	
How do you ensure the programme is implemented by suppliers? - Carrots? - Sticks? - Support? - Follow Up/Audits?	The programme is advertised throughout many Synlait campaigns. For those that decide to apply to be a part of the programme, 1 on 1 support and guidance is given till their initial audit, then follow up support is given if required from then on, with a re-audit once a year from certification.	
What steps have you taken to communicate the values behind the LWP programme to Synlait suppliers?	LWP is a core programme within the Synlait vision. The programme is communicated in many different ways: newsletter, conference, field days, media releases.	
How have you tried to incorporate good practice into being a "Good Farmer"?	Νο	
Engagem	ent and Participation	
How does Synlait engage suppliers with the LWP programme?	Prior to certification, constant engagement with suppliers to track their progress and give any assistance required. Once certified, communication with the suppliers for implementation is as required by supplier. If they need assistance, then they communicate directly to either Mark or Emma. Two LWP Focus days are organised throughout the year which are designed to educate.	
 How much influence do suppliers have on the development of: Identifying key outcomes through LWP? Synlait LWP auditable practices? Property practices? 	Twice a year there is a LWP Standards group. In this meeting, SML staff, AsureQuality staff and some farmer representatives come together to discuss the progress of LWP and if there are any changes required to be made. This could be through the complete requirements, the auditing etc.	
What steps have been taken to encourage suppliers to uphold the values behind LWP?	There is a financial benefit for those that are on the LWP program. 6c in total, broken down into 2c for being certified, 2c for having low SCC, 2c for being grade free. Once a year suppliers have an audit to ensure that they are keeping up with on farm requirements.	

How do you encourage suppliers ownership of issues on their property?	Suppliers that are on the programme are generally very open to 'constructive feedback'. At the initial visit we look at the infrastructure and high costing elements to ensure that there are no 'deal breakers' to joining the program. For other things that are required, the LWP team generally advise and encourage changes to be made, and suppliers are very open to change if they can be shown the benefits to on farm good practice.
Educa	ation and Support
What support do you provide to suppliers to ensure good LWP practices are being implemented?	As above, ongoing support prior to certification, then as required post certification with re-audits annually. LWP focus days twice a year to provide regular contact.
Who provides on-going support to suppliers? What personal attributes does this person(s) have which support:	LWP team, and the Area Managers are in constant communication with all suppliers (not just those on the programme).
 Building a trusting relationship with suppliers Tailors approach to different learning styles 	Each farm is worked with differently once the style of learning and organisation is recognised. A trusting relationship is formed as time spent with them increases, and following through with assistance when required.
How do suppliers know the information you have provided to them will assist with meeting the overall outcomes of the programme?	Trust.
What systems or tools have you put into place to assist suppliers and managers with meeting your requirements?	There is a LWP records book that is given to every farm either certified or working through the programme. A Complete Requirements is also given to each farm which outlines the full set of requirements to comply with the programme. As the programme develops on farm, some farms make their own check sheets / books that keep them on track with tasks.

Trust		
How do you build trust with your suppliers so they feel comfortable reporting issues to you? Reportin	Building a relationship with them by matching the right personalities to the right people. Gain an understanding of what the farmers are trying to achieve, and assist them to get to that place. g and Benchmarking	
What is your measure of success?	When auditing, there is a score out of 100 for each pillar, to pass the audit, they need to get at least 70 points per pillar. The number of farms certified is now at a stage where there is enough volume of milk to be able to stream and produce a product, success will be when a customer has been signed up to stream the milk into a particular product.	
How do you provide feedback of success (or not) to: - Synlait board? - Group Managers? - Complex Managers? - Farm Managers? - Suppliers?	There is a stakeholders group once a year which involves the CEO and General managers at Synlait to give an update on the programme. Any update to suppliers on success is communicated via the monthly supplier newsletter. If anything needs to be urgently communicated, then it is done via email.	
General Comments?		