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Farmer participation in catchment
groups: does reality meet
expectations?

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Executive Summary

Farmers in Aotearoa New Zealand face increasing regulatory pressure over coming decades. The need to reduce greenhouse gas emissions as well as reduce the loss of contaminants to water is going to be a major challenge for the farming sector in this country and difficult to achieve within complex farming systems. In response to these challenges many communities have founded catchment groups as a collective response to need provision on farm. These groups seek to utilise social learning techniques and communities of practice type approaches to increasing the capability of their members to shift them through decision making processes and through barriers that impede progress.

This study encompasses in depth interviews with five individuals involved in the formulation and running of catchment groups for their communities. Interviews were conducted to explore whether their experiences to date matched their expectations. Thematic analysis was utilised to identify key trends in the areas of success that the groups have had as well as the barriers to success that they have encountered. Areas that had particular prominence included the opportunity to feed back into regulatory processes to allow member to participate in the formulation of regulation. Members also expressed a desire to foster better communication with urban communities and to communicate their perspective on farming's role within a sustainable economy. One of the key benefits that participants have found is the way in which participation has increased the resilience of their community through allowing them a shared space to develop their understanding of the current environment through a narrative and experiential exploration of the issues they face.

Catchment groups in Aotearoa New Zealand are defined by their geographic extent rather than being united by practice or industry. This quality is not reflected in the literature published to date which focusses on utilising communities of practice to enable on farm practice change. As such the goals and work of catchment groups do not reflect a linear understanding of adaptation to an external threat. In many instances catchment groups are a method of enabling agency in attempting to redefine the problem before a course of action is determined. Though the groups have seen a lot of success in enabling their members to engage with more sustainable farming practices they have not yet made significant progress through decision making frameworks nor have they addressed the larger barriers to change in adoption of application of mitigations within complex systems. Further studies in this area need to adopt a more holistic viewpoint of the goals that a community may have in forming a catchment group and also the potential for longitudinal studies to be more efficacious in capturing changes in attitude and expectations over time. In order to be successful catchment groups are going to require funding support for administrative capacity as well as clear planning and gap identification from leadership within their group.

“I really see the value of catchment groups and community groups in that they’re the ones that know what’s happening on the ground, they have the vested interest. A lot of the people have been living in the area for generations and they have strong vision and goals for what they’d like to achieve on their own farms. The really engaged and motivated people are also looking at what’s going to be the situation for their kids and or farming in the future. So they’ve got that long term vision and they’re connected with the day to day environment. Having catchment groups and allowing them the space to grow and to have organisation and a voice is really valuable for the country as a whole. We need information to move in both directions. We need information to come from the ground up and we need it to be well disseminated when it’s coming the other way and the best way for that is if it’s communicated peer to peer as much as possible and that ideas are discussed and understood rather than terms and technology just being put out there without it being integrated. I feel that catchment groups really provide an opportunity for knowledge sharing and building ideas. They do have a lot of positive outcomes outside of just that particular group.”

Facilitator – Group A

Introduction

There are several challenges currently facing society at a planetary scale. Our emissions of greenhouse gasses and disruption of global nutrient flows have exceeded the planets ability to sustain our society at its current levels of consumption (Rockstrom, Steffen, Noone, & etal., 2009). Agriculture, and livestock agriculture in particular have played a large role in contributing to the current exceedance of planetary boundaries (LEAD & FAO, 2009). The economy of Aotearoa New Zealand (ANZ) has a significant component of primary production in its make up and this is reflected in the national greenhouse gas (GHG) inventory where approximately 48% of yearly emissions on a CO₂EQ basis come from agriculture (Statistics New Zealand, 2021). Agriculture in the country has also played a large role in the degradation of freshwater quality and this issue has gained large prominence as a political issue within the country (Parliamentary commissioner for the Environment, 2013). The prominence of these processes within ANZ has led to growing calls for the regulation of the effects of farming to achieve both reductions in greenhouse gas emissions and the improvement of freshwater quality through the reduction of sediment, zoonotic pathogens, Phosphorus, and Nitrogen compounds within waterways.

Currently legislation is in development by central government to include GHG emissions from agriculture that were previously excluded from the countries Emissions Trading Scheme (ETS) (Ministry for the Environment, 2021). In addition to bringing about the reduction of GHGs from the agricultural sector, regulations have been developed to manage activities on farm that have a detrimental effect upon water quality. The National Environmental Standards for freshwater apply at a national scale and regulate specific activities such as intensive winter grazing (Ministry for the Environment, 2020). Additions to the Resource Management Act (RMA) of Parts 9A and Section 360 mandate the exclusion of stock from some waterways and the creation of a Freshwater Farm Plan (FWFP) or Farm Environment Plan (FEP) for pastoral farms

greater than 20ha in size (Parliamentary Counsel Office, 2021). An FWFP is a regulatory instrument that is intended to be applied to activities on farm through a risk assessment and subsequent application of mitigation to identified risks. The outcomes in an FWFP will be different for each farm depending on inherent characteristics such as soil type, topography, etc and the system risks such as stock classes and feed wedge management through a season. Regional councils also have the opportunity to put in place additional direct rules upon activities on farm or to decrease the amount of risk tolerance allowed within the assessment stage of the FWFP. Councils have until 2024 to notify plan changes to their regional plans to incorporate FWFPs as a regulatory tool and will determine additional measures for each catchment they monitor based upon the needs of that catchment.

In response to the legislative and social pressures that have been placed upon farming to reduce its negative externalities within ANZ, many catchment groups have been formed within the country to enable their members and communities to respond. Group based forms of enabling change have been a feature of ANZ agriculture for many decades through extension services such as DairyNZ discussion groups. However, the formation of these new catchment groups have several unique features including a from the ground up dynamic and a desire to play a more active role in political and social processes. Farmers are engaging with these groups for different reasons than they engage with extension services and they are not satisfied with being passive receptors of information. Catchment groups are not simply a means to develop strategies to manage the regulatory burden within complex systems but have become means of expression and advocacy within a wider social environment as well as a means for developing a deeper understanding of wider environmental processes and effects.

This research project is intended to develop understanding as to whether catchment groups are serving the aims of the members that started them. Firstly, by establishing what the motivators were in starting the catchment group, and then by examining their experiences both positive and negative now that they have been running for several years.

Literature Review

Farmers experiences with the complexity of change

Farmers within ANZ face an increasing regulatory burden governing the effects of their activities upon the environment. Meeting these challenges may in some instances result in large scale change not just within their farming system but in the type of system that they employ on farm. In the past decade some regulatory initiatives have been enacted at a regional and sub-regional scale to attempt to achieve more sustainable farming practices that are better suited to the bioassimilative capacity of water receiving environments. One such initiative is Variation 5 to the Waikato Regional Councils Regional Plan. This variation used a nutrient modelling system named Overseer to inform a Nitrogen loss trading scheme on the farmers within the Lake Taupo catchment of the central North Island. Studies of the effects upon farmer practice and behaviour within this catchment have shown that these regulations have incentivised the change necessary to achieve the Nitrogen leaching reduction goals set by the Regional Council. However, farm system alteration has been an necessary step for many farmers within the catchment to remain compliant (Hammond Wagner, Greenhalgh, Niles, & Bowden, 2020) (Spicer, Swaffield, & Moore, 2021). This change in farm system can present a significant challenge to the individuals operating the farm. The extent of knowledge and practice change is much larger than it would be for alterations to a systems intensity or the implementation of infrastructure and interventions in meeting environmental outcomes. Kipling et. al. (2018) systematised a framework for diagnosing the barriers to change in response to environmental pressure within farming systems presented in the four tables below.

Costs	Initial costs
	Running costs
	Time/effort
Existing system and context	Physical assets
	Organisation and finance
	Trade-offs
Options	Availability
	Efficacy

Table 1. Practical limitations to change. Adapted from Kipling et. al. (2018)

Knowledge about measure (mitigation)	Awareness of new options
	Knowledge about efficacy
Expected system-measure interactions	Uncertainty about effects
	Uncertainty about future conditions
Evaluating effects	Knowledge of actual effects
Personal skills	Practical implementation knowledge
	Management knowledge

Table 2. Knowledge limitations to change. Adapted from Kipling et. al. (2018)

Farmers' interests	Level of interest
	Nature of interests
Farmers' perceptions	Of system

	Of self
	Of others
Interests and perceptions of others	Media
	Social
	Suppliers
	Customers
	Policy

Table 3. Interests limitations to change. Adapted from Kipling et. al. (2018)

Complexity	Farm-scale complexity
	Social, economic and political change
	Environmental change
	Conflicting interests
Limits on thought	Practical
	Knowledge
	Cognitive
	Interests

Table 4. Cognitive limitations to change. Adapted from Kipling et. al. (2018)

This categorisation of the barriers faced within farming systems that are complex in the factors that make up their form is illustrative of the difficulty of enacting change in response to any need. The most pressing aspect outlined within this study is the manner in which a change to one aspect of a system has a flow on effect to all other parts of the system as outlined in table 4. The difficulty of conceptualising these second and third order effects only becomes more difficult when considering wholesale systems change as has been enacted in the Lake Taupo catchment. This complexity and difficulty of applying a decision making framework to the co-opted ecosystems of farms is also reflected in Moser and Ekstroms (2010) paper diagnosing barriers to adaptation within a generic context. The authors outline a linear process of decision making that must be enacted in reaching a threshold for achieving meaningful adaptation.

Detect problem	Existence of a signal Detection of signal Threshold of concern Threshold of response
Gather information	Interest and focus Availability Accessibility Salience/relevance Credibility and trust Legitimacy Receptivity to information
(Re)define problem	Willingness and ability to use Threshold of concern Threshold of response need Threshold of response feasibility
Develop options	Level of agreement or consensus Leadership in leading process

Assess options	Ability to identify and agree on goals
	Ability to identify and agree on criteria
	Ability to identify and agree on options
	Control over process
	Control over options
	Availability of data to assess options
	Accessibility of data
	Availability of methods to assess and compare options
	Perceived credibility of information
	Agreement on assessment approach
Select options	Level of agreement on goals and options
	Agreement on selecting option
	Sphere of responsibility over option
	Threshold of concern over potential negative consequences
	Threshold of perceived option feasibility
Implement options	Clarity of authority and responsibility
	Threshold of intent
	Authorisation
	Sufficient resources
	Accountability
	Clarity/specificity of an option
Monitor outcomes	Legality and procedural feasibility
	Sufficient momentum to overcome institutional stickiness
	Existence of a monitoring plan
	Agreement and clarity on monitoring goals
	Availability of established methods
	Availability of technology
	Availability of economic resources
Evaluate effectiveness	Availability of human capital
	Ability to store, organise, analyse and retrieve data
	Threshold of need and feasibility of evaluation
	Availability of needed expertise
	Willingness to learn
	Willingness to revisit previous decisions
	Legal limitations to revisit prior decisions
Social or political feasibility of revisiting prior decisions	

Table 5. Barriers to climate change adaptation within a community-based process. Adapted from Moser and Ekstrom (2010).

This framing of adaption pairs with the Kipling et. al. (2018) because it outlines how change processes occur within a community whereas Kiplings work is best understood at a farm scale. The actions that are being undertaken in forming catchment groups in response to regulatory pressure sit somewhere between these two approaches in that a communal approach is being taken to facilitate individual on-farm decision making towards greater sustainability. Examining both of these frameworks highlights the difficulty and complexity in enabling on-farm action within the current context, many criteria for enabling change need to be met before change at a scale necessary to effect catchment sized outcomes will occur.

The scale and complexity of the challenge in front of farmers and its effect upon farmers outlook has been examined in several different contexts. The challenges facing farmers in delivering on farm change do not exist in a vacuum and exist alongside wider social and economic changes that are occurring in their community. At times changes such as demographic shift and a loss of a more traditional make up of rural communities can drive a more fractured landscape. This greater diversity of community can lead to an entrenchment of existing social structures that adopt and exclusionary

attitude to outside influence (Arnott, Chadwick, Wynne-Jones, Dandy, & Jones, 2021). Rural communities can feel threatened from several different vectors, not just environmental regulation, and this can have a reinforcing effect upon negative attitudes towards the changes being imposed upon them. Franklin et. al. (2021) examined the attitudes of Welsh farmers to Nitrate Vulnerable Zone regulations through self-reported surveys. They found that rather than feeling like they were at a cross-roads, the farmers felt as though they were at a dead end. The imposition of strict input-based rules upon those farmers had left them feeling as though they were without agency and caused them to begin to justify their actions in contravention of the rules as being good environmental practice in the face of unworkable regulation. The authors of this study developed methodologies for combating the mindset of farmers in this instance but it is illustrative of the extreme pressure that many farmers feel in the face of difficult to understand rules being applied to complex biological systems.

Communities of Practice

Agriculture in ANZ has long had a collective ethos with many upstream and downstream functions of the value chain being fulfilled by co-operatives such as Farmlands and Fonterra. This has extended into the work of extension services where programs such as the Red Meat Profit Partnership and Dairy Discussion Groups have been founded and led by levy funded bodies Beef & Lamb and DairyNZ. Utilising community based peer to peer networks for information analysis and subsequent application is not a new concept within this industry. These communities of practice (COP) are not a feature unique to agriculture either although they may play an outsized role in an industry such as agriculture where producers do not directly compete against each other but cooperate to achieve economies of scale. Many publications outside of the agricultural sector provide useful insights into the functionality of well performing COPs. They should be able to evolve, have differing forms of dialogue and participation, and deliver value to participants (Wenger, McDermott, & Snyder, 2002). A key point that is made is that COPs are usually a voluntary participatory outlet. They are not defined by geography but instead by shared practices or interests. Anil et. al. (2015) in their study on COPs amongst Western Australian farmers that a COP is determined by an understanding among its members about a shared practice and the bond developed between them in developing this understanding. Without this shared understanding they state, the social dynamics to will not arise in supporting processes that enable knowledge sharing and cooperative information interpretation. Bodin & Crona (2009) explore the limitations of social networks in natural resource governance and how social dynamics within groups may impede the progress those groups make. Particularly they find that identifiable sub-groups within the social landscape can limit collaboration and cohesion with decision making processes. They also find that these structures are most powerful when they are overlaid on top of existing social networks and utilise already extant relationships of participants. These factors show that the concept of a COP is heavily reliant for its success upon voluntary associations. Attempting to create a COP building it on top of an existing network or building that network prior to its construction creates large barriers that severely limit the utility of the approach. When COPs are constructed well they are effective in driving the adoption of more sustainable practices. They serve to connect participants with more

experienced practitioners of the practice they wish to investigate (Skaalsveen, Ingram, & Urquhart, 2020). However, this utility is based upon the concept of homophily where the necessary relationships tend not to develop where a community does not see itself as homogenous and having a shared identity.

Knowledge sharing within a collective

Access to knowledge about sustainable practices and innovative approaches to farming is a key determinant in whether those practices are considered and adopted within a farming system (Lapple, Renwick, Cullinan, & Thorne, 2016). Peer to peer learning, particularly when directed and facilitated by a COP could be a key intervention in ensuring access to knowledge and techniques that farmers need to become more sustainable. Kansanga et. al. (2021) demonstrated through a large-scale trial that the provision of peer-to-peer learning improves the adoption of sustainable land management practices. In particular it works well because the information and comprehension of that information are tailored to very specific local conditions. It also allows for the farmer to engage with an interlocuter that has a high degree of credibility and potentially is known to the farmer previously. The manner in which the discourse is conducted is also a key consideration as to whether peer-to-peer learning is successful. Slimi et. al. (2021) reject the conceptualisation of changed behaviour occurring through the “diffusion of innovation” framework within a rural context. They argue that this sees actors within the system as an object to be acted upon and that in fact farmers learn through narrative and experiential exploration of data. They state that a more useful framework for understanding how farmers learn, and also how they reconceptualise their understanding of a system, as well as their own place within it occurs through a horizontal exchange of experience based dialogue. Goulet (2013) also finds that framing knowledge through experiential dialogue is an important characteristic in lending the information credibility. They stress that traditional forms of information provision need to take a more nuanced understanding of how lay knowledge is developed and communicated. These conclusions have important implications for catchment groups as a method of improving understanding of the environment. They are less an opportunity to reach a large number of people simultaneously and more of an opportunity for individual actors to use their agency in choosing what information to engage with and how to engage with it. Phuong et. al. (2017) found in their review of social learning studies that insufficient research had been done to draw firm conclusions around what social learning is and its utility in a wider climate change adaptation context. However they did touch upon several factors that are useful in ensuring the utility of a community based approach to improving adaptive capacity. Trust, social influence, and cohesion in the community are important facets of ensuring that participants derive benefits from peer-to-peer learning. This reinforces the findings of others that a strength of COP of practice or catchment group approaches is the credibility of the source of the information and the utilisation of existing social structures to enable information comprehension processes.

Traditional models of rural extension have been criticised in recent years for their failure to deliver the necessary change to farming practices. The model of top down information diffusion to actors whom simply act as implementation agents is an outmoded understanding of how knowledge

is obtained and utilised. Several studies have examined alternative models for utilising social based models for information provision and comprehension, including COPs. Landini et. al. (2017) criticise the traditional model and examine the potential of other modes. While they do not come to any firm conclusions as to which should be adopted or whether the strengths and weaknesses of any alternative approach have been fully explored, they advocate for treating the farmers expected to enact change as actors that should be incorporated into the teaching structure and allowed to drive change in the information dissemination processes that they benefit from. Wood et. al. (2014) put this idea into practice by bringing practitioners into a sustainability trial as subject matter experts. In this trial a small group of local farmers was intimately involved in the design and monitoring of a trial on a pastoral system. The authors found that their involvement and the opportunity to utilise co-learning approaches amongst themselves drove higher engagement with the innovative practice and also spurred them to have more conversations about the trial work to others than they normally would. These studies show that an alternative model for allowing farmers to be both actors within a learning system and the recipients of the products of that system can drive higher rates of adoption of practices and enable greater adaptive capacity in the face of significant drivers for change in farm practices.

Methodology

This study utilised an interview format with to investigate the benefits and costs of catchment groups in assisting ANZ farmers to navigate regulatory pressure. Five in-depth semi-structured interviews were conducted with representatives from five different groups in different parts of the country. These groups were selected on the basis of having been operational for at least three years and having significant enough membership to indicate some success in representing the community. Three interview subjects were identified through existing professional relationships and two were nominated by officials at the Ministry for Primary Industries who have been assisting them with funding. The interviewees occupy a number of roles from professional facilitator to farmer-member (see table 6 below) within the groups but all play a leadership role. Interviewees participated upon the basis of confidentiality and an identifying label has been applied to each.

Group	A	B	C	D	E
Province	Waikato	Waikato	Manawatu	Southland	Southland
Interviewee Role	Facilitator	Facilitator Farmer	Farmer Chair	Facilitator Farmer	Farmer Chair
Predominant Land Use	Sheep and Beef	Sheep and Beef	Sheep and Beef	Dairy	Dairy

Table 6. Interviewees and group details

Interviewees were prompted with four questions:

- Why did the group form and what did you hope to achieve?
- What costs did you foresee when forming the group?
- What barriers have you encountered since forming?
- What successes have you had and where have you made progress?

Follow up questions were utilised where further explanatory detail was required but interviewees were allowed to define their interpretation of the question and the scope of their answer. Interviews were recorded via MS teams and transcribed manually. Thematic analysis and coding was conducted according to the process outlined by Braun & Clarke (2006). Only parent codes were identified prior to coding being conducted and were based upon the four prompt questions utilised. Child codes were identified individually from the transcripts and grouped post coding.

Results

The results for each of the four parent comments are presented in the tables below. Indications are made for the frequency at which a theme was identified by each interviewee.

Goals		A	B	C	D	E
On-farm actions	Maintain profitability	1				
	Improve farm sustainability		1		1	1
Learning and understanding of farmers	Help them to face the threats they perceive	1	1	1		
	Social responsibility and taking ownership			1		1
	Gain knowledge and understanding					1
External relationships	Influence the drawing up of regulation	1	2			
	Respond to criticism of farming and build connections to the urban community			2	1	1
	Create whole of catchment approach					1

Table 7. Responses to why did the group form and what did you hope to achieve?

Costs		A	B	C	D	E
Resources	Time spent organising	2		1		1
	Equipment	1				
	Administration		1			
	Hall hire/facilities					1
Expertise	Policy interpretation	1				
	Difficulty in allocating resources		1			
	Writing funding applications	1	1		1	1

Table 8. Responses to what costs did you foresee when forming the group?

Barriers		A	B	C	D	E
Participation	Policy pressure can demotivate	1	1			
	Reliant upon people wanting to be helped	1				
	Fatigue from too many field days	1				
	Need to operate in smaller groups		1			
	Having the right levers to influence corporate farmers				1	1
	Older age group tend to be less engaged				1	1
	Little interest from urban stakeholders					1
	Groups are male dominated					1
	Membership numbers		1			1
	Unrealistic expectations	1				
	Group becomes the bearer of bad news				1	
Leadership	Reliant upon proactive leadership	1	1			
	Leaders need support from subgroup leaders	1	2	1		1
External stakeholders	Finding experts with time and communication skills		1			
	Regulators have a narrow focus				1	
	Processors have their own agenda					1
	Iwi lacking resources and time					1

	Regional council not clearly communicating direction					1
Technical	Developing CBAs for mitigations		1			
	Finding underlying drivers of contamination			1		

Table 9. Responses to what barriers have you encountered since forming?

Benefits		A	B	C	D	E
Technical knowledge	Understanding of environmental processes	2		3	2	
	Understanding terminology	1				
	Provision of localised data	1		1		
	Understanding wider situation	1		2	1	
Internal relationships and social processes	Community connectedness	1		1	1	1
	Addressing fear as a group	1				
	Grieving for lost environment	1				
	Can influence environmental outcomes in community		1			
	Able to take a holistic view		1		1	
	Getting acknowledgement for work done		1			1
	Acting collectively eases the load			1	1	1
External relationships	Have become a voice for the rural community		1			
	Engagement with Iwi			1		1
	Aligned with processors desires				1	
	Developing relationships with councils					1

Building capacity for change	Spreading awareness of how to do good work	1				1
	Developing knowledge about regulation		1	2		1
	Getting FEPs completed		1		1	1
	Can use a farm system view				2	
Autonomy	Creating community defined environmental opportunities			1	1	1
	Platform with little outside influence				1	

Table 10. Responses to what successes have you had and where have you made progress?

Several trends are seen in the data represented here. The number of codes gathered for what members of catchment groups expected prior to forming a group was small in comparison to the number of codes seen with respect to their experiences. Key themes for motivating formation were around increased understanding of regulation and science. The only consistent theme in costs was that of the amount of effort required to secure government funding for on the ground works.

In contrast the themes identified for both the positive benefits and barriers that have been encountered since were much larger and covered a broader range of issues. The positive benefits encountered covered a number of knowledge aspects that have been grouped into understanding of science and knowledge of on the ground works/interventions. An unexpected theme that came through was the benefit that participants saw in strengthening community ties and social networks. The building of external relationships was also something that groups valued in one sense although disappointment in these was also reflected in a barrier theme around the disparity between the interests of catchment groups and those of many of these external groups. Participants also identified administration costs as a major barrier and cost that they faced. This barrier tied in with another barrier theme around the necessity of good leadership in order to be successful and the costs that were placed upon these leaders in maintaining their group. The largest theme identified in the barrier/cost section was the difficulty of getting widespread engagement within their community and also maintaining engagement over time.

Discussion

The study conducted here was retrospective in nature and while all interviewees were present with the group from an early stage their recollections may be impacted by the time that has passed as well as being biased towards their initial expectations that came to pass as opposed to those that did not subsequently have any prominence. Many more responses were seen to the questions about what experiences the interviewees have had since formation as opposed to why the group was started and what types of costs they expected to see. This may be a natural effect for people entering into a novel practice but the disparity should also be treated with a note of caution.

A review of literature into communities of practice and other related forms of creating on farm change has a strong emphasis on measuring success as a factor of on farm change being implemented. However, in the interviews conducted on-farm actions as a goal were of lesser importance than increasing the understanding and knowledge of farmers. Several different interviews reinforced the point by highlighting the value of creating data at a scale more appropriate to their catchment. Given the complexity of the ecological processes and their connection to on farm actions it is easy to assume that these communities are at early stages of Moser & Ekstroms decision making framework and many are yet to be convinced of a particular course of action. The most common category of reasons for forming a catchment group were to facilitate external relationships with regulatory bodies, urban residents, and to address criticism of farming in the media. This also suggests that the members of these catchment groups have not been convinced of the necessity for the application interventions designed at national scale. There could be several reasons for participants expressing a desire to develop an understanding of the issues before they embark upon a course of action, not least that the issues they face are localised in nature and require a locally responsive course of action.

The costs that were anticipated by interviewees revolved around the proper functioning of a community based organisation. They included the time required to organise events and functions, as well as the costs of hiring halls and procuring equipment. The two interviewees from Southland expressed much less burden in terms of these direct costs which may be due to the unique structure in Southland where an overarching body, Thriving Southland, has secured incorporated status and funding from government. This has allowed the catchment groups within its umbrella to offload much of the administrative burden on to them and focus upon on the ground works. It has also streamlined funding processes for infrastructure such as sediment ponds as demonstration sites. Both interviewees from Southland repeatedly mentioned the role of Thriving Southland and the benefits it provides in allowing them to focus on what they deemed to be the most valuable use of their time.

The barriers that interviewees have faced in running catchment groups were varied in nature and hadn't little consistency across the whole group. However, one very strong theme was the challenges in ensuring consistent high participation. The reasons for these challenges were varied but fell into two main camps. One, maintaining the interest and participation of current members and two, bringing in new members or providing a value proposition to different groups within the

catchment. Two groups that were consistently mentioned were corporate farmers where the people on farm didn't have the decision making capacity to positively affect sustainability priorities and older farmers who felt that they were at the end of their career and did not need another workload to take on. What participants did not talk about was why higher levels of participation were so important to the continued success of their groups. This participation issue was not linked back to their goals and how greater coverage among the community would interact with initiatives such as submitting on regulatory proposals or the development of catchment scale interventions.

The interviewees also communicated a frustration with divergent goals between themselves and external parties that they work closely with. They spoke about national organisations at times going "missing in action" when they should be taking a leadership role in analysing the implications of new regulation for local farmers. Frustration was also expressed in places at the role that regional councils play in creating positive outcomes. They talked about an over focus on regulation rather than facilitation and a lack of interest in communicating clear goals to the community that they could aim for.

When discussing the benefits of having a catchment group operating within the community accessing data and disseminating it to members was a consistent theme across several of the groups. It seems as though these groups are serving a valuable role in overcoming the knowledge limitations outlined by Kipling et. al. (2018) and helping to shift their communities through Moser and Ekstroms (2010) decision making framework. However their engagement in these frameworks still seems to be limited at this stage. No participant touched upon the cognitive barriers to adoption as outlined by Kipling et. al. (2018) and most of the mitigations discussed were at a lower level of effect and of an edge of field nature rather than anything intrinsic to farm system change. It remains to be seen as to whether these catchment groups have the capacity and capability to help their members navigate the more complex adjustments to farm operations that will be necessary in many areas.

An unexpected theme that was consistent across all groups was the way in which participation in catchment groups has benefited the relationships between members of the group and allowed them capacity to express themselves in an experiential fashion. Interviewees talked about the importance of allowing for a communal grieving process both for the environments they have lost as well as for the future they expected for their businesses. Acting in collective manner has also provided them with resilience as individuals by allowing them to communicate the sustainability work that they are doing to both internal and external parties. This opportunity to celebrate progress acts as an important corollary to the negative experiences of increased understanding of regulatory pressure and the environmental states that are driving their creation.

Several interviewees also expressed the benefits of the groups providing them with agency beyond what they would have as individuals. Much of the literature treats these kinds of groups as a body to be acted upon rather than one that will have its own effect upon the system it operates within. While the prevalence of these codes was not high, it was consistent across all parent theme groups particularly when it came to relationships with regulation and urban residents. Where proposals are made to utilise these groups as a means for enabling individuals to respond beneficially

to a problem defined by others, the groups represented here also see themselves as a body that has a role in defining what the motivating challenge is. They are not content with accepting the problem definition imposed on them by others and whether or not they are correct, any future examination of these groups must acknowledge their desire for a degree of autonomy.

The emphasis on the social dynamics and the representation as actors within a system rather than objects reflects a key difference in the catchment groups that are found in ANZ and the literature on COPs. COPs are defined by practice and in an agricultural context this means a farm system or particular technique within that system. This provides beneficial structure when facing regulatory pressure as it allows the tailoring of information exchange and techniques to a specific situation. This ensures that the investment of time members make is utilised well and that as little time as possible is spent addressing other important aspects of peer-to-peer learning such as the building of credibility. In contrast the catchment groups that are forming in ANZ are defined by geography. Although some similarities will exist across these landscapes, a whole of catchment approach is generally going to encompass a much wider range of systems across a smaller area and with a more cohesive social underpinning. This difference between the literature on how to effect change on farm through social learning and what is happening within ANZ is reflected in the results of this study. Participants are more interested in aspects such as representation, communication to outside bodies, and social structure than is reflected in any COP literature. This difference may have benefits to these groups in achieving their own goals but also seems to place a large constraint upon their ability to reach across the entirety of the catchment to engage with a majority of farmers within it. Outreach and knowledge sharing seems to be diminished in utility because of the diversity of systems and the differing levels of engagement that exist within a geographically defined community. This crucial difference in membership will invalidate any conclusion that are drawn from COP literature about form, function, and the utility of catchment groups. Further study is required in this area to define catchment groups as its own unique approach to regulatory pressure and how the dynamics within these groups work.

Conclusions

Traditional models of understanding decision making within communities are insufficient to appropriately analyse the actions and desires of catchment groups within rural ANZ. These groups often seek to coalesce not simply to respond to a problem but in an effort to redefine the problem for themselves and demonstrate agency within a system. Models of social learning and their relationship to frameworks such as communities of practice are also limited in the context of catchment groups within ANZ. These models fail to acknowledge the unique dynamics of community/industry groups formed on the basis of geographic extent rather than practice. Due to these deficiencies in the literature it is unclear whether catchment groups in ANZ will serve the purposes of improving environmental performance on farm in the manner in which external observers might believe they can.

Future studies on the role of catchment groups in this space would benefit from taking a longitudinal approach in contrast to the snapshot based methodology utilised here. A longitudinal approach would more accurately account for how expectations of participants change over time and how the interaction with social dynamics affects the utility of investigating on farm actions. Any future studies also need to approach the question of why groups form with a more holistic view of the desires of members of these groups. It is important to esteem the desires of group members to achieve more than just on farm actions if any further study is to be useful in assessing this approach.

In order to support catchment groups in assisting farmers over time government bodies could play a key role in funding two areas:

- Administrative support and operational capacity
- Capacity and capability in on-farm planning through the provision of decision support tools and farm planning infrastructure.

Potential catchment group leaders need to consider several factors in determining whether a catchment group is going to be the right approach for them and their community:

- Conduct informal goal setting and surveys with potential members to identify gaps to be served
- Ensure that a strong leadership group is in place and willing to contribute
- Identify gaps within a decision making framework towards delivering on farm planning and work towards serving those
- Lean in to the strengthening of social networks as a method of driving increased and sustained engagement
- Be realistic with yourself about the costs in this approach and the time and effort required to enact on the ground change.

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