

Factors influencing pastoral farmers' land-use change decisions in response to environmental regulations in the Selwyn District, Canterbury

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Highlights

- Pastoral farmers in Selwyn often feel misunderstood by regulatory authorities regarding the effects of increasing environmental regulations on their farm systems, and subsequent land-use change decisions.
- Financial factors and certainty around policy and practice were the most important factors to farmers when making land-use change decisions.
- Farmers were hesitant to make a sustainable land-use change decision without the confidence that it will remain a financially and strategically viable choice for the longer term.
- To encourage sustainable land-use change, regulatory authorities must give increased thought to understanding farmers' response to regulations and how this affects creation and implementation of future regulation.

Keywords: Causal mapping, farmer communication, decision making factors, policy.

Background

In response to public and political concerns in recent years, there has been increased regulatory pressures placed on New Zealand farmers to reduce their environmental impact and convert to more sustainable land-uses (Renwick et al. 2019). Anecdotal evidence suggests that the increasing environmental regulations have contributed to an unintended side effect of a declining relationship quality between farmers and regulatory authorities. Farmers often feel misunderstood about the effects of environmental regulations on their farm systems, leading to decreased efficacy of regulations, with which positive

environmental outcomes could be achieved. For effective implementation of environmental regulations, there must be a comprehensive understanding by regulatory authorities of farmers' response to regulation (Dwyer et al. 2007; Pike 2013).

While studies on the basic drivers of land-use change for farmers (Meyer et al. 1994; Britton and Fenton 2007; Briassoulis 2009; AgFirst 2017) and farmer environmental behaviour (Siebert et al. 2006; Mills et al. 2017; Liu et al. 2018), such as farmer engagement with environmental advice, farmer ability to adopt, and farmer willingness to adopt, may shed some light on how to foster effective policy implantation, more research is needed to better understand farmers' land-use change decisions in response to environmental regulations.

As one of the main agricultural regions of New Zealand, Canterbury has seen an increase in the amount and complexity of environmental regulations through the Canterbury Land and Water Regional Plan (Environment Canterbury 2018), by which farmers in various districts within Canterbury, including Selwyn, need to abide. The Selwyn District includes the sensitive Te Waihora catchment area as well as the ecological corridor that extends from the alpine to the sea (Environment Canterbury 2020) (Figure 1), with pastoral farms making up the highest percentage in all farm types and covering the largest area of all land types in the Selwyn District (Figure.nz 2018). In addition, pastoral farmers, particularly dairy, typically face some of the most stringent environmental regulations of all farm types in Canterbury, compared with non-pastoral farm types such as nursery production (Environment Canterbury 2018).

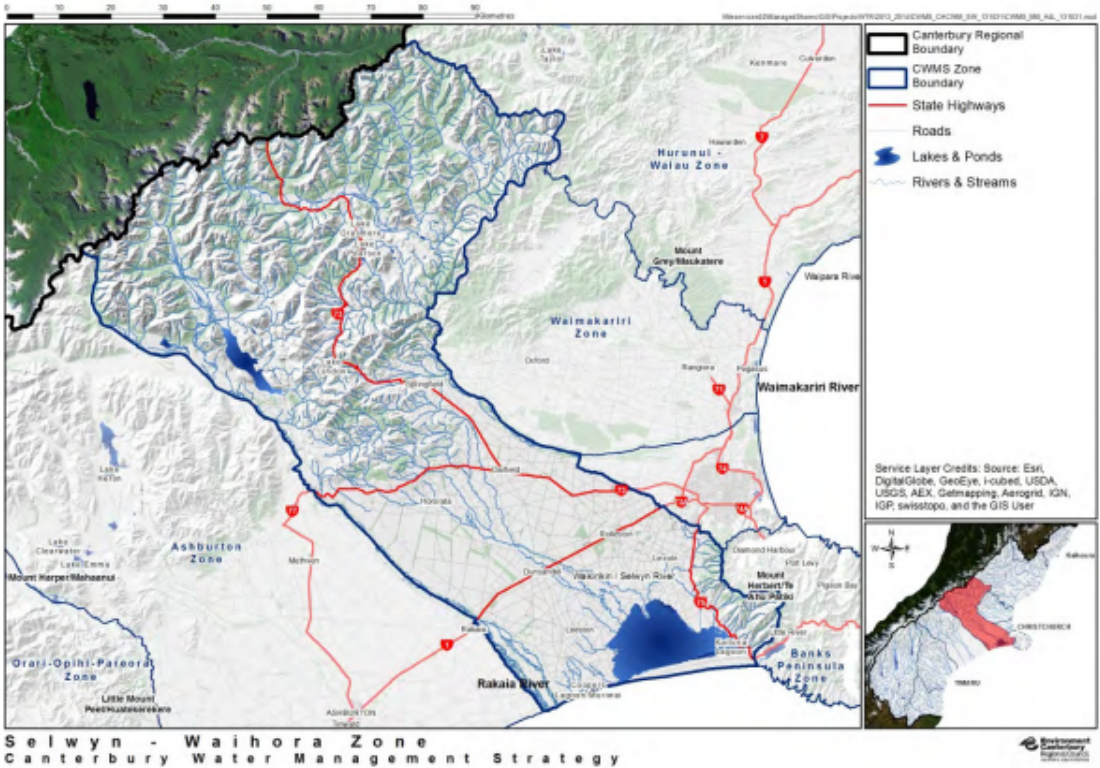


Figure 1 Map of Selwyn District (Source: Environment Canterbury (2020))

To date, limited research has been undertaken to link the rapidly increasing environmental regulations to their impact on pastoral farmers, their farm systems, and their land-use change decisions. An understanding of farmers’ land-use change decisions in response to environmental regulations will provide valuable learning to achieve better efficacy for future regulations and their implementation. The present research therefore identified answers to the following:

1. What factors influence pastoral farmers’ land-use change decisions in response to increasing environmental regulations in the Selwyn District and how important are these factors?
2. How do the factors influencing pastoral farmers’ land-use change decisions in response to environmental regulation in the Selwyn District interact?

Research Approach

Causal mapping was considered as the appropriate research approach for the present study. It has previously been used by several scholars (Gouttenoire et al. 2010; Fairweather and Hunt 2011; Christen et al. 2015; Lalani et al. 2021), with Fairweather and Hunt (2011) specifically focused on the New Zealand farming

context and recognised its potential for contributions to sustainability discussions. Causal mapping uses both quantitative and qualitative methods through scored causal diagrams, or causal maps. The map comprises of factors and causal relationships between these factors, with the aim to identify causation between factors in the system studied (Fairweather and Hunt 2011).

Despite the capability of causal mapping, Fairweather and Hunt (2011) only had minimal inclusion of environmental regulations in their New Zealand study. Since 2011, major environmental regulations affecting pastoral farmers today, such as the National Policy Statement for Freshwater Management (NPS-FM), have been introduced (Ministry for the Environment 2020). How farmers perceive their farm systems within the current and future environmental regulations and their land-use change decisions thereof are unknown, hence warrant investigation. Considering the potential of the causal mapping method in contributing to sustainability discussions (Fairweather and Hunt 2011), such a research method was chosen to be used in this exploratory research. A total of nine pastoral farmers from three different farm types (three dairy and dairy support, three intensive sheep/beef/arable,;

Table 1 List of 44 factors presented to farmers and their

respective mean Q-sort score (where 1=least important and 11=most important). Factors marked with * were derived from Fairweather and Hunt (2011)'s study.

Factor	Mean Q-sort score	Factor	Mean Q-sort score
Net profit before tax*	9.0	Time availability	5.9
Cash farm income*	8.3	Appetite for risk	5.9
Water availability*	8.2	Community*	5.8
Certainty around policy/practice	8.0	Stress	5.6
Farm working expenses*	7.6	Information availability*	5.6
N leaching	7.3	Freshwater farm plan	5.4
Satisfaction*	7.2	FEP audits	5.3
Soil type*	7.1	Industry body involvement	5.2
Farmer decision maker*	6.9	Public perception	5.1
Environmental stewardship	6.9	Diverse operation	5.1
Erosion and sediment loss	6.9	Market availability	5.0
Resource consents	6.8	Cultural values	5.0
Farming experience and education	6.7	He Waka Eke Noa	5.0
Farm environment as a place to live*	6.7	Future generations/succession*	4.9
Quality and quantity of plants and/or livestock*	6.6	Advisors/consultants*	4.9
Stocking rates*	6.6	Amount of non-intensively used farmland	4.8
Weather/climate*	6.4	Topography	4.7
Regional plan/regulation*	6.4	Farm size	4.6
Infrastructure availability	6.2	Age	4.6
Labour availability*	6.0	Funding opportunities	4.3
Farmer networks	6.0	Adoption of practices by neighbours	4.0
Land tenure	5.9	Family history*	3.8

and three extensive high-country sheep/beef) operating in the Selwyn District were selected using purposive sampling. This sampling method selects cases that are “information rich” and have insight into the research questions (Patton 1987). To avoid potential bias, there was a triangulation of subjects to provide maximum variation between cases (Perry 1998; Eisenhardt and Graebner 2007; Myers and Newman 2007).

Farmers were interviewed using causal mapping to obtain data on how they made land-use change decisions and the impact of environmental regulations on these. Specifically, following Fairweather and Hunt (2011), the data collected included Q-sort scores and individual causal maps, which later became processed into a group map. Q-sort methodology saw farmers place all 44 factors in a Q-sort distribution of 11 piles on a scale of least important to most important when making land-use change decisions, with 1 indicating least important and 11 indicating most important. The importance assigned to factors by farmers in the same farm type were compared with each other (e.g.,

dairy and dairy support to dairy and dairy support), and between different farm types (e.g., dairy and dairy support to intensive sheep/beef/arable). Providing the same factors to all farmers also allowed for direct comparison between them.

For the selection of factors used in interviews, Fairweather and Hunt (2011) had a strong influence as it was the most relevant and recent study found to be closest to this study. The study authors also added a number of topical phrases amongst farming communities at the time of the fieldwork, such as “He Waka Eka Noa (a government-industry initiative for the purpose of establishing feasible regulatory framework surrounding the carbon footprint of farming) (He Waka Eke Noa n.d.)”. Table 1 shows the list of the 44 factors selected for use in this study, and their Q-sort score rankings.

The group causal map was constructed using all individual causal maps, with weightings for each connection calculated by entering every connection identified between factors by all farmers into two

columns of 'influencing factor' and 'factor influenced'. Not all farmers used every connection identified. Therefore, any connection between two particular factors not identified by farmers was assigned a zero. Mean scores of each connection (weighted average of effects) were then calculated and sorted from highest to lowest to demonstrate which connections were identified by farmers collectively as the most important and least important. Factors with a mean score of at least 1.6 were selected for use in the group causal map, even if they did not connect to other factors in the map.

Key Findings

Table 1 demonstrates the combined average Q-sort scores for all farmers interviewed. It showed that 'net profit before tax' was the most important factor to pastoral farmers when making land-use change decisions. This was followed closely by 'cash farm income', 'water availability', and 'certainty around policy and practice'. This ranking demonstrated that financial factors were at the forefront of farmers' minds when deciding to change land-use. Although many factors can influence the success of a farm business, the bottom line was ensuring the business is profitable to continue operating.

The high importance assigned to financial factors was expected and echoed findings by Dwyer et al. (2007), Liu et al. (2018) and Renwick et al. (2019). In particular, Renwick et al. (2019) found that financial factors were typically rated as the most important when farmers within an irrigation scheme in the Selwyn District made land-use change decisions, as the new land-use must be financially viable to operate a business. The present study also echoed Renwick et al. (2019), in that to encourage farmers to change land-use towards farm systems with a lower environmental impact, there needs to be a financial advantage provided by the new land-use, or at the minimum, no disadvantage if other benefits are provided. Additionally, the advantages offered need to be low in financial risk, market risk, and uncertainty, to best encourage land-use change decision-making (Hand and Tyndall 2018).

'Certainty around policy and practice' closely followed in importance ranking behind financial factors when interviewed farmers made land-use change decisions. This echoes the discoveries of Knook et al. (2020) and Mittenzwei et al. (2017). The agricultural industry in New Zealand is currently experiencing significant policy changes, particularly with the introduction of He Waka Eke Noa (He Waka Eke Noa n.d.), National Policy Statement for Indigenous

Biodiversity (Ministry for the Environment 2023), and freshwater farm plans (Ministry for the Environment 2022). Farmers interviewed felt unsure about the impact these and future changes would have on their farms. This has created a sense of uncertainty and subsequent hesitation in making sustainable land-use change decisions, whether voluntary or required by regulations. Examples of this include significant investment in infrastructure which could improve environmental sustainability. Many interviewed farmers were concerned that the land-use change would not be a financially and strategically viable choice for the longer term if unsupported by subsequent new regulations.

Farmers in this study perceived themselves as environmental stewards of their land and wider landscape. This agreed with findings from several other scholars who found farmers had high intrinsic values surrounding environmental care (Lubell and Fulton 2007; Tiwari et al. 2008; Gedikoglu and McCann 2012; Chouinard et al. 2016; Ulrich-Schad et al. 2016). Farmers were aware that how they chose to farm and produce agricultural products affected what they can be rewarded by the environment. Poor environmental management would negatively affect the agricultural production of their farms and reduce the quality of the 'farm environment as a place to live', being their home. Environmental stewardship is an intrinsic value farmers hold, and is a major, natural factor driving their land-use change decisions, even though it was only identified to have one connection to the factor of 'farm environment as place to live' in the map. At the same time, environmental regulations greatly influence farmers' land-use change decisions in an extrinsic manner.

The group causal map, shown in Figure 2, echoed similar findings and reasons for these to the Q-sort scores, as shown in Table 1. Table 1 and Figure 2 drew on the same data. However, Figure 2 examined how factors connected to each other when farmers made land-use change decisions in response to environmental regulation whereas Table 1 examined the importance of individual factors to farmers when making these decisions. Figure 2 showed financial factors, and their connections, were the most important drivers of how farmers made land-use change decisions. Farmers are in a market economy where to operate financially viable businesses; they need to generate a sufficient return based on the quantity and quality of products they sell. Major land-use change decisions (e.g., developing an unproductive area of land) are difficult to make without significant financial backing.

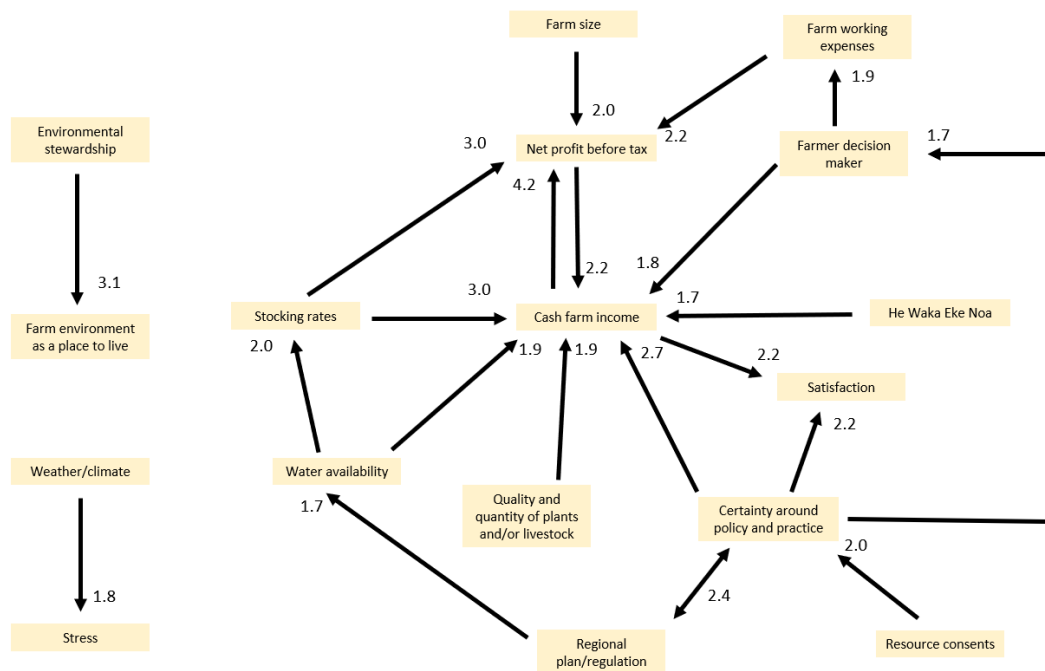


Figure 2 Group causal map. Numbers indicate mean scores calculated from individual farmer causal maps.

Factor connections related to environmental regulation were strongly present in the group causal map, indicating that farmers considered these factors as important when making land-use change decisions. Although farmers were also driven by their sense of care and belonging (environmental stewardship) for the environment they live in (farm environment as a place to live) and how the weather and climate will affect their stress, these were not connected to any other factors involved in land-use change decision-making and were viewed separately.

Conclusions and Future Implications

This study found that financial factors related to profit, income, and expenses were the most important to pastoral farmers in the Selwyn District when making land-use change decisions. If the business is unable to make a profit, the business cannot be successful in the long term. All land-use change decisions are therefore underpinned by ensuring it will sustain or improve the financial viability of the farm business.

Many farmers interviewed felt unsure about the impact of current and future policy and practice changes on their farms. This has created a sense of uncertainty and hesitation to make sustainable land-

use change decisions, with many farmers concerned that the decisions are not a financially and strategically viable choice for the longer term if unsupported by new regulations. Therefore, to encourage sustainable land-use change, regulatory authorities need to give more thought to the long term on how future regulations are implemented. For example, this could be improved coordination, using combined approaches between policies, or forming initiatives into one package rather than numerous separate initiatives. On that note, it is pleasing to see positive steps have been taken towards achieving this long-term focus as integrated farm planning is coming to the fore (Ministry for Primary Industries 2022).

This study has also found that farmers had high intrinsic values surrounding environmental care when making land-use change decisions in their role as environmental stewards. Farmers were aware of the impact of their farming activities on the environment and that a farm system cannot be optimised in the long term if the natural environment which supports it is continually degraded. However, this study has concluded that environmental regulations currently drive land-use change decisions in an extrinsic form to farmers. This is concerning because if farmers

become too focused on only doing enough to meet regulations, even though they have been created to be beneficial, it risks taking away the common-sense approach to stewardship farmers already have. Improved communication could provide one way of addressing such concerns. Without improvements in the communication between regulatory authorities and farmers, the future may see increased focus by farmers on ticking boxes and less on strategically thinking about what is best for the environment. This could result in a negative cycle, with flow-on, negative effects to increased farmer stress and increased tension between regulatory authorities and farmers.

This study was undertaken on a small scale and in one district. The Selwyn District was selected as the location of focus, as many pastoral farmers within these boundaries face some of the most complex and comprehensive environmental regulations in New Zealand (Renwick et al. 2019). However, there would be great value in repeating this study on a larger scale in Selwyn and other districts in New Zealand, particularly those with the most undeveloped and least comprehensive regulations. This would improve the current understanding of how farmers with less exposure to environmental regulations would perceive factors influencing their land-use change decisions and how these factors interact and contribute to regulatory authorities' understanding of farmers' decision-making before creating and implementing new regulations.

There is also value in having regulatory authorities complete the same causal map exercise to compare results with farmers. The similarities and differences identified from this would allow for an understanding of areas that match with farmers' perceptions as well as where discrepancies lie, so that subsequent improvements can be undertaken. In addition, as Fairweather and Hunt (2011) suggested, future research could explore farm system changes under different scenarios put to farmers. Scenarios to be tested could be climate change or the provision of a financial incentive to adopt an environmental practice.

Finally, this study has provided an opportunity for regulatory authorities to understand farmers' perspectives in relation to recent environmental regulations. However, there is still much more work to be done to foster such an understanding. Improvements in the communication between regulatory authorities and farmers are needed to optimise positive environmental outcomes for the future with greater efficiency. To prevent farmers from disengaging and moving into a permanent 'tick box' mindset, such an improved communication by regulatory authorities particularly needs to recognise farmers' role as environmental stewards. This improved communication should also provide farmers with more certainty around policy

and practice, with a particular focus on how future regulations are designed and implemented over the long term.

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