Understanding landholder adoption of technologies and practices using the Kaine Framework

Collaborative Stakeholder Group Healthy Rivers: Wai Ora Project

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Policy work stream report for discussion at CSG workshop 3

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1 Purpose

To provide the Collaborative Stakeholder Group (CSG) with a brief description of the theory and application of a framework to better understand landholder decision-making, and how this assists with the design and selection of policy.

2 Making policy decisions that impact landowners

In the absence of good predictors of what landholders will do in response to policy interventions, policy decision makers will struggle to distinguish if their chosen policy will 1) ensure the necessary changes in farm practices and technologies will happen and 2) identify how quickly change will occur. To date, Waikato Regional Council has relied on intensive consultation meetings over an extended time frame with a small group of landholders who seek to represent all other landholders[1]. This is costly for landholders involved and does not necessarily generate the information needed for policy design.

More information about the responses of landholders can help identify if these considerations about change can be managed for in policy design and ultimately if the potential for unfavourable responses be somewhat managed.

2.1 Context

- The objective of much of land and water resource management policy is to change the behaviour of landholders. That is change landholders' choice of practices and technologies.

- For policy decision makers to influence landholders' choice of practices and technologies they need to understand how landholders make choices.

- The Kaine Framework (Kaine 2008, 2004) is a method for understanding how landholders make choices about practices and technologies. It can provide insights into landholder choices and how these choices may be influenced.

- The framework can be used to help set priorities for, and design of water resource management policies. This framework forms part of a comprehensive, integrated approach to understanding behavioural responses of landholders to policy instruments.

- Insights from understanding landholders' choices can be used to target persuasive policy initiatives (such as awareness raising, education and training to achieve voluntary change), to select instruments to accelerate uptake and reduce the potential for counterproductive outcomes.

[1] For more information on how this approach was used in Variation 5 – Lake Taupo catchment see the Taupo Case Study. Policy Report for the CSG, WRC document number 3034258.

3 Using the Kaine Framework

Kaine (2008, 2004) has developed a method identifying how landholders make decisions about changing farm practices. The approach has been extensively applied to a range of agricultural technologies and practices (See Appendix 1 for examples of application).

Kaine has suggested that changing a farm practice or technology can be likened to a 'high involvement decision' in consumer behaviour theory. Involvement[2] represents an individual's motivation to make a decision in relation to satisfying their needs. Prior to any change in practice or technology, landholders spend a relatively high amount of time and effort making a decision. Therefore, they are able to articulate the reasoning behind their decisions. By conducting personal interviews it is possible to capture, analyse and predict the likelihood of adoption of a technology or practice.

The method integrates consumer research and farm systems theory[3] to identify the different market segments and an estimate of the number of potential adopters for a particular agricultural technology or practice. This can be used to help set priorities for research, extension and policy.

3.1 Approach

The Kaine Framework can be used to determine the circumstances in which an agricultural technology or practice may create benefits for a landholder. The premise of the framework is that landholders are active seekers of information and will adopt technologies and practices that provide them with a benefit above current practice.

The benefits sought by landholders are highly correlated with the landholder's farm context. The farm context can be defined as the mix of farm resources, technologies, management strategies and practices that will influence the benefits sought from the adoption of an agricultural technology or practice. For example, important factors in the farm context for a new irrigation system may include soil type, topography, water right (water allocation), water availability, type of irrigated crops and labour available on the farm to operate the technology.

Different farm contexts lead to different benefits being sought from a technology or practice change. In general, each farm has as different farm context, farm contextual factors influence the benefit or cost of adopting a technology or using a practice, so the relevance and cost of practices or technologies therefore varies from one farm to another. It is commonly assumed that a particular technology or practice can be adopted by everyone in an industry. This is rarely the case. This methodology demonstrates the important linkage between farm context and adoption of practices.

Understanding of the different farm contexts and the different benefits sought can be used to determine market segments or benefit segments for a technology or practice. The number of potential adopters for a given technology or practice is the set of landholders with farm contexts that suit that particular technology or practice. On this basis, policy decision makers can tailor research and extension products and messages to meet the specific needs of landholders in each segment.

[2] In broad terms, complex decision-making is associated with high involvement and limited decision-making is associated with low involvement. Involvement is a measure of motivation to devote time and effort to a decision. When an issue or activity is important to an individual they are motivated to devote time and energy to thinking about them and engaging with them. The way an individual processes information depends largely on their level of involvement.

[3] Farm systems theory considers the enterprise in its entirety with causal relationships between its components including the inputs managed by farmers to produce outputs.

Application of this framework involves:

1. Face-to-face interviewing (qualitative) followed by analysis to identify farm context and market segments;
2. Large scale survey (quantitative) to statistically validate interview results and to quantify population and market segments;
3. Face-to-face interviews to validate membership of market segments and implications.

Once policy makers are confident they know the number of potential adopters for a given technology or practice this information can be used to customise research, extension or policy to the different benefit segments (each set of landholders with farm contexts) that suit that particular technology or practice.

3.2 Examples of application

The Kaine Framework has been applied to understand the adoption of a range of agricultural technologies or practices. For example in New Zealand these include dairy enterprises grazing management practices (Davies and Topperwein, 2011), sheep and beef enterprises grazing management practices (Davies, 2012), and factors influencing dairy landholders' decisions to adopt stream fencing (Bewsell et al., 2007). In Australia the framework has been used for example to understand the adoption of sheep breeding techniques among wool enterprises (Kaine and Niall, 2001), dairy enterprises participation in water markets (Kaine et al., 2009), and the adoption of irrigation technologies among dairy enterprises (Boland et al., 2006).

4 Informing policy design

Insights from the Kaine Framework can inform the selection of policy instruments. Knowing whether a practice or technology contributes to the needs of landholders is useful. That is, factors motivating or inhibiting adoption and change.

This understanding of how landholders make decisions about changing practice or technology contributes to informing policy design, including:

- Understanding the likelihood of changes being made voluntarily.
- Obtaining initial insights into likely landholder response to policy initiatives if certain farm practices or technologies become mandatory[4].
- Being aware of the key benefits sought by landholders in the different farm contexts from a technology or practice supports the tailoring of research, extension programs and information provision to different segments to accelerate adoption. This is also helpful when considering the likely contribution of persuasive policy initiatives (such as education and extension) and the need for complementary policy initiatives.
- Technology or practices will be used in different ways by landholders. In some cases this may be counterproductive to the policy objective. These cases of counterproductive use can be predicted and designed for.

[4] Note that these initial insights are made by researchers, rather than being tested to find out the likely response to policy interventions directly from landholders. There are approaches to understanding behavioural responses of landholders to policy instruments. The Policy Choice Framework (Kaine, 2012) contains a robust method for verifying these insights.

5 Implications

The Kaine Framework demonstrates that landholders' decisions about practices and technologies are heavily influenced by their farm system or their farm context which includes farm resources (e.g. soil, topography) and existing technologies and practices.

A number of considerations follow from this:

1. Changing practices or technologies may be extremely difficult particularly if the elements of the farm that influence the advantage/s or disadvantage/s of a practice or technology are fixed (e.g. climate, soil or topography).
2. Farm enterprises can therefore be constrained if they can change practices or technologies.
3. Lack of change is not necessarily an indicator of recalcitrance, alternatively uptake of practices does not necessarily indicate support for policy objectives.

From a policy perspective this means lack of change cannot be treated as reflecting a lack of motivation to comply. If landholders are not changing their practices or technologies, this may simply reflect substantial cost or obstacles to change that may relate to practical considerations of their farm system. These fixed elements of the farm system could translate into significant constraints on farm management options and or considerable impact on farm profitability from policy interventions prescribing practice or technology change.

Some policy options may be infeasible or uneconomic for all landholders to implement. It is important to be aware of the substantial impacts that policy options may have.

6 Key Messages

Farm contextual factors influence the benefit or cost of adopting a technology or using a practice, each farm context is different therefore the relevance and cost of practices or technologies varies from one farm to another.

Changing practices or technologies may be extremely difficult, particularly if the elements of the farm that influence the advantages or disadvantage of a practice or technology are fixed (e.g. soil or topography).

Appendix 1: Examples of application of the Kaine Framework

1. Dairy farm and sheep and beef farm grazing management practices in the Waikato

See Policy Report for CSG document, WRC document number 2986745 and 3027629.

2. Micro- irrigation technologies by fruit growers in Australia

The Kaine Framework was used to understand why a limited number of fruit growers were attending extension events promoting the adoption of micro-irrigation technologies (Kaine et al., 2001, Kaine, 2008). The research revealed a disparity between extension agency expectations and fruit growers' needs. Extension event organisers had expected that 100% of the population were in the market for a technology that reduced their water use, when in fact this was only a key benefit to 17% of the growers.

Micro-irrigation technology is a technology to increase water use efficiency. Fruit growers were interviewed using the Kaine Framework. This revealed that while benefits sought in using micro-irrigation technology related to reduced water use, there were a wider range of benefits being sought by growers adopting this technology than predicted by the extension agency. They included:

- Reduced use of water and labour;
- Greater control over volume delivered; and
- Flexibility in timing of activities.

Findings also revealed key farm context variables influencing the adoption of micro-irrigation technology included:

- Limited labour;
- Limited water supplies;
- Problems with high water tables or salinity;
- Problems with supply of irrigation water at volume;
- Hilly or sandy country;
- High density planting; and
- Depended on having water available to irrigate on demand.

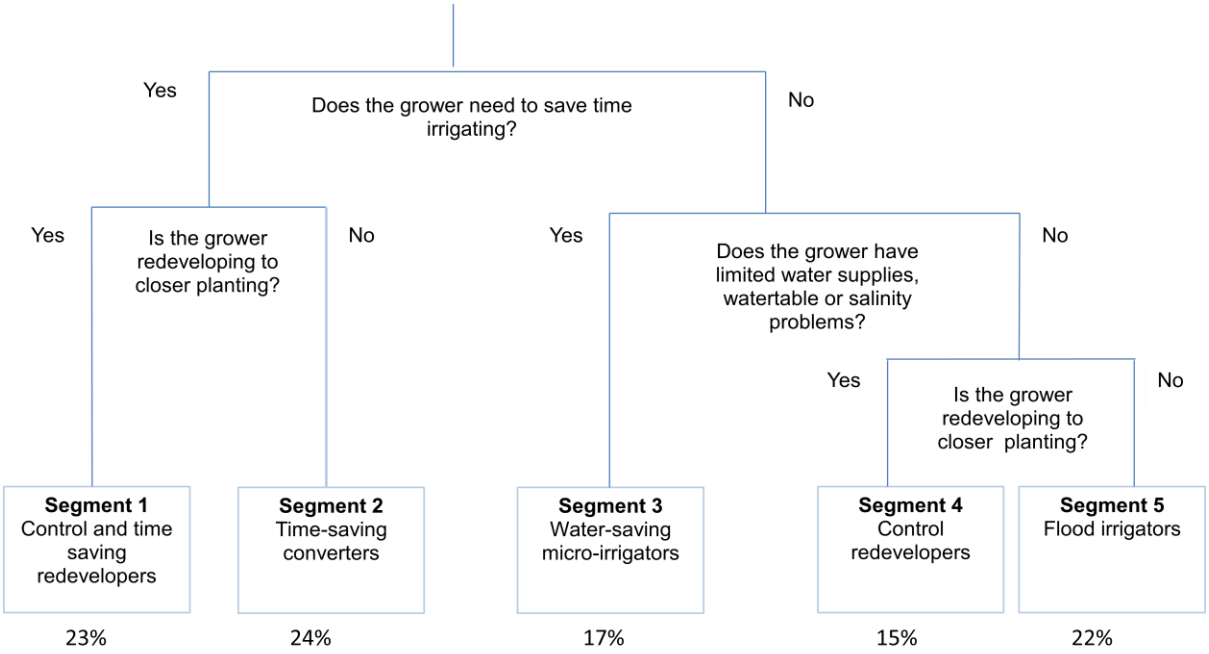

Figure 1: Classification of benefits segments for micro-irrigation technologies in horticulture (Kaine et al., 2001)

Based on the key benefit sought and farm context factors identified, different segments of potential adopters of the technology were then identified, which were subsequently quantified using a large scale survey. The five market segments and portion of the respondents in each segment are shown in Figure 1[5]. For example if a grower was under time pressure but was not redeveloping their orchard to closer planting they fall in segment 2, the 'time saver converters'.

Segment 1: Control and time redevelopers (23% of the market), were replanting (closer plantings) some or their entire orchard and were installing micro irrigation at the same time. Closer plantings are difficult to flood irrigate or existing sprinklers were not at the right spacing.

Segment 2: Time saver converters (24% of the market), were under considerable time pressure and were converting their irrigation system on an established orchard.

Segment 3: Water saving irrigators (17% of the market), had problems with water scarcity, water tables or salinity, converting to a micro irrigation systems addressed these problems.

Segment 4: Control redevelopers (15% of the market), were redeveloping their orchard for closer plantings often with trellis. They were converting to micro-irrigation as part of this development program.

Segment 5: Flood irrigators (22% of the market), were under no time pressure, were not short of water, did not have salinity or water table problems and were not redeveloping their orchards. They felt their irrigation system was working well (Kaine et al., 2001).

[5] Based on stage 1 face to face interviews with fruit growers in Victoria and stage 2 a large scale mail survey with 251 fruit growers in Victoria and NSW.

Growers were motivated to change irrigation management technology by the need to save time, to improve management flexibility and when redeveloping the orchard. The researchers suggested growers would respond to extension messages consistent with these motivations (Kaine et al., 2001).

Low levels of participation in irrigation extension activities are supported by these findings. The segment most likely to hear messages about water efficiency, the water saving irrigators segment, were only 17% of the market (i.e. population of adopters).

3. Adoption of stream fencing by dairy farmers across New Zealand

In 2006, the Kaine framework was used to identify factors influencing dairy farmers' decision to adopt stream fencing (Bewsell et al., 2007). The research revealed that if farmers did not perceive any farm benefits from stream fencing, then adoption rates will be low[6].

Stream fencing to keep cattle out of streams is seen as a way to improve water quality.

The Kaine Framework revealed that benefits sought from stream fencing included:

- Stock not getting into neighbours paddocks
- Stock control
- Protect animal health.

Results also suggested that farm contextual factors influenced dairy farmers' decision making when considering stream fencing included:

- Waterway is a boundary
- Stock could get stuck in waterway
- Wet or boggy areas
- Animal health issues
- External pressure to fence.

Based on the benefits and farm context factors dairy farmers were classified into four segments based on their reasons for investing in stream fencing and a further segment of farmers who had decided not to fence streams on their property (Figure 2)[7].

> Segment 1: The contextual issue identified in segment 1 was the presence of a stream on a paddock or property boundary. Farmers did not want stock getting into their neighbours paddock or the next paddock.
>
> Segment 2: The contextual issue identified in segment 2 was stock control. Farms in this segment had problems with stock getting into water ways and getting trapped. For this reason they fenced streams, drains and wet boggy areas.
>
> Segment 3: The contextual issue identified in segment 3 was animal health. Farmers fenced their stream out of concern for parasites that animal may pick up from access to wet areas.
>
> Segment 4: The contextual issue identified in segment 4 was external pressure to conform to local government guidelines or industry codes of practice.

[6] The interviews took place prior to the review of the Clean Streams and Dairying Accord that resulted in Version II of the document that introduced a stronger framework of new mandatory targets for all dairy cows to be excluded from defined water ways.

[7] Face to face interviews with 30 farmers across four dairy catchments.

Non-adopters: These farmers did not believe that fencing would have any significant benefits for their stock management and were not facing undue external pressure to fence.

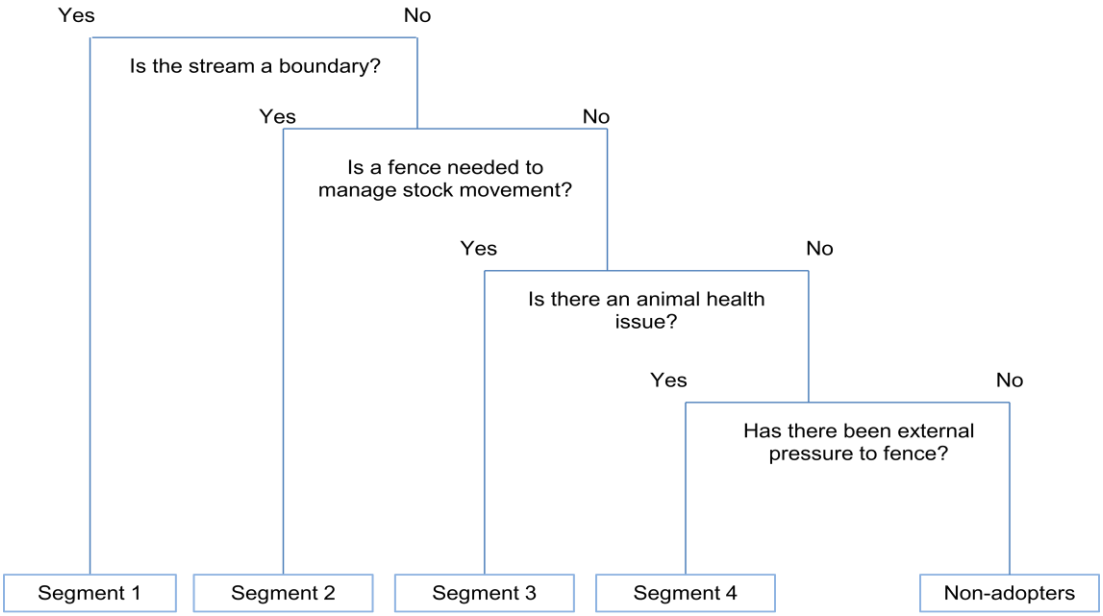

Figure 2 Classification of benefit segments for fencing of waterways in dairy (Bewsell et al., 2007)

The segments detail a range of benefits stream fencing offered farmers. When there are no perceived farm benefits from stream adoption rates will be low. The authors suggest efforts to increase adoption of stream fencing needs to focus on also prompting farm benefits consistent with the identified benefits. They also suggested that regulations may also be needed to increase the rate of adoption of stream fencing by dairy farmers (Bewsell et al., 2007).

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