

# Literature review of motivators and barriers to land management in the Manning Valley

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# Investigating the motivators and barriers to improved land management in the Manning Valley

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## Purpose

The purpose of this review is to provide an understanding of the factors which underpin landholder decision making and behavior change in general, and specifically with reference to land management practices which carry a risk of diffuse runoff.

This understanding will focus on barriers and attractors to practice change and can be used in two ways:

1. Initially, to guide the selection of questions and topics for interviews with local landholders, so that the questions and topics reflect the key factors that have been found to influence decision making and behaviour change.
2. Ultimately, to inform the design of future programs so that they reflect this understanding.

This paper provides a selective rather than exhaustive review of an extensive literature and focuses on research and reviews by established social scientists working in the field of rural practice adoption.

Human behaviour is notoriously complex to understand and predict, and difficult to change. Behaviour that we can observe (i.e. empirical observations) is a small part of the total of behaviour that occurs, and the underlying causal mechanisms for that behaviour are hidden (Pawson and Tilley, 1997).

Nevertheless, even a necessarily imperfect understanding can improve the design and implementation of programs aiming to change behaviour.

## Summary and implications for program design

This review has addressed the many complicated and interacting factors involved in landholders deciding to adopt (or not) a recommended practice or innovation. In general, the barriers and attractors for landholders involve their perceptions. Overwhelmingly, these perceptions concern the relative advantage of the practice or innovation for the landholder which is viewed in terms of the economic, environmental and personal aspirations and motivations.

In any given population of landholders there will some whose circumstances and perceptions mean that they will be likely to adopt, some who will not adopt now, and some who may never or belatedly adopt.

Social surveys can provide an appreciation of landholder perceptions, the factors which affect landholder perceptions and a likely distribution of the numbers of different 'types' of landholders. While generating a typology is a resource-hungry exercise, a simple social survey can point to the range of local perceptions of a problem or practice and guide the design of appropriate extension and incentive programs.

## Critical Success Factors and topics for interviews

The findings of this review suggest several critical factors need to be in place for adoption of new practices to occur, and logically these factors should be investigated in the landholder interviews.

These factors for investigation are the extent to which landholders perceive:

1. Downstream water quality to be a serious problem (i.e. very poor water quality)
2. Riparian and catchment condition cause the poor downstream water quality
3. Riparian and catchment condition are 'poor' a) in the district and b) on their own property
4. Riparian fencing and stock exclusion (or any other recommended practice) can improve riparian condition and therefore downstream water quality
5. Riparian fencing and stock exclusion (or any other recommended practice) is considered 'good practice' by other local landholders
6. Riparian fencing and stock exclusion (or any other recommended practice) is able to be undertaken and managed with the landholder's current knowledge and skills
7. Riparian fencing and stock exclusion (or any other recommended practice) is a disadvantage for production (i.e. has no production or management benefits) or an advantage
8. The dollar cost of riparian fencing and stock exclusion (or any other recommended practice) is quickly recouped (i.e. return on investment)

These eight factors are critical and should be investigated using qualitative interview questions with landholders i.e. they should be open ended questions with an allowance for prompting to elicit more detailed, richer understanding of perceptions. Similarly, these factors should form the basis of the focus group topics.

Other factors, while important, can be addressed using a more quantitative approach and closed questions or listed options e.g. farmers' objectives, information sources, and previous engagement with environmental projects and support agencies.

Current practices can also be investigated with closed questions in reference to infrastructure such as fencing and watering points, stocking rates, periods of grazing (in grazed riparian zones) and rest/recovery periods in fenced or rotationally grazed riparian zones.

## 1 Introduction: the nature of decisions and behavior change

There are many models within the adoption and consumer behavior literature which identify the staged process through which a person will go before deciding to change behaviour e.g. adopt a new practice or purchase something. In general, the process follows from the identification of an issue or problem through stages of:

1. **Awareness** that a new product or practice exists, but a lack of information about it
2. **Interest** in the new product or practice, and seeking information about it
3. **Evaluation** of whether the new product or practice is relevant to their circumstances. In the case of agricultural innovations, this is an evaluation of the likelihood of the product or practice providing a net benefit to them
4. **Trialing** the product or practice on a small scale. This is not always feasible, so a demonstration of the product or practice at another, similar farm may take the place of a trial
5. **Adoption** of the product or practice (and sometimes post-adoption evaluation).

The Theory of Planned Behaviour (Ajzen, 1991), which has informed many approaches to understanding behaviour, suggests there are six necessary factors for new behaviour:

1. Attitudes – will the anticipated outcome be favourable or unfavourable?
2. Behavioral intention – is the intention strong enough to lead to the behaviour?
3. Subjective norms - do most people approve or disapprove of the behavior?
4. Social norms – does it fit with common codes of behavior in a group or people or cultural context?
5. Perceived power – are there factors which can facilitate or impede performance of a behavior?
6. Perceived behavioral control – does it seem easy or difficult to undertake the behavior?

## 2 Factors in decision making in agriculture

Notably, the necessary factors in behaviour change are social and subjective rather than technical and objective. Vanclay (2004) maintains that adoption has a socio-cultural basis and that the key factors for understanding adoption are an awareness of farming as a social activity and recognition of the social diversity of farmers and the social drivers in agriculture.

## 2.1 Farming styles and culture

Farming styles and sub-cultures are social constructs which provide a lens through which to understand management practices. A farming style reflects the locally recognized notion of good farm management and will vary between districts. Vanclay et al (1998, 2006) suggest that farming styles provide a useful way to look at local practices as being socially acceptable.

However, while the idea that people's farm practices within a district are likely to be influenced by local conceptions of what is good management, there has been no real application of the concepts within Australian agricultural extension.

## 2.2 Personality

Research by Shrapnel and Davie (2001) indicates landholders' capacity to modify land-management practices are dictated by their underlying personality traits.

They maintain that personality plays an important role in the human-environment relationships which determine land use, and the potential of landholders to adopt ecologically sustainable practices.

### 2.2.2 Locus of Control

Kaine et al (2003) looked at Locus of Control and found that producers with a strongly internal locus of control were more likely than other producers to participate in extension or benchmarking programs; and more likely than other producers to exhibit a high propensity to adopt innovations. An internal Locus of Control means a person believes an event is contingent upon their behaviour or actions i.e. they can affect the outcome.

They define Locus of Control as a personality predisposition and describes an individual's perception of their ability to change a situation. It refers to a set of beliefs about behaviour and success or failure.

People with an external Locus of Control believe an event is largely the product of forces beyond their control i.e. regardless of what they do, forces beyond their control mean they cannot affect the outcome.

As a result, they suggest that extension and behaviour change programs would benefit from activities aimed at increasing the internality of producers' locus of control. Such activities would be those which build skills and confidence.

### 2.2.3 Temperament

Nicholson and Long (2015) defined temperament as the combination of the mental, physical and emotional traits of a person, which influence what they do. Using the Myers-Briggs Type Indicator (MBTI) of personality, they found a clustering of the four temperament types for agricultural producers

and compared these to the temperament types to those of the general population and of Landcare Facilitators i.e. people likely to be interacting with farmers as extension agents.

	<b>SJ</b>	<b>SP</b>	<b>NT</b>	<b>NF</b>
<b>Beef</b>	57%	25%	13%	5%
<b>Australian sample</b>	42%	13%	26%	18%
<b>Facilitators</b>	23%	17%	36%	24%

Their research data showed that beef producers are markedly different in temperament to the general population, and even more different to Landcare Facilitators (a proxy for program extension agents).

Significantly, over 80% of beef farmers were the ‘SJ’ or ‘SP’ temperament types, which reflect people who are proud to be farmers, cautious and predisposed to resist change or only change once there is good reason to do so.

An understanding of temperament typing can provide some self-awareness for extension agents, and inform how to engage with different farmers, what to say and how to assist in informing a decision. Nicholson and long also provide a guide for applying temperament in the field and without undertaking a psychological study, based initially on a determination of whether people are big picture or detail oriented, then a consideration of whether they are Organised, Flexible, Thinking or Feeling.

In addition, Shrapnel and Davie (2001) worked with Queensland graziers and found a predominantly introverted personality profile involving an ability to cope with isolation and a discomfort with group situations. Extraverts tend to be outgoing, talkative, and process information by discussing things, while introverts are more reserved, solitary and process information internally.

### 2.3 Learning style

A person’s learning style refers to their and preferred way of gathering, organizing, thinking about and making sense of new information.

Kilpatrick and Johns (2003) maintain that learning is critical for practice change. They identify four different learning patterns which are related to ongoing learning practices used by farm managers (or management teams) when making decisions about changing practices:

- *Local focused* management teams learnt for change by accessing only local sources (including government extension services) or a single individual.
- *People focused* farm-management teams preferred to learn for change principally by seeking information and advice on a one-to-one basis from more than one person, most frequently experts, but often other farmers.
- *Extensive networkers* accessed a large number of varied sources in learning for change.
- *Outward looking* used a less extensive range of information sources.

Kilpatrick and Rosenblatt (1998) have observed that seeking information is regarded as acceptable behaviour in the Australian farming community, but training is often regarded with suspicion. Their data



from training and education studies with farmers suggests that there are five reasons farmers prefer to seek information rather than undertake training:

- a preference for independence
- familiarity with a highly contextual learning mode
- lack of confidence in working in training settings
- a preference for information from known sources
- a fear of being exposed to new knowledge and skills.

Farmers are also predominantly Pragmatists in Davey's (1987) learning styles typology, which means that they prefer activities where there are links between the subject matter and a problem to address on the job. They dislike theory and prefer to see:

- techniques where there are obvious practical advantages, or a model to emulate
- immediate opportunities to implement what has been learned
- real problems and practical issues
- practical tips and techniques.

#### 2.4 Mental models

Mental models provide a lens through which people make sense of new information and simplify the complexity of information and situations to make decisions; much like a rule of thumb. They are "personal, internal representations of external reality that people use to interact with the world around them. They are constructed by individuals based on their unique life experiences, perceptions, and understandings of the world" (Jones et al, 2011).

Mental models have been elicited in the field by Abel et al (1998). In a paddock walk, they found that a farmer, ecological scientist and Landcare coordinator each viewed what they saw in very different ways.

Mental models can be drawn (mapped) to show discrepancies between expert (scientist) and lay (landholder) perceptions to identify alignment, misalignment, misconceptions and knowledge gaps (Prager and Curfs, 2016).

#### 2.5 Perceptions

Perceptions are the filter through which the world is viewed and decisions are made and may be different to reality.

Explanations of behaviour based on economic models which have rational beings making rational choices have been shown to be inadequate in explain the decision making of farmers (Carlisle, 2016).

Rogers' (1995) model of the diffusion of innovations (see section 11) shows perceptions to be a filter through which the need for innovations (new practices) and their benefits possible benefits pass in the process prior to decision making.

### 2.5.1 Of ecological condition (the problem)

MCC note that there is robust science behind the recommended management of riparian zones and that there are reasons to believe that the ecological condition of the catchment and riparian zones is degraded.

Wilson et al (2003) interviewed landholders in the Goulburn Broken catchment, which scientific investigations had shown to be degraded, and found a large proportion of landholders overestimated the ecological condition of riparian zones on their properties compared to scientists' assessments. Consequently, many landholders believed that improved riparian management was not necessary.

They conclude that that landholder knowledge of riparian zone function may be a more important factor in the adoption of recommended practices than the ability to complete a purely descriptive assessment of ecological condition.

While many landholders did not see a problem with the ecological condition of riparian zones, they did see problems with the proposed solutions. In particular, management and maintenance of fenced waterways raised issues of weed control, flood damage and loss of access to water.

In addition, the disparity between scientific and local perceptions of ecological condition can create risks for rehabilitation programs. Irwin and Michael (2003) note that local knowledge is an integral part of local cultural identity and that the presentation of scientific knowledge, if presented unequivocally, can be threatening and lead to loss of credibility with local landholders.

### 2.5.2 Of risk

At the catchment scale, the disparity between expert and landholder perception of ecological condition can be matched by a disparity between perception of risk. Slimak and Dietz (2006) surveyed the general public and risk professionals and found that the public is most concerned about ecological risks with low probability but high consequences (a catastrophe) while risk professionals were more concerned by longer term processes with whole ecosystem impacts.

At the property scale, farmers in general have an aversion to risk (Pannell, 2006). However, the level of this aversion varies with the level of financial resources (and sometimes off-farm income) and the business orientation of the farmers. Risks can include:

- implementation costs and capital outlay
- intellectual outlay
- loss of flexibility
- complexity
- incompatibility with other aspects of farm management and farm and personal objectives.

Conflicting information relating to any of these can raise the level of uncertainty and therefore the perception of risk. Similarly, the risk of a loss is commonly seen to be more influential than the promise of a benefit.

Considerable research has established that farmers are likely to adopt environmental management techniques when they consider themselves to be personally at risk from environmental degradation (Vanclay, 2004).

Risks perceptions may also relate to management and lifestyle preferences and stage of life. The management problems identified in the Goulburn Broken catchment (above) are risks to management preferences; and landholders in a 'winding down' stage of life will be unlikely to take risks to increase profits.

### 2.5.3 Of benefit

It seems common sense to say that people will only adopt new practices if they see a benefit. While the perceptions of benefit may differ from some objective reality it is the perception of relative advantage which is critical for adoption.

Relative advantage is discussed further below, but it is worth quoting Pannell's (2006) observation:

*"For some environmental issues, the real challenge is to find or develop innovations that are not only good for the environment, but also economically superior to the practices they are supposed to replace".*

### 2.6 Über wants

Robinson (2013) distills an extensive social science literature to identify three things (über wants) that motivate all people: time, control and self-esteem.

Time and control relate to relative advantage in terms of ease of farm management (see below) while self-esteem is intricately woven with the personal and social factors: farming styles and local cultures, personality, social acceptance and perceptions of 'good practice'.

## 3 Social factors

Social factors include the subjective and social norms (see Theory of Planned Behaviour) which provide a filter through which prospective actions are considered. Subjective norms are determined by the extent to which most people approve or disapprove of the behavior. Social norms reflect the extent to which behaviour is consistent with common codes of behavior in a group of people or cultural context (see Farming Styles).

This concept of social acceptability explains why Kancans et al (2014) found in a large Australian survey that farmers' conservation (and some other) practices were more likely to be adopted when farmers were members of groups that provide support for land management decision making.

## 4 Landholder goals and motivations

Landholders, like all people, have a mix of goals and motivations. Practices must be consistent with landholder goals for them to be adopted and as Pannell (2005) notes: “Even with the most expert and persuasive extension landholders are not likely to change their management unless they can be convinced that the proposed changes are consistent with their goals”.

Pannell et al (2006) note that: “The goals of landholder families or individuals are heterogeneous, and can include the following:

- material wealth and financial security
- environmental protection and enhancement (beyond that related to personal financial gain)
- social approval and acceptance
- personal integrity and high ethical standards
- balance of work and lifestyle.

A review by Curtis and Curtis (2018) makes the point that people can hold more than one value orientation simultaneously, which they say explains why almost all respondents to their surveys give a high rating to items measuring social, economic and environmental values.

This also explains why many surveys find apparently counter-intuitive evidence that financial considerations are not always paramount in farmer decision making. For example, Greiner and Gregg (2011) found that graziers have a very high level of conservation and lifestyle motivation and are motivated to lesser extents by financial/economic and social considerations, pointing to a strong stewardship ethic.

Yet it has been shown (Lawrence et al, 2004) that a stewardship ethic by itself is an unsatisfactory concept when looking to landholders to respond to environmental problems, and that the attitude of stewardship only rarely translates into actions in improving natural resource management practices on private land.

Kancans et al (2014) surveyed farmers nationally in 2010 and 2012 for the ABARES Drivers of Practice Change in Australian Agriculture project (2009-13). They found that farm managers were motivated to adopt sustainable land management practices by relative advantages (see below) that included triple bottom line considerations i.e. financial, environmental and personal dimensions.

Notably, they found that financial and environmental motivations were paramount in decisions about farm production practices, while environmental and personal motivations were paramount for decisions about natural resource management (in this case native vegetation management) practices.

*“While communicating production and financial benefits is important, communicating environmental and personal benefits is likely to also play an important role in encouraging*

*uptake of sustainable farm management practices. Extension that promotes the multiple benefits of adoption and also recognises the different motivations related to 'public good' activities (e.g. native vegetation management) and 'private good' activities is likely to have a greater influence on a wider audience than extension that fails to recognise these multiple benefits and motivations." (Kancans et al, 2014. P2)*

Bowles (2008) has suggested that these multiple motivations can be addressed by "good mechanisms" i.e. approaches which "channel the material interests for the achievement of social goods (public benefits) while also enhancing the contribution of the moral sentiments to the same ends".

Bowles (2008) also cautions that "programs need to take advantage of farmer's stewardship ethic for maximum effectiveness and efficiency and minimize the risk of crowding out intrinsic motivation and altruistic behaviour". A risk with financial incentives can be that perceptions may develop among landholders that:

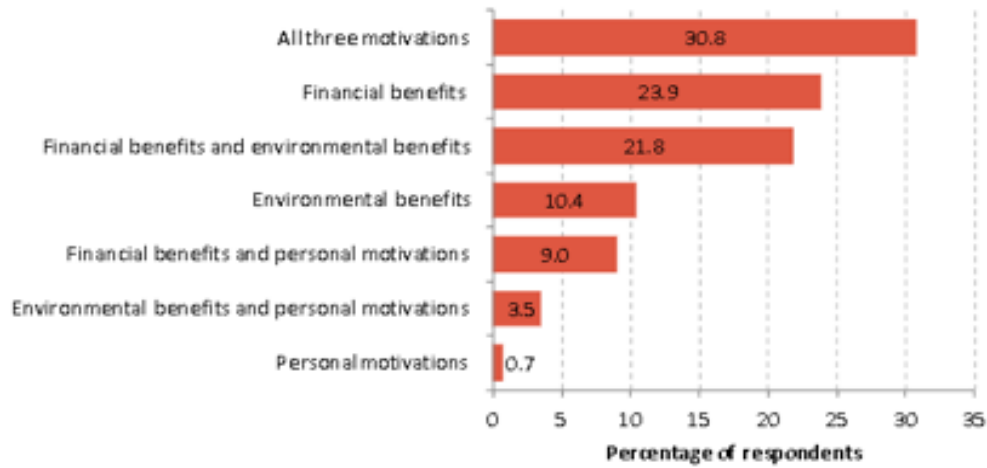
- the government is prepared to pay for these public benefits, so you would be a fool to do it without a grant
- if there was a benefit to landholders, then the government wouldn't need to be paying for it, so there must be a net cost to the landholder.

## 4.1 Multiple motivations

The national survey by Kancans et al (2014) looks closely at the variations between multiple motivations that play a role in a range of production and environmental decisions.

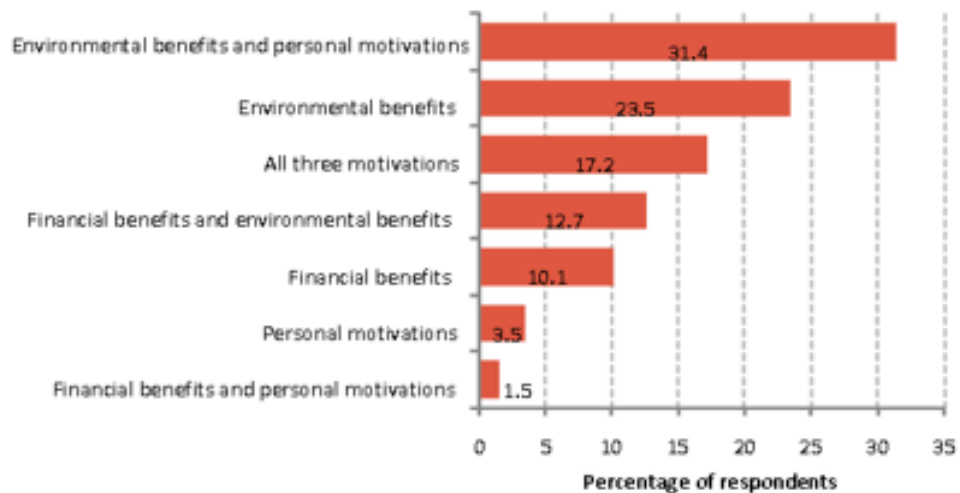
For grazing management decisions, for example, they found that while a combination economic, environmental and personal motivations were cited by the largest number of farmers, financial motivations were of highest importance, as shown in their Figure 5 below:

**Figure 5 Motivations of grazing management practice decisions 'to a great extent'**



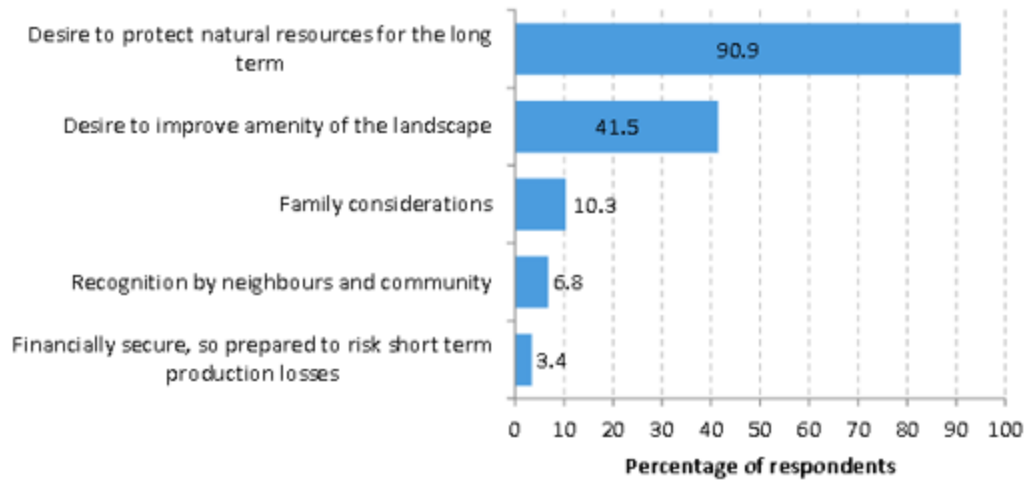
For native vegetation management decision, they found that environmental and personal motivations were cited by the largest number of farmers, while financial benefits were cited less often, as shown in their Figure 9 below:

**Figure 9 Motivations of native vegetation management decisions 'to a great extent'**



Looking more closely at the motivations for native vegetation management practices, they observed that the desire to protect natural resources was the strongest personal motivation, with an improvement to amenity being the second strongest, as shown in their Figure 12 below:

Figure 12 Personal motives for adopting native vegetation management practices



## 4.2 Key factors influencing adoption decisions

A seminal paper by Pannell et al (2006; and republished in 2011) distills much of the disparate literature with reference to barriers to adoption of conservation practices by Australian landholders. Their review includes perspectives from researchers in psychology, rural sociology and economics. They find that relative advantage and trialability are the key factors in adoption decisions.

Relative advantage is simply defined as “the degree to which an innovation is perceived as being better than the idea or practice it supersedes”. Relative advantage is seen to have many elements:

- Short term costs vs returns
- The impact on profits in the medium and long term
- Impacts on other parts of the farming system
- The cost of adjustment to the practice or system
- Impacts on the riskiness of production
- Compatibility with existing resources and practices
- Complexity of the new practice or innovation
- Compatibility of the new practice with beliefs and values
- Impacts upon family or lifestyle
- Effects on self-image (self-esteem)
- Perceived environmental credibility of the practice
- High establishment costs and long time scales for benefits

Trialability provides a way to reduce the uncertainty around the possible relative advantage of a new practice. It includes consideration of how easy it is for landholders to observe the results of trials and

also the complexity or difficulty in understanding the results. Trialability is influenced by a number of factors:

- Whether it can be trialed on a small scale as an experiment
- Observability of results
- How long it takes to see the results
- Cost of undertaking a trial
- Risk of failure from drought, disease or faulty establishment.

## 5 Landholder typologies

Typologies of landholders can provide an understanding of the range of landholder attitudes, perceptions, behaviour and circumstances. Typically a survey instrument gathers a range of responses and statistical techniques look for clusters of responses which form a similar pattern, which is then described as a 'type' of landholder, which can be applied to better target messages and programs.

Emtage et al (2006) reviewed the typologies that had been developed in Australia and found that the landholder types they describe have similarities, which suggests that the studies have identified the same fundamental divisions in the rural communities.

### 5.1 Farmers

The most common typology of landholders with respect to practice change and adoption is that of Rogers (1995, and earlier) which classifies types according to their propensity for adoption of innovations. This typology identifies five types:

1. innovators
2. early adopters
3. early majority
4. late majority
5. laggards.

It is important to note though that this typology is based on a simple statistical model of the normal distribution rather than on responses from real people, and that whether someone is an early adopter or a laggard may depend on their farm circumstances and whether the innovation is relevant or useful to them. People can be laggards for one technology and innovators for another.

Bohnet et al (2011) developed a typology of landholders in Queensland's Bowen-Broken Basin which focused on graziers' values and motivations to follow a particular management strategy.

They found three broad types of graziers:

1. Traditionalists



2. Diversifiers
3. Innovators.

Emtage and Herbohn (2012) applied a market segmentation approach to understanding the diversity of landholders and their concerns for natural resource management programs in the Queensland Wet Tropics and found that five landholder types emerged from their research:

1. Concerned but unengaged
2. Multiple objective
3. Production oriented
4. Disconnected and conservative (with low levels of interest)
5. Well connected and progressive (with high motivation and engagement).

Morrison et al (2012) found some similar landholder types in a national survey of almost 6,000 landholders. They found three 'mainstream' types which reflect the types found by Emtage and Herbohn, but also identified two 'lifestyle' segments:

1. Mainstream but disconnected
2. Quality operators
3. Profit first
4. High end hobby farmers
5. Small hobby farmers

## 5.2 Dairy farmers

Waters et al (2009) derived attitudinal segments from responses of Victorian dairy farmers and found six types of dairy farmers:

1. Love farming
2. Family first
3. Winding down
4. Established and stable
5. Growing for the kids
6. Open to change

The main attitudinal characteristics that were important in differentiating segments included: the importance of providing for the next generation, the relative emphasis on self-reliance and personal knowledge, aversion to risk, and perceived financial pressure.

They showed how different messages regarding climate change risk would be of interest and engaging to different farmers depending on their different types.

Notably, the 'winding down' type is often found in other typologies along with 'stage of life'. The obvious conclusion is that there will always be a segment of the population who are considering retirement from active farming who will be unlikely to be interested in new or challenging practices.

### 5.3 Small farmers

Small farmers are a relatively under-studied segment of the rural community. Hollier and Reid (2003) surveyed Victorian small farmers to gain an understanding of the needs of the small and lifestyle landowner sector and on constraints to participation in extension activities.

They suggest that small, lifestyle landowners be recognized as a distinct group, so programs can be appropriately targeted. This work also suggested that there was a belief that natural resource management information was difficult to access and that the landowners felt marginalised when they participated in extension activities with larger property owners.

Nevertheless, lifestyle landholders were keen to attend learning-based activities in land management that were targeted exclusively at the small and lifestyle sector.

Gill et al (2010) conducted research in the peri-urban zone around Sydney which looked at the motivations and practices of lifestyle landholders and characterised them according to three stewardship types:

1. Lifestyle agrarian: Similar to traditional farming where use of land resources occurs through production and conservation is seen to be a sensible part of farm management.
2. Regenerative: Interested in improving land management as a whole with improved ecological management and restoration as important goals. They have production goals but they may be subservient to conservation goals
3. Conservationist: Their primary focus is on ecological restoration and provision of habitat. Agricultural land use is perceived as having had largely negative consequences and their management is seen as an opportunity to remedy past mistakes even.

The characteristics of new owners and small farm lifestylers were identified as low dependence on farm income, relatively high interest in environmental stewardship, sub-commercial landholdings, and a focus on landownership for “lifestyle” reasons.

## 6 Types of innovations and practices

Not all innovations or practices are the same. Some involve simply changing the type of product which is already considered worthwhile. But some involve changes to farm management, new skills, or even new enterprises.

Kaine et al (2008) identify four types of innovations:

1. Incremental innovations which may involve new components or skills, but which build on and improve existing practices
2. Modular innovations which involve new components and concepts so that existing practices become obsolete and new skills will be required
3. Architectural innovations require a reconfiguration of existing elements within a system
4. Radical innovations require a new set of concepts as well as new infrastructure and skills.

In considering catchment and riparian management issues, excluding stock from an active gully may be simply an Incremental innovation. The concepts and skills are likely to already exist for the landholder.

In contrast, fencing of riparian zones might be a Modular innovation requiring new ways of doing things e.g. accessing stockwater, moving stock and managing weeds. A change from set stocking to rotational grazing, which may be seen as the best way to manage stock movement and access to water around the whole property, would be an Architectural innovation requiring new concepts of grazing management, significant learning and new skills, extensive infrastructure and changes to many aspects of farm management.

## 7 Agricultural production vs conservation

### 7.1 Private vs public benefit

Agricultural extension has in the past been seen as a public service and public good. The idea was that since agriculture plays an important role in the economy then production benefits to farmers would flow as benefits to the community.

However, since the 1990s government programs and extension have started to focus on the impacts of agriculture on the environment. This has raised two problematic issues.

First, farmers are less attracted (maybe even offended) by programs and extension which focus on repairing damage they are believed to have done to the environment. So it can be expected that extension programs do not automatically have credibility with farmers as they used when focused on extending the benefits of research to agricultural production.

Pannell et al (2006) suggest that this means: *“For some environmental issues, the real challenge is to find or develop innovations that are not only good for the environment, but also economically superior to the practices they are supposed to replace”*.

Second, if incentives are to be made available to encourage actions by farmers which improve or maintain the environment for community benefit, then public funding support may well be appropriate. But if economically superior practices are the ones most likely to be adopted, then what is the rationale for providing funding support.

In seeking to reconcile these conflicting issues, Mullen et al (2000) observe that because farmers inevitably consider the economic implications of any proposed practice change, they are “noticeably

disappointed when extension of prospective changes demonstrably fails to account for the production implications”.

## 8 Types of incentive

Incentive can be of several types: support and persuasion through extension, or a range of financial incentives. Natural Decisions (2015) suggest that incentive payments are used in two broad ways. First, to encourage people to trial, and (it is hoped) subsequently adopt, new practices that are believed to be in their best interest already, and that happen to also benefit the environment, and hence benefit the broader community.

Second, to compensate people for adopting practices that result in net costs to the adopters, but which benefit the environment and the broader community.

Their review a range of Landcare (\*1) projects Australia-wide found these projects have significantly accelerated adoption of improved riparian management practices, as shown with respect to riparian management on cotton farms in their Figure 10 below:

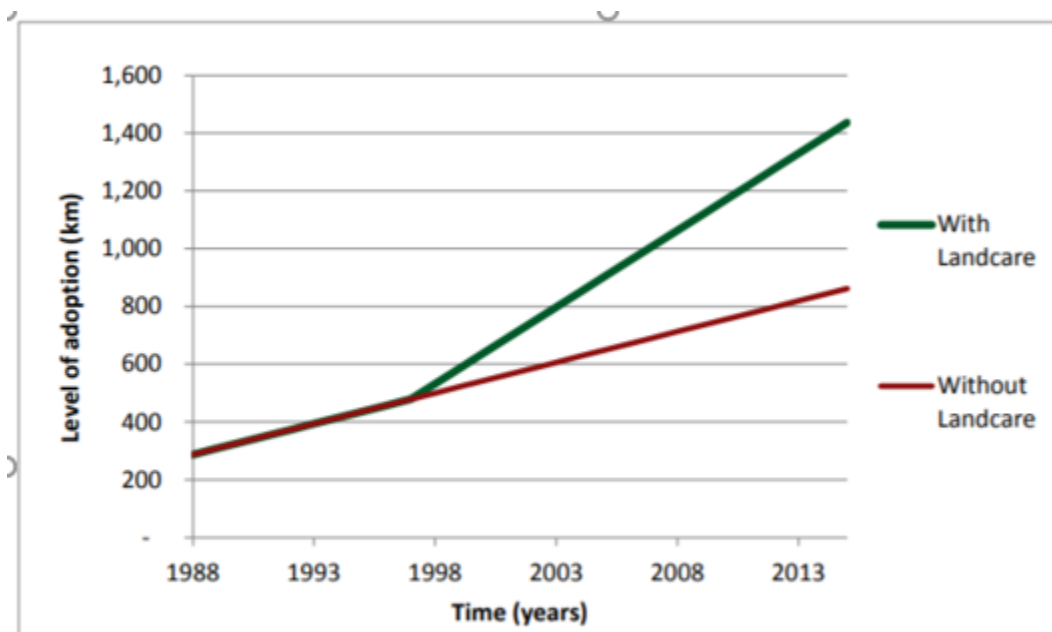


Figure 10. Estimated adoption of riparian management with and without Landcare funding in cotton growing areas (NSW and QLD).

An expert workshop conducted as part of their review found the major mechanisms by which Landcare has encouraged adoption were not restricted to financial incentives:

- Receipt of payments from Landcare
- Change in goals to put more emphasis on environmental outcomes
- Increased knowledge of how to implement the practices

- Encouraged cooperation with neighbours or other landholders
- Favouring of a collaborative approach between growers and groups to foster strategically valuable placement of plantings for soil erosion mitigation, corridors and/or for water protection.

(\*) Landcare projects were ones which involved community groups in extension activities and support with financial incentives.

## 9 Types of extension

The purpose of extension is to increase the rate of uptake and the number of people adopting practices and innovations which are thought to be beneficial. Practices which are actually beneficial can be expected to be adopted over time. Extension seeks to speed this process.

### 9.1 Approaches

Extension can be of two broad types. First, proactive extension i.e. where an organisation determines what practices or innovation is to be promoted (e.g. in the case of MCC it would be a suite of riparian and catchment management practices).

Second, responsive or needs-based extension where the practice/innovation is identified by the farmers as being of interest to them, and a program of information and extension is developed to address their interest.

In either case, the market for these practices or innovations is a subset of the total population who identify a benefit to the practices and can see how they might be applied on their own property.

### 9.2 Methods or models of extension

Coutts et al (2005) reviewed of a range of extension and education projects in the rural sector and identified five models:

1. Group Empowerment and Facilitation Model
2. Training Model
3. Technology Development/Problem-Solving Model
4. Information Access Model
5. Individual Consultant/Mentor Model

These models reflect changed perspectives over time as the top-down Transfer of Technology (see 3 above) model from the 1960 and 1970s has been added to by a range of more bottom up and participatory approaches.

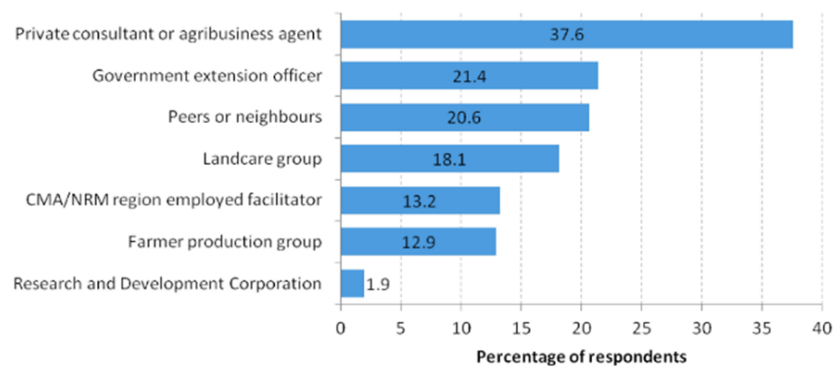
### 9.3 Types of extension agent

The types of extension agents or personnel can differ and some important factors include:

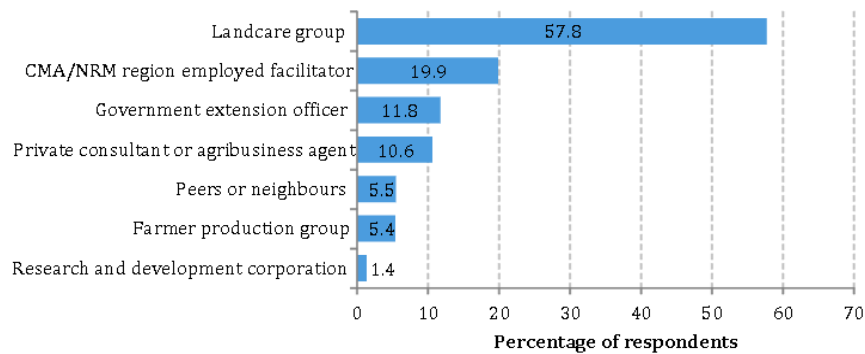
- Local and a member of community
- Respected as having relevant technical knowledge (and experience)
- Empathetic (i.e. understands the situation of people) and understands their mental models.

Kancans et al (2014) demonstrated that landholders will seek support from different extension agents and information sources depending on the topic. Their Figure 19 and Figure 20 can be compared to see that landholders choose to get information and advice from different sources for production (grazing management) and environmental (native vegetation management) issues.

**Figure 19 Support agents utilised for grazing management practices**



**Figure 20 Support agents utilised for native vegetation management practices**

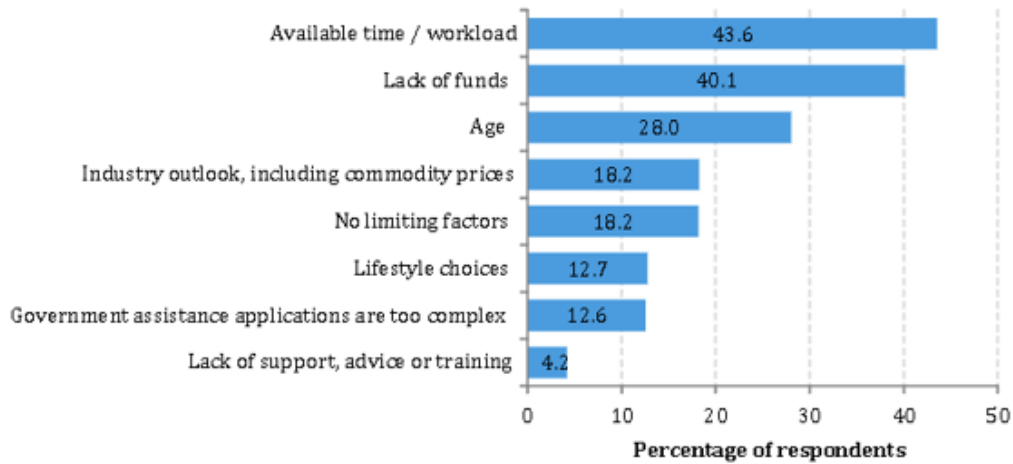


## 10 Barriers to adoption

Understandably, many people have sought to find the barriers to adoption of particular practices that they would like to promote. For example, Kancans (2014) national survey found that barriers to

adoption of changed practices could be identified for over 80% of broadacre and dairy farmers, as shown in their Figure 17 below:

**Figure 17 Barriers to changing land management practices**



They also identified a number of features of farmers who had or were more likely to adopt new practices, as shown in their Table 20 below:

**Fenced native vegetation to control stock access**

As can be seen in Table 20, relative to non-adopters of fencing of native vegetation to control stock or those who had only considered adopting this practice, farm managers who had adopted tended to:

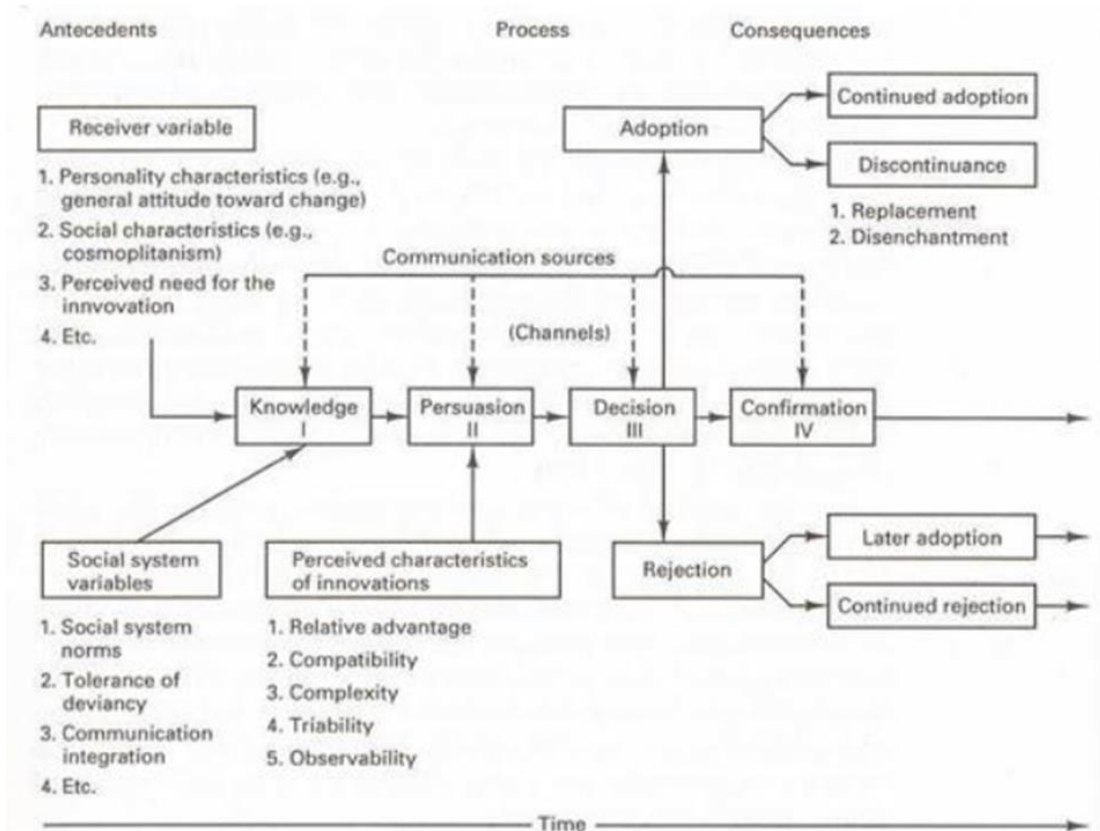
- have higher farm cash income
- have higher rate of return
- have higher off-farm income
- have smaller farms
- have a higher level of education
- be less likely to participate in extension
- be more likely to participate in government programs
- be more likely to be members of a group.

They note that while there has been increasing evidence of riparian fencing and bushland conservation since government funding programs began in the 1990s, the costs and the areas involved are generally small relative to the scale of the farm enterprises.

## 11 A Model of Adoption

The Conceptual Model of Diffusion of Innovations (Rogers, 1995) presented below is useful in conceptualizing the complicated mix of factors involved in adoption of new practices. The conceptual model highlights several important factors in landholder adoption:

- The receiver and social system variables which have been identified and discussed in this review
- The idea that knowledge is a necessary but insufficient pre-condition for a decision to adopt
- The characteristics of the innovation and their implications for relative advantage are considered before a decision
- The characteristics are 'perceived' rather than necessarily actual
- That adoption may not occur immediately (due to circumstances?) but may occur at a later date.



Kuehne et al (2017) have demonstrated that adoption can be predicted by consideration of the factors identified above, by investigating characteristics of the practice that influence its relative advantage, characteristics of the population influencing their perceptions of the relative advantage of the practice, characteristics of the practice influencing the ease and speed of learning about it, and characteristics of the potential adopters that influence their ability to learn about the practice.



## 11 Catchment and waterway management programs

There have been many programs in Australia which have sought to maintain or improve water quality through catchment, riparian and in-stream activities. However there have been no (i.e. none found) meta reviews of the methods and outcomes of these programs. It is recommended that review of programs elsewhere be considered in conjunction with evaluation and review of the findings of the landholder surveys and interviews.

Some examples which could provide useful lessons for MidCoast Council in the design of an extension and incentive program include:

- The model and experience of Rivercare in NSW (Raine and Gardiner, 1995)
- The Queensland Reef Water Quality Program and Great Barrier Reef Gully and Streambank Joint Program
- The South East Queensland Healthy Water and Land programs
- The Goulburn Broken Water Quality Strategy.

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