

# **Small Enterprise Conference 2007, Building Sustainable Growth in SMEs**

**Manukau City, New Zealand**

**23 - 26 September 2007**

## **Title: Decisions systems: influencing farming families' strategic decisions**

*Dr Quentin Farmar-Bowers, Post Doctoral Research Fellow, Centre for Sustainable Regional Communities, Latrobe University Victoria, Australia.*

### **Abstract**

An understanding of farmers' decision-systems would help government agencies appreciate how best they could encourage farmers make strategic decisions that would lead to better natural resource management (NRM), including the maintenance of native biodiversity on their farms. An appreciation of decision-systems in general would help farming families and their advisors improve their strategic decision making capabilities.

This paper outlines a decision-system theory we developed using the procedure for grounded theory from in-depth interviews with farming families. The theory helps explain farmers' perspectives on conserving biodiversity out of personal interest, compared with conserving biodiversity for business reasons.

The decision-system theory outlined in this paper has six parts. The first five parts concern decision-making from the farming family's perspective. Part one is a set of hierarchical stories that represented the life-long motivations (aspirations) of farming families. Part two is an understanding of how farm decision-makers create opportunities. Part three is a hierarchical set of decision-systems relevant to NRM. Part four is the concept of 'personal career path' that helped explain the impact of the decision-makers' family situation on strategic decisions. Part five is the concept of lenses that represent how farm decision-makers view opportunities. The sixth part of

the theory concern the farming family's decision-making from the perspective of a policy developer. It reinterprets the first five parts of the theory to create a concept called 'boxes of influence' that categorise government policy and programs from the farmers' perspective.

The paper discusses how the concept of 'boxes of influence' can help agencies develop policy that encourage farmers to invest in natural resource management (NRM), such as the maintenance of native biodiversity on farms, out of personal interest compared with policies that provide a business incentive for conservation. The inference is that policies that facilitate the expression of farming families' intrinsic interest in the maintenance of biodiversity may be more effective in the longer term than policies that rely on a business incentive for conservation.

## **1 Introduction**

The importance of biodiversity and the role agriculture plays in its maintenance worldwide is well documented (Millennium Ecosystem Assessment, 2005). In Australia, land uses associated with agriculture continue to have an impact on native biodiversity (CoA 1994; 1995). The maintenance of native biodiversity on farms is an essential part of the conservation of native biodiversity in Australian landscapes (Bennett and Radford 2004, Wilson and Lowe 2003, van Rees, M., 2003, Williams 2003,). However, farmers' main business aims are the profitable production of food and fibres rather than the maintenance of native biodiversity. Many farmers undertake some natural resource management (NRM), such as conserving native habitat, out of interest without expecting government funding. Beyond that voluntary amount of conservation, it seems that financial compensation is necessary (Herzon and Mikk, 2007, Mendham et al. 2007). So governments have to actively encourage farmers to maintain biodiversity on their farms if they are to achieve state and national biodiversity maintenance objectives. There are a variety of ways governments can go about achieving these objectives.

This paper seeks to explain farmers' perspectives on conserving biodiversity for personal interest, compared with conserving biodiversity for business reasons and to show the relevance of this difference for policy development. To explain this difference and its relevance to policy, we have developed a decision-system theory.

Farmers' decisions to maintain native biodiversity are different from most day-to-day decisions because to be effective they have to become ongoing actions. Biodiversity maintenance decisions are more like deciding on a strategy than taking a one-off decision. Strategic decision from individual farming families principally determine what native biodiversity remains on farms and collectively what remains in the region (Medley et al 2003). Farming families' strategic decisions are not always driven by agricultural production considerations and tend to be unique to the family. "To conceive of farmers as a homogenous group...can...be a barrier to understanding the driving forces behind farmers' decision processes..."(Busck 2002 p. 247).

## **2 Framework for the decision-systems theory**

Given the long-term and complex aspects of land-use, a systems-thinking approach, as described by Bates (1997), Flood (1991, 1999), and Midgley (2000), provides a flexible and expandable framework for building a theory about farmers' decision-systems. In building our decision-system theory we focus on two scales. The larger scale is at 'classes of systems' which is defined by the activity of farming and includes all farming families. Other classes of system in agriculture at this scale would be 'sellers of agricultural chemicals', 'farm business advisors and consultants' and so on. The various classes of systems within agriculture have a functional relationship to one another and the physical and economic aspects are often referred to as 'supply chains'.

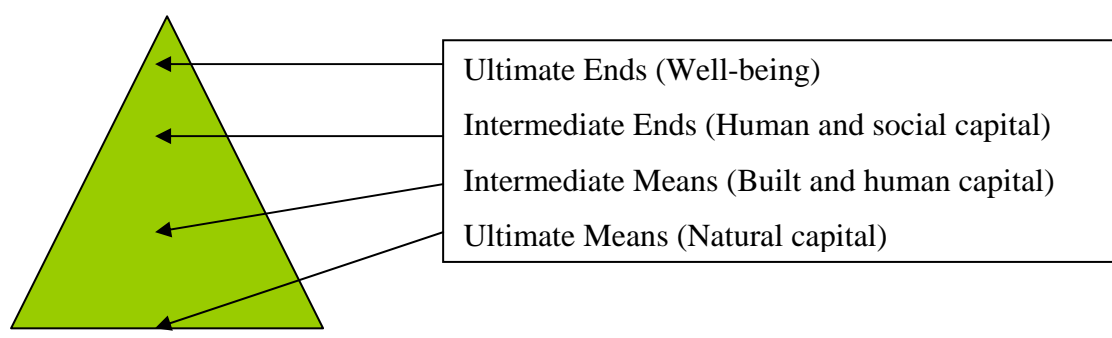
The smaller scale is at the individual farming family system. These systems collectively make up the farming family 'class of systems'. There are functional relationships between different kinds of actions within a single farming family system. Many of these functional relationships at both scales are hierarchical in that individual systems form part of larger systems and these systems in turn form part of even larger entities. Wilber (2000a, 2000b) discusses the concept of hierarchy in which higher levels are dependent on lower levels.

Two particular aspects of hierarchies are especially relevant to the decision-system theory. One aspect is the changing nature of the criteria used for solving problems, (or justifying decisions about problems) at different levels of the hierarchy. Martinez

de Anguita et al. (in press) has recently developed a concentric spheres environmental decision-making model that goes some way to illustrate this. Their model only refers to environmental problems and solutions but the principal that their model demonstrates is applicable to our decision-systems theory. In their model the problems at the smallest scale are technical and economic which require efficacy and efficiency criteria to solve them. At increasing scales the problems become political, ethical, philosophical and ontological which required, respectively, acceptability, coherence, realism and solidarity criteria to solve them.

The other aspect of hierarchies is the relationships between people and the planet devised by Daly (1996) and developed by Meadows (1998) as the Daly Triangle shown in figure 1.

Figure 1 representation of the Daly Triangle (Source Meadows 1998 p 42)



Ultimate ends: Well-being	Happiness, harmony, fulfilment, self-respect, self-realisation, community, identity, transcendence, enlightenment
Intermediate Ends: Human and Social capital	Health, wealth, leisure, mobility, knowledge, communication, consumer goods

The Daly Triangle illustrates the important idea that what people do at the base of the Triangle (biodiversity conservation in our case) is governed by what they are trying to achieve at the apex of the triangle and that ultimately what is achievable at the apex depends on what is achieved or remains below.

Within farming as a 'class of systems', farming families are taken to be an individual self-referential system. This means that the farming family may be influenced by external factors and changes but they are ultimately responsible for their own decisions and actions. Members of the farming family are taken to be the beneficiaries of the farming unit but management and technical arrangements might vary greatly. Individual family members may, in addition to farming, have parallel off-farm careers such as teaching, nursing, volunteer jobs or even running other businesses.

### **3 Development of the Decision-System Theory**

Three sets of in-depth interviews were undertaken with farmers in Victoria Australia. The first two set of interviews were conducted between 2002- 2005 with farmers in the North-East Victoria as part of a larger program called "Drivers of Land use Change<sup>1</sup>" (Crosthwaite et al. 2004). The third set of interviews was conducted in 2006 with farmers in Western Victoria and undertaken at RMIT University, Melbourne.

The first set of 28 confidential in-depth interviews tested a question guide used in later interviews and provided preliminary ideas about the relationship between farmers' motivations, opportunities and actions (McHugh and Macdonald 2003, Farmar-Bowers 2003). The question guide encouraged interviewees to talk about their strategic decisions and life-long issues. The second set of interviews involved 19 farming families and the third set of interviews involved 14 farming families. The second and third sets of interviews were analyses using the procedure for developing grounded theory (Strauss and Corbin 1998) and formed the basis of the decision-systems theory (Farmar-Bowers 2004, Farmar-Bowers and Lane 2006).

### **4 Overview of the Decision-System Theory**

The decision-system theory has six components:

1. a hierarchy of motivation stories,
2. the concept of suitability and availability of opportunities

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<sup>1</sup> A joint program of the Departments of Sustainability and Environment and Primary Industries, Victoria, Australia ([www.dcs.vic.gov.au](http://www.dcs.vic.gov.au) > conservation & environment > biodiversity and agriculture > drivers of land use change).

3. a hierarchy of decision-systems,
4. the concept of personal career paths,
5. the concept of lenses and
6. a policy classification system called boxes of influence.

These six components are related as follows.

- (1) Farmers have aspirations or motivations that are unique to them and to their families. We developed a set of five stories from the interviews that represent farming families' motivations.
- (2) Farmers seek to satisfy these motivations by creating many opportunities across all aspects of their lives. They create opportunities that are both 'suitable' for delivering their motivations and use components which are 'available' to them.
- (3) We were concerned about the decision-systems that farmers use to create opportunities that involve 'land use-change' because land-use is important for biodiversity conservation. We found that farming families make most of their decisions about land-use in three decision-systems.
  - (a) 'Family decision-system': decisions made from the perspective of the family as a whole.
  - (b) 'Farm business trading decision-system': decisions about running their farm business operations.
  - (c) 'Land-ownership decision-system': decisions made about buying and selling or leasing land.
- (4) The concept of 'personal career path' provides a framework to discuss the strategic decisions farmers make in regard to their stage of life and also to discuss the information on the differences between individual and family motivated decisions.
- (5) The concept called 'Lenses' indicates how the farm decision-makers view options when they are creating opportunities.
- (6) Finally, we considered how policy influences farmers' strategic decisions and developed a policy classification system we called 'Boxes of Influence' principally by amalgamating the concepts of Lenses and farmers' personal career paths.

The next section of the paper describes the theory in detail.

## 5 *The Decision-system Theory in detail*

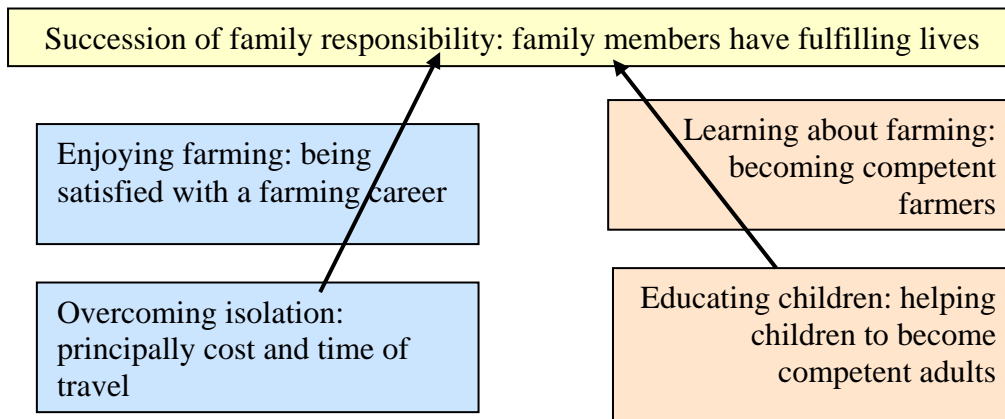
### 5.1 A hierarchy of motivation stories: Five stories about family motivations

From in-depth interviews we developed a set of five stories that represent the motivations of the farming family (Farrar-Bowers 2004). These motivations or aspirations are what farming families are trying to achieve or have, during their lives.

There is not just one thing but rather a hierarchy which is summarised in Figure 2.

The five stories represent the ‘ultimate ends’ in the Daly triangle.

Figure 2 The hierarchical arrangement of the five stories on motivations



The arrows in figure 2 represent the ‘flow of support’ so that ‘succession of family responsibility’, the top story, is only achieved if there is enjoyment and competence from learning.

‘Succession of family responsibility’ is about families helping their members become responsible citizens and living lives that they find fulfilling; intergenerational considerations are important for families. What this means in practice varies greatly. As part of this, farming families want to enjoy farming, and overcoming isolation is an important issue in enjoyment, although how they achieve this varies greatly.

Learning about farming is about becoming competent adults and farmers. It covers a range of issues and topics. For most farming families educating children represented a major section of family life and again how they dealt with this varies greatly.

## 5.2 The concept of suitability and availability of opportunities

Farmers were not passive recipients of opportunities but actively worked to create opportunities. They tend to talk about their actions in terms of the opportunities they created and the motivations they were trying to fulfil. We used a simple mental model of decision making, *Motivation + Strategic opportunity = Action*, to mirror their approach. ‘Actions’ means more than farm business activities; it included everything they do. For example, they could create a recreational opportunity by joining a local sporting club.

Farm decision-makers look to create opportunities that they believe will be ‘suitable’ in regard to their family’s motivations. Some will be business opportunities but others could be NRM opportunities, such as the conservation of native biodiversity.

Farmers create opportunities from components. To create an opportunity the necessary components must be ‘available’ to the farmer. If one or more of the components are lacking then the opportunity will not be available to the farmer. In regard to ‘availability’ one interviewee noted:

*See, you’ve got to be realistic about these opportunities. You can’t go out there even though you want it (Attribution MA<sup>2</sup>).*

The interviews suggested that farmers combine three kinds of components to create opportunities for themselves. These are:

- The *personal components* of opportunities include the farmer’s current knowledge, skills, energy, enthusiasm, the land they own, the financial capital they have and the contacts with other people and organisations that they can use. These components are unique to the farmer.
- The *external components* of opportunities include the existence of markets, finance, transport, insurance, information, expertise, training courses, land for sale or lease, tax laws, water to purchase, infrastructure, research, government programs and so on. These components are not unique to an individual farmer

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<sup>2</sup> Attribution: sex of the interviewee (M / F). Stage in life: Starting their career in farming (S) in the Middle of their career (M) or Advanced in their career (A)

although sometimes they may be restricted to particular areas or groups of farmers.

- *Random components* are events such as droughts, floods, fires, diseases, interest rates and market fluctuations. These components are not unique to individual farmers and often impact whole regions.

In regard to developing opportunities one interviewee noted:

*People call me a bit of an innovator and I tell them I'm not doing anything that hasn't been done before for at least 10 years. I'm just putting it all together (Attribution MM).*

Farmers are aware of the importance of developing personal components through education, experience and farm improvements. For example one interviewee noted the importance of developing skills and knowledge;

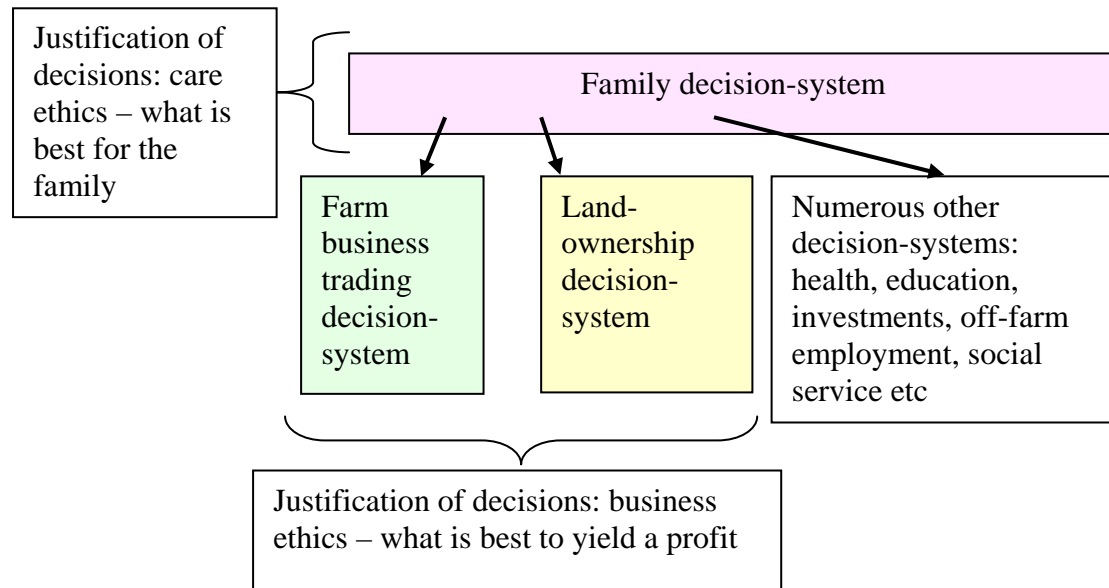
*You can have the block of land but it's what's inside your brain that helps it operate. Without that you've got nothing I reckon. We've got a set of skills entrenched in us and things that we learn and knowledge that we gather over a period of time, over a lifetime really. That's what is worth the money I reckon (Attribution MM).*

Farmers also tend to expand their access to external components by developing contacts and trusting relationships. Many also develop strategies to deal with random components such as droughts and market fluctuations (building dams and non-agricultural investments).

### **5.3 A hierarchy of decision-systems: Three land-use decision-systems**

Taking action to satisfy these family motivations requires making decisions. In terms of land-use, we found that farmers' decisions could be grouped into three decision-systems and that they were linked hierarchically as shown in Figure 3.

Figure 3 The hierarchy of decision-systems used by farming families and the basis for justification of the decisions



The really important decisions about land-use, such as ‘where to farm’ or ‘whether to farm at all’ are taken in the family decision-system. The family decision-system is the ‘central clearing house’ of all major decisions. Decisions in the family decision-system are justified in terms of care or rights-based ethics (what is best for the family or an individual member, or best for their community) (Patterson 2001, Sumner 1996, Sylvan and Bennett 1994, Wenz 2001).

The farm, as a physical entity, may have a range of values for the family other than just as a business asset. Because of this, farmers tended to make some land-use decisions directly in the family decision-system. These tended to be long-term or strategic decisions that could not be justified on economic criteria and decisions based on family preferences such as keeping bushland for aesthetics and recreational reasons.

In terms of the concentric spheres environmental decision-making model of Martinez de Anguita et al., the problems being tackled in the family decision-systems are the family’s political, ethical, philosophical issues and are solved using acceptability, coherence and realism criteria.

However, farms are principally business assets and so having decided that farming will be one of the ‘means’ the farming family will use to satisfy their family’ motivations (their ‘ultimate ends’), the decision-makers in the family have to get down to work and run the farming business.

Two distinct decision-systems are relevant; the farm business trading decision-system and the land ownership decision-system. These decision-systems are separated by ‘division of labour’, that is, the work done to buy or lease land is different from the work done to grow a crop. Decisions in both these decision-systems are justified on economics or business ethics grounds (Velasquez 1998, Boatright 1999).

In terms of the concentric spheres environmental decision-making model of Martinez de Anguita et al., the problems being tackled in the farm business trading decision-system and the land ownership decision-system are the economic and technical problems which are solved using efficacy and efficiency criteria.

Primdahl (1999) noted the difference between decisions, referring to the long-term decision as being made by an ‘owner’ as opposed to economic farming decision being made by a ‘farmer’ – even when the roles were being undertaken by the same person. The decision-systems theory suggests that the ‘owner’ kind of decisions fit into the family decision-system and ‘farmer’ decisions fit into the other two decision-systems.

However, land ownership often has an emotional side<sup>3</sup>. For example one interviewee said about selling some land he owned:

*Yeah, it's hard. That's why I tossed and turned for two months whether to sell that farm over there. I said, oh it's my left arm (Attribution MA).*

Thus most decisions about land-use are taken in one of these three decision-systems. Decisions taken in the family decision-system are justified on care ethics and can include decisions to use land (and other resources) to support a family motivation such as a personal interest, moral obligation or aesthetic enjoyment. These decisions

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<sup>3</sup> It's likely that decision hierarchy is reversed when the decision to sell land is ‘forced’ because of business reasons so that it clashes with an earlier decision in the ‘family decision-system’ to hold onto the land for ‘personal reasons’ (such as ‘its been in the family since 1920’). This reversal of the decision hierarch seems to create considerable dissonance.

tend to be long-term or strategic. Decisions in the other two decision-systems are principally justified in economic terms such as growing a crop for profit or buying land to capture capital gains. These decisions tend to be shorter-term as they concern finding the best ‘means’ to get results for decisions made in the family decision-system. Interviewees were acutely aware that business decisions were the ‘means’ needed to satisfy their family’s motivations; for example one interviewee noted:

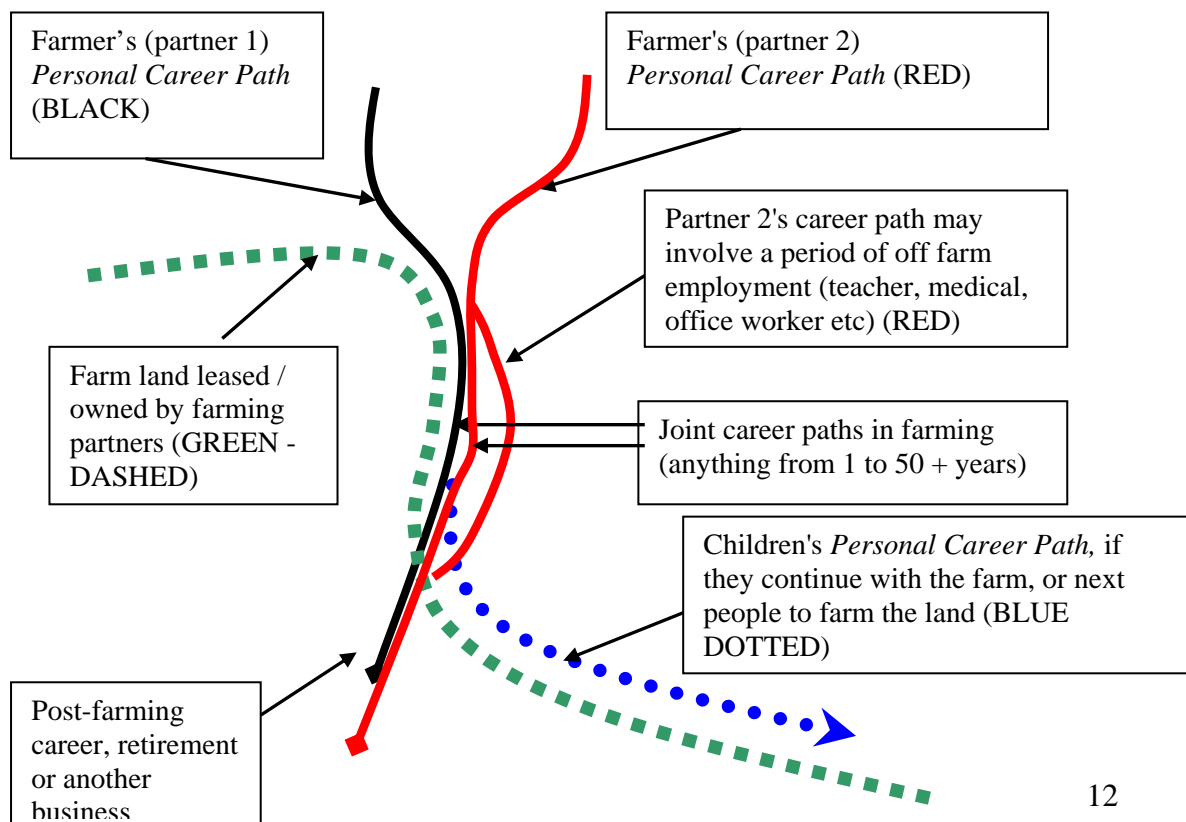
*I’ve got to make enough [money] to stay in business, but I want to do something for the long term (Attribution FM).*

Decision-makers can switch from considering an issue in one decision-system to considering the issue in another decision-system in an instant and this may lead observers to conclude that farm decision-makers have confused objectives. Decision-systems indicate the farmers’ logic in decisions.

### 5.4 The concept of personal career paths

The concept of personal career paths provides a framework for discussing how life-cycle situation affects strategic decisions and also to take account of the difference between individual and family motivations. The concept is shown in figure 4 and represents two decision-makers one of whom is shown to have an ‘off farm’ career for a time.

Figure 4 The relationship between *Personal Career Paths* and the management of the farm.



*Personal Career Path* represented the unique way in which people choose to satisfy their motivations through farming. It provides a framework for showing that there can be conflict between what people would like to do as individuals and what they ought to do to as a family member (or as business partners in farming). Success, in emic terms, that is from a personal perspective (Harris 1999), on a *Personal Career Path*, is determined by whether or not the individual thinks that his/her motivations are being satisfied by farming activities at different stages of their lives. One interviewee in talking about a farming career noted:

*Yes, I do find it [farming] exciting.... You've got to have an appreciation of animals and the soil and the climate and your general environment in waterways and the geological formation of the country. All of those sorts of things form an ideology in your mind about what it is you want to be involved in. It's from that sort of formation and understanding of those ideas is the reason that I pursue a career in farming (Attribution MA).*

Other career paths, such as teaching, politics or running business ventures outside the farm, and often outside the region, can be important to many farmers. They might run them sequentially or concomitantly with their farming careers. We did not note any gender bias in strategic decision-making and both men and women told of their personal career decision in both farming and in non-farm areas. One interviewee noted:

*I've done, over the years, a reasonable amount of physical work on the farm and... for the last 20 years I have taught at the local school, and I have been a councillor on the local shire (Attribution FM).*

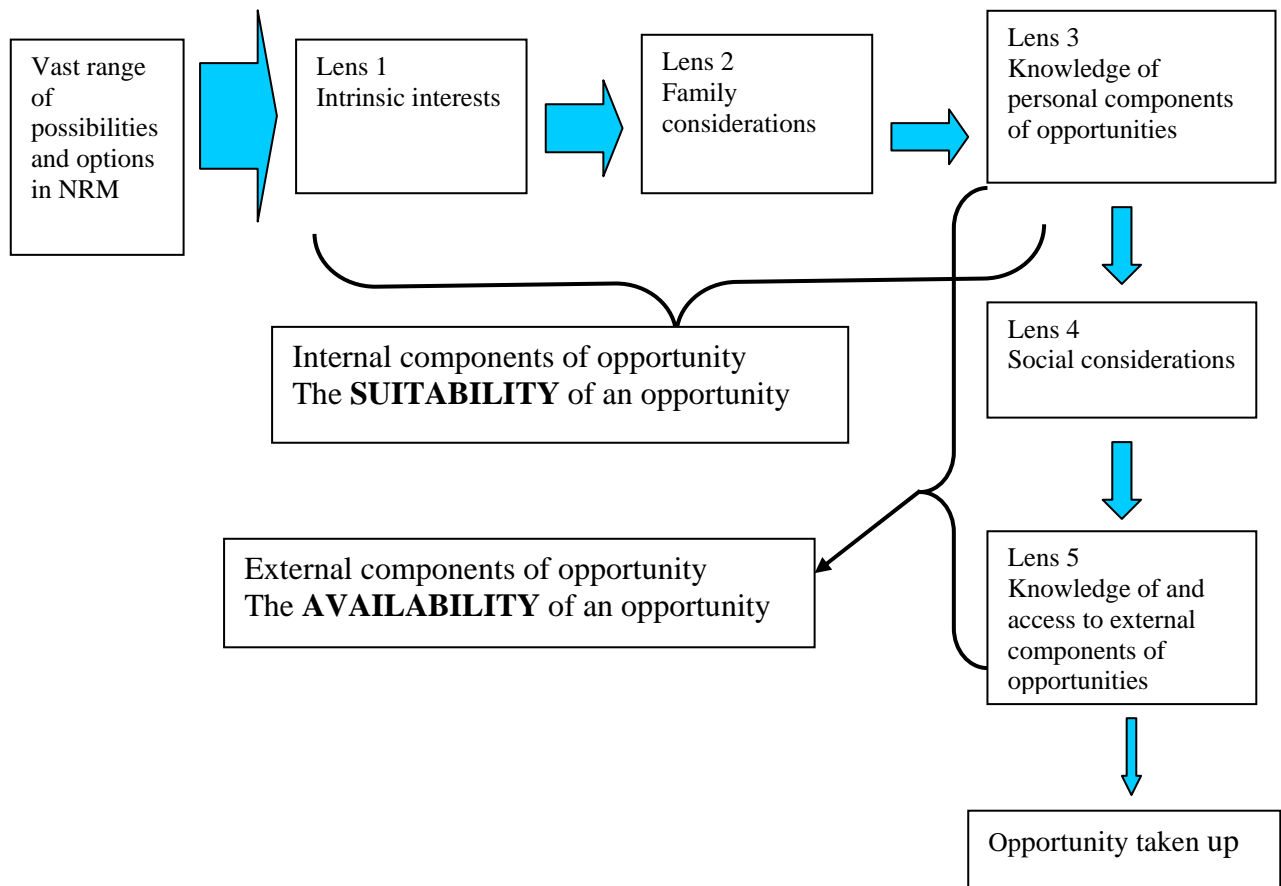
## **5.5 The concept of lenses**

The analysis of the interviews suggested that decision-makers were quite aware of the direction they wanted their personal career path to go and were actively creating the opportunities that would advance their career path.

The concept of 'Lenses' describes the vetting process they use to identify options that they think will satisfy their own and their family's motivation in the long-term and also help resolve the tensions between family members and to some extent, the tensions between them and the society in which the family lives. The Lenses are illustrated in Figure 5.

Burton (2004 p.196) observations about farmers wanting to maintain a ‘good farmer’ identity fit with the concept of lenses. The idea the farmers have a self identify so that “farmers are not foresters” and therefore tend to avoid forestry options even when profitable can be explained in ‘Lens 1’. Lens 1 suggests that when decision-makers look at options their first inclination is to look into options that they find intrinsically interesting. Thus a decision-makers intrinsically interested in particular kinds of farming may never consider ‘forestry’. Burton’s observation about ‘roadside farming’<sup>4</sup> suggest that farmers may be catering for (and influenced by) a special part of society – neighbouring farmers (Lens 4).

Figure 5 The five Lenses used in seeking and identifying an opportunity that is relevant to the farmer



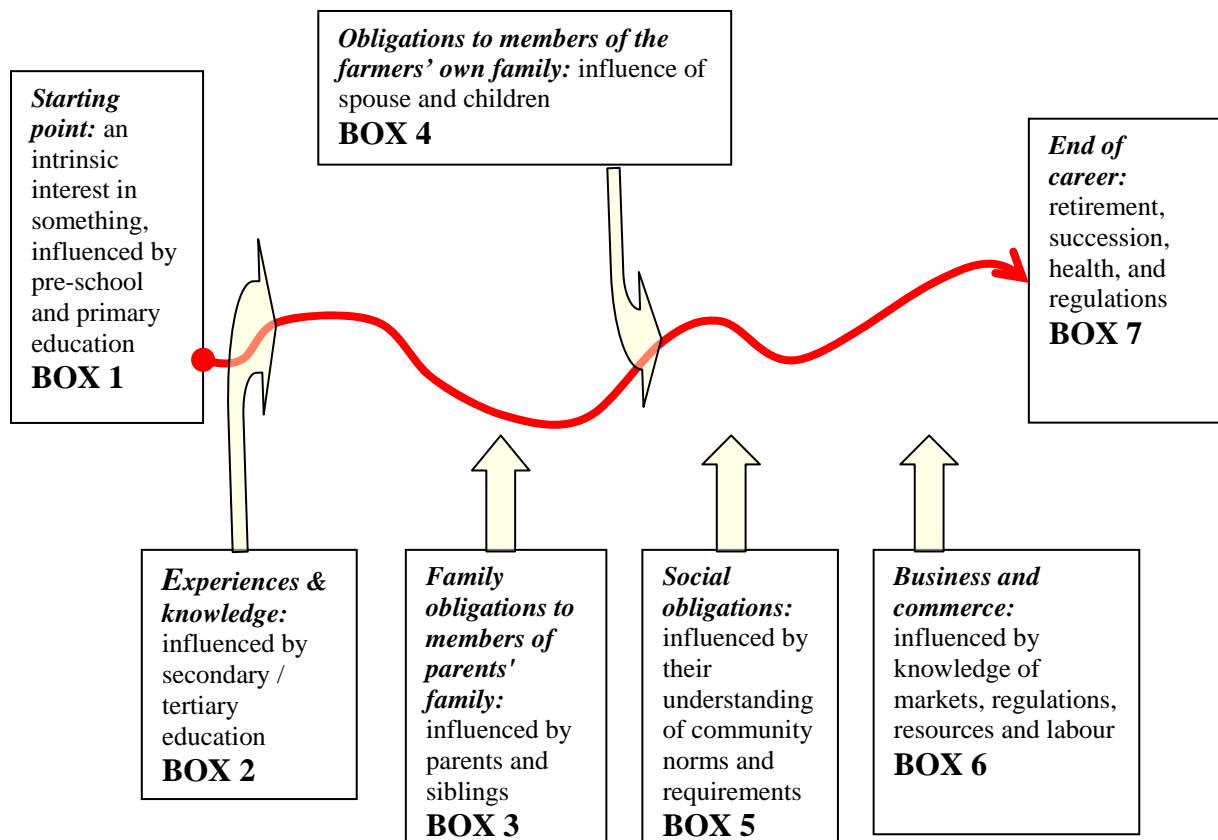
<sup>4</sup> Roadside farming is the practice of keeping land that can be seen from the road ‘neat and tidy’ so that other farmers observing the farm from the roadside will think the farmer is ‘good farmer’.

These five lenses indicate the points where decision-makers can be influenced. This influence can come from a wide range of sources including the private sector and government programs and policies. These lenses apply to all kinds of opportunities farmers create, including farm business, biodiversity conservation and educational opportunities.

## 5.6 A policy classification system called “boxes of influence”

The view the decision-makers have through each lens depends on where the decision-maker is on their personal career path. By amalgamating the concepts of lenses and personal career paths we developed the concept of 'Boxes of Influence'. These boxes can be used to classify government and industry policies according to how farm decision-makers view their influence over the long-term. This is illustrated in figure 6.

Figure 6 *Personal Career Path* with items that might influence it grouped into seven 'Boxes of Influence'



## 6 Using the decision-system theory for policy development

The seven boxes provide a classification system for policies and programs from the farmers' perspective. Figure 7 represents a simple template for this. Policy and programs that influence farmers' strategic decision come from a variety of sources including government, industry and non-government sources. Information on all these should be included in the template, not just the programs and policy the analyst has control over.

Figure 7 Template for classifying policies and programs according to how they influence farm decision-makers

	BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7
	Intrinsic interest + Early education	Later education	Obligations to parents' family	Obligations to own family	Social obligations (including NRM)	Business and commerce (regulations, markets etc)	End of career (retirement)
Policies & Programs							

Influences in the boxes, running left to right, tend to move from normative, such as education and experiences, through to mimetic, stemming from risk aversion, and on to coercive, such as, regulations, incentives and markets (DiMaggio and Powell 1991). Deci and Ryan (2000a, 2000b) suggested the existence of a continuum from intrinsic through extrinsic to a-motivation. The intrinsic to extrinsic part of this continuum seems to fit the boxes from left to right. Thus policies that fit into the boxes on the left-hand side tend to support intrinsic motivations for people. These policies can lead to interests and actions that are likely to be continued over a lifetime but are unlikely to be specific<sup>5</sup>.

Policies that fit into the boxes on the right-hand side create extrinsic goals for people and would lead to specific and immediate actions, but these actions may not be continued once the incentives from the program end. For example, saving a specific

<sup>5</sup> Unlikely to be specific overall but individual people will have specific but diverse interests.

native species would require a policy on the right hand side (specific and immediate action) but to improve farmers' receptiveness to all NRM issues would require a policy on the left hand side (general biological and ethical training during school years).

The important aspect of figure 7 is that it recognises the wide range of policies that impact NRM and raises the possibility that effective ongoing NRM policy program may require a suite of specific and targeted programs across all seven boxes and from all sectors of society.

To maintain native biodiversity on farmland it seems important to ensure that NRM policy supports farming families' intrinsic motivations because these motivations tap the energy, enthusiasm and creative capacities of farmers and also tap their appreciation of specific on-farm NRM situations that only they know. Unfortunately extrinsic motivations can quite easily become substitutes for intrinsic psychological motivations (Deci and Ryan 2000a). Providing a payment for an activity previously undertaken voluntarily creates an extrinsic motivation that can 'crowd out' intrinsic motivations (Reeson and Tisdell 2006).

Governments can choose to help farmers create biodiversity opportunities by providing, or helping farmers to obtain, the components for opportunities that would encourage the expression of their intrinsic motivations. Governments can also choose to provide the components to encourage farmers to undertake biodiversity conservation as a business (profit making) venture. The components needed to express farmers' intrinsic motivations are different from the components used in conservation schemes designed to be competitive with money making ventures in farm businesses. Because of the long lead time and duration of conservations programs on farms (a perpetual time frame) government programs have to be consistent over decades to be really effective.

## **7 Using the decision-system theory to help farmers develop skills in strategic decision-making**

The decision-system theory could be developed into a training program to help people – farmers especially – develop strategic decision skills. The theory has three particular values as a training tool.

- First, it encouraged decision-makers to clarify their personal and family's aspirations / motivations and provides a framework to help them work out how to satisfy these motivations / aspirations.
- Second, it provides a framework for identifying and discussing differing motivations between decision-makers managing a single farming enterprise. This could be helpful for family management teams, especially where the individuals are at different point in their careers, and for professional business partners.
- Third, it encourages decision-makers to identify the personal components they bring to the creation of opportunities. Comparing their personal components to the components actually needed to make the opportunity successful could stimulate targeted educational programs and the development of specific material assets.

## **8 Conclusions**

The decision-systems theory has value for both policy developers and farming families.

The decision-systems theory provides the general explanation of farmers' strategic decision-making which can help the analyst appreciate what information they need to obtain from farming families to develop practical and effective policy for strategic voluntary changes in agriculture.

The decision-system theory is applicable to any strategic decision where both ethics and economics are involved, such as NRM, farmer health or industry restructuring. Thus one would not use 'decision-system theory' to work out how to influence decisions that are based purely on financial or on technical considerations.

The decision-systems theory provides a framework for helping farming families improve the quality of their strategic decisions. It shows the importance of clarifying personal and family motivations (aspirations), provides a framework for discussion different motivations between decision-makers and identifies the gaps in what farmers can supply and what is needed in creating opportunities.

## **9 Further Work**

The decision-system theory was developed directly from farmer interviews so the first area of work (which is ongoing) is comparing the decision-system theory to the relevant literature. This comparison is ongoing and is helping to identify questions to guide further research. So far these questions suggest we ought to undertake more interviews with farming families in other industries (other than dryland cropping and grazing) and other locations to help us consolidate the theory. The questions also suggest we should consider expanding the topic from strategic decision about NRM and native biodiversity to tackle other strategic decisions such as health and structural adjustment.

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