

## Chapter 9

# Constructs guiding the production and marketing decisions of wool producers

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'I don't like to make dramatic changes - if I were totally dollar driven I would have sold and rebought - would probably have been up the creek by now.'

'If you have country and stick to something, come out OK over a period of 20 years - people who follow trends always miss the market.'

'Can't calculate profit margins all the time.'

'Look at worst scenario - look at how to handle them.'

'Looking at history in the New England, those who are successful have always been at finer end of wool clip; don't know anyone who made a lot of money out of medium wool.'

(Quotations from interviews)

### 9.1 Introduction

An outline was provided in the previous chapter of the major changes in the study area between 1989-92 in both the number of properties with particular livestock enterprises and the total numbers of livestock in the enterprises for the study area. Graziers' decisions to change or not change their enterprises over the period were interpreted by means of several hierarchical decision models. The results of the application and testing of these models are discussed in this chapter. Wool producers' decision-making processes and the constructs that had an important influence on their decisions to make changes in their enterprises are discussed. Each model is presented and discussed in detail in Appendix 3.

Two conceptually different types of decisions, which have been categorised as major strategic decisions and major annual decisions, were modelled in the study. They are discussed separately because they tended to involve different sets of factors. Decisions to change livestock numbers were not modelled. The reasons elicited for

the changes in numbers are, however, discussed in combination with the major strategic decisions, because in a sense they are part of the same story.

## 9.2 Types of decisions modelled

Farmers make many types of decisions, some of which are made only rarely, and some of which occur regularly. While almost all the decisions modelled in this study can be considered as major decisions, or big decisions in Malcolm's (1992) terminology, they were all decisions made within the context of maintaining farm viability. Using the functional taxonomy of decisions outlined by Koziol (1989), the decisions were protective, or homeostatic in nature, rather than transgressive. In this respect the decisions were contained within the boundaries of the higher level strategic decision to remain a grazier.

Some decisions occurred regularly, consequently, the aspects used in these decisions were 'tried and tested' because there had been numerous opportunities for producers to experiment. A few decisions may have become so 'tried and tested' that they may have been made almost unconsciously. Little exploration and processing occurred of the constructs involved in these decisions. Decisions about the sale time of wool and whether to sell by private sale or by auction were the two decisions in this category modelled in this study. Since only major decisions were examined, this category is called major annual decisions.

Conversely, most decisions about changes in the enterprise mix occurred rarely, and then often in different contexts from previous decisions of the same type. In this situation producers would have had less opportunity to try out different approaches, therefore it was considered many aspects involved in the decisions would have been decided as each decision arose. To this extent much greater elaboration of their construct systems was involved. It might be expected that some aspects in these decisions were included because of decisions made at a higher level in the decision hierarchy (e.g., a decision to be a fine-wool merino producer). Other aspects might have been derived from long experience with the wool industry and its boom and

bust, drought and flood environment. Again, since only major decisions were considered in this group, such decisions are called major strategic decisions.

Another approach to outlining the differences between the two types of decisions described above is provided by Svenson (1990, p. 20) who distinguishes four different levels of decisions by the

extent . . . [to which] the depth of the search and processing of values differ as a result of . . . earlier experience which the decision maker may have with a particular situation and its perceived importance.

At level one in this system, the decision is recognised as similar to earlier decisions and 'no explicit mapping of the value system onto the decision problem is performed'; while at the highest level 4, new and unfamiliar decision problems are confronted and 'elaborate mapping of values and a creative process involving the structuring and restructuring of the problem' is required (Svenson 1990, p. 20). Using this classification system the major annual decisions tended to be level 1 or level 2 decisions, while the major strategic decisions tended to be level 2 or level 3 decisions.

Not all decisions fell neatly into these categories. For example, a decision to mate cfa or cull merino ewes to prime lamb rams to produce 1x lambs reflected a decision to make a major change in emphasis on some properties, but was a minor speculative decision on other properties where it was made regularly.

### **9.3 Major strategic decisions**

Most of the decisions to start or stop a livestock enterprise, or to change the micron type of a merino flock (either ewes or wethers), were treated as major strategic decisions. Serious consideration of a major strategic decision occurred infrequently. Change because of a major strategic decision often had a major impact on the management of the property and was generally expensive to undertake, both in direct and opportunity cost terms. Many had the potential to have a disastrous impact on the financial viability of the property if a poor decision was made and circumstances

turned against the producer. In addition, the long lead times involved with some changes complicated the decisions because they increased uncertainty about prices.

Apart from the trigger aspects, the factors involved in the major strategic decisions are combined and discussed under four main headings: physical context (e.g., land, labour, management skills, other enterprises, seasonal); price changes and relative profitability of the possible enterprises; strategic orientations (e.g., not to chase the market, or to buy in sheep); and risk (sometimes allowed for in strategy and sometimes considered separately).

An example of a major strategic decision, the decision to change the micron of the merino breeding flock, is given in Figure 9.1a and Figure 9.1b. It contains a couple of sub-decisions and all the factors listed above. These models, like most of the models tested, yielded some inaccurate predictions or errors. Accuracy of models and major reasons for errors are discussed in 9.5. A detailed discussion of this decision can be found in Appendix 3.

### ***9.3.1 Trigger aspects***

When development of the models was discussed in 7.6.2, it was mentioned producers appeared to ignore or filter information about the short-term relative profitability of their major enterprises. Such filtering is consistent with the need for humans to selectively omit information because of the complexity of their environment (Resnikoff 1989) and with the hypothesis of bounded rationality. In the terminology of Personal Construct Theory, for long periods producers were construing the changes in prices and climate as random events that were beyond their power to predict; thus, their best option was to ignore them. This 'view of the world' seemed the dominant view among producers, and information about other enterprise options tended to be ignored - that is, they were eliminated pre-attentively by this construct or aspect. Before they would reconstrue this view, a change had to occur which was not eliminated; which forced them to change their construction of events. These changes have been called trigger reasons.

Figure 9.1a  
Change micron of merino breeding flock

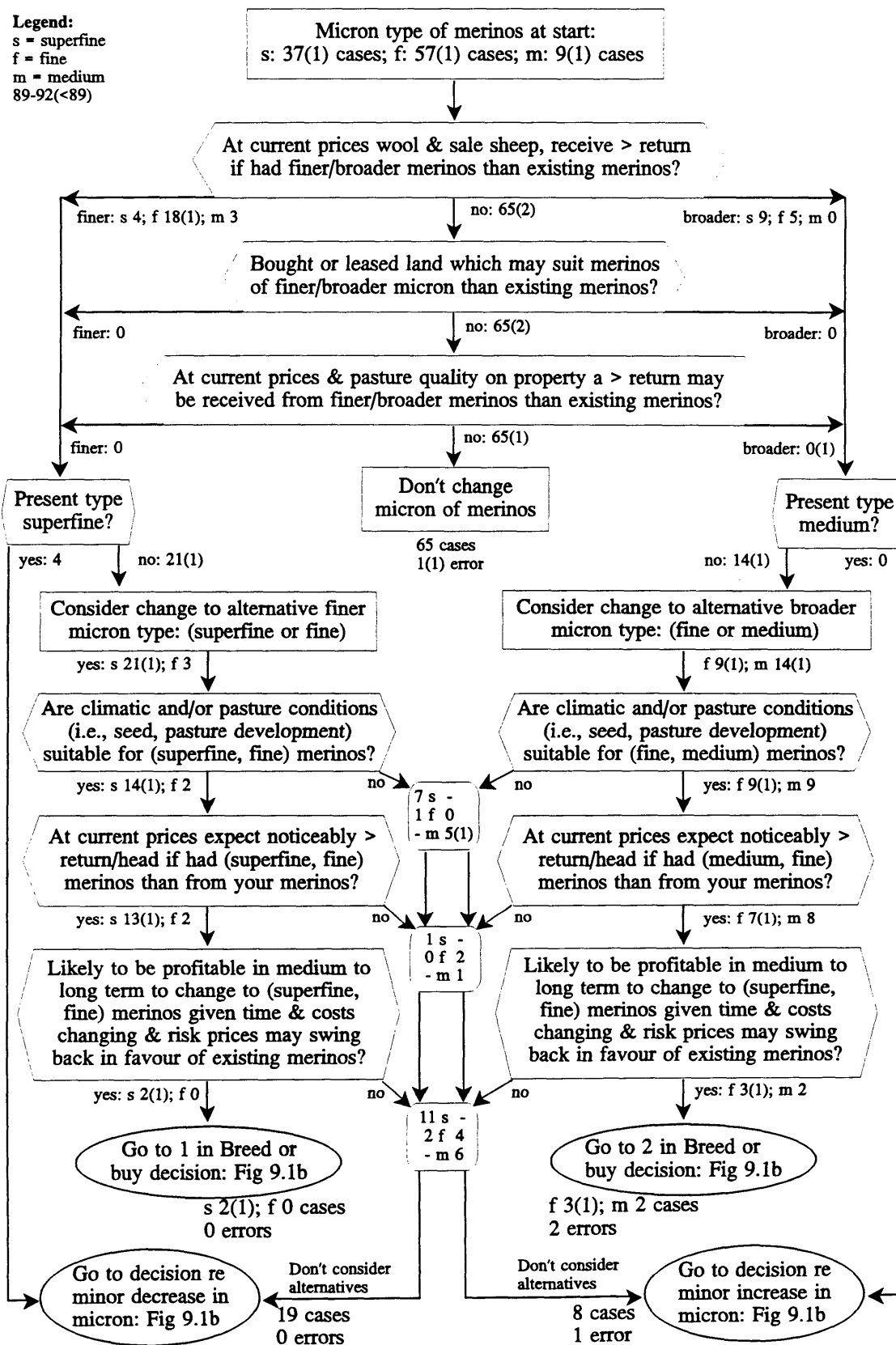
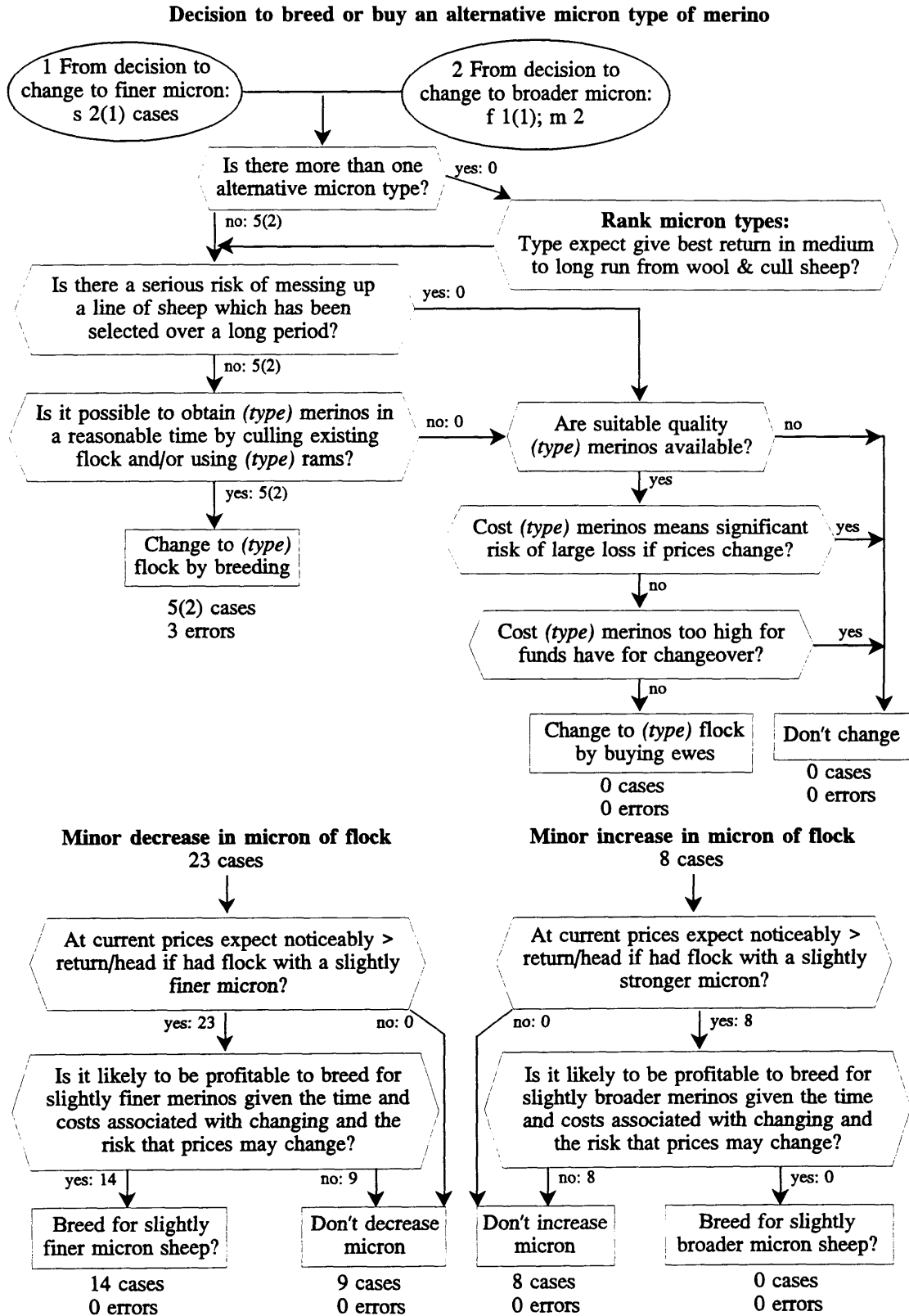


Figure 9.1b  
 Change micron of merino breeding flock (continued)



A trigger reason is a change that led to the realisation of the need for a decision, because the present, or projected future, was construed as unsatisfactory. It prompted a decision process in which it was decided whether it was time to make a change in the enterprise mix of the farm to suit what was construed as likely to occur in the future. Doing nothing was the reference point in the decisions, as well as a major alternative. These types of decisions have been classified as Type B decisions by Svenson (1990), in contrast to type A decisions where it is not possible to remain at the status quo and a decision is required between new alternatives.

Often, a particular trigger reason had a bearing on the possible changes that could be made, by defining particular options and eliciting particular constructions about the future (e.g., increased relative prices for finer wool, or dramatic increases in wool prices). Higher relative prices for fine wool suggested a need to breed or buy finer merinos; higher wool prices suggested the need to buy merinos, or increase merinos, depending on the context. Other alternatives apart from the existing enterprises tended to be ignored, because nothing had occurred to prompt their consideration. In a sense, these decisions had much in common with adoption decisions. Once aware of a price differential, for example, the decision was whether to change or not, followed by how, and by how much. For these reasons the models often contained very few alternatives in the initial elimination by aspects stage when compared to the models developed by Gladwin (1977) and Zabawa (1984).

It is apparent from the response to the trigger reasons in this study that, in some circumstances, producers were insensitive to fluctuations in prices. For instance, in 1989-90, for the decision to begin merino breeding, only four out of the fifteen producers who were not merino breeding said that, at the prices for wool and cull sheep at the time, the return from merino breeding was noticeably better than from their existing sheep enterprises. At this time wool prices were still very high and on most properties in the New England merino breeding would have been more profitable than other sheep enterprises. One explanation is that it was common for producers to express the view that they did not know if one enterprise was more profitable than another. This appeared to result from two main factors: they had not bothered working it out ('it's no good continually optimising . . . can't calculate

profit margins all the time'); and many producers were not sure of the production details required to calculate the profitability for enterprises with which they had little experience.

Conversely, for the decision to stop merino breeding, in 1991-92 only eight out of 36 said they had considered (no matter how briefly) that, at prices prevailing at the time, other enterprises would produce a better return than merino breeding. This was at a time when wool prices had collapsed after the scrapping of the Reserve Price Scheme.

In other words, the overwhelming majority of merino breeders were completely unresponsive, in terms of questioning their continued involvement in merino breeding, to one of the most dramatic collapses in wool prices in history. They did not even think about it! Although they were aware of the drop in wool prices, it had not triggered a reconsideration of their involvement in merino breeding. Most of them were in it for the long haul, and while they may (and only may) consider changes to their enterprises at the margin, it would take a fairly dramatic long-term decline in fine-wool prices to make many of them seriously consider changing to something else.

It could be argued that despite the change in product prices their existing enterprises or activities maintained their comparative advantage or that return on capital remained unchanged due to changes in prices of other inputs or products. This is possible, however, sometimes even when economic analyses implied a change would be profitable some woolproducers were still unwilling to change enterprises.

For those who were breeding merinos in the late 1980s, the biggest incentive to change came from the dramatically higher prices being paid for finer wool (see Figure 2.2). Producers were aware of this development. See Figure 9.1 for an illustration of this decision. For 1989-90, approximately 70 per cent of fine-wool producers interviewed, and all of the medium-wool producers, said they would receive a better return if they had finer merinos. At this time the differential in prices had endured for a considerable period, it had received considerable media



attention and, anyhow, many producers attended the wool sales in Newcastle and were aware of the prices being paid. Even so, some did not consider finer wools would bring a better price on their property. It is not clear exactly why this was the case, although some mentioned they did not know enough about the wool weights of finer flocks to make an accurate assessment.

In addition, it appears producers might have been aware of changes in prices, but these may not have triggered a consideration of the relative profitability of enterprises. Support for this notion is provided by the responses to the model of the decision to stop running their own wethers. Most producers who were breeding and running their own wethers saw little difference in their profitability. Typical responses were:

‘I’m in wool production and wethers cut you the most wool.’

‘I haven’t thought about breeding being more profitable than wethers.’

Yet many comparisons of merino breeding and wethers favoured breeding (e.g., Agricultural Business Research Institute, various issues 1977-88). In the 1980s factors such as the live-sheep trade brought higher prices for cull and cfa stock. Whereas before this period almost all the income in a traditional wool enterprise came from wool, during this time a significant proportion came from the sale of stock. This shifted the relative profitability towards breeding over straight wool production suggesting a profit maximising (or utility maximising) producer should increase the proportion of ewes to wethers.

It appears many producers had not responded mentally, let alone managerially, to a change in the relative prices for the products produced by the two enterprises. The first comment above is in the nature of a rule of thumb derived from experience. Together they suggest these graziers had taken a long-term strategic decision to be wool producers. Experience from the past had been that in the New England a self-replacing merino flock with a significant proportion of wethers was the best way to achieve this. The main purpose of the merino breeding operation was to provide a reliable source of wethers. Information that might lead to a change in this decision was being filtered out, or ignored, so the question of change did not arise.

Similar responses to changes in prices and other factors were found for the other models. In general, a situation had to arise which triggered consideration of change. What is more important, it appears it was not enough for a producer to be aware of a change in a factor such as price, this still had to trigger an awareness that the change in price might have ramifications for the relative profitability of enterprises. In other words, it still had to influence the producer's 'view of the world'. The implications of this finding for models of supply are discussed in the next chapter.

Factors other than price also triggered decisions to change enterprises and these are discussed in detail for each model in Appendix 3. For some decisions, these factors were more important as trigger reasons for a change than fluctuations in price (e.g., purchase of land was an important reason for decisions to begin running bought merino wethers).

### ***9.3.2 Physical and contextual constraints***

A major problem in building the decision models was to accord sufficient flexibility to allow for the context in which the decisions were made. For example, a decision to mate merino ewes to Border Leicester rams to produce 1x replacements was influenced by: whether there was a 2x lamb operation, whether replacement ewes were needed, whether it had been decided to replace these ewes, and whether sufficient merino ewes were present to mate to the rams. Some flexibility was achieved by separating out the decisions, and through the trigger reasons that were sometimes context dependant themselves. For example, triggers relating to prime lamb enterprises or bought wether enterprises were only relevant to producers with those enterprises. Each trigger reason was connected to a model that was appropriate to its context, although sometimes the same model was used for more than one trigger.

#### **Land**

The type of land, its location, climate and pasture quality were of primary importance in most decisions. The location, climate and soil types of the New England were well recognised by producers as suited to sheep and cattle grazing and unsuitable for cropping. Similarly, many considered finer-wool merinos had an advantage over

broader types that normally make up the bulk of the Australian clip. Within the study area, specific areas were recognised as more suited to prime lambs, or superfine merinos, or cattle, or medium merinos.

The results obtained from the models probably do not show the entire effect of type of land on decisions. During testing of the models producers were asked if a particular situation had arisen. For example, for the decision to change the micron of the breeding flock (Figure 9.1), if an alternative (such as superfine sheep) was considered unsuitable for their type of country, they may have answered no to the first trigger asking for differences in monetary return of different micron types of merinos. The alternative may already have been eliminated unconsciously by the land criterion.

Sometimes, with cattle for example, land and climate were constraints. In a few cases producers recognised that cattle were bringing a better return than their sheep enterprises, but they did not consider them seriously as a replacement. While a few cattle could be run without too much difficulty, they could not have been expanded to replace sheep because of the problems this would have created in dry seasons. They could not be run at a sufficiently high stocking rate, year in year out, to provide the same return as sheep. This is consistent with the lack of significance of price variables in deciding cattle numbers in the Southern Tablelands found by Munro and Fisher (1982), and the importance, in that study, of the variables for current cattle numbers and proportion of improved pasture. They did not include seasonal effects, but they seem an important determinant of cattle numbers in the New England.

On many properties wethers were run on land considered too rough or undeveloped for breeding or fattening. If the property had a merino breeding operation, they were generally bred wethers, while bought wethers were often run with a 2x lamb enterprise. Wethers were also used in a few situations for pasture development, because they could be stocked at high rates to control grass seed and other weed infestations in pastures.

In decisions about the type of merino to run, whether for merino breeding or as woolcutters, climatic and pasture conditions on the property were important aspects in deciding which micron type of merino was bought. Producers with high seed content in their pasture tended to eliminate superfine, and sometimes fine-wool merinos, while medium-wool merinos were eliminated in areas with high rainfall. Some producers considered their soils and pastures to be too well developed to successfully run superfine merinos.

### **Labour**

While shortage of labour strongly influenced a couple of decisions, either to quit merino breeding, or to cut back on merino breeding or prime lamb operations, it was generally not an important factor in most decisions to change between enterprises. Some producers ran wethers and ewes, rather than all ewes, because they had insufficient labour to handle the number of ewes the property could carry.

### **Management**

Management experience with sheep was normally not a factor limiting changes between prime lambs and merino breeding. The two types of experience were generally considered transferable, although less so from merinos to prime lambs. On the other hand, some producers considered superfine merino breeding demanded special skills that limited their ability to begin such an enterprise. Lack of experience with sheep did prove to be a barrier to two producers who wanted to switch from cattle to sheep. They bought merino wethers initially to gain some experience with wool and sheep before they began breeding.

### **Capital**

The capital cost of changeover from one enterprise to another was an important criterion. For instance, cattle were more expensive to buy than sheep on a per hectare or stocking rate basis, while producers contemplating buying fine and especially superfine merinos in the late 1980s were faced with a substantial outlay. This tended to slow the process of change by proscribing the change, or encouraging the producer to breed as many as possible. Borrowing money to buy expensive stock

involves an element of risk that was also an important consideration. It will be discussed later when risk factors are considered.

### **Availability of sheep**

Another criterion that influenced some decisions about what micron type of sheep to buy was availability of lines of suitable quality sheep. This aspect was mainly relevant to producers who wished to purchase superfine merinos. Lines of quality superfine merinos were often unavailable because few properties had surplus sheep to be sold. Superfine merino flocks have low weaning percentages which meant breeders had difficulty meeting their own replacement requirements. This generally left only small lines of sheep for sale and these were often of dubious quality. For producers who wished to buy superfine wethers, it was likely to be a continuing problem unless a stable arrangement could be reached to buy sheep from the same property each year.

For decisions where producers were considering buying woolcutters (e.g., when land was purchased), an important criterion was whether the sheep might be obtained by keeping culls or seconds from the breeding flock. Many producers preferred to keep their own sheep rather than outlay money to buy sheep. An additional consideration was that bought sheep might introduce disease. Breeding up sometimes meant the property was understocked for a few years. If it was decided to purchase woolcutters, the other aspect considered was the compatibility of the wool of the bought flock with the wool of the existing flock. For small flocks different types of wool meant small bale lines which dramatically increased selling costs. This could be avoided by buying a similar type of sheep.

### **Factors influencing livestock numbers**

While physical and contextual aspects were important in decisions to change enterprises, they were particularly important for decisions about numbers of livestock. These were very much dependent upon the existing enterprise mix and other resource restrictions. For instance, decisions about the numbers of merino ewes to be mated were not only influenced by major decisions about whether to expand or contract merinos because of price or other changes, but also by factors such as the amount of

suitable breeding country, previous lambing percentages, current and expected seasonal conditions, sale price of cfa and cull old and young stock, current age of flock, price differentials between hogget wool and mature wool, and so on. Other strategic decisions also had an influence (e.g., proportion of wethers kept to decrease the risk of drought, or for disease control, or for labour reasons, or for pasture control).

Unlike utility models, the personal-construct hierarchical decision model could incorporate physical and contextual constraints and show the impact of these aspects on wool producers' decisions. Although the impacts of some physical and contextual aspects are apt to cancel in aggregate, others are likely to provide the underlying reasons behind lags in response to prices. For example, lack of management experience may impede the movement of cattle producers into sheep production, and the movement of fine and medium sheep breeders into superfine merino breeding.

### ***9.3.3 Price factors***

Not surprisingly, prices for the various products had a major influence in most of the decisions to change enterprises. Their impact in triggering decisions to change has already been discussed. Within the models themselves, expectations of prices for the products were used to eliminate alternatives pre-attentively, to decide between alternatives in Stage 2, and as part of the criteria with which the risks of making strategic changes were assessed.

An example of this range of aspects can be found in the model of the decision to change the micron of the merino breeding flock (Figure 9.1). The price of wool and sale sheep acted as a trigger to encourage change. At this stage current prices were the main ingredient. If fine wool prices were higher, broader wools were eliminated automatically. Current prices were then used to assess the likely returns from a major change to a finer micron type of merino. If this criterion was passed then a longer-term view of prices was undertaken using a criterion that assessed the benefits to be gained from changing a strategy of 'not chasing prices'.

Other points to be noted with these criteria are that the price of more than one product is considered and that it is the return (as construed by the woolproducers) that is compared rather than the price. While the price of wool has a major influence on prices for stock and other products in the industry, the advent of the live-sheep trade introduced another variable that influenced the livestock market. Its influence was felt in both the breeding and the bought wether industries. As has already been mentioned, because of its sale prices for cfa and boat sheep were higher, and therefore sheep sales were a significant proportion of overall returns in wool enterprises throughout the 1980s. This was in contrast to most of the previous history of the wool industry. It should be mentioned that the direct impact of the live-sheep trade on sheep prices was probably not as great for superfine and fine merinos. They were smaller than was normally demanded by the market. However, because of substitution between broader and finer sheep types in other mutton markets, prices for both types were closely linked.

### **Return**

Return, or return per head, was used in the criteria because return was the term used most commonly by producers when comparing enterprises. It was not necessarily the same as gross margin, although a few producers compared enterprises on this basis. Neither does it imply producers always made detailed comparisons of the likely return from enterprises.

Typically what appeared to happen was that producers focused on wool prices, calculated a return per head for estimated wool weights, and adjusted it for other factors such as sale price of sheep. A comparison made on this basis had to have an obvious benefit before the criterion was passed. This occurred because of the inaccuracy and uncertainties involved in the comparison. Although the current price of wool might have been known relatively accurately, producers were unsure of the wool weights likely to be achieved by different micron types of sheep, and of sale prices for their cull and cfa sheep. In addition, the process of adjustment for these factors was necessarily inaccurate. Other factors that were difficult to allow for included changes in lambing percentages, and differences in wool prices between hoggets and adult sheep.

**Long-term price expectations**

Usually the models also included a criterion in which price of products was part of a long-term view of what was likely to happen in the alternative enterprises. Many producers had little confidence in their ability to predict price in the long term (or anyone else's ability for that matter). Wright (1986) also found many sheep and wheat producers were not confident in their ability to predict the wool and wheat markets. The observations of Munro and Fisher (1982) that wool producers were unwilling to form long-term price expectations and that they tended to rely on their own experience for long term decisions, are consistent with this finding. The results from testing the decision models suggest that to cope with their inability to predict wool prices, most producers adopted the strategy of not changing their enterprises in response to price fluctuations unless a long term trend was apparent. This criterion will be discussed in the section on strategic factors.

**Short- to medium-term price expectations**

One class of decision for which short- to medium-term price expectations were found to have a much more important effect was that to mate cull or cfa merino ewes to prime lamb rams to produce 1x lambs. These were generally not major strategic decisions since they tended to involve a small proportion of sheep in the merino flock. Producers who had suitable country for finishing 1x lambs were sometimes tempted to speculate on good lamb prices in the following year. For example, a couple of producers, who had not raised 1x lambs for several years, decided to try some because many producers had left the industry and they expected prices would rise in the next couple of years. Prices for 1x lambs remained poor until 1992, but some producers were still willing to continue the next year since more people were leaving the industry and they thought there was a good chance prices would increase the following year.

Such findings indicate at least some producers were incorporating supply and demand factors when formulating their short- to medium-term price expectations and were reaching conclusions inconsistent with naive expectations. They seemed a minority, however, with most people expecting prices for prime lambs to remain low. Many of these seemed to incorporate supply and demand factors also, with the main emphasis



on poor demand, but their conclusions were consistent with naive expectations. This may account for the conclusion of Munro and Fisher (1982) that a naive model provided the best explanation for the formation of producers' short- to medium-term price expectations.

Another area where short-term price effects might have been expected to have had a major influence was on changes in matings of merino ewes and numbers of bred and bought wethers. For reasons that will be discussed in the next section (on strategic factors) this was not so for changes that occurred between 1989 and 1992. Decisions to change enterprises because of the effects of long-term price trends and seasonal conditions were far more important in deciding livestock numbers.

Apart from the price of different micron categories of wool, prices of other products that had an influence on changes in enterprises were: prices of cull, cfa and mutton sheep, prices of prime lambs, and to a lesser extent cattle prices. For the major strategic decisions long-term price trends and historical performance of an enterprise seemed more important than current fluctuations in prices.

#### ***9.3.4 Strategic factors***

Perhaps the most important group of aspects for their influence on decisions have been classified under the heading of strategic factors. The influence of such factors first became apparent in situations where producers said their only reason for not changing to another enterprise was that they did not believe in 'chasing their tail', or that they 'didn't think it actually pays to change . . . if you stick with what you've got it all takes its turn'.

The consequence of this type of thinking is best illustrated by a case where the owners of one property considered selling their medium wool flock and replacing it with a fine wool flock. With the help of a consultant, budgets for the change were worked out based on various expected prices scenarios (this was before there was any hint of collapse of the Reserve Price Scheme). The change appeared (on paper) to be extremely profitable. Yet they did not change. Their reason was that they did not believe in making dramatic changes. They were not prepared to take the risk of

departing from this strategic orientation by making such a radical change in their operation; their inherent caution won the day. As it turned out, in retrospect of course, this proved the best decision, and did not threaten the continued viability of their operation. Risk in this sense is being used in its broadest connotation of uncertainty and ambiguity, of threat to survival of the farm business.

This attitude was typical of many producers who took a similar approach when considering a major change in direction. Long experience had shown many that they were incapable of determining, with any reliability, the direction in which the wool market was heading. Not surprising, therefore, that Munro and Fisher (1982) found they did not like to make long-term predictions about prices. About the only thing many producers felt any confidence in predicting was that, over time, the market would favour each of the grazing industries and each of the different micron types of merinos. Many also took the long-term view that fine wool had an advantage in the New England area, because it is one of the few places in the world where it could be produced as a quality product, free from contamination, which would therefore attract a premium price.

This does not imply that producers did not change enterprises or micron types of merinos. It was found that some producers who expressed a belief in not chasing market trends, still went ahead. Belief in such a policy was therefore not a decision criterion. A change in those circumstances involved a reconsideration of strategy.

A decision criterion (or criteria) was sought which distinguished between those who believed in not following trends yet changed, and those who did not change. It needed to be able to predict cases where strategy was overruled. Elaboration of producers' construct systems for such decisions, using laddering techniques derived from Personal Construct Theory, suggested two main factors were involved - expected return and risk. The first involved making an assessment of the likely costs and benefits of change in the medium to long term to see if this was positive. Since change took time and often required an outlay of money, it involved an element of risk. From experience producers were aware prices tended to go in cycles. Since they were unable to predict the cycles, and uncertainty about prices increased the

longer a change would take, they ran the risk of losing if the market collapsed and they were 'caught' with expensive sheep. If a major change was involved this could put the long-term viability of the business at risk.

Various types of criteria were experimented with, including separate criteria for the extra expected return and the risk aspects of the decision. In the end it was found a criterion that involved a tradeoff between the extra expected return and the perceived risk or concern about the consequences of failure was the most appropriate. While slightly different wordings were used for each of the major strategic models, they followed the pattern of the criterion used for the model in Figure 9.1. This was:

Is it likely to be profitable in the medium to long term to change to (superfine, fine) merinos given the time and costs of changing and the risk that prices may swing back in favour of your existing merinos?

This type of criterion was generally effective in distinguishing between those who were willing to change their strategy and those who did not. Those who did not change often expressed their reasons in terms of not believing in chasing trends, but most said the criterion above embodied their thinking on the matter.

The apparent lack of response to changes in prices, and the reluctance of producers to change although their budgets showed otherwise, may be empirical examples of the recent experimental evidence of the competence and omission biases. The competence hypothesis is that people avoid betting in areas where information is lacking and they feel ignorant (Heath and Tversky 1990), while the omission hypothesis is that they prefer not to act even when this may produce a change in the status quo (Ritov and Baron 1992). Most producers did not feel competent in predicting wool prices and a number commented on cases of fellow graziers who had followed the trends and got 'burnt'.

Some people, using the spectacles of utility theory, might like to construe these criteria as examples of maximising subjective expected utility. Given the discussion above, it is probable this would not be the most accurate interpretation of what was occurring, although a cursory glance might suggest it could be interpreted in that

way. If anything, they were more in the nature of safety-first criteria. A major change of enterprise, because it often required money to be borrowed, increased the probability of income falling below critical levels. Opportunities were forgone 'because a business cannot "chance" an adverse outcome of some possible event that may or may not happen' (Malcolm 1992, p. 3).

When judged by the proportion of cases split either way (see models of decisions to begin merino breeding (Appendix Figure A3.2), stop merino breeding (Appendix Figure A3.4), change micron of breeding flock (Appendix Figure A3.5), stop running own wethers (Appendix Figure A3.9), change micron of bought wethers (Appendix Figure A3.14)), criteria of this type were important to the decision processes of wool producers when they made major strategic decisions. This implies strategy was an important aspect of wool producers' decision processes in the New England. This is not to suggest they necessarily used formalised strategies, although some did (e.g., one producer, who worked out changes based on budgets and various expected price scenarios, said that even when they made a decision to change, they had a policy of not changing by more than 10 per cent per year).

### **Strategy and livestock numbers**

Another area in which the influence of strategy shows is in the numbers of merino ewes mated to merino rams from 1989-92. Wool prices peaked in May 1988 and although initially the decline was slow, by mating time in 1992, prices for 19 micron wools were around one-third the peak in 1988. Yet between 1990 and 1992, matings of merino ewes to merino rams decreased by only 4 per cent (Table 8.3). From 1991 to 1992, 44 per cent of flocks still increased matings to merino rams, while the number that decreased matings was 50 per cent. Reasons for the increases were dominated by decisions to start merino breeding and the buildup following these decisions (see Appendix Table A3.7). Reasons for decreases in matings were dominated by the drought of 1991-92, with very few indications they had decreased their ewe matings because of the decrease in wool prices.

In other words, despite a substantial decline in wool prices, almost half the flocks were still increasing the number of ewes being mated to merino rams in 1992, some

four years after the decline in prices began. Many of these increases were the result of long-term strategic decisions to begin merino breeding, generally made several years before when prices were still rising or were near their peak. Even for the remaining half who decreased their mating, the major factor contributing to the decline was the poor seasonal conditions. A similar pattern can be seen in the reasons given for changes in numbers of bred merino wethers (see Appendix Table A3.13).

Evidently, though prices and returns to merino breeding had collapsed, most of those who had made a decision to begin merino breeding (and those who were in the industry already), were not ready to make a sudden about-turn and reconsider their position. If a long-term trend becomes apparent, more producers will reconsider their position but, by the middle of 1992, it appears most producers were not yet ready to change their long-term view of the industry.

### **Diversification strategy**

Other sayings that can be viewed as having strategic connotations were the desire 'not to have all my eggs in one basket' or to 'have another string to my bow'. This idea was incorporated as a criterion in the model of decisions to mate ewes from merino breeding flocks to prime lamb rams to sell 1x lambs (Appendix Figure A3.10). Some producers were aware that they had received lower returns from mating their cfa/cull ewes to prime lamb rams than to merino rams, but continued to do so because 1x lambs acted as a diversification which spread the risk associated with fluctuations in the wool industry. This construct became less important in the 1980s as wool prices increased and when the Reserve Price Scheme was in operation. However, now that the Reserve Price Scheme has collapsed, it is likely more producers will run a few 1x lambs to 'spread the risk'. Another associated advantage for some producers was that sale of lambs provided a cash flow during a time of the year when little other income would have been coming in.

A similar justification was also used by a couple of producers who began buying merino woolcutters as a means of 'spreading the risk' associated with running 2x lambs as the only enterprise. No doubt the good prices for wool that were being

received at the time were a further incentive although, when wool prices fell, they were prepared to stick with them for the same reason.

### **Sale of young culls**

Another interesting decision, for which a strategic orientation or view of the world had a major influence, was whether young seconds sheep would be kept instead of older sheep to reduce the average micron of the wool clip. Particularly in the late 1980s, wool micron was a major determinant of price. In the fine/superfine end of the market, small decreases in micron generated large increases in price.

Before the late 1980s, young woolcutters did not provide the same return per head as older woolcutters because the slightly higher prices paid for their finer wool did not make up for lower fleece weights. In the late 1980s, some believed this situation was reversed because of the premium paid for fine wool. One option to take advantage of this was to have a younger age structure in the flock, with a higher proportion of breeding and young sheep. Some people did adopt this option, although they were often motivated by the higher prices being paid for cull sheep because of the boat market. Another option was to keep young sheep that would normally be sold as weaners or 2Ts and sell some of the oldest wethers instead. Generally the sheep kept were called seconds, rather than culls. Previously, producers with big flocks, good lambing percentages and well-bred sheep, often sold many of their young sheep as weaners or 2Ts and kept only the best for their replacements. In culling their flocks they distinguished between 'real' cull sheep, and other cull or seconds sheep, which they sold for other producers to use as their main lines of sheep.

In the model of this decision (Appendix Figure A3.6), one criterion asked if producers were willing to keep seconds sheep on their property under some circumstances. A considerable number said they were not. Over a long period cull sheep had been sold and there had been little reason not to. The specific set of circumstances that occurred in the late 1980s were unusual in the history of the wool industry and few producers appeared to have thought about what might be done to take advantage of it. In other words, their 'view of the world', or their 'rules of thumb', in which 'older wethers were the best woolcutters' and 'cull sheep were

sold', restricted their range of responses to the situation. It implies similar responses occur in other situations in which unusual sets of circumstances arise. Producers do not have a set of constructs adapted to the new set of circumstances, hence they continue to use their existing approaches until they are aware of a need to develop or adapt their constructs to the situation.

### **Wether strategies**

Strategic criteria were also used in the models of decisions to run wethers. These included keeping wethers as part of a strategy for worm control in the breeding flock, and as a safety valve for the breeding flock during drought years. Wethers are less susceptible to worms than ewes and young sheep and were used to 'clean' pastures for them. They were also 'run harder' during droughts and were generally among the first stock sold to lighten stocking rates. They formed a major proportion of the increases in stock numbers during the buildup phase following the drought in the early 1980s and when prices increased in the mid 1980s. Evidence of this for the Australian flock can be seen in Figure 2.8 (p. 24). Although not included in the models, another strategy used by some properties to decrease the risks from droughts was to have a lower stocking rate.

Strategic thinking can be explained in Kellian terms as a result of experimentation over time. As a consequence of the formulation and testing of various hypotheses about the operation of the wool industry, producers would eventually settle on particular explanations that enabled them to cope with uncertainty. Comments such as: '. . . don't follow trends - believe in sticking with what I've always done and I won't get into any bother' can be seen in those terms. They are views of the world that are stable and act to guide short-term decisions in the same way as formal strategies.

While the impact of 'strategic' criteria are readily apparent in the models, it is also possible these construct subsystems may have had an influence in more subtle ways. They may have acted as unconscious filters. If producers construed 'chasing trends' as having no positive influence on their long-term profitability, it may have induced them to ignore quite wide fluctuations in prices. This could be an explanation for the

many instances where producers said they had not been aware of trigger situations having arisen, even when quite large fluctuations in prices had occurred. Only when major fluctuations ensued did many say it had stimulated their conscious thought processes. Even then, as was indicated earlier, many did not change, because after more serious consideration it was rejected by a 'strategic' criterion.

Anyway, as Wright (1986) has shown a policy of continually optimising the mix of enterprises may produce little long-term increase in profitability compared with a policy of maintaining the status quo. The quality of expectations about prices is so poor as to make it unlikely that the planning of enterprise changes based on these expectations would have any beneficial impact. This is even more likely with grazing enterprises because of their complexity and long production periods.

### ***9.3.5 Risk aspects***

Producers interviewed in this study perceived many different forms of risk and reacted to them in differing ways. Some of these have been discussed in earlier parts of this chapter. Risks of introducing diseases associated with buying sheep were managed by some producers by not buying sheep other than rams. Risks associated with running breeding flocks during droughts were lessened by having a substantial proportion of wethers, or having a conservative stocking rate. Risks arising from fluctuations in prices were countered by diversification of enterprises, off-farm investment, by specialising in a quality product, and by maintaining a high equity. Risks connected with beginning a new enterprise with limited technical knowledge and experience were decreased by beginning with a related enterprise that would not be as susceptible to these shortcomings. And perhaps most important, risks associated with changing to new enterprises in response to fluctuations in prices in the short to medium term, were handled by adopting a strategy of resisting change.

The impact of risk was also apparent when producers considered buying expensive sheep, either when starting a new enterprise, or when buying speculative stock. In the first of these situations two types of risk were mentioned by producers. The first arose because of the chance that they would make a loss if prices fell. Experience with the tendency for prices to go in cycles made some producers cautious about



paying too much for stock. The second risk arose for producers who needed to borrow money to buy stock. Their attitude to borrowing money, and the attitude of their creditors, tended to place a cap on the money available to purchase stock. Although in theory more money could have been borrowed, this would have increased the risk of going broke to an unacceptable level, and thus placed a limit on purchase prices.

Although these criteria were not particularly important factors in terms of the number of times they split final decisions, they were probably relevant to bidding at particular auctions when bids were being made on lines of sheep. In the 'initial' series of interviews, two producers delayed the purchase of sheep for a year or more because they were outbid at auction (more than once). In both cases it was the risk associated with borrowing money that had placed a cap on the amount of money they were willing to pay for the sheep.

For speculative stock purchases, the main risk was that wool prices would fall and a loss would be made on the deal. This seemed an unimportant criterion for the speculative purchases discussed in the study (most of which occurred after wool prices fell), largely because producers considered the wool market had bottomed out. Recent experience suggests they were incorrect in this assumption.

It seems from the above discussion there were many forms of risk perceived by producers. They were handled in several different ways, some of which might be explained using utility theory. Usually, however, better descriptions, and perhaps predictions of behaviour, can be obtained by means of hierarchical decision models. Strategic behaviour obviously fulfilled an important function in setting the context in which risky decisions were made.

### ***9.3.6 Models of production decisions***

The personal-construct hierarchical decision models discussed in this section described and predicted the decision-making process used by wool producers when making major production decisions. They predicted the individual decisions of the spectrum of producers within a zone of similar climatic, topographical and soil

environments. Minor production decisions could not be modelled because of the complexity of the factors involved.

#### **9.4 Major annual decisions**

The two major annual decisions examined in this study were wool-marketing decisions: whether to sell wool by auction or private sale; and whether to delay sale by auction beyond the first sale for which the wool would be ready. These were important decisions in that they involved most of producers' incomes for the year and therefore had the potential to have a major influence on profitability and survival of the business.

Unlike the major strategic decisions discussed earlier, they had to be made at least once each year and therefore producers had plenty of opportunity to work out which aspects were important. In this context producers could be thought of as using a well-rehearsed script when making the decisions to the extent that little conscious thought was given to many aspects. Perhaps because of this, producers found it difficult to remember clearly decisions made more than a few years before, therefore, only decisions made between 1989 and 1992 were examined. Even so, some producers were unable to remember clearly decisions made in 1989-90; thus, their replies were not used to test the models.

Since no-one in the group interviewed had forward sold their wool in recent times, decisions about when to sell wool were made in the context of when the wool was shorn. Most of the merino sheep were shorn between July and December, although crossbreds were sometimes shorn earlier. Factors involved in the selection of shearing times were not modelled, but informal discussions suggested stock management reasons and availability of shearers were important factors. It is possible, however, many producers may have been unwilling to change shearing of superfine-fine merinos to the February to June period, because this would have made it expensive to hold wool for the main New England selling season of October to February.

Four main groups of aspects influenced the major annual decisions: strategies or beliefs; physical or contextual constraints; price and relative return; and risk. An illustration of a model of a major-annual decision can be seen in Figure 9.2. It is the initial part of the model of the decision to delay the sale of wool. The full model and a discussion of the criteria it contains can be found in Appendix A3.13.

#### ***9.4.1 Strategies or beliefs***

Most producers made decisions about where and when to sell their wool using stable systems of constructs expressed as a few basic beliefs about the best options to use for the decisions. This meant most people behaved in the same way each year. Even when trigger reasons arose which might have resulted in a change in behaviour, such a change rarely came about. For example, of 237 cases where producers had not sold main lines of wool privately before, only two contacted a buyer and obtained a quotation on their lines of wool. Such was the stability of these decisions that many producers mentioned they had not considered the other option, be it selling their wool privately or selling their wool at another time of the year.

#### **Private or auction sale**

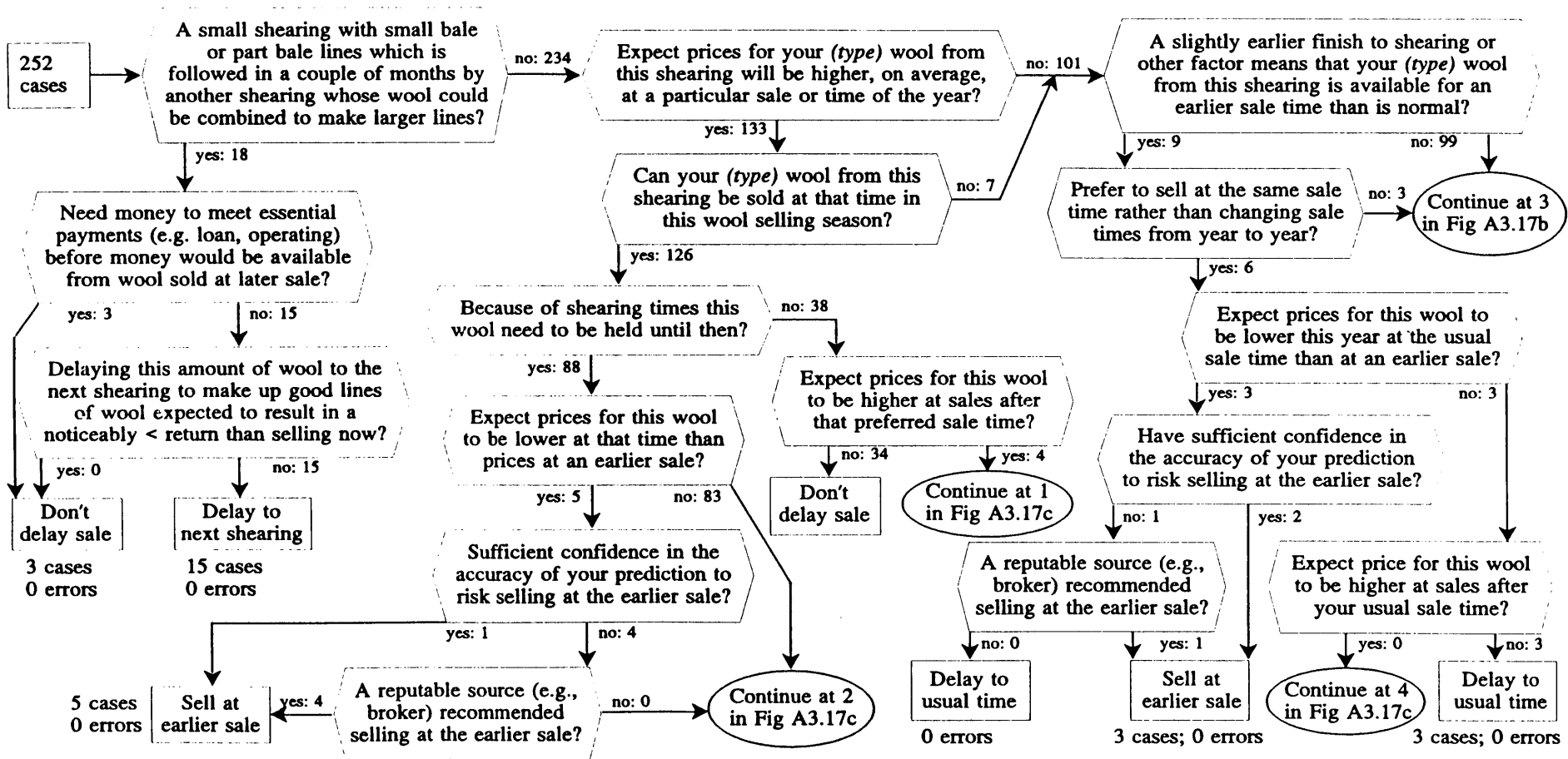
Most people sold their wool at auction because they believed they would get at least as good a return as selling it privately and because they believed it involved less risk. This was due to a couple of factors:

A belief that since the private buyer had to make a profit and would probably be selling through the auction anyway, they might as well get the benefits by selling direct.

A view that auctions provided better competition and therefore the prices were likely to be higher.

For superfine wool, private buyers could not offer the prices offered by the market.

Figure 9.2  
Decisions to delay sale of wool



A lack of knowledge of the value of their wool in comparison to the private buyer which might put them at a disadvantage.

The risk of being taken advantage of, or of not being paid, if the wool was sold privately.

These constructs, either on their own, or in combination with the other constructs, contain the reasons why many producers did not think about selling privately. When a trigger situation occurred, they were also the main reasons producers did not take the matter any further and continued to sell by auction.

### **Sale time for wool**

When it came to selecting the auction to sell wool at, three main beliefs or views were important. These were:

Prices for wool would be higher, on average, at a particular sale or time of the year. For example, many superfine/fine wool producers believed November or February were the best times to sell superfine/fine wool.

It's not possible to predict the wool market so the best strategy is to sell at the same time every year; that way what you lose out on one year you will pick up the next year.

It's not possible to predict the wool market so the best strategy is to sell the wool as soon as it's ready.

For fine/superfine wool producers the first belief was generally based on the view that the designated fine-wool sales held in November and February attracted the most buyers for this type of wool and therefore competition was greatest. Some were attracted to the fine-wool sale in February, because it was the last sale, and they felt over the years this had engendered higher prices than the earlier sales.

Other producers, who did not believe that one sale was better on average than another, believed that the best method of dealing with the problem of not being able to pick the market was to sell at the same time every year. That way, due to the 'law of averages', their prices would even out in the long run. A consequence of this thinking was that when shearing was earlier than normal, they often held their wool to their normal sale. Occasionally, this even extended to selling at a particular sale time, even though shearing had been shifted forward permanently for management or other reasons.

Producers who held the first belief, often held a related form of the second belief as well. They also believed in selling at the same time every year, because they did not believe they could pick the market on a year to year basis. This belief was subordinate to the first belief, which meant they were unwilling to change from the 'best sale' even when market signals suggested this might be an option.

Those who followed the third view, also believed it was not possible to pick the market, but believed their best option was to sell their wool when it was ready. Since this did not involve trying to pick the market, they believed results would average out in the long run. It had the added advantage that it did not involve any holding costs.

Within the constraints imposed by choice of shearing time, the beliefs presented above explain most of the decisions made about where and when to sell wool. As can be seen in the models of these decisions, very few producers changed from the choice implied by their beliefs, even in the 91/92 wool selling season when the Reserve Price Scheme was no longer operating.

### **Reasons for strategies**

In the same way that long-term strategies were important to the major strategic decisions discussed earlier, these beliefs can also be viewed as strategies adopted by producers to cope with the uncertainty associated with selling wool. Rather than trying to deal directly with the uncertainty associated with selling privately, the strategy of most producers was to sell by auction. Sometimes this was purely

because private buyers were not offering competitive prices for superfine wool. Commonly, however, producers were not confident in their ability to obtain a good deal from private sale. Therefore, their strategy was to sell at auction, because this provided the best competition and they did not have the problem of deciding the value of the wool. This was left to the market. For the decisions of timing of wool sales, two main strategies were adopted by those who were not confident in their ability to pick the market: sell at the same time each year, or sell when the wool was ready. Ironically, both were justified by the 'law of averages'.

Those producers who had sold main lines of wool privately before, often took a different view of private selling and were more likely to undertake it in the future if the net returns they received had been as good as returns they had expected from auction. If returns from private sale had not been as good as from auction, then another trigger reason was required to entice them to consider selling privately again.

According to Kelly (1955), anxiety is provoked when a person recognises that, when faced with a particular choice, they have very little ability to predict or control the subsequent events. In this study, most wool producers recognised they lacked the competence to predict the direction prices would take in the wool market, from sale to sale, or from year to year. To avoid the anxiety this induced, most appeared to have chosen a simplifying rule that provided some degree of stability and control; that is, if they did not deliberately choose the sale time (on a year to year basis), their prices would average out in the end. Such an approach is also consistent with the competence hypothesis that people do not like to bet when they lack information about the underlying causes of events (Heath and Tversky 1990), and that they appear to react more strongly to adverse outcomes caused by action than inaction (Ritov and Baron 1992).

#### **9.4.2 *Trigger aspects***

As occurred with the major strategic decisions, some situations arose with the major annual decisions which triggered producers to consider changing their strategies, although very few acknowledged any of these situations as having occurred, and even fewer changed their behaviour. The trigger reasons for each decision are discussed in

detail in Appendix 3. Apart from expectations of rises or falls in the market price, they involved such factors as: pressure from creditors, visits from private buyers, and increased brokerage charges for the auction/private decision; and taxation advantages and small shearings for the time of sale decision.

Again producers were insensitive to price when judged by its effect on stimulating a reconsideration of where and when to sell wool. Here mainly short-term price predictions were involved. Not surprisingly, since even experts are often no more accurate at predicting wool prices in the short term than naive projections, most producers ignored short-term price trends because they had little confidence in their chances of being correct.

#### ***9.4.3 Physical and contextual constraints***

The context of the decision and related constraints were often important factors in deciding which aspects would be considered in these decisions and in deciding the outcome. For example, producers who had a small shearing, from which lines of wool could be combined with another shearing in a couple of months, were likely to consider delaying sale of the initial shearing. However, if money was required before then to meet loan or operating payments, they were likely to sell the wool to meet the payments rather than negotiate or renegotiate a loan. This criterion was also used for decisions to delay the sale of wool when prices were expected to be higher at a later sale. In such cases, the relative size of the payment to the size of the wool cheque influenced the decision about whether part or all the wool was delayed.

#### ***9.4.4 Price and relative return criteria***

Their inability to predict the wool market meant producers were insensitive to prices where this meant a change in their strategy. Even so, predictions of price changes in the shorter term influenced some producers to consider changing from their long-term strategies. For example, when the wool market began to fall, some producers, although only a small proportion, were encouraged to sell early, rather than wait until their normal selling time. Others, again only a small proportion, dissatisfied with



low prices at their normal selling time, expected prices to be higher at a later sale date and considered delaying the sale.

In cases where a delay of sale time was being considered, a criterion was needed which evaluated the expected difference in prices against the costs of holding the wool to a later sale. This was expressed as:

Are the expected returns from delaying to the later sale, minus the costs of holding the wool, noticeably greater than the costs of selling at the earlier time.

The criterion had to be left vague with respect to the costs of holding wool to allow for the different contexts in which this comparison was made and the different ways in which producers assessed the costs of holding wool.

### **Opportunity costs**

Wool firms did not charge producers directly for storage costs of wool in the short to medium term, so this factor was generally not important. The main cost of holding wool was therefore the interest cost. How this was assessed often depended on whether producers had an overdraft or were operating in surplus. Those who were paying interest, generally, but not always, considered it as a cost. If the delay was a month or less it was more likely to be ignored. In cases where only the opportunity cost of money was involved, rather than a direct cost, producers were much less likely to consider interest as a cost and to consider there were 'no real costs of holding'. In addition, where there had been a long-term strategy of selling at a particular sale time, interest costs had less impact. For earlier sales no costs of holding were involved, so the criterion was not relevant.

In circumstances where producers were weighing the interests costs of delaying sale against expectations about price increases, a break-even approach was commonly used. The interest cost was calculated as cents/kg of wool per month. This was then used to estimate the amount by which the wool price had to rise before it would be profitable to delay the sale.

#### **9.4.5 Risk aspects**

Apart from the strategic approaches for handling risk discussed earlier, criteria were necessary in the models to account for circumstances that arose when producers decided to depart from their normal strategies, or where other situations occurred which involved a degree of risk. As in the models of major strategic change, it was apparent several different types of risk were identified by producers and various schemes were used to manage them.

In the models of how and when to sell wool, criteria were used to deal with uncertainty associated with predictions about price rises and falls, and with risks associated with losses that might have occurred if sale of all the wool was delayed, or if it was sold privately. When considering a change in sale time for their wool, producers who were not confident in their prediction about price, often offset this uncertainty by consulting their broker and taking their advice about price trends. For obvious reasons, this option was not available to producers who considered selling privately because of a predicted price fall, but anyhow, testing of the model showed the risk criterion in this situation was not a major determinant of behaviour.

Two options were used by producers who were unwilling to take the risk of a loss if all their wool was delayed to a later sale: split the wool and sell some early and some later, or not to delay the sale of any wool. Some producers in this circumstance decided to 'split their risk', but most opted not to delay sale.

Producers who were deciding between private and auction sale also could have split their wool and sold some privately and some by auction. No producers mentioned this option and so it was not included in the model. A criterion was included which allowed them to avoid a private sale if they were unwilling to take the risk of selling all their wool in that manner, although this was not an important factor limiting private sale.

Another form of risk was perceived by producers considering private selling for the first time. This risk arose because of their inexperience with assessing the value of wool, and the disparity between their knowledge and information, and the perceived

experience, knowledge and information possessed by the private buyers. This was not an important criterion once private sale was being considered consciously, but many producers did not even consider private sale because they expected the information disparity would result in lower returns from private than auction sale. Therefore this aspect was more likely to have been acting pre-attentively than consciously. It is a classic example of the heuristic to 'avoid betting when you lack information others might have' (Camerer and Weber 1992, p. 330).

#### ***9.4.6 Financial and personal ties with brokers***

Wool brokers were an important source of advice and support to producers when it came to decisions about sale of their wool. Occasionally these personal ties were supplemented by financial ties through loans and advances on shearings. The effect of brokers' advice was apparent when producers were not confident in their predictions of price trends, but their influence was also evident when producers were considering a change to private selling.

Producers were sometimes unwilling to upset ties with their brokers by selling privately even if this were to occur for only one or two sales. Selling wool was often seen by them as a job best handled by the experts. A large proportion were not confident in their ability to obtain a good price for their wool if they made decisions about its value on their own. They compensated for this by selling by auction to provide maximum competition and by remaining loyal to their broker in the belief that this would ensure they would be looked after in the future and receive good advice and service.

#### ***9.4.7 Models of marketing decisions***

While only two marketing decisions were modelled in this study, they suggest that the approach can be usefully applied to provide predictive and descriptive models of this type of decision. Again it successfully handled individual decisions by the broad spectrum of wool growers in the region.

The models provide a unique insight into the decision-making processes of wool growers when they are handling decisions made regularly, but involve variables with ambiguous probabilities. Heiner (1983) has hypothesised that in these situations decision makers will use simplifying heuristics and rule governed behaviour. The evidence of both models supports this hypothesis.

### **9.5 Accuracy of models**

A simple measure of the accuracy of the models is given by the success rate. It is the proportion of cases in which the model gives the correct prediction. The success rate and the number of errors in the models are given in Table 9.1. The reasons for the errors in each model are discussed in Appendix 3.

Most of the models gave correct predictions for 80 per cent or better of cases. Where producers had not considered a change, either for a reason given in the model, or for a reason not included in the model, that case was not included in the estimates of the accuracy of the models. In a few cases change was considered for reasons not tested in the models. These were included as errors. The other source of errors was incorrect predictions from within the models.

Major causes of errors in the models included additional trigger reasons to those contained in the models and missing criteria within the models. Sometimes the missing criterion was totally different from the other criteria contained in the models.

In a couple of cases, however, it appears two related but separate constructs had been included in a model under a single criterion. The difference between these two constructs had not been properly understood when the model was being developed. It was not until the errors occurred during testing that this was realised. Testing of the models on a totally separate group of individuals obviously provides a more valid test of the accuracy of the models and provides a further opportunity to make improvements to the models.

Table 9.1  
*Accuracy of decision models*

Decision model	Cases	Errors	Success rate
Begin merino breeding <sup>a</sup>	33	6	82%
Type to breed	13	1	92%
*Stop merino breeding <sup>ab</sup>	22	1	95%
Change micron of merino flock <sup>a</sup>	43	5	88%
Breed or buy new micron sheep	7	3	57%
Minor increase/decrease in micron	31	0	100%
Keep seconds to reduce micron of clip <sup>a</sup>	48	0	100%
Run own wethers after begun merino breeding	11	1	91%
Keep own wethers past 4T	12	1	92%
*Stop running own wethers <sup>a</sup>	20	3	85%
Mate own merino ewes to sell 1x lambs	110	6	95%
*Raise own 1x ewes from own merino ewes	10	3	70%
Begin to buy merino woolcutters <sup>a</sup>	37	5	86%
Micron type to buy	14	1	93%
Buy another micron type of woolcutter <sup>a</sup>	21	1	95%
Stop buying a micron type of woolcutter <sup>a</sup>	38	3	92%
Delay sale of wool	252	12	95%
Sell by auction or private	272	2	99%

\* Models at a preliminary stage of development at testing.

<sup>a</sup> The number of cases listed in these models includes those producers who answered yes to one of the trigger reasons listed in the models plus those who considered change for reasons not listed in the models (who are also included as errors of the model).

<sup>b</sup> Since no-one stopped merino breeding in the 'initial' series of interviews, only very basic criteria were available. The answers from the 'test' series of interviews were used to expand the model so this model has not been tested with a separate group of interviews.

Two of the models that were at a preliminary stage of development for the 'test' series of interviews, are not included in the table as they were not accurate enough to provide a meaningful test. These were models of the decisions to buy merino ewes for the purposes of breeding 1x ewes, or producing 1x lambs. The model of the decision to stop merino breeding is included; however, some criteria were refined following the 'test' series of interviews, so the success rate is probably an overestimation of its accuracy.

## **9.6 Conclusions**

While relative profitability was the major factor inducing change in behaviour, apparently maximising profitability was not an important short-term objective of producers. A range of physical, contextual, strategic and risk factors served to dampen the response of producers to changes in profitability. There is also evidence to suggest that in the long term the profit objective was subservient to a survival objective.

The main predictors of behaviour were criteria that incorporated simplifying rules and in keeping with this producers were often unresponsive to factors that could have triggered changes in behaviour. Producers seemed reluctant to gamble in situations where they were not confident in their abilities to predict the outcomes, or where they believed others held an advantage.

Several conclusions and implications arise from the empirical research reported in this chapter and from the literature reviewed in the earlier chapters. These are discussed in the following chapter, along with the weaknesses of the study and some directions for future research.

# Chapter 10

## Conclusions and implications

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The reporter (perhaps from the Country Hour), was interviewing a very successful farmer who also was known as a man of few words:

'Sir, can you tell us how you were able to become so successful?'

*'Experience.'*

'I know, sir, but can you tell us more specifically what experiences led to your great success?'

*'Good decisions.'*

'I know, sir, but what experiences led to the good decisions?'

*'Bad decisions.'*

(Anon)

### 10.1 Introduction

A long and circuitous route has been taken in this study in an attempt to arrive at the overall objective of identifying and evaluating, at the farm level, the major stimuli determining the production and marketing decisions of wool producers. It involved searching for a descriptive and predictive model of behaviour, which allowed these stimuli to be elicited, while minimising the level of contamination of the results from the theoretical assumptions of the model. On the way, an in-depth appraisal was made of the various models of decision making based on utility theory. In the end an approach was chosen incorporating Gladwin's (1977) hierarchical decision model and Kelly's (1955) personal construct theory. Models of production and marketing decisions based on this approach were developed and tested using information from wool producers in the Armidale Rural Lands Protection Board area of the New England Tableland in NSW.

A range of conclusions arises from this research, from the original objectives of the study and from the possible implications of the findings for: aggregate models of supply of agricultural commodities; provision of prescriptive advice and decision aids

to wool producers; and for farm management teaching and research. These issues are addressed in this chapter as are directions for future research.

## **10.2 Conclusions arising from objectives of the study**

Any attempt to describe and predict decision making by wool producers had to be cognisant of the complex and turbulent environment in which their decisions are made. Wool producers interviewed in this study made a range of decisions, from the mundane organisation of the equipment and resources for daily jobs, to decisions that will ultimately decide the prospects for survival of the farm as a business. These decisions were taken in an environment where prices for their output (e.g., wool) and some of their inputs (e.g., money), involved major ambiguities that were compounded by the ever-present uncertainties of the weather.

An equally important factor was that the information-processing capacities of the wool producers were limited (as are those of the rest of humanity). Given the ambiguities of their decision environment and their processing capacities, they would have been unlikely to have a clear idea of the alternatives they faced, or of the outcomes for those of which they were aware. This implied the wool producers would be using simplifying rules and models based on their experience to cope with this environment. Support for this view comes from a range of sources (e.g., Simon 1955; Payne 1976; Janis and Mann 1977; Schoemaker 1982; Larichev, Moshkovich and Rebrik 1988; Heath and Tversky 1990; Grether 1992).

If the results of this study were to make a meaningful contribution to understanding wool producers' decisions, then the approach chosen needed to be able to incorporate the main features of these rules. This was so, even if a consequence was behaviour that would not be considered 'economically rational'; otherwise, the underlying reasons for the behaviour would be masked by the assumptions of the model.



### *10.2.1 Evaluation of decision theories*

Since subjective expected utility has traditionally been widely used by agricultural economists to describe and predict behaviour in agriculture, its performance for this purpose was evaluated. A detailed literature review and critique of subjective expected utility were undertaken (Chapter 3). In short, it was concluded the theory involves assumptions which decision makers are unwilling or unable to comply with for some simple decisions, but more important, for complex decisions.

Increasingly, particularly over the last decade, the weaknesses of subjective utility theory have been recognised. In an attempt to overcome its many problems a plethora of models (some of which are reviewed in Chapter 4) have been proposed which involve different assumptions aimed at overcoming the behavioural violations of the subjective expected utility model (e.g., Allais 1979a; Kahneman and Tversky 1979; Loomes and Sugden 1982; Machina 1982; Quiggin 1982; Fishburn 1983; Einhorn and Hogarth 1986; Gärdenfors and Sahlin 1988; Luce and Fishburn 1991). Most of the models retain a few assumptions of subjective expected utility, including an assumption of a von Neumann-Morgenstern cardinal utility function, although in some models this is abandoned for a value function or a classical cardinal utility function.

None of these models has yet achieved preeminence as a descriptive or predictive theory of behaviour in simple experimental situations, let alone being applicable to the complex environment faced by wool producers. Even in simple experimental conditions there are realistic scenarios that result in behaviours inconsistent with the predictions of the models. Many involve even greater assumptions about the processing capacities of decision makers than does subjective expected utility. Most are not cognitively realistic models of the decision process.

To the extent that the assumptions of these models ignore the decision processes and the decision capacities of wool producers, they involve a considerable risk of making inaccurate deductions about their behaviour. While all models will of necessity be simplifications of reality, it was argued in Chapter 4 that these theories, which treat the decision process as a 'black box', do not meet the requirements of this study for

a predictive and descriptive model of behaviour. Progress in this area to date can be summarised in the following comment of Loomes (1991, p. 105) who said the search for 'a single unified model of individual decision making under risk and uncertainty will fail *simply because no such model actually exists*' (original italics). Part of the reason for this may be that the context and framing of the decision seem as important as the type of problem.

A variety of theories that incorporate people's mental limitations and the influence of context on decisions have been advanced in the consumer and psychological literature. After an examination of this literature, the hierarchical decision model (Gladwin 1977) was chosen. It assumes decisions are decomposed into their various parts and the alternatives are compared sequentially using several characteristics or aspects. The two-stage decision process hypothesised for the model allows for informal or unconscious processing, as well as a formal or conscious processing stage. The stages of this process can be elicited and formulated as a series of questions or criteria which form a decision tree.

An advantage of this approach is that the decision trees can be used to test the models directly using individual decisions. Theoretical bias is reduced because no assumptions are made about which factors should be included in the models. As well, the criteria are elicited from decision makers and therefore do not assume capacities they do not possess.

A major weakness of the model was that it did not incorporate an adequate theoretical explanation of the underlying motivation for behaviour and for the selection of the aspects included in the decision trees. A contribution of this thesis is to show that personal construct psychology (Kelly 1955) can be used to overcome this weakness. In simple terms this involves assuming people behave as 'scientists' whose motivation and behaviour are directed by their expectations of the future and the interactions of their behaviour with the future. The combination of personal construct psychology and the hierarchical decision model provides a theory and empirical model of behaviour that explains the motivation and reasons for behaviour, allows for and explains learning, and can describe and predict individual decisions.

Using this approach, a series of models was developed of production and marketing decisions for merino wool production in the New England Tableland. These models were tested on a separate group of producers approximately six months after the interviews used to develop the models were completed. Most of the models achieved success rates of 80 per cent or better for individual decisions (see Table 9.1). In this respect their success was similar to the rates reported by Gladwin (1975, 1976) and Zabawa (1984).

### *10.2.2 Stimuli influencing production and marketing decisions*

The results of the study suggest graziers in the New England area used simplifying rules and strategies to make their production and marketing decisions. Hierarchical decision trees were used to successfully model these decisions and show the relative importance of factors they considered. Models were derived for economically important decisions that occurred relatively infrequently and for economically important decisions that occurred annually. An advantage of this method over more traditional economic models was that intuition was not required to explain the reasons behind a particular result, particularly if it differed from the expected result; wool producers were simply asked to explain their behaviour.

Many wool producers seemed to ignore a great deal of the information about changes in relative prices, sometimes unconsciously and sometimes as a deliberate strategy. Evidence was found that some producers were not aware of changes in the relative profitability of enterprises that had the potential of increasing the short-term profitability of their businesses. In their experience, trying to predict prices and change enterprises in response was not likely to lead to greater profits in the long run, and entailed expenditure that might put the viability of their business at risk.

Typically, in the New England area at least, a policy of deliberately avoiding response to trends in prices did not appear to have any significant adverse consequences provided the existing enterprises were suited to the country and were undertaken with reasonable technical efficiency. In this respect the results are in complete agreement with the results of the interviews conducted by Wright (1986).

Once a price trend became obvious, most livestock enterprises either required a considerable lead time to breed into, or were expensive to buy into. Given these considerations, producers lacked confidence in their abilities to divine trends in prices sufficiently well to allow them to make a profit from a dramatic change in direction.

This construction of events appears to have been the main reason for the slow response, by June 1992, to the collapse in wool prices. Although prices had been trending down for four years, the main reasons for the declines in total merino numbers and matings of merino ewes to merino rams were associated with the drought. Very few producers had decreased merino numbers because of prices, while many were still increasing. Even fewer producers were considering changing from merino breeding. They appeared uncertain about where the market would head next and were prepared, at that time, to 'tough it out'.

This is not to suggest that producers did not react, or will not react (even dramatically), to price changes. In fact, once producers realise a decrease in prices is occurring which is likely to have a significant impact on the profitability of an enterprise compared with competing enterprises in the medium to long term, there may be a marked response. The point is that the context of the price change is relevant to the reaction that will occur. Much of the initial decline in wool prices had little effect on the ranking of the competing enterprises. Even after the collapse producers did not appear to believe that there would be long-term benefits attached to changing.

Although it was not expressly addressed in this study the woolproducers would have had to make other adjustments in their business to the decline in prices and hence profitability of their operations. Capital and maintenance expenditure may have been reduced. In addition many producers would have taken other strategic decisions (e.g., to maintain a high level of equity) expressly to handle downturns in wool prices and poor seasonal conditions.

The lack of response to price fluctuations was also apparent when it came to selling wool. Most adopted strategies designed to 'average out' prices rather than have to choose consciously the 'best' time to sell. Occasionally (e.g., selling at the same sale

every year no matter what the time of shearing) these strategies may not have been profit maximising, even in the long-run, because they ignored the opportunity cost of money.

While many people got carried away with the high prices during the 1980s, it was apparent many more experienced wool and prime lamb producers realised it was a passing phase and that the pendulum would swing back sometime in the future. Even now the same view is common. Although they were not sure what would happen, or how or when it would happen, and were unwilling to make a long-term prediction about prices except in the vaguest of terms, when the industry was 'up' they were aware that they should allow for some unfavourable event or events in the future.

It is not being argued here that profits were unimportant to the decisions. They were. The argument is just that profit maximisation was not their overriding concern. Survival of the property was the overriding concern; a satisfactory level of profit was required to achieve this and meet their other requirements.

Just, Zilberman, Hochman and Bar-Shira (1990) provide evidence that simple behavioural rules may explain farmer behaviour more successfully than a model assuming profit maximisation. This is interpreted by Just (1992) to be due, in that case, to habit formation and that practices will be modified in response to profit if the opportunity costs become sufficiently large. Presumably this partly explains the lack of response of wool producers in this study, but their deliberate strategy of not following trends provides a more compelling explanation than habits. It provides a better explanation of the cases where producers did not respond despite ostensibly quite compelling profit advantages. An implication of this is that producers may be less responsive to change if strategy, rather than habit, is the explanation.

Another possible explanation for some lack of response, which is consistent with the strategic explanation, is that limited cognitive capacities mean that producers can only pay attention periodically to the profitability of their enterprises (Earl 1990). Thus,

consideration of change will occur if something happens to attract the persons' attention, or the person has a policy of undertaking reviews at regular intervals.

Ambiguity, arising from a lack of information about the formation of prices in the wool market, could have made some wool producers reluctant to gamble. This was particularly apparent in the models of decisions to delay the sale of wool and whether to sell privately or by auction. One producer even said he gambled on the cattle market because he felt he could forecast in this market, but did not bother in the wool market because he had no idea what would happen; a view he shared with many others. Of course, the wool cheque was also considerably more significant than a few cattle sales, so this was probably another consideration. Anyhow, perceived competence in forecasting a market was evidently an element that reduced producers' sensitivity to price fluctuations.

The hypothesis that people prefer inaction to action when action is associated with change (Ritov and Baron 1992) may also offer a partial explanation for the reluctance of some producers to change even when their formal analyses suggested it was profitable to do so. It is also relevant to the decisions about the selling time for the wool and whether to sell privately or by auction. Those producers who sold their wool at the same time every year, even if this involved a delay, seemed to perceive selling earlier as trying to pick the market, that is, taking a decision. On the other hand, those who sold the wool when it was available did not consider this as trying to pick the market. If this was the case, it would probably be simple to convince the first group to reframe or reconstrue the problem and sell when the wool became available.

Price was influential in all the decisions. Its effect varied from decision to decision and within different stages of the decision. Short-term price changes sometimes drew producers' attention to the need to consider changing their enterprise mix, although if the price change was minor, or sometimes even fairly major, they ignored it. Production of 1x lambs was often undertaken based on expectations about next years' prices but, for most other enterprises, producers tended to take a long-term view of prices and returns when evaluating the various alternatives.

When producers were making long-term production decisions, Munro and Fisher (1982) found they tended to rely on their own ideas and considered past prices of the alternative products to be the most important factors influencing their decisions. The patterns of behaviour outlined in the decision-tree models of this study may suggest why this was so. Many producers did not consider change because experience had shown that the pendulum would swing back and they would be as well off with their existing mix of enterprises.

One of the most important criteria in most of the models was the one in which expected long-term returns were compared with the costs and risks of change. A major source of information for producers' expectations about long-term returns was their experience of relative returns in the past. Since the overwhelming proportion of producers had little confidence in anyone's ability to predict prices in the future, they tended to rely on their experience of what had proved to be successful on their country in the past.

While costs were nominally a component of most decisions, evidence was found that many producers perceived out-of-pocket costs differently from opportunity costs. This perception led to different treatment of out-of-pocket and opportunity costs. For example, when it came to selling wool, producers who had an overdraft on which they were paying interest were more inclined to include this as a cost than those who were not in debt. It was common for those in the latter situation to comment that there were no costs of holding wool. One producer did not seriously consider the opportunity costs involved in holding his entire clip from a July shearing to a February sale.

Since the opportunity costs for the decisions were often substantial and occurred over many years, this behaviour had obviously not been removed by market forces. Other examples of this type of effect have generally been found in experimental situations (e.g., Kahneman, Knetsch, and Thaler 1986). A different treatment of opportunity costs and out-of-pocket expenses is also consistent with the hypothesis of a S-shaped value function, with changes being evaluated about a neutral reference point, from where losses loom larger than gains (Tversky and Kahneman 1991). These effects

could also be just further examples of context effects, with producers using different constructs when evaluating out-of-pocket expenses compared to opportunity costs.

The effect of risk on decisions has been alluded to already. It was perceived in many different contexts, arose from a myriad of different influences, entailed a range of outcomes, and evoked a host of strategies and responses from producers. A hierarchy of responses to risk were observed, beginning with strategic decisions to maintain a particular level of equity, diversify or specialise, and resist change arising from fluctuations in prices of alternative commodities. More detailed discussions of the responses producers made to the different forms of risk can be found in 9.3.5 and 9.4.5.

The strategic responses formed the context in which other decisions were made. For instance, once a decision to begin merino breeding had been made, there were other risks to be considered. Purchase of sheep involved a risk of a loss if the purchase price was too high, also the risks associated with going into debt when a loan was required to finance the purchase. Additional risks arose from the chance of introducing disease and the uncertainty associated with the breeding quality of the sheep to be purchased. For example, responses to price risk for wool may include off- and on-farm diversification, maintaining high equity, lower use of inputs, selling at the same time every year and so on.

In these circumstances, it is difficult to conceive of a wool producer as having a fixed attitude to risk which can be gauged from the shape of their utility function. How they would react to the risks in a particular situation could depend upon how they construed the situation at the time. Their construction could include the initiatives they had taken at higher levels in the hierarchy of decisions to alleviate the possible effects of uncertainty. They may also adapt to risks involved with a particular decision by adjusting other aspects of their business. Therefore, response to a particular type of risk may be multifaceted.

As for immediate impact on livestock numbers, climatic conditions, in particular dry conditions, were found to have the greatest effect. Much of the buildup in total



livestock numbers during the 1980s appears to have been due to a combination of prices and seasonal conditions. Interestingly, total cattle numbers increased in approximately the same proportion as sheep numbers over this period (see Figure 8.3), although beef prices showed only a steady increase compared to wool prices (see Figure 2.4). Prices seemed to have a greater effect on changes between enterprises within the sheep industry than between the sheep and cattle industries.

Poor seasonal conditions during the beginning of the 1990s was the main reason given for the decreases in dry stock and matings of merino ewes. It had a cumulative effect through its impact on lambing percentages. Dry springs and summers during the early and late 1980s, which made it difficult to finish prime lambs, were important in several decisions to stop prime lamb production. Finishing lambs in a dry season was expensive on some properties, and lambs that were not finished brought only lower, store prices for lambs.

For particular decisions and for particular wool producers, other physical and contextual factors had an impact on decisions. The type of land, its climate and pasture quality were particularly important influences on the micron type of merinos selected and bred. Management experience had little impact on changes between the various sheep enterprises. Capital constraints and availability of sheep were important factors in slowing the pace of change, by discouraging purchases of sheep and encouraging changes through breeding instead.

The effect of the Reserve Price Scheme on producers' decisions could not be assessed from the decision models. No particular criterion included specific reference to the Reserve Price Scheme. Its main impact would have occurred in the strategic criteria where producers balanced the risks of change against their expectations of the long-term return available from beginning a merino enterprise. A couple of producers entered the industry because of the high prices and the added security net provided by the scheme. Others mentioned they may be more inclined to diversify into other enterprises such as 1x lambs now the Scheme had collapsed. The effect of these influences was incorporated in the existing criteria so the impact of the Reserve Price Scheme could not be differentiated from other considerations.

### *10.2.3 Predictions of aggregate supply*

While decision-tree models were well suited to providing insights about the factors wool producers considered when major decisions were being made, general models of all the factors influencing changes in livestock numbers could not be developed. Therefore the approach could not be used to model aggregate supply of wool or livestock numbers. Decisions about changes to livestock numbers on individual properties were too complex and situation-specific for general decision-tree models.

The effect of price on these decisions was much more difficult to detect at the individual level. For instance, many increases in mating to merino ewes that occurred in 1991 and 1992, after prices had declined dramatically, were due to the buildup phase following decisions to begin merino breeding taken four or more years before. Conversely, the decrease in prices was given as the main reason for very few of the decreases that occurred over the same period. In other situations, a fall in wool prices and prices for cfa ewes sometimes led to a temporary increase in livestock numbers, provided the season was expected to hold out and the property was not overstocked at the time.

If the theory and principles underlying this research are to have a use in predicting aggregate supply, new approaches need to be developed. Due to the difficulties encountered with modelling decisions about livestock numbers at the individual level, analytical techniques will be required which deal with more aggregated data. These techniques may involve other simplifications. However, given the discontinuities in response to price found in this study, one would need to be wary of a simplification involving continuous sensitivity to data.

### *10.2.4 Extension of results to other areas*

Wool producers interviewed in the study were close to a random sample of wool producers in the Armidale Rural Lands Protection Board area, so the results should be directly applicable to the population sampled. The value of these results in describing the decisions of wool producers beyond these areas is obviously less

assured. It would depend on the group of wool producers being considered and which aspects of the findings were involved.

The high rainfall wool-producing areas of Australia have similar production environments so, to that degree, many decisions involved would be similar. The unknown is the degree to which the construct systems of wool producers in these areas are similar to New England producers. Producers in the northern part of the New England would be expected to be closest in outlook to their southern cousins. Several findings reported in Munro and Fisher (1982) for the Southern Highlands suggest they also may possess similar construct systems. Little evidence is available for other areas of Australia.

Some more general findings about the role of strategy in decision making and its interaction with responses to risk and uncertainty are likely to have much wider applicability. Most farmers in Australia are faced with a turbulent environment and, given the limitations of their cognitive capacities, would be expected to react in similar ways.

#### *10.2.5 Use of decision-tree models*

An approach using hierarchical decision models, based on personal construct psychology, could make a useful contribution to the analysis of a wide range of problems by: improving understanding of the reasons behind existing behaviours that might help with the development of research programs; ex-ante analysis of the likely impact of new technologies; the design of information support and management aids; planning of extension programs; and evaluation of existing programs. It provides a means of documenting behaviours that have often been dismissed because they were based on anecdotal evidence only and were not consistent with economic theory.

Problems with the quality of demand and supply estimates in agriculture have been attributed to a neglect of micro-level empirical analysis in the profession (Just 1992). This approach can make a contribution in this area by meeting Petit's (1978, p. 141) call to 'understand how decisions are actually made, for what reasons, on the basis of which information and with which consequences'. Although it cannot be used to

estimate supply, and consequently elasticities of supply, it may help increase understanding of the reasons for the inaccuracies in measurements obtained using other approaches.

### **10.3 Implications of results for econometric estimates of agricultural supply**

Econometric methods used to forecast agricultural supply commonly contain linear-additive models that allow tradeoffs between variables and entail assumptions about the manner in which decision makers form expectations about the future value of variables. Many hypotheses about the formation of expectations (e.g., naive and adaptive expectations) involve an assumption that the decision maker has a fixed sensitivity to the value of a variable (Kaine-Jones 1988). Distributed lag models involve a similar assumption. The additive nature of the models also contains an assumption that people use a compensatory decision process.

Hierarchical models have provided accurate predictions in this study about the decisions of wool producers in the New England area. This implies that a hierarchical decision process is at least as plausible as a linear-additive decision process, since most linear-additive econometric models do not give accurate predictions of individual decisions without the use of dummy variables (Just 1992).

If decisions at the micro-level are made using hierarchical decision processes, then it may not be rigorous to use linear-additive econometric models at the aggregate level. The defence against this argument has been a form of the 'as if' argument based on the assumption that the aggregation of the data will negate the non-additive effects at the micro level. However, as Gladwin H. (1975) has shown, fitting a regression model to aggregated data generated from a hierarchical decision process gave biased estimates about the importance to the decision of the variables in the decision process. The weighting and statistical significance of some variables increased, while others became insignificant.

Because livestock numbers for the wool producers surveyed were extremely slow to respond to the decline in prices and this occurred across the whole of the sample, suggests the 'law of large numbers' will not render the behaviour identified in this research insignificant in aggregate data. The behaviours were noticeably biased in one direction and were not cancelled by other producers' reactions for other sets of circumstances and other types of country.

Incorrect conclusions about the significance of variables are obviously a problem for policy decisions and for decisions about which variables to include in the models. Another important problem arises when the regression model is used to predict future trends. If a change occurs in the range of the existing variables, or the underlying structure of the model, then the regression model will probably give inaccurate predictions. A possible reason for problems with econometric estimates of agricultural supply is, therefore, that aggregation of the data does not cancel the effects caused by hierarchical decision processes. When different data sets and estimation techniques are used, the differences in the underlying and assumed structures lead to errors in the estimates and predictions.

A related, but separate issue, is that the final supply of a commodity from an individual farm arises because of a series of major and minor decisions and natural phenomena (not one decision). The conclusion to be drawn from this study is that decisions may often be taken in semi-isolation, perhaps using different decision processes and using different types of expectations about prices. Decisions to change the micron of a merino wool flock may involve different aspects from decisions to keep cfa ewes for an extra year. Both will have an impact on the number of sheep and the supply of wool in the current and subsequent years.

Work by Kalaitzandonakes and Shonkwiler (1992), on planting and replanting in perennial crops, has shown there are advantages to be gained from estimating the planting and replanting decisions separately. The continuing influence of the decisions to begin merino breeding on subsequent matings of merino ewes, shows that decisions about changing enterprise are long-term decisions that continue to have effects even when the original reasons for the change have disappeared. This implies

a need to treat decisions to change enterprises differently from decisions to change the size of an existing enterprise.

An important conclusion of this study was that producers ignored, or did not react to, quite major fluctuations in prices unless they perceived a long-term trend (e.g., reduced consumption of lamb). When making their decisions they also used decision rules that were in the nature of on/off switches rather than a continuous adjustment process. Response to price fluctuations was shown to be very much context dependant. By this it is meant that some changes in prices in one context led to a change in behaviour, while the same, or even greater changes in another context, had no effect. Different price variables were relevant to different decision makers, or to different decisions made by the same decision maker in different contexts (e.g., prices of prime lambs and/or cattle were relevant to some producers but not to others).

What these imply is that the assumption of fixed sensitivity to the value of a variable may not be appropriate. It is certainly not appropriate at the individual level, and the collective response of wool producers in this study to the collapse of wool prices suggests it may not be appropriate at the aggregate level, either. It provides support for the trend detection approach to modelling response proposed by Wright and Kaine-Jones (1985). It also provides an explanation and support for the suggestion by Just (1992) that the different estimates of short-run elasticities over time may be due to factors not included in the problem; perhaps the contexts in which the decisions are made. Over time these vary and therefore the responses will vary.

Closely allied to the above issues is the question of the use of expectations in econometric models. Many models of the formation of expectations use past observations of the variables and assume a consistent weighting. They imply persistent sensitivity of response to changes in the past observations of this variable. The same problems raised in the previous two paragraphs are thus also applicable to expectation models.

Another implication emanating from the recent literature on ambiguity, and from this research, is the effect of the ambiguity of expectations on decisions. Even if

information about producers' expectations was collected by means of a survey, the level of confidence of producers in their expectations could influence their decisions in the same way that it has been shown to affect the use of elicited probabilities. In this study evidence was found of a reluctance to bet (or gamble) on expectations about wool prices. Additional complications are that this research, and that of Munro and Fisher (1982), have found that the long-term history of prices is an important factor in producers' decisions. Yet, they do not like to make long-term predictions about price, although some decisions are based on a view of what is likely to occur in the long term.

A further debate is whether the significance of the lagged variables is due to price uncertainty or the costs of adjustment. Based on data collected from producers in the three wool-producing regions of the state, Munro and Fisher (1982, p. 222) argue the distributed lags 'are attributable more to the costs of adjustment than to the effects of price uncertainty'. Their argument is not necessarily valid, and anyhow the evidence from the decision models suggests it may be an unresolvable 'chicken or the egg' problem.

The lack of significance attributed to prices lagged more than one period may be due to the assumption of fixed sensitivity, not lack of influence in the formation of expectations. If the effect of past prices depends on the context in which the change takes place, then the further removed the period, the more variable the influence is likely to be. Sometimes it may be relevant, in other cases, possibly not at all.

Also, costs of adjustment meant that producers were still responding to prices that occurred several years before, viz. many producers in this study still increased their matings to merino rams in June 1992. One main cost of adjustment occurred because producers were not willing to take the risk of making a dramatic change. A dramatic change cost more money up front, which may have resulted in failure of the business. They were not willing to make a dramatic change because they were uncertain about the prices, so they adjusted slowly and therefore were responding to past levels of prices.

Studies such as this may also help econometricians and their aggregate supply models through building an understanding of the behavioural rules, habits and variables that have a bearing on producers' production and marketing decisions. They should help with decisions about which variables to include and improve the structure of the models. This may be especially important if, as discussed earlier, tests of statistical significance and size of the coefficients do not provide a good estimate about the importance of a variable in a decision, because the decision process is hierarchical rather than linear-additive.

#### **10.4 Implications for prescriptive advice and decision aids**

The importance attached to strategies that limited response to fluctuations in price in most of the decision models provides compelling evidence about the overriding importance of survival of the property to the wool producers surveyed. These strategies acted as a 'blinkers' which may have limited the producers' opportunities to maximise their profits. It shows producers were willing to pay this price in recognition of the higher priority given to the survival objective.

It also suggests an objection many producers may have to advice based on the expected value of outcomes (however measured). For many major decisions producers may only get one chance, while the expected value measure implicitly assumes many chances. Prescriptive advice must therefore recognise that the main objective of many producers is not the maximisation of some objective function. In most situations alternatives must pass some form of survival criterion first. Even then, other criteria may be applied in a hierarchical fashion to decisions. About the only case where a survival criterion may not be passed is when the survival of the property is already under threat, in which case high-risk options may be chosen.

Evidence of the use of strategies by wool producers to deal with situations where information about a variable is perceived as ambiguous, or where little confidence is felt in their predictions of a variable, shows it poses an important practical problem for prescriptive advice. Evidence from the literature suggests this ambiguity may take many forms and that people's reaction to it will be context-dependent (Winkler



1991). It would appear, therefore, ambiguity cannot be ignored, since in many situations people are unwilling to accept advice that ignores the issue.

A solution to the problem that is currently being applied by producers is to develop strategies that minimise the perceived impact of ambiguity. Occasionally (e.g., when selling wool), some strategies may produce lower profits and yet not reduce the impact of ambiguity compared to alternative strategies. In these cases it should not be difficult for an adviser to compare the relative benefits of the competing strategies and to reframe the solutions so that the advantages of the more profitable option are obvious. In other situations, sensitivity analysis could be used to compare options. Perceptions of ambiguity of information by decision makers would then be incorporated separately by them using their decision processes.

It was also apparent from the decision models that risk was not incorporated holistically in choosing between alternatives; it was considered separately. Their attitude to risk appeared to depend upon the context of the decision as well as their overall attitude to risk. A range of strategies and responses was used by producers in responding to the various forms of risk perceived.

Since a producer's 'attitude to risk' may vary from context to context, it may not be appropriate to incorporate attitude to risk in a single recommendation for risk-averse farmers, or for farmers with particular 'levels' of risk aversion. Without an understanding of the context in which the decision is made, particularly the degree to which uncertainty has been mitigated by strategy, it would be invalid to incorporate 'attitude to risk' in making the recommendation. Methods are required which present the information in a format that allows producers to make their own decisions about the levels of risk they wish to bear in a particular situation.

The apparent importance attached to strategy by many wool producers, as a means of coping with risk and uncertainty, reinforces the need for greater attention to be paid to this area in providing advice to farmers. It is an area that has so far been largely neglected in the Australian farm management literature (see Malcolm 1990), if not by farmers. A recent paper by Wright (1993) suggests a cybernetic attitude to strategy

should be taken. In this framework the purpose of strategic planning is to specify what is to be avoided, rather than placing the main emphasis on achieving particular levels of profit or production. Such an approach seems to have the advantage of being consistent with the philosophy of management embraced by many wool producers (as interpreted from the results of this research).

Some issues raised above are relevant to the design and use of decision aids. By definition they are aids to decisions, not decision makers. Therefore, one requirement for an effective decision aid is that it meets farmers' requirements for information and provides information that they can incorporate easily in their decision processes. Personal construct psychology and hierarchical decision models are ideally suited to providing information about the types of information farmers use in their decisions and how they use it.

As Malcolm (1992) points out, sophisticated mathematical modelling techniques are unable to handle the complexity of the combinations of resources and constraints faced by individual farms, so successful decision aids are less likely to be used for major strategic decisions. Initially at least, they are likely to be most useful in assisting with the more mundane production and marketing decisions where the main effects of uncertainty have been taken care of by higher-level strategic decisions.

As with prescriptive advice, the decision aids should allow producers to adjust for risk and uncertainty separately from the output of the decision aid. One method of achieving this is to allow the decision makers to adjust key variables simply and quickly to assess the impact of different scenarios on the results. A means of presenting the results of these alternatives that can be understood easily would also be an advantage. General recommendations will often be useless.

### **10.5 Implications for farm management teaching and research**

Most of the implications for farm management teaching and research arise from the discussion in the previous section. The relevance of subjective expected utility to farm management has already been questioned (e.g., Wright 1983). Doubts about

many of its axioms, its inability to handle ambiguity, and the arguments made here for risk and uncertainty to be handled separately by the decision maker, limit the usefulness of subjective expected utility for practical farm management. They therefore imply the amount of time spent on the theory should be commensurate with its relevance. It may serve some purpose in introducing concepts associated with the literature on risk, as a lead in to other theories in the area. It could also serve a purpose as a research tool until other more cognitively-realistic approaches have been developed.

A great deal of effort is being expended currently in attempting to develop axiomatically based theories of behaviour based on the idea of using a single 'utility' index to choose between alternatives. Given the evidence that people do not appear to accept holistic solutions to their decision problems, this may prove to be a dead-end line of research. Its main benefit may be to improve our understanding of how people make decisions and therefore lead to the development of theories whose solutions decision makers are willing to accept.

The role and application of strategy have been areas neglected in farm management teaching and research in Australia. As has been shown in this research, strategies can have both positive and negative benefits to producers. They can protect producers from the risk of 'chasing the market' and always coming last, but they can act as 'blinkers' that inhibit change when it would be beneficial. Wright (1993) has already outlined a direction for research in this area. The challenge is to find ways of incorporating these ideas in teaching programs.

## **10.6 Future directions for research**

If this research had been carried out in several decision-making environments, particularly if these had a greater range of possible activities and enterprises, the results would have been more generalisable and the conclusions more useful. It was not possible as already stated, however, it could still be useful to conduct a similar study in a mixed cropping and grazing area with a greater range of opportunities. To get the full benefit a couple of different decision-making environments would be

necessary and it would need to be conducted for a time when large fluctuations in prices and/or seasonal conditions occurred for the most important enterprises in these environments.

The major weakness of the research method in this study was that it could not be applied to develop predictions about individual or aggregate levels of supply. It is believed, however, the research has shown the assumptions contained in the theory about the way people make their decisions, provide a potentially sound basis for developing models that describe and predict farmer behaviour. Research needs to be undertaken to develop empirical techniques, other than decision trees, which embody these assumptions, but can deal with the 'how much?' questions.

Possible areas to be explored include the trend-detection technique (Wright and Kaine-Jones 1985) and neural networks. The latter approach assumes parallel processing, which is inconsistent with some implicit assumptions of the hierarchical decision model, but is not inconsistent with personal construct psychology. Another possibility is to use decision trees to elicit behavioural rules that can be incorporated in statistical models using the procedures outlined by Just, Zilberman, Hochman and Bar-Shira (1990).

Despite these shortcomings the theoretical approach has potential to contribute to understanding in a broad spectrum of decision areas from decisions to undertake conservation measures, to adoption of new technology, to issues of gearing and financial management. Much research remains to be done in these areas to improve the relevance and efficiency of technical research.