Chapter 9

GENERAL DISCUSSION

9.1 Introduction

The problem with attempting the formulation of a holistic view of the data/information/decision processing chain is that, by its nature, the end product is so convoluted that it defies any objective confirmation in terms of the acceptance or rejection of a simple hypothesis on the basis of statistical differences. This leads to a reversion to an approach based on the gathering of evidence supportive of the view developed.

There are two potential ways to generate evidence in support of the hypothesised "Contingency Model of Market Information Utilisation in Agricultural Decision Making". One, is to find expressions of the underlying theoretical basis for the model, this foundation having been laid in Chapters 2, 3, 4, and 5. The second is to observe the behaviour of the producers in the survey group using the hypothesised model as the frame of reference.

It is recognised that the following discussion can quite rightly be referred to as an ordering of circumstantial evidence, generated from the survey reported in Chapter 8, to test the argument that voluntary analytical decision behaviour is constrained behaviour.

9.2 Decision Taxonomies and Problem Conceptualisation

Chapter 2 established a taxonomy of decision structuring aids based on a taxonomy of problems, developed by Humphreys and Berkeley (1983) which used the inherent level of problem abstraction as the classification criteria. This taxonomy of decision structuring aids was then used to classify a range of aids described in the literature. Of particular interest, gross margins analysis and cash flow budgeting were classified level 1 decision structuring aids and linear programming and decision theory level 3 decision structuring aids.

With the acceptance of the concept of continuum of decision making behaviour ranging

from heuristic decision making, through unaided analytical to aided analytical decision making, with the previously described taxonomy of decision structuring aids providing a finer gradation of the latter group, a continuum along which producers' decision behaviour could be ranked, had been established. Such a continuum or ranking is essential to allow the ordering of particular behaviours and to provide the metric by which a particular decision process may be judged to be constrained relative to any other decision process.

Any decision continuum and taxonomy of decision structuring aids can only be of conceptual value if decision behaviour is observed over at least part of its range. If all decision behaviour was identical the continuum could be said to have degenerated to a single point, in both problem conceptualisation and decision processing.

The survey results clearly indicate a range of decision behaviours (Table 8.1, 8.2 and 8.3) ranging from unaided decision making, through the utilisation of level 1 decision structuring aids, to the application of level 3 decision aids. This can be seen to establish the diversity of behaviour. (The validity of the metric used to measure this diversity rests on the literature reviewed.) However, it does not establish the causal factor for the observed diversity.

If the proposition that producers' voluntary decision behaviour is constrained behaviour (with the level of various constraint experienced by individuals being the causal factor for the observed diversity of decision behaviour) is to be supported, it is first necessary to describe how constraints may occur and second to show some evidence of such constraining factors being in existence.

9.3 Potential Constraints

With the development of the decision taxonomy it was possible to describe in general terms the data sets required for the application of decision aids at any particular level. This leads to the fundamental statement that, unless the required data set (the producers' set of expectation) for a particular decision aid is available to a producer, the producer will be constrained from using that decision aid. Therefore, constraints on such activities as data generation, communication and data processing/inferencing may act as constraints on producers voluntary decision behaviour. In fact, all of the steps in the

information/decision chain described in Figure 9.1 are seen to potentially have significant constraints associated with them.

The survey results in general do not provide a validation in an agricultural context of much of the theory and the associated descriptions constraints, relating to the steps in this data/information/decision chain, discussed in Chapters 2,3,4 and 5. However, some of the results are partially predictable on the basis of the literature reviewed.

Howell and Burnett (1978) suggest that the cognitive approach to inferencing adopted by individuals will be influenced by task characteristics, with inferencing outcomes being disproportionately influenced by various cognitive elements such as frequency of the task, prior generator knowledge and the internal or external nature of the generator involved (see Section 3.3.9). The survey results clearly show differences in the confidence held by producers in their own prediction of production related variables (Figures 8.8, 8.9 and 8.10) in contrast to their confidence in their own predictions relating to product prices (Figures 8.11, 8.12, 8.13, 8.14 and 8.15). The former task has characteristics similar to those associated with internal generators and the latter with external generators as described by Howell and Burnett (1978).

The survey results showed a very low level of producer confidence in the accuracy of forecasts generated by external agencies (Figures 8.16 to 8.19). This is not surprising given the general acceptance in the literature of the inaccuracy inherent in agricultural forecasting.

Similarly the data pertinent to producers sources of information is generally consistent with the literature reviewed in Chapter 4, especially the information type (subject)/source interaction, see Table 5.1 and Figures 8.20 and 8.21.
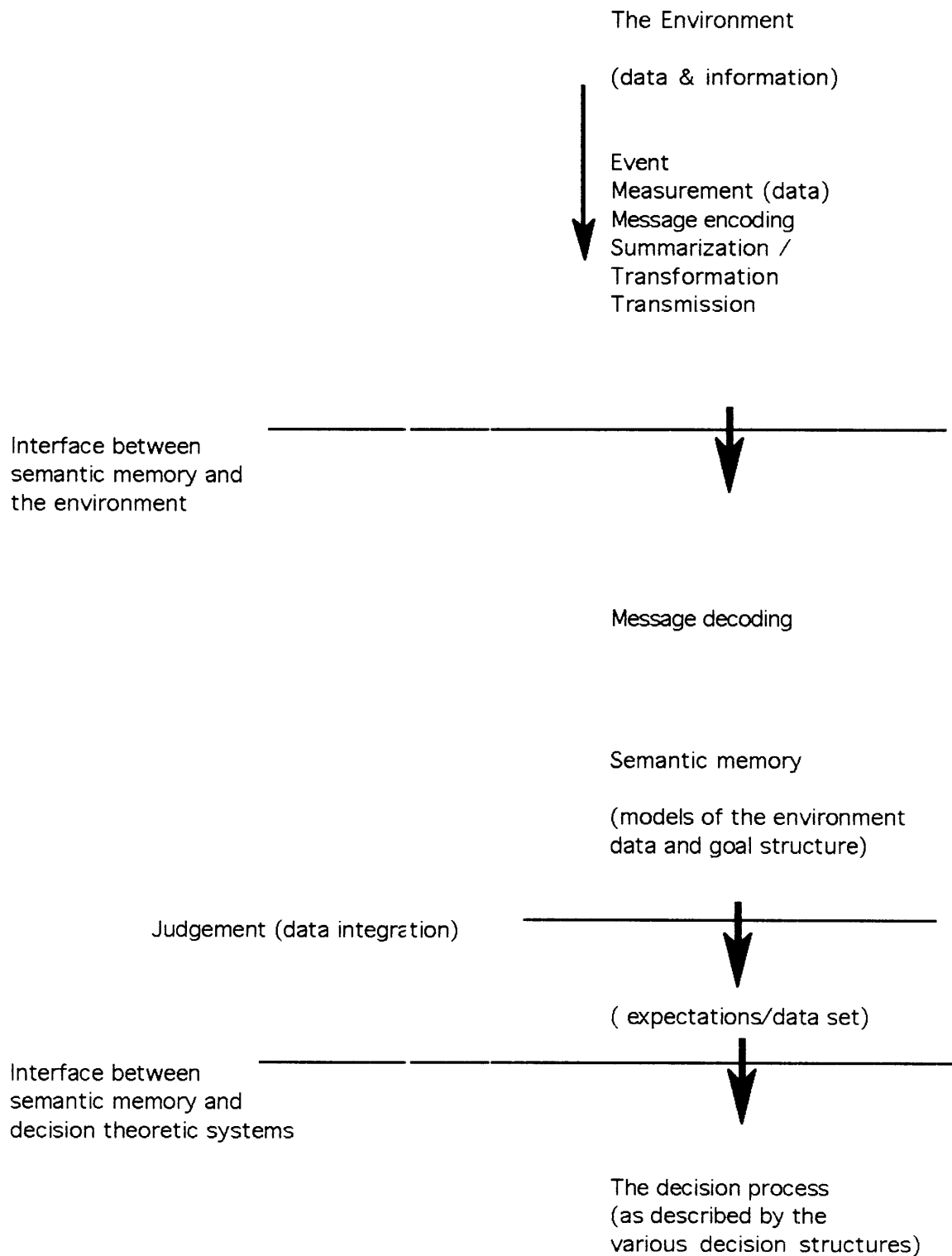
Figure 9.1

The Environment

(data & information)

Event
Measurement (data)
Message encoding
Summarization /
Transformation
Transmission

Interface between
semantic memory and
the environment

Message decoding

Semantic memory

(models of the environment
data and goal structure)

Judgement (data integration)

(expectations/data set)

Interface between
semantic memory and
decision theoretic systems

The decision process
(as described by the
various decision structures)

Figure 6.1 The Environment - Memory - Decision Process Interfaces
(adapted from Humphreys, 1983)

9.4 Constraint Action

The second approach to the development of the case in favour of the hypothesised "Contingency Model of Market Information Utilisation in Agricultural Decision Making", is to observe the behaviour of the producers in the survey group using the hypothesised model as the frame of reference.

Prior to this it is necessary to briefly consider the potential modes of action of such constraints. In genetic theory the concept of recessive and dominant gene action is used to describe genes which induce a particular outcome, for example the determination of sex (male or female). It is suggested that some constraints on the decision making process will have a similar mode of action.

The second major mode of genetic action is termed "additive gene action", this being the expression of a number of genes acting in concert. Classical examples of additive gene action is the expression of genes influencing such characteristics as fibre diameter, fleece weight and mature live weight. It will be suggested that some constraints on the decision making process will act in concert to induce a particular behaviour such that several constraints may successively add to producers' dissonance

9.5 Dominant Constraint Action

The major evidence from the survey, in support of the existence of dominant constraint action, is that derived from the measures of familiarity (GM, CF, LP and DEC) and their association with decision structure use. There is a significant association, at the 1% level of significance (see Table 8.7), between reported familiarity or lack of familiarity with the gross margins and cash flow budgets and the use or non-use of these decision aids.

Further, the inclusion of the familiarity predictors in the CRGM, CRCF and CFG discriminant functions resulted in relatively high levels of overall predictive accuracy and very low level of miss-prediction of membership of the no-use groups (see Appendix 4.1,4.2 and 4.3).

This is taken as evidence in support of the proposition that familiarity with a particular decision aid is a dominant constraint on the utilisation of the aid. However,

this proposition does not contend tha: the overcoming of the constraint dictates use of the aid. Its only contention is that, in the absence of capacity to overcome the constraint, an individual will be barred from using the decision aid or exhibiting the particular decision behaviour.

Exhibited behaviour is seen to be potentially influenced by a number of such dominant constraints and the impact of additive constraints encountered.

9.6 Additive Constraint Action

Bettman, Johnson and Payne (199)) describe the adverse affect of excessive cognitive strain on the adoption of analytical cecision structures. The basis of "additive constraint action" is suggested to be the effect on decision behaviour derived by the successive addition to strain experienced, arisinj from such factors as increasing amounts of computational effort, conceptualisation requirements and the dissonance arising from the ambiguity producers associate with the forecasts that they make to fill the data sets required by particular decision structures (behaviours).

The survey generated data on a rarge of factors in the producers' decision environment that could potentially act as additive constraints. These include producers' perceptions of their ability to predict future prices, input costs and production levels (see Figures 8.5 to 8.15), perceptions of the validity of external predictions, managerial resources, computative power and the ability of a decision aid to accommodate the factors influencing producers' production decisions.

9.6.1 Computational capacity

Access to computing capacity (Ccmp) was considered a potentially important constraint on the adoption of analytical decision structuring, due to associated reduction in computative and mental effort recuired in the application of such decision aids (see section 2.3.4). The ownership of computers is seen to be a significant predictor of gross margins utilisation once the familiarty predictors (GM and CF) were removed from the discriminant function (see Alternate Discriminating Function Current Gross Margins (CRGM), Section 8.12.3). The predctor failed to attain the (criterion) 0.3 level of correlation with either the original current cash flow discriminant function or the

alternate current cash flow (GM and CF familiarity predictors removed) discriminant function. However, in both the original current cash flow group (CFG)discriminant function or the alternate current cash flow group discriminant functions, the Comp predictor had positive (0.35473 and 0.42117 respectively) correlations with the second functions. In both the original and the alternate case the second function was significant in the separation of the cash flow groups 1 and 2, with the cash flow group 1 exhibiting higher mean scores on the second function.

The association between computer ownership and current gross margin non-user/user and cash flow groups suggests that an additive computational constraint is evident in the producers decision behaviour. However, the crude measure of human resources available in the enterprise (the number of people involved in the management of the farm, implying greater analytical resources) used in the survey (Appendix 1) failed to show any significant association with decision structure utilisation.

9.6.2 The predictability constraint

A basic postulate of the "Contingency Model of Market Information Utilisation in Agricultural Decision Making" is that, unless the expectations (estimates of production levels, input costs, market prices or market risk measures) ultimately destined for input into a decision structure are of an adequate degree of accuracy and are viewed as being adequate by the producer, analytical decision structures will be considered less than appropriate to real-world agricultural decision making. That is, analytical decision behaviour will be constrained in the absence of valid external forecasts or where producers associate high levels of ambiguity with their own market expectations.

Figures 8.5 to 8.15 indicate that different decision groups believe that they can predict price, input costs and production levels to varying degrees of accuracy. In general the groups have greater confidence in their ability to predict production and input costs than prices.

Three principal factors were identified, see Table 8.14 and Appendix 3. Factor 1 (pdict-1), is taken to represent the underlying belief of producers in their ability to predict. Producers exhibiting high scores on this factor have a low regard for their own ability to predict input costs, production levels and product prices.

The second factor (pdict-2)differentiates sheep/grain producers from cattle producers. High scores on this factor indicate a lack of confidence in predicting input costs, production levels and prices associated with cattle.

The third factor (pdict-3) (11.5% of the variation) identifies the disparity in the accuracy with which producers believe they can predict input cost and production as opposed to product prices. Producers' lack of confidence in their ability to predict input costs associated with sheep and grain production is positively associated with this factor.

Comparison of between-decision structure group means for the variable Pdict-1 indicates significant differences between cash flow groups and current cash flow non-user/user groups means at the 5% level of confidence. On the basis that this variable reflects the producers' overall confidence in their ability to predict input costs, production and prices, these differences are held to be supportive of the proposition that ambiguity associated with producer-generated expectations act as an additive constraint to the adoption of these decision aids

The negative correlation between the Pdict-1 (-0.42041) in the Alternate Cash Flow discriminant function (Table 8.27) and the negative correlation between the Pdict-1 (-0.48681) in the Alternate Cash Flow Group discriminant function 1 (Table 8.33) is consistent with the statement that producers' with lower perceptions of their ability to predict are less likely to adopt cash flow budgets as a decision structuring aid.

Similarly the negative correlation between the Pdict-3 (-0.31963) with the Current Gross Margins discriminant function (Table 8.18)and (-0.46493) with the Alternate Current Gross Margins discriminant function is supportive of the contention that confidence in the ability to predict input cost and production outcomes is important in growers' adoption of gross margins as a decision structuring aid.

External forecasts may be integrated into personal estimates of prices or be adopted as an alternate to the personal estimates. In either case, these forecasts will need to be viewed by producers as having an adequate level of validity if they are to significantly impact on the decision process.

Producers' perceptions of AWC, AMLC, AWB and ABARE forecasts (Figures 8.16 to 8.19) indicate that they are viewed, in general, as being less reliable than individual own estimates.

Examination of the cumulative distributions of cash flow groups perception of forecasts from AWC, AMLC, AWB and ABARE (Figures 8.16, 8.17, 8.18 and 8.19) show between-source differences in perceptions of forecast accuracy. However, it is apparent that producers exhibit a degree of consistency in their perceptions of external forecasts. Factor analysis of the data for all four sources indicates that 62.0% of the variation could be accounted for by a single factor (Section 8.10.1). Producers with high scores ("Forecast" variable Appendix 2) on this factor have a low regard for the ability of external agencies to predict prices.

The variables Pdict-1 and Forecast are positively correlated (0.3498 / p= .001) indicating that producers who have confidence in their own ability to predict input costs, production and prices are also likely to hold external agency forecasts in higher regard than producers who have a low level of confidence in their own forecasts.

Within the discriminant function analysis carried out the generally negative correlation between the Forecast variable and the functions separating users and non-users of cash flow budgets, is consistent with the proposition raised earlier. However, it is necessary to note the relatively low level of the correlation between the variable and the discriminant function.

9.6.3 Fit of decision aid and problem conceptualisation

It is suggested that miss-fit between the degree of problem conceptualisation inherent in the decision aid and producers own conceptualisation of their management problems, constitutes an additive constraint, within the frame work of the hypothesised "Contingency Model of Market Information Utilisation in Agricultural Decision Making".

The survey approach adopted made it difficult to gain a detailed insight into the level of problem conceptualisation adopted by producers, their understanding of the stochastic nature of their economic environment, or their perception of the adequacy of a particular decision structure's description of their conceptualisation of any particular problem.

However, the survey did provide some measure of the factors which producers consider of importance in planning next year's production.

Significant between-decision structure group differences in the weight given to current rotations, stock on hand, future prices, current prices and the production environment were observed (see Table 8.12). Producers who give greater weight to what can be termed physical drivers of production planning (rotations, stock on hand) are less likely to use economic decision aids such as gross margins and cash flow budgets. Producers placing greater weight on current cash flow and future prices in planning future production are more likely to use economic decision aids such as gross margins and cash flow budgets.

The 8 decision weight variables were collapsed into 4 factors (see 8.8.1 and 8.8.2) with the following interpretation attributed to each factor. Individuals with high scores on the first factor (Dwght-1) were termed "economic maximisers" as they placed emphasis on rotations, stock on hand, current prices and future prices in their production decision making.

Producers with high scores on the second factor (Dwght-2) were considered to be producers constrained by cash flow problems. These producers placed emphasis on future prices and current cash flow in making production decisions.

High scores on the third factor (Dwght-3) are considered to identify producers that are not cash flow dependent and reactive to their own experience, current (past) prices and past production experience.

High scores on the fourth factor (Dwght - 4) are taken to be suggestive of a livestock producer, production orientated, reactive to past production experiences and realised prices.

The positive correlation exist between the, Dwght-1 variable and the Alternate Gross Margins Discriminant Function (Table 8.20), the Alternate Cash Flow Discriminant Function (Table 8.27), and the Alternate Cash Flow Group Discriminant Function 1 (Table 8.33). It is suggested that this indicates that producers consider to be "economic maximises" are more likely to find adequate fit between their problem conceptualisation

and that inherent in gross margins and cash flow budgets, than those producers who exhibit low scores on the Dwght-1 factor.

Similarly the existence of positive correlations between the, Dwght-2 variable and the Alternate Cash Flow Discriminant Function (Table 8.27), and the Alternate Cash Flow Group Discriminant Function 2 (Table 8.33) is further evidence in support of the conceptualisation fit postulate.

In summary, as producers place greater emphasis on future prices and current cash flow they are more inclined to use the analytical decision structuring aids (gross margins and cash flow budgets) whereas those placing emphasis on physical production constraints (rotations and stock on hand) are less likely to utilise these decision structuring aids. It is difficult at this point to judge, in the latter case, whether these producers reject the decision aids on the basis of their belief that the aids themselves are not an adequate conceptualisation of the problems facing producers or whether producers fall back to heuristic or unaided analytical decision making as a result of their lack of confidence in the data set required by these decision structures.

9.7 Summary

The survey data and the analysis presented contain some indications of constraint driven volitional decision behaviour amongst the group of producers surveyed. The evidence further supports the notion of both dominant and additive constraint action, with an observation of a "familiarity constraint" illustrating the former and observations of "computational constraints", "predictability constraints" and "conceptualisation fit constraints" the latter.

However, the data and analysis presented can not be held to rigorously validate the hypothesised "Contingency Model of Market Information Utilisation in Agricultural Decision Making".

Chapter 10

CONCLUSONS AND IMPLICATIONS

10.1 Introduction

At the beginning of this study the intent was to develop a set of prescriptive guidelines for market reporters by which they nay improve the delivery and the standard of market information on which primary producers make decisions.

The intended approach to the subject area was basically a reductionist approach, define the problem, segment the the problem so that it was able to be manipulated in an experimental sense, develop a hypothesis, prove or disprove this hypothesis and from this stand point then develop the se of prescriptive guidelines desired.

The process foundered on the fact that it was impossible to define the target, that is the idealised data set that producers need for their decision making. It became evident that it was first necessary to define or describe the range of producers' data/information demands, through a process of descr bing the types of decisions producers make and the scope of the data sets required for particular decisions. Having achieved this, the processes of, and the mechanisms involved in, the filling of these data sets become the areas of critical importance to any a tempt at improving data/information flow to producers. Consideration of the process of filling the data demand subsequently led to the development of the contingency approach, presented in Chapter 6.

As in the fifth level of decision making described earlier, there was a need to restrict the scope of this thesis (restrict the decision world). The boundaries drawn loosely constrained the work to the investigation of fulfilling the market data/information needs of producers looking at production decisions 12 months in advance. However, it is suggested that the principles developed in this thesis are generally applicable to the study of short- and long-term decision making and production data/information demands.

It was necessary to differentiate heuristic, unaided analytical and analytical (decision structure aided) decision making. The application of Humphreys and Berkeley's (1983)

decision taxonomy has allowed the development of a parallel classification of decision structuring aids (cashflow budgets, portfolio theory, decision theory, etc), described in the literature (see Chapter 2), on the basis of their applicability at the various levels of problem conceptualisation described. The data demands of the decision structuring aids can then be seen to describe the data demands of decision making at the particular level of conceptualisation, whether or not that decision making is in its nature aided analytical or unaided analytical.

Here, heuristic decision making is seen as the fall-back position, where deficiencies in the data/information set or other constraints prevent the application of an analytic approach to decision making. As such, heuristic decision making can be seen as a form of satisficing in the face of constraints such as the lack of time, computative capacity, etc.

Reversion to heuristic decision making may follow the application of analytical decision structures, such as gross margins and cash flow budgets, where producers include in their conceptualisation their decision world concepts of risk and uncertainty but are constrained from the inclusion of these concepts in their analytical decision behaviour by the lack of an adequate data set or knowledge of the appropriate decision structuring aids (for example, stochastic computerised activity budgeting).

10.2 The Contingency Approach

Three assumptions have been made in the development of the contingency approach presented in this thesis. First, it is assumed that producers are capable of problem conceptualisation at all levels, but do not engage in the conceptualisaton or computation of every decision at the highest level possible. For example, a producer considering the sale of lambs may not in fact question the advisability of selling in the paddock versus the local auction verses over the hooks sales, nor consider questions relating to communication channel efficiencies which may impact on the validity of the market reports they rely on, every time they make the decision to sell. However, it is assumed that they have the cognitive capacity to conceptualise the problems they face in light of such factors.

Second, it is assumed that the actual application of aided analytical decision making

indicates that producers consider the data set available to them is adequate to meet the data demands of the decision structure employed. A significant qualification to this statement is that, if the decision structure is employed as a reporting mechanism (for example, cash flow budgets constructed for the bank manager), the data adequacy constraint can be relaxed.

The third assumption is that aided analytical decision making represents an advance over heuristic decision making, such that the basic aim should be to assist producers in the adopting the former.

The contingency approach described is basically a linear model in that it traces the generation of data in the decision environment, its communication to producers, the cognitive activities involved in the storage and manipulation of the data, the formation of expectations, through to its processing in the decision structure being applied. The perceived factual and conceptual adequacy of the data set (the producer's set of expectations) along with other constraints such as limitations on cognitive capacity and knowledge of decision structuring aics are seen to limit producers' decision making behaviour.

This linearity is a significant aid to the investigation of the processes involved; however, it can be seen to be a conceptual limit if the potential for counter-current flows is recognised (see Figure 4.2).

Evidence supporting the validity of the contingency approach to the understanding of agricultural producers' decision behaviour has been generated in this thesis in two ways. First was the identification of constraints on the data/information processing chain reported in the general literature reported in Chapters 3, 4 and 5. For, if it is to be argued that the contingency approach is invalid, a rational explanation has to be found as to why primary producers, as a subset of the general population, and the information systems servicing them, are exempt from, or immune to, the constraints identified. It is extremely difficult to envisage any causal effect derived from physical or managerial involvement in agriculture that would generate such immunity or exemptions.

The second source of evidence in support of the contingency approach is derived from the survey work reported in Chapters 8 and 9. Here, the argument in support is based on

the assumption that the cumulative impact of the constraints encountered throughout the data/information processing chain is reflected in the overall confidence producers have in their own forecasts (expectations of the current levels of variables such as price, production and input costs) required to fill the decision data set.

In the survey work presented in Chapters 8 and 9 producers' expressions of their confidence in their ability to predict production, input cost and product price variables have been used as an indirect measure of their beliefs as to the adequacy of the data sets available to them. These proxies may be criticised as a measure of producers' ability to formulate expectations as to market risk/uncertainty measures or ambiguity measures for inclusion in decision structures applicable at higher levels of problem conceptualisation. However, the use of the proxy is considered appropriate where decision makers appear to be only using decision aids applicable at the lowest level of problem conceptualisation.

The significant between-group (current cash flow non-user/user and cash flow groups) differences in mean score on the Pdict-1 variable (derived from the proxies discussed above)(9.1.5) supports the contingency hypothesis. However, they do not shed any light on the causal factors of variations in producers' expressions of their confidence in their ability to predict production, input cost and product price variables. Development of an understanding of the causal effects will require further investigations relating to variations in the expression of the conceptual elements described in the contingency model (Chapter 6).

An example of the application of the model in developing an understanding of the causal relationships can be seen in the exploration of the relationship between the Pdict-3 variable and the second of the Alternate Cash Flow Group (CFG) canonical discriminant functions (8.13.3). The Pdict-3 variable has high positive correlations with the variables input costs sheep (INSH), production sheep (PSH) and production grain (PG) and is negatively correlated with the Wool, cast for age sheep (CFA), lamb (LMB) and cattle (C) price prediction variables. Application of the model would suggest that explanation of the apparent differences in cash flow group 1 and cash flow group 2 perceptions of their abilities to predict production, input costs and product prices may be sought in variations relating to concepts of integration (Figure 6.8) especially those associated with the selection of inferencing techniques (3.3.9). The prediction of market

prices can be considered a task characterised by the dominance of an unknown external generator in which heuristic and selective bias could be expected to be a major influence in the final predictions, whereas prediction of input costs could be viewed as a practiced task characterised by known external generators. Prediction of production outcomes will have, to some degree, an internal characteristic (Table 3.1).

The impact of the practiced and the unpracticed characteristics of prediction task on the final confidence producers place in their forecasts can be seen in the clear differentiation of producers with cattle enterprise and those without cattle, evident in the variable Pdict-2 (Table 8.14).

10.3 Implications for Data/Information Providers

The work presented in this thesis is only of relevance to the data/information provider who is concerned with the ultimate utility of the product they are providing. Suppliers of services who are concerned with the validity of decisions, made by producers, based on the data sets to which they contribute will, have by reason of this concern, an interest in the real and perceived adequacy of producers' expectations.

The adequacy of a data set can only be judged in the context of the decision method (heuristic, unaided analytical and aided analytical) and the decision structure employed.

Suppliers may adopt a demand driven approach, attempting to supply data to fulfil the demands of a predetermined decision structure. These suppliers will need to follow the process of delineating the nature of the data set demanded, followed by a process of examination of the conceptual elements of the model in the context of their operating environment. Such an examination should highlight the limiting factors (constraints) on the delivery of data/information to the clients. Having identified these factors their expression will only need to be at the minimum threshold levels required to service the demand.

Suppliers adopting a contingency approach to client servicing will need to take a holistic view of data/information supply. The approach, then, to maximising data/information utility is one of examination of all conceptual elements as expressed in the particular environment and attempting to raise all constraints to allow producers to

operate at the highest economic level of problem conceptualisation.

Such an approach will involve suppliers in the consideration of, and involvement in, processes all along the data/information/decision chain, from the development of appropriate concepts of data, the communication of such concepts and explanation of data transformation/summation techniques to their clients. Further, suppliers will need to be involved in the education of growers in areas such as data integration techniques and decision structuring.

It is through the latter approach that the greatest potential contribution to raising the conceptual level of on-farm analytical decision making appears to be. Banks, financial institutions, accountants and pastoral houses, by reason of their predominance as information sources (Figures 8.20 and 8.21), would appear to be logical candidates to undertake such actions.

However, such actions by these institutions may appear to be overly altruistic as the temporal and public good nature of most market information limits the ability to extract a financial remuneration from clients. This, however, does not suggest that there is not significant potential for economic gain from more appropriate market data/information and the greater application of analytical decision structures to overcome the observed low level of decision structuring and of problem conceptualisation in agricultural decision making.

10.4 Future Directions for Research

The review of the literature conducted here has revealed a substantial range of agricultural decision structuring aids applicable across the first three levels of problem conceptualisation and some generalist decision structures applicable at the fourth level of decision conceptualisation.

The survey work conducted indicated that there was only limited (both in volume and conceptual complexity) aided analytical decision making being undertaken on farms.

These two observations suggest that the development of our understanding of the constraints associated with the concepts developed in the model presented has the

potential to significantly raise the level of decision making efficiency, and hence the levels of returns to agricultural enterprises.

In the pursuit of this goal this work can only be considered a scoping document.

The model presented has been developed on the basis of a large amount of literature derived from non-agricultural specific studies and as such has required extensive extrapolation. This has occurred, for example in the fields of human inferencing, problem conceptualisation and information systems theory. As a result of this extrapolation there is a need for validation of a significant amount of this work in an agricultural context suggesting a move towards a much more reductionist approach to work in the area associated with specific constraints identified by the model.

As stated at the beginning of this work the emphasis has been on market information and production decisions with a 12 month time span. The work has consequentially ignored both short term marketing decisions and longer term decisions, such as property acquisition. However, the concept of constrained behaviour appears to be of some potential value in understanding producers' short and long-term decision behaviour. However, the extension of the concepts put forward in this thesis to these situations, will need to be based on a substantial degree of prior validation of the concepts in relation to medium term decisions.