Farm Economic Analysis: Mid-Talbragar Catchment

iCAM client report no. 2003 TARGET 7

iCAM client report prepared for the
TARGET project—a pilot project under
the New South Wales Salinity Management Strategy

December 2002

The Australian National University
Integrated Catchment Assessment and Management (iCAM) Centre

Funding: The TARGET project is funded as part of the National Heritage Trust Murray-Darling 2001 program with joint funding from the Commonwealth and the State Salinity Strategy in New South Wales.

Oliver, M., Hall, N. and Watson, W. 2002, *Farm Economic Analysis: Mid-Talbragar Catchment*, Integrated Catchment Assessment and Management (iCAM) Centre report no. 2003 TARGET 7, prepared for the TARGET project, Australian National University, Canberra.

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ACKNOWLEDGMENTS

The iCAM team gratefully acknowledge the support, for the TARGET project, of the New South Wales and Commonwealth Governments.

We also wish to thank Allan Nicholson and colleagues at the Department of Land and Water Conservation (DLWC) NSW as well as Sandra Walpole of the NSW National Parks and Wildlife Service (formerly with DLWC).

We acknowledge the contribution made by the Department of Agriculture to this project through the publication of gross margin data.

We particularly wish to thank the producers who provided the profiles data that forms the basis of this analysis.

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Executive summary

The *Tools to Achieve Landscape Redesign Giving Environmental /Economic Targets Project* (TARGET) is a cornerstone project of the NSW Salinity Management Strategy, which is jointly funded by the Commonwealth and New South Wales Governments under the National Heritage Trust Murray-Darling 2001 program. A major objective of the TARGET project is to facilitate large-scale land use change in the Lachlan and Macquarie catchments and the Little River, Mid Talbragar, Weddin and Warrangong sub-catchments.

A key component of the TARGET project is to analyse the financial consequences of current farming practices and proposed management actions in the four focus sub-catchments. The proposed management actions are based on generally accepted "no regrets" biophysical principles and processes relating to natural resource and environment management, particularly salinity management.

Six management actions have been selected for the Mid-Talbragar farm level analysis:

1. Farm forestry
2. Saline agroforestry
3. Remnant vegetation conservation
4. Riparian zone conservation
5. Perennial pastures
6. Saline pastures

The farm level analysis involves using a constructed 'reference' farm to analyse the relative profitability of each selected management action as well as a combination of management actions. This report presents the farm level economic analysis results for a hypothetical reference farm that is broadly typical of properties with salinity management problems in the Snake Gully sub-catchment of the Mid-Talbragar catchment. The physical characteristics (such as farm size, crop/pasture areas and enterprise types) of the reference farm are based on the average results from the producer profiles study. While broadly representative of farms in the catchment there are nonetheless important differences between the reference farm and the average of catchment farms. The Mid-Talbragar reference farm is assumed to be 640 hectares in size with 280 hectares devoted to grain crops (wheat, canola and triticale) and 345 hectares to pasture.

A model was developed specifically for the analysis. The TARGET model is a multi-enterprise, multi-period, whole-farm analysis tool with an emphasis on 'what if' types of analysis.

The economic analysis involves comparing the Net Present Value (NPV) of farm costs and returns from a base scenario with costs and returns from each management action. The base or "business as usual" scenario is simply the reference farm assuming no further implementation of any management action.

In this study, the analysis focuses solely on the effects of the management actions on producer's incomes and future financial sustainability at the farm level. No quantitative attempt is made to determine the catchment-wide or down-stream biophysical, social or economic effects of implementing management actions.

The TARGET project provides a variety of assistance measures—such as financial assistance, training courses and provision of technical advice—as incentives for landholders in the Mid-Talbragar catchment to implement management actions. The direct financial impacts of these assistance measures are estimated as part of the analysis.

Analysis results

1a. Forestry – hardwoods

Planting 60 hectares of land (around 6 percent of total area) to a commercial hardwood forest results in a loss of NPV of around $90,000 (no assistance) and $35,000 (with assistance).

1b. Forestry – pine

This second forestry scenario, planting 60 hectares to commercial pine, results in a loss of NPV of around $106,000 (no assistance) and about $51,000 (with assistance). The major factor behind the relatively low profitability of plantation forestry is the long wait until a return is realised.

2. Saline forestry

Planting 20 hectares of salt tolerant trees around saline discharge sites results in a reduction of NPV of about $13,600 (no assistance) and $5,600 (with assistance). By accessing the assistance available under this management action, producers would be within around one percent of the base scenario result (not accounting for any environmental benefits).

3. Fence-off remnant vegetation

Fencing off remnant vegetation produces a loss of NPV of about $15,000 (no assistance) and $7,500 (with assistance). Again, by accessing the assistance available under this management action, producers would be within around two percent of the base scenario (not accounting for any environmental benefits).

4. Fence-off creeks/rivers

Fencing off creeks and rivers produces a reduction in NPV of about $25,000 (no assistance) and $13,500 (with assistance).

5a. Increase area of perennial pasture– reduce annual pasture

Replacing 75 hectares of annual pasture with perennial pasture is estimated to reduce NPV (no assistance) by $8,500. With the assistance offered, NPV is estimated to increase by $9,000 because most of the costs of the change are covered by the assistance package.

5b. Increase area of perennial pasture – reduce crop area

In contrast, replacing 75 hectares of profitable crop area with perennial pasture is estimated to reduce NPV by about $126,000 (no assistance) and by $104,000 (with assistance).

6. Utilise saline pastures

Fencing off 20 hectares of saline areas and planting them to relatively salt tolerant pasture species is estimated to reduce NPV by around $6,800 (no assistance and by $5,600 (with assistance).

7. Combination – Saline forestry + saline pastures +fence-off remnant vegetation

Establishing saline forestry in conjunction with saline pastures and fencing remnant vegetation is estimated to reduce NPV by almost $46,600 without assistance) and around $10,800 (with assistance).

Sensitivity

All management actions were run at higher and lower discount rates to test the sensitivity of the NPV results. Discount rates are key variables in long-term analysis such as this. It was found that all scenarios were sensitive to discount rates. The sensitivity was greatest for the management activities involving significant areas of commercial forestry and for which there are large initial implementation costs and long periods before returns are received.

The sensitivity of NPV to tree growth rates was also tested. All the management actions with large financial consequences involve forestry and the yield of trees in the Mid-Talbragar catchment is uncertain. The results were shown to be sensitive to assumed tree growth rates. Since actual growth rates in the catchment are not known this uncertainty is an additional cost to be taken into account in planning forestry activities

Summary of analysis

- Almost all the management actions considered would reduce NPV from the base scenario NPV result.

- With the exceptions of actions involving farm forestry and the substitution of crop area with perennial pasture, all actions (with assistance) produce NPVs within five percent of the base scenario NPV.

- The reductions in NPV may be offset by environmental gains and greater future productivity of farms.

- The benefits of most of the management actions would not need to be large to make them worth adopting given the assistance available.

- Results are affected by changes in discount rates; the main effects are on the plantation forestry activities. The ordering of activities by NVP is unchanged by changes in discount rates.

- Changes in tree growth rates significantly affect both NPV and farm financial results. Tree productivity in the catchment is a key variable in determining the profitability of plantation forestry for salinity management.

The analysis takes no account of environmental benefits that may flow from implementation of any of the management options. In some cases the benefits of management actions accrue to the broader community (eg. biodiversity benefits). Hence, the difference between the NPV of the base scenario and the NPV of a management action can be interpreted as the environmental break-even value.

Analysis in this study indicates that the lack of appropriate policies and programs to reward producers for the environmental benefits received by the community is currently a significant impediment to the adoption of management actions by producers. There is an urgent need for further research and the development of cost sharing mechanisms to ensure the adoption of management actions designed to achieve integrated catchment management objectives.

1

Introduction

A recent assessment of salt trends in the Murray-Darling Basin (Williamson et al. 1997) highlighted the severity of salinity problems confronting the Central West Region of New South Wales (catchments of the Macquarie, Lachlan and Castlereagh Rivers). For example, it is predicted that the Macquarie River at Narromine will be unfit for human consumption 30 percent of the time by 2020, and 55 percent of the time by 2050.

It is increasingly being recognized that significant efforts are required to halt and eventually reverse salinity and water quality problems. In many cases, a change at an individual farm level is unlikely to result in much change to what is usually a regional scale problem. Effective solutions may require changes to land use practices and production activities over whole catchments drainage basins (Hajkowicz, Hatton, Meyer and Young 2001). This concept of large-scale land use change is sometimes referred to as "landscape change or redesign."

The *Tools to Achieve Landscape Redesign Giving Environmental /Economic Targets Project* (TARGET) is a cornerstone project of the NSW Salinity Management Strategy that is jointly funded by the Commonwealth and New South Wales Governments under the National Heritage Trust Murray-Darling 2001 program. A major objective of the TARGET project is to facilitate large-scale land use change in catchment areas that have been identified as being major contributors to Murray-Darling Basin salinity. These areas are the Lachlan and Macquarie catchments and the Little River, Mid Talbragar, Weddin and Warrangong sub-catchments.

A number of on-farm management actions have been proposed by the Department of Land and Water Conservation (DLWC) to target natural resource and environmental problems, primarily salinity, in each of the four sub-catchments. These are largely no regrets actions which cause no harm if implemented and include increased use of native, perennial and saline pastures, establishment of farm forestry and saline forestry plantations, increased use of conservation farming practices, intercropping and, increased fencing off of waterways and regenerated/remnant vegetation. In the second year of the TARGET project the range of options has been widened to encourage more farmer based initiatives to be implemented. The proposed management actions are based on generally accepted biophysical principles and processes relating to the management of natural resource and environment problems, particularly salinity problems.

What is not as well known is how economic factors influence land use change. In particular, there is little existing information on the relative profitability at a farm level of proposed alternative land use management actions.

A key component of the TARGET project is to analyse the financial consequences of current farming practices and proposed management actions in the Lachlan and Macquarie catchments and the four focus sub-catchments. This report presents the farm level economic analysis results for a hypothetical reference farm that is broadly typical of properties with salinity management problems in the Snake Gulley sub-catchment of the Mid-Talbragar catchment. Results of similar analyses for properties in the other three focus catchments are available in related TARGET project reports.

The farm level analysis complements the producer profiles work carried out as part of the TARGET project. Producer profiles are a survey based approach to assessing socio-economic and biophysical sustainability and involves collection of data on the social, economic and biophysical characteristics from a selected sample of farms. In particular, the profile project identified impediments to producers' participation in community based strategic management actions. Data collected as part of the producer profiles project has been used to construct the hypothetical farm model.

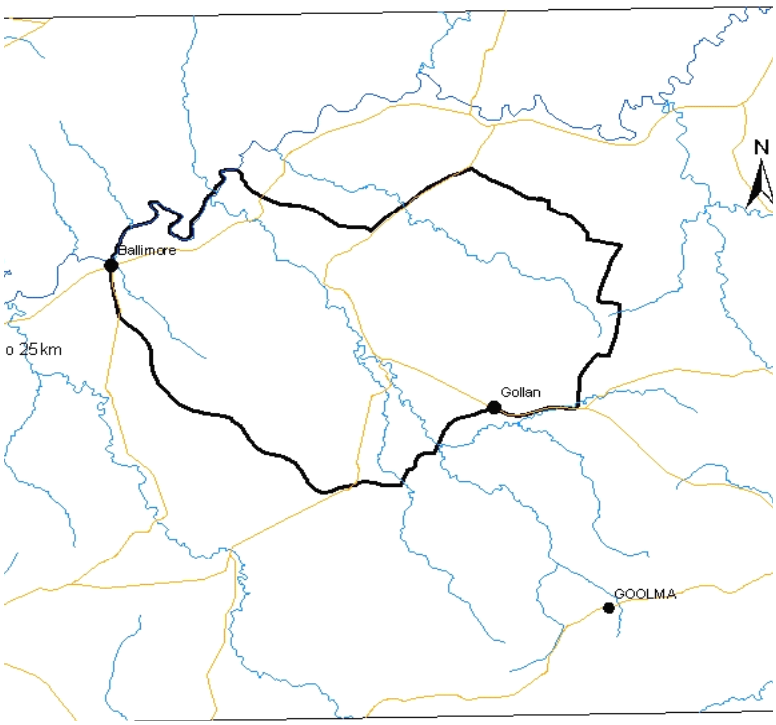
The Integrated Catchment Assessment and Management (iCAM) Centre has prepared a separate report on the producer profiles study for the Mid-Talbragar catchment.

2

Mid-Talbragar Catchment

The Mid Talbragar catchment is part of the greater Macquarie Catchment that is located in the central northern part of NSW.

Figure 1. Catchment location



The Talbragar River, from which the catchment takes its name, is one of the main tributaries of the Macquarie River. The Talbragar River joins the Macquarie near the town of Dubbo. The study area lies predominantly within the Spicer's Creek catchment, approximately 40 kilometres north of Wellington and 40 kilometres east of Dubbo.

The Mid Talbragar social catchment is different from the topographic catchment of Spicer's Creek and is based on four previous Landcare areas. There are over fifty properties in this catchment, of which a sample of 24 was used to develop sustainability profiles. The Snake Gulley sub-catchment, which has a significant salinity management problem, is the focus for the following farm economic analysis. Sustainability profiles from 13 properties in the sub-catchment were used as the basis for the development of a reference property.

Catchment overview

The following summarises the important findings from the Mid Talbragar producer profiles report that was based on a survey of 24 farms in the catchment.

The main primary production enterprises in the Mid Talbragar catchment are dryland winter cropping, sheep and cattle production. On average, about 66 percent of property area was under pasture, predominantly improved perennial pasture. The area devoted to farm forestry, revegetated land and remnant vegetation was 9 percent of total property area. Farm forestry comprised the lowest proportion of total tree area at about one percent. Remnant vegetation comprised the largest proportion with 87 percent and revegetated area at 12 percent.

Sheep and cattle were the main livestock enterprises with about 28 percent of total cash income coming from livestock sales and 16 percent from wool sales. A further 27 percent of cash receipts came from grain sales. A majority of surveyed properties grew crops with the largest area devoted to wheat. Smaller areas of canola, barley, oats, lupins and fodder crops were also grown.

The owner-operators supplied the majority of property labour – an average of 20 months out of a total of 24 months. An average of six months per property was worked off-property. The reliance on family labour suggests that there may be little flexibility in labour supply and the proportion of off-property work indicates that there is probably little owner-operator labour reserve available for new work associated with the management of natural resource and environmental issues.

The land condition problems of most overall concern were weeds, kangaroos, foxes and salinity/high watertables. The average area affected by salinity/high watertables was estimated at 9 hectares with up to 100 ha affected in more severe cases.

In the 1999-2000 financial year, property cash receipts averaged about $157,000 per property with cash costs of around $128,000. Net cash income averaged $29,000. Average value of assets was over $1.3 million and average debt per property was $175,000.

3

Project management actions

TARGET is both a research and an implementation program. The implementation is focussed on managing natural resources in general and salinity in particular, in each of the four focus catchments by applying on-farm management actions. A cost sharing protocol for each action has been developed by the DLWC. This chapter provides background information as well as details of the nature of producers' usage of the six management actions selected for the Mid-Talbragar farm level analysis.

The management actions are:
1. Farm forestry
2. Saline agroforestry
3. Remnant vegetation conservation
4. Riparian zone conservation
5. Perennial pastures
6. Saline pastures

Outline of management actions

1. Farm forestry

Planting trees can help manage salinity by reducing infiltration of rainfall to the groundwater; interception of lateral flows; and, drawing down of shallow aquifers. However, tree planting for salinity management in the Mid-Talbragar catchment may need to be on marginal areas for commercial timber production where it is expected to be less profitable under forestry than under farming.

The importance of forestry for salinity control is that there is considerable scientific support for its effectiveness in recharge management. However, there are a number of possible impediments at the farm and regional scale to implementation of forestry based salinity management. These impediments, outlined in appendix A, include climate, timing and uncertainty regarding long term returns, capital costs, distance from market, tree growing skills and relative enterprise profitability. A report entitled "Forestry Economics for the Lachlan and Macquarie Catchments" discusses these in more detail (Hall 2002).

2. Saline agroforestry

Saline agroforestry is the growing of trees in or near saline areas to remove the excess water. Trees cannot survive indefinitely on very saline sites because the tree extracts the water and leaves the salt behind. Thus, the site around the tree will become saltier until the tree eventually dies.

There is also a place for interception planting to control inflows of shallow groundwater that are not saline themselves but contribute to salinity in other areas. Under these circumstances the tress will be highly productive because of the extra water that they draw from the shallow watertables. Such trees are likely to be much more profitable than other trees planted in the same areas where growth is limited by low rainfall.

3. Remnant vegetation conservation

Remnant vegetation conservation is the retention and fencing-off of significant stands and areas of remaining native scrub and forest. Remnant vegetation conservation encourages greater biodiversity and depending on its area and location, may also assist in salinity mitigation.

4. Riparian zone conservation (fence off creeks/rivers)

Riparian zone conservation is primarily the fencing-off of watercourses to protect them from damage by stock. Fencing off creeks and rivers encourages greater biodiversity, decreases stream bank erosion and may also assist in improving water quality.

5. Perennial pastures

Perennial pastures provide ground cover and at least some transpiration throughout the year in contrast to annual pastures that die off in summer after setting seed. Hence, perennial pastures provide interception of rainfall and at least some removal of water throughout the year so that they can reduce rainfall infiltration to the groundwater, particularly at the times when annual pastures have died off.

6. Saline pastures

Discharge sites and saline soils require special management because they are a source of salt in the system as a result of wash-off processes. If discharge sites are not managed carefully with judicious grazing pressure, then the surface of the soil may become exposed and even worse, erosion of the topsoil may occur which severely complicates the nature of and time for rehabilitation and often results in a deterioration of water quality.

Plants vary in their ability to flourish under saline conditions. Where the soil is very saline there may be no possibility of establishing any productive plant species but in less saline areas suitable selection of species may provide both ground cover and profitable land use. Such species include Tall Wheat Grass, Puccinella and Strawberry clover. In some areas saltbush can also be a productive fodder crop on saline land.

Recent national and state salinity management strategies have identified the inevitability that salinity will never be totally eliminated (ie. producers will

always have to live with salinity). Consequently, considerable effort is now being devoted to the identification and development of productive uses of saline land. It is likely that in the near future a number of new options will be discovered which significantly increase the productivity and profitability of saline lands (eg. salinity tolerant lucernes species and salt wort—an oil seed crop).

Overall implementation of actions

Table 1 summarises Mid Talbragar respondents' past implementation and their likely future implementation of management actions based on the producer profiles (refer to appendix B for more details). The table shows a mixed pattern of correlation between extent of past implementation and likely extent of future implementation.

Table 1. Past and future implementation summary

Salinity mitigation measure	Past implementation	Future implementation
Increase perennial pasture area	79%	96%
Fence off creeks/waterways	37%	54%
Fence off remnant vegetation	21%	42%
Establish farm forestry	21%	25%
Increase saline pasture area	17%	50%
Utilise saline agroforestry	12%	29%
Utilise intercropping	12%	25%

Note: Past implementation refers to the percentage of respondents who had implanted the measure to some extent during the past five years and future implementation refers to the percentage of respondents who did not rule out implementing the measure in the next five years.

For perennial pastures and to a lesser extent fencing-off creeks/rivers, the correlation was strongly positive. A majority of respondents both had, and were likely to, increase their area of perennial pasture (79 and 96 percent respectively).

The action of least popularity, intercropping, was also reasonably positively correlated. This action had been implemented the least in the past and was least likely to be implemented in the future. The remaining management actions were ranked below fencing-off creeks/waterways and above intercropping for both past and future implementation. The order of ranking changed for each remaining management action according to past and future implementation.

4

Farm analysis methodology

The farm level analysis involves using a constructed 'reference' farm to compare costs and returns from each selected management action. This reference farm has been constructed to be broadly representative of properties with salinity management problems in the Snake Gulley sub-catchment of the Mid-Talbragar catchment. An actual property was not used because of confidentiality issues. The reference farm implicitly assumes that some management actions have already been implemented to varying extents. The reference farm is discussed in more detail later in this chapter.

Two approaches are used for the comparison of costs and returns—economic analysis and financial feasibility analysis. Both approaches involve comparing farm costs and returns from a base scenario with costs and returns from each management action. The base or "business as usual" scenario is simply the reference farm assuming no further implementation of any management action.

In this study, the analysis focuses solely on the effects of the management actions on producer's incomes and future financial sustainability at the farm level. No quantitative attempt is made to determine the catchment-wide or down-stream biophysical, social or economic effects of implementing management actions.

Economic analysis

The economic analysis method used to evaluate the profitability of each management action is Discounted Cash Flow (DCF) analysis. Investments in some of the management actions under consideration (eg. farm forestry) are characterised by sizeable initial costs followed by returns in future years. To determine an investment's profitability therefore requires the comparison of costs and returns from different times. To do this, all dollar amounts are converted into today's or "present" dollar terms. This conversion process is referred to as discounting (Gittinger, 1984).

The DCF procedure comprises two main steps. The first is to construct a yearly cash flow budget for the term of the investment period. The second step is to multiply the net cash surplus/deficit for each year by a discount rate that discounts all future cash flows back to their equivalent present day values.

The discount rate used is normally either the interest rate on relevant bank loans, or, where investors use their own funds, the earning rate on investments. For this report, the discount rate used is 7.5 percent.

The DCF criteria used in this report is Net Present Value (NPV). The NPV is the sum of the annual discounted net cash surpluses/deficits throughout the life of the

project. If the NPV is greater than zero the investment is normally considered profitable. More detailed information on NPV and other DCF criteria can be found in, for example, (Ross et al. 2000) and (Makeham and Malcolm 1998).

The period for the analysis is dictated by the longest production cycle for an enterprise. Some forestry investments may need up to 40 years before the trees are ready for harvest, therefore the maximum modelling time frame is 40 years. In this study, the final harvest date for farm forests is assumed to be 30 years after planting therefore the NPV is calculated over 33 years (allows for tree plantings over the first three years and not just year one).

While not used for this study, the annuity equivalent approach provides another means of comparing enterprises with different production cycles. An annuity equivalent is the average amount of net revenue that an enterprise generates every year to produce the total NPV for that enterprise.

The economic analysis simulates the decisions facing a farmer at the beginning of the modelling period. It is not a forecast of producers' actual behaviour and experiences in the future. Although costs and prices are held steady over the analysis period, other assumptions are possible and could be simulated but constant prices and costs are more readily interpreted. There is also the fact that increases in farm productivity over time tend to compensate for falling terms of trade.

A further assumption is that the analysis is done on a pre-tax basis. The complexity of individual producers' tax situations is such that modelling tax for the representative farm would significantly increase the number of assumptions to be made and in particular would assume that taxation arrangements would be constant over the entire analysis period.

A financial feasibility budget is also calculated to highlight the extent of borrowings and the amount and timing of peak debt. In effect, it asks the question can the farm business pay its way if any of the management actions are implemented on a first time or ongoing basis. It is theoretically possible for an investment to be economically profitable (ie. NPV > 0) yet not be feasible (eg. short term debt may increase to such an extent that the farm becomes unviable).

Farm level model

Farming systems typical of the TARGET catchment areas comprise a mixture of broadacre crop and livestock enterprises. The alternative management actions proposed to mitigate environmental and particularly salinity impacts—in some cases already at least partly implemented—have been discussed in Chapter 3.

Given the considerable research and extension efforts into dryland salinity on farms throughout Australia it was possible that a farm level model suitable for the TARGET project economic modelling component was already available. Accordingly, a scoping study (Oliver, Hall and Watson 2002) was undertaken to determine if such a model was available. The scoping study revealed that none of the models reviewed was ideal for the TARGET project and those that were possibilities, would still require significant adaptation. It was therefore decided that a new model be developed for the TARGET project.

Model outline

The TARGET model was developed as a multi-enterprise, multi-period, whole-farm analysis tool with an emphasis on 'what if' types of analysis. Most financial inputs (eg. prices and costs) and production inputs (eg. yields, lambing rates) can be readily varied on a yearly basis.

The model platform is Excel, version 2000, and consists of seven main worksheets that accommodate a broad range of integrated farm enterprises including a cattle enterprise, two sheep enterprises, up to six broadacre winter crops, fodder crops and fodder production, up to four pasture types and two forestry enterprises. There are also two ancillary worksheets comprising DSE assumptions. A diagrammatic structure of the model is presented in Figure 2.

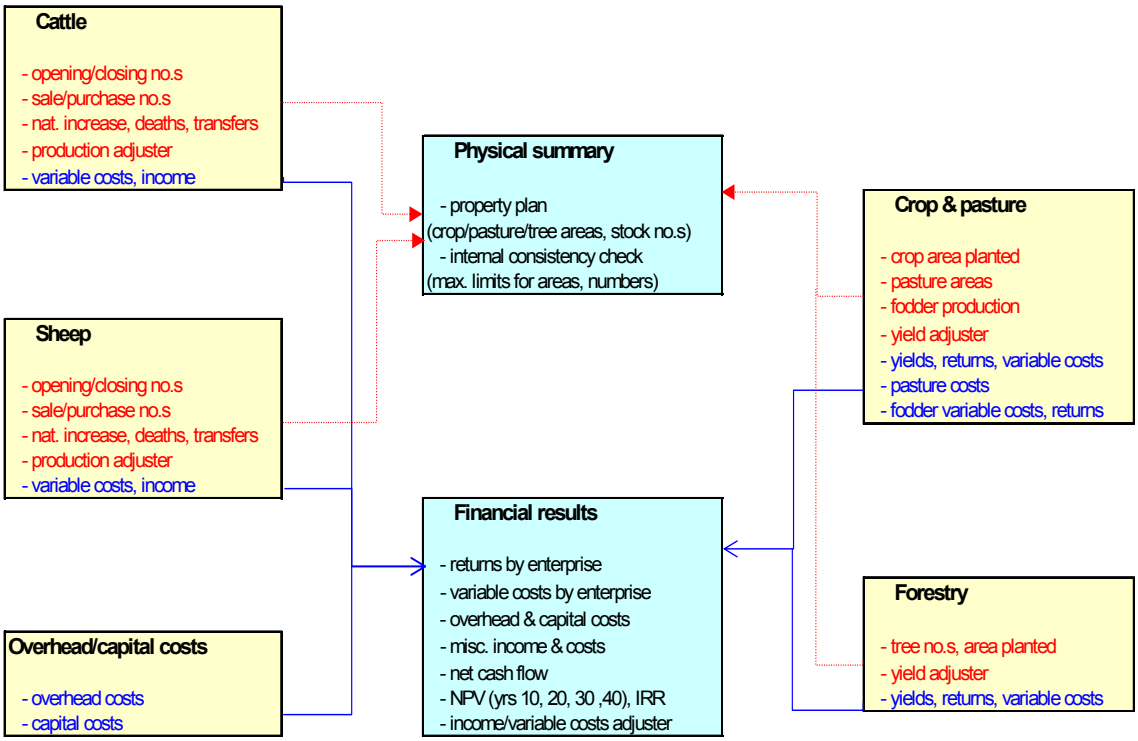
The production, costs, prices and financial measures as inputs or outputs are:

- Prices, variable costs, overhead costs and capital (including development) costs;
- Production yields, stocking rates, tree growth rates;
- Profitability measures, discounted cash flow criteria, debt levels.

As stated above, most of the enterprise production coefficients, input costs and prices can be varied on a yearly basis if necessary. This capability allows the user to take account of feedback from environmental degradation over time as well as test key variables for sensitivity analysis.

Production and financial data are generated on a yearly basis for each selected enterprise and/or development scenario. In order to account for long-term enterprises such as farm forestry, the model's analysis time frame extends to 40 years. The analysis viewpoint is effectively that of a property manager looking forward into the future. That future will include uncertainty with respect to prices, weather and government policies; therefore, the actual outcomes will not necessarily correspond to the expectations now held. This model does not have an endogenous biophysical subsystem including soil, water and vegetation components and their associated forms of degradation. A detailed description of the model is provided in Appendix C.

Figure 2. Model structure



Reference farm

As discussed earlier, a reference farm, broadly representative of properties with salinity management problems in the Snake Gulley sub-catchment of the Mid-Talbragar catchment, has been used to analyse the relative profitability of each selected management action as well a combination of management actions.

While a reference farm provides an approximation to an 'average' farm there are some drawbacks—in particular, aggregation error. Aggregation error is a technical problem with using an average farm. In any group of actual farms, each is likely to have a different resource limitation. For example, one farm may be short of land, another short of capital and a third short of labour. These limitations help to determine the cropping and management decisions for each individual farm. In the case of a constructed average farm however, these shortages are evened out because the average is simply the total for all farms divided by the number of farms. Hence the abundant capital of one farm supplies the shortage of another, possible leading to differences in management decisions

between the decisions suitable for the group as a whole and those that the individual producers would make given their individual resource mix. This problem needs to be acknowledged but is unavoidable unless a wholly imaginary farm is made up in place of the average. However an imaginary farm is likely to be even less useful than an average farm.

The physical characteristics (such as farm size, crop/pasture areas and enterprise types) of the reference farm are based on the results from the producer profiles study.

As the reference farm is representative of properties with salinity management problems in the Snake Gulley sub-catchment it therefore differs from a catchment 'average' farm both in resources such as land and in the selection of enterprises. Only enterprises used by a majority of respondents were incorporated into the reference farm. Livestock and crop enterprises used by a minority of producers were not included.

Some of the financial characteristics (such as debt level and capital expenditure on plant and improvements) were also derived from the producer surveys. Enterprise specific information, particularly variable costs, was based on gross margin data published by the NSW Department of Agriculture (NSW Agriculture 2002 various). Forestry information was gathered from a number of sources including individuals working as extension agents and industry bodies. In many cases, empirical data for forestry in the Mid Talbragar, particularly long-term growth rates, does not exist and therefore the data and assumptions used are on a "best estimate" basis.

The reference farm is constructed on a "business as usual" basis for the base scenario. That is, cattle and sheep opening and closing numbers, stocking rates and crop/pasture areas are relatively constant year-in, year-out and no additional enterprises are introduced or major additional costs incurred. Subsequently, for each of the management actions, the relevant parameters in the reference farm are adjusted to assess the long-term impacts (eg. stocking rates are progressively reduced to accommodate a decrease in pasture area because of a forestry plantation).

The Mid Talbragar reference property is assumed to be 950 hectares in size with 250 hectares devoted to grain crops and 600 hectares to pasture. Beef cattle, wool sheep and second cross lamb enterprises are run at a stocking rate of about 6.5 dry sheep equivalents (DSEs) per hectare for the pasture area. The reference property is assumed to have 23 months of owner-operator labour available each year with casual labour as required. Opening year debt is assumed to be $165,000. Refer to Boxes 1, 2 and 3 for further details on the reference farm.

Box 1. Reference property assumptions

***Total area**:*	950 ha		
***Remnant vegetation area**:*	100 ha		
***Crop area**:*	250 ha		
***Pasture area**:*	600 ha	Improved perennial	230 ha
		Improved annual	120 ha
		Native	250 ha
Saline affected area:	10 ha —	1 main site	
***Breeders**:*	Sheep	1,320 head	
	Cattle	25 head	
***Water resources**:*	Rainfall	—	585 mm
	1 creek	—	Periodic flow
	13 dams	—	26 megalitres
	1 bore		
***Family labour**:*	23 months		
***Costs**: **	Fixed	—	$20,000 pa
	Capital (net)	—	$46,000 pa
***Debt**:*	$165,000	—	at year 1

* *Variable costs and income are generated via the modelling exercise.*

Box 2. Livestock enterprise assumptions

Stocking rate maximum

6.5 DSEs per hectare of pasture area
3,900 total DSEs

Self-replacing mixed merino flock

Maximum breeders:	880 head	Lambing:	90 %
Ewe replacements:	233 ewe hoggets	Deaths:	4 %
Major sales:	56 cfa wethers 198 cfa ewes 455 mixed hoggets		

Cross-bred flock producing 2nd cross lambs

Maximum breeders:	440 head	Lambing:	100 %
Ewe purchases:	121 1st cross ewes	Deaths:	4 %
Major sales:	438 lambs at 6-10 months 100 cfa ewes at 5 yo		

Self-replacing beef herd

Maximum breeders:	25 head	Branding:	87 %
Cow replacements:	11 heifers	Deaths:	2 %
Major sales:	19 mixed yearlings at 12-15 months		

Notes: *Assumptions relating to variable costs, selling age, turn-off percentages and mortality percentages for both flocks are based on NSW Agriculture Farm Enterprise Budgets (please refer to References for titles). Total livestock numbers, wool cuts and lambing/branding percentages are largely based on profiles survey data.*

Box 3. Crop, pasture and forestry assumptions

Average crop/pasture area per year

Wheat	185 ha	Barley	25 ha
Canola	40 ha	Pasture	600 ha

Average crop yield per year

Wheat	2.5 t/ha
Canola	1.5 t/ha
Barley	1.9 t/ha

Forestry operations and yields

	Pine	**Eucalypts**
Area (ha)	60	60
Pruning (yrs)	5, 7, 9	3, 5
Thinning (yrs)	15, 22	4, 8
Final harvest (yr)	30	30
Roading (yr)	15	30
Haulage to mill (km)	60	60
Mean annual increment (m3/ha/yr)	15	8.8
Total wood available (m3/ha)	450	264
Wood - sawlog grade 1 (%)	54	92
- sawlog grade 2 (%)	4	0
- posts, etc. (%)	7	0
- pulp wood (%)	35	8

Notes: *Assumptions relating to pasture establishment costs and crop and pasture variable costs are based on NSW Agriculture Farm Enterprise Budgets (please refer to References for titles). Total crop and pasture areas, crop average yields and average pasture rotation length are largely based on profiles survey data. Average perennial and annual pasture life is assumed to be six years therefore around 58 hectares are renovated each year. It is assumed that a timber mill is established in the region (see appendix A, impediments to farm forestry).*

Analysis scenarios

Base scenario

This is the business as usual scenario. It is simply the yearly results for the reference farm assuming no change. Results from the Base scenario provide the benchmark with which results from all management actions are compared.

1a. Forestry – hardwoods

Under this scenario, it is assumed that 60 hectares of land (around six percent of total area) is diverted from pasture (all from improved annual pasture) to commercial forestry plantings. In the first of two forestry scenarios, the 60 hectares is planted to eucalyptus species. The planting period is three years—20 hectares are planted in each of the first three years. With a reduction in pasture area, maximum stocking rate is therefore also reduced from 3,900 DSEs to around 3,500 DSEs (both sheep flocks are downsized proportionally).

The 60 hectares is based on the total catchment planting area that is likely to be needed to sustain a small regional forestry industry. A study by Race (1999) estimated that a small hardwood specialty timber industry would require a total planted area of 450 – 900 hectares. An area this size would allow a sustained harvest of 15 – 30 ha/year for a local sawmill.

In general, the greater the capacity to provide processors with adequate and sustained timber supplies, the greater the chance of attracting capital investment and employment associated with timber processing.

1b. Forestry – pine

This second forestry scenario is the same as the previous scenario with the exception that Radiata Pine replaces the eucalyptus species.

2. Saline forestry

This scenario is based on salt tolerant trees (hardwood species) being planted around the main saline discharge sites. For the reference farm, the total area planted is assumed to be 10 hectares (replacing native pasture). Plantings are done over a two-year period with 5 hectares planted each year. A commercial contractor does the planting. The saline forestry plantings are not intended for direct commercial gain (ie. sale of wood). While it is possible that some use of the plantation could be made in the medium term for firewood, this option is not included in the analysis. A total of 1.5 kilometres of fencing by a contractor is also assumed in the first year.

3. Fence-off remnant vegetation

Under this scenario, any more thickly wooded areas of remnant vegetation, particularly those on recharge sites, are fenced off. For purposes of this report, a length of 4 km of fencing is assumed with all fencing done by a contractor in the first year.

4. Fence-off creeks/rivers

This scenario is based on fencing for the one creek that is assumed to run through the middle of the property with a total length of about 3 kilometres. This creek, with periodic water flow, is totally fenced-off.

A fencing contractor does the 6 kilometres in the first year. With direct stock access to the creek no longer available, water is pumped to a 10,000-litre tank and then gravity-fed to a trough. Installation of the new watering system is by family labour in the first year.

5a. Increase area of perennial pasture – reduce annual pasture area

Under the first of two perennial pasture scenarios, the 120 hectares of annual pasture are converted to perennial pasture. It is assumed that perennial species are sown down in place of annual species at time of pasture renovation—in this case during the first two years.

5b. Increase area of perennial pasture – reduce crop area

This second perennial pasture scenario is the same as scenario *5a* with the exception that 50 percent (or 125 ha) of cropping land is converted to perennial pasture. The area of crop is progressively reduced over the first three years. Cattle numbers are increased in proportion to the increase in carrying capacity associated with the increase in total pasture area.

6. Utilise saline pastures

This scenario is based on fencing-off the 10 hectares of saline areas (one site on native pasture) and planting it to relatively salt tolerant pasture species. The area would not be used for regular grazing but may be used in dry times as a small fodder reserve. A total of 1.5 kilometres of fencing by a contractor is assumed in the first year. The areas are also sown down to salt tolerant pasture species in the first year.

7. Combination – Increase perennial pasture + fence-off creeks/rivers + fence-off remnant vegetation

The combination scenario involves an increase in perennial pasture (reduce annual pasture area) in conjunction with fencing-off both creeks/rivers and remnant vegetation. With the exception of fencing-off the creek in year 2 (instead

of year 1) the assumptions are the same as outlined above for each individual management action.

TARGET assistance measures

The TARGET project provides a variety of assistance measures—such as financial assistance, training courses and provision of technical advice—as incentives for landholders in the Mid-Talbragar catchment to implement management actions. In order to be eligible for the assistance measures, landholders must usually agree to certain conditions that may involve, for example, some cost sharing, monitoring and maintenance responsibilities or allowing access to sites for field days and extension activities.

For purposes of this report, only the assistance measures that provide a direct monetary contribution are incorporated into the farm level analysis (a full list of TARGET assistance measures is available from the DLWC). The measures providing direct monetary assistance are:

Forestry

- Up to $1,500 per hectare for costs of site ripping and mounding, purchase and planting of trees and initial application of fertiliser.

Saline forestry

- Up to $1,500 per hectare for costs of site ripping and mounding, purchase and planting of trees and initial application of fertiliser.

Remnant vegetation conservation

- Up to $2,000 per kilometre for costs of erecting a stock proof fence around remnant conservation.

Riparian zone conservation (fence-off creeks/rivers)

- Up to $2,000 per kilometre for costs of erecting a stock proof fence around riparian zones.

Increase perennial pasture area

- Up to $150 per hectare for perennial pasture establishment costs (for areas in addition to existing perennial pastures).

Utilise saline pastures

- Up to $450 per hectare for saline pasture establishment costs.

5

Results

Base scenario

The reference farm financial profile (for the base scenario) is presented in Table 2. This base scenario financial profile has been designed to approximate an average farm profile based on the producer profiles information. Results from this scenario provide the benchmark with which results from the management actions are compared.

Total cash receipts (including off-farm income) are assumed to be around $205,000 while total cash costs are assumed to be about $186,000. A net cash receipt, being the amount remaining to meet personal costs and principal repayments, is about $19,000. The NPV over 33 years (at a 7.5 percent discount rate) is around $497,000. Under the base scenario, the reference farm makes positive net cash income in all years. Opening year debt is assumed to be $165,000.

Table 2. Base scenario financial profile

	$
Cash receipts	
Cattle sales	9,000
Sheep sales	52,000
Wool sales	36,000
Grain sales	87,000
Misc. sales	9,000
Off-farm income	12,000
Total receipts	205,000
Cash costs	
Variable	104,000
Overhead	25,000
Interest	11,000
Net capital	46,000
Total costs	186,000
Net cash receipts	**19,000**
NPV over 33 years	**497,000**
Opening debt – amount	**165,000**

Notes: Net cash receipts are the surplus available for personal costs and principal repayments.

Table 3 summarises the results, both with and without assistance, for each scenario. Shown are the NPV and any increase in debt above $165,000.

Table 3. Analysis results summary

Scenario	NPV (over 33 yrs) ($)	Increase in debt ($)
Base scenario	497,200	Nil
1a. Forestry – hardwoods		
▪ with assistance	462,500	Nil
▪ no assistance	406,900	51,600
1b. Forestry – pine		
▪ with assistance	446,600	Nil
▪ no assistance	391,000	53,400
2. Saline forestry		
▪ with assistance	491,600	Nil
▪ no assistance	483,600	Nil
3. Fence-off remnant vegetation		
▪ with assistance	489,700	Nil
▪ no assistance	482,300	Nil
4. Fence-off creeks/rivers		
▪ with assistance	483,700	Nil
▪ no assistance	472,500	7,400
5a. Increase perennial pasture (less annual)		
▪ with assistance	506,500	Nil
▪ no assistance	488,700	Nil
5b. Increase perennial pasture (less crop)		
▪ with assistance	392,800	35,700
▪ no assistance	371,200	52,800
6. Utilise saline pastures		
▪ with assistance	491,600	Nil
▪ no assistance	490,400	Nil
7. Increase perennial pasture + fence-off creeks/rivers and remnant vegetation		
▪ with assistance	486,400	Nil
▪ no assistance	450,700	11,900

Under the assumptions used, significant changes in debt levels were limited to the hardwood/pine forestry scenarios and the increase in perennial pasture (at the expense of crop land) so they are not further discussed. The results for NPV are discussed below.

1a. Forestry – hardwoods

Planting 60 hectares of land (around 6 percent of total area) to a commercial hardwood forest results in a reduction in NPV of around $90,000 (no assistance) and around $35,000 (with assistance).

Clearly, the provision of assistance makes a significant difference to the profitability of hardwood forestry—NPV is about $55,000 higher. The assistance provided largely offsets the site establishment and tree planting costs incurred in the first three years.

The major factor behind the relatively low profitability is the long wait until a return is realised. Effectively, discounting at reasonable rates reduces the present value of cash flows beyond about 25 years to very little. The first receipts from timber sales occur after year 30. To illustrate this issue another way, the $315,000 received in year 31 is worth about $33,000 (or around 10 percent) in today's dollars using a discount rate of 7.5 percent.

While a large increase in price might increase the long-term economic profitability of this management action, it would do little for the financial feasibility outcome. This is because the costs would be unchanged and so there would be no benefit to cash income until the wood is sold in the latter part of the period. Therefore negative incomes and increasing debts would be experienced for the first few years whatever the eventual price of timber.

1b. Forestry – pine

This second forestry scenario, planting 60 hectares to commercial pine, results in a reduction in NPV of around $106,000 (no assistance) and about $51,000 (with assistance).

2. Saline forestry

Planting 20 hectares of salt tolerant trees around saline discharge sites results in a reduction in NPV of about $13,600 (no assistance) and $5,600 (with assistance). By accessing the assistance available under this management action, producers would be within about one percent in terms of NPV of the base scenario (not accounting for any environmental benefits).

3. Fence-off remnant vegetation

Fencing off remnant vegetation produces a reduction in NPV of about $15,000 (no assistance) and $7,500 (with assistance). Again, by accessing the assistance

available under this management action, producers would be within two percent in terms of NPV of the base scenario (not accounting for any environmental benefits).

4. Fence-off creeks/rivers

Fencing off creeks and rivers reduces NPV by about $25,000 (no assistance) and by about $13,500 (with assistance). The outcomes for this action are again improved through the provision of direct assistance. By using the assistance provided under this management action, producers would be within three percent in terms of NPV compared to the base scenario (not accounting for any environmental benefits).

5a. Increase area of perennial pasture– reduce annual pasture

Replacing 75 hectares of annual pasture with perennial pasture reduces NPV by about $8,500 (without assistance). After taking account of assistance however, this scenario becomes more profitable than the base scenario by around $9,000. This is the only management activity that increases NPV.

If the 75 hectares were left as annual pasture it would incur establishment costs as part of the usual pasture renovation program. However, by converting the 75 ha to (extra) perennial pasture the first time establishment costs are effectively zero because of the assistance.

5b. Increase area of perennial pasture – reduce crop area

In contrast to the above scenario, replacing 75 hectares of crop area with perennial pasture does make a large difference to the profitability of the farm. The results indicate that NPV falls by about $126,000 with assistance and $104,000 with no assistance. The assistance makes little proportionate difference to the large reduction in NPV.

6. Utilise saline pastures

Fencing off 20 hectares of saline areas and planting them to relatively salt tolerant pasture species results in a reduction in NPV of around $6,800 (without assistance) and $5,600 (with assistance). The provision of assistance results in NPV being within about one percent of the base scenario outcome without accounting for environmental benefits.

7. Combination – Saline forestry + saline pastures + fencing-off remnant vegetation

Establishing saline forestry in conjunction with saline pastures and fencing-off remnant vegetation reduces NPV by almost $46,600 (without assistance) and around $10,800 (with assistance). The assistance measures provided for each management action brings this combination to within about two percent of NPV produced under the base scenario.

There is an important caveat attached to the above results. The analysis takes no account of environmental benefits that may flow from implementation of any of the management options. In reality these benefits are difficult to quantify and will vary from farm to farm according to the existing biophysical situation and proneness to environmental hazards. In some cases the benefits of management actions accrue to the broader community (eg. biodiversity benefits).

It follows that the difference between the NPV of the base scenario and any management action can be interpreted as the environmental break-even value. That is, if a NPV difference is $5,000 then any environmental benefits resulting from implementation of that management action would only have to be at least $5,000 for the action to be more profitable than the base scenario.

Results summary

The results indicate that all management actions (except replacing annual pasture with perennial pasture) would reduce NPV both with and without assistance. However, all management actions, with the exception of those involving farm forestry, and replacement of crops with perennial pastures, produce NPVs within a three percent range of the base. Table 4 compares farmers' likely future implementation of each management action with the expected NPV changes.

Table 4. NPV changes and likely implementation of management actions

Management action	Future implementation	NPV change (no assistance)	NPV change (with assistance)
Increase perennial pasture area (less annual pasture)	96%	– 1.7%	+ 1.9%
Fence off creeks/waterways	54%	– 5.0%	– 2.7%
Increase saline pasture area	50%	– 1.4%	– 1.1%
Fence off remnant vegetation	42%	– 3.0%	– 1.5%
Utilise saline agroforestry	29%	– 2.7%	– 1.1%
Establish farm forestry (pine)	25%	– 21.4%	– 10.2%

Note: Future implementation refers to the percentage of respondents who did not rule out implementing the measure in the next five years. NPV change is the difference, expressed as a percentage, between the NPV for the base scenario and the relevant management action (eg. implementing farm forestry results in a NPV that is around 21 percent (no assistance) and 10 percent (with assistance) **less** than the base scenario NPV).

Plantation forestry on the scale proposed significantly reduces NPV. This is mitigated by TARGET assistance but the losses are still large. This is consistent with the farmers' past and intended actions. Only 21 percent of producers in the Mid-Talbragar catchment had established forestry in the past five years and three quarters were not intending to plant forestry in the next five years. Of those giving a specific reason 60 percent thought forestry was unprofitable and the rest were either not interested or felt they did not know enough about tree growing. This suggests that farm forestry is to make a limited contribution to salinity control in this catchment.

Most farmers in Mid-Talbragar also rejected saline agroforestry as an option. Forty percent of farms considered that they did not have a significant watertable problem so that the measure was inappropriate for them.

In saline areas there is often a clear need for saline pasture establishment although the NPV cost was higher than for perennial pastures. Those not intending to establish saline pastures mostly did not have a salinity problem. Fencing of creeks and waterways and of remnant vegetation were only ruled out by farmers who either did not have any to fence or considered they had fenced all that was necessary. These measures were otherwise well accepted where farmers believed they were needed.

The reductions in NPV may be offset by environmental gains and greater future productivity of farms. When the assistance is taken into account the analysis shows that the benefits of most of the management actions would not need to be large to make them worth adopting. The exceptions are the two plantation forestry procedures and replacement of crops with perennial pastures.

Sensitivity analysis

The purpose of sensitivity analysis is to determine how variations in key variables may affect the profitability of implementing each management option. Sensitivity analysis provides a guide to the risk associated with an investment.

The key variables varied are the discount rate and growth rate (for the forestry scenarios only). All management actions were run at higher and lower discount rates because the discount rate is a key variable in long-term analysis (Table 5). In addition to discount rate, the sensitivity to tree growth rate was also tested as all the management actions with large financial consequences involve tree production (Table 6).

Table 5. Sensitivity of NPV to discount rate

Scenario	NPV at 5% ($'000)	NPV at 7.5% ($'000)	NPV at 10% ($'000)
Base scenario	719.1	497.2	362.7
1a. Forestry – hardwoods			
▪ with assistance	752.0	462.5	304.1
▪ no assistance	693.7	406.9	250.9
1b. Forestry – pine			
▪ with assistance	710.0	446.6	299.4
▪ no assistance	651.7	391.0	246.2
2. Saline forestry			
▪ with assistance	713.4	491.6	357.3
▪ no assistance	705.1	483.6	349.6
3. Fence-off remnant vegetation			
▪ with assistance	711.5	489.7	355.5
▪ no assistance	703.8	482.3	348.2
4. Fence-off creeks/rivers			
▪ with assistance	705.3	483.7	349.6
▪ no assistance	693.8	472.5	338.6
5a. Increase perennial pasture (less annual)			
▪ with assistance	726.6	506.5	373.0
▪ no assistance	708.2	488.7	355.8
5b. Increase perennial pasture (less crop)			
▪ with assistance	591.3	392.8	273.9
▪ no assistance	568.7	371.2	253.2
6. Utilise saline pastures			
▪ with assistance	713.4	491.6	357.2
▪ no assistance	712.2	490.4	356.1
7. Increase perennial pasture + fence-off creeks/rivers and remnant vegetation			
▪ with assistance	705.8	486.4	353.6
▪ no assistance	668.8	450.7	319.1

The NPV of all scenarios is sensitive to the discount rate used. The NPV of the base scenario is 45 percent greater at 5 percent than at 7.5 percent and is 27 percent lower at 10 percent. The sensitivity of the individual management actions to the discount rate varies between actions. The management actions involving significant areas of forestry (1a, 1b) are much more sensitive to interest rates than the others. The inclusion of assistance in the calculation of NPV slightly reduces the sensitivity to discount rate.

Table 6. Sensitivity of NPV to tree growth rate

Scenario	MAI 50% lower	MAI 25% lower	MAI standard	MAI 25% higher
	NPV ($'000)			
1a Forestry – hardwoods				
▪ with assistance	415.6	439.1	462.5	486.0
▪ no assistance	356.0	383.4	406.9	430.3

Note: NPV is calculated at a discount rate of 7.5 percent over 33 years. MAI stands for Mean Annual Increment and is a standard measure of tree growth rate.

Plantation forestry is shown to be sensitive to tree growth rates. The NPV (with assistance) of hardwood plantations is decreased by $46,900 by a 50 percent reduction in assumed tree growth. A 25 percent increase is still not enough to make the NPV for hardwoods as profitable as the base scenario.

The results are sensitive to the assumptions made. In particular, the forestry management actions are sensitive to both discount rate and tree growth rate assumptions. However, tree growth rates are not known with certainty in the study area. This extra level of uncertainty can be expected to reduce the likelihood of farmers undertaking extensive forestry.

A

Appendix

A. Impediments to forestry

Climatic limitations
The Mid-Talbragar catchment has an average rainfall of around 590 mm, with the highest rainfall properties receiving around 670 mm. The minimum limit used by the Department of State Forests of NSW to define areas suitable for joint venture forestry is 700 mm.

Uncertainty about eventual returns
All farming involves some uncertainty about yields and prices. These are magnified for timber because of the long wait for a return. This is not especially a problem with the Mid-Talbragar catchment per se but markets for timber should be considered as an important factor in farm forestry development.

Time scale for costs and returns
This is not especially a problem for the Mid-Talbragar catchment where there are a substantial number of younger people on properties compared to other areas.

Capital cost
Tree establishment costs range from around $1,000 to $2,500 per hectare (Southern Tablelands Farm Forestry Network 2002a, 2002b). The profiles study revealed that property cash flow and debt level might be important constraints to obtaining capital funds. Some properties may be unable to safely take on the cost of planting a large area of trees without endangering their credit arrangements. The TARGET project will contribute to the cost of land preparation and tree establishment for forestry.

Distance from market
There is currently no major timber mill in the Mid-Talbragar catchment. The nearest facilities are at Bathurst and Oberon—distances by road of approximately 200 kilometres and 240 km respectively.

Lack of skill in tree growing
The profiles study indicated that the majority of property owners surveyed had little if any, experience in farm forestry. The TARGET project provides funds for training in forestry skills.

B. Producers' adoption of management actions

1. Farm forestry

Appendix A outlined a number of reasons why producers might be unwilling to commit to long-term forestry. This is supported by the findings of the producer profiles study, which indicated that only 5 properties had established forestry in the last five years and 18 were not intending to establish farm forestry in the next five years (Table 7).

Almost two thirds of respondents said that forestry plantations would not be profitable or productive on their farms. Trees occupied 9 percent of farmland in the producer profiles survey; almost all of this was remnant vegetation with an average of one hectare of plantation forestry.

Table 7. Producer responses to plantation forestry

Number of respondents who *had* established farm forestry in the past 5 years	**5**
Number of respondents who were *not* intending to establish farm forestry in the next 5 years	**18**
Reasons for *not* intending to implement measure:	
▪ Not profitable or productive	61%
▪ Other reasons	17%
▪ Simply not interested	6%
▪ Don't know enough about it	6%
▪ Country/climate not suitable	6%
▪ No need for it	6%

2. Saline agroforestry

Three respondents in the producer profiles study indicated that they had implemented saline agroforestry in recent years and 17 indicated that they were not going to establish saline agroforestry in the next five years (Table 8). Of those who did not intend to establish agroforestry, 41 percent said that they did not have a salinity/watertable problem and a further 29 percent said that saline agroforestry was not profitable or productive.

Table 8. Producer responses to saline agroforestry

Number of respondents who *had* established saline agroforestry in the past 5 years	**3**
Number of respondents who were *not* intending to establish saline agroforestry in the next 5 years	**17**
Reasons for *not* intending to implement measure:	
▪ No or insignificant salinity/watertable problem	41%
▪ Not profitable or productive	29%
▪ Other reasons	12%
▪ No need for it	12%
▪ Don't know enough about it	6%

3. Remnant vegetation conservation

Fencing off remnant vegetation was a relatively popular option among the profiles sample properties (Table 9). Five respondents had fenced-off remanent vegetation in the past five years while 14 respondents indicated they would not be implementing this action in the next five years. Major reasons provided by those who did not intend to fence-off remnant vegetation were that it would not be profitable or productive and other reasons.

Table 9. Producer responses to fencing-off remnant vegetation

Number of respondents who *had* fenced-off remnant vegetation in the past 5 years	**5**
Number of respondents who were *not* intending to fence-off remnant vegetation in the next 5 years	**14**
Reasons for *not* intending to implement measure:	
▪ Other reasons	29%
▪ Not profitable or productive	21%
▪ Wouldn't fit-in with existing set-up	14%
▪ Already doing as much as intend to	14%
▪ Not applicable (eg. don't have a creek)	14%
▪ No need for it	7%

4. Riparian zone conservation

About a third of properties had implemented this management action in the last five years (Table 10). The major reasons provided by the 11 respondents not intending to fence-off creeks/rivers in the next five years were that it was not profitable or productive, they had already done all they intended to and other reasons.

Table 10. Producer responses to fencing-off creeks/rivers

Number of respondents who *had* fenced-off creeks/rivers in the past 5 years	**9**
Number of respondents who were *not* intending to fence-off creeks/rivers in the next 5 years	**11**
Reasons for *not* intending to implement measure:	
▪ Not profitable or productive	36%
▪ Already doing as much as intend to	18%
▪ Other reasons	18%
▪ Wouldn't fit-in with existing set-up	9%
▪ Not applicable (eg. don't have a creek)	9%
▪ Don't know enough about it	9%

5. Perennial pastures

Table 11 shows that perennial pastures are already well accepted by properties in the Mid-Talbragar catchment. Around 80 percent of respondents had increased their area of perennial pasture in the past five years and only one had ruled out the option for the next five years because it would not fit in with the farm's existing set-up.

Table 11. Producer responses to perennial pastures

Number of respondents who *had* increased area of perennial pasture in the past 5 years	**19**
Number of respondents who were *not* intending to increase area of perennial pasture in the next 5 years	**1**
Reasons for *not* intending to implement measure:	
▪ Wouldn't fit-in with existing set-up	100%

6. Saline pastures

Table 12 shows that four properties had established saline pasture species in the last five years. With respect to future use of this management action, 50 percent of all respondents reported they would not establish saline pastures. The main reason given was that they did not have a salinity/watertable problem.

Table 12. Producer responses to saline pastures

Number of respondents who *had* established saline pastures in the past 5 years	**4**
Number of respondents who were *not* intending to establish saline pastures in the next 5 years	**12**
Reasons for *not* intending to implement measure:	
▪ No or insignificant salinity/watertable problem	50%
▪ Other reasons	33%
▪ Not profitable or productive	8%
▪ Don't know enough about it	8%

C. Model description

The seven main worksheets in the TARGET model are cattle, sheep, annual crop (including pasture and fodder), forestry, overhead and capital costs, physical summary and financial results.

Cattle worksheet:

- Calculates opening and closing numbers by stock category (eg. steer) as well as by age group. Sales, purchases, joinings, births and deaths can be adjusted on a yearly basis if required;
- Calculates total stock sales revenue as well as sales revenue by age group and category;
- Calculates up to nine categories of variable costs. Total variable costs are calculated as well as costs by age group and category;
- All physical coefficients can be varied on a yearly basis for the first 15 years, thereafter the herd structure is held constant.

Sheep worksheet:

- Allows for two sheep flocks with the capability to transfer stock between the two flocks;
- Calculates opening and closing numbers by stock category (eg. wether) as well as by age group. Sales, purchases, joinings, births, deaths and transfers can be adjusted on a yearly basis if required;
- Calculates total stock sales revenue as well as sales revenue by age group and category;
- Calculates up to nine categories of variable costs. Total variable costs are calculated as well as costs by age group and category;
- All physical coefficients can be varied on a yearly basis for the first 15 years, thereafter the flock structures are held constant.

Crop (and pasture) worksheet:

- Allows for 6 winter and 6 summer crops as well a fodder crop. This worksheet also allows for 4 pasture types as well as fodder production;
- Calculates crop and fodder production based on areas and yields;
- Calculates total crop and fodder revenue as well as revenue by crop type;
- Calculates up to nine categories of variable costs for each crop, fodder and pasture type. Total variable costs are calculated as well as costs by crop/pasture type. Each pasture type also differentiates between routine maintenance costs (variable) and pasture renovation costs (capital);
- All physical coefficients can be varied on a yearly basis for 40 years.

Forestry worksheet:

- Allows for 2 forestry types (eg. hardwoods and pine);

- Calculates timber production based on areas, tree growth rates and recoverable yields;
- Calculates total timber revenue as well as revenue by tree age;
- Calculates up to nine categories of variable costs. Total variable costs are calculated as well as costs by tree age group;
- Worksheet has provision to calculate overhead and capital costs associated with forestry. This means the worksheet can be used as a stand-alone model for a forestry only farm;
- All physical coefficients can be varied on a yearly basis for 40 years.

Overhead & capital worksheet:
- Calculates overhead costs and capital costs associated with the broadacre enterprises;
- All physical coefficients can be varied on a yearly basis for 40 years.

Physical summary worksheet:
- This worksheet is linked to the cattle, sheep, crop/pasture and forestry worksheets;
- Summarises totals for sheep and cattle numbers, DSEs, crop, pasture and tree areas;
- Summary data are presented on a yearly basis over 40 years;
- Provides an internal consistency check to ensure maximum areas and stock numbers set by the user are not exceeded.

Financial results worksheet:
- This worksheet is linked to the cattle, sheep, crop/pasture, forestry and overhead/capital worksheets;
- Summarises sales revenue and total variable costs for each livestock, crop/pasture and forestry enterprise;
- Capacity to adjust enterprise prices and variable costs for any individual year;
- All physical data is summarised on a yearly basis over 40 years;
- Provides a summary yearly cash flow budget over 40 years. This whole farm cash flow budget shows income from each enterprise as well as other sources, variable costs for each enterprise, overhead and capital costs as well as other costs;
- Calculates NPV at user defined rates for 10, 20, 30, 33 and 40 years;
- Calculates yearly cumulative debt level.

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