# Case Farm One

## (Hay Plains, New South Wales)

Part of the report

## An economic analysis of native pasture in the hills and tablelands of south-eastern Australia

**Jim Crosthwaite and Bill Malcolm**
Institute of Land and Food and Land Resources
The University of Melbourne

December 1998

# Table of Contents


**1. Nature of the case study** **1**

**2. The current farming system** **1**

*2.1 Background to the farm* *1*

*2.2 Conservation overview* *2*

*2.3 Farmer goals* *2*

**3. The state of the pastures and their utilisation** **4**

*3.1 Soils* *4*

*3.2 Current state of the pastures and soils* *4*

*3.3 Species composition* *5*

*3.4 Dry matter proportions by vegetation class* *6*

*3.5 Utilisation of pastures* *8*

3.5.1 Seasonal variation and management response 8

3.5.2 Quantifying pasture utilisation 9

**4. Economic and financial state of the current farm business** **13**

**5. The future - current plans and other opportunities** **14**

**6. Investing in saltbush** **15**

*6.1 General approach to the economic and financial analysis* *16*

*6.2 Assumptions* *18*

6.2.1 Area planted, planting density and stocking levels 18

6.2.2 Benefits 19

*6.3 Costs* *21*

*6.4 Results* *22*

*6.5 Sensitivity* *25*

*6.6 Discussion* *26*

**7. 'Conservation management' options for other remnant vegetation** **28**

**8. Conclusions** **29**

**9. References** **30**

**10. Appendices** **31**

*10.1 The farming calendar* *31*

*10.2 Gross margins per DSE* *32*

*10.3 Stock trading schedules* *33*

*10.4 Pasture assessment* *34*

10.4.1 **Validation of the dry matter estimates** 34

*10.5 Weights and adjustments used in calculating feed demand* *37*

*10.6 Saltbush budgets* *38*

# Tables

Table 2-1 Stocking - total and per hectare....2
Table 3-1 Estimated species composition (per cent dry weight) by site ....6
Table 4-1 Statement of estimated profit and loss....13
Table 4-2 Estimated Uses of Cash Statement....14
Table 6-3 Assumptions about saltbush plantations....18
Table 6-4 Deriving the required area of saltbush ....19
Table 6-1 Avoided costs - supplementary feeding and drought feeding....20
Table 6-2 Extra gross margin related to improved animal performance....20
Table 6-3 Revenue foregone from grazing ....22
Table 6-4 Partial budget for three saltbush benefit scenarios....23
Table 6-5 Net farm profit (after tax) - before and after change ....23
Table 6-6 Profitability (after tax) of saltbush plantings for each scenario ....24
Table 6-7 Financial implications of the saltbush plantings....24
Table 6-8 Sensitivity to expected stocking rate on saltbush ....25
Table 6-9 Net present value of saltbush establishment (at 15% real) by stocking rate and saltbush seedling cost ....26
Table 6-10 Internal rate of return of saltbush establishment by stocking rate and saltbush seedling cost....26
Table 7-1 Destocking land....28
Table 7-2 Resting land for an extended period every year....28
Table 10-1 Gross margin for the sheep enterprise....32
Table 10-2 Stock trading schedule....33
Table 10-3. Estimated per cent species composition by site - visual assessment - estimates of composition (not dry matter) ....34
Table 10-4 Species abundance by site and plant characteristics - October 1997 ....35
Table 10-5 Weights and adjustments used in calculating feed demand ....37
Table 10-6 Partial discounted cash flow budget for saltbush plantings....38

# Figures

Figure 1 Feed utilisation (total lsms) by source by month ....10

Figure 2 Feed utilisation (lsm/ha) by soil type (excludes holding paddocks & saltbush)11

# Disclaimer

The options outlined in this paper have been developed for the purposes of this study. They do not constitute recommendations for this property and should not be used as such without a more thorough examination of the validity of the assumptions used and of alternative options that might be available.

# 1. Nature of the case study

This case study is used to explore the situation facing a small to medium size grazing property on the Hay plains of New South Wales which does not pursue irrigated cropping.

There are two conservation management issues. The first issue is how the extensive native grasslands across the property are managed, and the consequences for their future given the lack of alternative on-farm enterprises which can generate income at least in the medium-term.

The second issue, which is secondary to the main objectives of this project on native grasslands, is how areas of other remnant vegetation along sandy ridges and also in prior streams which comprises trees, shrubs and ground layers fits into the farm system and the consequences of managing these areas for conservation outcomes.

On many properties in this region, grazing will continue to be the mainstay of the farm system into the foreseeable future. However, because grazing incomes are at historically low levels, property owners are seeking ways to increase income. On this property, the owners have begun establishing saltbush. They expect saltbush plantations will provide a source of feed in years with relatively poor seasonal conditions, and thereby help to reduce the fall in revenue from wool and sheep sales and minimise increases in costs usually associated with those years. Ultimately they hope to see saltbush naturally seeding across the property as it once did.

# 2. The current farming system

## *2.1 Background to the farm*

The farm is located near Jerilderie in the New South Wales part of the Riverine plains, the flat or gently sloping flood-plains of the Murray River and its tributaries located to the west and north of foothills and ranges.

The area of the farm is 4,791 ha. Rainfall is 300mm (50 year average). The whole farm is in native grassland, though there are significant variations in composition (both native and naturalised species) largely related to soil type and management history.

A self-replacing merino flock of 2,500 breeding ewes is run; young sheep surplus to breeding requirements are turned off soon after weaning except in good seasons. The breeding ewes include a small stud with 250-300 ewes for breeding their own rams; in earlier years rams were sold from the stud. There were 54 breeding cattle until the 1994 drought and up to 18 years ago about 320 hectares was cropped each year. The low and erratic rainfall make dryland cropping problematic, and the owner indicates that the previously cropped area has still not recovered with pasture production being below other areas. There is no irrigation now, though there was in the past - many

nearby properties are currently installing deep bores to pump water for irrigated rice production.

The dry sheep equivalents (DSE) for the sheep enterprise are shown in Table 3-1.[1]

**Table 2-1 Stocking - total and per hectare**

| | DSE |
|---|---|
| Total | 5,860 |
| dse/hectare | 1.2 |

## *2.2 Conservation overview*

The farm is in the Western Riverina Natural Grasslands, an area designated under the *Native Vegetation Conservation Act* 1998 as having native grasslands of conservation significance. This Act requires any clearing to be undertaken in accordance with the regional Plan of Management[2]. The first plan, prepared before the Act was proclaimed, specifies that a) sites of known high conservation value must be retained, b) that grassland must not be cleared below a Basic Threshold Limit of 15 per cent of the property area, and c) a tiered approvals process applies with the process depending on the level of bush or shrub cover. Areas with under five per cent shrub can be cleared subject to b) above. Areas with between five and ten per cent shrub cover require inspection and approval by a vegetation management officer, while areas with more than ten per cent shrub require more detailed assessment and higher level approval

This property does not have any sites of known high conservation value, but does have extensive areas where the proportion of cottonbush exceeds five per cent. The owner estimates that 50 per cent is grassland, and 50 per cent shrubland/woodland. The owner estimates that 33 per cent of the grassland area includes cottonbush. Naturalised annuals occur across the farm. Shrub and tree vegetation is fairly closely associated with soil type - pine on the sand, and boree is on either side of the pine. Tree planting began 12 years ago and has been undertaken over 220ha.

There are five saltbush plantations. 28 hectares in three plantations is now being utilized, with another 48 hectares in two plantations only recently planted.

## *2.3 Farmer goals*

The farm is run by a family partnership which includes two elderly parents and two sons with families. One family live on the farm, and hold most of the responsibility. The

[1] Dry sheep equivalents are a standard used to compare the feed requirements of different classes of livestock; one DSE is the amount of feed required to maintain a wether sheep weighing 48 kg for a year.

[2] Plan of Management for Specified Native Grasslands in the Western Riverina. Nd.

other family derive a living off the farm, but are involved in discussing management strategies and planning and in physical activities on week-ends and in holidays.

Maintaining farm income is the most critical goal to the family living on the farm as they do not work off-farm although they have been able to make very limited investments out of farm profits.

The family are conservative stockers, and make decisions in early spring about retaining or selling stock based on the likely feed availability in autumn. Their interest in planting large areas of saltbush stems mainly from the desire for more scope to retain stock until autumn and for more flexibility in managing grasslands.

They are also very conscious of the effect of different management practices on the land, and consciously strive to minimise long-term adverse effects. This derives in part from observation of the effects of grazing practices on soils and presence of cotton bush on nearby farms, as well as previous experience at dryland and irrigation cropping on the farm. This concern for the sustainability of production is based both in an interest in protecting the long-term base for grazing, and in a concern with biodiversity. They have fenced out large areas of sandhill to encourage regeneration.

# 3. The state of the pastures and their utilisation

This section of the report will:
a) identify the state of the pastures from production and conservation viewpoints;
b) show how the pasture-livestock system operates, how it is used to meet production goals, and its effects on conservation values; and
c) clarify how sustainable the system now is from production and conservation viewpoints, and changes needed for it to be so

This information will be used to:
a) draw conclusions on changes needed if the system is to be sustainable from production and conservation viewpoints;
b) provide a benchmark for envisioning how the farm might operate differently in 10-20 years time;
c) provide a benchmark for considering the effects of public policy initiatives on conservation values, long-term productivity and income generated from native grasslands

Pasture survey results are included in Table 12-5 and Table 12-6 in the appendices.

## *3.1 Soils*

There are three types of soils, with some gradation between the types. Heavy black mulching clay, which according to the farmer is the most productive in wetter years, is found on approximately 50 per cent of the property. A lighter red loam found over red clay is on 30 per cent of the property. These are said to be responsive to light rain. Very sandy soils, which the landholder says are the most responsive to rain in all seasons, are found on 20 per cent of the property. The sandy soils run right through the centre of the property. The owner indicates that 90 per cent of the farm problems relate to this 20 per cent of the area - with erosion, weeds, rabbits - “if there’s a problem, we’ve got it on the sandy country.”

## *3.2 Current state of the pastures and soils*

By comparison to many other properties in the region, the cover and height of vegetation at the time of inspection is very good. Nevertheless, the owners remain concerned that there may be inadequate feed to carry stock through the long summer.

The soil condition is generally very good - see Table 1. This estimate is based on surface roughness (Tongway 1994) which is regarded as a more consistent (between observers and over time) measure than amount of ground cover (A. Wilson pers comm). Soil condition on previously cultivated areas is now not noticeably different to the uncultivated areas.

### *Table 1. Estimates of soil condition*

| | Good | | | Poor |
|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 |
| Proportion of farm | 80% | 15% | 4.9% | 0.1% |
| Comment | Most of the black and red soil country | Some sandy areas. Parts of the black and red country | Near gateways and troughs | May be completely bare |

The cover of bushes across the property varies considerably. Where the bushes have thinned out, there is generally a good cover of perennial grasses. This is important for protecting the soils and providing a micro-climate for other species. The cautious grazing practices of the owners have encouraged native perennial grasses. However, in some areas of the farm, there may be too few inter-tussock spaces for the native annual and perennial forbs. At the time of inspection, the number of different species was low relative to the other case study property.

## *3.3 Species composition*

The species composition data can be used to draw a picture of the 'nativeness' in terms of total number of species, as well as number and abundance of exotic species compared to native species. Structural composition of the grasslands is addressed in the next section.

All grasslands are reasonably diverse, though at the time of inspection were not highly so with the number of species at each site being under 20 in all cases. A total of 56 species were found, 19 of which are exotic. Attachment one shows the species found at each of the 13 sites, and their relative abundance.

There are few exotic species. Four sites had either five or six exotic species, with all others having less than five. All sites had two or more exotic species in the abundant or common category.

Six sites, including two on black soil and four on red, had more than 10 native species, one of these had been cropped many years ago. Four sites, all in previously uncropped paddocks, had five or more native species in either the abundant or common categories - two of these were in black soil paddocks. Only one of the 13 sites (on a sandy ridge) had no native species in these categories.

None of the species are listed as threatened on regional, state or national species lists. A more comprehensive survey may find such species. Different seasonal conditions might produce a very different species mix, even in October, the time of year that the survey was conducted.

### *3.4 Dry matter proportions by vegetation class*

Estimates of the proportion of dry matter accounted for by each vegetation category were made using the dry weight rank technique (Jones & Hargraves 1979); results are shown in Table 3-1. These estimates were made primarily to gauge the production value for livestock of the different pasture types. They are also an approximate guide to the proportion of the pasture cover accounted for by each vegetation class - another indicator of conservation value.

**Table 3-1 Estimated species composition (per cent dry weight) by site [3]**

| Site | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Paddock | Stag | Deal | Deal | Yoyo | South | West | Ridge | Rest | East Barren | Barren | Gums |
| Soil | black | black | red | red | black | red | sandy | black | black | red | sandy |
| Naturalised annuals grasses | 35 | 30 | 5 | 40 | 60 | 52 | 70 | 40 | 50 | 40 | 50 |
| forbs-medics | 8 | | 2.5 | 4 | | 5 | 20* | 15 | 5 | 15 | 20* |
| Native annuals forbs | 2 | | 2.5 | 1 | | | | 0 | 10 | 10 | |
| Native perennials cool season C3 grasses | 15 | | 40 | 20 | | | | | 5 | 8 | 5 |
| warm season C4 grasses | 15 | 60 | 5 | 5 | 30 | 35 | 10 | 15 | 15 | 15 | 20 |
| shrub - cottonbush | 10 | 5 | 5 | 10 | | | | 27.5 | 12 | 10 | |
| shrub - poverty bush | | | | | 5 | 3 | | | | | |
| palatable chenopods | 15 | 5 | 32 | 15 | 1 | | | | 3 | 2 | |

There is marked variation in the relative proportions of dry matter produced by annual and perennial species, and of native and naturalised species in each of the surveyed paddocks. This can in part by attributed to soil type and management history. In terms of livestock production, the availability of different types of fodder at different times of the year is important.

Saltbush was the dominant species historically, with other bushes, annual native forbs, some native grasses and small palatable chenopods always present. As saltbush has disappeared under grazing pressure, cottonbush has become the main shrub cover. Bushes remain an important component of the vegetation, generally accounting for between five per cent and 10 per cent of the vegetation. Some paddocks, which were cultivated many years ago, have no bushes. Some areas have up to 30 per cent bushes.

[3] Survey estimates were validated with quadrat throws at two sites - see Table 10-3 in the appendices.

The cover of cotton bush in the Rest paddock has increased markedly over the last 10 years, in response to more selective grazing management, according to the owners.

Apart from their grazing value, the bushes have an important role in creating a micro-climate which shelters both other plant species and stock. Relatively unpalatable poverty bush is present on previously cultivated paddocks. The cotton bush provides valuable feed in late summer and autumn when more palatable grasses and forbs are no longer producing green feed.

Calitris pine woodland is found over possibly 10-15 per cent of the whole property, mainly along sandy soils. Other woodland vegetation is found along creeks and depressions.

Perennial grasses are an important component of the grassland in most paddocks. Wallaby grass (*Danthonia spp*.) is the main cool season perennial grass, but Spear grass (*stipa spp*) is also present on the lighter soil. These grasses can provide green feed following autumn showers right through until early summer. By contrast to cooler regions, they tend to be less responsive to summer showers. They comprised between five per cent and 20 per cent of the dry matter in four paddocks, 40 per cent in one, and were not found in several paddocks. Their absence in several of the paddocks may possibly be attributed to the soil type.

Warm season C4 grasses including Windmill grass (*Enteropogan ramosus*) and Rigid Panic (*Homopholis proluta*) are found more consistently than the cool season grasses. It was estimated that they comprise between 15 per cent and 30 per cent of the vegetation in most paddocks, with the proportion as low as five per cent in two paddocks but 60 per cent on the black soils in Delta paddock. These grasses are green from mid spring through to autumn, provided there is moisture. Main growth is after summer storms, and they are valuable at those times for taking advantage of occasional summer rain.

Annual species, both naturalised and native, are estimated to account for over 45 per cent of the vegetation in all but two of the surveyed paddocks, and over 60 per cent on several. Seasonal conditions during the survey may mean this is under-estimated. Annual species have a relatively short growing season in winter/spring, but are of high quality over this period and hence a valuable part of the vegetation. Over summer and early autumn, they provide some dry feed, but quality declines as does quantity.

Annual grass species include ryegrass, barley grass and wild oats. In winter and spring they provide the bulk of feed for stock. The livestock system is organised around this, with available greed feed matching peak demand from lactating ewes and weaner lambs. Barley grass responds quickly to rain in late autumn and early winter. Rye grass complements it by producing most of its bulk in early to mid spring. The feed available from annual grasses, and how long it remains green, varies with the season. If the season is good, weaner lambs and cull stock will have been sold while the annual grasses are still providing the bulk of feed.

Medics, which are naturalised annual forbs, are also an important component of the pasture. They provide the most palatable feed at the same time as the naturalised

annuals, although unlike sub clover the medic burr cannot sustain livestock in summer in the absence of other feed (Wilson, Leigh & Mulham 1969). Medics comprise between five per cent and 15 per cent of the vegetation across most of the farm, though they are not present in some areas. On the sandy soils, Common Heron's-bill (*Erodium circutarium*) replaces medic as the main naturalised annual forb.

Palatable perennial forbs - chenopods such as Slender Blue-bush or fissure weed (maireana pentagona) and other plants like Variable Sida (*Sida corrugata*) are a valuable component of the grassland in some paddocks. They comprising between three per cent and five per cent in most paddocks, but over 15 per cent in several, and none in others. These species are not as digestible as soft grass and legumes. They're good quality in spring but will not be eaten until the December-May period. They occupy the same forage niche as saltbush and cottonbush, but are not as structurally prominent.

Annual native forbs were estimated comprise up to 10 per cent of the vegetation in two paddocks, but below five per cent in another four paddocks. They were not found in four of the ten paddocks. Their presence on the case farm does not appear to be associated with soil type (see Table 2). Depending on the species, they will produce feed from winter through as long as the rains last. Seasonal conditions greatly influence which species appear and their abundance. Relatively few different species were found.

## *3.5 Utilisation of pastures*

How the different vegetation types on the farm are utilised is reflected in the long-term and seasonal pattern of stocking. Over the long-term, stocking will be influenced by climatic factors, as well as by management goals and practices. Seasonally, stocking will vary with the requirements of each animal class, availability of feed, farm layout and availability of water. Determining how paddocks are currently stocked is an essential step in understanding likely utilisation as climatic conditions and farming circumstances change. First the owner's management approach is outlined.

### 3.5.1 Seasonal variation and management response

Matching stocking to available feed is the biggest management factor. Stocking rates are planned to match the growth of plants. From lambing in June until livestock sales in October, the rate is highest.

Assessment of likely feed availability, and hence stocking, is made six months ahead. Decisions for autumn are made in spring, and further decisions affecting winter stocking are made in autumn. "By the time stock start to lose condition, you're three months behind." There are further stock sales in autumn.

In **spring**, the aim is to use lighter feed that will not be there later. Heavier feed will hold on. Spring produces the dry matter for the dry seasons. They rarely have a poor spring. Management is usually the same, no matter what spring. If it is really wet, stock can be put anywhere.

In **summer**, stock are kept on the heavier country. In a dry summer, the heavy clay hangs on. A summer shower can be of use for green pick, especially on the lighter red soils. Rain will also freshen up the bushes (blue bush etc), though when there is good grass stock do not go for them. Older sheep can make better use of the bushes in a drier summer. 50 mm of rainfall is needed to be of real value. With heavy rain, the heavy black soils are most responsive - the rains build the bulk of the curly windmill grass. Especially in the last two years, they have really noticed this, and it has been very helpful as poor autumns have followed - it 'saved our bacon'. If the rains come, they must make them last - saltbush which gets a good response is used to fill the autumn gap.

**Late autumn**. If rains come in April or May, the grasses will respond. Ideally they want rains in April, but seldom get them. After May, response is slower due to soil temperature, and it is higher on the lighter red soils. If there is no rain, they look to utilising any dry standing feed.

In **winter**, the heavy country builds up dry matter for later use. The later the first rains, the less build up. Ideally they should start in April to kick things off and then continue over winter and spring. If rainfall only starts in June, there is a different type of germination. Grasses that usually provide the bulk of feed don't germinate.

As yet, there are no conclusive findings about the effects of different management. They have tried heavier stocking on small areas by rotating stock, and lighter continuous stocking on larger areas. If the seasons are satisfactory, the results don't appear to differ. Now they are using a combination of these two methods, depending on the seasons and what's advantageous for each paddock. In 25 years the landholder has been here, the seasons and pasture growth have never been the same, and hence he belives it needs individual assessment. Spelling of paddocks does not follow a set pattern because of seasonal variation and differences between the paddocks. The red clay country needs more spelling and lighter stocking.

### 3.5.2 Quantifying pasture utilisation

Information about the stock numbers, type of stock and which paddock they were in was collected during a visit to the farm in September 1996. This information was periodically updated over the following 12 months, with approximate dates of livestock movements between paddocks or for sale being requested. The information was incorporated into a spreadsheet model which links livestock classes to particular paddocks. The model incorporates adjustment factors to estimate the feed demand in the paddock of particular animal classes. These adjustment factors cover animal weight, pregnancy, lactation, supplementary feed, feed quality and the exercise demands placed on the animal (Rickards & Passmore 1976). In this case, no

supplementary feed is given out. The model does not yet adequately cover how weight gain or loss affects feed demand.

The weights and adjustments used for this property are shown in

Table 10-5 in the appendices. They were set on the advice of the owners. Ewe and lamb weights, and the lactation factor, have been adjusted to ensure that feed demand is approximately the same in the six months from the beginning of lambing in May to weaning in November.

Figures one and two show the pasture utilised (expressed as livestock months) for each paddock and pasture type for each month of the year.

**Figure 1 Feed utilisation (total lsms) by source by month**

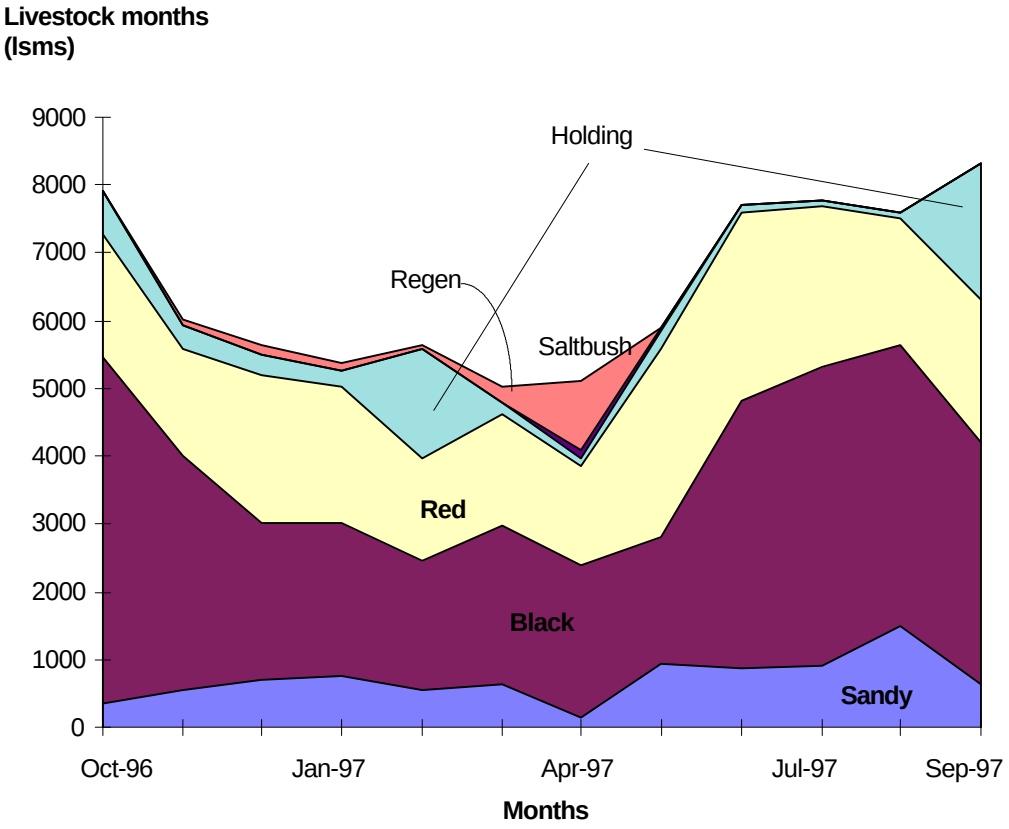
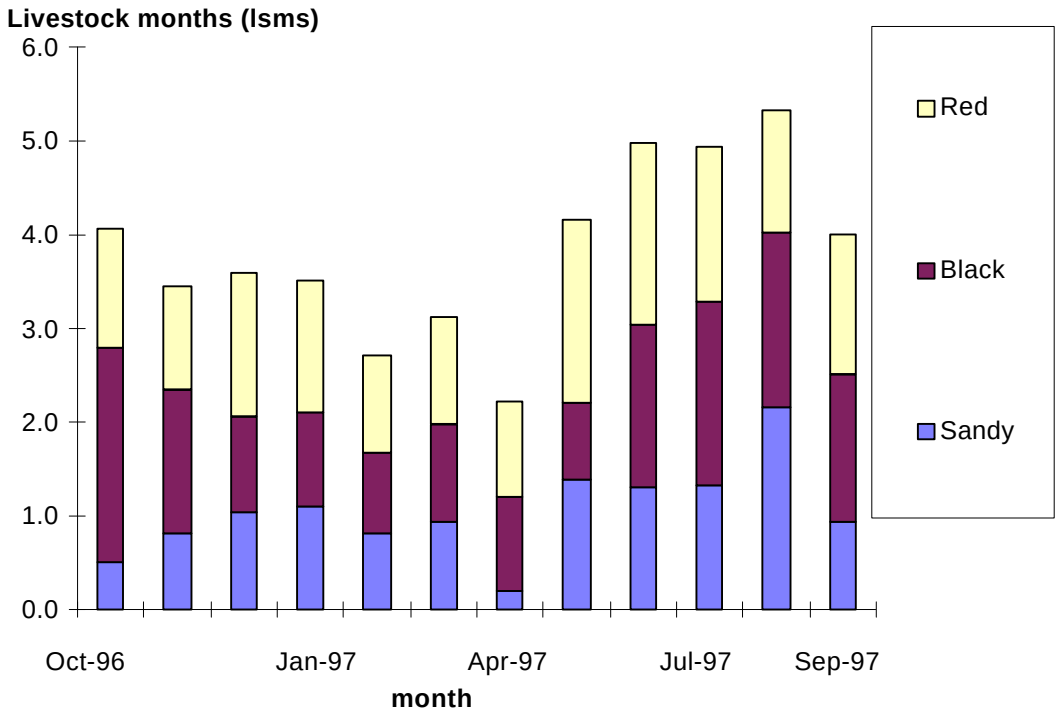


**Figure 2 Feed utilisation (lsm/ha) by soil type** (excludes holding paddocks & saltbush)




Over the full year, the property as a whole supplied an average 14 livestock months (LSMs) worth of feed per hectare (LSMs/hectare). Expressed as dry sheep equivalents (DSEs), the property was running 1.2 DSE/hectare (ie 14 LSM/12 months). On a per hectare basis, the red soils provided the bulk of the feed - 17 LSMs/hectare - throughout the year under investigation. The black soils provided on 13 LSMs/hectare and the sandy soils 12.5 LSMs/hectare.

The red soils were stocked relatively evenly throughout the year, while the black soils were utilised mainly in winter and spring. The sandy soils were also utilised mainly in winter and spring, but the quantity of feed utilised in December and January is still relatively high, even though these grasslands are predominantly annual. There will be some plants here that grow in summer after rain, and dry matter from the spring growth will still be utilised.

The relatively low utilisation of the black soil grasslands relates to management and rainfall pattern. Two of the main black soil paddocks - South and East Barren - were stocked very lightly over the past year. Their potential contribution is suggested by two other black soil paddocks Deal and Boree which respectively provided 18 LSMs/hectare and 16 LSMs/hectare. An extra 700 LSMs carried throughout the year on the black soils would lift their average contribution to 17 LSMs/hectare. The owners also suggest that the red soils have been more responsive to the lighter rains over the last year or so, and that the black soils which they regard as having the capacity to provide most feed have not performed as well as in previous periods. The black soils hold moisture better but take longer to make water available to plants.

The saltbush and holding paddocks carry very high numbers of stock per hectare for short periods. The saltbush was utilised over several months in early 1997, but particularly in April.

The regeneration areas comprising 128 hectares are providing very little of the feed at 1.5 LSM/hectare. The opportunity cost of setting aside these areas can be gauged by comparing this stocking rate to the 12.5 LSMs/hectare on the sandy soils that aren't fenced out.

## 4. Economic and financial state of the current farm business

Total farm capital is estimated at $1,190,000 of which $960,000 is the land value. Equity is estimated at 88 per cent.

Expected profitability and cash flow in future years are now estimated, based on an assumption that the farm will continue to be managed as it is now. The results do reflect what might occur in any one year, but are based on a 'typical' year or on expected values which take account of seasonal fluctuations.

Expected gross margin for the sheep enterprise is estimated to be $18.70/DSE.[4] The expected long-term values used to derive income in the sheep enterprise are: 2,500 breeding ewes, 6.0kg/head wool clip, $4.30/kg wool price, and a $42 average hogget sale price. The gross margin break-down and the trading schedule are shown in Table 10-1 and Table 10-2 in the appendices.

Expected operating profit after tax and return to capital are shown in Table 4-1. Overhead costs are small, apart from an operator's allowance which is costed at $40,000. Whole farm unallocated variable costs which are not directly attributable to the sheep enterprises include, fuel, repairs and maintenance, fencing and weed spraying.

Expected annual return to capital is a little over one per cent.

**Table 4-1 Statement of estimated profit and loss**

| | $'000 |
|---|---|
| Income | 155 |
| Sheep activity costs | 45 |
| Whole farm unallocated variable costs | 21 |
| Overheads incl labour & depreciation | 69 |
| Total costs | 135 |
| Operating profit before tax | 20 |
| Estimated tax payable | 6 |
| Operating profit after tax | 14 |

Expected net cash flow is shown in Table 5-3.[5] This is based on a family consumption allowance of $40,000 (which is based on consumption expenditure unlike the operator's allowance). Net cash flow does not include equipment replacement or investment out of cash flow for farm development.

**Table 4-2 Estimated Uses of Cash Statement**

| | $'000 |
|---|---|
| Cash in | |
| Sales | 155 |
| | |
| Cash out | |
| Activity variable costs | 45 |
| Whole farm variable costs | 21 |
| Cash overheads | 29 |
| Land lease costs | |
| Income tax | 6 |
| Interest | 12 |
| Principal on loan | 8 |
| Consumption | 40 |
| Total | 162 |
| | |
| Net cash flow (before equipment replacement or investment out of cash flow for farm development) | -7 |

## 5. The future - current plans and other opportunities

The farm busines needs to generate a higher net income in future, and is not likely to be viable in the long-term if this cannot be achieved. A flock of 2,500 ewes is not a large one. Generally in Australian broadacre farming, the cost-price squeeze means that output needs to increase by 1-2 per cent every year for the farm business to maintain profitability. Given the intensification of this squeeze in recent years due to

[4] Gross margin is gross income less variable costs (e.g. shearing, health costs) associated with the particular enterprise.

[5] Estimated tax payable is based on total income less deductions which include variable costs, overheads, estimated interest payable, livestock purchase costs and depreciation on equipment aged 10 years and less.

poor wool prices of recent times, more dramatic changes are needed. While an increase in wool price from $4.30/kg to $5.50/kg or higher would make a significant difference; any expectation of such an increase in the current uncertain wool market is unrealistic.

The owners view the property as providing the major source of income, but do not expect it to provide all their requirements in the future. Investing any surplus funds off the farm is a high priority.

The owners are already managing in a way that is consistent with conservation priorities and retaining its productive capacity for the long-term. Grazing is relatively light. Considerable areas of remnant vegetation are fenced out, and further limited fencing according to soil type is planned.

Stocking more intensively is not regarded as an option by the owners, though they are clearly stocking more cautiously than many other properties. The owners are keen to increase their capacity to move stock according to livestock and pasture needs. They are not interested in small sub-divisions, because of the cost of fencing and extra management required. They see saltbush plantations as giving them the desired flexibility.

Although many properties are making great short-term gains by investing in irrigation, this family are not interested given the investment required, uncertainty over future water entitlements and their concern for the long-term sustainability of the land. They would consider buying more land in an irrigation area before undertaking it here.

Neighbouring landholders are sinking deep bores to draw water for irrigating rice. Returns from rice, and the threat to availability of water for irrigation and rising water prices has made sinking bores attractive.[6] However, the owners are not interested in this option. They sank a bore over 10 years ago, and it collapsed after two years of irrigating crops. They have firmly decided that in terms of long-term productivity the land is best suited to grazing.

Hosting day visits by tourists and camping tours are being considered at present. Harvesting kangaroos is considered a possibility for the distant future, rather than a realistic one at present, given the lack of market infrastructure.

## 6. Investing in saltbush

The owners see a major role for saltbush plantations across the farm. They expect these plantations will provide a source of feed in years with relatively poor seasonal conditions, and thereby help to maintain income levels. Saltbush is less susceptible to rainfall pattern than grasses. The amount of feed it is expected to provide in autumn

[6] New South Wales has recently imposed a moratorium on approvals for groundwater extraction.

can be estimated and relied on with more certainty than for grasses and other species. This security is important when crucial stocking decisions are made in spring.

Saltbush is also expected to provide management flexibility. Large numbers of stock can be congregated onto small saltbush plantations enabling pastures to be spelled. Labour time in moving flocks of sheep is expected to fall as the flocks can be kept on saltbush plantations near the sheds.

Some of the benefits can be readily quantified and others cannot. The benefits quantified in this study are: better sale prices for young stock, savings in supplementary feed purchase costs for young stock, savings in drought feed costs, and preventing a fall in lambing percentages and wool cut. While the most likely drought response strategy in the absence of saltbush will involve both selling stock and feeding drought rations, as later explained savings in drought feed costs are used as a proxy for selling stock.

On some farms a major benefit from saltbush might be to maintain or even increase the long-term productivity of degraded grasslands by allowing them to be rested for longer periods than might otherwise occur. Here on this property, the quality of soil and pastures is already generally good.

On this farm, the saltbush is being established on the relatively few areas where feed value is deteriorating and soil erosion might be occurring. In the relatively harsh climatic conditions here, perennial shrubs create a micro-environment for other plants. The saltbush will provide wind-break protection which is expected will help perennial grasses and annual forbs establish.

Care needs to be taken not to over-state the benefits, or to double-count. It does not follow that a given area of saltbush can be used for all the above purposes in any one year. Trial results make this clear (reported in Wilson 1998). Use of saltbush as a reserve for a six month drought may not be possible if it has already been used to hold young sheep in anticipation of better market prices.

There are different expectations about saltbush. Some property owners and advisors are optimistic, whereas others are more sceptical. These owners base their optimism on practical experiences with saltbush to date. The following analysis is organised so that the effects of achieving all or only some of the above benefits can be assessed.

## *6.1 General approach to the economic and financial analysis*

Partial budgets, both steady state and discounted cash flow, are used to identify the profitability and pre-tax cash flow effects of additional investments.[7] These budgets allow a comparison of the farm situation - before and after - to be made.

[7] An alternative is to use whole farm budgets. This would be appropriate where a new farm buyer was evaluating the potential of the property - it can be used to show the return to capital of the current farm system as well as the return if additional investments were made.

The steady state partial budget involves a snapshot into the future to the point of peak production after all development expenditures have occurred. This budget requires all gains and losses associated with the new situation to be identified. The result indicates the net gain or loss relative to the situation before the investment. It is used to ask ‘is it worth getting there?’.

The discounted cash flow budget helps compare options in which revenue and cost streams occur over a different time sequence. All cash flows are discounted to the same point in time irrespective of when they occur to give a net present value (NPV). This budget is useful for answering the question ‘is it profitable after taking account of the cost of getting there?’ By using salvage values, this budget can handle expected productivity of the initial investment beyond the period of the budget. Falls in revenue can also be incorporated, e.g. declining revenue associated with a drop in pasture productivity after a certain period.

Expected values rather than actual prices or costs are used in these budgets. This is appropriate as the future is unknown. Where an event will occur, but it is uncertain in which year, an expected value is used in each possible year. For instance, if a drought is expected every five years and in such circumstances drought rations will cost $20,000, the expected value each year is $4,000. This approximates the drought preparedness strategy of ‘putting a little away each year’. The alternative when using relatively simple spreadsheet models is to guess which year the drought will occur in.

The analysis is run over 15 years in the discounted cash flow budgets. In terms of farm planning, it is a relatively long period—half a farming generation. Real discount rates of five per cent, 10 per cent and 15 per cent are used. Most farmers would require a 10 - 15 per cent return on marginal capital, compared to an expected return of two to three per cent on whole farm capital. The discount rate represents the cost of the capital involved, i.e. the opportunity cost of the funds involved, the actual cost of funds borrowed, or a weighted average of both (Makeham & Malcolm 1993). A high rate is realistic given the choices, often risky, facing farmers about what to do with their borrowings or marginal investment funds. So that options with costs occurring over a different time sequence can be compared, all cash flows (of costs and returns) are discounted to the same point in time irrespective of when they occur to give a net present value (NPV).

In the financial analysis associated with the discounted cash flow budgets, each investment is assumed to be funded with an overdraft at 12 per cent interest per annum. Once debt is paid off, cumulative cash surpluses are invested at five per cent interest per annum.

## *6.2 Assumptions*

### 6.2.1 Area planted, planting density and stocking levels

Plantations are assumed to be 20 hectares in size with 690 bushes per hectare. Each plantation can carry 45 livestock units/hectare for 60 days and each bush can feed one livestock unit for four days if it supplies 0.5 kg of leaf per day. These and other assumptions made about saltbush plantations are shown in Table 6-3. A livestock unit is the equivalent to one dry sheep weighing 50 kg.

**Table 6-3 Assumptions about saltbush plantations**

| | Unit | 8 ha plantation | 20 ha plantation | Source |
|---|---|---|---|---|
| Planting density | stems/hectare | 1,041 | 690 | - industry |
| Spacing | metres | 2.4 * 4 | 2.4 * 6 | - industry |
| Bushes | number | 8,328 | 13,800 | - derived |
| Capacity | livestock units/60 days | 500 | | - case farm one experience |
| | livestock units /60 days/hectare | 62.5 | 45 | - based on 500 dse/60 days |
| | livestock unit days | 30,000 | 54,000 | - industry |
| | days/bush | 4 | 4 | - derived |
| Sheep requirements | kg/day | 0.5 bush, 0.5 pasture | 0.5 bush, 0.5 pasture | - A. Wilson |
| Necessary yield | kg/bush | 2 | 2 | - derived |
| Drought capacity | plants/sheep/2 months | 16.7 | | - 8328/500 |
| | plants/sheep/6 months | 50 | | - 16.7*3 |

The area sown depends on the purposes of saltbush and the number of weaner, replacement and adult sheep to be carried. A relatively small area of saltbush is needed for the purposes of feeding young sale sheep for a short period in autumn. However, drought proofing a property requires much more extensive plantations for which these other benefits will not apply.

If plantations are 20 hectares in size, it is estimated that 167 hectares are required (Table 6-4). This assumes that the area planted to feed animals and obtain better prices can be used for drought feeding.

**Table 6-4 Deriving the required area of saltbush**

| | Better prices | Supplementary feeding | Drought feeding |
|---|---|---|---|
| No sheep to be fed | 1,296 | 1,296 | 2,500 |
| Weeks sheep will require feeding | 8 | 4 | 24 |
| Weeks feed is available per saltbush plantation | 8 | 8 | 8 |
| Maximum sheep/ha carried per plantation | 45 | 45 | 45 |
| Area (ha) needed | 29 | 14 | 167 |
| Utilised ….one year in | 3 | 2 | 7 |
| Total area (ha) required | | | 167 |

The consequences of stocking rate only reaching 50 per cent and 75 per cent of the rate shown in Table 6-3 will be tested. While the data from this farm suggests that 50 plants are required to feed a dry sheep for six months, this is considerably below the 110 calculated by A. Wilson (1998) which is based on weights of sheep grazing saltbush. It should also be noted that recent research has shown that some claims for Oldman Saltbush have been shown to be overstated because of weighing of stems as well as leaf (A. Wilson pers comm).

### 6.2.2 Benefits

Saltbush will allow young sale stock stock to be held on the property for longer so as to capitalise on higher out-of-season sale prices. It is most likely that older sheep will be run on the saltbush so that pastures are freed up for the young sale stock. In good years, sufficient forage will be available to carry the stock through good years and so saltbush has less benefit.

The better sale prices have been derived as follows. Every third year, the owners expect that the saltbush can be utilised so young sale sheep can be held back and sold at a time when fewer lambs are coming onto the market. It is assumed that sale price will be $6/head higher.[8] This will only occur in some of the poorer years when saltbush gives the flexibility to hold stock on. In better years, assumed to be every second year, the pastures can carry all stock. In these years, running stock on saltbush can be used to rest pastures and otherwise increase management flexibility. There are no direct financial gains.

Saltbush plantations can also be used to save on feed costs. In the absence of saltbush on this property, young sheep would receive supplementary feeding for short periods in most years - assumed here to be every second year. Saltbush is also expected to reduce the necessity of purchasing drought rations. It is expected that the costs incurred in drought on this property are roughly similar irrespective of whether the drought response tactics are to sell stock cheap and buy back dear, or to purchase

[8] This gain is independent of any extra price due to the greater carcass weight and extra wool on the fleece when the animal is sold. In poor years such gains are unlikely.

drought rations.[9] Hence the breeding flock of 2,500 adult sheep is to be fed, with cull sheep assumed to be sold before the drought breaks and the drought ends before the feed requirements of ewes increases in the last two months of pregnancy.[10]

Estimated savings in supplementary feeding and drought feeding costs are shown in Table 6-1. The amount being fed is 3.5kg of grain per sheep per week costing $0.15/kg. The cost in the year that drought occurs is $32,500. On the basis that an annual sum should be set aside as part of drought preparedness, expected values which show this annual sum are derived. The expected values are based on supplementary feeding for eight weeks every second year and drought feeding for six months every seven years.[11]

**Table 6-1 Avoided costs - supplementary feeding and drought feeding**

| | Supp Feed | Drought |
|---|---|---|
| Cost/week/head | $0.50 | $0.50 |
| Weeks fed | 8 | 26 |
| Cost/head | $4.00 | $13.00 |
| Numbers fed | 1,296 | 2,500 |
| Cost | $5,442 | $32,500 |
| | | |
| Expected value | $2,721 | $4,643 |

As previously indicated, the owners expect average weaning percentage and wool cut to be maintained in poor years relative to how they would have otherwise fallen. In order to be cautious in assessing the net benefits of saltbush, these advantages will be included in a separate option to the benefits already outlined. It is assumed that on average there is a poor season every second year, and wool cut is 0.3 kg/DSE lower and weaning percentage 7.6 per cent lower in the absence of saltbush. With saltbush, the annual average 'savings' are thus 0.15 kg/DSE in wool cut and 3.8 per cent in average weaning percentage. The effects on gross margin are derived in Table 6-2.

**Table 6-2 Extra gross margin related to improved animal performance**

| | Extra wool | Extra weaning % |
|---|---|---|
| Stock numbers | 5,860 DSE | 2,500 ewes |
| Extra gain | 0.15 Kg/head | 3.8% extra weaning % |
| Quantity | 879 kg | 94 extra lambs |
| Unit value | 4.30 $/kg | 42 $/lamb |
| Extra gm/DSE | 0.64 $/DSE | 1.58 $/DSE |

[9] The owners point out that if sheep are kept on the property, the pastures will be eaten out and will take longer to recover. Drought feeding is likely to be required into the following year.

[10] Relaxing this assumption will increase drought feed costs - see later discussion.

[11] A drought requiring six months of rations will almost certainly occur once in 10 years and a second drought requiring a lesser period of feeding is also likely to occur. This has been simplified by assuming that a drought lasting six months will occur once every seven years.

| | | |
|---|---|---|
| Extra gross margin | $3,780 | $3,938 |

It is assumed that the first benefit will be three years after saltbush establishment.

Saltbush is salvaged at 100 per cent of the initial investment cost, given that it is expected to last at least 40 years if managed appropriately. Salvage value of the fencing and water supply at 15 years is included at 50 per cent of initial cost.

### *6.3 Costs*

Establishment costs are based mostly on information provided by the property owners on the basis of their experience with saltbush. They total $61,423 which includes re-planting costs of over $4,500 if establishment fails in the first year. The cost is $369 per hectare and $0.53 per bush.

The break-down of costs is as follows:

- seedlings $0.18 each;
- fencing $1,500/km (an existing fence will be utilised along one side);
- stock water costs $600 for troughs per plantation, totalling $7,000. Plantations are established near existing water pipes;
- It is assumed that all the area sown requires ripping. Ripping costs $13/hectare. This is based on use of a 138kw tractor costing $20/hour to run (ie variable costs). Using the tractor will not change tractor overhead costs, so this factor is not included. Ripping is estimated to take 0.7 hours/hectare.
- Rotary hoeing costs $8/hectare. This is based on use of a 64kw tractor costing $10/hour to run. Overhead costs are not included. The operation will take an estimated 0.8 hours/hectare.
- Planting costs $7/hectare. This is based on use of a 64kw tractor costing $10/hour to run. Overhead costs are not included. The operation will take an estimated 0.7 hours/hectare.
- Watering newly established plants is likely to be required every fourth year. It costs $167/hectare (an average of $42/hectare every year). This is based on use of a trailer pulled by a 64kw tractor costing $10/hour to run. Overhead costs are not included. The operation will take an estimated 16.7 hours/hectare.
- Herbicide will be required in very wet years to control weeds. It is assumed to be required every fourth year, is done by contract and costs $20/hectare.
- It is assumed that paid labour is not required and establishment can be matched with seasonal demands on family labour. This is likely where small areas are established but not for large plantations;
- Likelihood of failure was assumed to be 1:5 in which case costs for seedlings, rotary hoeing, and planting will be required again in the second year.

Maintenance of fence and water supply will be necessary. In the discounted cash flow budget, this is provided for by using a salvage value, whereas for the purposes of showing results in a steady state year, a depreciation allowance is included.

Revenue will be foregone from grazing on land previously occupied by the saltbush plantation. This applies only in the years that a benefit from the saltbush is received i.e. five years out of ten. In other years it is assumed stock will have some access to the plantation. It is expected that saltbush will be planted in less productive areas; stocking rate is assumed to be 0.8 DSE/hectare compared to the property average of 1.2 DSE/hectare.

**Table 6-3 Revenue foregone from grazing**

| | |
|---|---|
| Area planted (ha) | 167 |
| Former stocking rate (DSE/ha) | 0.8 |
| Gross margin ($/ha) | $18.70 |
| Foregone grazing in poor year | $2,490 |
| Foregone grazing in good year | $0 |
| Average grazing foregone | $1,245 |

## *6.4 Results*

Three scenarios are examined which reflect the differing expectations about the benefits of saltbush on the property. The scenarios are:

Scenario one Saltbush saves drought feed costs only

Scenario two Saltbush saves drought feed costs, saves supplementary feed costs and increases sale price of young stock

Scenario three Saltbush saves drought feed costs, saves supplementary feed costs, increases sale price of young stock and increases wool cut and weaning percentage

Expected net gains annually from planting saltbush are shown in Table 6-4, with the effect on whole farm results shown in Table 6-5. The results can be used to compare the three scenarios in the steady state i.e. once saltbush establishment costs have been paid off. Planting for drought benefit alone is not expected to be worthwhile; the annualised benefits are not expected to be large and are eroded by the effects of

depreciation, tax and interest on capital tied up in fencing and water provision. Scenario two is expected to have a relatively large annual net gain before tax and interest, but the result after tax and interest is expected to be under $3,000.

**Table 6-4 Partial budget for three saltbush benefit scenarios**

| | Scenario | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| **Gains** | | | |
| Revenue gained if changes made | | | |
| More lamb sales | $0 | $2,591 | $2,591 |
| Better weaning % | $0 | $0 | $3,938 |
| Better wool cut | $0 | $0 | $3,780 |
| More stock carried | $0 | $0 | $0 |
| Costs avoided if changes made | | | |
| Supp feed costs | $0 | $2,721 | $2,721 |
| Drought feed costs | $4,643 | $4,643 | $4,643 |
| *Total gains* | $4,643 | $9,955 | $17,673 |
| **Losses** | | | |
| Revenue foregone if changes made | | | |
| Pasture no longer available | $1,245 | $1,245 | $1,245 |
| Costs incurred if changes made | | | |
| Depreciation on assets | $1,583 | $1,583 | $1,583 |
| *Total losses* | $2,828 | $2,828 | $2,828 |
| Total gain/loss | $1,815 | $7,127 | $14,844 |
| Marginal tax rate | 20% | 20% | 20% |
| Extra taxable income | | | |
| Tax on extra gain/loss | $363 | $1,425 | $2,969 |
| Total gain/loss after tax | $1,452 | $5,702 | $11,876 |
| Released capital | $44,262 | $44,262 | $44,262 |
| Interest rate | 6.5% | 6.5% | 6.5% |
| Interest on capital | $2,877 | $2,877 | $2,877 |
| Net gain/loss after tax and interest | -$1,425 | $2,825 | $8,998 |

**Table 6-5 Net farm profit (after tax) - before and after change**

| | Scenario | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Current farm profit after tax | $13,760 | $13,760 | $13,760 |
| Net gain/loss after tax and interest | -$1,425 | $2,825 | $8,998 |
| Farm profit after change | $12,335 | $16,585 | $22,758 |

Whether it is profitable to establish saltbush under the three scenarios needs to be assessed using a discounted cash flow analysis which takes account of the establishment cost and annual costs and benefits for 15 years. This analysis will also indicate the financial feasibility of establishing all plantations in one year - this may be a useful guide to the owners as they plan out the sequence of plantings over time.
Expected results are shown in Table 6-6 and Table 6-7. The saltbush budget for scenario two is included in Table 10-6 in the appendices.

Under scenario one, i.e. with the drought benefit only, saltbush is not expected to have an acceptable rate of return on the above assumptions. Careful consideration is advisable before planting more than 50 hectares i.e. the area used for running young stock. The rate of return is acceptable under scenario two, in which saltbush saves drought feed costs, saves supplementary feed costs and increases sale price of young stock. Scenario three, which also includes extra wool cut and a better weaning percentage, has a very high rate of return. This scenario is what the owners would hope to achieve.

**Table 6-6 Profitability (after tax) of saltbush plantings for each scenario**

| | | Scenario 1 | Scenario 2 | Scenario 3 |
|---|---|---|---|---|
| Net Present Value @ | | | | |
| | 5% real | 16,426 | 53,904 | 107,151 |
| | 10% real | (9,359) | 16,899 | 53,763 |
| | 15% real | (22,646) | (3,491) | 23,142 |
| Internal Rate of Return | | 8% | 14% | 22% |

Only scenario three is expected to be financially feasible if all the investment funds have to be borrowed, and assuming all plantings are to be done at once. The first scenario doesn't break-even within 15 years - reflecting the fact that most of the plantings are done solely for the drought benefit. Scenario two also has a long pay-back period, and would be very risky if all the funds were borrowed.

**Table 6-7 Financial implications of the saltbush plantings**

| | Scenario 1 | Scenario 2 | Scenario 3 |
|---|---|---|---|
| Years to positive cash flow | 15 | 13 | 7 |
| Peak Debt | 136,789 | 72,352 | 72,352 |
| Year of Peak Debt | 15 | 2 | 2 |
| Cumulative cash flow after year 3 | (75,210) | (69,962) | (62,930) |

| | | | |
|---|---|---|---|
| after year 7 | (88,661) | (54,559) | (8,640) |
| after year 10 | (101,406) | (34,748) | 54,002 |
| after year 15 | (136,789) | 16,996 | 187,919 |

## *6.5 Sensitivity*

What if these results are tested for sensitivity to change in key assumptions? Testing a range of assumptions is relevant because there has been little economic work done previously on saltbush plantations in this region, and guidance is needed on which technical data needs to be collected if evaluation is to be on a firmer basis.

The effect of lowering the expected stocking rate on saltbush is shown in Table 6-9. The first column of data under each scenario shows the expected value used in the analysis to date. If expected stocking rate is 25 per cent lower than anticipated, under scenario two which is the most likely one on this property, profitability is probably unacceptably low. Unless there is more certainty about stocking rate, and careful monitoring of the actual rates achieved with early plantations, it may be advisable to be cautious about a major expansion in the number of saltbush plantings. It is relevant to ask how much would other factors (eg. seedling cost) have to change to make it clearly worthwhile?

**Table 6-8 Sensitivity to expected stocking rate on saltbush**

| | Scenario 2 | | | Scenario 3 | | |
|---|---|---|---|---|---|---|
| Sheep/ha | 45 | 33.75 | 22.5 | 45 | 33.75 | 22.5 |
| NPV @ 15% real | -$3,491 | -$16,997 | -$43,961 | 23,142 | $9,166 | -$18,041 |
| IRR | 14% | 11% | 8% | 22% | 17% | 12% |

As shown in Table 6-9, a drop in the cost of saltbush seedlings has a considerable effect on profitability, but not enough to counter the effects of a lower than expected stocking rate. It suggests that efforts to establish direct seeding techniques which lower establishment costs even further are worthwhile.

**Table 6-9 Net present value of saltbush establishment (at 15% real) by stocking rate and saltbush seedling cost**

| | Sheep/ha | |
|---|---|---|
| **Seedling cost** | 45 | 33.75 |
| **$0.18** | **-$3,491** | -$16,997 |
| **$0.12** | $353 | -$11,904 |
| **$0.06** | $4,239 | -$6,810 |

As the rate of return expected by the owners may be lower than the rate used in the above table, the same results are presented in Table 6-10 using the criterion of internal rate of return.

**Table 6-10 Internal rate of return of saltbush establishment by stocking rate and saltbush seedling cost**

| | Sheep/ha | |
|---|---|---|
| **Seedling cost** | 45 | 33.75 |
| **$0.18** | 14 | 11 |
| **$0.12** | 15 | 12 |
| **$0.06** | 17 | 13 |

## *6.6 Discussion*

Planting small areas of saltbush for the purposes of managing young sale sheep appears profitable.

Care is needed in attributing benefits to any *extra* saltbush plantations that might be considered on this property. Sufficient saltbush is already established to feed all young stock for three or four weeks each year. Extra saltbush may not have this benefit.

Saltbush planted for drought proofing alone is not expected to be worthwhile. However, it may be worthwhile if drought costs are significantly higher than estimated here and other benefits can also be achieved. If saltbush can also be used to maintain weaning percentages and wool cut during poorer seasons then the outlook for large areas of planted saltbush might be very different. The technical feasibility of obtaining such additional benefits needs to be carefully evaluated.

Risk was partly incorporated into the analysis by allowing for possible establishment failure, and by analysing profitability at different rates of return (a higher rate may be

required for a risky investment). The possibility that the saltbush would prove capable of providing only fifty or seventy-five per cent of the anticipated carrying capacity was also examined.

Information that would assist in further economic analysis includes:

- cost savings associated with saltbush e.g. feed costs
- animal performance measures for whole properties with and without saltbush e.g. weaning percentage, wool cut
- detailed records of utilisation of saltbush plantations over a number of years. This should include for each plantation, the number of grazings, number and type of animals grazing, length of each grazing.
- expected life of a saltbush plantation eg. the number of plants remaining and their productivity after 15 years, 30 years, 45 years etc

An interim analysis might use expected values for how each benefit attributable to saltbush might change according to the type of season (e.g. best, good, most likely, poor, worst). For instance, how wool cut would change from season to season with and without saltbush plantations on the property. Scenarios could then be constructed according to the expected values of a number of different people reflecting their degree of optimism about saltbush.

## 7. ‘Conservation management’ options for other remnant vegetation

The role of native grasslands in the farming system has already been discussed. This section evaluates the effect of managing the remnant bush, mainly along sandy ridges and prior streams, for conservation purposes. It is assumed this area is 2.5 per cent of the total farm area. This area is to be totally destocked initially (Table 7-1), and once regeneration occurs rested for an extended period each year (Table 7-2).

As shown in Table 7-2, the cost to the owner of managing 2.5 per cent of the farm area differently is expected to be approximately $2,000 and $1,000 respectively - or $19/hectare and $9/hectare. It should be noted that the owners have already destocked at least this area in order to encourage regeneration, and are selectively re-introducing grazing.

**Table 7-1 Destocking land**

| | |
|---|---|
| Area involved - ha | 120 |
| Estimated stocking reduction in DSE/ha | 1.22 |
| Gross margin/DSE | $19 |
| Capital value per DSE | $16 |
| Sale value of stock | $2,348 |
| | |
| Gains | |
| Interest earned on sale value of stock (after tax) | $100 |
| Saved fertiliser costs (one in four years) | |
| Total savings | $100 |
| | |
| Losses | |
| Gross margin | $2,741 |
| | |
| Net gains/loss before tax | -$2,641 |
| less Marginal tax savings @ 15% | -$396 |
| Net profit/loss after tax savings | -$2,245 |
| per hectare | -$19 |

**Table 7-2 Resting land for an extended period every year**

| | |
|---|---|
| Area involved - ha | 120 |
| Estimated stocking reduction in DSE/ha | 0.6 |
| Gross margin/DSE | $19 |
| Capital value per DSE | $16 |
| Sale value of stock | $1,174 |
| | |
| Gains | |
| Interest earned on sale value of stock (after tax) | $50 |
| | |
| Losses | |
| Gross margin | $1,371 |
| | |
| Net gain/loss before tax | -$1,321 |
| less Marginal tax savings @ 15% | -$198 |
| Net profit/loss after tax savings | -$1,123 |
| per hectare | -$9 |

## 8. Conclusions

The pastures are being managed relatively conservatively, and in a way that is probably consistent with maintenance of conservation values in the long-term. Surveys in different seasons and monitoring may be required to confirm if this is true. The owners have fenced out some areas with sandy soil to encourage regeneration.

The farm business is relatively small. Ways to increase income from the farm or from investing or working off-farm will need to be found over the medium term. Irrigation has been rejected as an option by the owners.

If saltbush achieves the aims set out by the owners, then it will make a significant contribution to the property. However, it is not yet clear that this will be the case. Consequently a more cautious conclusion about its potential role of saltbush is reached. Saltbush plantations may make a modest contribution to increasing average income by evening out the slumps in poor years. However, it is by no means certain that this will be profitable unless saltbush establishment costs fall markedly and there is more certainty over the expected stocking rate on saltbush plantations. In reaching this conclusion, the sensitivity of saltbush results to changing critical assumptions has been tested. There are two key factors which might change this conclusion about the role of saltbush on this property. Firstly, drought costs being significantly higher than estimated here. Secondly, more certainty that saltbush plantations will have a large effect on weaning percentage and wool cut in poorer years.

There is a divergence of views about the potential of saltbush. The owners have had some practical experience with saltbush, and are optimistic on this basis. However, the benefits have yet to be scientifically documented, and it is beyond the scope of this economic analysis to do so.

Ecotourism or other alternative enterprises may make a contribution to the farm business. The on-farm success of such initiatives are likely to depend very much on the management and marketing skills of the owners. The start-up costs are likely to be very high, unless a way is found to move into the activities slowly over time. An economic evaluation would be more appropriate once a concept plan had been developed.

A twenty year vision for this property as a viable unit includes the following characteristics. It is still stocked conservatively. Plant diversity is as high as at present. Saltbush plantations are scattered over the property, and saltbush is self-seeding through pastures that have been rested periodically from grazing. Grazing income is more even over good and poor seasons, and modest income is generated from ecotourism and investments and off-farm work.

## 9. References


Benson, J., Ashby, E. and Porteners, M.F., 1996. The native grasslands of the Southern Riverina, New South Wales. Report to Australian Nature Conservation Agency. National Herbarium of New South Wales.

Jones, R.M. and Hargraves, J.N.G., 1979. Improvements to the dry-weight method for measuring botanical composition. *Grass and Forage Science* (1979) 34: 181-189.

Makeham, J. P. and Malcolm, L. R., 1993. *The Farming Game Now*, Cambridge University Press, Cambridge.

Rickards, P.A. and Passmore, A.L., 1977. Planning For Profit In Livestock Grazing Systems. Professional Farm Management Guidebook Number 7, Agricultural Business Research Institute, University of New England, Armidale.

Tongway, D., 1994. Rangeland Soil Condition Assessment Manual. CSIRO Division of Wildlife and Ecology, Canberra.

Wilson, A.D. 1998. 'Oldman Saltbush is a drought reserve, but not a wonder shrub' Role of Forage Shrubs Workshop, Condobolin, October 1998

Wilson, A.D., Leigh, J.H. and W.E. Mulham, 1969. A study of Merino sheep grazing a bladder saltbush (*Atriplex vesicaria*) - cotton-bush *(Kochia aphylla*) community on the Riverine Plain. *Australian Journal of Agricultural Research*. 20: 1123-36.

# 10. Appendices

## *10.1 The farming calendar*

- Joining begins 1 January
- Shearing - 3rd week of February
- Lambing is in June/July
- Marking and mulesing are done in early August.
- Classing of sheep starts in mid-August and may extend over a month
- In September pasture condition is assessed and decisions made about stocking in autumn
- Crutching begins in about the third week of September
- Jetting lambs is done soon after crutching
- Sorting and selling older ewes and other surplus stock is done in October and November
- Weaning is over early November
- Wether lambs are sold following weaning
- Lambs are crutched at the end of November
- December is taken up with watching the stock, especially to ensure younger ones adapt to watering points.

## *10.2 Gross margins per DSE*

**Table 10-1 Gross margin for the sheep enterprise**

| | Self Replacing Merinos |
|---|---|
| INCOME : | |
| Wool (gross) | $18.18 |
| Livestock trading profit/loss | $8.24 |
| Total Income | $26.42 |
| | |
| COSTS : | |
| Shearing & crutching | $3.34 |
| Mulesing | $0.14 |
| Animal health | $1.01 |
| Supplementary feed | $0.00 |
| Freight | $0.65 |
| Wool tax | $1.55 |
| Wool selling expenses | $0.73 |
| Stock selling expenses | $0.48 |
| Total Costs | $7.88 |
| | |
| GM PER DSE | $18.54 |
| | |
| CAPITAL VALUE | $13.36 |

### *10.3 Stock trading schedules*

The stock trading schedule is shown in Table 10-2.

**Table 10-2 Stock trading schedule**

| | $/hd | No. | Value $ | | | $/hd | No. | Value $ |
|---|---|---|---|---|---|---|---|---|
| **Opening stock** | | | | | **Sales** | | | |
| Breeding ewes | 22 | 2,500 | 55,000 | | cfa ewes | 2 | 550 | 1,100 |
| 1 yo ewes | 42 | 644 | 27,038 | | | | | |
| | | | | | Ewe weaners | 42 | 326 | 13,679 |
| | | | | | Wether weaners | 42 | 970 | 40,740 |
| Rams | 156 | 75 | 11,700 | | Rams | 12 | 23 | 273 |
| **Births** | | 2,000 | | | **Deaths** | | 157 | |
| **Purchases** | | | | | **Closing stock** | | | |
| | | | | | Ewes | 22 | 2,500 | 55,000 |
| | | | | | 1 yo ewes | 18 | 644 | 27,038 |
| Rams | 300 | 25 | 7,500 | | Rams | 156 | 75 | 11,700 |
| **Profit/Loss** | | | 48,292 | | | | | |
| | | 5,244 | 149,529 | | | | 5,244 | 149,529 |

## *10.4 Pasture assessment*

The survey to identify and assess composition of each grassland type, native and naturalised, was undertaken in October 1997. The aim was to gain an appreciation of the different pasture types on the property, their distribution across the farm and how they might be contributing to production in different seasons. Allan Wilson, consultant in rangeland research and management, was involved in this assessment and in following discussions with the owners about management options.

The owners provided background information about paddock types and 'representative' paddocks using a rough farm map. In the selected paddocks, species were recorded as abundant, common, occasional, rare or localised against a species list for the Hay plains (based on Communities 1a & 1b identified by Benson *et al* 1996). Visual estimates of the abundance of bushes, naturalised annual grasses and forbs, and native grasses and forbs were made at 13 sites. 'Representative' sites were selected within paddocks, taking care to avoid fence and water effects.

### 10.4.1 **Validation of the dry matter estimates**

In order to verify the accuracy of the visual estimates of abundance estimates, quadrats were thrown at two sites. Results are shown in brackets in Table 2. Calculation of error proportions suggest that the visual estimates have accurately determined the relative order of the major categories.

Perennial species were found to be not quite as important as the estimates suggested. Annual grasses were correctly estimated to comprise the bulk of the vegetation at the two sites, although their relative importance was under-estimated. Medics were over-estimated. Taken together with native annuals, the annual species - and hence the relative amount of feed being generated in winter and spring - were under-estimated.

**Table 10-3**. Estimated per cent species composition by site - visual assessment - estimates of composition (not dry matter)

| Site | 8 | 10 |
|---|---|---|
| **Naturalised annuals** | | |
| grasses | 40 (59) | 40 (51) |
| forbs-medics | 15 ( 6) | 15 (11) |
| **Native annuals** | | |
| forbs | 0 (0.2) | 10 (4) |
| **Native perennials** | | |
| cool season C3 grasses | | 8 (1) |
| warm season C4 grasses | 15 (15) | 15 (19) |
| shrub - cottonbush | 27.5 (15) | 10 (8) |
| shrub - poverty bush | | |
| palatable chenopods | | 2 (3) |
| other palatable forbs | 2.5 (3) | |

**Table 10-4 Species abundance by site and plant characteristics - October 1997**

Notes to table 3.

**Int** = naturalised. **A** = abundant; **c** = common; **o** = occasional; **l** = localised; **r** = rare; **y** = unverified, but mostly occasional or rare.

**Sites** - **1** Staging **2** Deal black **3** Deal red **4** Yoyo **5** South **6** West **7** Ridge **8** Rest **9** East Barren **10** Barren **11** Gums **12** JJ **13** North.

| | | | Site | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Botanical name** | **Common name** | **Int** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** |
| *Acacia pendula*[Vic] | | | o | | o | o | | | | | | | | | |
| *Arctotheca calendula* | Cape Weed | * | o | | | | | | | | | | o | o | c |
| *Asperula conferta* | Common Woodruff | | | | | | | y | | | | y | | | |
| *Atriplex leptocarpa* | Slender-fruited Saltbush | | | | | | | | | | | | o | | |
| *Avena fatua* | Wild Oats | * | | c | | | A | c | o | o | c | | c | c | c |
| *Calocephalus sonderi* | Pale Beauty-heads | | | | | | | | | | | o | | | |
| *Calotis scabiosifolia* var. *scabiosifolia* | Rough Burr-daisy | | | | | | y | y | | y | y | y | | | |
| *Chamaesyce drummondi* | Caustic Weed | | | | | | | | | | | | | y | |
| *Chenopodium dsertorum* subsp. *virosum* | Foetid Goosefoot | | y | | | | | | | | | | | | |
| *Chrysocephalum semipapposum* | Clustered Everlasting | | | | | y | | | | | | y | | y | y |
| *Circium vulgare* | Spear Thistle | * | | | | | | | | | | | | | y |
| *Danthonia caespitosa* | Wallaby Grass | | c | | A | A | | | | o | c | c | | A | A |
| *Daucus glochidiatus* form G | Austral Carrot | | | | | | | | | | o | | | | |
| *Echium plantagineum* | | * | | | | | | | c | | | | o | | |
| *Enteropogon ramosus* | | | o | | | c | | | | | | A | c | o | o |
| *Eriochlamys behrii* | Woolly Mantle | | | | | | | | | | | y | | | |
| *Erodium cicutarium* | Common Heron's-billl | * | | | | | | | c | | | | A | | |
| *Erodium crinitum* | Blue Heron's-bill | | | | | | | | | r | | | | o | c |
| *Goodenia pinnafida* | Scrambled Eggs | | | | | | | | | | | | | y | y |
| *Hedypnois rhagadioloides* | Cretan Weed | * | | | | | | | | | y | | | | |
| *Homopholis proluta* | Rigid Panic | | c | A | o | o | A | A | | c | A | | | | o |
| *Hordeum leporinum* | Barley Grass | * | | | | | | | A | | | | A | | |
| *Hypochaeris radicata* | Flatweed | * | | | | | | | | | y | | | | |
| *Ixiolaena leptolepis* | Stalked Plover-daisy | | y | | | | | y | | | | | | | |
| *Leptorhynchos panaetoioides* | Woolly Buttons | | | | | | y | | | y | | | | | |
| *Leucochrysum molle* | Hoary Sunray | | y | | | y | | | | | y | | | | |
| *Lolium rigidum* | Wimmera Rye-grass | * | A | A | c | A | A | A | | A | A | A | | A | A |
| *Maireana aphylla*[Vic] | | | c | c | c | c | c | r | | A | c | A | | | o |
| *Maireana excavata*[Vic] | Bottle Blue-bush | | c | | A | A | | | | | o | o | o | | |
| *Maireana pentagona* | Slender Blue-bush | | o | | o | c | | | | | c | o | | | c |
| *Marrubium vulgare* | Horehound | * | | | | | | | | | | | | | |
| *Medicago polymorpha* | | * | c | c | c | c | o | c | | c | c | A | c | | |
| *Medicago praecox* | | * | | | | | | | | | | | | A | c |
| *Medicago truncatula* | Barrel Medic | * | | | | | | | o | | | | | | |
| *Oxalis perennans* | Grassland Wood-sorrel | | o | o | o | o | o | | | o | c | o | | o | o |
| *Paspalidium constrictum* | Box Grass | | | | | | | | o | | | | | | |
| *Phalaris paradoxa* | Paradoxa Grass | * | | | | | | | | y | | | | | |
| *Plantago turrifera* | Small Sago-weed | | | | | | | | | | y | | | | |
| *Podospermum resedifolium* | Scorzonera | * | | | | | y | | | | | | | | |
| *Rhagodia spinescens* | | | | | | r | | | o | | | | | | |
| | | | Site | | | | | | | | | | | | |
| **Botanical name** | **Common name** | **Int** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** |
| *Rodanthe coymbiflora* | Grey Sunray | | | | | | | | | | | | | y | y |
| *Salsola kali* | Prickly Saltbush | | | | | | | | o | | | | o | | |
| *Sclerolaena muricata* var | Roly-poly | | | | | | y | | | | | | | | |
| *Sclerolaena muricata* var. | Five-spined Bassia | | | r | | | c | | | | | r | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *semiglabra* | | | | | | | | | | | | | | | |
| *Sida corrugata* | Variable Sida | | o | | o | | | | | | | o | c | o | |
| *Sisymbrium erysimoides* | Smooth Mustard | * | | | | | | | o | | | | | | |
| *Solanum esuriale* | Quena | | | | | | | | o | | | | | | |
| *Sonchus asper* subsp. *glaucescens* | Rough Sow-thistle | * | o | o | | | | | | | | | | | |
| *Sonchus oleraceus* | Sow-thistle | * | | | | | o | | | | | | | | |
| *Stipa aristiglumis* | Plump Spear-grass | | | | | | | | | | | | | o | |
| *Stipa nodosa* | Knotty Spear-grass | | c | | c | c | | | | | o | o | c | c | o |
| *Teucrium racemosum* | Grey Germander | | | | | | | | | | y | | | | |
| *Vittadinia cueata* group | Fuzzweed | | | | | y | y | | | | | | | | |
| *Vulpia* spp. | Fescue | * | c | | | | | | c | | c | o | c | c | |

## *10.5 Weights and adjustments used in calculating feed demand*

**Table 10-5** Weights and adjustments used in calculating feed demand

| | Weights (kg) | | | | LSM adjustments | | | |
|---|---|---|---|---|---|---|---|---|
| | Ewes & lamb | Weaners | Wethers | Rams | Poor pasture quality | Extra effort | Pregn-ancy | Lactation[12] |
| Nov-96[#] | 70 | 25 | 55 | 120 | 1 | 1 | 1 | 1 |
| Dec-96 | 70 | 32 | 55 | 120 | 1 | 1 | 1 | 1 |
| Jan-97 | 68 | 34 | 50 | 100 | 1 | 1 | 1 | 1 |
| Feb-97 | 65 | 34 | 45 | 80 | 1 | 1 | 1 | 1 |
| Mar-97 | 62 | 32 | 45 | 80 | 1.2 | 1.1 | 1 | 1 |
| Apr-97 | 62 | 32 | 45 | 86 | 1.2 | 1.1 | 1.1 | 1 |
| May-97[*] | 62 | 40 | 55 | 92 | 1.2 | 1.1 | 1.3 | 1.4 |
| Jun-97 | 60 | 42 | 55 | 98 | 1 | 1 | 1.3 | 1.4 |
| Jul-97 | 65 | 44 | 55 | 104 | 1 | 1 | 1.2 | 1.4 |
| Aug-97 | 75 | 48 | 55 | 112 | 1 | 1 | 1 | 1.4 |
| Sep-97 | 80 | 53 | 55 | 120 | 1 | 1 | 1 | 1.4 |
| Oct-96 | 85 | 55 | 55 | 120 | 1 | 1 | 1 | 1.3 |

[#] weaning
[*] lambing starts

[12] The usual pregnancy adjustment for one and two months before lambing is 1.2 and 1.5, and lactation adjustment is 1.8 (Rickards & Passmore 1976). As lambing occurs over three months, these weightings have been spread out over longer periods.

### *10.6 Saltbush budgets*

The budget is for saltbush plantings for scenario 2 - when saltbush is expected to save drought feed costs, save supplementary feed costs and increase sale price of young stock

**Table 10-6 Partial discounted cash flow budget for saltbush plantings**