Case Farm Three

(Southern Tablelands, 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

Ver 2. March 1999

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1. Nature of the case study

This property is located to the north of Crookwell in the Southern Tablelands of New South Wales. The owners have recently begun developing areas of native pasture, mainly by sowing clovers into the existing pasture. The owners are also intent on increasing the wool cut for their fine wool sheep.

This case study will investigate these and other options for increasing income, and determine the income foregone if the native pasture with the most species diversity is retained.

2. The current farming system

2.1. Background to the farm

The farm is 907 ha in size. A self-replacing merino flock of 1250 ewes and a flock of 1320 wethers producing fine wool are run. A large number of replacement stock are carried as ewes do not lamb until over three years old and the major culling does not take place until the sheep are 2.5 years old. Only seven beef cows and progeny are run. The herd was reduced from 70 as with a string of poor autumns, the owners felt there was insufficient growth to carry them as well as the sheep.

The dry sheep equivalents (DSE) for each enterprise are shown in Table 2-1.

Table 2-1 Stocking - total and per hectare

	DSE
Self Replacing Merinos	4,716
Wethers	900
Cattle	207
Total	5,822
DSE/ha	6.5

The farm is split into five different blocks - Toops, Martins, Carls, Home and Seddons. The first three blocks join up. Home is separated from these three by another property, and Seddons is eight kilometres (or two hours droving time) away.

Table 2-2 gives the size of each block and the number of paddocks.

Table 2-2. Characteristics of each block on the property

Block Name	Size (ha)	No. paddocks
Toops	243	14
Martins	250	6
Carls	202	4
Home	49	12
Seddons	130	6
Total	907	42

The calendar of farming events over the full year is shown in section 10.2 in the appendices.

2.2. Conservation overview

2.2.1. Vegetation

No sites of important conservation value were noted. The native pastures are dominated by native grasses and naturalised annual grasses. Other native species were found but occurrence was either rare, localised or occasional, by contrast to the grasses which were frequently abundant or common. The one exception was kidney weed which was common at one site. The most diverse pasture had 27 species including 13 introduced or naturalised and 14 native (six grasses, six forbs and two legumes). Survey results are discussed further in section 3.1.

The pastures have been somewhat modified since the woodland on the property was cleared. Originally many species other than grasses would have been present. Over time these have disappeared under stocking pressure, fertiliser use and competition from naturalised and native species more adapted to the new environment.

Woodland remains in small sections of a few paddocks, with a moderately diverse understory. Isolated trees remain in most paddocks either in patches or singly.

On two sites where native grasses were dominant, native perennial forbs were found to comprise up to five per cent of cover. Native perennial forbs were found scattered at other sites.

2.2.2. Acidity, erosion, salinity and nutrient movement

There are some issues affecting long-term productivity. Soils across most of the property are slightly acidic. Erosion has occurred in the past, mainly in gullies which were ripped with a mouldboard plough many years ago to help control fluke disease. The owners say that dryland salinity is not a problem.

Off-site effects of land management are likely to include movement of soil resulting from erosion and run-off of nutrients. Sediment and nutrient movement is likely to be lower relative to other properties which are more heavily stocked and which use greater quantities of fertiliser.

2.3. ***Farmer goals***

The farm supports two married generations of the farm family. Both husbands work on the farm, and there is no income earned through off-farm work. The younger generation have dependent children.

The farm needs to provide sufficient income to support both families for some time into the future. Adequate cash flow is therefore a major requirement.

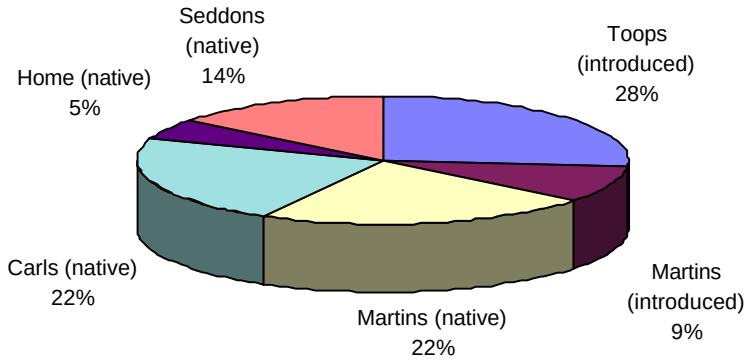
They have been involved in PROGRAZE groups for over one year. The aim of PROGRAZE is to improve skills in managing pastures and livestock, starting with improved ability to monitor pasture and livestock condition.

3. The place of native pasture

The farm is predominantly native pasture. Figure 1 understates the importance of native pasture as the Toops block, shown as introduced pasture, is estimated by the owners to be 40-50 per cent native perennial grasses.

Pasture survey results are included in Table 10-6 and Table 10-7.[1] The first shows percentage composition of each type of vegetation (eg. native grass, introduced grass, introduced legume) at each site that was surveyed. The second table shows all the identified species, grouped according to characteristics, by their abundance. The survey was conducted late in a particularly dry year, and composition at the same time in another year may be different. For instance, the owners state that in a good year the native grasses make up 40-50 per cent of the dry matter across the Toops block, except at sheep camps whereas the survey suggested that it was 10 per cent or lower.

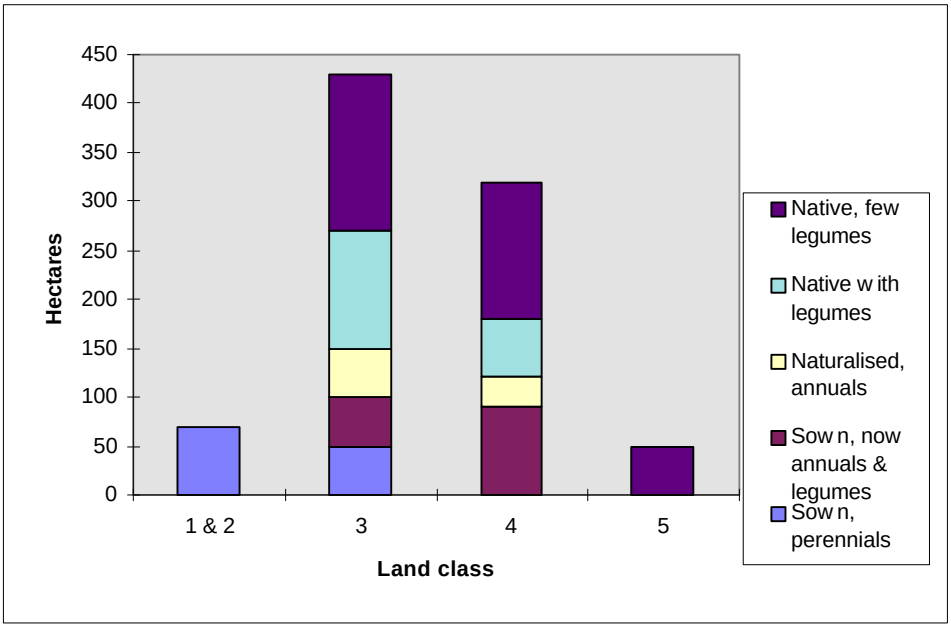
Figure 1 Blocks on the farm (and pasture type) by % of total farm area



The farm has a large area which can potentially be sown to introduced grasses. However, as shown in Figure 2 this is nearly all land class three ie. land with moderately acid soils on lower slopes where establishment and persistence problems have been found. There is only a small area in land classes one and two.Land class three is mostly in native pasture, with a considerable proportion having over five per cent legumes (at the time of survey). Only part of the area sown to introduced pasture retains introduced grasses. Almost half the farm is land class four and five. The areas previously sown but which are now dominated by annual grasses are on steeper slopes than in land class three.[2]

[1] A botanist surveyed the pastures in December 1997.
[2] Simpson & Langford (1996) define each land class as follows:

Figure 2 Area of pasture - pasture type by land class



3.1. Characteristics of each block and the stock it runs

Toops block. Toops block is the original part of the farm, it is 243 ha. It has 14 relatively small paddocks which were sown in the 1960s. Soils are light granite. Most fertiliser is put out on this block, ideally every second year according to the owners. Sheep camps have been spray topped in some paddocks. Trees are red stringybark on the lower slopes and red stringy bark, red gum, yellow box and bundys gum on the higher slopes.

Toops block mainly carries the ewes, except from March to May when they're moved to Martins or Carls to give the block a rest. Some wethers or weaners remain here, preferably wethers as they don't contaminate the pastures. The block is estimated by the owners to carry over six DSE/ha (five ewes and lambs) over winter, poor autumns have reduced this considerably in the last two years. From January 1996 to February 1997 it carried all 1200 ewes except for short periods when between 200 and 600 were on other blocks. From shearing in October 1996 to February 1997 it carried 290 of the 610 weaners, and most of the 750 two year olds.

- one and two - arable, high fertility, minimal erosion risk and non-acid
- three - semi arable, lower fertility, moderate acidity ph 4.5-5.0 CaCl, moderate erosion risk, lower slopes
- four - non arable, low fertility shallow soils, acidic, moderate to high erosion risk, middle to upper slopes
- five - as for land class 4, but usually highly erodible, steep upper slopes

Most of the introduced perennial grasses sown in the 1960s has disappeared, partly because fertiliser was not applied for a long period. Five sites were surveyed in this block (see Appendix for detailed composition). On the two west facing sites on gentle to moderate slope, introduced annual grasses comprised over 70 per cent of the vegetative cover. Native grasses comprised between five per cent and 10 per cent of cover. Weeping grass was common on all sites, with *Elymus scaber* (Tall Wheat Grass) found occasionally on one site. Introduced legumes comprised five per cent of vegetative cover at each site, and introduced perennial grasses made up a similar proportion.

On the steeper slopes, differences emerged between the three sites. At two sites, one west facing and the other east facing, annual grasses and introduced legumes were as significant as on the lower slopes. Native grasses comprised between 10 per cent and 15 per cent of the cover. *Danthonia racemosa* (White Top or Wallaby Grass) was localised on one site. *Bothriochloa macra* (Red Grass), a warm season grass, was found to be localised at both sites. The third site, mid-slope and south-east facing comprised 40 per cent *Danthonia eriantha*, 20 per cent *Bothriochloa macra*, five per cent native forbs and 15 per cent introduced annual and perennial forbs. Annual grasses were only five per cent at this site.

Aerially spreading fertiliser with clover onto these paddocks is an option.

Martins block. Martins block is 283 ha and has seven paddocks. It was purchased in 1981. The whole block was then fertilised and clover seed sown. The granitic soils are the lightest on the property.

Three paddocks totalling 81 ha were sown to introduced pasture in the early 1990s. Little of the cocksfoot sown still remains. These paddocks are regularly fertilised, but soil tests show low phosphate at 4ppm. The three sown paddocks carried 460, and sometimes 610, of the weaners from October 1996 to February 1997. The sown pastures are said by the owners to carry a ewe and lamb in winter and over two weaners from November to March.

Two relatively flat, west facing sites were surveyed on the regularly fertilised paddocks. Native grasses comprised 50 per cent of the vegetative cover, mostly *Bothrichloa macra, Themeda australis¸ Aristida ramosa* with some *Danthonia spp* and several other native grasses. Introduced legumes comprised five per cent of cover. Introduced annual grasses accounted for 40 per cent of cover on one site and six per cent on the other, with introduced perennials Fog Grass and Sweet Vernal comprising 33 per cent of cover on the second site. There is some tree regeneration on one of the paddocks - the previous owners had not stocked the paddock for a long time.

The three native pasture paddocks on Martins block carry mostly wethers - between 150 and 270 all year in 1996. Fertiliser has not been applied since 1981. One smaller paddock is dominated by *Aristida ramosa* (wire grass), but other native grasses are present. They included at one site *Agrostis avenacea, Danthonia eriantha, Danthonia racemosa, Dichelachne crinita, Elymus scaber* and *Poa sieberana* The owners

estimate 2.5 DSE/ha can be carried in winter and three DSE/ha in summer on the unfertilised native pasture paddocks.

Two sites within the largest paddock were surveyed. Composition at the two sites was very different. The first site, a flat north facing area near a creek, had 85 per cent warm season native grasses - *Themeda australis, Aristida ramosa, Bothriochloa macra* and *Eragrostis brownii* - and five per cent cool season native grasses, namely *Elymus scaber* and the annual native grass *Agrostis avenacea*. There were no introduced legumes or perennial grasses, and only two per cent introduced annual grasses. Introduced forbs made up the balance. The other site, westerly facing in a flattish shaded area was found to have 40 per cent introduced annual grasses, five per cent warm season native grasses - *Themeda australis* - but 48 per cent cool season native grasses. *Danthonia racemosa, Elymus scaber, Microlaena stipoides* were all common and *Poa sieberana* found occasionally. Grass trees were scattered through the third paddock which was not surveyed.

The owners have plans to sub-divide the largest paddock into three smaller paddocks. Without fertiliser, they expect stocking rate to increase from 2.5 DSE/ha to three DSE/ha and to be able to carry current stock through winter, though this is hard to predict. They may direct drill clover, which would be followed by fertiliser for two years and every two or three years after that. Stocking could be expected to increase to 3.75 DSE/ha, though the owners are uncertain if the fertiliser would be sufficient to maintain the clover base. This operation would be less expensive on Carls block which has better soil - but Martins was the earliest block to be purchased and the owners are keen to do it first.

Carls block. Carls block was purchased in 1985 and has four paddocks totalling 202 ha. It includes one large paddock of 97 ha. Soils are a light granite. It was fertilised with 25-27 tonnes of single superphosphate in 1988 and again in 1995. The owners estimate it carries 4.5 DSE/ha all year.

The large paddock carries most of the wethers on the property. Three sites were surveyed in this paddock. Red grass made up 85 per cent of the vegetative cover in a high north facing gully with gentle slope, 61 per cent on a moderate north facing slope and 48 per cent on a east facing flat area. Introduced annual grasses make up most of the remainder. Introduced legumes comprised five per cent at the gully site.

The large paddock is very hard to manage in autumn given uncertainty about rain at that time of year. If the bulk in the feed can be kept, sheep can be maintained over winter, but not if the paddock is stocked heavily. The owners would like to sub-divide the large paddock. Apart from fencing, two dams would be required.

The smaller paddocks carry weaners from December usually for a full year. In 1996-97 they carried 600 of the 900 weaners for much of the year. *Bothriochloa macra* provides lots of green leaf over summer, with *Danthonia* spp, *Microlaena stipoides* and various flat weeds providing winter feed.

One site was surveyed in these other paddocks. This site was on a west facing steep ridge adjacent to a trial site where protein content of the native grasses is being

monitored against the weight of weaners being run in the paddock. Warm season grasses made up 66 per cent of vegetative cover. *Bothriochloa macra* was found to be abundant, and *Aristida ramosa* common. Cool season grasses made up five per cent; they included *Danthonia eriantha* as common and *Danthonia penicillata* and *Elymus scaber* both occasional. Soil test results for this site show acidity with phCa of 4.56, and low phosphate at 1ppm.

The owner sees spreading fertiliser and clover seed on these paddocks as potentially increasing winter feed without losing much production in summer.

Seddons block. Seddons block has six paddocks totalling 130 ha. The block was purchased in 1971. Carrying capacity is estimated by the owners at 6.2 DSE/ha - the best on the farm. It was fertilised for five years in the 1970s, with a break until 1995 when 15 tonnes was spread at 120kg/ha. Plans are to fertilise every four years. The owners say that the last fertiliser application brought back the clover which had all but disappeared. Some spray topping has been done.

After shearing, all two year olds are carried on Seddons for a full year before classing and joining.

One site with a south-easterly aspect on a moderate slope was surveyed. Composition was 65 per cent introduced annual grasses, two per cent legumes, 30 per cent *Bothrichloa macra* and 1 per cent *Microlaena stipoides.* Danthonia spp and Spear grasses are also present on the block according to the owner. A higher proportion of *Microlaena stipoides* could be expected in the gullies.

The owners believe annual fertiliser could lift stocking rate from 6.2 DSE/ha to 7.4 DSE/ha by increasing winter production. However, the current management fits well into the whole farm system. The owners see it as maximum production for minimum input. The sheep are rounded up only four times a year. Utilising the extra carrying capacity would require changes elsewhere on the farm - Seddons block is pushed to carry 800 weaners through from shearing to sales at present. Current management allows the sheep to do well, there are minimum hassles and less expense than pushing it harder, and it provides some surplus feed. Current stocking also reduces the risk of dust affecting wool quality. The block is used to carry some one year old sheep as well as the two year olds.

Whereas the block now runs 800 sheep, when regularly fertilised it used to run 900 as well as some cattle

House block. House block has 12 paddocks in its 49 ha. It is stocked heavily in spring while Toops block is rested.

Small flocks of weaners and one year olds are carried on House block. It also carries large flocks during shearing.

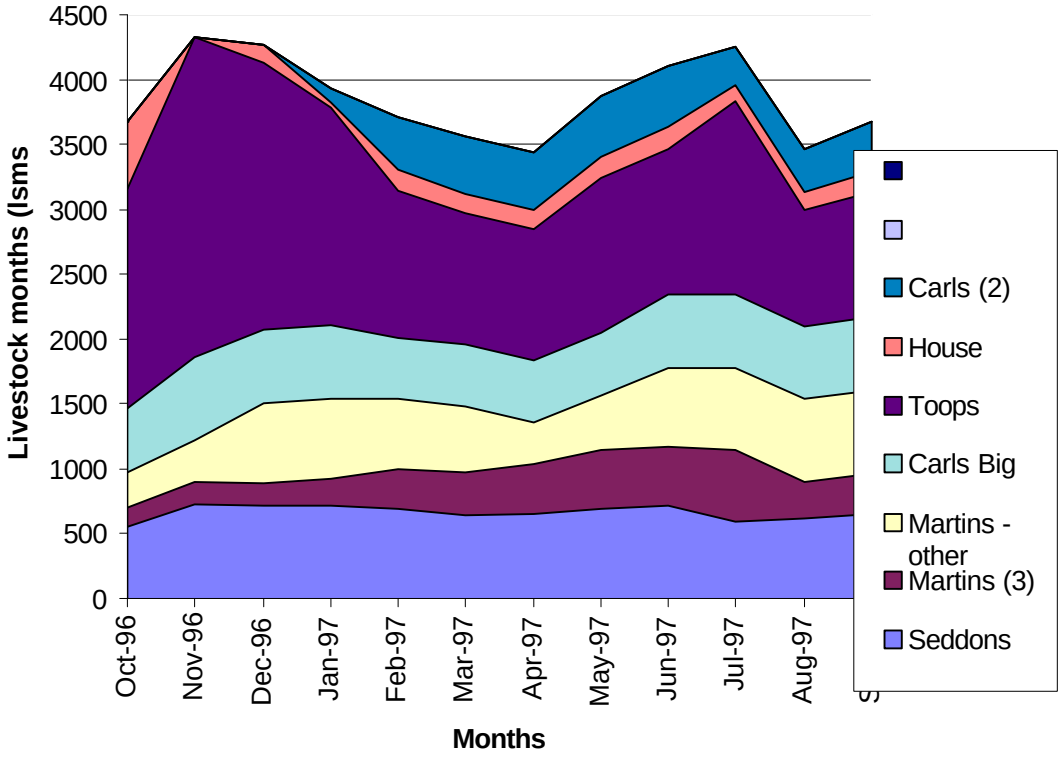
3.2. The contribution of native pasture to the feed supply

The owners say the native pastures provide green pick for large mobs of young sheep in summer months. In years with a dry spring and summer, introduced pasture provides less green feed. In winter the roles are reversed with native grasses are providing little feed. In drought, the owners say native grasses are the basis for maintaining stock.

Poor seasonal conditions in recent years have meant the farm is running fewer stock than 10 years ago, even accounting for the pasture development that has taken place.

The contribution of each area of the farm to total feed supply varies considerably as shown in Figure 3. Utilisation peaks in winter after lambing, and again in late spring after classing of replacement stock into flocks and before cull stock have been sold.

Figure 3 Pasture type by utilisation (in livestock months) over the year



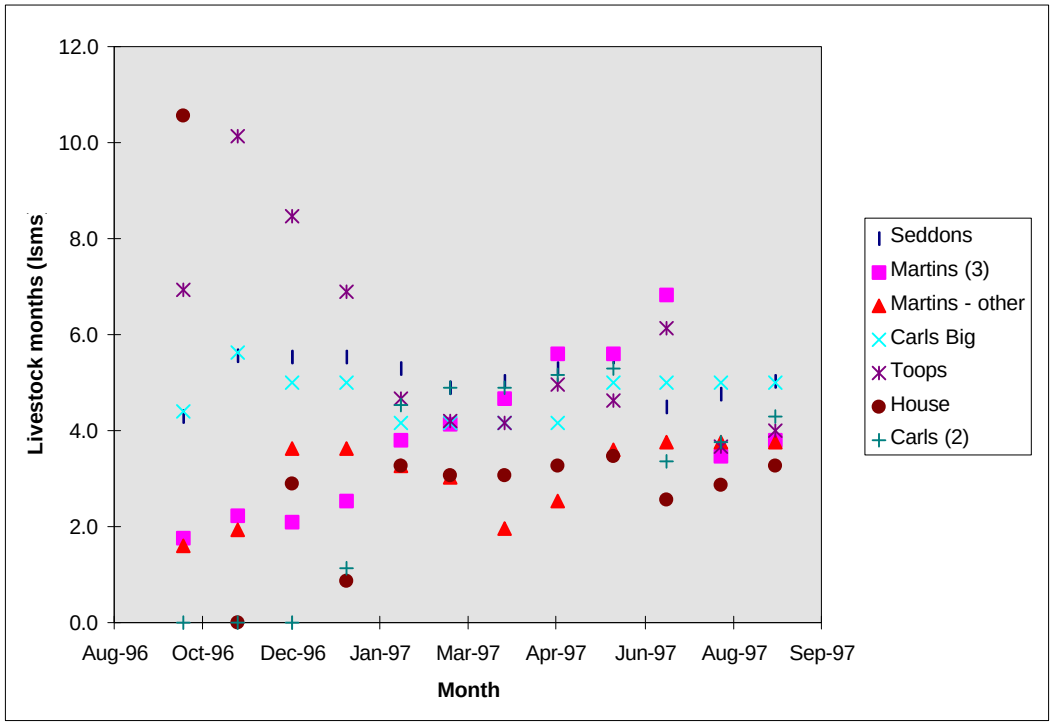
Relative utilisation of blocks on a per hectare basis is shown in Table 3-1.

Table 3-1 Blocks ranked by feed utilisation on a per hectare basis

Block	Status	lsms/ha	approx DSE/ha
Toops	Naturalised annual grasses, native perennials, introduced legumes	79	6.6
Seddons	Native and annual grasses, few legumes	62	5.2
Carls - Big	Native grasses mainly, some annuals, few legumes	58	4.8
Martins (3)	Native grasses with legumes	43	3.6
Carls (2)	Native grasses, some annuals, few legumes	37	3.1
Home	Naturalised annual grasses, legumes	27	2.2
Martins (other)	Native grasses, few annual grasses or legumes	20	1.7

The seasonal pattern of feed utilisation is shown in Figure 4.

Figure 4 Pasture type by per hectare utilisation (in livestock months) over the year



4. Economic and financial state of the current farm business

The total capital of $1,570,000 is made up of:

- land valued at $1,340,000
- livestock worth $160,000
- plant worth $70,000.

The owners estimate the average value over the farm is $1,500/ha.

Equity is 100 per cent.

The gross margins for each enterprise and their relative size are shown in Table 4-1.

Table 4-1 Total gross margins by enterprise

	$'000	%
Self Replacing Merinos	92	80
Wethers	20	18
Beef cattle	3	3
Total	116	100

Activity gross margins and capital values of stock per DSE are shown in Table 10-1 in the appendices. Overhead costs of $56,000 are detailed in Table 10-2 in the appendices. The major component of overhead costs is operator's allowance of $40,000. Further unallocated or whole farm variable costs, shown in Table 10-3 are $21,000 (for fertiliser, weed control, rabbit control etc).

Expected operating profit after tax from the current farm system is shown in Table 4-2 below. Expected annual return to capital (after tax) is 1.5 per cent.[3]

Table 4-2 Expected profit/loss

	$'000
Income	159
Activity costs	44
Whole farm variable costs	21
Overheads incl labour & depreciation	59
Total costs	124
Operating profit before tax	35
Estimated tax payable	11
Operating profit after tax	24

[3] Land leasing costs are included in calculating return to capital, but are excluded in calculating operating profit. Tax is based on an average 15%.

Net cash flow, as shown in Table 4-3, is high enough to provide the two families with a consumption allowance of $20,000 each and to provide a modest sum for equipment replacement and farm development expenses.

Table 4-3 Expected uses of cash

	$'000
Cash in	
Sales	159
Cash out	
Activity variable costs	44
Whole farm variable costs	21
Cash overheads	15
Income tax	11
Consumption	40
Total cash out	131
Net cash flow	28

5. The future - current plans and other opportunities

Operating profit after tax (Table 4-2) and net cash flow (Table 4-3) are reasonable at present, and provide for consumption needs as well as a surplus for re-investment. However, return to capital is below the level which can be reasonably expected from the capital tied up in a farm.

5.1. The owner's plans

The owner's are seeking to increase income in two main ways.

They have reduced the wool micron from 19.3 to 17.9 over 10 years with only a very slight reduction in fleece weight. Now they are seeking to increase fleece weights without allowing an increase in wool micron.

Several native pasture paddocks are being targeted for increases in carrying capacity. They are being sub-divided and and clover is then being sown with fertiliser containing potash, lime and phosphorus. Previous efforts have also included introduced grass seed, but the introduced grasses did not establish.

The owners do not believe they can easily increase production from the area sown in the 1960s to introduced pasture, which has since reverted to naturalised annual grasses and native perennial grasses. Recently, two paddocks dominated by broadleafed weeds and annual grasses were resown with introduced grasses and clovers. All other introduced paddocks are in better condition.

Changing from lambing in May/June to August/September is being considered by the owners, but they regard it as a difficult decision. Feed supply and demand would be better matched. The spring flush, particularly of legumes and naturalised annual grasses, would provide feed for the ewes and lambs, and the native grasses would later assist in fattening the weaners as other species begin to dry out. However, the weather in August and September can be 'wicked', and only two paddocks at present have good shelter. Mustering ewes for shearing is also difficult with one month lambs at foot. Later lambing in warmer weather in October means lambs are more likely to have grass seed problems and be difficult to fatten as the pastures are drying off.

5.2. Options chosen for analysis

There are two options for increasing production on native pasture areas and two conservation management options.

1. **Adding clovers to native pasture after sub-division** - the owners are now sub-dividing a large paddock into which they will sow clover. Another large paddock will follow, making a total of 179 ha. Fertiliser will be spread annually.

2. **Strategically apply fertiliser to native pasture.** This strategy can be applied to a three smaller native pasture paddocks totaling 105 ha which now carry weaners.

3. **Manage for conservation by reducing stocking for 6-12 weeks every year** - this option is tested on a 27 ha paddock, which is one of the newly sub-divided paddocks. Species diversity was highest here.

4. **Retire land from production** - the 27 ha that has the most native species is to be fenced out. This area is considerably more than what the owners would be prepared to consider at present. The effect of totally removing stock is to be tested, whereas in reality such areas are likely to be utilised for grazing in dry times and for short periods possibly every year.

5.3. General assumptions

It is assumed that a self-replacing merino flock is the only enterprise run on the native pasture. Wool price is expected to average $7.70/kg and gross margin per dry sheep equivalent is expected to be over $20/DSE. The breakdown of the gross margins can be found in Table 10-1.

Fertiliser costs $250/tonne spread.

Each investment is funded with an overdraft at 12 per cent. Once debt is paid off, cumulative cash surpluses are invested at five per cent.

An inflation rate of three per cent is assumed for the financial analysis of each investment option. The economic analysis is based on current prices ie. real dollars.

Further explanation of the methodology is given in the main report.

6. Investing in native pasture

The approach to the economic and financial analysis is explained in the main report.

Options are to:
1. sub-divide and establish clover into 179 ha of native pasture
2. fertilise 105 ha native pasture annually

For the first option, the proportions of the pasture being sown by different methods is: 40 per cent direct drill, 25 per cent broadcast, 35 per cent aerial. Averaged for all methods, the stocking rate is expected to increase by four DSE/ha from the current stocking level of 2.5 DSE/ha to 6.5 DSE/ha over 10 years. The pattern of increase is assumed to be: first year - 0, second year - 0.4 DSE/ha, other years - 0.45 DSE/ha.

For the second option it is expected that stocking rate will increase by 0.4 DSE/ha each year for 10 years. This pasture which now runs weaners is on better soils. Although clover is present, the slow response is expected as the paddock has only been fertilised twice in the last 12 years.

Assumptions are:

- for both options, fertiliser is applied at 125kg/ha annually until pasture production peaks and then every second year. Fertiliser costs $250/tonne which includes spreading costs.
- sowing costs are $104/ha ($42 clover seed, $4 seed treatment, $52 fertiliser, $6 sowing). This is based on the owner's experience with direct drilling. It is assumed that the costs will average out to this for the three methods of establishment.
- Fencing costs $2,200/km for 1.5 km of fencing for each of the two sub-divisions. This is based on the owner's experience.

6.1. Economic and financial results

Discounted cash flow budgets have been prepared to show the extra contribution to the farm for one option of sub-dividing and adding clover to a native pasture and another option of fertilising native pasture. These are in the appendices. Table 6-1 shows that both options are worthwhile on economic criteria, but that financially both need to be scrutinised carefully.

Table 6-1 Profitability and financial feasibility of each option[4]

Option	Clover and fertilise	Fertilise
Economic analysis		
NPV at a discount rate of:		
5% real	$72,662	$48,413
10% real	$29,874	$24,271
15% real	$8,350	$11,914
Initial investment (yr 1 only)	$18,618	$972
Internal rate of return	18%	29%
Steady state year	11	11
Extra operating profit in steady state	$10,049	$5,500
Financial analysis		
Years of debt	12	9
Maximum debt	$44,856	$9,623
Year of peak debt	7	5
Cum net cash flow yr 7	-$44,856	-$7,633
Cum net cash flow yr 15	$49,307	$61,392
Salvage value yr 15	$103,865	$56,064

[4] The initial investment does not include stock purchases occurring in years two and later.

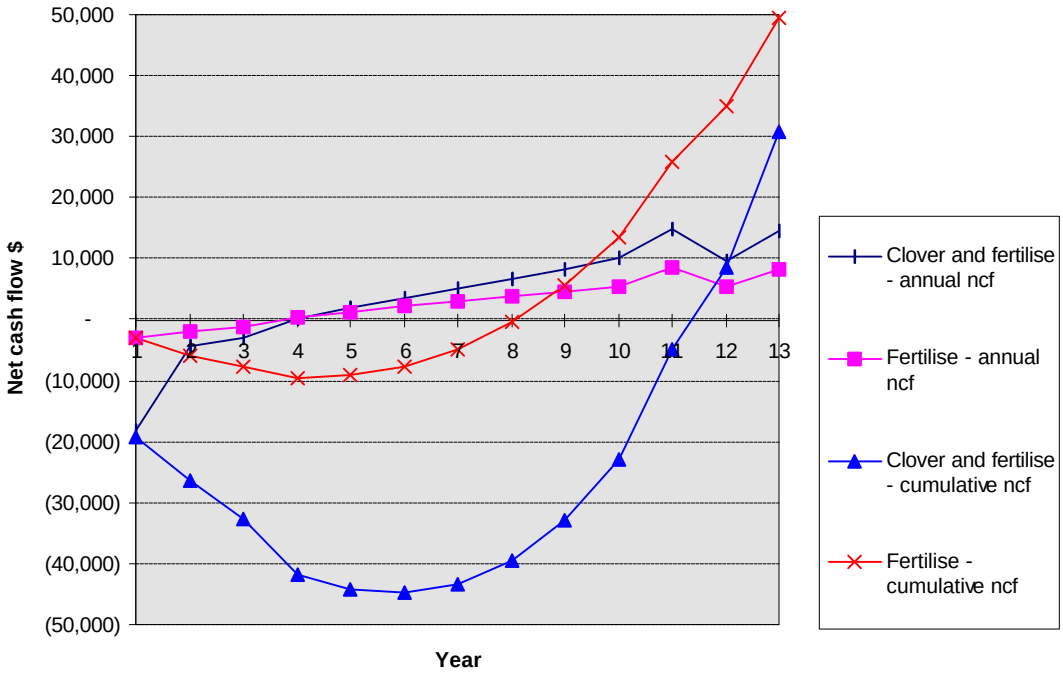
Both investments are profitable. Net present value (NPV) is positive even at a 15 per cent real discount rate. Internal rates of return for both options are higher than can generally be found off farm. Internal rate of return is high for fertilising native pasture as it is based on a low initial capital outlay.

Table 6-1 and also Figure 5 show the financial feasibility of each option after interest payments have been deducted. On affordability grounds, both investments do not break-even for nine or more years, and consequently large capital investments may be difficult to finance. Negative cash flows mean that debt increases in the early years of both investments, as shown by the maximum debt level in Table 6-1. Debt increases considerably beyond the initial investment because of livestock purchases and interest costs.

In the case of fertilising native pasture, the fertiliser costs are greater than the net returns from wool and livestock sales for the first three years - and with accumulated interest costs added, it takes several more years before the debt is cleared. Cumulative net cash flows in years seven and 14 favour fertilising pasture over direct drilling.

This analysis is based on the investment funds costing 12 per cent in interest, irrespective of whether the funds are borrowed or obtained from cash surpluses on the farm.

Figure 5 Annual and cumulative net cash flow - the two options



6.2. Sensitivity of results

Once the effect of changing critical input variables on profitability and cash flow is clear, a realistic choice can be made about which option, if any, to pursue - assuming other investment alternatives on or off the farm are no better.

Net present value is shown at a number of discount rates in Table 6-1 to allow for uncertainty.

The relationship between profitability and different combinations of wool price and stocking rate increase is shown in Table 6-2 for the option of fertilising native pasture. If NPV exceeds zero, the option is profitable. Fertilising native pasture is profitable except if a stocking rate increase of only 2.0 DSE/ha is achieved over the 10 years ie. 0.2 DSE/ha per year with a low wool price. If stocking rate increases by 3.0 DSE/ha or more, it is expected to be profitable at all shown wool prices.

Table 6-2 Net present value (NPV) by wool price and stocking rate increase achieved by year 10

		Wool price ($/kg)		
		$6.70	$7.70	$8.70
SR increase (DSE/ha)	2.0	-$902	$674	$2,254
	3.0	$4,074	$6,243	$8,428
	4.0	$9,120	**$11,914**	$14,725

The sensitivity of the direct drilling option to changes in stocking rate and wool price has not been tested.

7. Summary of development options

The extra net profit contributed each year by the developments once they reach a steady state is summarised in Table 7-1. The options both take a long time to deliver.

Table 7-1 Extra net profit in steady state

	Steady state (year)	$'000
Add clover and fertilise	11	10
Fertilise	11	6
Total		16

8. ‘Conservation management’ options

There are two management options being considered - retiring 27 ha from production and resting 27 ha in spring. Both options mean fewer stock carried and hence foregone income. The level of foregone income will depend on the stock reduction required, and on the rejuvenation of pastures that might occur due to the resting.

Retiring land from production will reduce stocking from three DSE/ha to nil.

Changes assumed with resting native pasture in spring include an initial reduction in stocking rate from three DSE/ha to two DSE/ha. Pasture productivity is assumed to increase by four per cent a year so that by year 15 stocking rate is about 2.5 DSE/ha - it is assumed that reducing stock in spring will rejuvenate the pasture and allow a slow increase in the number of stock carried. Fertiliser is applied every four years as is the case now.

The objective of the stocking reduction is for conservation reasons, and total destocking will be necessary for two to three months to prevent stock from eating the palatable native species like daisies, glycines and lilies. If reducing stock in spring is not for conservation reasons but to rejuvenate native grasses, this can be achieved by reducing stock numbers to the point where they are eating only the palatable clovers and leaving the grasses.

The extent of the stock reduction in pasture resting option depends on the extent to which other areas of the farm can carry extra stock during spring. As indicated above, it is assumed here that 2/3rds can be. As the level of stocking is based on carrying stock through the most limiting period of feed supply, usually autumn or winter, some of the surplus feed produced in spring on these other paddocks will feed the displaced stock instead of being carried over as dry summer or autumn feed. In turn, resting the paddocks might also increase the feed supply from the rested area in autumn - the season of shortest supply.

8.1. Economic and financial results - ‘conservation management’ options

Table 8-1 shows the annual loss associated with resting an area for 6-12 weeks. If the resting contributes to pasture rejuvenation, there may be benefits rather than a loss. For instance, if stocking increased by one DSE/ha after the paddock had been rested in this way for four years, the gain each year from the fifth year onwards would be $494 a year.

Table 8-1 Annual loss from resting an area for 6-12 weeks

Area involved - ha	27
Estimated stocking reduction in DSE/ha	1
Gross margin/dse	$22
Capital value per dse	$23
Sale value of stock	$625
Gains	
Interest earned on sale value of stock (after tax)	$27
Losses	
Gross margin	$604
Net gain/loss before tax	-$578
less Marginal tax savings @ 15%	-$87
Net profit/loss after tax savings	-$491

The annual loss from retiring land from production is shown in Table 8-2. Retiring this area of land will reduce farm income by about $1,000. The owners may take into account other factors in deciding whether they can afford this. Such factors could include shelter benefits if bush regeneration occurs, use of the area as a potential drought reserve, any particular feelings that they may have towards the area because of its history, management difficulties or scenic value.

Table 8-2 Annual loss from retiring land from production

Area involved - ha	27
Estimated stocking reduction in DSE/ha	3
Gross margin/dse	$22
Capital value per dse	$23
Sale value of stock	$1,875
Gains	
Interest earned on sale value of stock (after tax)	$80
Saved fertiliser costs (one in four years)	$203
Total savings	$282
Losses	
Gross margin	$1,813
Net gains/loss before tax	-$1,531
less Marginal tax savings @ 15%	-$230
Net profit/loss after tax savings	-$1,301

9. Changes to the whole farm business

Farm income needs to increase in order to generate an adequate return to capital. This is not an urgent matter given that the net cash flow is sufficient to meet farm family needs and to provide for re-investment. The extra income requirement can be partly met by other management changes apart from the native pasture developments (see section 5.1). These are not likely to be sufficient without the planned sub-division and sowing clover into native pasture.

9.1. The proposed actions to increase farm income

The combination of actions proposed for the new farm strategy are:

- sub-divide and direct drill clover seed into 179 ha of native pasture which will be fertilised annually
- fertilise 105 ha of native pasture which has a good legume base

The issues about this plan are:

- will it increase income sufficiently?
- can the farm afford to wait for the slow response of native pastures to fertiliser?
- can the farm afford the conservation management options?

Results from the combination of actions are shown in Table 9-1. The results are expressed in terms of how the current farm system will look in the future compared to a different farm system which incorporates the above activites.

The investment options make little difference to annual net operating profit after tax by year five, and adding the conservation options would reduce net operating profit after tax from the current level. By year 10, the native pasture options are expected to contribute to an annual net operating profit that is 50 per cent higher. In this context, the conservation management options are expected to cost $1,500 a year.

Table 9-1 Snapshots into the future - current and new farm plans - at current prices

	Net annual operating profit after tax			
		Year		
	now	5	10	14
	$	$	$	$
Farm without investments	**24,169**	**24,169**	**24,169**	**24,169**
Investments - native pasture				
Clover and fertilise		305	8,139	13,965
Fertilise		430	4,355	7,902
Investments - rest of farm		-	-	-
Farm with investments	**24,169**	**24,903**	**36,663**	**46,035**
Conservation management options				
Rest land		-1,301	-1,301	-1,301
Retire land		-491	-491	-491
Farm with investments and conservation options	**24,169**	**23,111**	**34,870**	**44,243**

10. Appendices

10.1. Gross margins per dse

Gross margins per DSE are shown in the following table.

Table 10-1 Gross margins per DSE for all enterprises

	Cattle	Self Replacing Merinos	Wethers
INCOME :			
Wool (gross)		$25.02	$37.73
Livestock trading profit/loss	$17.40	$5.66	-$4.99
Total Income	$17.40	$30.68	$32.74
COSTS :			
Shearing & crutching		$3.31	$3.45
Mulesing		$0.09	$0.00
Animal health	$0.64	$0.82	$0.75
Supplementary feed	$0.00	$0.29	$0.00
Freight	$0.57	$0.20	$0.64
Wool tax		$2.13	$3.21
Wool selling expenses		$1.20	$1.81
Stock selling expenses	$1.15	$0.35	$0.37
Total Costs	$1.21	$8.38	$10.22
GM PER DSE	$16.19	$22.29	$22.51
CAPITAL VALUE	$40.64	$23.15	$27.00

10.2. The farming calendar

Sheep

Joining - January
Drenching - February
Crutching ewes - April
Lambing - May/June
Marking, crutching dry sheep - July
Classing, drenching - September
Weaning, shearing - October
Re-organising mobs - November
Drenching - December
Sales - January

10.3. Overhead costs and variable costs not attributed to one enterprise

Table 10-2 Overhead costs

Overheads		
		$
Land leased/rented		0
Rates		5,281
Consultant		0
Insurance		3,823
Registrations		605
Accountant		650
Power & phone		2,972
Bank charges		464
Administration		207
Sundry 1		1,375
Depreciation rate on new plant	10%	
new plant (under 10 yrs)	40,000	
depreciation on plant		4,000
Operator's allowance		40,000
OVERHEADS		59,377
OVERHEADS (excl. land lease, depreciation & labour)		15,377

Table 10-3 Variable costs not attributed to one enterprise

	$
Wages & casual labour	497
Fuel	2,383
Repairs & maintenance	6,374
Weeds/spraying pasture	3,618
Fertiliser	8,584
Total	$21,456

10.4. Stock trading schedules

The stock trading schedules are constructed as though each enterprise was a separate operation. The schedule for the cattle enterprise is not shown.

Table 10-4 Stock trading schedule - self-replacing merinos

	$/hd	No.	Value $		$/hd	No.	Value $
Opening stock				**Sales**			
Breeding ewes	29	1,250	35,625	cfa ewes	30	275	8,250
2 yo maiden ewes	35	408	14,290	2 yo ewes	35	84	2,937
1 yo maiden ewes	27	442	11,937	1 yo ewes	27	33	886
				Ewe weaners	27	0	-1
2 yo wethers	35	338	11,829	2 yo wethers	35	328	11,484
1 yo wethers	27	444	11,993	1 yo wethers	27	103	2,784
				Wether weaners	27	0	-1
Rams	760	13	9,500	Rams	20	1.7	34
Births		938		**Deaths**		115	
Purchases				**Closing stock**			
Ewes				Ewes	29	1,250	35,625
Wethers				2 yo maiden ewes	35	408	14,290
Weaners				1 yo maiden ewes	27	442	11,937
Rams	1,500	2.1	3125	2 yo wethers	35	338	11,829
				1 yo wethers	27	444	11,993
				Rams	760	13	9,500
Profit/Loss			23,249				
		3,835	121,548			3,835	121,548

Table 10-5 Stock trading schedule - wethers

	$/hd	No.	Value $		$/hd	No.	Value $
Opening stock				**Sales**			
Wethers	27	900	24,300	Wethers	22	273	6,006
Births		0		**Deaths**		27	
Purchases				**Closing stock**			
Wethers	35	300	10,500	Wethers	27	900	24,300
profit/loss			-4,494				
		1,200	30,306			1,200	30,306

10.5. Pasture composition - abundance by vegetation type

Estimates of abundance by vegetation category made on 10th December 1997 are shown below.

Table 10-6 Estimated % species composition by site - visual assessment - estimates of composition (not dry matter)

	Toops					**Carls**				**Martins**					**Sedn**
Site	**1**	**2**	**3**	**4**	**9**	**5**	**6**	**7**	**8**	**10**	**11**	**12**	**13**	**14**	**15**
.	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Introduced annuals															
grasses	73	82	77	83	20	5	20	20	40	3	39	6	2	40	65
forbs	5	1	1	1	5	5	2	5	5	1	1	2	5		1
legumes	5	5	5	5		5	3		1	2	5	5			2
Introduced perennials															
grasses	5	5									2	3			1
forbs	1				10		3	3	1	1	3	3	3	1	
Native annuals															
legumes										2				1	
forbs															
Native perennials															
cool season grasses	10	5	5	5	40		5	10	5	1	10	3		48	1
warm season grasses			10	5	20	85	66	61	48	89	40	48	85	5	30
forbs	1	2	2	1	5		1	1		1			5	5	
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
All annuals	83	86	83	89	25	15	25	25	46	8	45	13	7	40	
All perennial grasses	15	10	15	10	60	85	71	71	53	90	52	54	85	53	
All introduced species	89	91	83	89	53	15	28	28	47	7	50	19	10	41	
All native species	11	7	15	10	65	85	72	72	53	91	50	51	90	54	

Native perennial forbs are mostly carex and juncus

1 = Smiths Corner west facing medium slope.; **2** = Hollow Corner west facing gentle slope; **3** = Harris Brother west facing near ridge steep; **4** = Middle Paddock east facing near ridge steep; **9** = Middle Paddock sout-east facing mid-slope medium slope; **5 =** Big Brother north facing high flattish gully gentle slope; **6** = Little Brother west facing steep ridge rocky ; **7** = Big Brother north facing low slope medium slope; **8** = Big Brother east facing low on slope flat; **10** = First Martins west facing gentle slope; **11** = Middle Martins west facing gentle slope; **12 =** Back Martins east facing gentle slope; **13 =** north facing flat near creek; **14 =** west facing flat shaded; **15** = Seddon south-east facing mid-slope medium slope

10.6. Species lists

Estimates of abundance by vegetation category made on 10th December 1997 are shown below.

Table 10-7 Species abundance by site and plant characteristics

G/F/L/S = Grass/Forb/Legume/Shrub
A/P = Annual/Perennial
C/W = Cool/Warm season

A = abundant
C = common
O = occasional
L = localised
R = rare

Date 12/10/97 Site inspected

						Toops					Charlies				Martins					Sedd
Exotic	G/F/L/S	A/P	C/W	Species	Common Name	1	2	3	4	9	5	6	7	8	10	11	12	13	14	15
1	F	A		*Carduus tenuiflorus*	Slender Thistle	R		O	L											O
1	F	A		*Carthamus lanatus*	Saffron Thistle			O	O		R	O								
1	F	A		*Centaurium tenuiflorum*	Centaury												O			
1	F	A		*Cerastium glomeratum*	Mouse-ear Chickweed	R														
1	F	A		*Cirsium vulgare*	Spear Thistle	O	R	O		O		O				R				O
1	F	A		*Juncus capitatus*	Dwarf Rush					O	O		O	L	O		O			
1	F	A		*Parentucellia latifolia*	Red Bartsia						O	O				L	L			
1	F	A		*Petrorhagia nanteuilii*							O	O	O			O				
1	F	A		*Sanguisorba minor subsp.muricata*	Sheep's Burnet							O	O	O						
1	F	A		*Silybum marianum*	Variegated Thistle	O														
1	F	A		*Tolpis umbellata*	a Daisy						O	O		R		R		R		
1	F	P		*Acetosella vulgaris*	Sheep Sorrel	O	O										O			
1	F	P		*Chondrilla juncea*	Skeleton Weed	O														R
1	F	P		*Hypochaeris radicata*	Flatweed, Catsear	R	L		O	C		C	L	O		L		C	O	
1	F	P		*Marrubium vulgare*	Horehound				L											
1	F	P		*Rumex crispus*	Curled Dock	O	O		R											
1	G	A	C	*Aira spp.*	Hairgrass		C	O			O	L		L	C		C	L	O	
1	G	A	C	*Anthoxanthum odoratum*	Sweet Vernal Grass												A		O	
1	G	A	C	*Briza maxima*	Quaking Grass								O	L						
1	G	A	C	*Briza minor*	Shivery Grass		O													
1	G	A	C	*Bromus diandrus*	Great Brome	L	O													O
1	G	A	C	*Bromus mollis*	Soft Brome	A	A	A	A	O	O	C	C	L	O	C		R		A
1	G	A	C	*Critesion murinum*	Barley Grass	L		R												L

						Toops					Charlies				Martins						Sedd
Exotic	G/F/L/S	A/P	C/W	Species	Common Name	1	2	3	4	9	5	6	7	8	10	11	12	13	14	15
1	G	A	C	*Cynosurus echinatus*	Rough Dog's Tail		R	O		L			O	L	R			R	A	
1	G	A	C	*Lolium perenne*	Perennial Ryegrass	O														
1	G	A	C	*Vulpia spp.*	Rat's tail Fescue	A	A	O	A	C		C	C	C	O	A	L	O	O	A
1	G	P	C	*Holcus lanatus*	Fog Grass	L	L			O						O	C			O
1	G	P	W	*Nasella trichotoma*	Serrated Tussock															R
1	L	A		*Trifolium angustifolium*	Narrow-leaved Clover							C					L			
1	L	A		*Trifolium arvense*	Haresfoot Clover							O								
1	L	A		*Trifolium campestre*	Hop Clover										L					
1	L	A		*Trifolium spp.*	Clovers	C	C	C	C			R		O			C			O
1	L	A		*Trifolium subterraneum*	Subterranean Clover											C				
1	L	P		*Trifolium repens*	White Clover											C	C			
	F	A		*Schoenus apogon*	Common Bog-sedge					C				L	L			C		
	F	A		*Sebaea ovata*	Yellow Centaury													R		
				Date	12/10/97									Site inspected						
	F	P		*Acaena novae-zelandiae*	Bidgee-widgee				R											
	F	P		*Asperula conferta*	Common Woodruff												R			
	F	P		*Carex appressa*	Carex		L		L				R							
	F	P		*Cheilanthes sieberi*	Rock Fern									O						
	F	P		*Convolvulus erubescens*	Bindweed							R	O							
	F	P		*Dichondra repens*	Kidney Weed							R						C		
	F	P		*Epilobium billardierianum ssp cinereum*	Willowherb								O							O
	F	P		*Geranium solanderi*	Native Geranium							R								
	F	P		*Gnaphalium gymnocephalum*	Creeping Cudweed													O		
	F	P		*Gonocarpus tetragynus*	Raspwort										O				L	
	F	P		*Goodenia hederacea*	a Goodenia										O					
	F	P		*Hydrocotyle laxiflora*	Stinking Pennywort														C	
	F	P		*Hydrocotyle sp.*	Pennywort													R		
	F	P		*Hypericum gramineum*	Small St.John's Wort							R	R						O	
	F	P		*Juncus australis*	a Rush	R	L	O	R	L		R	L	R						
	F	P		*Lomandra multiflora*	Many-flowered Mat-rush							R								
	F	P		*Oreomyrrhis eriopoda*														O		
	F	P		*Solenogyne gunnii*	Solenogyne														O	
	F	P		*Tricoryne elatior*	Yellow Rush-lily										R			R	R	
	G	A	C	*Agrostis avenacea*	Blown Grass											L				
	G	P	C	*Danthonia eriantha*	Wallaby Grass			O		C		O	C	O	O	O				
	G	P	C	*Danthonia penicillata*	Wallaby Grass					O			O							
	G	P	C	*Danthonia racemosa var. racemosa*	White top				L			O				O			C		
	G	P	C	*Dichelachne crinita*	Long-hair Plume-grass											R				
	G	P	C	*Elymus scaber*	Tall Wheat grass	O		O		O		L	O		R	O	R	O	C	
	G	P	C	*Microlaena stipoides*	Microlaena	C	C	C	C										C	O
	G	P	C	*Poa sieberana var. sieberana*	Snowgrass										R	R			O	

Exotic	G/F/L/S	A/P	C/W	Species	Common Name	Toops 1	Toops 2	Toops 3	Toops 4	Toops 9	Charlies 5	Charlies 6	Charlies 7	Charlies 8	Martins 10	Martins 11	Martins 12	Martins 13	Martins 14	Sedd 15
	G	P	C	*Stipa scabra ssp. falcata*	Spear Grass, Corkscrew		O													
	G	P	W	*Aristida ramosa*	Wire Grass						L	C	C		A	C		C		
	G	P	W	*Bothriochloa macra*	Red Grass		L	L	O	A	A	A	A		C	L		L		A
	G	P	W	*Cynodon dactylon*	Couch			O		O						O				
	G	P	W	*Eragrostis brownii*	Brown's Lovegrass													O		
	G	P	W	*Sorghum leiocladum*	Native Sorghum						L	L	R							
	G	P	W	*Themeda australis*	Kangaroo Grass										O	O	A	A	O	
	L	P		*Desmodium varians*	Slender Tick-trefoil						R								L	
	L	P		*Glycine clandestina*	Twining Glycine												R			
	L	P		*Glycine tabacina*	Glycine						R	R								
	S	P		*Acacia verniciflua*	Varnish Wattle													L		
	S	P		*Cheiranthera cyanea*	Finger Flower														R	
	S	P		*Hibbertia obtusifolia*	Guinea flower										O		O		L	

Site inspected

	Toops 1	Toops 2	Toops 3	Toops 4	Toops 9	Charlies 5	Charlies 6	Charlies 7	Charlies 8	Martins 10	Martins 11	Martins 12	Martins 13	Martins 14	Sedd 15
Native species															
grasses	2	1	5	4	4	2	6	6	4	6	10	2	5	5	2
forbs	1	2	1	3	2	0	6	5	3	4	0	1	7	5	1
legumes	0	0	0	0	0	0	2	1	0	0	0	1	0	1	0
shrubs	0	0	0	0	0	0	0	0	0	1	0	1	1	2	0
Sub-total	3	3	6	7	6	2	14	12	7	11	10	5	13	13	3
Introduced or naturalised species															
grasses	6	7	5	2	4	2	3	4	5	4	3	4	4	4	6
forbs	8	4	3	5	3	5	7	4	4	1	4	4	3	1	3
legumes	1	1	1	1	0	0	3	0	1	1	2	3	0	0	1
Sub-total	15	12	9	8	7	7	13	8	10	6	9	11	7	5	10
Total species	18	15	15	15	13	9	27	20	17	17	19	16	20	18	13

Notes:
Aira spp. = mix of A. caryophyllaea, A. elegantissima
Trifolium spp. = mix of T. subterraneum, T. repens, T. campestre, T. glomeratum, T. dubium
Vulpia spp. = mix of V. myuros, V. bromoides

10.7. Development budgets

Development budgets for the relevant options follow.