Pasture Development for Salinity Control in the Kyeamba Valley of New South Wales

An Economic Appraisal

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AN ECONOMIC APPRAISAL

1. INTRODUCTION

Dryland salinity is a rapidly expanding form of land degradation in the Riverina Region of NSW. A number of techniques for controlling dryland salinity have been suggested by hydrogeologists and conservationists. Generally they suggest increasing plant water use in the groundwater recharge areas to prevent further ascension of water to the water table. Controlling the water table also controls dryland salinity.

Increased plant water use through tree planting has been suggested in the past, however it has doubtful economic benefits in drier areas and also has considerable management problems for farmers with no experience in forestry or agroforestry.

Deep rooted perennial pastures have a high water use (up to double annual pasture water use) and have the benefit of needing commonly used management techniques for establishment. They also complement grazing enterprises. In the present economic downturn, the economic impact of establishing these pastures needed to be appraised. This appraisal can provide supporting data for extension work with landholders who are attempting to counter dryland salinity through the formation of landcare groups and the implementation of better land use systems.

1.1 Background

The Kyeamba Valley is located 15 kilometres east of Wagga Wagga in NSW and covers an area of 100,000 Ha. The average annual rainfall is 650-700 mm. Presently 90% of the land area is used for wool, beef and dairy production. Cereal cropping is limited to 5% of the area.

Pastures have been greatly modified since settlement, particularly in the post-war period with the introduction of superphosphate and subterranean clover. Predominantly summer active native perennial grasses have given way to introduced winter growing annuals. Significant tree cover remains over only 10% of the area.

The clearing of deep rooted trees and grasses, and their repiacement with shallow rooted annual pastures has resulted in less water use and rising watertables. As a result there has been a significant increase in dryland salinity and waterlogging. 218 hectares of land are now affected by saline outbreaks, and research by NSW Department of Water Resources (D. Woolley, 1991) indicates that 20,000 Ha (20% of the catchment) is prone to being salt affected. In many cases the watertable is rising at more than 1 metre per year and already in the catchment there are large areas (4,500 Ha) with a groundwater pressure head above ground level.

Landuse recommendations to reduce the amount of recharge in areas where the groundwater aquifers are unconfined (flowing) include the sowing of perennial pastures. Before undertaking this costly task during a rural income crisis, the Kyeamba Valley Landcare Group requested a simple assessment of the impact of sowing deep rooted perennial pastures on their cumulative net cash flow. The assessment was requested to be applicable for on farm implementation of recharge control through summer active perennial pastures.

1.2 Objective

To carry out an economic appraisal of localised perennial pasture establishment to provide landholders in the Kyeamba Valley with economic management information with a view to controlling groundwater recharge.

1.3 Data Collection

Given the practical local application envisaged for the results, farmer confidence was encouraged by gathering data in group sessions which professional advisory staff (local agronomist, landcare co-ordinator, agricultural economist) and landholders (the majority) discussed input costs and expected outcomes. This determined realistic average data for the Kyeamba Valley. This data was in some cases significantly different from official NSW Agriculture recommendations.

2. THE MODEL

A simulated variable period cash flow development budget was used to model cumulative net income. In implementing the model, sensitivity analysis to the major variables was carried out to test the effects of changes in wool prices, carrying capacity of the pasture, input costs and input mixes (eg. with or without lime).

The model was used to offer management outcomes for a relatively wide range of input variables, but the further step of profit maximising options was not attempted.

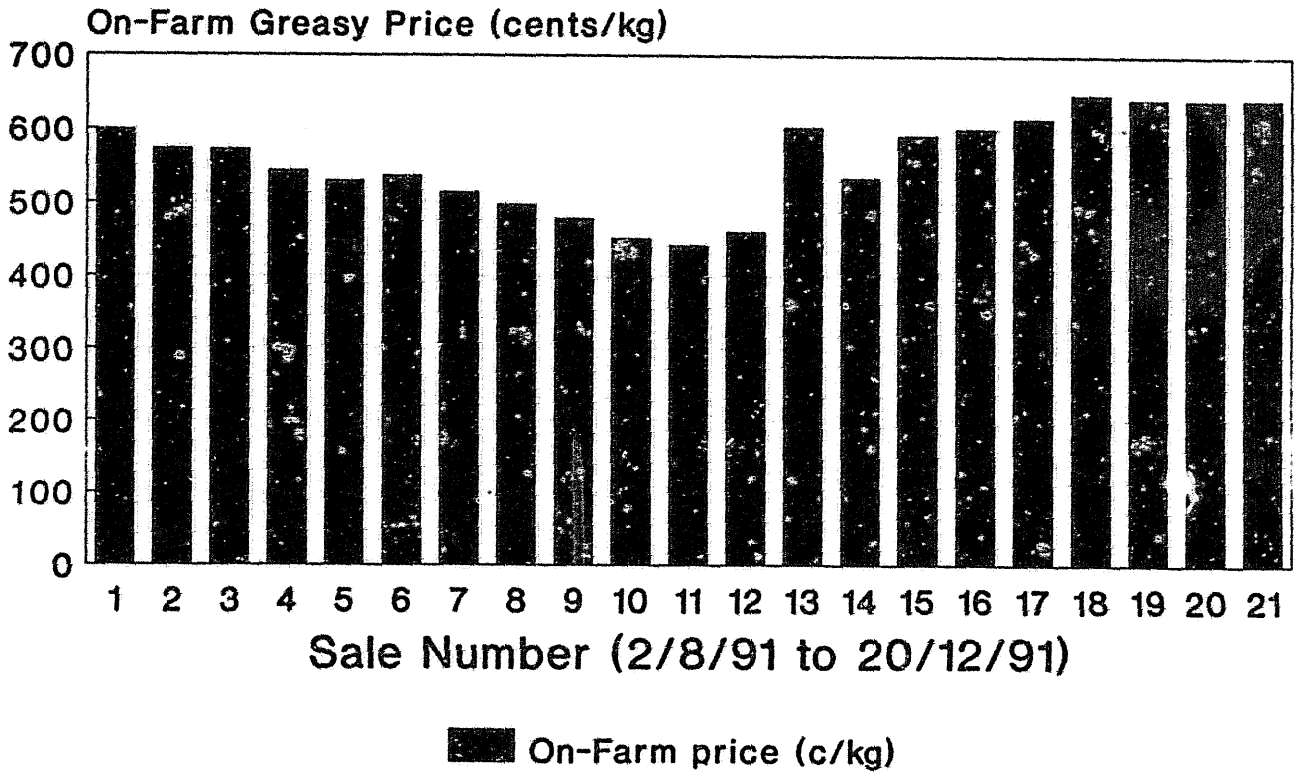
Because the wool price is a critical variable, and because this price has been highly volatile over the period of the study, a range of prices was used in the key calculations. The model assumes that 22 micron merino wethers are run on the improved pasture, the wool produced is assumed to be Type 79 (good topmaking merino fleece).

The model has been developed such that the on-farm price (cents/kg) is used as a variable input. The initial wool price used in the analysis was calculated by taking the average price received on-farm for Type 79 wool for the 21 sales between 2/8/91 and 20/12/91. Graph 1. shows the on-farm prices (cents/kg) for the 21 sales.

The average on-farm wool price for Type 79 (22 micron, good topmaking merino fleece) wool in the first 21 sales of the 1991/92 selling season was 317 cents/kg. Sensitivity analysis was undertaken on the wool price for a 25 per cent increase (396 cents/kg) and a 25 per cent decrease in price (238 cents/kg). This range of prices is considered likely to cover the actual market range for the medium term.

The model was used to evaluate the net cumulative cash balance from a number of pasture development options. These are described in this section.

22 Micron, Type 79
Good Topmaking Merino Fleece



Graph 1.

1991/92 wool sales up to 20/12/91

2.1 Normal Phalaris Establishment

This analysis was based on the most likely range of inputs and outputs, these are shown in Appendix 1. No lime was applied, mid range superphosphate application was used and a pasture life of 10 years was estimated (actual pasture life maybe longer). As a result of this establishment the carrying capacity of the pasture was estimated to double in year two, to 10 DSE per hectare and remain at this level for the life of the pasture. Cumulative cash balances were calculated for on-farm greasy wool prices of 238 cents, 317 cents and 396 cents per kilogram.

2.2 Phalaris Establishment - Lime Applied

This analysis used similar input assumptions as the normal Phalaris establishment (shown in Appendix 1.), but included the application of 2.4 tonnes of lime per hectare to reduce soil acidity and hence to assist in pasture establishment. Much of the Kyeamba Valley suffers from soil acidity which limits establishment of Phalaris as well as Lucerne.

2.3 Phalaris Establishment - Low Input Regime

The current cost cutting emphasis in agriculture led to the need to analyse the effect of reducing inputs. A common way in which inputs in pasture improvement are reduced is to cut back on the amount of superphosphate used. In this section of the analysis it was assumed that the stocking rate was reduced by 25 per cent to a maximum of 7.5 DSE per hectare.

2.4 Phalaris Establishment - High Input Regime

A high input, high output analysis has been included to show the economic consequences of following the optimum high input recommendations provided by the District Agronomist of NSW Agriculture. Under this regime, the stocking rate increased from 5 DSE/Ha to 12.5 DSE/Ha in year two (a 25 per cent increase in stocking rate from the initial model). Lime as well as high levels of superphosphate were applied. Returns for the range of wool prices have been calculated.

2.5 Phalaris Establishment - High Input Regime - Subsidised Inputs

There is considerable evidence to show that control of water tables on farms has beneficial offsite effects. In the Kyeamba Valley this offsite benefit includes reduced road damage, currently running at $200,000 per annum, and reduced salt load to the Murray Darling River System. Methods of 'internalising' this offsite benefit to landholders have been canvassed and include a subsidy on inputs to pasture establishment. Accordingly an analysis of Phalaris establishment with high inputs has been made, with the major input costs of superphosphate and lime reduced by 50%. Output data is the same as for the unsubsidised high input regime, however the cumulative net cash flow per hectare is obviously altered considerably.

2.6 Lucerne Establishment - Lime Applied

Given suitable growing conditions Lucerne is a better alternative to Phalaris in the control of high water tables due to its deeper root system. Lucerne is normally best suited to more fertile soils in the Kyeamba Valley, to get a reliable pasture establishment, lime application at 2.4 tonnes per Ha is considered essential. Appendix 2. shows the input assumptions and results of the simulated cash flow development budget of Lucerne establishment. The average DSE for improved Lucerne pasture is assumed to be higher than Phalaris pasture, and the life of the pasture is assumed to be 5 years.

3. RESULTS

The critical economic result considered by landholders was the period of time before the cumulative net cash flow became positive. Most simulated pasture establishment's modelled, showed a positive cumulative cashflow within the pasture life, and most would result in a positive net present value. However, any period of more than two years before a positive result was obtained was considered an unsatisfactory option by landholders, that is farmers required a positive cumulative cash flow in year two.

3.1 Normal Phalaris Establishment

A summary of results with sensitivity analysis of wool prices is shown in graph 2. Detailed input and output data is shown in Appendix 1. The normal Phalaris establishment analysis shows that this enterprise does not meet landholders financial criteria of a positive cumulative net cash flow in year 2, given the average price of 317 cents/kg on-farm. However if prices were to rise such that the average increased 25 per cent to 396 cents/kg, then a positive net cash flow will be achieved in year 2 and beyond.

3.2 Phalaris Establishment - Lime Applied

The additional cost of lime in the pasture establishment extends the period of time before positive financial results are achieved to 5 years, assuming a greasy on-farm wool price of 317 cents/kg. Details are shown in Graph 3.

3.3 Phalaris Establishment - Low Input Regime

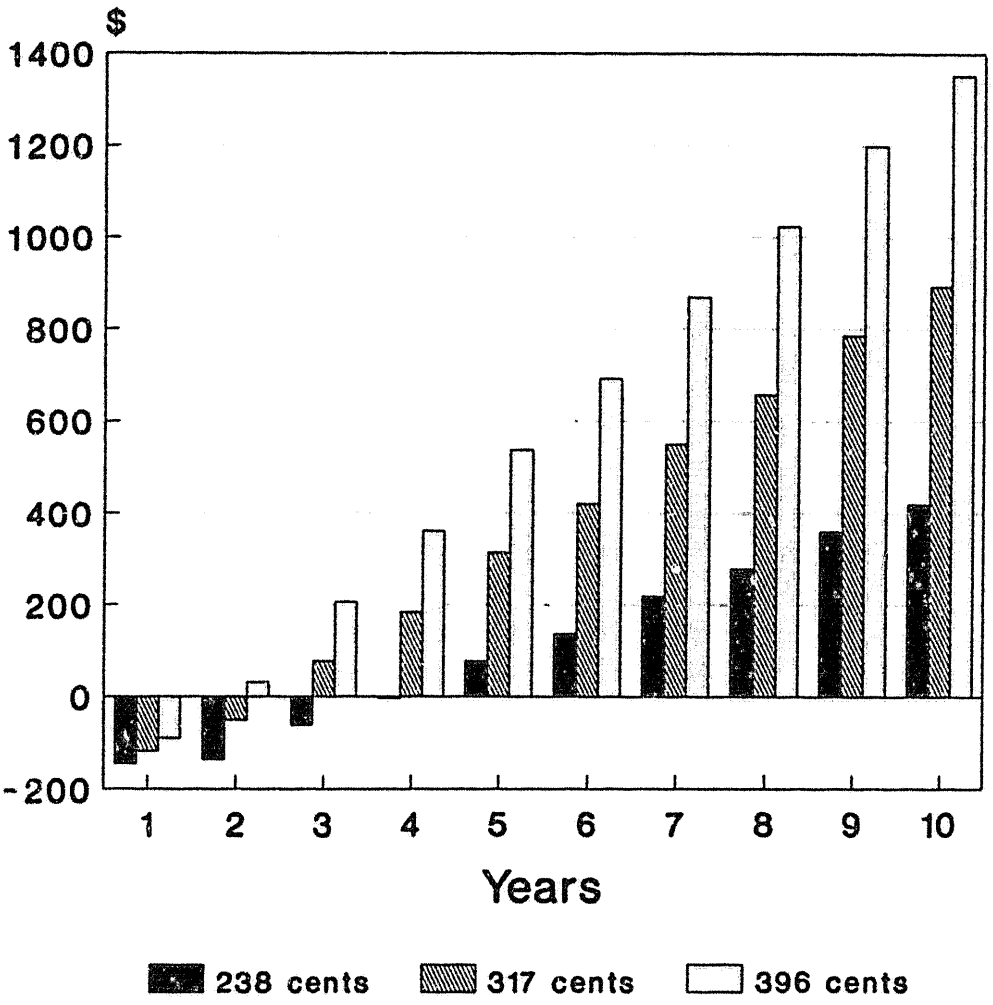
This regime is initially attractive to landholders because of the lower input costs. Unfortunately the lower returns defer a positive financial result until year three, and then only when wool prices are 317 cents (greasy on-farm) or higher. Details are shown in Graph 4.

3.4 Phalaris Establishment - High Input Regime

Results including sensitivity to wool price changes are shown in Graph 5. This high input high output model results in relatively high positive net cash flows, however, as with other establishment options, the delay of more than two years before positive results are achieved means that landholders requirements for financial return are not met. With lower wool prices a delay of more than three years is experienced.

Graph 2.

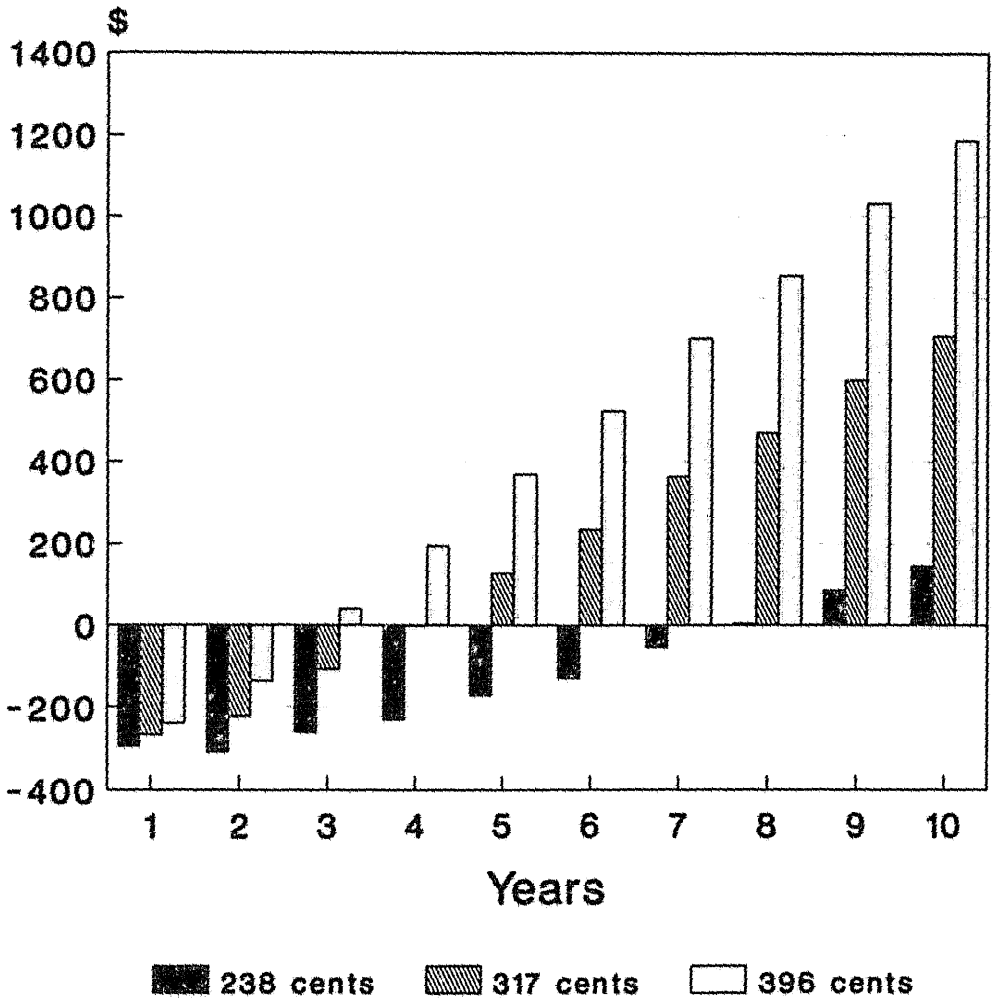
Kyeamba Valley
Phalaris Est. Economics



Cumulative net cash flow per hectare
22 Micron Wethers, on-farm price c/kg
Lime not applied, 10 yr pasture life

Graph 3.

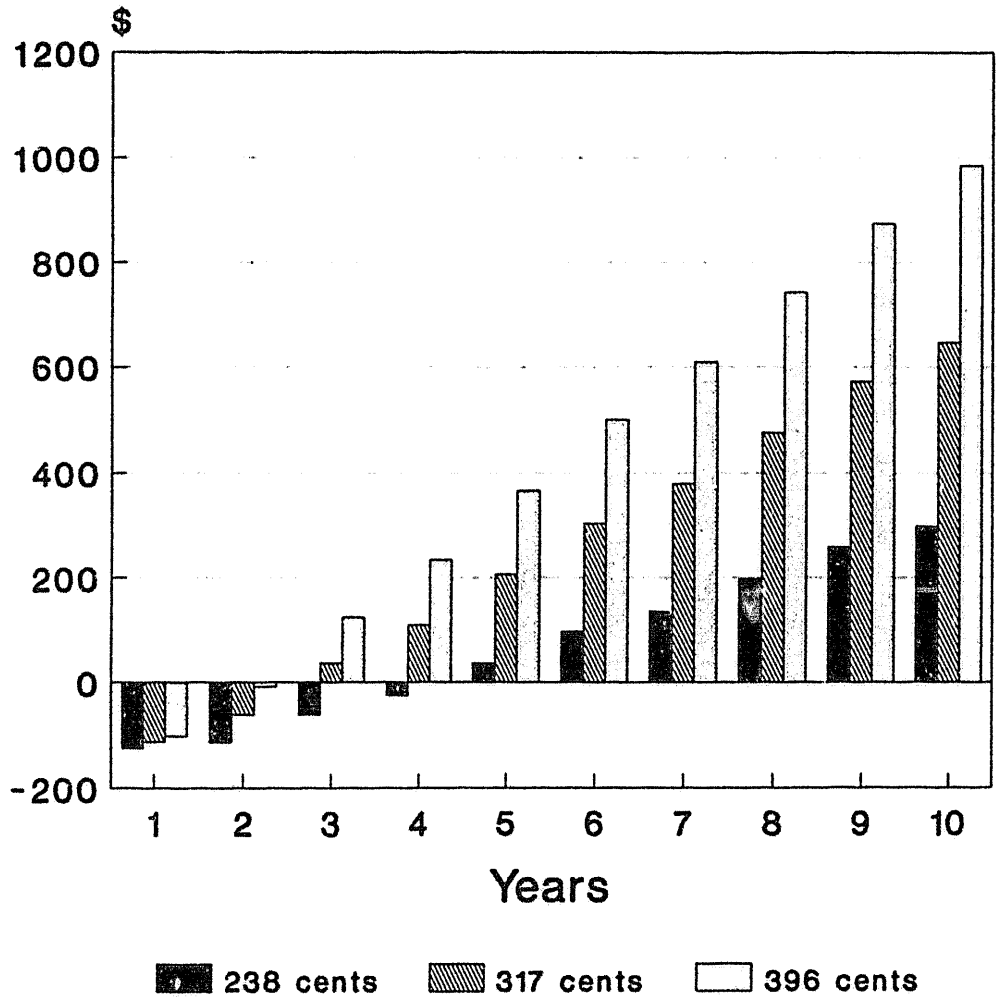
Kyeamba Valley
Phalaris Est. Economics



Cumulative net cash flow per hectare
22 Micron Wethers, on-farm price c/kg
Lime applied, 10 yr pasture life

Graph 4.

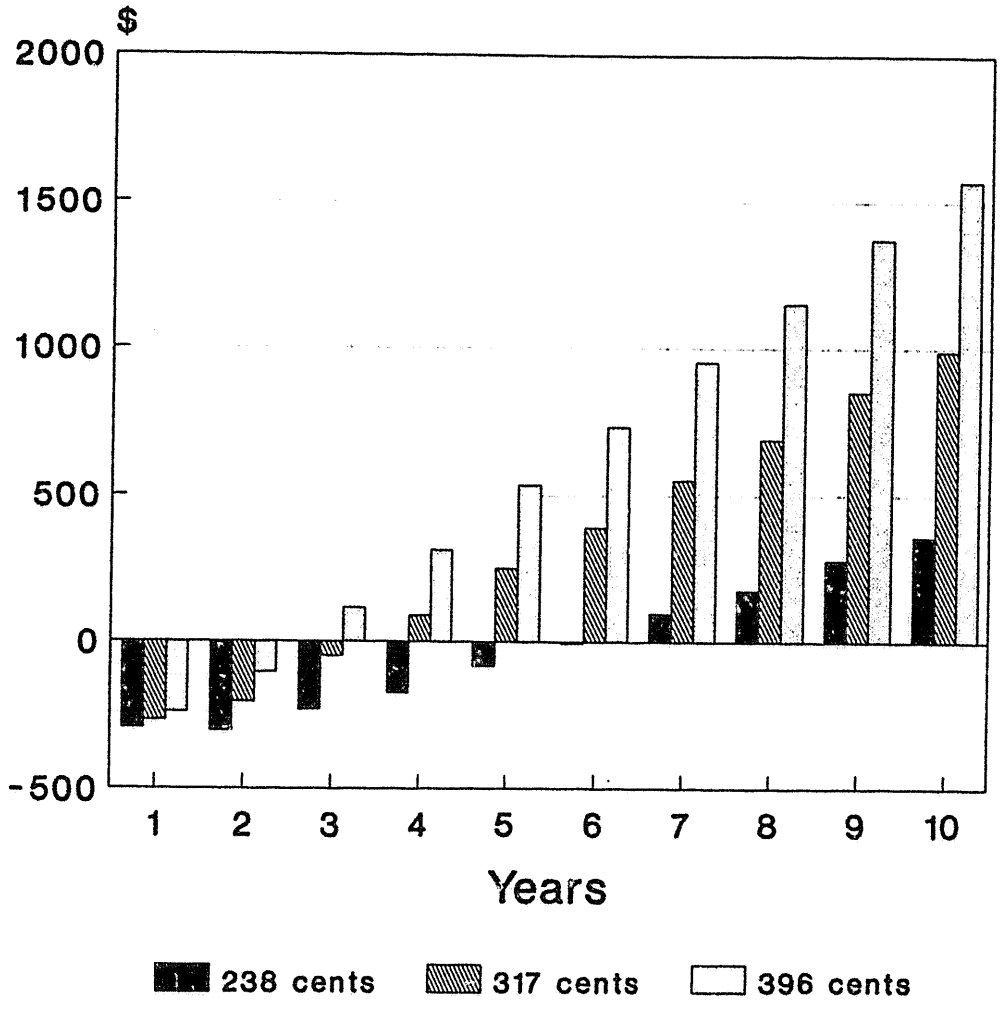
Kyeamba Valley
Phalaris Est. Economics



Cumulative net cash flow per hectare
On-farm price c/kg, low stocking rate
No Lime applied, 10 yr pasture life

Graph 5.

Kyeamba Valley
Phalaris Est. Economics



Cumulative net cash flow per hectare
On-farm price c/kg, high stocking rate
Lime applied, 10 yr pasture life

3.5 Phalaris Establishment - High Input Regime - Subsidised Inputs

Detailed results are shown in Graph 6. This regime gives high cumulative net cash flows per hectare, and for most wool prices achieves a positive result in year 3. Despite a break-even point being reached in the second year for the highest wool price modelled of 396 cents/kg, the landholders criteria of a positive result in year 2 has not been met assuming lower wool prices.

3.6 Lucerne Establishment - Lime Applied

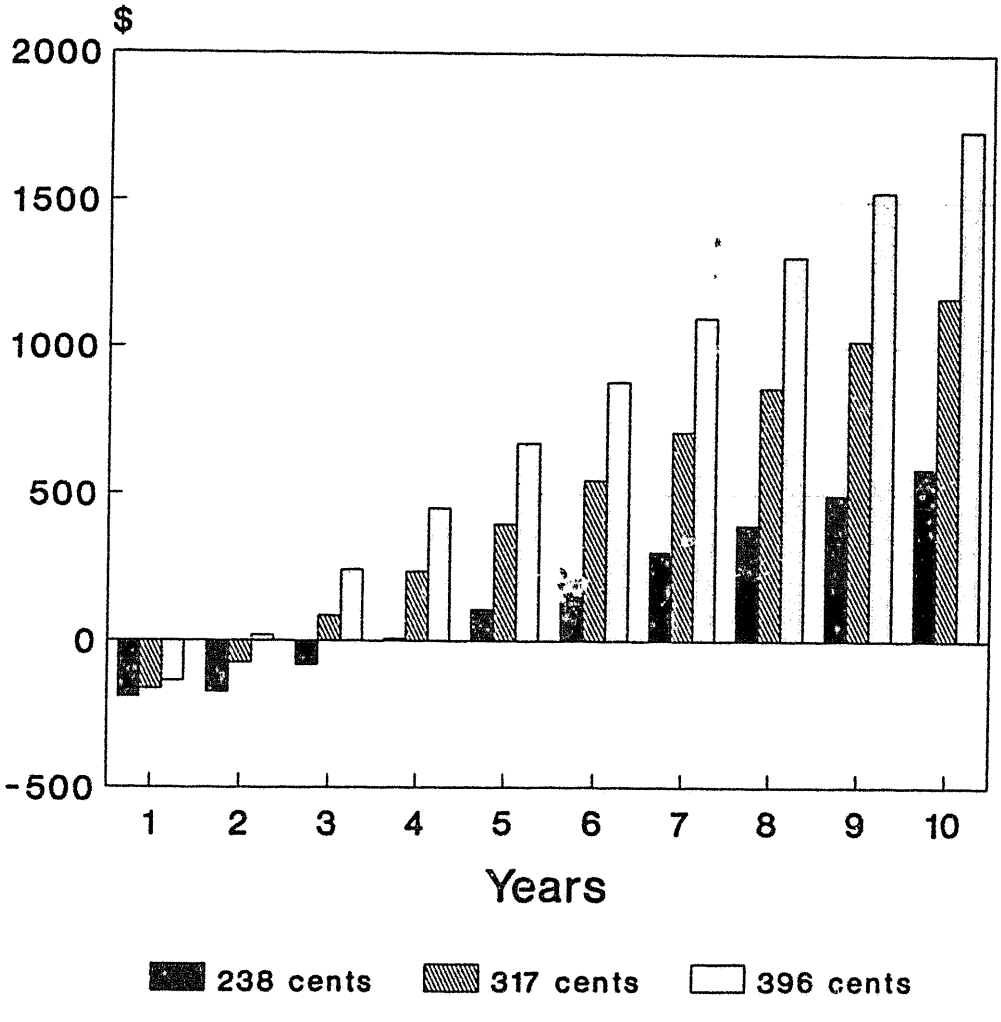
Appendix 2. shows the input assumptions and results for the five year pasture life of Lucerne as an improved pasture. Results are shown graphically in Graph 7. and indicate that for more than half of the 5 year pasture life for the majority of wool prices, the results are negative. This is an interesting result as Lucerne pasture returns are often considered to be the most profitable. Lime application which is mandatory in the Kyeamba Valley for Lucerne establishment is the main reason for the relatively poor result.

3.7 Factors Affecting Profitability

The main variables which influence the profitability of pasture improvement include, wool prices, stocking rate and input costs. To give an indication of the influence these variables have on pasture improvement profitability refer to Graph 8. Input assumptions for the Phalaris pasture establishment are initially as in Appendix 1., apart from the stocking rate which is assumed to reach 7.5 DSE/Ha. The cumulative net cash flow of these input assumptions are depicted by the black shaded columns in Graph 8. The other two column types in Graph 8. compare the effects on cumulative cash flow of a 25 per cent increase in stocking rate (to 10 DSE/Ha) and a 25 per cent increase in wool price (to 396 cents/kg). The graph highlights that the main influence on cash flow is the price of wool.

Graph 6.

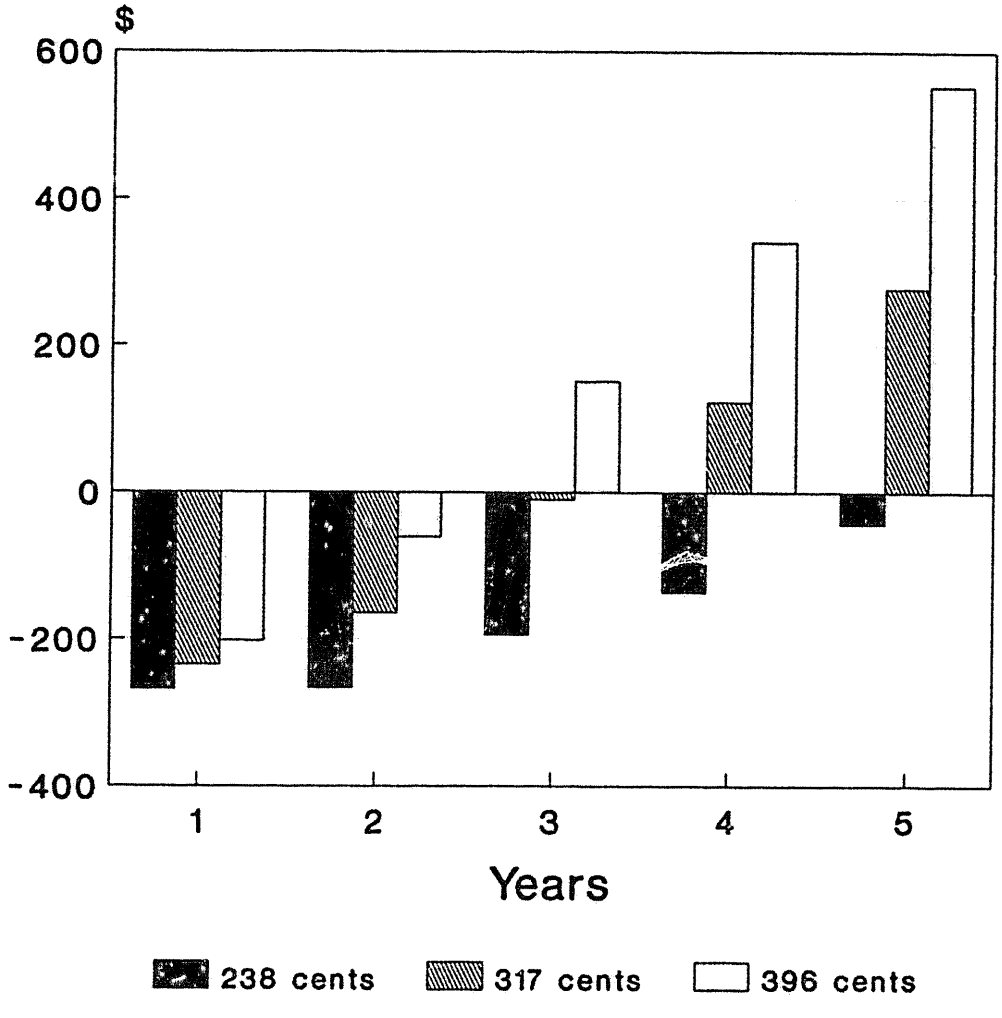
Kyeamba Valley
Phalaris Est. Economics



Cumulative net cash flow per hectare
On-farm price c/kg, high stocking rate
Lime applied, subsidised inputs

Graph 7.

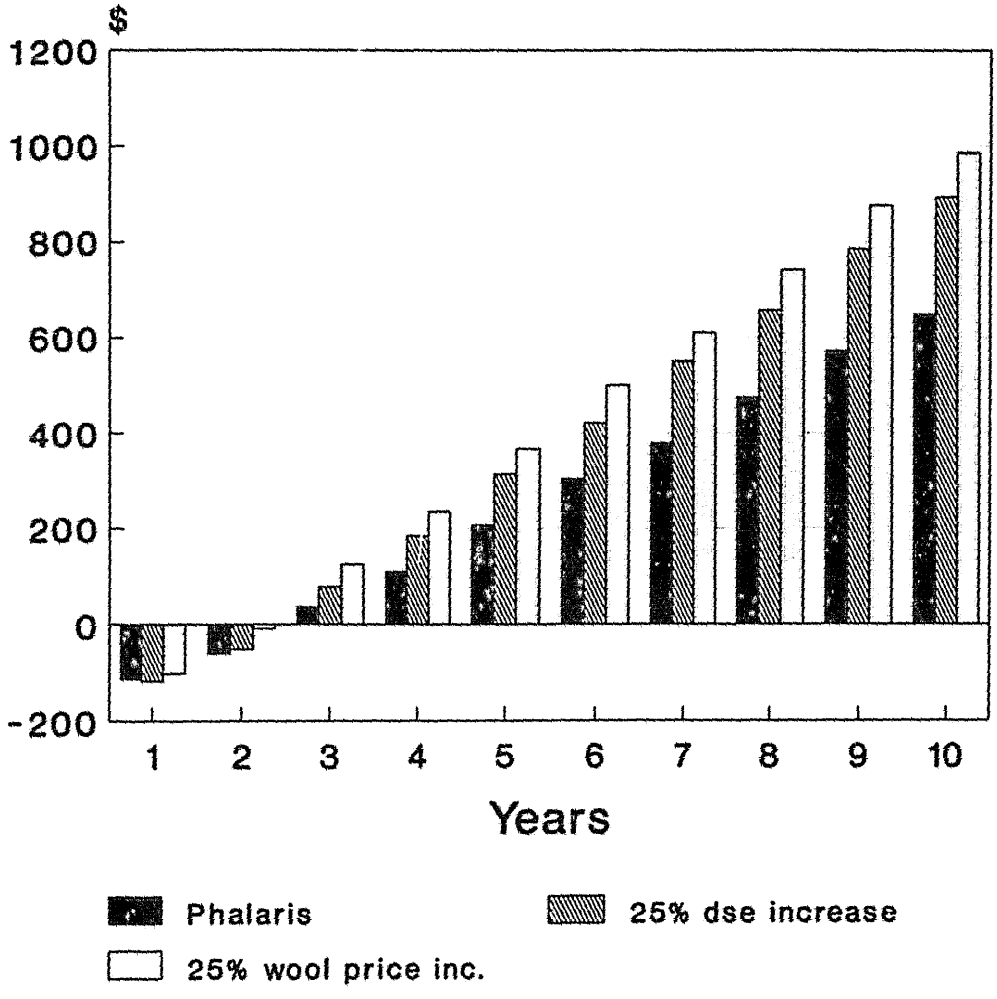
Kyeamba Valley
Lucerne Est. Economics



Cumulative net cash flow per hectare
22 Micron Wethers, on-farm price c/kg
Lime applied, 5 yr pasture life

Graph 8.

Kyeamba Valley
Phalaris Est. Economics



Cumulative net cash flow per hectare
Initial wool price 317 cents/kg on-farm
Initial stocking rate 7.5 dse/ha

4. DISCUSSION AND CONCLUSIONS

Pasture improvement is an important means of increasing the productivity and profitability of livestock enterprises, through, increased stocking potential and better nutrition leading to increased meat and/or wool production.

The potential benefits of improved pastures are well documented and include factors such as higher quality feed, more feed, greater flexibility of livestock enterprises, increased property value and improved farm viability (Watson and Davies, 1989).

The question that remains is "is pasture improvement profitable ?", (Montgomery, 1991) makes the statement that we would be wise to avoid making generalisations about the profitability of pasture improvement as pasture improvement is definitely profitable for some farmers, and definitely unprofitable for others.

This paper is aimed at giving a simple insight into the cash flow implications of establishing deep rooted perrenial pastures, there are no allowances for whole-farm planning considerations such as the necessary inclusion of pastures in cropping rotations or land sustainability.

It is frequently asked `How come although we know the benefits of well established perennial pastures, there are very few such pastures in the Kyeamba Valley area?' The answer to this question may be partly explained by the results outlined in this paper. The practical agronomic problems of pasture establishment are generally well understood by landholders. Their assessment of the risks of pasture establishment is that if they do the job well, the chances of failure are `nil'. In spite of this, immediate cash flow considerations which are now paramount in most farmer's management decisions, dictate that a positive investment return within two years is necessary. Indeed for many landholders, being able to defer returns for more than one year is now not possible.

These results indicate that at present wool prices and input costs, there will not be any extensive perennial pasture planting in the Kyeamba Valley based on economic motives. Current shortages of cash flow on-farm and instability in the wool market are two important considerations. Degradation control in itself offers another

incentive to landholders, and the landholders in the Kyeamba Valley are a well informed and active in environmental matters. Nonetheless, unless the prescribed environmental treatment involving deep rooted perennial pastures makes economic sense only limited uptake of the treatment can be expected.

Current anti salinity strategies of tree and pasture establishment and associated management changes are supported by extension services and landcare groups. Other incentives include taxation concessions under section 75D of the Tax Act, this incentive has become increasingly less effective as the taxable income of landholders has greatly reduced over the past two years. Low interest loans through the NSW Rural Assistance Authority at 8% over 15 years are generally available to control land degradation, however this concessional interest rate has not been lowered in line with general interest rate falls in the market, and is also increasingly less attractive as an incentive.

Direct subsidies have been suggested, either on the cost of lime or as a general cash grant. Amounts of $30 per Ha have been used in Victoria with limited success, and when increased to $60 per Ha still had limited appeal.

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Appendix 1.

Economics of Salinity Control

Sam Walker, Economist, Wagga

Pasture Establishment of Phalaris - 10 year pasture life

Enterprise Unit 1 ha

Enterprise: Merino Wethers, 22 Micron, Wool Type 79

Mortality rate	5%
Culling	25%
Wool cut (kg)	6
Wool price ($/kg)	$2.38
Replacements ($/hd)	$9.50
Cull wethers ($/hd)	$3.00
Variable costs ($/hd)	$4.00

Stocking Rate

	dse/ha
Year 1	5
Year 2	10
Year 3	10
Year 4	10
Year 5	10
Year 6	10
Year 7	10
Year 8	10
Year 9	10
Year 10	10

Stocking Schedule

Years	1	2	3	4	5	6	7	8	9	10
Potential	5	10	10	10	10	10	10	10	10	10
On hand (start of year)	0	4	7	7	7	7	7	7	7	7
Purchases	5	7	3	3	3	3	3	3	3	3
Culls	1	3	3	3	3	3	3	3	3	3
Deaths	0	1	1	1	1	1	1	1	1	1
On hand (end of year)	4	7	7	7	7	7	7	7	7	7

Seed Mix

	kg/ha	$/kg	$/ha
Phalaris	1.50	$5.00	$7.50
Cocksfoot	1.50	$5.00	$7.50
Sub Clover	4.00	$1.50	$5.50
		Total	20.50

Fertilizer Programme

1. Single super @ $225 /t
Cost of application @ $0 /t
2. Starter12 @ $450 /t
3. Lime @ $70 /t

Year	1	2	3	4	5	6	7	8	9	10
kg/ha	100	100	0	100	0	100	0	100	0	100
Type (1,2,3)	2	1	1	1	1	1	1	1	1	1

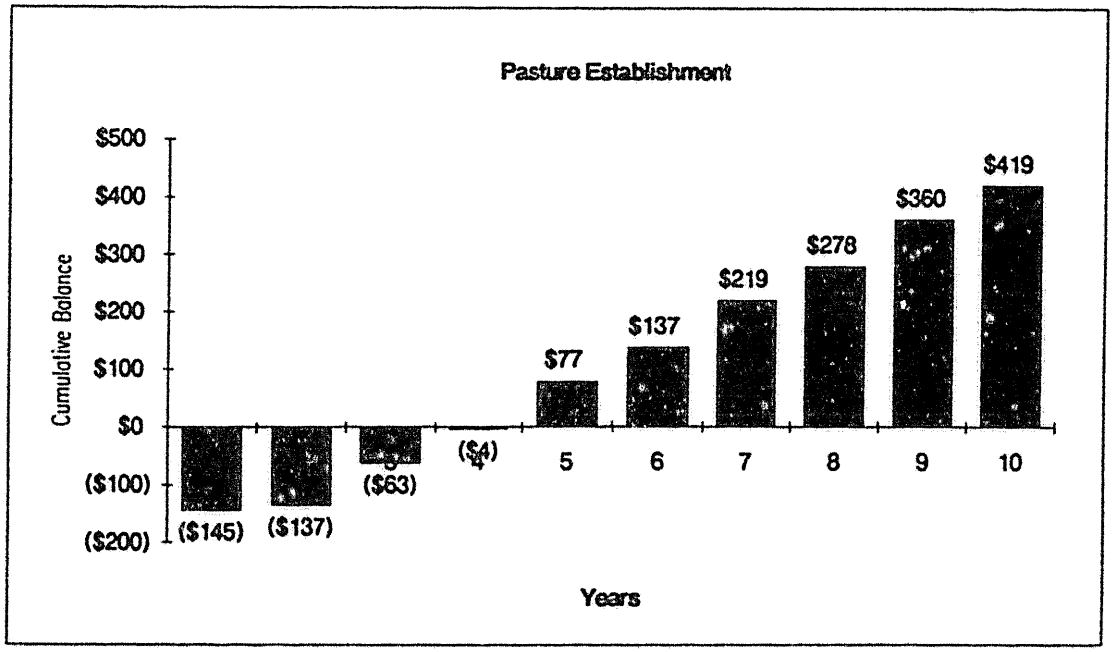
Herbicide Programme

	Repititions				$/ha
Glyphosate (*1)	1	0.7 l/ha	@	$14.25 /l	9.98
Glyphosate (*2)	1	1.2 l/ha	@	$14.25 /l	17.10
Ally	1	5.0 gm/ha	@	$1.19 /gm	5.95
Lemat	1				0.70
Molybdenum	1				2.00
Spraying	3		@	$5.50 /ha	16.50
				Total	52.23

Establishment Costs

	$/ha
Sow (Direct Drill)	12.50
Seed Dusting	0.09
Slug Control (Defender)	3.30

Years				1	2	3	4	5	6	7	8	9	10
Costs													
Slug Control	@	$3	/ha	3.30									
Seed Dusting		$0	/ha	0.09									
Sow	@	$13	/ha	12.50									
Seed	@	$21	/ha	20.50									
Herbicide		$52	/ha	52.23									
Starter12		$450	/t	45.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lime	@	$70	/t	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Single sup.	@	$225	/t	0.00	22.50	0.00	22.50	0.00	22.50	0.00	22.50	0.00	22.50
Fert applic	@	$0	/t	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stock purch	@	$10	/hd	47.50	61.75	28.50	28.50	28.50	28.50	28.50	28.50	28.50	28.50
Stock costs	@	$4	/hd	20.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00
Total Costs				201.12	124.25	68.50	91.00	68.50	91.00	68.50	91.00	68.50	91.00
Returns													
Wool sales				$71	$143	$143	$143	$143	$143	$143	$143	$143	$143
C.F.A. Sales				$4	$8	$8	$8	$8	$8	$8	$8	$8	$8
Total returns				$75	$150	$150	$150	$150	$150	$150	$150	$150	$150
Net returns				($126)	$26	$82	$59	$82	$59	$82	$59	$82	$59
Interest				($19)	($18)	($8)	($1)	$0	$0	$0	$0	$0	$0
Cumulative balance				($145)	($137)	($63)	($4)	$77	$137	$219	$278	$360	$419
Interest on Borrowed Funds				0.15									



Appendix 2.

Economics of Salinity Control

Sam Walker, Economist, Wagga

Pasture Establishment of Lucerne - 5 year pasture life

Enterprise Unit	1 ha
Enterprise:	Merino Wethers, 22 Micron
Mortality rate	5%
Culling	25%
Wool cut (kg)	6
Wool price ($/kg)	$3.17
Replacements ($/hd)	$9.50
Cull wethers ($/hd)	$3.00
Variable costs ($/hd)	$4.00

Stocking Rate

	dse/ha
Year 1	6
Year 2	12
Year 3	12
Year 4	12
Year 5	12

Stocking Schedule

Years	1	2	3	4	5
Potential	6	12	12	12	12
On hand (start of year)	0	4	8	8	8
Purchases	6	8	4	4	4
Culls	2	3	3	3	3
Deaths	0	1	1	1	1
On hand (end of year)	4	8	8	8	8

Seed Mix

	kg/ha	$/kg	$/ha
Lucerne seed	3.00	$4.50	$13.50
Sub Clover	4.00	$1.50	$5.50
		Total	19.00

Fertilizer Programme

1. Single super @ $225 /t — 2. Starter12 @ $450 /t
Cost of application @ $0 /t — 3. Lime @ $70 /t

Year	1	2	3	4	5
kg/ha	2500	100	0	100	0
Type (1,2,3)	3	1	1	1	1

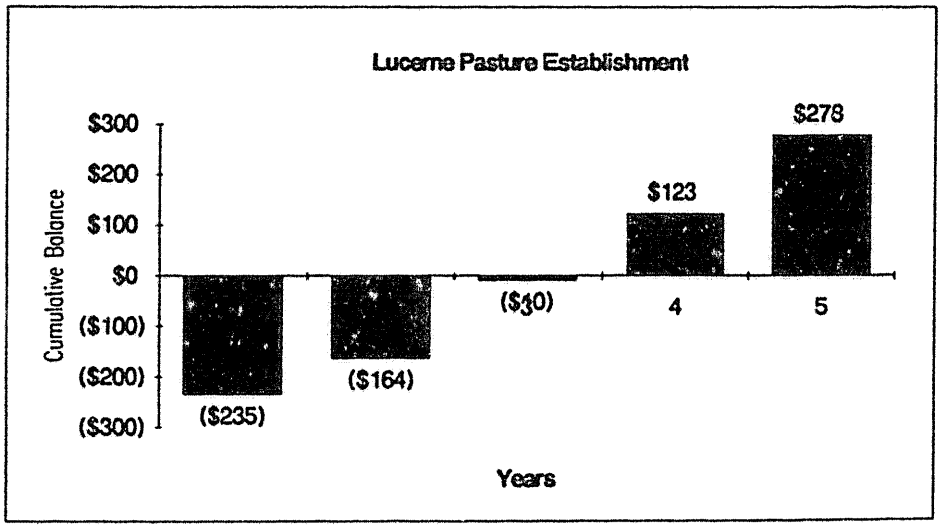
Herbicide Programme

	Repititions				$/ha
Glyphosate (*1)	1	0.7 l/ha	@	$14.25 /l	9.98
Ally	1	5.0 gm/ha	@	$1.19 /gm	5.95
Lemat	1				0.70
Treflan	1	2.0 l/ha	@	$6.63 /l	13.26
Spraying	1		@	$5.50 /ha	5.50
				Total	35.39

Establishment Costs

	$/ha
Sow (Direct Drill)	12.50
Seed Dusting	0.09

Years				1	2	3	4	5
Costs								
Seed Dusting		$0	/ha	0.09				
Sow	@	$13	/ha	12.50				
Seed	@	$19	/ha	19.00				
Herbicide		$35	/ha	35.39				
Starter12		$450	/t	0.00	0.00	0.00	0.00	0.00
Lime	@	$70	/t	175.00	0.00	0.00	0.00	0.00
Single sup.	@	$225	/t	0.00	22.50	0.00	22.50	0.00
Fert applic	@	$0	/t	0.00	0.00	0.00	0.00	0.00
Stock purch	@	$10	/hd	57.00	74.10	34.20	34.20	34.20
Stock costs	@	$4	/hd	24.00	48.00	48.00	48.00	48.00
Total Costs				322.98	144.60	82.20	104.70	82.20
Returns								
Wool sales				$114	$228	$228	$228	$228
C.F.A. Sales				$5	$9	$9	$9	$9
Total returns				$119	$237	$237	$237	$237
Net returns				($204)	$93	$155	$133	$155
Interest				($31)	($21)	($1)	$0	$0
Cumulative balance				($235)	($164)	($10)	$123	$278
Interest on Borrowed Funds				0.15				



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