PROFITABLE UTILIZATION OF PASTURES BY WEED CONTROL, DIRECT DRILLING AND LIMING

Wayne Rabjohns
"Leeston"
Woodhouselea NSW

I am a prime lamb producer who in conjunction with my parents run a 600 ha property called "Leeston", near Roslyn between Goulburn and Crookwell. Elevation just under 900m with an average annual rainfall of 800mm. Soil types mostly basaltic with pH levels ranging from 4.8 to 6.4. Carrying capacity 9.3 dse/ha. The terrain is hilly to steep and the ground is generally stoney but highly fertile. Less than 1/3 of the property can be ploughed. Consequently establishing pastures by direct-drilling was the only feasible alternative.

In this paper I will only give chemical, fertiliser and seed costs. There are no contract rates for application of spray, fertiliser or seed. These rates vary too dramatically from farm operator to contractor and from one area to another.

WEED CONTROL

Pre fight-verbals

Thistle control has been going on for over 10 years on "Leeston" and you would think that by now I should have no thistles. This is not so.

About 10 years ago we realised that the combination of a large variety of nodding, varigated, scotch and black thistle were severely reducing the stocking rate and lowering our wool prices due to increased vegetable fault.

The decision was taken by several neighbours to have a mass spray program. Well into spring, when the thistles averaged a metre in height, the planes were contracted and large amounts of Estone 80 were sprayed out. The thistles died, leaving tall, wooden skeletons as their epitaphs and bare ground in their shadows. I'm sure many of you have seen it before. This program continued for the next couple of years with the major results being:

1. Reduced farm cash surplus.
2. Reduced even more the amount of sub. clover.
3. Reduced thistle population only marginally.

We decided thistles were something you just had to live with.

(Round 1) Thistles fight doggedly

After 2 years of drought, we received a big spring in 1984. The grass was prolific and the thistles were even more prolific. No worries, we had plenty of grass. That was until mid summer.

By now the sheep had eaten the grass in the 30% of the paddock that did not have thistles. Next, we knew that they would move into the thistles and eat the grass under them. To our horror, the thistles had grown so dense there was no grass underneath them. We were now in a thistle induced drought less than 2 months after the best spring for years.

(Round 2) Farmer fights back

A local agronomist was consulted and a plan drawn up to spray MCPA 500 after the autumn rains in about May/June.

MCPA 500 was applied to 800 mls/ha @ $3.42/l, costing $2.74/ha.

The chemical cost of $2.74/ha seems very reasonable - about one-third of the high rates required in spring time. The results were spectacular, especially with varigated and nodding thistle. However, the spring germinating saffron and scotch thistles were not affected. Both these thistles are easily killed with low rates in the spring.

Major benefits of autumn/winter spraying:

1. Sheep will eat all sprayed thistles.
2. Grass will grow on thistle areas and be productive the following spring and summer.
3. MCPA is very mild on clovers, especially as the clovers are near dormant.
4. Because of the thistles slow growth at this stage, spraying can be done more leisurely. It is nice to know that if you miss spraying for a week that the thistle will not be half a metre higher.

Warning Sheep will consume sprayed thistles more quickly than unsprayed. The spray makes it more palatable.

DIRECT DRILLING

(Round 3) Thistles down for the count

Firstly, as a preface I would like to say that my comments are totally concerned with direct drilling pasture as opposed to direct drilling crops. Direct drilling of pasture should only take place when moisture levels are high, hence the need for heavy machines for penetration is not essential. I feel depth is not as important as is a niece clean furrow for the small seed to lie in. Major losses of seed are from it being placed too deep or from clods falling back into the furrow allowing slugs to attack the seedling.

Equipment: Mine consists of a slightly modified $3,000 second-hand seed drill and a home made boom spray. My neighbour invested in a $20,000 triple disc and a $4,000 boom spray. I cannot say his results are better. It is important to select

the machinery most suited to your individual needs. There is no best direct-drill. All have major limitations in certain areas. The triple disc is very expensive and prone to smearing in wet, heavy soils. The tyned machines are not suited to stoney ground, however in free country I have seen excellent results with the Baker Boot.

The boomspray must be accurate, have some sort of marking system and be stablised to prevent excessive whip of the boom. The ability to spray low volumes of water is becoming more essential with such chemicals as C.T. Roundup. Boom jets or fan jets are not suitable, they are not accurate and are prone to massive drift problems.

Method: It is the typical chemical farming approach.
1.Plan ahead. If an autumn sowing is intended then heavy grazing should commence mid summer at the latest. At least three crash grazings are necessary to reduce the paddocks to a totally bare state.

2.Allow regrowth of 2 to 4 cm. Usually a couple of days after rain will be sufficient.

3.Spray, allow recommended time before regrazing or sowing. I prefer to completely denude the paddock prior to sowing. This I find gives better penetration and cleaner furrows.

Chemical: Possibly the most critical decision of the whole program is the determination of exactly what weeds, grasses and legumes exist in the paddock to be chemically treated. Without this evaluation, it is impossible to select the chemical and the rate of application. For example, if 200 mls/ha of Roundup is used unnecessarily, then you have wasted $3.75/ha. On the other hand you may need an extra 200 mls to kill a hard to kill annual, such as rats tail fescue, or you may decide on a mixture. If in any doubt contact an agronomist. The savings will be well worth it. Pay attention also to the shifting price of chemicals. In previous years I have used Dalapon at 6 kgs/ha mixed with Amitrol at 3 ltrs/ha. This proved highly efficient in most situations and by far the cheapest. However in one year with the changing Aust. $, Dalapon increased dramatically in price making Roundup and Estercide a better proposition. I cannot emphasise enough that the rates and chemicals to be used differ from one area to another and even from one season to another. In my own case, I need less Roundup, 800 mls/ha in the autumn where as in the spring 1 L/ha is needed due to the presence of hard to kill annuals.

Sowing: Here I go for the overkill, remember this is for highly infested thistle areas. I sow 8 kgs/ha of Australian Phalaris with 100 kg/ha single Mo super.
This usually gives me a paddock looking like an oat crop two months after germination. Australian Phalaris is used because of its better ground coverage.

Table 2 Direct drilling costs

Roundup C.T. @ 1 l/ha @ $18.72/l	$18.72
Estercide 80 @ 500 ml/ha @ $5.40/l	2.70
Cost of spray/ha	$21.42
Seedmaster phalaris @ 8 kg/ha @ $5.30/kg	$42.40
Single Mo Super @ 100 kg/ha @ $9.45/50/kg	$18.90
Total Cost/ha	$82.72

Post-germination management: In some cases competition control may be necessary some months after germination. This is usually done late spring/early summer by crash grazing for a short period. Do not worry about loosing the phalaris, it will bounce back better than ever. In most cases I spray the following autumn for thistle control after that the paddock is clean.

LIMING ACID SOILS

In the 60's and 70's it became obvious that we were no longer obtaining the spectacular results with superphosphate that we had in the 40's and early 50's. I can clearly remember as small boy being able to see where the super. cart had turned at the bottom of steep gullies and the difference in the height of supered to non-supered clover would be one foot. At first, we thought that it may have been the change to aerial spreading. Perhaps the planes just didn't miss any ground. With a change in economics in the 70's we went back to ground spreading. The results were dismal.

1979 saw the commencement of the Pejar Dam catchment scheme by the NSW Soil Conservation Service. Their experts soon became aware that many graziers in the catchment had similar complaints;

Poor superphosphate response.
Poor clover nodulation.
Difficulty in pasture establishment, especially lucerne.
Increased bare ground.
Lowering stock rates.

Many of these pastures had been sub. clover pasture improved for up to sixty years with long histories of supering. It is now well documented that soil acidity has increased under sub. clover based pastures on the Southern Tablelands of NSW.

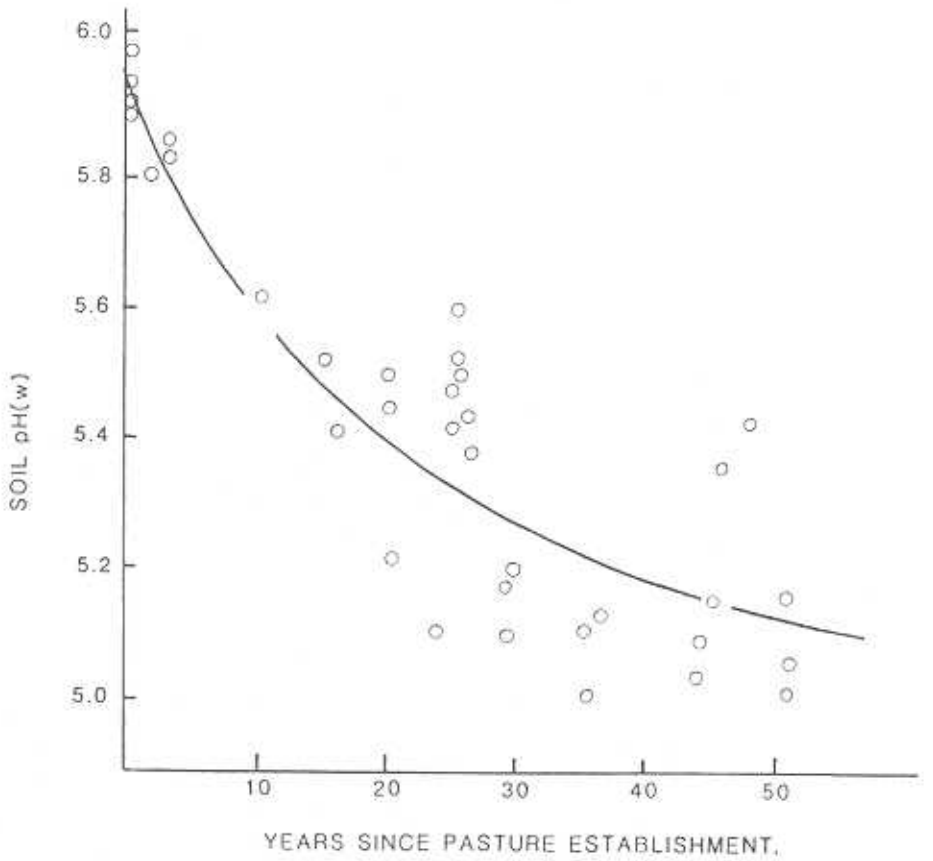


Figure 1. The relationship between period under sub. clover pasture and pH(w) of the surface 10 cm of soils at Binda NSW. (Williams).

In a study near Crookwell NSW, Williams (1980) showed that increased soil acidity had also been linked with problems of plant growth associated with:

Hydrogen ion toxicity.
Deficiences of potassium, calcium, magnesium or molybdenum.
Toxicity of maganese, aluminium, nickle, cobalt and chronium.
Decreased phosphate availability.
Inhibited nitrification.
Nodulation difficulties.
Increase in fungal rootrot diseases.

Neither time nor space permit me to comment further on these plant growth problems but to say that they can be extremely serious for production, not only for the plant but in the case of high pasture manganese levels it has been indicated in New Zealand that young sheep grazing on pastures containing > 400 ppm Mn have a growth depression rate of between 33% and 48%.

Table 2 Pasture Manganese Levels (December 1980)

	Treatment	Manganese ppm
Granite Soil	No lime.	724
	Lime Incorporated 3.55t/ha.	- *
	Lime Surface Applied 3.55t/ha.	487
Basalt Soil (Leeston)	No lime.	396
	Lime Incorporated 5.95t/ha.	296
	Lime Surface Applied 5.95t/ha.	361

*Not sampled

Trial plots

In mid 1979 a trial plot was set up on "Leeston" by the Soil Conservation Service to monitor the:

1. Effects of liming on pH levels
2. Change in ground cover
3. Passage of the lime through the soil.

The average pH(water) of the plots at the commencement of the trial was 5.2. The following table shows the results of surface liming on the pH. Lime was applied on 7/8/79.

Table 3 Effect of surface lime application on pH* at "Leeston"

Date	To achieve Lo(Zero)	pH(w) 6.0 L1(2.8t/ha)	pH(w) 7.0 L2(4.97t/ha
10.4.79	5.2	5.08	5.07
24.9.79	5.18	5.85	6.03
30.9.80	5.47	6.21	6.55
23.9.81	5.63	6.30	6.68
9.82	5.56	6.03	6.43

* pH in water

On a nearby trial plot on granite soil the following percentage change in pasture production was obtained in 1981.

Table 4 Percentage change in pasture production following lime and super. application.

Super. (kg/ha)	L0(Zero)	L1(2.8t/ha)	L2(4.97t/ha)
0	100	116	116
50	100	104	107
100	100	102	118

It should be noted that the period from 1979 to 1981 were years of either below average rainfall or exceptionally uneven. This I feel could have only helped to reduce the responses.

A further concern of ours was, would the surface applied lime move down through the soil and at what rate? As little research has been done, it seems evident that acidity moves down the soil profile with time.

Figure 3. The effect of surface applied superfine F70 lime on soil pH, 6 yrs after application.

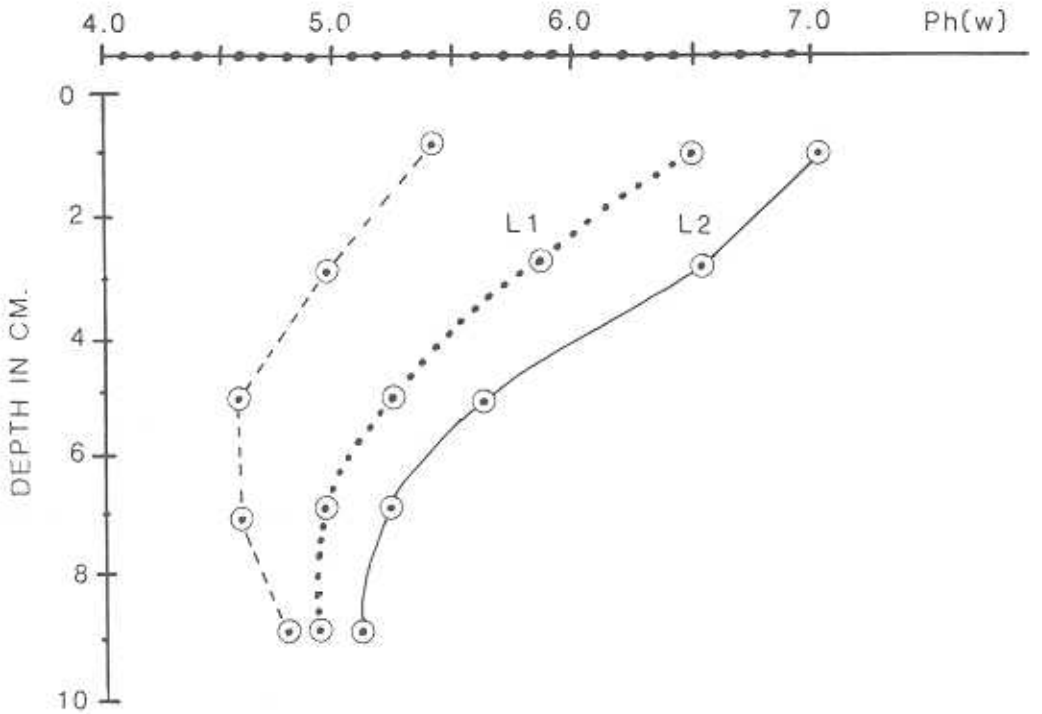
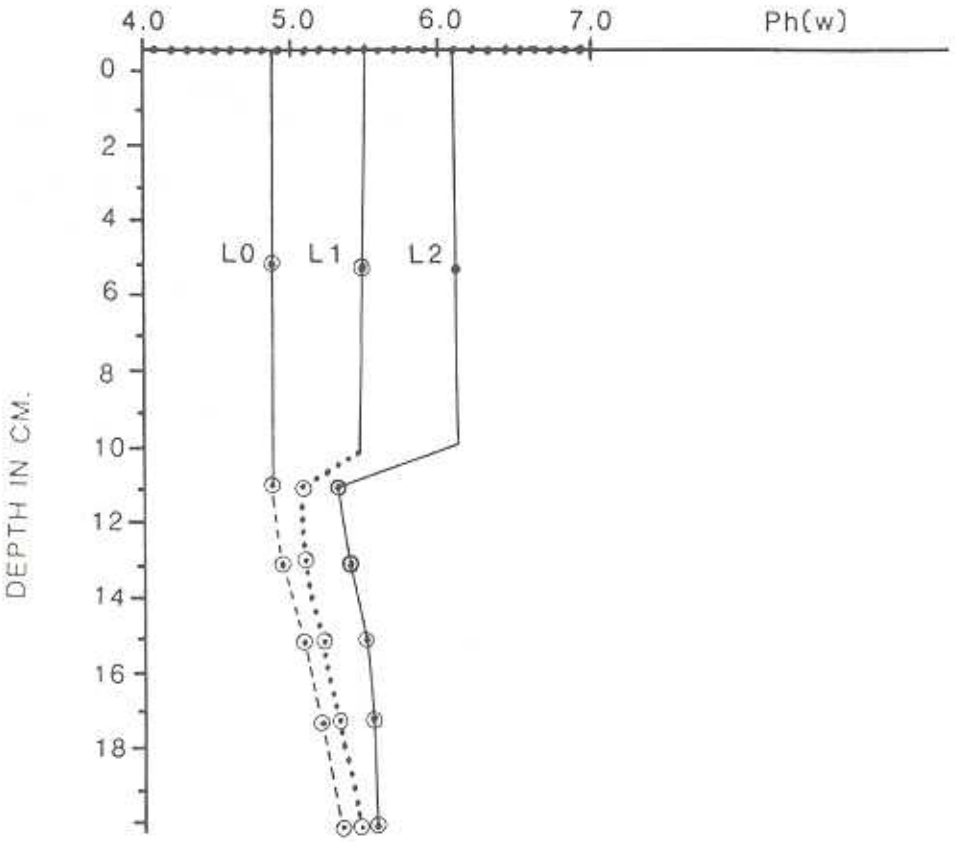


Figure 4 The effect on soil pH, 6 years after incorporating to 10 cms. superfine F70 lime.



The data from these lime trials showed that surface applied lime will increase the pH of the subsurface layers and while not a uniform change, it does follow a shallow gradient from the surface to 10 cm. A comparison of the pH profiles under incorporated and surface applied lime show that less incorporated lime is required to raise the average pH of the top 10 cm of soil. However, as the pH gradient of the surface applied lime is more shallow it is expected that the residual value of the surface applied lime may be considerably longer.

It is therefore a management option of either using less lime and more energy to incorporate it, or more lime and less energy to achieve a given pH at a depth of 10 cm. In our own case, incorporation was impracticable due to the stoney, hilly nature of the terrain.

Type of lime

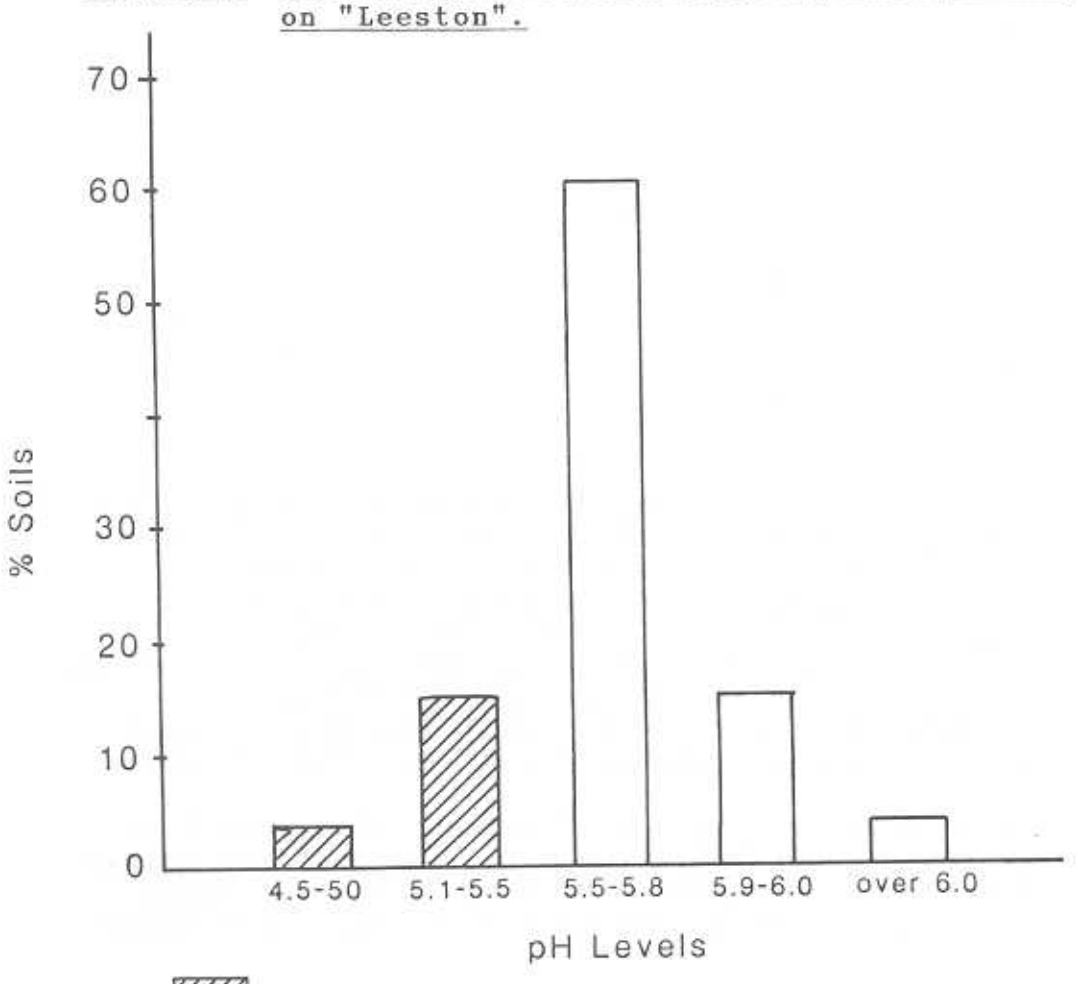
There are many types of lime and various grades. Remember limestone is extremely insoluable. The coarser the particles the longer they will take to break down. Agricultural grade lime often screens at 80% through a 300 micron sieve. This lime takes many years to react and correct an acid soil. We use

superfine F70 lime (75% passing through a 75 micron sieve), a product of Southern Limestone, Moss Vale.

Method of spreading

It is essential that the lime be evenly spread. By placing one metre square trays on the ground the accuracy of the machines could be checked. An elaborate twin spinner super-spreader was first tested and proved to be 25% inaccurate. This was accentuated even further by wind and vehicle speed. When dealing with rates of up to 6 tonnes/ha this became an intolerable situation. The only machines which proved accurated were direct drop. These machines are almost unprecurable with one eventually being imported from Germany.

Figure 5 Percentage of basalt soils in each pH range on "Leeston".



Average cost of liming on "Leeston" per ha 1986

Lime F70 superfine @ $38/t delivered @ 3.6t/ha.	$136.80
Spreading @ $12/t @ 3.6t/ha.	43.20
	$180.00/ha

Average lime requirement on "Leeston" 3.6t/ha

CONCLUSIONS

Weed Control (Thistles)

The economics for controlling thistle, barley grass, wireweed etc. have never been clearer for the sheep producer. Wool is now being heavily discounted for seed fault. I recently saw a crossbred wool clip sold for 282c/kg with 0.6% fault. Some of the same wool clip contained 9% seed fault, it received 158c/kg, a discount of 124c/kg.

If I carry 4 ewes/ha which cut 5 kg wool, then a seed fault discount of only 13c/kg will cover the chemical cost. The current discount for 1% to 2% seed fault is 28c/kg. Furthermore, lambs foraging among the rosette stage of thistles in winter cause tremendous damage to young prime lambs by setting up a scabby mouth condition.

Direct Drilling (Sowing Phalaris)

Due to the greater initial out-lay the economics may seem less clear. However, consider that the areas I have been treating were highly thistle infested, to the extent that production was seriously affected. One such paddock could only be used in autumn-winter running adult sheep, the rest of the time it was a wall of thistles with some barley grass. It carried 5 dse/ha.

Two years after sowing (after receiving two thistle sprays) the pasture is virtually clean and it has cost approximately $80/ha and is now capable of 12 dse/ha. I think a very reasonable proposition.

Liming Acid Soils

Liming acid soils is for those with a long term dedication to their property and the faith of a saint. It is very difficult to spend a large amount of money on a problem which is difficult to see and creeps upon the land more slowly than death. However, it is now some 5 years since liming commenced and although the visual results are only just becoming noticeable, I can now confidently say the areas which have been limed are now the best performing pastures on "Leeston".

Table 10 Example of costs and stock carried on "Leeston"

Paddock history

Area 8.6 hectares.		
May- 1981	Limed @ 4t/ha @ $45.	$180.00
Sept-1983	Sprayed thistles MCPA 500 @ $2.20/ha.	2.20
June-1984	Direct-drilled 8 kgs/ha phalaris 100 kgs/ha Mo super $76.00/ha.	76.00
June-1985	Sprayed thistles MCPA 500 @ $2.74	2.74
		$260.94

Stocking history 1985

June, July, Aug. Sept.	90	Ewes lambed and reared until sale
Nov.	50	Dry ewes
Jan. Feb. 86	210	Ewes being joined
May	46	Ewes on the point of lambing

Stocking Rate 8.48 2nd X ewes/ha @ 2.16 dse-equiv 18.3 dse/ha.

Gross Margin 2nd X Ewe/ dse $7.37*
Return/ha $134.87

* Guide for Graziers (May 1985)

ACKNOWLEDGEMENT

R.W. Cumming, Research Office, Soil Conservation Service N.S.W. L.G. Walker, Pejar Catchment Soil Conservation Officer, Soil Conservation NSW for their helpful efforts in the collection and preparation of results on "Leeston" trial plots and much of the information concerning liming.