3. IMPROVING PASTURE MANAGEMENT

Allocating limited cash reserves post-drought to increase the productivity of pastures is a difficult exercise. This chapter will address those steps that can be taken without the high cost of pasture renovation.

The highest return from money spent will be from the application of fertiliser (in particular phosphorus). However there may be good opportunities to manipulate pastures through grazing management if you are understocked.

Generally speaking, there are a number of major decisions you will need to make post-drought to maximise the productivity of your existing pastures.

1. How much fertiliser should I put out? (maintenance versus capital)
2. Should I apply lime?
3. Can I repair pastures by manipulating the species content through grazing management?
4. Can I increase the amount of pasture produced through grazing management?

SECTION KEY MESSAGES

Long-term trials show that fertilised pasture produces around 4 times the dry matter of unfertilised pasture.

Grazing stock removes around 0.8-1.2 mg phosphorous per kg soil per DSE per year.

If understocked due to the drought, there may be little to be gained from investing in fertiliser in the short-term, especially lime.

The highest return from money spent will be from the application of fertiliser (in particular phosphorus). However, there may be good opportunities to manipulate pastures through grazing management if you are understocked.

Increasing pasture production from existing pastures

How much fertiliser for your pastures

It is important to remember there will be a future cost in cutting back on fertiliser. However, this may be an option where you have much lower stocking rates than normal, even to the extent that if you have built up high soil fertility from continuous capital applications of phosphorus (P) in the past, you may even be able to skip the fertiliser application for a year while you rebuild numbers.

About 0.8-1.2 kg of P/DSE is required to maintain soil phosphate levels for most grazing systems in south eastern Australia. If your predicted cashflows allow, this is the minimum that you should apply.

If you have additional capital available above this, then you should consider that the application of fertilisers, usually in the form of superphosphate, is the simplest and most cost effective way to increase pasture production. This can be used to improve soil P levels but the most efficient use of land is to match P inputs with requirements of pasture production. Long-term pasture trials have shown that around four times the total dry matter production is achieved on fertilised versus non-fertilised pastures.

How much to apply

Nutrients need to be applied to pastures because they are removed through livestock products leaving the farm, soil fixation and leaching. A guide to understanding your soil fertility levels is shown in Table 3.1.

What are the economics?

When pasture growth or quality is increased as a result of fertiliser application, the stocking rate must also be increased in order to realise the financial benefit of your expenditure (unless you were previously overstocked). Put simply, there is little point in top-dressing superphosphate to grow more feed unless you graze the extra feed with more stock. If you cannot afford to put more stock onto the pastures, then don't attempt to lift their productivity from their current levels, but wait until you have sufficient capital.

There is little point in top-dressing with superphosphate to grow more feed unless you graze the extra feed with more stock.

If you do have enough capital to increase stock numbers then the most important consideration will be that the return on investment will be dependent on the expected increase in the carrying capacity of the pasture.

Table 3.1 is a fertility guide to interpreting soil tests for phosphorus. It is important to recognise which test was performed and what your soil type is. The economic effect of soil fertility and the pasture response to fertiliser is shown in Table 3.3.

Table 3.1: A guide to soil test values for pastures

SOIL TYPE	NUTRIENT STATUS	PHOSPHORUS LEVELS			SULPHUR
		OLSEN P mg/kg (ppm)	BRAY - 1P mg/kg (ppm)	COLWELL P mg/kg (ppm)	KCL mg/kg (ppm)
SANDY LOAMS	Low	0 -7	0 - 8	0 - 14	0 - 3
	Medium	7 -15	8 - 15	14 - 20	4 - 6
	High	>15*	>15*	>20*	>6*
LOAMS	Low	0 - 8	0 - 10	0 - 16	0 - 3
	Medium	8 - 18	10 - 18	16 - 30	4 - 6
	High	>18*	>18*	>30*	>6*
CLAY LOAMS	Low	0 - 9	0 - 10	0 - 18	0 - 4
	Medium	9 - 24	10 - 20	18 - 40	5 - 8
	High	>24*	>20*	>40*	>8*
HEAVY CLAY SOIL	Low	0 - 13	0 - 10	0 - 30	0 - 4
	Medium	13 - 30	10 - 20	30 - 80	5 - 8
	High	>30*	>20*	>80*	>8*

* Adequate soil test value. This is the level at which phosphorus is adequate for healthy growth. If the soil test exceeds this level there is no need for phosphorus fertiliser in that year. If it exceeds this level by a large amount, phosphorus application may be suspended for a longer time, but don't overlook the need for sulphur during this period.

Source: HSA AgInsights - How to Graze High Profit Pastures 2001

Effect on enterprise profits

To work out the expected return from fertiliser application, you need to work out what the marginal costs will be (the difference between the current fertiliser costs and the subsequent fertiliser costs) and what the marginal income will be (difference between current income per hectare and the expected income per hectare). It is easiest to do this by calculating what your gross margin per DSE is.

To calculate your gross margin per DSE add the expected fleece value of your sheep to the price you would expect to pay for a weaned lamb off that sheep (if ewes). Use three - year averages if possible to get a better picture of what the price is likely to be over the next three years. Divide this by 1.3 if your sheep are ewes or by one if they are wethers. This will be your gross income per DSE.

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Table 3.2 : Calculating gross margin per DSE

Fleece Value 3.8kg clean @ 9.20/kg	$35.00
Weaned Lamb $35 x 85% weaning	$30.00
Total	$65.00
Average Annual DSE's	1.3
Gross Income per DSE	$50.00
Enterprise Expenses	$8.00
Gross Margin per DSE	$42

Deduct between $7 to $10 for enterprise expenses. The higher the rainfall you have, the higher your deduction should be. This will put you in the ball park of your gross margin per DSE.

Table 3.3 shows the long-term economics of applying extra fertiliser when your soil P content is below optimum levels. The assumptions are that the enterprise has a long-term gross margin of $20 per DSE, and that it costs $55 per DSE for additional stock. The cost of fertiliser is calculated at $220 per tonne with each tonne of fertiliser having 90 kilograms of phosphorus.

Table 3.3: Net returns from increased fertiliser applications for an average wool producer

• Calculated using $20 per DSE Gross Margin

KG P/HA	DSE/HA	COSTS OF EXTRA PHOS. PER HA	COST OF ADDITIONAL LIVESTOCK	YEARS TO BREAKEVEN CASHFLOW	% RETURN	ADDITIONAL GROSS MARGIN PER HA
0	6.4	$0				
6 (Low)	10.9	$14.70	$330	4	24.4%	$90
12 kgs (medium)	13.9	$29.40	$495	4	26.2%	$150
18 kgs (high)	15.2	$44.10	$567	5	17.2%	$176

Source: HSA AgInsights - How to Graze High Profit Pastures 2001

When your soil P levels are low, a carrying capacity response similar to that of moving between nil to low fertiliser application rates could be anticipated. If soil P levels are 'medium', you would anticipate a response similar to moving between low and medium application rates. When your soil P levels are at their optimum, a response similar to moving between medium and high rates would be expected.

As soils become more fertile the response from fertiliser is reduced. As a result, the greatest return on your investment will be achieved if you spread fewer kilograms of P per hectare over more responsive hectares, than if you spread large amounts of P on only a few hectares.

As soils become more fertile, the response from fertiliser is reduced and the marginal returns from capital applications become smaller. Fertiliser application decisions should therefore be based on pastures having:

- Below optimum levels of soil P.
- Soil pH of no less than 4.5 ($CaCl_2$).
- A pasture capable of responding to increased P (perennials or improved annuals with at least 30 per cent legumes)
- Enough profitable stock to utilise extra feed production.

On a whole farm basis, the implications of the response relationship is that the greatest return on your investment will be achieved if you spread fewer kilograms of P per hectare over more responsive hectares, than if you spread large amounts of P on only a few hectares. This is especially the case if you are working on a limited fertiliser budget post-drought.

The Economics of lime

Results from trial work show that the application of lime can improve carrying capacity by 2-4 DSE where soils have a high acidity and high aluminium content. Because lime can be slower acting and is more expensive to put out than superphosphate, ($150-$300 per hectare versus $30-$50 per hectare) and results in lower increases in productivity, it should rank below superphosphate in order of priority. Each additional DSE from superphosphate costs $5-$7, but with lime, it costs $40-$150 per DSE.

Liming acidic soils is important but where it is not part of the cropping phase on a farm, lime application should be postponed until cash flows can once again support its application.

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Manipulating pasture composition

Attempting to manipulate pasture composition provides another possible option to the more expensive pasture renovation. Usually this is difficult to achieve, because it involves resting paddocks at critical times of the year when feed is limiting. Post-drought, when stock numbers are lower than normal, there may be an opportunity to manipulate your pastures.

Table 3.4 provides guidelines on the appropriate grazing management to either increase, maintain or decrease pasture species within a sward. This means both a decrease or increase in persistence and production. The challenge for graziers is to firstly identify what makes the dominant species in your sward, secondly identify the species that will provide the most favourable livestock production responses and thirdly work out the appropriate grazing management strategy to optimise both pasture persistence and production.

Being understocked for a period of time will give you more flexibility in grazing management to manipulate pastures.

The challenge for graziers is to firstly identify what makes the dominant species in your sward, secondly identify the species that will provide the most favourable livestock production responses, and thirdly work out the appropriate grazing management strategy to optimise both pasture persistence and production.

Table 3.4: Grazing management to increase, maintain or decrease pasture species

PASTURE TYPE	TO INCREASE OR MAINTAIN	TO DECREASE
Phalaris	• Increase phosphorus applications. • In northern environments with more summer rainfall rest in spring/summer, remove excess trash late summer then rest until 3-4 weeks after autumn break. • In southern environments rest over autumn winter to allow more tillering of the existing plants.	• Allow soil fertility to decline • Graze heavily during spring/summer or repeatedly cut to not allow to run to head. • Graze heavily any new green shoots in summer and autumn.
Cocksfoot	• Graze to maintain above 1000-1500 kg DM/ha • Apply high rates of phosphorous fertiliser • Avoid continuous grazing of green shoots during summer and autumn	• To avoid cocksfoot dominance graze all summer growth with individual tussocks down to 10cm tall at the autumn break • Graze heavily during autumn to physically pull plants from the ground. • Graze hard down to 2.5cm or less during late spring or summer • Allow soil fertility to decline
Perennial Ryegrass	• Rotational graze during summer, ideally grazed when plant reaches 3 leaf stage. • Apply high rates of phosphorus fertilisers	• Allow soil fertility to decline • Do not allow to run to head • Continuously graze heavily during summer
Tall Fescue	• Graze frequently (every 14-21 days) for short periods (2-3 days) during periods of active growth. • Do not graze unless 3 weeks of good active growth and 12-15cm of grass growth occurs. • Set stock or rotationally graze from autumn to spring to maintain 1000-2500kg DM/ha (or 5-15cm) of pasture.	• Continuously graze in hot dry conditions. • Graze heavily in the early autumn or dry summers
Sub Clover	• Avoid grazing until seedlings have 3-5 true leaves, usually 3-6 weeks after autumn break • Keep grass/weed cover below 1000kg DM/ha during summer/early autumn. • Maintain a sward height of 5cm or less until flowering • Increase phosphorus applications	• Maintain grass and weed cover above 1000kg DM/ha • Don't control earth mites • Cut hay or graze heavily during seedset • Apply herbicides during flowering • Allow soil fertility to decline, including Molybdenum and Boron.
White Clover	• Keep grass/weed cover low at break and graze continuously to keep the grasses short. • Over winter and early spring graze pasture to 750kg DM/ha (or 3cm). • Heavily rotationally graze in spring to control grasses. Maintain pasture height between 1000-3000kg DM/ha (or 10-25cm). • Increase phosphorus applications	• Graze heavily during flowering • Graze to less than 1200kg DM/ha while under moisture stress during summer • Allow soil fertility to decline, including Molybdenum and Boron.
Lucerne	• Allow to achieve well in excess of 10% flowering prior to grazing. This must be achieved at least once per year, preferably in the autumn. • Rotationally graze, for most areas with 2 weeks grazing and 5 weeks rest during summer, and 2 weeks grazing and 7-8 weeks rest during winter.	• Increase Phosphorus applications • Set stock paddocks at heavy stocking rates • Allow soil fertility to decline, including Molybdenum and Boron.
Sub Tropical Grasses	• Allow to set seed once a year • Control growth of clover, ryegrass and barley grass in early spring	• Graze Rhodes grass to ground level • Graze heavily during flowering
Temperate Native Grasses	• Prevent clover dominance in spring • Keep spring growth below 2500kg DM/ha	• Build up soil fertility rapidly and allow clover dominance in spring

Source: HSA AgInsights - How to Graze High Profit Pastures 2001

Case Study - Pasture management

Bob and Sue Wantwater run a predominantly grazing enterprise at Bendigo in Victoria. They had been investing in their pastures in an effort to lift their stocking rates prior to the drought and are now wondering what they should do in the immediate period after the drought. At the onset of the drought, Bob and Sue Wantwater made the decision to sell three age-groups of wethers because they thought the prices for wethers were attractive at the time.

At the onset of the drought, the owners made the decision to sell three age-groups of wethers because they thought the prices for wethers were attractive at the time.

The property has 445 grazing hectares with an average annual stocking rate of nine DSE per hectare. The pasture is a mix of improved perennial, sub clover based pastures and native sub clover based pastures.

It is estimated that it would take them two years to get stock numbers back to where they were pre-drought. There was some degradation of pastures during the drought, however nothing so serious that the pastures would be deemed irreparable.

The first step for Bob and Sue was to work out exactly what their reduction in stocking pressure has been. Table 3.5 shows the before and after stocking schedules.

Table 3.5: Effect of drought on stock numbers

	DSE rating	Pre Drought		Post Drought	
		Number	DSE's	Number	DSE's
Weaner ewes	1.1	512	563	513	564
Weaner wethers	1.1	535	588	552	607
Ewe Hoggets	1.1	313	344	294	323
Wether Hoggets	1.1	250	275	231	254
Mature Ewes	1.3	1300	1690	1254	1630
Mature Wethers	1.0	600	600	200	200
Total DSE's			4060		3578
DSE's Per Hectare			9.1		8.0

The key considerations are:

- In the first year after the drought the stocking rate will have been reduced from 9.1 to eight DSE/ha. Bob and Sue will not be able to afford to buy stock as there is already a $15,000 hole in their cashflow from a reduction in stock sales.
- In the second year after the drought, Bob and Sue will be back to their pre-drought stocking levels.
- In the third year, the strategy to increase stocking rates will continue.

The decision to retain as many weaner wethers and ewes as possible, means that instead of five to 600 hoggets to sell next year, they will only sell around 200 of the worst. At an expected price of $40, that is $12,000 to $16,000 of lost income, however they will be back up to their pre-drought stocking levels.

Because there is a strong history of fertiliser use on the property, with a minimum of 125 kg/ha of single superphosphate being applied on all paddocks each year, Bob and Sue will reduce their fertiliser output to maintenance levels to meet the reduced stocking rates.

The maintenance rate will be one kilogram of phosphorus per DSE, therefore eight kilograms of phosphorus per hectare or 90 kilograms of single superphosphate per hectare. Table 3.6 shows they will save themselves $5,000 in year one on this reduced fertiliser cost. If this is not sufficient to help manage the cashflow, those pastures with high soil phosphorus levels may not receive any single superphosphate for one year.

Table 3.6: Post drought fertiliser strategy compared to pre drought

	Pre drought	Post drought
Rate	125kg/ha	90kg/ha
Cost @ 240 spread	$26,640	$21,600

In the second year, the superphosphate rate will be returned to the normal 125 kg/ha.

In the third year, selected pastures will receive 250 kg/ha in order to boost the productivity and resume the strategy of lifting the stocking rate.

In Bob and Sue Wantwater's case, the cost of purchasing stock is too prohibitive to immediately resume the previous pasture improvement program. Therefore, the core strategy is to return stocking rates to pre-drought levels by foregoing sales. The foregone sales income would be partly compensated for by reduced fertiliser in the first year post-drought.

Only when their flock matches pasture production will they consider lifting their pasture productivity by sowing new pastures in order to achieve their target 12 DSE per hectare. Some of that cost can be alleviated in the short term by reducing fertiliser application to the maintenance level per DSE.