



Extension note 2

How can managing hill country be more profitable?



Woolgrowers with hill country can improve profits by 10% and avoid bare hills, erosion and weed problems in winter.

Research commissioned by *Land, Water & Wool* has identified three different strategies for achieving whole farm profitability while ensuring the condition of native vegetation on hill country wool growing properties is improved.

This Information Note is based on the major findings from this research.

Hill country is classified as anything with a greater than 3% slope.

The research identified the following strategies for managing hill country:

- Strategy 1: Deferred grazing
- Strategy 2: Intensive rotational grazing of productive paddocks
- Strategy 3: Targeting soil nutrient deficiencies



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1. Deferred grazing in hill country (DG)



Deferred grazing involves removal of livestock from hill country for several months in late spring to early autumn. This reduces the amount of bare ground in late summer by retaining more grass, and enables summer flowering native perennial grasses to set seed.

Deferred grazing can improve the cover of native vegetation on hills, which may lead to added benefits for conservation of native flora and fauna, soil health and water quality. The persistence of some native perennial grasses on hill country provides an important opportunity for woolgrowers to improve these pastures without expensive sowing and fertilisers. Improving the cover of existing native grasses in hill country can be done at relatively low cost and will increase productivity of what are traditionally considered 'marginal' areas of the farm.

Deferred grazing can conservatively increase stocking rates by between 25% and 50% within 3 years on hill country currently carrying less than 8 DSE per ha. Stocking rates have also known to be doubled under deferred grazing regimes. If the carrying capacity was increased by 50% on hill country, farm profits could be increased by over 30%.

This strategy is sensitive to whether supplementary feeding is required or not. If supplementary feeding of stock is not required during summer months, the return on capital generated from this strategy can be higher than 25%.

Costs involved



Capital costs of up to \$60 /ha. may be associated with adopting deferred grazing (in particular for land class fencing and additional watering points). Land class fencing and water points enables sheep to be rotated on hill areas from March to November. Native grasses are usually found in more fragile parts of the landscape, and are susceptible to overgrazing. Fencing to land class helps enable sheep to graze the hills more evenly and reduce the effects of overgrazing areas such as hill-tops and north facing slopes.

When sheep are removed from hills, supplementary feeding may be required if other parts of the property are operating at optimal carrying capacity. This depends on pasture availability as a consequence of the season, and grazing management on other parts of the farm.

Many Victorian woolgrowers already manage native vegetation areas differently to other areas of their farms. Maintaining a cover of native trees, shrubs and grasses can have benefits such as:

- stock shelter
- increased pasture growth
- drought fodder
- improved appearance to the landscape
- limiting erosion and salinity
- more cover on hill country
- provision of habitat for native species.

Steep Hills Project

The Sustainable Farming Systems for Steep Hills Project aims to develop sustainable and profitable pasture management systems that will increase ground cover, reduce recharge and run-off and improve the seasonal growth pattern and persistence of perennial grass pastures for steep hill country in central Victoria. Three field sites have been established near Ararat since 2002, to investigate the impact of strategic grazing and deep-rooted perennial pastures on major sustainability issues such as ground cover, pasture density and water/nutrient run-off in steep hill country. The results have shown that replacement of annuals with perennials (both native and introduced) through deferred grazing can increase the pasture density by 40% and ground cover by 50% (in March). It also reduces deep drainage and nutrient run-off considerably.

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Further information & references:

- Zollinger RP, Nie ZN, McCaskill, M (2005) The impact of strategic grazing practice on hilltops in steep hill country. Proceedings of 4th Stipa Conference on Management of Native Grasses and Pastures. Burra, South Australia. pp38-43.
- Nie ZN, Quigley PE and Zollinger R (2005) Impacts of strategic grazing on density and ground cover of naturalised hill pasture. Proceedings of the XX International Grassland Congress, Dublin, Ireland, p518.

2. Intensive rotational grazing of productive paddocks (IRG)



Stocking rates may be increased on the most productive paddocks to offset the cost of managing native vegetation on the more 'marginal' (low stocking rate or unstocked areas) of the farm. Undertaking a whole farm planning exercise will help identify the best paddocks or parts of the farm for adopting intensive rotational grazing, which was identified as a strategy in the 'Broadford Grazing Trial', a long term research project aimed to demonstrate techniques to increase farm productivity (see box to right).

Intensive rotational grazing can increase the cover of native pastures over a large farm area, generating increases in carrying capacity and increasing wool profits by 11% on average. It can improve the persistence of perennial grasses, reduce some weeds and improve the utilisation of the available pasture. The timing of rotation depends on pasture growth rates and required 'rest' period of pastures, the total number of paddocks and watering points, and the number of stock being run.

Suggested management actions

- Re-fence paddocks (where required) into smaller areas and provide watering points for more even pasture utilisation, and increased carrying capacity.
- Base rotation on plant recovery rather than time grazed.
- Manage watercourses, remnant bush and hill tops solely for biodiversity enhancement, ideally at least 15% of farm area.
- Adopt specific management practices to improve native vegetation condition e.g. strategic grazing of biodiversity areas for weed control

Costs involved

Capital costs associated with intensive rotational grazing are fencing and additional watering points estimated to cost up to \$60/ha. The re-fencing of existing paddocks and more water points enables sheep to be rotated through a greater number of smaller paddocks and grazing efficiency and carrying capacity to be increased.

Fertiliser application (phosphorous in particular) has been shown to decrease the overall condition of native vegetation. It is therefore critical to carefully select which paddocks are to be fertilised to avoid undesirable impacts on native biodiversity.

Broadford Grazing Trial

This long term trial demonstrated the benefits of both rotational grazing and fertiliser use on the profitability and sustainability of improved pastures. It provides the most up-to-date principles for applying rotational grazing and fertiliser regimes on Victorian farms (note: research was based on pastures sown to introduced species). The trial showed increases in carrying capacity of 35% over 4 years on low Phosphorous areas, 37% on high Phosphorous areas.

For more information use the search engine from www.dpi.vic.gov.au and type in Broadford Grazing Management Trial.



3. Targeting soil nutrient deficiencies (TND)



Parts of the property with good condition native vegetation should not be fertilised. In addition, care needs to be taken with fertiliser application, especially in paddocks adjacent to waterways and areas with high native vegetation condition. It is a good idea to leave a 50m buffer surrounding any biodiversity areas.

However, overall biodiversity benefits are possible if targeted fertiliser application is balanced with appropriate management of native biodiversity on other parts of the farm.

Generally, there is least risk of damaging biodiversity from fertiliser application in paddocks that have:

- had a history of moderate to high fertiliser application (Olsen phosphorous greater than 15 mg/kg)
- been sown to improved pasture species
- been grazed at high stocking rates (→10 DSE/ha.).

The production benefits and higher stocking rates from correcting soil nutrient deficiencies on the most productive paddocks, can more than offset costs from enhancing native biodiversity on 'marginal' parts of the farm.

A whole farm plan and regular soil testing will help identify the most appropriate paddocks or parts of the farm for fertiliser application. Targeting soil nutrient deficiencies with a fertiliser program based on regular soil testing, enables pasture growth to be improved, and carrying capacity to be lifted on well-selected paddocks.

Costs involved

Costs involved can be minimal and fit within the existing fertiliser budget, especially if only well-selected paddocks are targeted, and only a couple of paddocks are targeted at a time.



Assumptions used in the profit analysis



Required investment

The three strategies outlined in this Information Note are compared in the table below, based on an 'average' wool growing property operating on hill country in central Victoria. This average property would:

- be 1400 ha. in size, which includes 800 ha. of hill country,
- have an average stocking rates of 12 DSE/ha. on the flatter parts, and 8 DSE/ha. on the hill country.

Analysis of the total investment cost shows targeting nutrient deficiencies requires the highest investment over the initial 15 year period. This however, is a reflection of the extra amount of livestock required to be purchased to utilise the extra pasture available under this strategy.

Note: Investment in livestock should be treated as investing in an asset returning an annual dividend, unlike the investment in infrastructure which may increase land value but generally not annual returns.



Required Investment	\$/ha	DG		IRG		TND	
		ha		ha		ha	
Fencing/watering	\$ 60	800	\$48,000	1190	\$71,400		
Fencing for biodiversity						210	\$ 24,675
Purchase DSE's (\$/DSE)	\$ 40	1525	\$61,000	2010	\$80,400	3720	\$148,800
Extra fertiliser (over 10 years)							\$ 33,518
Total Cost (over 15 years)			\$109,000		\$151,800		\$206,993
	Area (ha)	800		1190		1190	
	Total Cost per ha		\$136		\$128		\$174

Investment (\$) required for each strategy on an average wool growing property

Note the cost of purchasing livestock to utilise pasture, is the major cost for each strategy. The cost of fencing is highest for the Intensive rotational grazing strategy.

DG= Deferred grazing

IRG= Intensive rotational grazing

TND= Targeting soil nutrient deficiencies

Profitability



The profitability of the three strategies described in this Information Note is shown in the following table.

Comparing profit results indicates targeting soil nutrient deficiencies generates the largest extra annual profit on an average property, equivalent to a 30% return on invested capital. Deferred grazing also generates a healthy 25% return on investment, if extra supplementary feeding is not required over the summer months.



Profit Analysis		DG		IRG		TND	
EXTRA annual income	GM/DSE	extra DSE		extra DSE		extra DSE	
% inc in stocking rate		25% on hills		24%		37%	
from inc. in stocking rate	\$ 20	1525	\$30,500	1,336	\$26,720	2,928	\$58,560
from inc. in GM/DSE	\$ 1						
extra fodder					3,120		3,120
EXTRA annual costs							
supplementary feeding			\$16,013		\$0		\$0
maintenance/deprec			\$3,360		\$5,006		\$494
EXTRA annual profit			\$11,127		\$24,834		\$61,186
	capital investment	109,000		151,800		206,993	
\$ Return on Capital		inc supp feed	10%		16%		30%
		ex supp feed	25%				

Profitability of each strategy on an average wool growing property"

The increase in stocking rate associated with Targeting soil nutrient deficiencies strategy, tends to be the highest for most wool growing properties.

Supplementary feeding, if required, has a large impact on profitability of the Deferred grazing strategy.

DG= Deferred grazing

IRG= Intensive rotational grazing

TND= Targeting soil nutrient deficiencies

Assumptions used in the profit analysis



Deferred grazing:

- land class fencing is carried out on hill areas of the property, using electric fencing at a cost of \$1,500/km
- a conservative 25% increase in carrying capacity is achieved over 3 years
- stock are removed from 25% of the total hill areas for 4 months each year, and supplementary feed costs are estimated at \$8.40/DSE if required
- extra livestock are purchased at \$40 /DSE if more than an extra 200 DSE can be carried per year.

Intensive rotational grazing:

- fencing and watering points developed over whole farm area (except areas managed for native vegetation) at a cost of \$60 /ha
- area managed for native vegetation is 15% of the total farm area and fenced at \$2,500 /km
- increase in carrying capacity is 35% over 4 years on low Phosphorus areas, 37% on high Phosphorus areas, (based on results from the Broadford Grazing Trial)
- extra livestock are purchased at \$40 /DSE if more than an extra 200 DSE can be carried per year.

Targeting soil nutrient deficiencies:

- the cost of extra fertiliser is \$33,500 over 15 years
- a 37% increase in carrying capacity is achieved over 6 years (resulting from improved pasture growth)
- fertiliser is assumed to be applied on areas with least biodiversity, and not applied to paddocks adjacent to high biodiversity areas
- area managed for native vegetation is 15% of the total farm area and fenced at \$2,500 /km
- extra livestock are purchased at \$40 /DSE if more than an extra 200 DSE can be carried per year

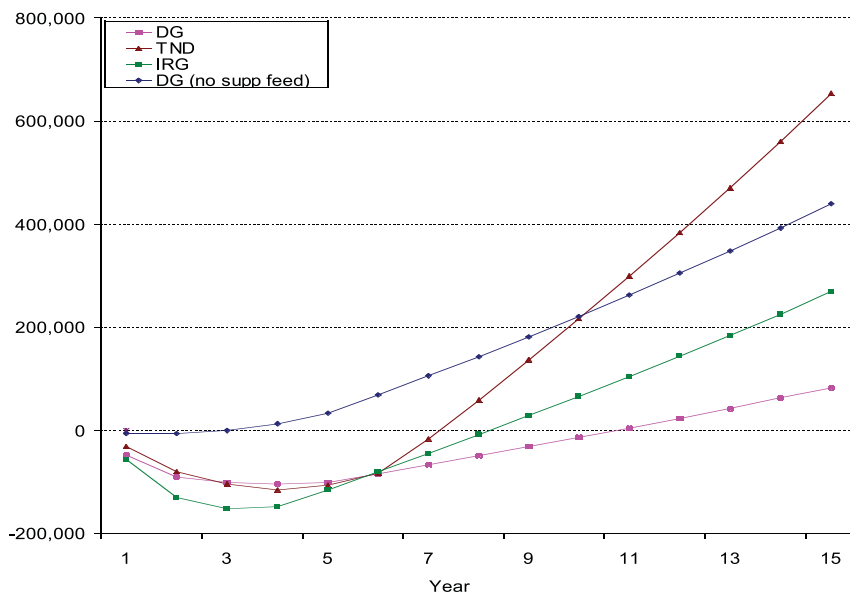


Cash flow



The cash flow of the three strategies described in this Information Note is shown in the following graph. An additional situation has been considered that indicates if supplementary feeding was not required for the deferred grazing strategy, this strategy breaks even the quickest, in under 3 years.

Both targeted soil nutrient deficiencies and intensive rotational grazing break even between year 7 and 8, with the targeted soil nutrient deficiency generating the highest cumulative surplus.



Cumulative cash flow for each strategy
on an average wool growing property

DG= Deferred grazing

IRG= Intensive rotational grazing

TND= Targeting soil nutrient deficiencies

Glossary



Native vegetation

any indigenous plant community (includes trees, shrubs, herbs, grasses, mosses, lichens and soil crust) that are naturally occurring within a region or locality. It excludes plantations or vegetation established for commercial purposes.

Remnants

patches of native vegetation. They are usually surrounded by land that has been modified for another use such as grazing or cropping. These patches also vary in their condition and how they connect to other patches.

Deferred grazing

strategy to purposely withhold grazing at critical times of plant development, for improved yield, pasture composition and persistence of desirable pasture species. The timing and duration of deferred grazing will depend on what is to be achieved, the pasture types, soil and climate conditions. Deferred grazing during summer months has been shown to increase pasture ground cover and persistence of native perennial pastures.

Intensive rotational grazing

grazing strategy where sheep are moved through a large number of paddocks of a size which permits high stocking densities (number of sheep per hectare) to be applied to each paddock for a suitably short period. Requires pasture growth rates to be monitored, and grazing periods to be calculated according to growth and recovery rates of the desirable pasture species. This aims to keep pastures in their most active growth stage.

Crash grazing

grazing a paddock at a high stock density for a short period of time to reduce the bulk of feed, or density of annual grasses. Crash grazing may also be referred to as block grazing or mob stocking.

Land class fencing

a land class is a unit of rural land with a relatively uniform set of characteristics (geology, soil type, slope, aspect etc) which allow it to support a distinctive type and intensity of use. These areas are fenced as a unit under this management strategy.

Native grasses

grasses (e.g. wallaby grass, weeping grass, kangaroo grass, spear grass) that occurred in Australia before European settlement.

Native pastures

pastures that are predominantly composed of perennial native grasses with a variable number of native herbs.

Exotic plants

vegetation introduced from overseas (for example phalaris, perennial rye and brome grasses, but may also refer species not native to the region).



Suggested reading



- Baxter, N. and Williamson J. (2000), *Land classing kit for farmers*, Department of Natural Resources and Environment, Melbourne.
- Dorrrough, J. and Moxham, C. (2005), *Eucalypt establishment in agricultural landscapes and implications for landscape-scale restoration*, Biological Conservation 123:55-66
- Dorrrough, J., Moxham, C. Crosthwaite, J. and Moll, J. (2005), *Vegetation management in temperate livestock production landscapes*, Department of Sustainability and Environment, Melbourne.
- McFarlane, G. and Trewick, K. (2002), *Environmental Best Management Practice on farms: Workbook 1 - farm self assessment sheets*, Department of Natural Resources and Environment, Melbourne.
- Moll, J. and Dorrough, J. (unpublished), *Investment analysis of proposed management options to increase native vegetation and wool profits*, Department of Sustainability and Environment, Melbourne.
- MLA (2002) *Tips and Tools for making change – Biodiversity*, Meat and Livestock Australia, Sydney.
- Sargeant, K. and McLarty G. (2003), *Grazing management for productive hill country pastures 1998-2002*, Department of Primary Industries, Seymour.
- Straker A. and Lowe K. (2005) *Environmental management in agriculture – native biodiversity resource kit*, Department of Sustainability and Environment, Melbourne, www.dse.vic.gov.au → Conservation and Environment.

WEBSITES

Department of Sustainability and Environment

www.dse.vic.gov.au
Interactive maps - information on biodiversity mapping

Follow links from www.dse.vic.gov.au to 'Conservation & Environment' for

- Biodiversity Action Planning
- Local Area Plans
- Living Systems (also 'How to plan wildlife friendly landscapes')
- Environmental management in agriculture
- Management systems for Victorian agriculture
- Ecological Vegetation Classes
- Victoria's Biodiversity Strategy.

Bats in Paddock Trees

www.dse.vic.gov.au/ari
→ publications & downloads → brochures.

Department of Primary Industries

www.dpi.vic.gov.au
Note information series (in particular Land for Wildlife)

Use the search engine from www.dpi.vic.gov.au to locate:

- Broadford grazing management trial
- Weed management in riparian zones – a guide for grazing properties in SW Victoria
- Sustainable farming systems for steep hills

The project



Two projects have supported the development of this extension note.

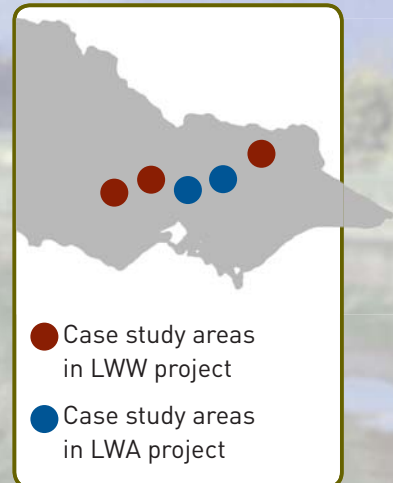
The Victorian-based **Farm businesses, wool production and biodiversity** project has identified productive, practical solutions for native vegetation management, incorporating the commercial aspects of wool growing and sheep breeding. The project is funded by Land Water & Wool, which is a joint investment between Australian Wool Innovation Limited, the wool industry's peak research and development body, and Land & Water Australia.

The **Managing landscapes to meet public biodiversity and farm business goals** project, funded by Land & Water Australia.

Guiding principles of these projects are that landowners will want to:

- pass the farm on to future generations in a better condition
- manage their farming systems to achieve financial, environmental and other family goals
- be confident in knowing that farm business will not be limited by better management of biodiversity.

The research project involved seventeen case study farms throughout Victoria, including the Springhurst, Upper Goulburn, Mid Goulburn, Maryborough/Lexton, and the Ararat Hills districts. The study area is characterised as being foothill country consisting of hills, low hills and some flat country. The soil types are generally fragile or light and the substantial land clearing in the past has contributed to some large areas of soil erosion and low productivity. Native pastures and vegetation occur in much of the hill country.





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The Native Vegetation and Biodiversity sub-program of *Land, Water & Wool* has five major regional projects across eastern Australia that are bringing woolgrowers and researchers together.

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- Extension Note 1** Farm businesses, wool production and biodiversity
- Extension Note 2** How can managing hill country be more profitable?
- Extension Note 3** Using natural regeneration to establish shelter on wool properties

