Economics and the Environment: not mutually exclusive!

Land, Water & Wool
Northern Tablelands
Project Fact Sheet

8

A technical guide

Introduction

Between 2004 and 2005, the Land, Water & Wool Northern Tablelands Project (NSW) collected paddock, production and financial information from 21 Monitor farms. The farms varied in grazing management, input levels, target markets and family goals.

Based on these data, farm models were built to evaluate the economic impact of management practices that affect biodiversity and farm profits. We also talked to ten Case Study and Testimonial farms about the production and biodiversity benefits of their management practices (Fact Sheet 11.)

Results indicate that a range of mechanisms are in place to enhance biodiversity, and that woolgrowers can demonstrate exciting examples of environmentally friendly management that improve the bottom line.

Production levels on Monitor farms

There was no difference between grazing management systems in production indicators (Fig. 1).There was as much variation within grazing systems as between them, suggesting that all systems are potentially profitable. The level of profit is dependent upon farm management, family goals and type of country.

Most New England Wool properties also run cattle which can impact on farm management. The need to fatten stock for certain markets also dictates grazing options—there is no single 'correct' way to manage—it varies with the circumstances noted above.

Monitor farms used various practices to enhance biodiversity, with associated production benefits. These practices included:

- Establishing shelterbelts
- Increasing groundcover
- Regenerating native timber
- Conserving areas of native bush
- Fencing off creeks and dams
- Managing grazing
- Reducing runoff and erosion
- Lowering chemical use
- Retaining native pastures.

In an era where the environmental performance of farms is under scrutiny, there are some key factors in the biodiversity-profit debate...

- Farmers have a duty of care to the land, but the financial realities of running a farm business impose limits on what is possible—there is a point beyond which it is unreasonable to expect private individuals to bear the full cost of public goods.
- Agriculture is the number one contributor to regional economic performance in the NSW Northern Statistical Division (Tablelands, Gwydir and Namoi). Data from the last census (2001) show the direct and flow-on effects of agricultural production contribute $4.4 billion (52%) to gross output, $1 billion (48%) to household income and 32 500 jobs (45% of total employment).
- The most cost-effective way to boost biodiversity on farms is to identify systems and investments that are profitable. Profitable farms mean more scope for private investment in the environment.
- Ecologists agree that conservation on private land is critical to biodiversity protection—national parks and nature reserves are not enough. Smart policies make biodiversity enhancement on private land a valuable and profitable activity, not a cost burden.

Regardless of the system used, it is possible to generate both profits and biodiversity benefits with a pro-active approach to managing the entire farming system.

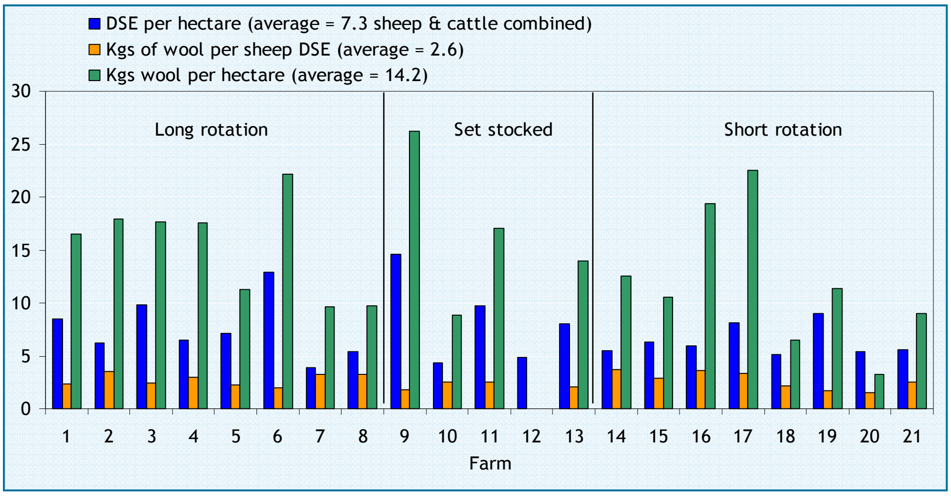

Figure 1. Average production indicators for Monitor farms in 2004. Wool was the principal source of income on most Monitor farms, and a major source of income on all farms, although quantitative data were unavailable for one farm. Long rotation: grazed more than once per year for an annual total of 1.5-10 months (e.g. rotational grazing). Set stocked: grazed continuously for 6-12 months per year. Short rotation: grazed 3-12 times per year for an annual total of less than 1.5 months (e.g. planned grazing).

Table 1. Sheep and cattle stocking rates (DSE/ha) on Monitor farms in 2004. There was no significant difference in sheep or cattle stocking rates between grazing management systems (ANOVA); s.e.m. = standard error of the mean.

	Sheep		Cattle	
	Average (± s.e.m.)	Range	Average (± s.e.m.)	Range
Long rotation	6.4 (0.91)	2.9-11.2	2.2 (0.42)	2.2-4.6
Set stocked	7.2 (1.91)	3.5-14.0	1.2 (0.41)	0.5-2.6
Short rotation	4.6 (0.59)	2.1-7.0	2.2 (0.38)	0.9-4.0

Costs & benefits of biodiversity

The financial impacts of some of the interventions that aim to enhance farm production and biodiversity are outlined below. The biodiversity and production benefits to individual growers are explained in the various Testimonials and Case Studies arising from the project (Fact Sheet 11).

Planned grazing

Several farms had changed to a particular form of short rotational grazing system called 'planned grazing' and had documented costs and benefits. The whole-farm financial effects of the changes were estimated for a typical New England wool property based on the average farm characteristics found in our woolgrower survey (see Fact Sheet 7). Table 2 illustrates these effects.

The key financial benefits under the planned grazing system are generated from higher carrying capacities and livestock income and reduced labour costs. These are offset somewhat by higher fertiliser inputs, but the overall result is still improved whole-farm financial performance.

The results are consistent with those reported by some of the Monitor farms. However, owing to variation in management, goals and country, it is possible that others moving to planned grazing might achieve different outcomes.

Table 2. Planned grazing—financial changes.

Change on Farm	Size or Value of Change	Financial Impact over 20 Years
Costs		
1. Additional fencing (4-barb suspension, steel posts) and watering (tanks, poly-pipe, troughs) staged over 5 years	$50/ha	$13,420/yr for the first 5 years
2. Cattle supplementation in winter/dry periods	$3.75 per cow/calf unit	$2,600/yr
3. Fertiliser applications	Apply 1/100th of total farm DSEs in tones of single superphosphate/year for nutrient replacement	$4,330 average annual increase in fertiliser costs with cell grazing (16% increase) due to higher farm carrying capacity under planned grazing
Benefits		
4. Stocking rate increase	20% in carrying capacity, 9% increase in calf weaning rate	$40,500 increase in net livestock income (21%)
5. Labour cost	Reduced from 1 person/6000 DSE to 1 person/16 000 DSE	$33,200 reduction (56%)
6. Sheep drenching costs	Reduced by 70%	Included in 4 above
7. Drought feeding	Reduced from $15.50 per cow/calf unit over 10 months to $0.80	$6,900 saving over 20 years (94% reduction)
8. Wool quality	Vegetable fault in skirtings reduced from 5% to 1%, tensile strength of skirtings increased by 40%	Additional 9% return for skirting lines, included in 4 above
9. Biodiversity benefits	Better pasture composition, increased groundcover and improved water cycle	Unknown
Impact on business bottom line		
Whole-farm gross margin	Increased by $40,500 (21%) from $189,200 to $229,700	
Net farm income	Increased by $43,700 (131%) from $33,300 to $77,000	
Farm business return	Increased by $42,600 (256%) from $-16,000 to $26,000	

Hypothetical typical farm = 1347 ha grazed area, average 7.3 DSE/ha, 90% stocked (123 cows producing heavy feeder steers, 2185 wethers, 2238 ewes @ 16.8 microns), native pasture with fertiliser applications prior to the change, average paddock size reduced to 10-25 ha under planned grazing.

Sown pastures

Retaining native pastures is one way of maintaining biodiversity. The costs of sown pasture development need to be weighed up against the benefits in terms of increased carrying capacities and the ability to turn stock off at higher weights and prices. For some target markets, sown pastures are necessary to provide adequate nutrition at key times to finish stock. Table 3 shows indicative costs for pasture management and carrying capacities for Northern Tablelands farms.

Table 3. Production assumptions for Northern Tablelands pasture types. Source: NSW DPI Sheep Enterprise Budgets, http://www.agric.nsw.gov.au/reader/background-2005.

Pasture Type	Carrying Capacity (DSE/ha)	Estimated Fertiliser and Seed Costs
Native pasture, unfertilised	1.8 - 4.7 (ave. 3.0)	Nil
Native pasture, fertilised (clover & fertiliser)	4.2 - 9.1 (ave. 6.1)	$45/ha ($40 single superphosphate, $5 clover seed)
Sown perennial pasture (grasses, clovers & fertiliser)	6.7 - 16.9 (ave. 10.0)	$250-400/ha, need to re-establish every 7-15 years plus annual single superphosphate application @ $40/ha

Estimating the impacts of sown pastures on financial performance is problematic due to variations in pasture performance and target market characteristics for livestock. Several pasture scenarios were run using our Northern Tablelands farm model to examine level of pasture development, stock type and pasture replacement intervals (Figs 2A-C). The gross margins are based on the DPI budgets for 19 micron Merino ewes/wethers, first-cross prime lambs and heavy feeder steers. It was assumed sown pasture carried 10 DSE/ha and establishment costs were $275/ha plus an annual maintenance fertiliser requirement of $40/ha. The remainder of the property was fertilised native pasture, with a fifth of the property fertilised every year at $40/ha and a carrying capacity of 6.1 DSE/ha.

These results suggest that obtaining a return from the additional investment in sown pastures requires careful attention to:

- The gross margin return from the livestock enterprises—higher return fattening enterprises appear to be necessary to justify the investment.
- The pasture replacement interval—a shorter replacement interval reduces the value of the pasture investment, even where higher gross margin enterprises are being operated.

Stock shelter

Several Monitor, Testimonial and Case Study farms noted production benefits from planted and natural tree cover on farms, in terms of reduced stock losses during lambing and off-shears in poor weather. Two properties planted 11% and 18% of farm area to blocks and belts of trees with no reduction in carrying capacity or wool production.

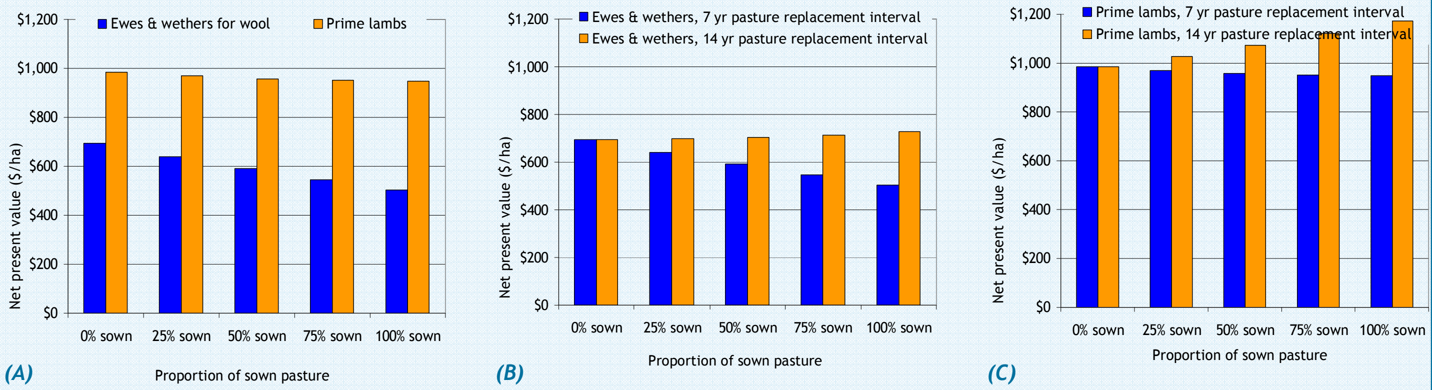

Figure 2. Effect of enterprise selection and pasture replacement interval on returns from sown pasture. (A) 7-year pasture replacement interval, (B) 7 versus 14-year pasture replacement interval for wool flocks, and (C) 7 versus 14-year pasture replacement interval for prime lambs.

In general, the benefits of shelter trees on farms include:

- Reduced wind-speed by up to 80% at 15-20 tree heights on the lee side of the windbreak (Fig. 3)
- Reduced stock mortality and increased weaning percentage
- Increased carrying capacity (Fig. 4.)
- Increased land values—Sinden (2003) found this depended on the amount of native vegetation cover on the farm. Where cover was low, land values could be increased by increasing tree and shrub cover.

Work carried out on the property 'Newholme' in 1998 revealed the following financial implications of native shelterbelts on farms in the region (Fig. 5). Each tree and shrub belt was 13 m wide, costing $1,918/ha to establish (in 1998 dollars).

When only the stocking rate benefits were considered, a 7% increase in farm carrying capacity was sufficient to justify the establishment of windbreaks on all north-south fence-lines (a total of 11.7 ha of windbreaks in this case) for a 1000-ha property.

Contour plantings

One Case Study farm in our project has established double tree rows on contours (on average 60 m apart). These consist of a row of pines for timber and a row of native species for shelter and biodiversity. Over the last 15 years, the farm has reported a 50% reduction in sheep death rates and lambing rates rising from 80 to 90% due to the additional shelter. Stock were excluded from the contoured paddocks for the first year after planting, then gradually re-introduced until normal carrying capacity was resumed 5-6 years post-planting. The farm achieved this change with no overall loss of carrying capacity. The cost of the contour plantings was $145/ha.

These parameters were run through the hypothetical Northern Tablelands farm model assuming a 10-year development period for contoured tree planting across 11% of the farm. The benefits in terms of improved lambing and death rates were phased in over this development period. No income from commercial timber was included.

Results of the analysis are summarised in Figure 6 and indicate a substantial return on investment in shelter as a result of higher lambing rates, lower deaths and therefore increased sales of surplus ewes and wether hoggets. On average, the gross margin was improved by $11/ha.

The net present value of the shelter of $113/ha is the stream of farm cash flows over the 20-year period discounted back to a current day value at a 5% discount rate. It shows the additional present day value from the shelter of the contour planting. Internal rate of return (IRR) is a measure of the return on the investment in contour plantings. It is the discount rate that would be required for the NPV to be zero.

Fencing off bushland

Excluding livestock from native bushland is a common form of biodiversity and habitat conservation used by natural resource management agencies. Using the hypothetical farm model, the costs of excluding stock from bushland were estimated (Fig. 7).

The costs included:

- Reduced farm carrying capacity by not allowing stock to graze these areas. Losses in carrying capacity of 1, 2, 3 and 4 DSE/ha in bushland areas were examined;
- Stewardship costs of maintaining these fenced-off areas are estimated at $40/ha for fencing (one-off cost) plus $30/ha annually for maintenance and pest and weed control. It was assumed that without access to shelter in bushland areas, sheep death rates were double.

The costs estimated in Figure 7 are averages over a 20-year period. The establishment and stewardship costs are higher than the average in the first year due to the cost of establishing fencing.

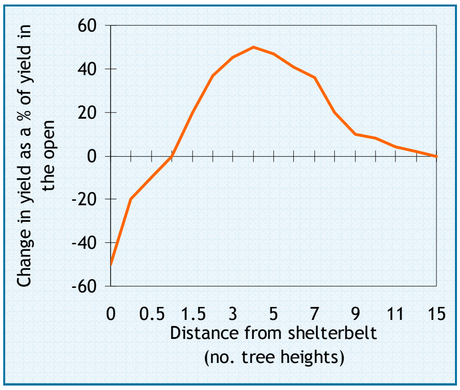

Figure 3. Shelter effect on crop and pasture yield (adapted from Loane 1991).

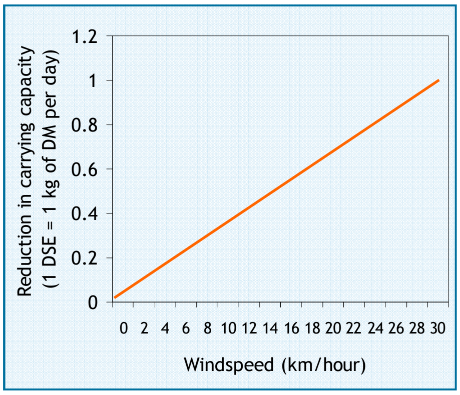

Figure 4. The reduction in capacity with increase in windspeed (adapted from Loane 1991).

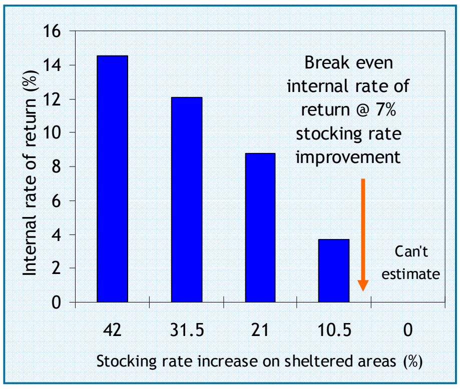

Figure 5. What level of benefit is required to break even?

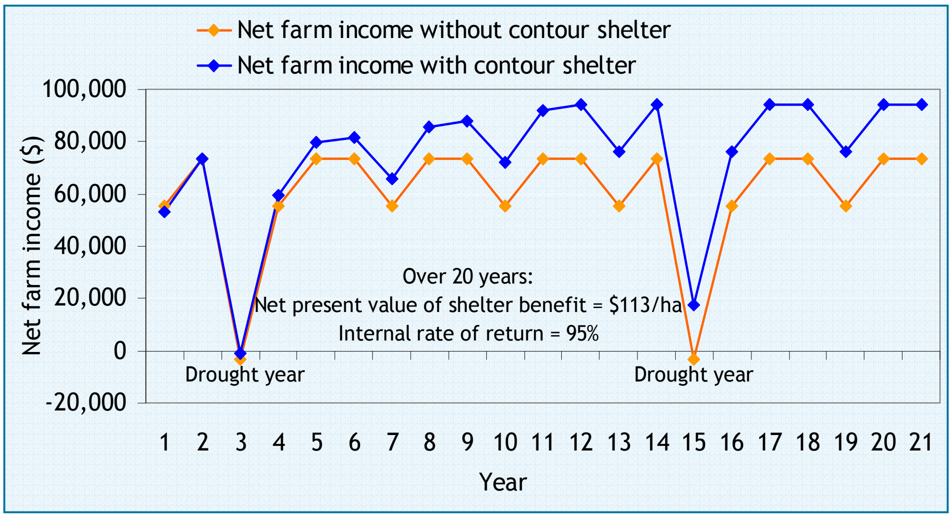

Figure 6. Whole-farm returns from contour shelterbelts.

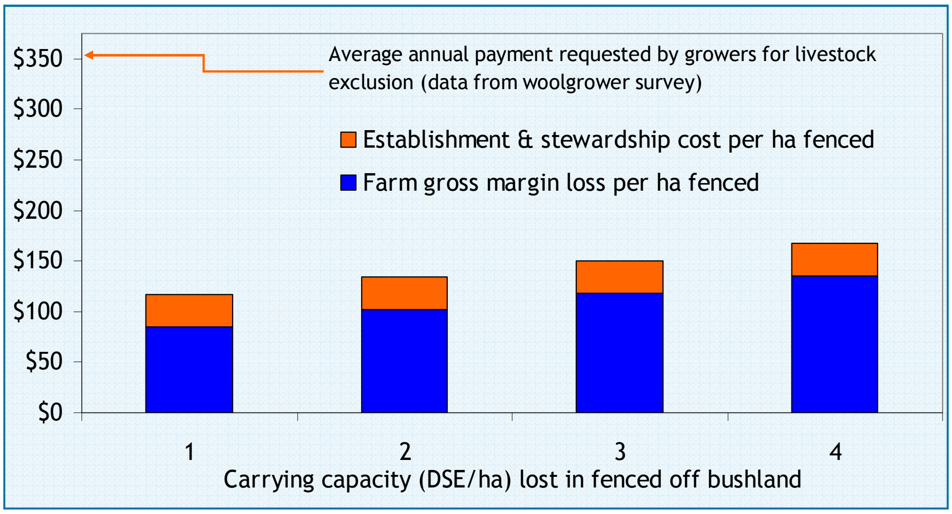

Figure 7. Financial effect of excluding stock from bushland areas.

Using these assumptions, the main cost is in terms of lost livestock production, a loss that increases as the carrying capacity of the fenced-off areas increases. The average annual cost of excluding stock is less than the average payment requested by landholders for livestock exclusion.

Figure 7 presents the maximum cost to woolgrowers of managing bushland for conservation. If further work established that occasional grazing of bushland maintains or improves conservation values, the cost to woolgowers would diminish.

Conclusions

Many Northern Tablelands woolgrowers are generating profit and enhancing biodiversity on their farms though a wide range of mechanisms. These vary from whole-farm practices such as choice of grazing system, to smaller scale interventions including riparian zone protection, wetland creation, shelterbelts and retention and management of native pastures and timber.

Using actual farm data, we have analysed the financial implications of biodiversity related interventions for an average farm to demonstrate the effects on farm finances. In practice, real-world results will vary from farm to farm, yet findings suggest considerable scope for win-win scenarios, where biodiversity enhancements also increase profit. This is key for the broad-scale uptake of management systems required to make a real difference to regional biodiversity. Practices that enhance biodiversity and profits simultaneously will gain greater acceptance amongst the farming community than regulatory interventions that impose farm costs.

The project also illustrates the large investment in environmental outcomes many landholders are making at their own expense. These investments are warranted because they are good for the environment and good for business.

Land, Water & Wool (LWW) is the most comprehensive natural resource management research and development program ever undertaken for the Australian wool industry. LWW is a partnership between Australian Wool Innovation Limited and Land & Water Australia, and has seven core sub-programs. The Native Vegetation and Biodiversity sub-program is working with woolgrowers, and demonstrating that biodiversity has a range of values, can add wealth to the farm business and can be managed as part of a productive and profitable commercial wool enterprise.

The Land, Water & Wool Northern Tablelands Project is led by Associate Professor Nick Reid, University of New England, in collaboration with Southern New England Landcare Ltd, and the Centre for Agricultural and Regional Economics.

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