Cost-benefits of supplementing ewes with willow and poplar foliage on a model hill country farm in Wairarapa

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Abstract
An estimate of the financial benefits from feeding willow/poplar, was attempted by applying results from a three-year trial at Massey University's Riverside Farm, near Masterton, to a typical Wairarapa hill country farming situation using computer modelling. The model assumed poplar and willow planting started ten years ago, and results for Year 10 and Year 20 were compared with a control where sheep were grazed only on pasture typical of Wairarapa farms in late summer/early autumn.

After repairs, maintenance and wages were accounted for, the difference in gross margins was $4,755 between the ten-year model and the control model, and $10,236 between the twenty-year model and the control model. While a drought will always affect costs on a hill country farm, protecting the following year's income is crucial. Feeding willow and poplar foliage to ewes during mating can help to sustain lambing percentages and is a drought management option available to farmers having this supplementary feed resource on their properties.

Keywords: economic analysis; financial benefits; poplars; willows; feed supplementation

Introduction

Trials with sheep receiving supplements of willow or poplar foliage during summer/autumn have been conducted for three years at Massey University's Riverside Farm, near Masterton in Wairarapa, with encouraging results (McWilliam *et al.* 2003). For example, increases in reproduction performance of up to 30% have been achieved from feeding fresh tree foliage at up to 1.5 kg/ewe/day.

The aim of this paper is to determine the financial benefits from feeding willow and poplar by applying the Riverside Farm trial results to a typical Wairarapa hill country farm.

In this model, we have assumed planting of poplars and willows as poles started ten years ago. Results for Year 10 and Year 20 are compared with the control treatment, in which sheep were without any willow/poplar supplementation.

Model Farm

The model farm used in this analysis is based on a typical Wairarapa hill country farm. The farm covers 650 ha and the farmer has implemented a progressive planting scheme. This model farm is separated into land class types (Appendix I), some of which require planting to enhance soil stability. These areas will be planted at 70 trees/ha (30% willow and 70% poplar, the current average planting ratio of these trees).

Of the 650 ha, 171 ha (26%) have been budgeted for planting in willow/poplar. Planting will be undertaken at a rate of 340 poles per year (240 poplars and 100 willows). These guidelines fit the typical Greater Wellington Regional Council farm sustainability plan currently targeted for numerous Wairarapa hill country farms.

Since this tree planting has only been conducted for ten years on this model farm, the quantity of available feed fed as supplementary stock feed is increasing, hence the analysis shows the impact in Year 10, and the expected impact ten years later, compared with the control treatment.

Yields have been calculated utilising data from Kemp *et al*. (2003) on the quantity of edible foliage available from a willow or poplar tree. Ewe intakes have been calculated at the same rate as applied in a trial at Riverside Farm during autumn 2001, where the medium supplementation level was 0.25 kg DM/ewe/day.

The model also assumes a dry period will occur every five years, when trees will be harvested. Poplars more than five years old will be thinned to 50% of their initial planting density and willows older than 10 years will be pollarded at 2.0–2.5 m height (Charlton *et al*. 2003).

Table 1 shows the total yield of these trees in Year 10 and in Year 20.

Table 1. Yields, as kg dry matter (DM)/tree, of edible foliage from 10 and 20 year-old poplar and willow trees.

	Year 10			Year 20		
	Number of Trees	Yield/tree (kg DM)	Total Yield (kg DM)	Number of Trees	Yield/tree (kg DM)	Total Yield (kg DM)
Poplar	600	14.8	8,880	600	14.8	8,880
Willow	500	29.2	14,600	500	29.2	14,600
				1,000	45.5	45,500
Total			23,480			68,980

Economic Analysis

The economic analysis (Appendix I) compares a control farm (pasture only), a typical farm ten years after tree planting began, and a farm after twenty years of planting. This analysis is based on a financial year that ends on 30 June.

- Supplementing ewes with tree fodder at Year 10.
- Supplementing ewes with tree fodder at Year 20.

The analysis is based on the model farm performance during the year following a summer/autumn drought.

Opening stock units on this model farm comprise 5,817 stock units (at 8.9 su/ha) run as 70% sheep (4,115) and 30% cattle (1,502). Closing stock units are expected to be up to 6,143 stock units (4,635 sheep and 1,508 cattle). Opening and closing sheep and cattle numbers are the same for the three analyses.

The total number of ewes at mating for the three scenarios is 4,350. If these ewes are not supplemented then their lambing percentage is expected to be 118%, as shown in the control farm.

The ewes being fed tree foliage supplementation receive 0.25 kg DM/ewe/day of willow/poplar for ten weeks. In Year 10, 1,342 ewes can be supplemented at this rate and in Year 20, all ewes can be supplemented at this rate.

The lambing percentage of the supplemented ewes is 12% above the control mob, based on the 2001 Riverside Farm trial findings at this intake level. Therefore, the overall lambing percentage for the control mob is 118%, 124% for the ten-year model and 132% for the twenty-year model.

Table 2. Income from the three scenarios for a model Wairarapa hill country farm.

	Income		
	Control	**Year 10**	**Year 20**
Sheep (adjusted)	$253,033	$259,205	$265,519
Sheep /ssu	$58.6	$60.1	$61.5
Cattle (adjusted)	$87,146	$87,146	$87,146
Cattle /csu	$58.0	$58.0	$58.0
Other	$3,000	$3,000	$3,000
Gross Farm Income (GFI)	$343,179	$349,351	$355,665
GFI/ha	$528	$537	$547
GFI/su	$59	$60	$61

Results from the analysis

Aspects of these findings include:

- Cattle performance on this model farm is the same for the three scenarios because the cattle are not fed tree fodder.
- Adjusted sheep income (adjusted for change in livestock numbers from 1 July to 30 June) is expected to be $253,033 ($58.60/su) for the control farm and $265,519 ($61.50/su) for the year 20 scenario.

- Cattle income is consistent over the three scenarios at $58/su.
- Gross farm income is $343,179 ($528/ha or $59/su) for the control farm and $355,365 ($547/ha or $61/su) for the Year 20 scenario.
- This is a gross difference of $12,486 between the Year 20 scenario and the control farm.
- Wages have been charged at half cost, due to the owner/manager of the property needing two people when operating the chainsaw in this environment, and therefore will need additional help.
- After repairs, maintenance and wages have been accounted for, the difference in gross margins is $4,755 between the Year 10 scenario and the control farm, and $10,236 between the Year 20 scenario and the control farm.

Summary

Feeding willow and poplar improves conception rates. The trials conducted at the Riverside Farm have shown that there is a financial benefit from feeding edible foliage of willow and/or poplar during the ewe mating period. This supplementation has very little effect on ewe liveweight loss during a dry late summer, but it can increase ovulation rates. This is very important because a typical ewe response to a drought situation is a decline in ovulation, especially in ewe flocks of traditional breeds. An advantage of $10,236 through feeding willow/poplar to breeding ewes during mating should therefore be very encouraging for farmers, though considerable long-term planning is required before this can happen.

There will always be a cost on a hill country farm from a drought, but it is most important to protect the following year's income. Feeding willow and poplar foliage to ewes during mating has the potential to protect ewe conception rates and should therefore be pursued by farmers able to use this supplementary feed resource in drought conditions.

References

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Appendix I.
Model Wairarapa Hill Country Farm – Land resources and tree planting schedule.

Area Class	650 ha Sub Class	Description	% of Farm	Are	% Planted	Planted Area	Stocking Rate	Pole Number	Willows	Poplars
III		Flat to undulating terraces	10.0	65.00		0	0	0	0	0
IV		Rolling to strongly rolling downland	5.0	32.50		0	0	0	0	0
V		Strongly rolling hills	5.0	32.50		0	0	0	0	0
VI	VIe7	Moderately steep mudstone hill country	13.5	87.75	40%	35.1	70	2088	627	1462
	VIe9	Moderately steep sandstone hill country	5.0	32.50	20%	6.5	70	387	116	271
	VIe12	Moderately steep crushed argillite hill country	6.5	42.25	30%	12.7	70	754	226	528
	VIe13	Moderately steep argillite hill country	10.0	65.00	20%	13.0	70	774	232	541
	VIe15	Banks and gullies in terrace land	5.0	32.50	15%	4.9	70	290	87	203
VII	VIIe1	Steep mudstone hill country	25.0	162.50	50%	81.3	70	4834	1450	3384
	VIIe4	Steep sandstone hill country	5.0	32.50	20%	6.5	70	387	116	271
	VIIe6	Steep crushed argillite hill country	5.0	32.50	20%	6.5	70	387	116	271
	Viie11	Steep argillite hill country	5.0	32.50	15%	4.9	70	290	87	203
			100.0	650.0	26%	171		10191	3057	7134

Assumptions

Pole planting started in 1993
Survival rate of 85%
70% poplars, 30% willows
All surviving willows are pollarded
Half the poplars are used for fodder
Droughts occur every five years, beginning 2003

Appendix II
Model Wairarapa Hill Country Farm – Economic Analysis

650 ha Farm	Control Farm	Supplemented Year 10	Supplemented Year 20
Opening Sheep su	4,315	4,315	4,315
Opening Cattle su	1,502	1,502	1,502
Total Opening	5,817	5,817	5,817
Closing Sheep su	4,635	4,635	4,635
Closing Cattle su	1,508	1,508	1,508
Total Closing	6,143	6,143	6,143
Total no. of ewes	3,450	3,450	3,450
Supplements available (kgDM)	0	23,480	68,980
Intake (kgDM/day)	0	0.25	0.25
Weeks supplemented	0	10	10
No. of ewes supplemented	0	1,342	3,450
Lambing %	118%	132%	132%
No. of ewes not supplemented	3450	2108	0
Lambing %	118%	118%	118%
Overall lambing	118%	124%	132%
Lambs weaned	4,071	4,261	4,560
Lambs Sold	2,671	2,861	3,160
Calving %	88%	88%	88%
Wool Weight/ssu	5.0	5.0	5.0
Income			
Sheep Income (adj)	$253,033	$259,205	$265,519
Sheep Income/ssu	$58.6	$60.1	$61.5
Cattle income (adj)	$87,146	$87,146	$87,146
Cattle income /csu	$58.0	$58.0	$58.0
Other Income	$3,000	$3,000	$3,000
Gross Farm Income	$343,179	$349,351	$355,665
GFI/ha	$528	$537	$547
GFI/su	$59	$60	$61
Difference (Supplemented – Control)		**$6,172**	**$12,486**
Direct Expenses			
Wages (1/2 total cost)		$917	$1,750
Repairs and Maintenance		$500	$500
Total		$1,417	$2,250
Gross Margin	$343,179	$347,934	$353,415
Difference (Supplemented - Control)		**$4,755**	**$10,236**
Assumptions			
Wages			
Number of trees		1,100	2,100
Number of weeks		10	10
Trees/hour		12	12
$/hour		$20	$20
Total cost		$1,833	$3,500