Effect of space-planted ‘Veronese’ poplars on pasture production in hill country

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Review

- Erosion reduction 50-95%

  Understorey pasture reduction 20-40%
- 69% NZ's slopes greater than 12°
- 2% yearly reduction in pasture production at 100 sph planting density
- 20-40 years to regain 80% original pasture production

Purpose

- To determine the impact space-planted poplars of different ages have on understorey pasture growth compared with open pasture.
  - Light intermission through canopy cover
  - Soil moisture
  - Stock exclusion cages

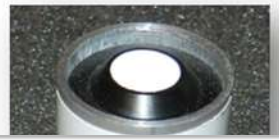
Tree-pasture Sites

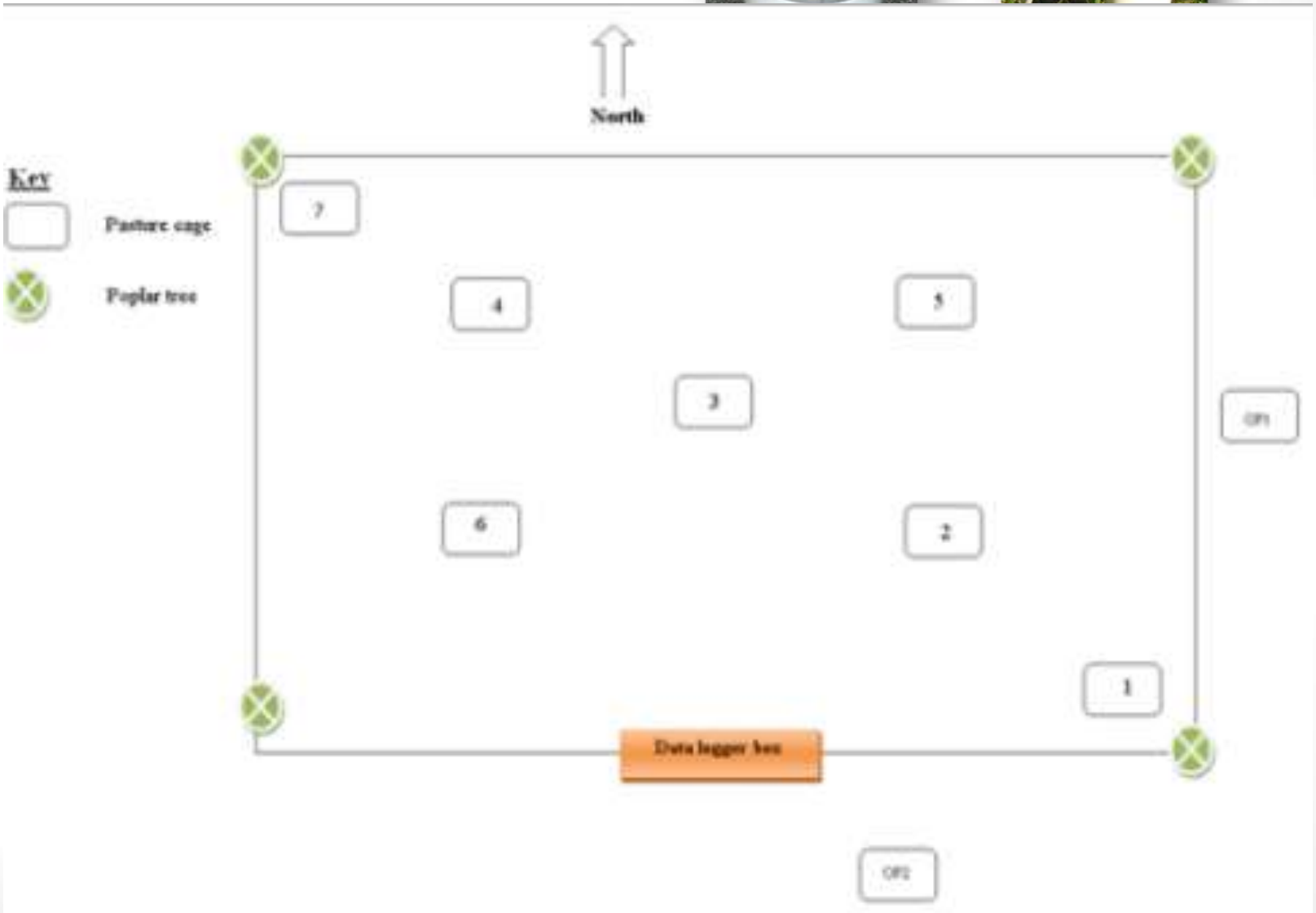
- 10 m spacing in grid formation
- Mahoenui Silt Loam
- Western aspect 22.4 degree slope
- 10-12 years old
- Diameter breast height 26-31 cm
- Canopy width approximately 3 m
- Average canopy closure 29 %

Tree-pasture Sites

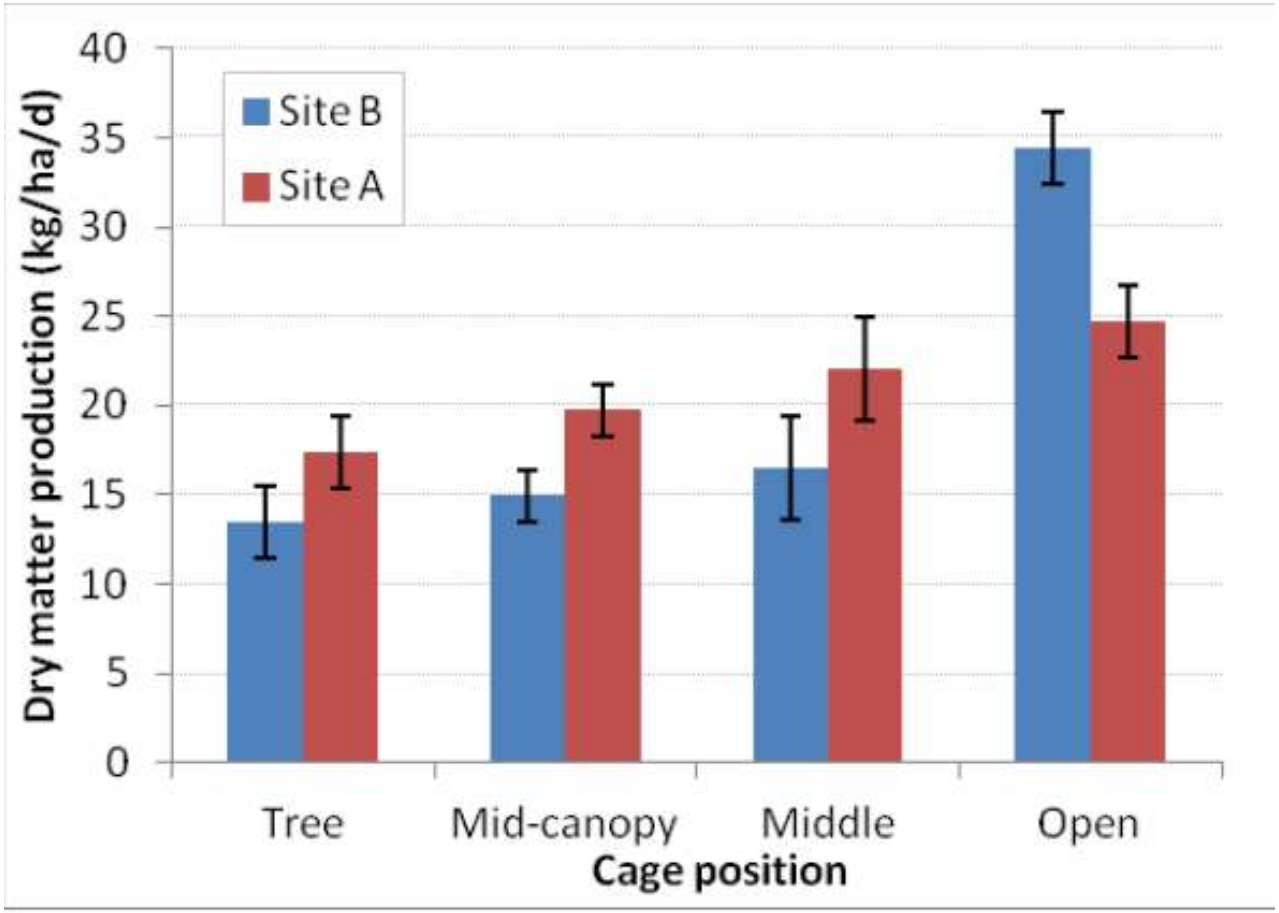
- 11 m spacing in grid formation
- Purimu Silt Loam
- Western aspect 23.5 degree slope
- 20-25 years old
- Diameter breast height 51-54 cm
- Average canopy closure 78 %

Method:





Results



Mean DM production (kg/ha/d) at the two sites and four cage positions, averaged over 10 months. Error bars represent one standard error of the mean

- 65-90% reduction in light level to the ground

Results

	Position					
	Month	Tree	Mid-canopy	Middle	Open	%OPP
TPA	May-12	7.1	17.4	16.3	24.7	55
	Jul-12	6	9.7	10.9	8.5	104
	Nov-12	30.3	20.2	24.9	21.8	115
	Jan-13	26	31.9	36.2	43.9	71
TPB	May-12	7.8	9.4	11.8	39.5	24
	Jul-12	5	7.9	11.8	15	55
	Nov-12	21.5	27.6	27.6	38	67
	Jan-13	19.5	14.8	14.7	45.1	36
SEM		4.1	2.9	5.8	4.1	

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Modelled impact of trees on net pasture production

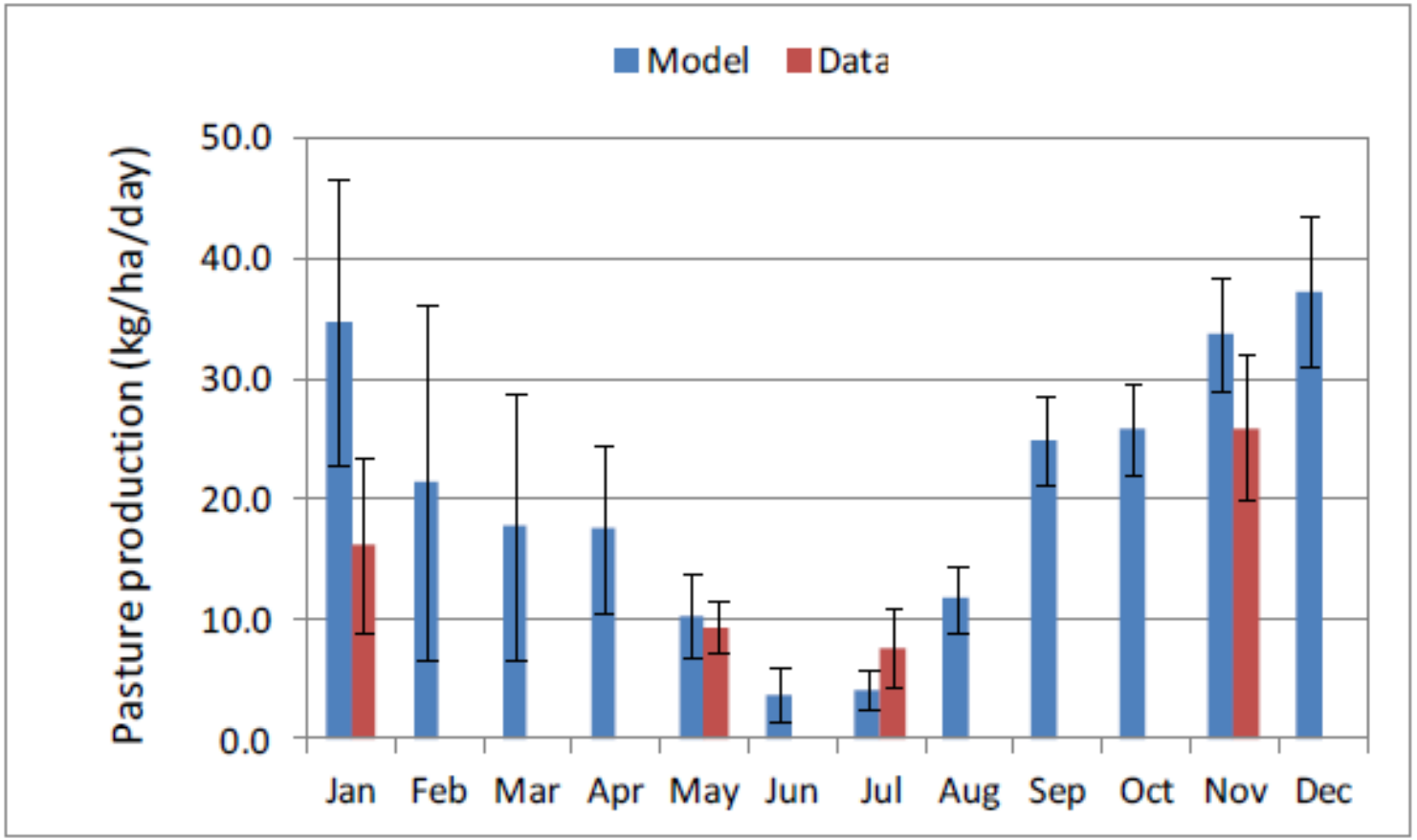

Figure 5 Modelled pasture production over 12 months for 11 yr tree-pasture system based on data of pasture production measured for the exclusion cages and long term climate data (Jan 2000-Jan 2013). We calculate an annual pasture production of 7400 kg/ha.

Modelled impact of trees on net pasture production

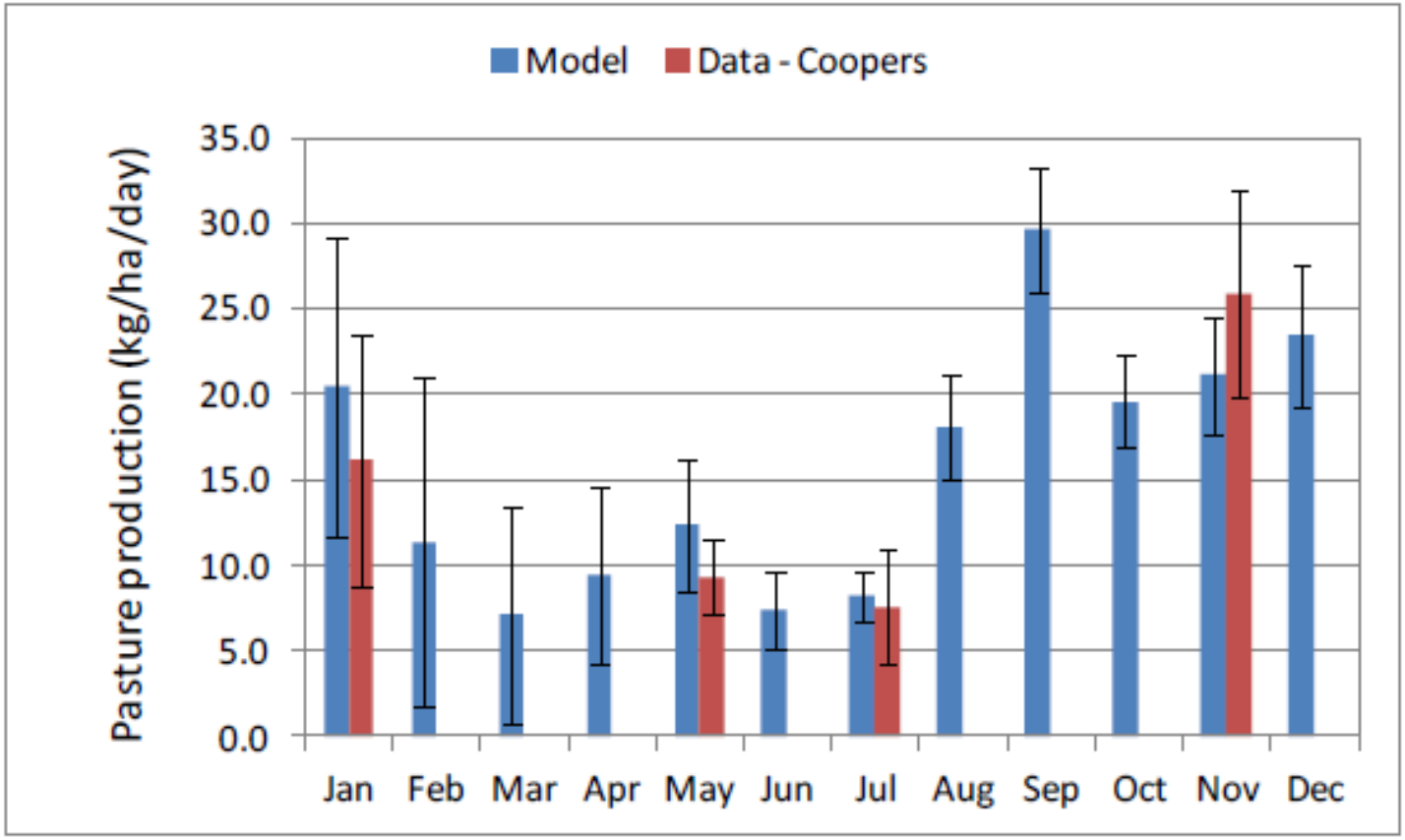

Figure 6 Modelled pasture production over 12 months for 22 yr tree-pasture ystem based on data of pasture production measured for the exclusion cages and long term climate data (Jan 2000-Jan 2013). We calculate an annual pasture production of 5700 kg/ha.

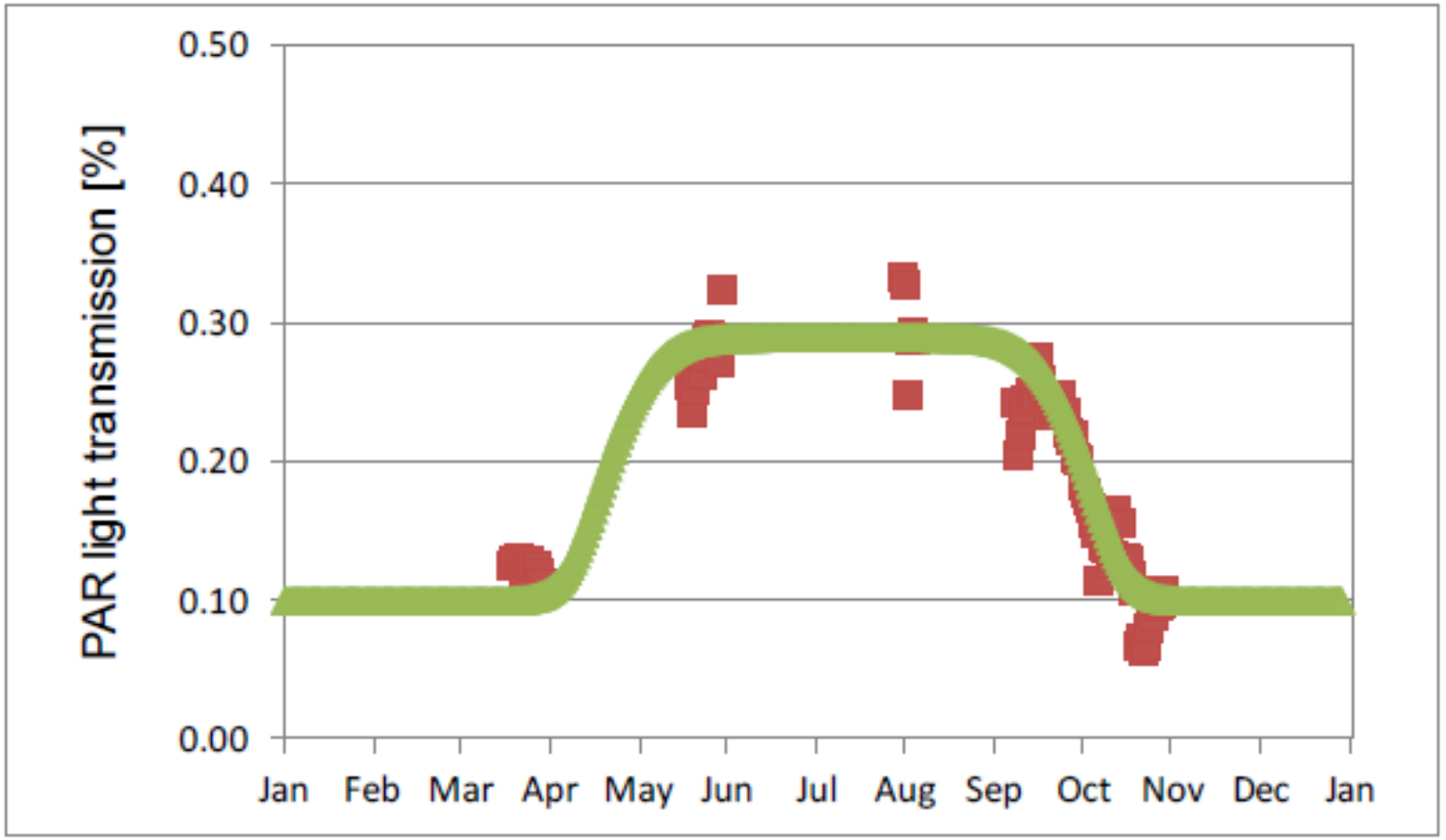

Figure 7. The average light transmission measured by an array of 7 PAR light sensors placed on the ground under the mature poplar trees at Site B (markers). The line represents a simple empirical function fitted to the data point to describe the light level on the ground, Φ_G, that is used to model pasture production via Eq. 3.

Summary

- Tree age is a major factor for pasture production
- Average annual pasture production in the 11 year site at 77 % and 44 % at the 25 year site
- Annual decrease of 140 kgDM/ha/yr in understorey pasture production
- Lower soil moisture availability may have a major influence on understorey pasture production
- Further investigation into the impact slope and aspect has on space-planted understorey pasture production

Importance of Management