5. SYSTEMS TRIALS

5.1 BOOSTING WINTER PRODUCTION OF LUCERNE BREAK CROPS WITH CEREALS (WOORNDOO VIC)

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Location: Woorndoo, South West Victoria

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Rainfall (2005):
351.5 mm cf 50 year average of 532 mm/yr

Summary:
Cereals can be successfully established into existing stands of lucerne to increase winter production without compromising summer production of the lucerne. The choice of cereal will influence the amount of winter and spring production.

Four cereals were sown into a 9 month old lucerne stand (*Kiatuna*, WA 5) on May 25.

Total winter and spring production from the lucerne and cereal was:

Lucerne & barley:	3,100 kg/ha in winter,	3,070 kg/ha in spring,	total 6,170 kg/ha
Lucerne & oats:	2,800 kg/ha in winter	3,910 kg/ha in spring	total 6,710 kg/ha
Lucerne & trit:	2,600 kg/ha in winter	3,430 kg/ha in spring	total 6,030 kg/ha
Lucerne & wheat:	2,500 kg/ha in winter	3,650 kg/ha in spring	total 6,150 kg/ha
Lucerne only:	2,200 kg/ha in winter	2,180 kg/ha in spring	total 4,380 kg/ha

The growth rates achieved by a prime lamb enterprise indicate a gross margin of more than $300/ha is achievable.

Background:
Poor winter and late summer pasture production are major constraints to overall animal productivity on farms in Western Victoria. Winter water logging can further restrict the ability of feed to grow over winter.

Lucerne has the potential to improve the summer production deficit if it can be successfully established, but limited winter growth, even using highly winter active varieties, can aggravate the winter feed shortage.

Lucerne is being investigated as a means of producing both quality feed in the summer and as a means of depleting soil profile moisture so significantly that winter water logging ceases to occur.

Objectives*:*
To examine if winter cereals can be successfully sown into exiting lucerne stands to lift winter production but without compromising lucerne production the following summer.

Methodology:
The trial involved subdividing a large 36 ha paddock sown to *Kaituna* lucerne (winter activity 5) on 2.0m raised beds into 6 paddocks.

Sowing Date:
The larger paddock was sown in August 2004 at a sowing rate of 12.5 kg/ha. Plant densities exceeded 80 plants per square metre in the following winter.

Soil pH was 4.9 $CaCl_2$ (5.6 H_2O) and an aluminium of 0.5% of total cations. Exchangeable sodium was 2.9%, with a soil phosphorus of 26.6 mg/kg (Olsen P) and a potassium of 246 mg/kg (Colwell K).

The paddocks were heavily grazed through the autumn as per normal practice. This removed all lucerne foliage and most stalk and all 'trash', creating ideal conditions for direct drilling. No herbicide treatments were used prior to establishment.

Four winter cereals and one fodder brassica were direct drilled into separate paddocks. The cereals were selected to give a range of winter activities and periods of growth.

Species were direct drilled on May 25, using disc sowing modules under a John Shearer trash seeder, immediately following 10mm of rain. One paddock was left as a control (lucerne only). Cereals were sown at 70 kg/ha and the fodder brassica at 3.0 kg/ha.

Varieties used and there characteristics are shown below:

Block	Variety	Characteristics
#1, Oats	*Saia*	Black oat, general purpose grazing/forage.
#2, Triticale	*Crackerjack*	Medium-early maturity forage variety with good winter activityand early vigour.
#3,Wheat	*Mackellar*	Red wheat with slow winter growth suited to some grazing with early sowing & good grain recovery.
#4, Barley	*Dictator*	Extremely vigorous autumn winter production
#5, Control	No crop	
#6, Rape		*Winfred* Commonly used as a carry over winter fodder crop in NZ

All varieties were sown with 60kg/ha MAP. 100kg/ha of urea was topdressed on July 8 to all paddocks and a further 100kg/ha of "Pasture Booster" (7/3/30/6.7) was spread on September 30 to all paddocks.

The trial was grazed with a number of different mobs of lambs. These including fine wool Merino lambs, Texel lambs and Merino x Border Leicester lambs. Rotational grazing was adopted to ensure stand density and longevity. A six week rotation was employed, with mobs spending approximately one week in each paddock, until animal production targets had been achieved. The six week rotation was then continued with another mob. The movement of sheep around the trial was based on grazing heights (residual dry matter) that would ensure that neither the cereals nor the lucerne were grazed to a point where recovery would be compromised. The standards employed were for cereal height to be grazed no lower than 100mm (usually between 100 mm and 300 mm) and to avoid grazing the lucerne regrowth from the crown.

Feed budgets were used to determine mob size and grazing duration such that these grazing conditions were met. Mob size was calculated based on available feed and anticipated growth so that weekly movements would coincide with predetermined grazing heights.

Dry matter determination from pasture cuts were carried out immediately before and after each movement of lambs in paddocks. These samples were partitioned into there components (lucerne or crop) and separately assessed by Feedtest for dry matter and quality.

Lamb liveweights were taken regularly during and at the beginning and end of each grazing period.

Mobs entering the treatments were drenched with an effective drench and faecal egg counts were taken after 4 weeks. A drenching threshold of 150eggs/gram was set but never reached. The highest count was 120e/g therefore no drenching was carried out after sheep entered the trial

The cereal crops was removed from the lucerne in the spring (early October) by heavy grazing, which involved grazing the cereal below the 100 mm minimum height after the first node had started to move up the stem.

Three permanent soil moisture probes were installed in each of the lucerne oversown with barley and control (lucerne only) plot, to measure the impact an active cereal crop would have on the soil moisture. Measurements were taken at 10cm intervals to a depth of 1.0m.

Results and Discussion

The results are presented to answer six key questions.

Question 1: How much extra feed could be grown in winter by introducing winter active plants?

Table 5-1: Feed Production During Winter (1/6/05 to 31/8/05)

Treatment	Lucerne production (kg/ha)	Winter crop production (kg/ha)	Total production (kg/ha)	Growth per day (kg/ha/day)	Variation from control
Oats + lucerne	1600	1200	2800	30.4	+27%
Barley + lucerne	1600	1500	3100	33.7	+41%
Triticale + lucerne	1450	1150	2600	28.3	+18%
Wheat + lucerne	1600	900	2500	27.2	+14%
Rape + lucerne	1500	400	1900	20.6	-14%
Control (lucerne)	2200		2200	23.9	0

Question 2: How much extra feed could be grown in total?

Figure 5-1: Total Dry Matter Production Of Treatments During The Year

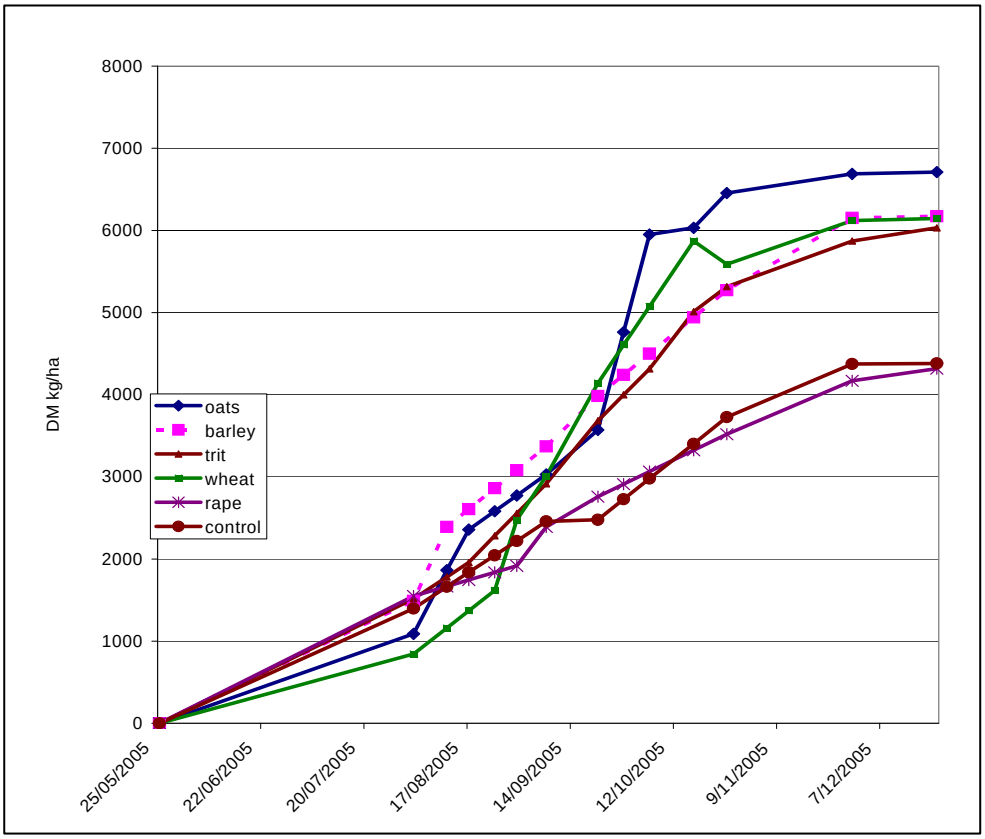
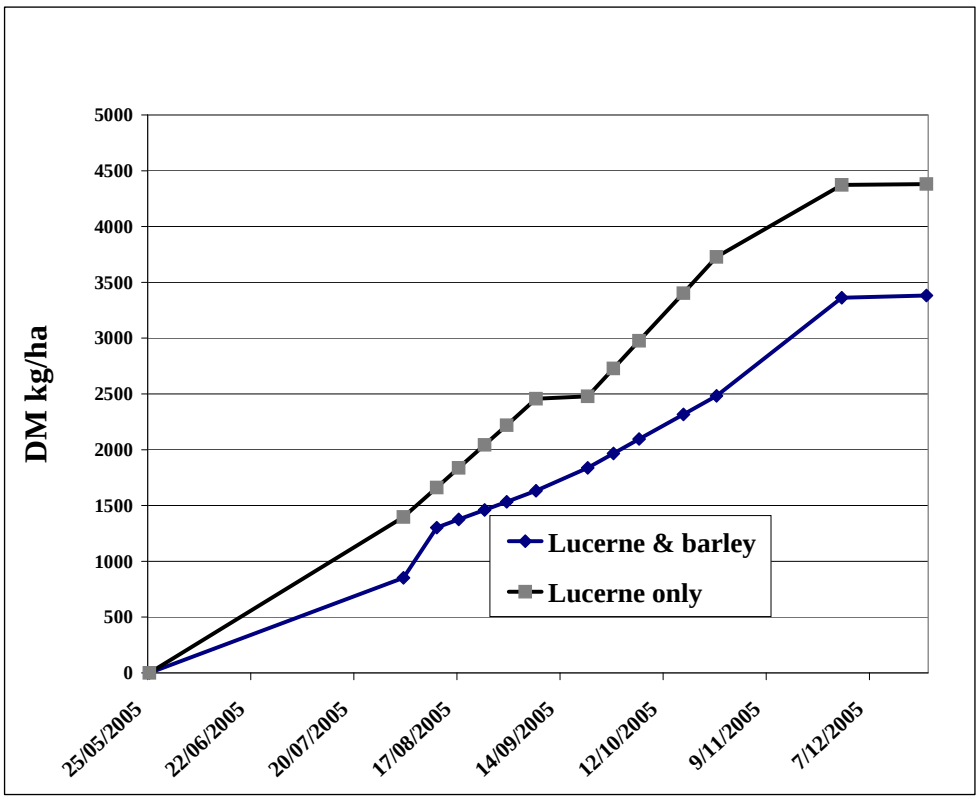


Figure 5-1 shows the cumulative total production for each treatment during the year. The height of the line shows the production and the slope of the line indicates the growth rate. The steeper the line, the higher the growth rate in that period.

The decision of which cereal to sow is a matter of when the extra feed is required, either winter or spring (or both).

Question 3: Would increasing winter production result in decreased lucerne production in winter and the subsequent summer?

Figure 5-2: Impact On Lucerne Production Of Drilling In Winter Active Cereal



The introduction of winter cereals decreased total production of the lucerne (Figure 5-2). However the loss of lucerne production only occurred during the winter period. Summer lucerne production was the same in all treatments.

Question 4: What quality feed would be produced and what animal performance could be expected?

Table 5-2: Lamb Performance

	Merino Lambs	Texel lambs
Day grazing	48	25
Ave lwt, (kg)	33	29
Ave FOO (kg/ha)	1560	2000
Ave digestibility (%)	69	62
Ave crude protein (%)	28	28
Ave height of DM, (cm)	20	20
Weight gain, Kg	10.1	7.5
Actual daily gain, (gm/hd/day)	210	300

The feed on offer (quality and quantity) and animal performance for a merino and prime lamb enterprise are shown (Table 5-2).

Question 5: What would happen to the soil moisture status by growing extra feed in winter and summer?

There was little difference in the soil moisture extraction profile over time between the barley and lucerne and the lucerne only treatments.

Question 6: Would the whole exercise be financially worthwhile?

A simple partial budget comparing the lucerne and oats treatment to the lucerne only control showed an extra margin of $316/ha for a prime lamb enterprise and $120/ha for a wether merino lamb enterprise.