TAKE HOME MESSAGES

1 Grazing crops early and/or lightly will generally not affect grain yields.

2 Plant recovery is supported by having more green material remaining after grazing; the more the merrier!

3 Early sown winter wheat can produce more biomass earlier in the season than spring wheat varieties.

THE EFFECT OF GRAZING INTENSITY ON CROPS

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BACKGROUND

In low rainfall areas, taking advantage of an early sowing opportunity by planting a cereal crop with good early vigour will provide green feed for livestock in early winter and give pastures time to bulk up before grazing. However, grazing a crop can be a risk to grain production when plants have limited growing season time and/or moisture to allow them to recover from grazing. They must be able to produce enough biomass for storage of carbohydrates in leaves, stems and roots to use for grain fill.

Often a yield loss will be accepted as a fair trade for the feed value to the livestock enterprise, but careful grazing management can minimise it. Grain & Graze 2 trials at Raywood in 2012 and Watchupga East 2013 (see *BCG 2012 Livestock Research Results* pp. 58-62 and *BCG 2013 Season Research Results* pp. 204-207) indicated that a crop can be safely grazed without yield penalty when a quantity of leafy material remains after grazing to aid crop recovery. This amount will vary with the crop stage of growth, and grazing duration and intensity.

BCG, through the Grain & Graze 3 initiative, conducted a trial in 2014 to further explore 'safe' grazing management practices.

AIM

To validate the effect of grazing intensity and growth stage on forage value and yield response of different wheat varieties, with sowing times suited to cultivar.

TRIAL DETAILS

Location:	Quambatook
Soil type:	Clay loam without sub-soil constraints
GSR (Apr-Oct):	168 mm
Crop types:	Rosella, Revenue, Scout and Mace wheat
Sowing dates:	1 April (TOS1) and 6 May (TOS2)
Seeding equipment:	Knife points, press wheels, 30cm row spacing
Target plant density:	150 plants/m^2

Harvest dates: 14 November (TOS1) and 1 December (TOS2)

TRIAL INPUTS

Fertiliser: Granulock supreme Z @ 50kg/ha at sowing
plus 180kg/ha of urea (83 kg N/ha) top-dressed in two separate applications

Pests, weeds and diseases were controlled to best management practice.

METHOD

A replicated field trial was sown using a split plot trial design with time of sowing as main plots and variety x grazing as sub-plots. Winter wheat varieties Rosella and Revenue were sown at time of sowing 1 (TOS1) in April. TOS1 occurred after receiving 50mm of rain during March, with 10mm falling just prior to sowing. Mid and short season varieties Scout and Mace were sown (TOS2) in early May. TOS2 occurred after 30mm of rain during April, with 13mm falling just prior to sowing. All plots established very evenly.

Assessments included crop biomass removed at each grazing time and height, nutrient value of that grazed biomass, total biomass at anthesis and grain yield and quality parameters.

Grazing was simulated using a line trimmer, cutting the crop to the treatment height.

Using DM and feed tests, dry sheep equivalent (DSE) grazing days were calculated as follows:

DSE grazing days = DM (kg/ha) x feed test metabolisable energy (ME) / 8 MJ, which assumes that each DSE requires 8 MJ ME/day.

Treatments for each variety are presented in results Tables 2-4.

RESULTS AND INTERPRETATION

The season began in March with welcome opening rains which continued steadily until the end of July. However, little rain fell during spring and crops were forced to rely on stored soil moisture to finish. 72 days were recorded with a minimum temperature below 2°C; many plants suffered from stem frost.

Grazing value

Early grazing of crops occurred at GS16 when plants were 25-35cm. Late grazing occurred when plants were at GS30-32 when crops were 40-45cm tall.

All light grazes were to 25cm, moderate to 15cm and heavy to 10cm.

Feed tests indicated that all crops had adequate protein, metabolisable energy (ME), and fibre (NDF) to support lactating ewes and growing lambs (16% protein, 11 MJ ME/kg and >30% NDF). As crops matured, or were more intensely grazed, nutrient value reflected the change in plant structure with age and proportion of leaf: stem (Table 1).

CEREAL YIELD IS NOT AFFECTED BY EARLY OR LIGHT GRAZING

Table 1. Feed value of Rosella and Scout wheat grazed at different times and intensities, Quambatook 2014.

Grazing timing	Grazing intensity	Rosella			Scout		
		Crude protein (% of DM)	Metabolisable energy (MJ/kg DM)	Neutral detergent fibre (% of DM)	Crude protein (% of DM)	Metabolisable energy (MJ/kg DM)	Neutral detergent fibre (% of DM)
Early GS16	Mod	31.9	12.0	38.9	27.6	12.0	42.4
	Heavy	30.7	12.1	34.4	31.6	12.6	36.7
Late GS30	Light	25.1	11.4	44.4	30.3	12.4	35.6
	Mod	22.3	11.2	43.2	29.2	11.8	37.6
	Heavy	20.6	10.6	48.0	22.4	11.3	42.7

As expected, the feed (dry matter) and subsequent grazing days' value increased the more heavily the crop was grazed, and the later the crop was grazed for all varieties (Tables 2, 3 and 4). Dry matter recovery by anthesis also followed a similar trend, with a tendency to have lower dry matter when grazed more heavily and later.

Grain value

Rosella: Despite a reduction in anthesis dry matter for later grazed crops, grain yields were unaffected by grazing at any stage or intensity in 2014 (Table 2). The early sowing in April gave Rosella sufficient time in the season to recover and maintain production. However, Rosella yields were poor compared with the neighbouring early wheat trial (av. 1.7t/ha) (see *'Early sowing of wheat' pp 65*), for which the reason is unknown. Plants that have lower yield potential need fewer resources to be able to recover and maintain grain yield when grazed.

Grain protein was higher for ungrazed and early-light grazed crop compared with later grazed crop to 10 and 15cm tall, but all protein levels were high, exceeding 14%. Grazing Rosella at any stage did not affect screenings.

Table 2. Feed value, grain yield and quality of Rosella wheat grazed at different growth stages and intensity, Quambatook 2014.

Grazing timing	Grazing intensity	Dry matter of feed available (t/ha)	Grazing days	Dry matter at anthesis (t/ha)	Yield (t/ha)	Protein (%)	Screenings (%)
Ungrazed	-	-	-	6.40[a]	0.70	15.5a	3.5
Early GS16	moderate	0.37[c]	550[c]	5.80[ab]	0.76	15.2a	3.6
	heavy	0.73[b]	1098[b]	5.75[ab]	0.83	14.9ab	3.9
Late GS30	light	0.38[c]	528[c]	5.21[bc]	0.83	14.9ab	3.8
	moderate	0.71[b]	1014[b]	5.18[bc]	0.86	14.5b	3.3
	heavy	1.57[a]	2082[a]	4.23[c]	0.89	14.4b	3.6
Sig. diff.		P<0.001	P<0.001	P=0.017	NS	P=0.021	NS
LSD(P=0.05)		0.19	263	1.12		0.64	
CV%		16.5	16.2	13.7		2.9	

Revenue was sown with the same treatments as Mace (Table 4). This variety has a higher vernalisation requirement (cold temperatures needed to trigger vegetative to reproductive growth) than Rosella, and it remained vegetative well into the season. By 22 May, 0.27t/ha of DM had been produced and by 26 June 0.88t/ha of DM when grazed moderately. Subsequently, Revenue flowered very late and with the dry spring conditions, failed to set grain for harvesting.

Scout: An early-mid maturing variety sown later, and hence grazed later, had similar value responses to grazing treatments to Rosella, but didn't produce quite as much dry matter. Grain yields were maintained in early grazed plots, and the lightly grazed later timing. Yields of the later, more heavily grazed crops to 15 and 10cm were lower than ungrazed crop.

Grain protein of Scout was unaffected by grazing. Screenings, however, were above 5% for all treatments and suffered from the late, heavy graze.

Table 3. Feed value, grain yield and quality of Scout wheat grazed at different growth stages and intensity, Quambatook 2014.

Grazing timing	Plant height after grazing (cm)	Dry matter of feed available (t/ha)	Grazing days	Dry matter at anthesis (t/ha)	Yield (t/ha)	Protein (%)	Screenings (%)
Ungrazed	-	-	-	5.75[a]	1.58[a]	12.9	5.8[cd]
Early GS16	15 (mod.)	0.28[c]	440[c]	5.84[a]	1.50[a]	12.4	5.1[d]
	10 (heavy)	0.63[b]	949[b]	4.53[b]	1.35[ab]	12.2	5.8[cd]
Late GS30	25 (light)	0.24[c]	375[c]	5.72[a]	1.29[abc]	12.5	7.2[bc]
	15 (mod.)	0.55[b]	810[b]	4.56[b]	1.19[bc]	12.4	8.2[b]
	10 (heavy)	1.14[a]	1603[a]	3.87[b]	1.05[c]	12.7	11.1[a]
Sig. diff.		P<0.001	P<0.001	P=0.004	P=0.014	NS	P<0.001
LSD(P=0.05)		0.15	210	1.04	0.29		1.76
CV%		16.7	16.3	13.6	14.6		16.2

Mace: This fast maturing variety had excellent feed value at the early grazing time compared with other varieties. Due to its fast maturity, grain yield and quality was unaffected.

Table 4. Feed value, grain yield and quality of Mace wheat grazed at different growth stages and intensity, Quambatook 2014.

Grazing timing	Plant height after grazing (cm)	Dry matter of feed available (t/ha)	Grazing days	Dry matter at anthesis (t/ha)	Yield (t/ha)	Protein (%)	Screenings (%)
Ungrazed	-	-	-	6.30[a]	2.21	11.5	3.5
Early GS16	15 (mod.)	0.49	749	5.05[b]	2.07	11.0	3.6
Late GS30	15 (mod.)	0.42	620	5.48[ab]	2.02	11.7	4.9
Sig. diff.		NS	NS	P=0.04	NS	NS	NS
LSD(P=0.05)				0.90			
CV%				9.3			

COMMERCIAL PRACTICE

Early planting of wheat varieties when opportunities present, matching the month of sowing with growth type (i.e. winter wheat to late March-early April and spring wheat to late April-very early May) capitalises on early moisture, spreads the sowing window for the farm program, and presents a grazing opportunity for livestock.

Unfortunately, in this trial Rosella did not perform as well as expected, but in the neighbouring early wheat trial (*'Early sowing of wheat' pp 65*), both winter wheats (Rosella and Wedgetail) sown early yielded as well as May sown Scout. Winter wheats are capable of producing more biomass at an earlier date, creating greater forage value at a time of increased demand.

Trial results support previous work which showed that if the crop is sown at the appropriate time, and grazed early, or lightly, as it approaches GS30, then it should recover and maintain grain production. However, the ability of the crop to recover depends on the time of grazing in the year and plant maturity, stored and in-season rainfall, and the intensity of grazing.

ON-FARM PROFITABILITY

Livestock production is a reliable source of income for mixed farming businesses across seasons. Growing green feed for ewes and lambs with high nutrient demands when other pasture growth is limited will improve survival of ewes and lambs, and lamb growth rates.

With careful grazing management, crops can be grazed early and lightly in most years without suffering yield penalty. This will be a trade-off in the amount of feed available for stock and potential grain yield penalties later. Heavier and later grazing, when there is more feed, may incur yield penalty risk. In 2014, it was more profitable to graze Rosella and Mace as they maintained yield in addition to their forage value. Grazing Scout was profitable early, but a decline in yield and subsequent income of later and more heavily grazed crop needed to be balanced with grazing value.

Making the decision when to graze will depend on the need for feed and importance of livestock and cropping to the business.

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KEY WORDS

grazing crops, forage value, grazing intensity, grain & graze 3