GRAZING CEREALS IN MEDIUM AND LOW RAINFALL ENVIRONMENTS

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Key messages

- **Grazing cereals is a tool for risk management in low and medium rainfall environments.**
- **Late grazing of cereals in medium rainfall affected grain yield.**
- **Grazing cereals is useful only if the feed is required.**
- **Locally adapted wheat varieties performed better than long growing season winter wheats.**

Why do the trial?

As the costs of production rise, farmers have been pushed to make more from their cropping and livestock enterprises by increasing the percentage of land cropped and increasing stocking rates. Grazing cereals can help achieve this for those farmers who are focused on improving returns by lifting production.

Grazing cereals has been practiced for many years, yet its purpose and benefits have changed in modern farming systems. Today, farmers face the complications of herbicide residues, resistant weed populations, tillage options, disease management, feed gaps and ailing regeneration of pastures. The search for greater profit and improved management of feed gaps and pastures are incentives for grazing cereals.

Pasture feed gaps are resolved by either reducing stock numbers to match the available feed, increasing feed supply (e.g. pastures, hay, grain) or by allowing stock to lose condition. A feed deficit often occurs from early autumn in medium rainfall zones, through to June in low rainfall zones. Decreasing soil temperatures will slow down plant growth rates and pasture paddocks may not have time to recover or get ahead of stock going into winter. Eyre Peninsula farmers have observed that regenerative pastures produce less dry matter (DM) bulk than they used to. The practice of grass-freeing pastures in break years has led to productivity gains for cropping, but the quantity and quality of pastures has been reduced. Grazing cereals have a role to play in filling this autumn –early winter feed gap.

Trials at Minnipa and Edillilie in 2006 supported results from last year (2005 EPFS Summary, page 61) and once again demonstrated that grazing cereals will reduce their grain yield at Minnipa, while there is extra potential to increase returns from cereal crops at Edillilie as yields were not penalised by grazing at early growth stages.

How was it done?

The Grazing Cereal Trial at Minnipa evaluated DM production, grain yield and quality, response to extra N and total crop value on cereals that were grazed once only. The trials at Edillilie assessed cereal recovery and DM production after a single early grazing or a double grazing (early and late), which was simulated by mowing. Grain yield and quality, response to not applying extra N, higher seeding rates, winter wheat production compared to traditional wheats and total crop value were also assessed.

What happened?

Minnipa results

Grazing at Minnipa reduced grain yields on average from 0.75 t/ha for ungrazed to 0.55 t/ha for grazed. Grain incomes were higher on average for ungrazed treatments ($166/ha) than grazed treatments ($120/ha).

Table 1 Grain yield and gross income for the Grazing Cereal Trial at Minnipa, 2006.

Grazed				Ungrazed			
Treatment	Yield (t/ha)	Price ($/t)	Grain gross income ($/ha)	Treatment	Yield (t/ha)	Price ($/t)	Grain gross income ($/ha)
Wallaroo	0.07 a	260	18	Wallaroo	0.36 b	260	94
Wedgetail	0.38 bc	231	88	Wedgetail	0.56 de	230	129
Barque+N	0.53 cd	209	111	Barque+N	0.71 defgh	209	148
Barque	0.52 cd	209	107	Barque	0.55 cd	209	115
Yitpi	0.64 de	240	154	Yitpi	0.98 ghi	241	236
Wyalkatchem	0.66 def	229	151	Wyalkatchem	0.83 efghi	230	191
Yitpi+N	0.68 defg	241	164	Yitpi+N	0.97 ghi	241	234
Keel	0.92 fghi	187	172	Keel	1.02 hi	209	213

Grain yields in treatments followed by the same letters are not statistically different from each other. ANOVA was conducted on log transformed data.
Grain prices were calculated from base price (plus Yitpi premium) less freight, levies and variable treatment costs, sourced ABB as at Nov 2006. Gross income = price x yield.

Screening levels were increased by grazing, particularly for Wallaroo oats and Keel barley, which lifted from 5.5% to 8.7% and 15.3% to 31.9%, respectively. Wheat screenings were below 2% and therefore of negligible financial consequence.

For the second year it was found that additional N did not increase grain yield on grazed or ungrazed treatments. Urea was applied at 40 kg/ha on 1 August to coincide with the earliest rainfall event post-grazing (19 July), but there was inadequate moisture post-application to generate a response in yield or quality.

Table 2 Dry matter production and gross income from Grazing Cereals Trials at Minnipa, 2006.

Variety	DM production on July 19 (kg DM/ha)	Grazing gross income ($/ha)	Total crop value ($/ha)
Yitpi	211	14	168
Wedgetail	212	14	102
Wallaroo	217	15	33
Yitpi + N	219	15	179
Wyalkatchem	221	15	166
Keel	270	18	190
Barque + N	342	23	134
Barque	418	28	135
LSD (P=0.05)	*69*		

DM value is based on 2006 Rural Solutions SA Merino GM of $25/DSE/year and the assumption that 1 DSE will consume approximately 1 kg DM/day.
Total crop value = gross income from grain plus gross income from grazing of grazed treatments.
At grazing, barley was early tillering; wheat and oats were four leaf.

The Minnipa site was sown on 12 May and crash grazed on 19 July at a stocking rate of 227 DSE/ha for one day. Barque barley produced the most DM (Table 2) at Minnipa, followed by Keel. Table 1 indicates that grazing did not reduce the grain yields of Keel and Barque, although grazing resulted in higher screenings and a price penalty for Keel. Keel yielded the highest overall and was most profitable. However, when DM value is added to grain value, Barque is more profitable as a grazed crop than ungrazed. Wyalkatchem also recovered well from grazing and did not experience reduced grain yield. Wallaroo yielded the poorest and was further reduced by grazing, as were Wedgetail and Yitpi yields.

Cereals sown at Minnipa for early feed should be selected first for their DM production to serve the purpose of meeting a feed demand. Should the season permit and feed demands have been met, the opportunity for crop recovery and grain harvest may exist.

Edillilie results

Across all crop types at Edillilie, there was no yield penalty as a result of grazing crops early (20 July). The trial was sown 18 May and grazed (early) at growth stage 3–4 leaf (wheat, oats) to early tillering (barley) with a mower to approximately 50 mm above the ground. Some early grazed plots were also late grazed (10 August) with a mower to approximately 50 mm above the ground. The double grazing reduced grain yield by 39%, or 0.9 t/ha, across all crops.

Table 3 Average grain yields and grain gross income at Edillilie, 2006.

	Grazing strategy						
	Ungrazed		Single, early		Double, late		
Treatment	**Grain yield (t/ha)**	**Grain gross income ($/ha)**	**Grain yield (t/ha)**	**Grain gross income ($/ha)**	**Grain yield (t/ha)**	**Grain gross income ($/ha)**	**Average variety yield (t/ha)**
Wedgetail	1.75	365	1.72	354	1.04	232	**1.50**
Whistler	1.60	307	1.96	329	1.09	254	**1.57**
Wyalkatchem–N	1.87	372	1.88	321	1.02	270	**1.59**
Yitpi	1.88	328	1.78	407	1.36	294	**1.68**
Wyalkatchem	2.14	447	2.28	401	1.24	338	**1.89**
Wallaroo	2.46	640	2.36	613	1.12	391	**1.98**
Wyalkatchem high seed	2.26	478	2.35	462	1.46	333	**2.02**
Barque	2.33	502	2.59	472	1.78	372	**2.23**
Keel	2.76	548	2.71	498	1.86	400	**2.44**
Barque high seed	2.85	567	2.87	533	1.79	394	**2.50**
Average yield by grazing strategy (t/ha)	**2.21**		**2.26**		**1.38**		
LSD (P=0.05)	***0.55***						***0.23***

Average grain prices as follows — Barque, Keel $199; Wallaroo $260; Wedgetail $211; Whistler $188; Wyalkatchem $209; Wyalkatchem–N $201; Yitpi $211.
Grain prices calculated from base price (plus Yitpi premium) less freight, levies and variable treatment costs, sourced ABB as at Nov 2006. Gross Income = price x yield.

There is a difference in gross income between crop types but very little between the grazing management of each variety. In contrast to 2005 results, oats and barley were more valuable crops than wheat. The GM of a self-replacing Merino in 2006 went down to $25/DSE/year from $30 in 2005, and there was a general increase in grain prices. The success of grazing cereals is dependent on productivity and commodity prices so GMs will be highly variable from year to year.

A late application of urea at 76 kg/ha was broadcast (2 August) over all treatments except Wyalkatchem–N. This N application increased grain yields, backing up data from 2005. Results show there was no difference in grain yields or DM production between Wyalkatchem and Wyalkatchem–N, but the decision to not apply extra N each season will always depend on soil N reserves (previous year's crop) and financial consideration (cost of fertiliser versus potential loss of production).

Grazing strategies influenced the level of screenings across all crops. Averages show that screenings for early grazing (7%) were no worse than for ungrazed crops (8%), but late grazing (12%) increased screenings.

Wedgetail and Whistler winter wheats have longer growing seasons and are used in the eastern states as dual-purpose crops. Grain yield comparisons against locally adapted wheats Wyalkatchem and Yitpi (av. 1.8 t/ha) showed that the shorter growing season varieties performed 0.3 t/ha better than the winter wheats (av. 1.5 t/ha), and appeared to recover from grazing as well as the winter wheats. Grazing will delay the growing season of cereals, which can be especially detrimental on Eyre Peninsula in a tight finish year for those varieties that already have longer growing seasons.

Wyalkatchem wheat and Barque barley were trialled at higher seeding rates, which improved the grain yield of both crops. Seeding rates for all other treatments were set to target an establishment of 200 plants/m^2 for wheat, 180 for barley and 190 for oats (below district practice).

Oat and barley varieties produced the highest amount of DM. The higher seeding rate improved early DM production for Barque barley although it did not benefit Wyalkatchem (Table 4). Grazing commenced relatively early in 2006. Although this compromised DM production, it allowed the crops to recover in a season with less than average rainfall.

Table 4 Dry matter production and grazing gross income at Edillilie, 2006.

	Grazing treatment			
	Single, early		Double, late	
Treatment	**DM prod. 20 July (kg DM/ha)**	**Grazing gross income ($/ha)**	**DM prod. 10 Aug (+ early) (kg DM/ha)**	**Grazing gross income ($/ha)**
Whistler	72 a	5	214 (+72) a	19
Wyalkatchem–N	119 ab	8	292 (+119) bc	28
Wyalkatchem high seed	119 ab	8	260 (+119) ab	26
Yitpi	121 ab	8	242 (+121) ab	25
Wyalkatchem	127 ab	9	279 (+127) abc	28
Wallaroo	164 b	11	382 (+164) bcd	37
Wedgetail	176 bc	12	254 (+176) ab	29
Barque	242 cd	16	490 (+242) d	50
Keel	278 de	19	442 (+278) cd	49
Barque high seed	321 e	22	507 (+321) d	56

DM production in treatments followed by the same letters are not statistically different from each other.
DM value based on 2006 Rural Solutions SA Merino GM of $25/DSE/year and the assumption that 1 DSE will consume approximately 1 kg DM/day. Value of double grazed treatments = early + late.

Barque at a higher seeding rate produced the most DM from the early grazing (321 kg DM/ha) and the double grazing (507 kg DM/ha), as well as producing the highest grain yields overall, followed by Barque and Keel on DM production and grain yield. Wallaroo was not a high DM producer at the early grazing (164 kg DM/ha) but recovered well for the second grazing (382 kg DM/ha), though finished with poor grain yields.

There was little difference in total crop value (grain plus grazing value) between crop types, whether ungrazed, or grazed once or twice at Edillilie in 2006.

What does this mean?

In medium rainfall zones, grazing cereals has potential benefits to the whole farming system such as increasing total farm area cropped, increasing livestock production through higher stocking rates, and improving pasture utilisation and production. Early grazed cereals can recover sufficiently to cause no grain yield penalties and therefore value-add the crop, while supplying feed during the autumn feed gap.

For low rainfall zones, grazing cereals can be a risk management tool or a planned pasture component of a feed budget. Low rainfall croppers are typically adept at managing risk with strategies such as early sown crops, which are ideal pasture options or fallbacks when feed is short. A crop may be designated to get stock through an early winter feed gap, with the potential to use for hay production, as a standing crop later in the season or for grain harvest. Sowing a cereal for feed is the simplest way of providing bulk feed for stock and only complicated by its place in crop rotations. Issues such as disease and herbicide resistance are important considerations in crop type and varietal selection.

Managing feed supply during the autumn–early winter period should be part of whole-farm feed budgeting. If the feed deficit is severe, other livestock management strategies may be put in place to alleviate the pressure put on pastures. It may be feasible for stock to be sold, agisted or put in feedlots if paddocks are susceptible to erosion from over-grazing.

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Location

Closest town: Minnipa
Cooperator: MAC

Rainfall
Av. annual: 325 mm
Av. GSR: 242 mm
Actual annual: 235 mm
Actual GSR: 111 mm

Yield
Potential wheat: 1.02 t/ha
Actual: 0.8 t/ha (Yitpi)
Potential barley: 1.42 t/ha
Actual: 1.0 t/ha (Keel)
Potential oats: 1.02 t/ha
Actual: 0.2 t/ha (Wallaroo)

Paddock history
2005: grass-free pasture
2004: grass-free pasture
2003: Barque barley

Soil
Land system: flat
Major soil type description: red calcareous sandy clay loam

Location:

Closest town: Edillilie
Cooperator: Brett and Vicky Siegert

Rainfall
Av. annual: 475 mm
Av. GSR: 380 mm
Actual annual: 435 mm
Actual GSR: 236 mm

Yield
Potential wheat: 3.62 t/ha
Actual: 1.9 t/ha (Wyalkatchem)
Potential barley: 4.02 t/ha
Actual: 2.4 t/ha (Keel)
Potential oats: 3.62 t/ha
Actual: 2.0 t/ha (Wallaroo)

Paddock history
2005: canola
2004: pasture
2003: wheat

Soil
Land system: flat, base of Marble Range
Major soil type description: loamy buckshot over clay

Category: Searching for answers
Research