Pushing the limits with spring sown winter canola in 2013

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Take home messages

- Winter habit canola has been successfully sown in spring, grazed over summer and harvested for grain in 2012 and 2013.
- Establishing canola in spring means larger, more resilient plants in autumn with less impact from slugs and waterlogging.
- Forage value comparable to commercially available dedicated forage rapes over summer and autumn with added benefit of oil seed production.
- In 2012, grazing over summer increased grain yield compared with no grazing. Ungrazed yield was 1.9 t/ha; grazed was 2.7 t/ha. Taurus sown at the conventional time (April) yielded 2.3 t/ha.

Grazing cereals has proven to be a major opportunity for mixed livestock and cropping farmers in southern Victoria. If managed correctly, the crop can provide ample amounts of forage over winter and go on to produce grain without a penalty on yield. With more and more land sown to canola in the HRZ, finding the fit of canola in a mixed farming system has been the focus of more recent research. Over the last four years, SFS trials have shown that grazing of canola over winter hasn't supplied much feed and has usually been at the expense of yield.

Conventional grazing of canola in the HRZ provides valuable winter fodder, yet often at the expense of grain yield come harvest. With the introduction of varieties with a vernalisation requirement, such as Taurus and Hyola 971 CL, spring sowing and grazing over the summer/autumn period can fill the feed gap with potentially little impact on subsequent grain yield, as well as provide other options for management of problem paddocks.

Sowing in October or November means that the crop is in the ground for over 12 months. The vernalisation requirement of winter canola varieties dictates that a plant will not flower until it has endured a certain period of cold weather (over winter). To test this theory, in 2010 some Hyola 50 (spring canola variety) was sown alongside Taurus and was attempting to flower over summer.

What did we do?

In spring 2011 we sowed some Taurus canola into a fallow area at Dunkeld to test the vernalisation theory and answer questions around grazing management.

In spring 2012, five winter canola varieties were sown at Inverleigh into a paddock coming out of thirty years of poor pasture. The summer and autumn of 2013 certainly tested the resilience of this niche crop rotation with next to no rainfall received between sowing in November 2012 and the break in May 2013.

Figure 1. Sheep grazing winter canola variety trial, sown on November 16th 2012

Grazing management

We set out to answer some key questions relating to grazing spring sown canola. How many times can it be grazed before a yield penalty is suffered? Should I graze it lightly or can I graze it as heavily as my cereals? Does nitrogen application following grazing enable better recovery?

Grazing commenced at the end of January 2012 following some decent rainfall in the summer to enable the crop to get up and away, with 3 t/ha of good quality dry matter available when most of the area was lacking feed. The area was grazed by dry ewes at a stocking rate of 26 DSE/ha. Grazing management of the crop is outlined below (Table 1), detailing the dates of the three grazings as well as the dry matter consumed during this time. All up, there was just over 4000 kg/ha of DM removed over 55 days of grazing.

Quality of feed on offer was high throughout the grazing period. Metabolisable energy (ME) averaged 13.5 MJ/kg DM and protein was up around 22%. In 2012, nitrate poisoning was not of concern, with levels well under the toxic threshold of 1000 mg/kg for lambs. In saying that, introducing stock to forage brassicas needs to be done gradually – it is important that stock are not put out on canola with an empty stomach and they perhaps should be supplied with some roughage when grazing. Observations of the animals grazing suggest that it can take a few days for them to develop a taste for the crop, as almost every other plant in the trial area was eaten before they began on the canola. It is also important to monitor feed levels when stock are grazing, as it didn't take long for the sheep to completely eat the paddock bare once they had accustomed to the forage. The third and final grazing in this experiment was much heavier than planned due to the sheep eating it down rather quickly.

Table 1. Dry matter production and grain yield for spring sown Taurus canola at Dunkeld in 2012

Grazing (no).	Intensity of grazing	Grazing times	Days grazed	DM consumed cumulative (kg/ha)	Grain yield (t/ha)
1	Light	31 Jan - 22 Feb	22	494	2.8
	Heavy	31 - Jan - 5 Mar	34	2316	2.5
2	Light	31 Jan - 22 Feb	29	2763	2.9
		29 Mar - 5 Apr			
	Heavy	31 - Jan - 5 Mar	46	2944	2.5
		29 Mar - 10 Apr			
3	Light	31 Jan - 22 Feb	36	3488	2.7
		29 Mar - 5 Apr			
		26 Apr - 3 May			
	Heavy	31 - Jan - 5 Mar	55	4031	2.4
		29 Mar - 10 Apr			
		26 Apr - 7 May			
		LSD $_{(p=0.05)}$			**NS**
		Sown in Spring, ungrazed			**1.9**
		Sown in Autumn, ungrazed			**2.3**

What was the effect on grain yield?

This experiment has demonstrated the ability of canola to recover from the stress of complete defoliation and go on to produce a fairly handy grain yield. The final grazing was severe, with most plants eaten back to the ground with next to no leaf present, however after a week or so, they had begun to reshoot and grew back rapidly, catching the lighter grazed plants.

After the grazing treatments were completed, the gate was closed and the trial was left to grow into a grain producing crop. Due to the spectacular recovery and compensatory nature of canola following the stress of grazing, it was very difficult to identify between treatments.

In 2012, grazing over summer increased grain yield compared to no grazing as shown in Table 1, above. Spring sown and ungrazed yielded 1.9 t/ha with optimal grazing going 2.7 t/ha. Taurus sown at the conventional time (April) yielded 2.3 t/ha. Observations were that plants that were grazed had branched more and produced a denser canopy with stems producing pods for grain.

The number of times the crop was grazed had a small effect on yield. Grazing twice produced the best result, yielding 0.1 t/ha more than grazing once and 0.2 t/ha more than grazing three times. Although there was a yield

penalty by grazing three times compared to two times, the third grazing supplied an additional 1 t/ha of high quality feed at the beginning of May.

Heavy grazing reduced yield compared to light grazing irrespective of the number of times it was grazed. However the reduction in yield was small and the heavy grazing produced 4 t/ha of feed compared to 1.4 t/ha when lightly grazed. When deciding on stocking rate and grazing intensity, it can be a trade-off between the value of the feed over summer and autumn and final grain yield suggesting that attitude and preference will vary between growers. Applying nitrogen over summer has no yield benefits except for multiple (three) heavy grazings. In this case yield increased from 2.0 t/ha to 2.7 t/ha when 150 kg/ha of urea was spread after each grazing. This would suggest that an application of fertiliser purely to boost crop performance is not necessary.

Establishing the crop and maintaining plant numbers

Having a good seed bed to sow is paramount to ensuring the success of spring sowing. Sowing into dry, cloddy soil has the potential to set back fodder and yield production before summer even arrives. Successful germination needs good seed/soil contact so a loose, friable soil free of lumps and clods is suggested. Given that spring sowing has a potential fit with fallow/pasture paddocks that are coming back into the cropping rotation means that there may be quite a bit of work involved with paddock preparation particularly if there is residual pasture present.

Despite the heavy grazing in 2012, plant numbers did not suffer under grazing. In fact, the general appearance of the heavily grazed spring sown crop was far better than April sown canola which was struggling with the cool, wet weather as well as pest pressure from slugs and earth mites.

The summer of 2013 was hard on the crop, with plant losses around 30-40%, however plant loss was similar between grazed and ungrazed so can probably be blamed on the dry, hot conditions rather than grazing pressure. It is also worth noting that plant numbers under spring sowing and heavy grazing were significantly higher than when sown in autumn due to dry conditions at sowing and loss through pests.

Table 2. Dry matter production and grain yield for several winter canola varieties sown in spring 2012 and harvested in December 2013, Inverleigh VIC

Variety	Time of sowing	Grazing	Spring estab (pl/m²)	Autumn survival (pl/m²)	Reduction in plants (%)	Summer DM (t/ha)	Grain yield Manual harvest (t/ha)
Taurus	Spring	Grazed	47	26	-43%	2.5	4.0
		Ungrazed	42	30	-29%		5.0
	Autumn			8			3.6
Hyola 971 CL	Spring	Grazed	41	28	-28%	2.4	4.6
		Ungrazed	42	28	-28%		5.2
	Autumn			14			4.4
Hyola 930	Spring	Grazed	42	26	-38%	2.2	4.9
		Ungrazed	39	36	-4%		5.2
	Autumn			11			4.1
Clifford CL	Spring	Grazed	43	24	-44%	2.3	4.2
		Ungrazed	38	30	-18%		4.5
	Autumn			17			3.9
CB Sherpa	Spring	Grazed	38	24	-35%	2.8	4.7
		Ungrazed	43	27	-36%		5.2
	Autumn			Not sown			-
Winfred	Spring	Grazed	62	31	-49%	2.8	-
LSD (P=0.05)			**12**	**7**	**NS**	**NS**	**0.8**

The 2013 season was almost completely opposite to 2012, with extremely dry and hot conditions from sowing until the break in May 2013. Table 2 indicates that dry matter production was down on 2012 (over a tonne less feed) however the value of the green feed in 2013 would most likely outweigh the extra tonne in the favourable 2012 season. It is difficult to put a price on almost three tonne of high quality green feed when there is nothing else around!

Resilience of the canola was well and truly tested, with three very heavy grazings occurring between the end of January and the end of April. There were plants lost and for a while it looked like nothing was going to grow back, however the thick starchy stem and root system of the established canola allowed the plants to hang on, and begin to grow leaves back once the break finally came. The recovery of the plants was just astounding – in winter 2013 you wouldn't have believed what the area looked like only three months before.

Due to the variation in maturity, mechanical harvest would have compromised the performance of the crop so hand cuts were taken at windrowing and put aside to mature. Although this makes yields hard to compare between the seasons, it allows us to evaluate the performance of varieties as well as a spring versus a conventional autumn sowing. There were no significant differences within varieties when looking at yield under spring and autumn sowing except for Taurus which came from a seed source of very low germination. In spring sowing, whether it was grazed or not also had no role in the final yield performance, and considering there was nearly 3t/ha of feed eaten in an extremely dry period, why wouldn't you graze it?

Figure 2. Big differences in plant numbers and canopy cover were observed in July 2013. On the left, spring sown and ungrazed, middle spring sown and grazed and on the right, canola sown 27th May 2013.

What about slugs and other pests?

In June 2012, the war against slugs was in full steam at the Dunkeld research site. After being in the ground for almost seven months, the resilient, mature Taurus plants were unaffected by slugs and red legged earth mites, whilst these pests posed a real threat to emerging plants in other trials nearby and demanded costly preventative treatments. The overall resilience and health of the spring sown and heavily grazed crop was astounding, allowing us to leave it and concentrate on the struggling April and May sown crops.

The presence of cabbage moth over summer was noted, however no spray program was implemented. Instead, the crop was grazed by sheep and hence the leaf being eaten by the grubs was removed. How is that for an IPM strategy?

Slug numbers need to be monitored when sowing in spring because they are around!

What about weeds?

Planting a conventional variety can limit weed control from the beginning. Sowing into a paddock that has an existing broadleaf weed burden is likely to exacerbate the problem due to the long rotation and limited control options throughout this time. In 2012, there was no observed difference in weeds when grazed compared to not grazed, nor were there fewer weeds in the April sown crop. Throughout both years of trialling, weed numbers have been of no concern as it appears the rapid closure of the canopy following grazing easily outcompeted any early weeds and is noticeable throughout the season.

Release of winter canola with Clearfield chemistry has provided greater flexibility and weed control options, particularly when sowing in spring or early autumn.

Grazing effect on canopy

As the crop matured, there were noticeable differences in the canopy development of the plants. Grazing appears to have removed the main stem, causing secondary stems or tillers to appear, of which all went on to produce pods and grain. Grazing more led to more stems. Plant height was not noticeably altered by grazing. There was some discussion through the season, whether these secondary stems would go on to produce sufficient grain compared to one good main stem, results indicate that in fact, the branching of canola following grazing was a positive effect.

Fitting into the farming system

One of the biggest benefits is the opportunity to sow in spring which meant that the crop could make the most of summer rainfall and establish at a time when there were fewer threats to plant growth. In 2012, large amounts of rainfall in May (80 mm) and June (75 mm) left a lot of the site and surrounding area either underwater or very close to it, making access for sowing and subsequent management difficult. By then, plants were well and truly established, with tap roots of 300 mm being observed in the grazed areas giving us a healthy, vigorous crop at a time when conventional sown canola was struggling to cope with the conditions or paddocks were unable to be driven on.

The resilient, mature plants were unaffected by slugs and red legged earth mites, whilst these pests posed a real threat to emerging plants nearby and demanded costly preventative treatments.

Another common concern is the ability for the crop to survive a very dry summer and autumn period, recovery from grazing and survival of enough plants to result in a viable crop. After 40 mm of rainfall two weeks after sowing in November 2012, the crop was pretty much deprived of rain until the break occurred in May 2013. We were sceptical about whether the plants would bounce back from the three grazings on top of the dry and hot conditions, but they came back with a flair. At the time we were sowing the autumn crop, the spring sown and grazed plants were well on their way to being a viable commercial canola crop, without the threats caused by slugs, red legged earth mites and cold, wet conditions over the winter.

Benefits of spring sown canola in the system:

- Sowing in spring means less pressure at usual sowing time
- Makes use of summer rainfall
- Large amounts of feed on offer in summer and autumn
- Established, vigorous crop in autumn, less likely to fall victim to slugs and waterlogging
- Paddock sown before paddock gets too wet in autumn/winter
- Two crops from one sowing pass

Potential threats/limitations

- Weed numbers and weed control a concern in long-season crop
- Pests at establishment in spring/summer including slugs, red legged earth mites and diamondback moth
- Insufficient moisture over summer and autumn resulting in low plant numbers