05

FARMLINK RESEARCH REPORT 2020

LONG SEASON GRAZING TRIAL

REPORT AUTHOR Hayden Thompson

TRIAL SITE LOCATION Hart Bros Seeds, Junee Reefs

INTRODUCTION

Annual grazing crops containing a mix of species bring diversity into cropping and livestock systems and can increase livestock carrying capacity at different times of the year. 'Graze and grain' (dual-purpose cropping) has been a successful technique for mixed farmers in Southern NSW and can produce a high return in meat or wool, as well as grain. However, grazing periods can be limited, especially in drier years, which can result in feed shortages. This becomes significant if permanent pastures also have low productivity due to drought.

Mixed species grazing crops can produce higher amounts of biomass throughout the season and grazing time is not limited by the demands of grain production. They also provide a more balanced diet and are more nutritious if legumes are included. They can act as a break crop to aid weed and pest control, prevent soil erosion, improve water infiltration and boost SOC levels.

Although the benefits are well recognised, they are hard to quantify, and growers like to see a ROI in the current year. FarmLink and Hart Bros Seeds have been working on a long season grazing trial, where treatments consisted of a vast range of long season wheats, oats, triticale and canola varieties, as well as a range of legumes, single species pastures and mixed species.
The goal was to measure the gross margin in each treatment, which was treated as a farmer would in a mixed farming system. This means a dual-purpose crop was grazed for a short period before it was locked up to target grain yield.
A vetch crop or oats/clover mix was grazed before it was locked up to get a final hay cut, and a mixed species pasture was grazed continually.
Biomass cuts and feed test results as well as a final grain yield were used to estimate a $/ha value of the crop for each treatment.

PROJECT PARTNERS

FarmLink, Hart Bros Seeds

FUNDING PARTNERS

Hart Bros Seeds, AWB, Seed Force, Pacific Seeds, Advanta, AGF seeds, Pioneer, Barenbrug, Seednet, grainsearch, AGT, SEA Seedexchange, S&W

PROJECT CODE - MSP20

The trial was established by Kalyx Australia as part of the Hart Bros Seeds variety trials, which are conducted each year to showcase new and upcoming varieties. The mixed species grazing trial was a part of the long season variety trial, which was sown on 13th March into good soil moisture conditions. The following table outlines all species and varieties that were included in the trial.

KEY POINTS

- Atomic ryegrass was the best performing treatment in the trial
- Mixed species pasture was significantly more valuable then Kittyhawk and Illabo wheat
- If grazing is the main purpose of winter wheats, varieties such as Bennett and RGT Accroc are more suitable
- Timing of grazing is important to capture feed quality
- Although pasture legumes are slow to establish, they are very high biomass producers in spring

Canola		Mixed/Legumes		Triticale		Oats		Wheat		Barley	
1	V7001CL	7	HBS Grazing Mix*	13	Kokoda	16	Eurabbie	24	DS Bennett	33	Urambie
2	SF Nizza CL	8	Clover/Rye/Oats	14	Normandy	17	SF Tucana	25	Manning		
3	Hyola970CL	9	Arrowleaf Clover	15	Cartwheel	18	PO 1418	26	Annapurna		
4	CL82005	10	Common Vetch			19	PO 1535	27	Illabo		
5	Phoenix CL	11	Kokoda + TR			20	PO 1446	28	RGT Accroc		
6	45Y93CL	12	Atomic Ryegrass			21	Comet	29	Kittyhawk		
						22	Express	30	Nighthawk		
						23	Yiddah	31	SEA20-002		
								32	ADV08-008		

*Grazing mix made up of wheat, oats, ryecorn, tillage radish, vetch and field peas

Table 1 - All species and varieties included in the long season trial at Hart Bros Seeds

Several biomass cuts were taken through the season to measure total dry matter and feed quality, using the feed analysis service at NSW DPI, Wagga Wagga. However, a cut was taken only if it would be at a time when farmers would be likely to graze the crop in a paddock situation. For example, arrowleaf clover and vetch were slow to establish, therefore these treatments were not cut until springtime. The canola treatments were cut only once, as they were slow to recover from the first cut and if additional cuts were taken, it may have impacted final grain yield. The biomass cuts were taken on 5th May, 5th June, 21st July and 14th October. Each time a cut was taken, the whole plot was mown off to simulate the crop being grazed. After the final cut in October, the treatments that were not taken through to grain were sprayed out. A summary of the four cuts is shown in Figures 1 and 3. Every variety was measured in the May cut, except for vetch and arrowleaf clover. All treatments were cut again in June, except the canola varieties and arrowleaf clover. In July, only four wheat varieties were cut, due to the remaining wheat and oat varieties reaching a stage in development that meant grain yield would be impacted if they were cut again. The pasture treatments were also left, so there was potential for a larger cut in late spring, which could be treated as a hay cut with high dry matter production due to the seasonal conditions. The remaining treatments that were taken through to grain were harvested on the 9th December with results shown in Figure 6 and 7.

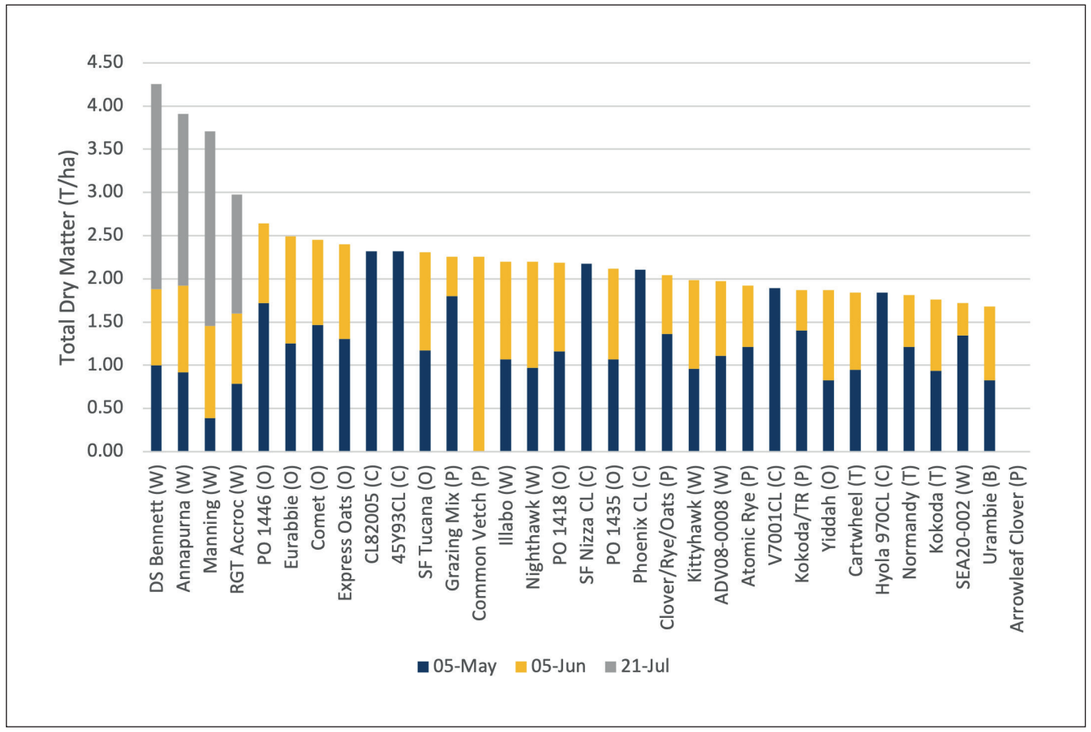

Figure 1 - Total dry matter (T/ha) recorded for the first three biomass cuts taken from autumn and winter growth

As shown in Figure 1, there is no significant difference in dry matter yield for most of the treatments when combining the first two cuts, except for the wheat varieties that were cut three times. However, there are differences that show some treatments produced high dry matter yield early, which is an indicator of early vigour plants, whereas some treatments – such as vetch – are slower to establish, but still produced the same amount of biomass overall. This highlights that with overlapping phenology of different plant types, growers can sustain carrying capacity of livestock with different feed sources for a greater period. The four winter wheat varieties that were cut four times were not high biomass producers early in the season, as they had very prostrate growth habits. However later into winter they had an increased growth rate, allowing for an extra graze when all other grain and graze treatments had already reached a reproductive growth stage and could no longer be grazed without impacting yield. The grazing mix was not a standout treatment: it showed high biomass production in the first cut but low in comparison in the second cut. The researchers believed this was because it was dominated with species that had very fast early growth, such as ryecorn and tillage radish. Other species in the mix were not able to establish well enough to contribute to the later dry matter production. Sowing rates and the ratio of species included in the mix will need to be carefully considered going forward, to make sure early crops do not dominate the mix.

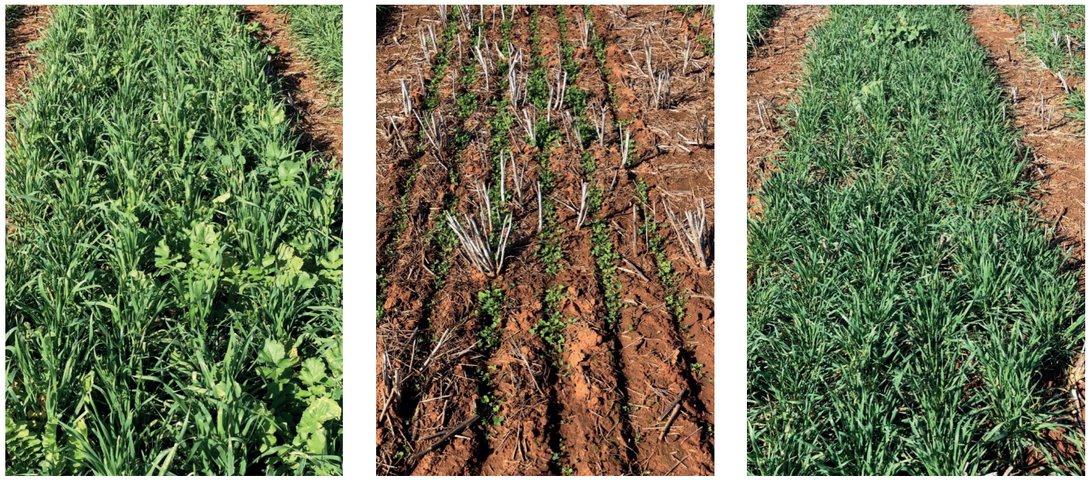

Figure 2 - Comparison of grazing mix (1.8T DM/ha), arrowleaf clover (not cut) and Bennett wheat (1T DM/ha) taken before cutting on the 5 May

400mm of growing season rainfall (March-October) resulted in very high biomass production. Figure 3 shows the results from the spring cut taken on 14 October. The arrowleaf clover treatment was significantly higher than the mix, being the only cut taken from this treatment. While clover may not always perform like it did in the seasonal conditions of 2020, it does highlight that a variety that may be slow to establish can still add great value as part of a mixed species pasture, by producing biomass in spring as well as providing additional soil benefits. Atomic ryegrass was the standout treatment, cutting over 12T DM/ha. This is a great species for providing winter growth but, as with the other example treatments shown in the energy values in Figure 3, the quality starts to tail off through spring once the plant is in a reproductive growth stage.

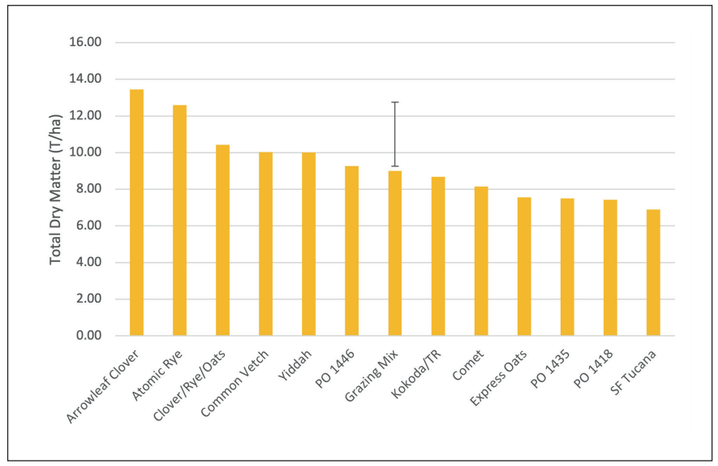

Figure 3 - Total dry matter (T/ha) recorded for a spring biomass cut taken on 14-Oct. The error bar indicates the least significant difference (P=0.05), which is 3.502 T/ha.

The decline in quality shown in Figure 4 is correlated to the growth stage of the different plant types. As plants switch from vegetative growth to reproductive growth, and starts to put energy into grain production, feed quality declines. The grazing mix, which was heavily dominated by the rye corn, reached a reproductive stage very early after its fast growth, meaning feed quality decline was rapid. Ryegrass, which is pictured in Figure 5, also shows a decline and reinforces the importance of having high stocking rates to maintain these pasture types in a vegetative stage.

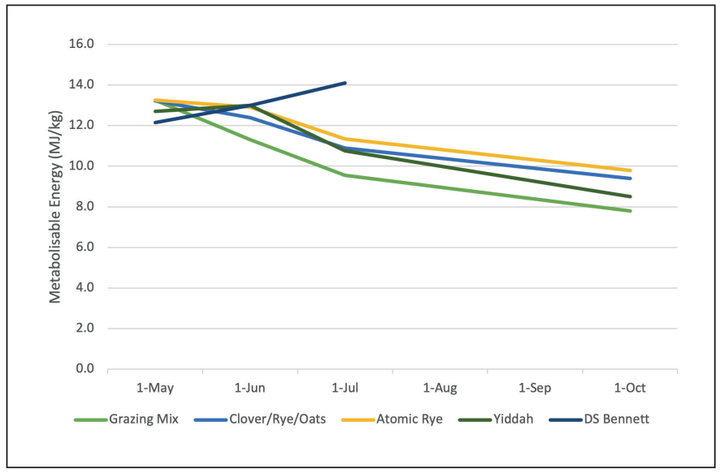

Figure 4 - Metabolisable energy values for a group of feed types through the season

Figure 5 - Atomic ryegrass had an energy value on the 5 June (left) of 12.9 MJ/kg but on 14 October (right) only 9.8 MJ/kg

The canola yields shown in Figure 6 may have been impacted by the heavy grazing in May, from which they were slow to recover. The mower cutting the canola plants so low resembled overgrazing, which can cause a significant setback in grain yield. It was as if the crop had to be resown, which means that the long season varieties such as 970CL were too late to reach maximum yield. This assumption is supported by the 43Y93CL treatment – which is not a true winter variety – and the May biomass cut and plant reset would have pushed it into a more ideal sowing window. This is an important lesson from the 2020 results; it caused the canola to perform poorly against all other treatments in total value and indicates that grazing management is important to achieve maximum potential.

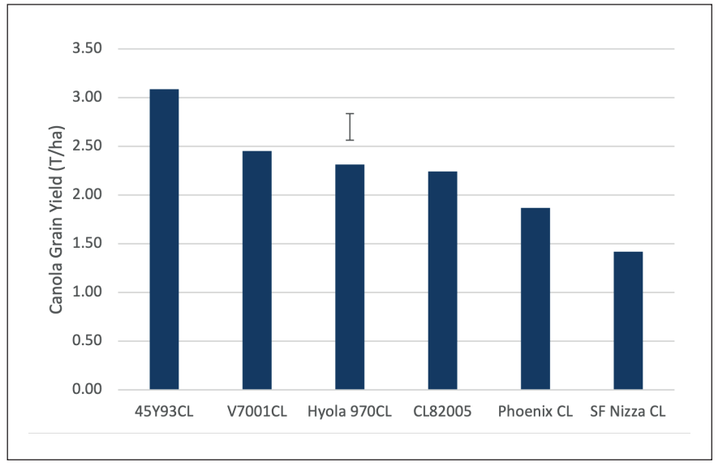

Figure 6 - Final grain yield of all canola treatments. The error bar indicates the least significant difference (P=0.05).

Triticale was the highest yielding cereal grain treatment. However, market demand for triticale is much lower than wheat, therefore a higher triticale grain yield may not result in a higher gross margin. The results shown are reflective of what others have reported, such as the poor performance of some winter wheats, however these poor grain yields may be a result of sowing too early for certain varieties. April sowing may have been more suitable than March for varieties such as Kittyhawk and Illabo. RGT Accroc was the highest yielding wheat as it is a longer season variety.

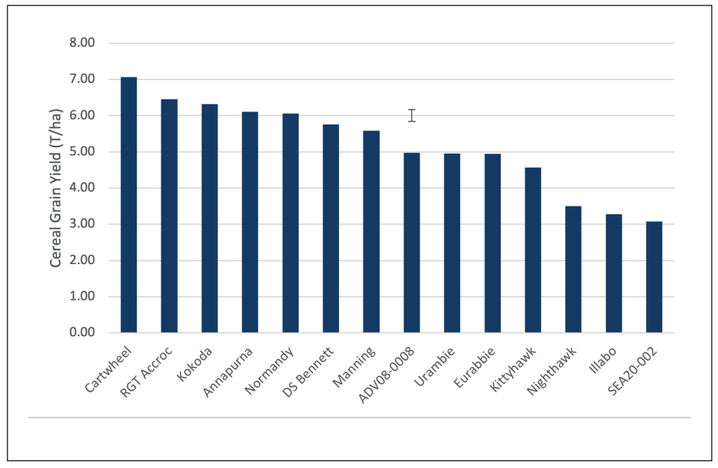

Figure 7 - Final grain yield of all cereal treatments taken through to harvest including triticale, oats, wheat, and barley. The error bar indicates the least significant difference (P=0.05).

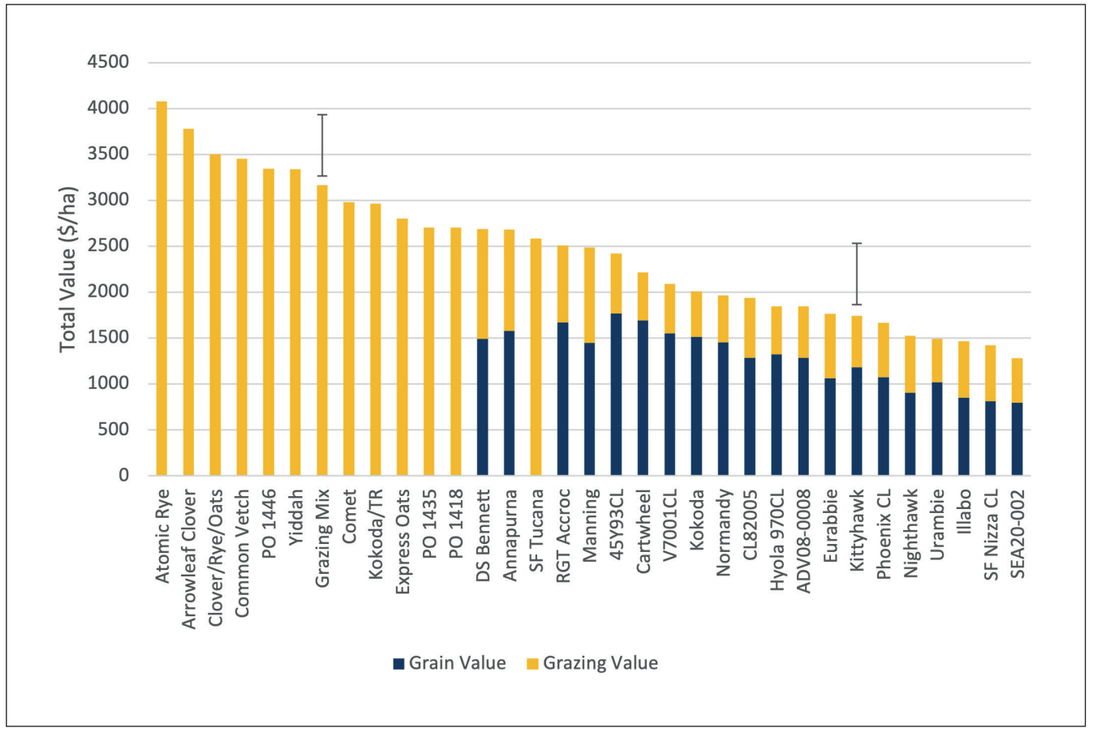

Figure 8 - Estimated total value ($/ha) for each treatment. Error bars show the least significant difference (P=0.05) between treatments.

To calculate estimated value of each treatment, a grazing value ($/ha) formula was adapted from (Kirkegaard, et al., 2020). This uses an estimated conversion of biomass to liveweight gain resulting in $/kg of meat produced. The value of grain was taken from local markets if it had been sold on the 19th January, 2021 for a cash price at Temora, NSW. This has allowed for a comparison of all treatments in dollar value, which is shown in Figure 8.

Although Figure 8 is only an estimated value based on lamb and grain prices, it highlights that treatments consisting only of grazing can be more valuable than a graze and grain treatment. Atomic ryegrass proved to be the most valuable treatment through its very high dry matter production. It was significantly higher than the full grazing mix, but not significantly higher than a mix that included ryegrass and clover. However, the grazing mixes were significantly higher than all dual-purpose treatments, except for the four winter wheats that were grazed three times (Bennett, Annapurna, Accroc and Manning). These wheats were the best performing dual-purpose treatments as they were sown at the right time and the extra grazing time had no impact on final grain yield. The most valuable canola treatment was 45Y93CL as the overgrazing essentially reset the crop's growth to be more like a correct sowing date.

The aim of a mixed species pasture is to bring diversity to the farming system and to include more legumes in the rotation. This trial has proven that this can be successfully achieved. Having the mix was as or more profitable than dual-purpose crops , while maintaining the value of most other treatments and even being significantly higher than most dual-purpose treatments through the cash benefit of grazing multiple times rsthger than just one winbdiw as the dual-pupose crop. However, the trial has also highlighted that the grazing mix could be improved so it can reach the potential of a single species pasture such as Atomic ryegrass and arrowleaf clover.

FarmLink and Hart Bros Seeds plan to repeat the trial in 2021, to build on the knowledge of the 2020 trial and act upon some of the key lessons. This includes better grazing management of canola, and improving the ratio of seeding rates in the grazing mix.

Acknowledgements

FarmLink would like to acknowledge Kalyx Australia for trial management and Hart Bros Seeds providing a site and funding the trial. The trial was also funded by seed companies AWB, SeedForce, Advanta Seeds, AGF Seeds, GenTech Seeds, Barenbrug, Seednet, Grainsearch, AGT, Pacific Seeds, John Shepard and S&W Seeds. NSW DPI feed testing services provided discounted testing, and Geoff Minchin from NSW Local Land Services provided valuable guidance.

References

Kirkegaard, J., Swan, T., Sandral, G., Whish, J., Leighton, E., Bullock, M., Bullock, M., Friske, K., Pumpa, R. (2020). Farming systems: profit, water, nutritional and disease implications of. Canberra: GRDC.

Appendix 1:

Calculations used to estimate grazing value adapted from (Kirkegaard, et al., 2020):

Winter Grazing Value ($/ha) = Plant dry matter (kg) removed x Liveweight dressed weight (c/kg) x Feed conversion efficiency (0.12) x Dressing % (lambs) x Feed utilisation efficiency (0.75)

Dressed weight and value:

- Lambs = 22.9kg (three-year average of light, heavy and trade lambs)
- Dressed weight = $6.25/kg (three-year average NSW)
- Dressing percentage = 50%

An example of 45kg lambs grazing winter Hyola 970 canola: 3800kg plant DM removed x $6.25 x 0.12 x 50% x 0.75 = $1069/ha

Appendix 2:

Prices used to calculate grain prices taken on the 22/01/2021:

Grain	Price ($/Tonne)
Canola*	$574
Triticale	$240
Oats	$215
Wheat (ASW)	$259
Barley (Feed)	$206

*Victory Canola (V7001CL) has a $60 premium added