

Dual-Purpose Potential of Vetch for Grazing and Grain Production

GRDC/Grower Group Alliance/Facey Group

Project Lead: Grower Group Alliance

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Contact: Facey Group - Agricultural Research and Extension Coordinator, Franco Renteria - agrec@faceygroup.org.au

BACKGROUND

The integration of dual-purpose crops cultivated for both grazing and grain has gained attention in Western Australia due to the prevalence of mixed farming systems. This strategy offers multiple benefits, including improved feed availability during critical periods, enhanced livestock productivity, and more efficient land use. To date, most dual-purpose research has focused on cereals such as wheat and oats, with limited attention to legumes.

Vetch (*Vicia sativa*) is increasingly adopted in farming systems across the Kwinana West region due to its adaptability, soil nitrogen fixation, and soil health contributions. Despite its growing presence, the use of vetch as a dual-purpose crop remains underutilised, particularly in terms of opportunistic grazing before harvesting. Understanding the effects of grazing intensity on vetch growth, recovery, and grain yield is critical for assessing the full potential advantages. This research provides a timely opportunity to quantify the trade-offs between early-season grazing and grain production, as well as benchmark best management practices for maximising profitability.

Incorporating vetch into rotations with managed grazing could provide growers greater flexibility before establishing cash crops and contribute to nitrogen supply. Additionally, its role in addressing the autumn feed gap through opportunistic grazing may reduce supplementary feeding costs and further support whole-farm profitability.

AIM

The purpose of this trial was to assess vetch as a dual-purpose crop by quantifying the potential yield and the economic trade-offs associated with grazing it before harvest.

Trial

Property:	Braden and Brooke Lange
Plot Size & Replication:	4 x 150m strips; 6 treatments; 4 replicates
Soil Type:	Loamy sandylol
Crop Varieties:	Vetch - RM4, Volga, and Timok
Sowing Date:	22 May 2025
Seeding Rate:	Vetch 40 kg/ha Alosca E 10 kg/ha

Fertiliser:	Macro Pro Extra 40 kg/ha
Herbicides:	<u>Pre-Seeding</u> Glyphosate 450 2 L/ha. Paraquat 1.8 L/ha <u>12 June</u> Butroxydim 120 ml/ha + 1% Hasten <u>14 August</u> Butroxydim 120 ml/ha + Clethodim 500 mL/ha + 1% Hasten + 1% SLA Trojan 25 mL/ha
Description of Paddock:	A mild slope toward the left-hand side of the paddock. Areas of higher gravel content are present and unevenly distributed across the site.
Harvest Dates:	Timok 13 November Volga 27 November RM4 16 December

METHODOLOGY

The trial evaluated three vetch varieties: Volga, RM4, and Timok. Treatments were arranged in strips. Each variety was initially allocated to three grazing treatments: ungrazed, grazed once, and grazed twice (Figure 1). However, seasonal constraints limited the trial to an effective comparison between ungrazed and single-grazed treatments. Lawn mowing was used to represent nonselective grazing.

	12	11	10	9	8	7	6	5		4	3	2	1	
	G2	G2	G2	G2	G1	G0	G2	G0		G2	G1	G1	G0	
Buffer (timok + RM4)\	G0	G0	G1	G1	G2	G2	G0	G1		G1	G2	G0	G1	Buffer (Volga)
	G1	G1	G0	G0	G0	G1	G1	G2		G0	G0	G2	G2	
2m	2m	2m	2m	2m	2m	2m	2m	2m		2m	2m	2m	2m	2m
	Timok	RM4	Volga	Volga	Volga	Timok	RM4	RM4		Volga	Timok	RM4	Timok	

Figure 1: Experimental layout and treatment application.

At seeding, a gravelly zone through the centre of the trial resulted in shallow and uneven seeding depth. One strip (between plots 4 and 5) was therefore excluded due to failure. An additional strip of the same variety was sown at the end of the trial area as a contingency and was used instead to maintain trial integrity (Figure 1).

Weed pressure became variable across the trial due to the absence of pre-emergent herbicides. As weed control was a concern for the following seasons, the decision was made to limit harvest measurements to clearly representative sections of each treatment.

To allow yield assessment while managing weed and carryover risk, a 2 × 4 m representative area within each treatment was retained for sampling, while the remainder of the trial was sprayed out using multiple knockdown applications. These retained areas were selected to be representative of each treatment and were used for hand-harvested grain yield assessment.

Establishment counts, early Normalised Difference Vegetation Index (NDVI), weed counts, and biomass (hand cuts) were collected before spray-out. Grain yield was determined from hand-harvested quadrats. Statistical analysis was conducted by Analytics for the Australian Grains Industry (AAGI) using an ANOVA (Analysis of Variance) model to test for significant differences between varieties and grazing treatments.

RESULTS AND DISCUSSION

Table 1. 2025 rainfall statistics from nearest BOM weather station – Wickepin South WA, station number 010511 (mm).

Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
6.4	6.6	46.8	25.2	12.4	19.2	84.0	80.6	36.6	14.2	42.2	0.2	374.6

Total rainfall from January to April 2025 was 85.0 mm, with 39.0 mm (83% of March rainfall) falling in a single event on 14 March, followed by approximately nine weeks with little to no rainfall prior to seeding. As a result, effective carry-over soil moisture at sowing was low. Seasonal rainfall conditions improved markedly later in the season, with 164.6 mm received in July–August, alleviating early moisture stress and supporting crop recovery.

Plant establishment, NDVI, weed count, and nodulation

Table 2. Average plant establishment and weed density by variety, 4 weeks after sowing.

Variety	Plant density (plants/m ²)	Weed density (plants/m ²)	Nodulation score (0-10)
RM4	58	4	0.5
Timok	58	2	0.5
Volga	56	2	0.5
Average	57	3	0.5

All vetch varieties established within the recommended density range, averaging 57 plants/m² (Table 2), which aligns with the typical target of 40–60 plants/m² for reliable biomass production and nitrogen fixation (Hart Field Site Group, 2022; Seymour et al., 2002). Early-season nodulation scored an average of 0.5, indicating small, likely ineffective nodules, consistent with early stages of development (GRDC, 2023).

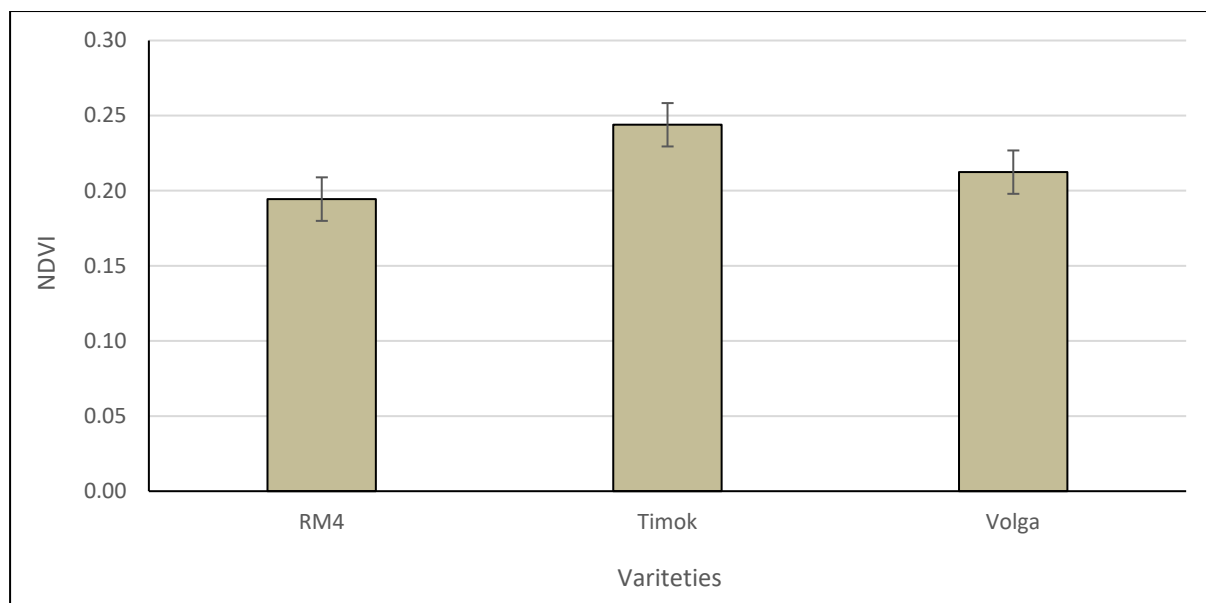


Figure 2. Average NDVI values by variety, 7 weeks after sowing.

NDVI across the site was 0.21. Timok recorded a slightly higher numerical NDVI value (0.24) than the other varieties (Figure 2). However, there were no significant differences between vetch varieties for plant establishment, weed pressure, and NDVI values (Table 3).

Table 3. Results of statistical analysis for plant establishment, weed count, and NDVI, at a 95% confidence level ($p < 0.05$).

Test	Effect	P-Value
Plant establishment	Variety	0.94 (NS)
Weed count	Variety	0.34 (NS)
NDVI	Variety	0.06 (NS)

*Note: Significant effects have a corresponding p-value less than 0.05 and are marked with “****” in the Significance column. Otherwise, they are marked with “NS”.*

Biomass assessment

The first grazing simulation was timed to account for delayed seasonal growth and uneven establishment, to assess whether sufficient recovery would occur to permit a second grazing approximately one month later. However, none of the varieties recovered enough biomass to support a second grazing without materially compromising their capacity to be harvested for grain. A second biomass assessment was therefore conducted at peak growth to continue the comparison of varietal performance.

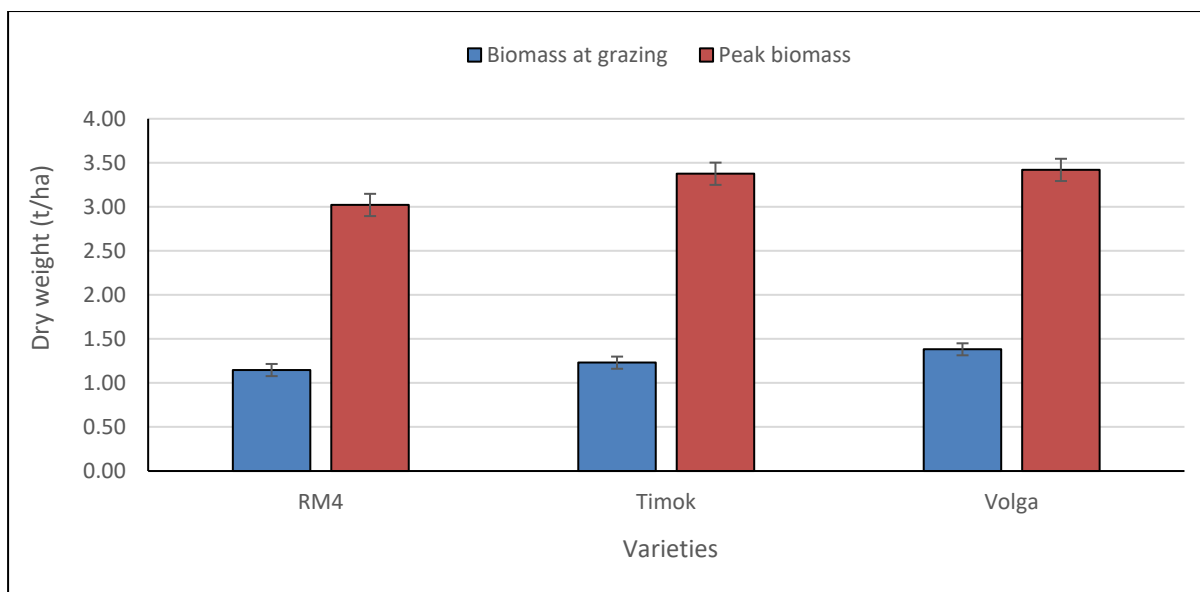


Figure 3. Biomass values at first grazing (12 weeks after sowing), and peak biomass (2 months after grazing).

At the time of grazing, Volga produced the highest biomass at 1.38 t/ha, compared with Timok (1.23 t/ha) and RM4 (1.15 t/ha). All varieties were below the optimum winter grazing threshold of 1.5 t DM/ha, indicating limited feed availability at the time of grazing (Curnow & Lifetime Wool, 2007). A similar comparative performance was observed at peak biomass, with Volga reaching 3.42 t/ha, followed by Timok (3.38 t/ha) and RM4 (3.02 t/ha) (Figure 3). Despite observed differences, no statistically significant varietal differences were detected for biomass (Table 4).

Table 4. Results of statistical analysis for biomass at grazing, and peak biomass, at a 95% confidence level ($p < 0.05$).

Test	Effect	P-Value
Biomass at grazing	Variety	0.34 (NS)
Peak biomass	Variety	0.85 (NS)

*Note: Significant effects have a corresponding p -value less than 0.05 and are marked with “***” in the Significance column. Otherwise, they are marked with “NS”.*

Plant nitrogen content and feed quality

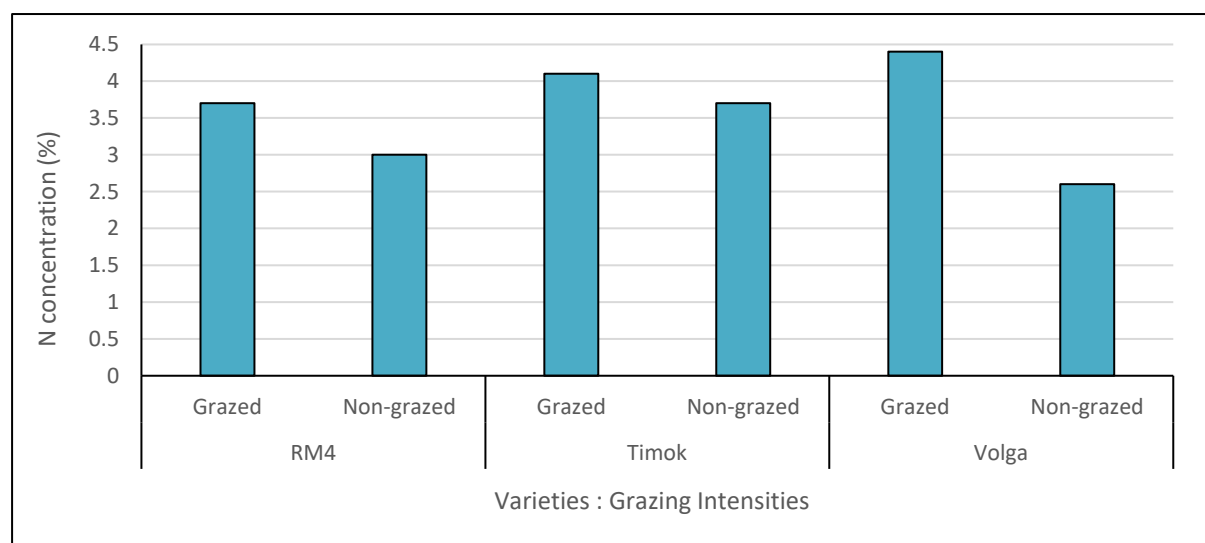


Figure 4. Nitrogen concentration values by variety and grazing treatment from the plant tissue test taken at peak biomass timing.

Tissue testing showed that grazed treatments had a higher nitrogen concentration (%N) with an average concentration across all varieties of 4.06% of plant dry matter compared with the 3.1% in non-grazed sections. This reflects the regrowth of younger plant tissue following grazing rather than an increase in total nitrogen accumulation per hectare (Figure 4).

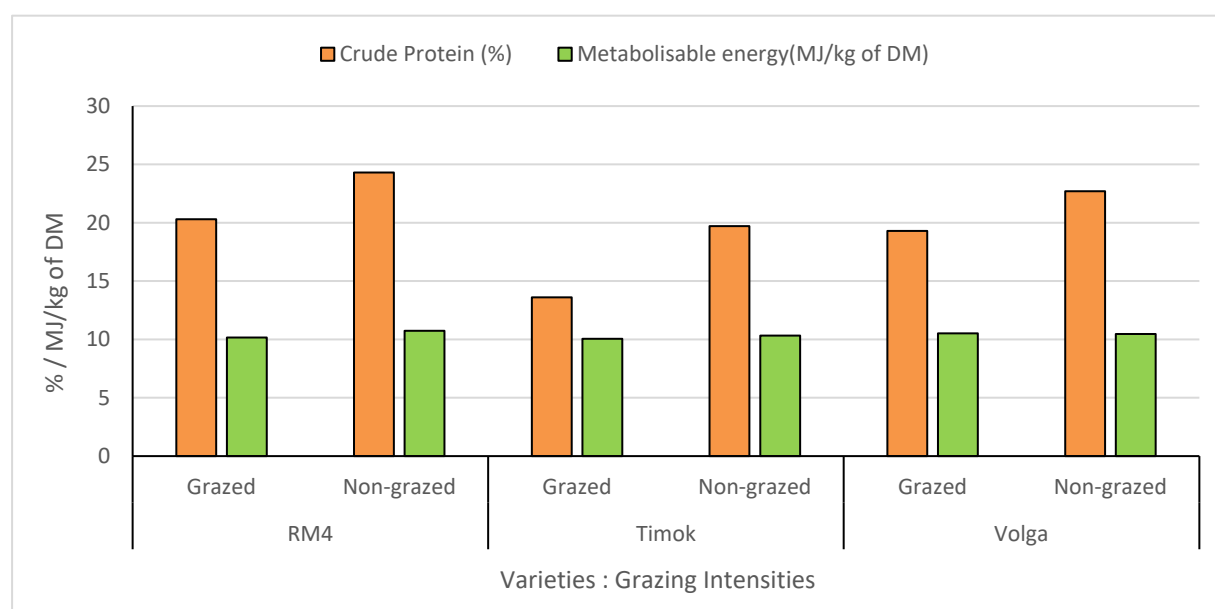


Figure 5. Crude protein and metabolisable energy values by variety and grazing treatment from the feed test taken at peak biomass timing.

Grazing influenced crude protein (CP) concentration but did not affect metabolisable energy (ME). Non-grazed treatments consistently recorded higher CP across all varieties, with values ranging from 19.7% to 24.3%, compared with 13.6% to 20.3% in grazed sections. The RM4

variety recorded the highest CP concentrations under both grazing treatments (24.3% in non-grazed and 20.3% in grazed sections). Metabolisable energy (ME) had a mean value of 10.38 MJ/kg of dry matter across all varieties (Figure 5).

Across all treatments, crude protein (CP) concentrations exceeded the minimum requirement for dry sheep (6% CP) and met the requirement for the last month of pregnancy ($\geq 14\%$ CP), except for Timok (13.6%), which was marginally below this threshold. Metabolisable energy (ME) levels (10.38 MJ/kg DM) exceeded the minimum requirement for both dry sheep maintenance and late pregnancy (8 MJ ME/kg DM) (NSW Department of Primary Industries, n.d.).

Grain yield

Yield sampling was performed in selected 2 m $\times$ 4 m plot sections randomly allocated within each variety and treatment, while the remaining trial area was terminated and sprayed as part of paddock weed control. Therefore, yield data were not subjected to formal statistical analysis, as the use of retained sub-sections introduces potential selection bias and limits valid statistical inference. Yield results should be interpreted as indicative trends rather than statistically confirmed differences.

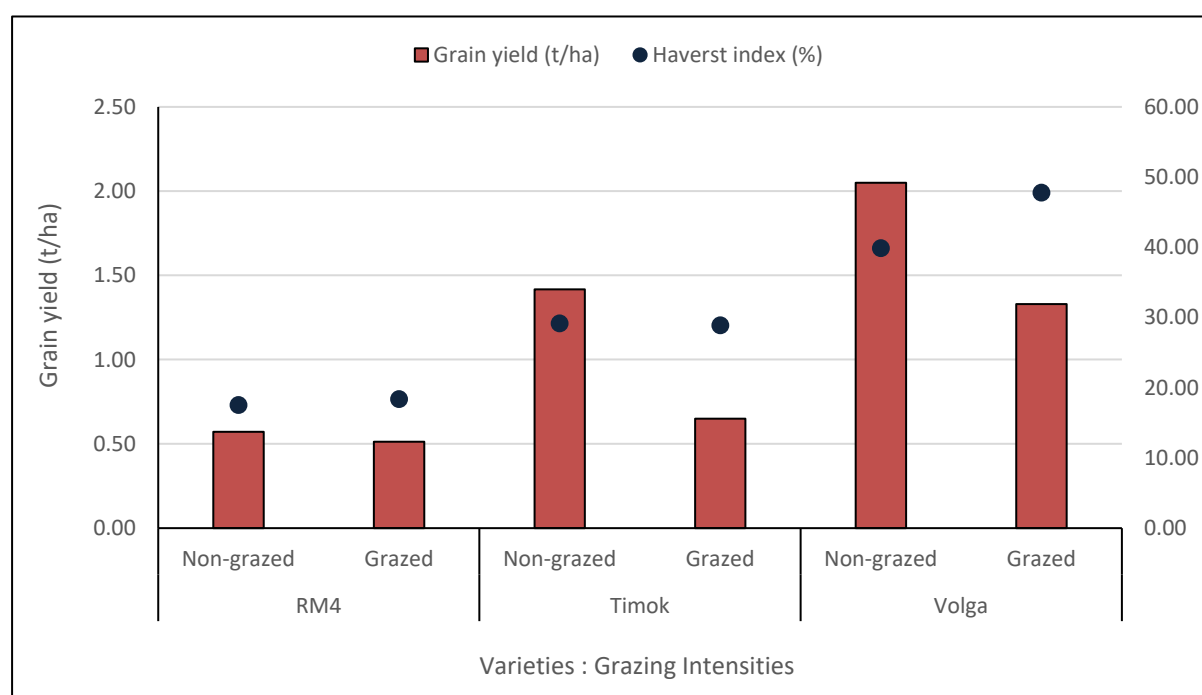


Figure 6. Yield and harvest index by variety.

Grain harvest maturity was determined at the point when more than 90% of pods had lost their green colour, showing a yellow-buff colour and more firmness (GRDC, 2018). Harvest timing differed between varieties, with Timok maturing earliest (13 November), followed by Volga (27 November) and RM4 (16 December). This reflects inherent varietal differences in

maturity type, with RM4 exhibiting a longer growing season and delayed dry-down relative to Timok and Volga.

In the ungrazed treatments, Volga produced the highest yield at 2.05 t/ha, followed by Timok at 1.42 t/ha, while RM4 was substantially lower at 0.57 t/ha. Under grazing, Volga again recorded the highest yield at 1.33 t/ha, representing a reduction by grazing of 0.72 t/ha. In contrast, Timok dropped from 1.42 t/ha to 0.65 t/ha, a reduction of 0.77 t/ha, while RM4 showed minimal change (0.57 t/ha to 0.51 t/ha) due to its already low yield potential.

CONCLUSION

Early-season growth was constrained by low stored soil moisture and limited post-sowing rainfall. Although plant establishment averaged 57 plants/m², within an adequate range, biomass development was further restricted.

The first grazing was applied on 6 August (late winter) under suboptimal feed-offering capacity. While grazing was intended to test the potential for a second grazing timing, none of the varieties recovered sufficient biomass to support it without materially compromising grain yield. Where regrowth occurred, it was too close to reproductive development and harvest timing to be considered viable. Under these seasonal conditions, vetch functioned effectively as a single-graze crop.

Grazing concentrated nitrogen in new regrowth (higher %N), but reduced total leaf area and biomass, lowering whole-plant crude protein. Due to higher biomass volume, non-grazed crops retained more leaf, resulting in crude protein levels averaging 5.3% higher than grazed treatments.

Despite these constraints, Volga recorded the best trade between yield and feed on offer for grain and grazing, with a yield penalty of 0.72 t/ha and a late-winter grazing capacity of 1.38 t/ha. Timok was more sensitive to grazing, while RM4 showed comparatively low grain performance under both grazed and ungrazed treatments. Further evaluation across seasons is required to determine the long-term viability of this dual-purpose approach in the region, given the complexity of the practice.

ACKNOWLEDGEMENTS

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REFERENCES

Curnow, M., & Lifetime Wool (Australia). (2007). Feed on offer photo gallery: for annual pastures during the green period. Department of Agriculture and Food Western Australia.

Grains Research and Development Corporation. (2023). Inoculating legumes: Back pocket guide. GRDC.

Grains Research and Development Corporation. (2018). GrowNotes™ vetch (southern region): Late-season management. GRDC. <https://grdc.com.au/resources-and-publications/grownotes/crop-agronomy/vetch-southern-region-grownotes>.

Hart Field Site Group. (2022). Optimising vetch grazing and hay production – vetch variety performance. https://www.hartfieldsite.org.au/media/2022%20Trial%20Results/2022_Hart_Trial_Results_Optimising_vetch_grazing_and_hay_production.pdf.

NSW Department of Primary Industries. (n.d.). Ewe nutrition. NSW Government. <https://www.nsw.gov.au/regional-and-primary-industries/livestock/sheep/ewe-nutrition>.

Seymour, M., Malik, R., & Hunter, H. (2002). Vetch agronomy in south-western Australia. Department of Agriculture, Western Australia. Miscellaneous Publication.