5.4 EXPLORING GRAZING & FERTILISER MANAGEMENT IN A PHALARIS PASTURE — 2024 UPDATE

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KEY MESSAGES

- The drier than average conditions in 2024 limited pasture production across the trial. The simple and intensive rotations produced a total of 4800 kg DM/ha and 4200 kg DM/ha for 2024 respectively while the continuously grazed treatment averaged 3800 kg DM/ha, all statistically similar.
- Pasture composition assessments over multiple years showed both rotational strategies increased the phalaris persistence and vigour, while the continuously grazed strategy favoured undesirable species and increased bare ground over time.
- Capital rates of single superphosphate increased the Olsen P above the recommended levels of 15 mg/kg. However, this did not result in an increase in production when compared to the maintenance rates of single superphosphate as moisture was likely the limiting factor in pasture production in 2024.

Keywords: pasture, phalaris, grazing management, phosphorus

BACKGROUND

The Southern Farming Systems (SFS) Rokewood pasture trial site has an established old Australian phalaris pasture base. While the established pasture was persistent for a long period, production was likely to be limited. One of the main limitations of Australian phalaris is that it is semi-winter dormant. Replacing the existing phalaris with a newer variety that is winter active could help boost production but can be costly to re-sow. Soil tests indicate the trial site has production limiting phosphorus (P) levels. In 2021, the trial site had a Colwell P level of 13 mg/kg. This is below the recommended level for a productive pasture which is 34 mg/kg Colwell P or Olsen P equivalent of 15 mg/kg when Phosphorus Buffering Index (PBI) is above 140. This trial aims to evaluate management strategies to improve the productivity of the existing pasture over multiple years.

The application of fertiliser is to overcome the phosphorus deficiency and increase productivity of the pasture but whether this can be further enhanced with strategic management of grazing is being evaluated.

Research shows that phalaris performs better under rotational grazing. This is particularly true for winter active varieties of phalaris. Research also shows that plant growth will be optimised when grazing is based on leaf stage. This requires short grazing periods of just a few days, before appropriate spelling to allow carbohydrate plant reserves to be restored as indicated by the re-growth of four new leaves per tiller. This can require additional management by livestock managers and may require smaller paddocks.

Over the first three years of the trial, three different grazing strategies are being compared:

1. Continuous grazing (set-stocking)
2. Simple rotational grazing based on time (two weeks grazing, six weeks spell)
3. Intensive rotation based on leaf stage (grazing at the 4-leaf stage and then spelling to allow leaf number recovery).

Overlaying these grazing strategies are two different fertiliser treatments aiming to address the phosphorus constraint in the paddock and reach the targeted levels for 95% production.

This report is a summary of findings from the 2024 season. A previous report on the findings from 2021-23 was published in the Second Edition of the 2023 SFS trial results book.

METHOD

Trial Layout

The trial evaluates two factors: fertiliser management and grazing strategy. Three adjacent paddocks were established at the Rokewood pasture trial site on an old Australian phalaris pasture. The three paddocks were separated into three grazing methods, with a paddock for continuous grazing, simple rotation (based on time), and intensive rotation (based on leaf stage). Each paddock was split in two with one section receiving a maintenance rate of phosphorus fertiliser and the other section receiving a capital rate of phosphorus fertiliser.

Trial Inputs

Soil tests taken in 2021 when the trial was established showed phosphorus (Colwell P) levels of 13 mg/kg. An annual maintenance rate of 105 kg/ha of single superphosphate (SSP) was calculated and applied in autumn each year to the maintenance P treatments. The capital rate was calculated at 478 kg/ha of SSP and was applied annually for the first three years to try to achieve an Olsen P of 15 mg/kg or Colwell P of 34 mg/kg. As of 2025, an annual SSP top-up rate of 100 kg/ha will be applied to all treatments as soil test results indicated the capital treatments had reached the target P levels. Fertiliser inputs are detailed in Table 1.

Table 1. Trial inputs as of June 2025.

Inputs	Date	Product	Rate/ha	Timing
Fertiliser - Capital P rate	19-May-22	Single superphosphate	478 kg	Autumn break
	26-May-23			
	24-Apr-24			
	1-Mar-25		100 kg	
Fertiliser - Maintenance P rate	19-May-22	Single superphosphate	105 kg	Autumn break
	26-May-23			
	24-Apr-24			
Insecticide	12-Oct-21	Alpha duo	50 mL	RLEM Timerite application
Other	24-Feb-22	HY-MAL	110 mL/10 kg of grain	Cricket baiting
	15-Feb-24			
	20-Jan-25			

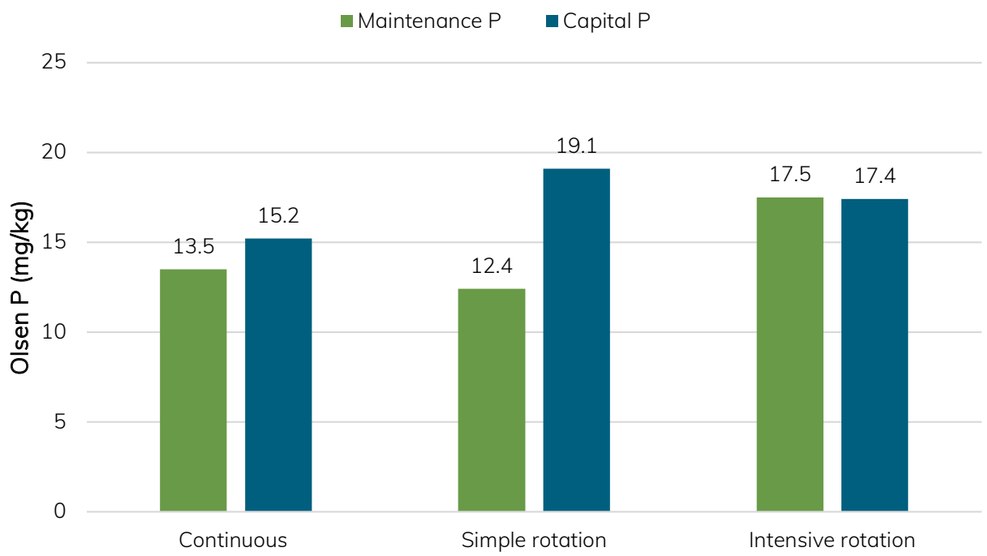


Figure 1. Olsen P levels (mg/kg) from soil test results in December 2024.

MEASUREMENTS

Pasture Production

Pasture cages were set up in each paddock to monitor growth and fixed quadrats established to monitor changes in pasture composition over time. The pasture cages were used to measure pasture production with a cut taken under each to get a representative subsample. Cuts were taken prior to the sheep entering for grazing or when pasture was approximately 10 cm or 2000 kg DM/ha, cut to a residual height of 2 cm. The continuous grazing cuts were taken at 8-10 cm or after roughly 6 weeks during winter and autumn and 3-4 weeks during spring. The samples were used to calculate pasture production of each grazing method and fertiliser treatment.

Pasture Composition

Five fixed monitoring points were established in each treatment to monitor the phalaris presence and frequency of other species and weeds. Photos were taken of monitoring points annually with a 1 m^2 grid overlaying the photo to measure basal cover and bare ground. Photos were taken in late winter or early spring of each year.

Table 2. Dry matter production (kg DM/ha) for fertiliser treatments in 2024.

P Treatment	Autumn 2024	Spring 2024	Summer 2024	Cumulative 2024
Maintenance	2103 -	1008 -	1241 -	4227 -
Capital	1797 -	1022 -	1307 -	4222 -
LSD P=0.05	456	225	149	618
p-value	0.219	0.783	0.403	0.985
CV (%)	30	4	14.5	18.4

Means followed by the same letter do not significantly differ (p>0.05).

RESULTS & DISCUSSION

Fertiliser Management

In April 2024, the last application of capital SSP was applied to achieve an Olsen P level above 15 mg/kg which is the level recommended for a productive pasture at a PBI of 140. Soil test results from December 2024, shown in Figure 1, indicate that all capital P treatments are above the 15 mg/kg threshold. The results from the maintenance treatments show levels below recommended for the simple and continuous grazing paddocks at 12.4 and 13.5 mg/kg, respectively. The intensive grazing maintenance P paddock was above the recommended target at 17.5 mg/kg. This is likely higher in Olsen P as the higher stocking rate would increase the amount of P put back in the soil from sheep faeces.

Both the maintenance and capital treatments produced 4200 kg DM/ha cumulatively for 2024 and were statistically similar. As with most producers in South-West Victoria, the Rokewood trial site faced a challenging autumn and winter in 2024. A very late autumn break and limited rainfall in winter heavily impacted pasture growth at the site. With decile 2 rainfall for 2024 at the site (See climate data), total DM produced for the trial was reduced and likely influenced the similarity in the two fertiliser management strategies. The similarity in yields was likely a result of moisture being the limiting factor in pasture growth, not phosphorus levels, leading to a lack of response to SSP applications. Additionally, the lack of follow-up rainfall from when the SSP was applied may have led to losses or reduced its effectiveness and not allowed it to be taken up by plants during key periods of growth.

Table 3. Phalaris frequency of fertiliser treatments in 2022 and 2024.

Fertiliser Treatment	Phalaris Frequency % 2022	Phalaris Frequency % 2024
Maintenance	47.9 -	55.3 -
Capital	51.2 -	59.8 -
LSD P=0.05	11.5	13.8
p-value	0.552	0.506
CV (%)	30.5	31.4

Means followed by the same letter do not significantly differ (p>0.05)

Results from monitoring pasture composition in 2022 and 2024 showed a trend of higher phalaris frequency in both years in the capital treatment, even though results showed both fertiliser treatments to be statistically similar. On average, the phalaris frequency in the capital treatment was 4.5% higher than the maintenance in 2024. Phalaris frequency also increased from 2022 to 2024 for all treatments (Table 3).

The results from the basal cover assessment in Table 4 show that both treatments are statistically similar in all categories. When comparing maintenance to capital, the maintenance treatment had higher percentages of bare ground and unimproved grasses compared to the capital treatment, which aligns with the phalaris frequency results, indicating that the phalaris is responding to the higher P inputs even though the total DM production has been similar.

Table 4. Basal cover assessment for fertiliser treatments in 2024.

P Treatment	Phalaris %	Bare Ground %	Unimproved Grasses %	Onion Grass %	Broadleaf Weeds %
Maintenance	30 -	8.9 -	43.7 -	9.7 -	5.2 -
Capital	38.1 -	6 -	36.7 -	9.7 -	7.2 -
LSD P=0.05	18.5	5.5	13.5	4.5	4.5
p-value	0.370	0.282	0.297	1.0	0.369
CV (%)	71.3	97.4	44.1	61.1	96.1

Means followed by the same letter do not significantly differ (p>0.05).

When comparing the 2022 basal cover assessment to 2024, all treatments reduced the bare ground percentage by an average of 13.5% in 2022 compared to an average of 7.5% in 2024. While the 2024 season resulted in limited response to SSP applications, given the lack of rainfall, these trends suggest that over the course of the trial, fertiliser applications are improving the pasture composition.

Composition and yield of the fertiliser treatments will continue to be monitored in the coming seasons and now that the capital P treatment has exceeded targeted Olsen P levels, it will be interesting to see if there is a more significant response in a less challenging season.

Grazing Management

The grazing management dry matter results are shown in Figure 2. The autumn cuts resulted in the simple and intensive rotation treatments producing the highest dry matter with 2370 kg DM/ha and 2455 kg DM/ha, respectively. This was significantly higher than the continuous grazed paddock producing only 1025 kg DM/ha.

Conversely, the spring cuts resulted in the continuous treatment producing significantly more than both the simple and intensive treatments.

The summer cuts showed significantly more production in the simple rotation with 1592 kg DM/ha, which was more than the continuous with 1165 kg DM/ha and the intensive with 1065 kg DM/ha, which were both statistically similar.

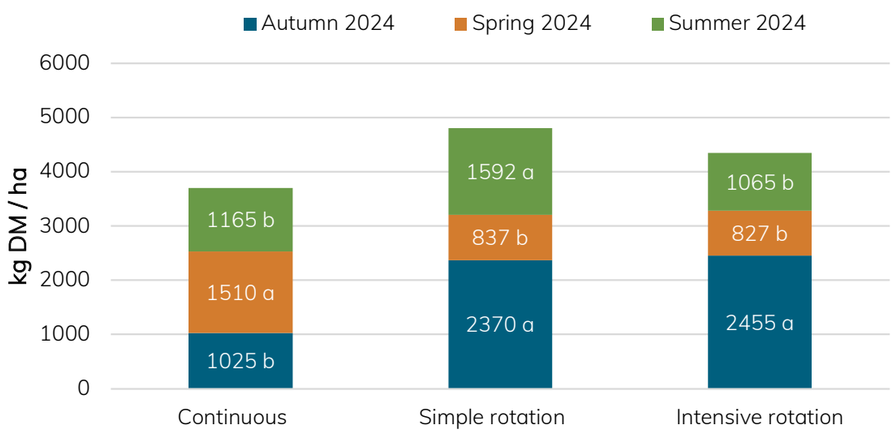
Cumulatively, there were no statistically significant differences between the three grazing strategies which is similar to previous year's results. There was however a trend towards increased production with the two rotation-based strategies when compared to the continuous grazed strategy. The simple rotation was the highest producing cumulatively for 2024 at an average of 4800 kg DM/ha, and the intensive rotation produced 4200 kg DM/ha. The continuous treatment had the lowest dry matter production with an average of 3700 kg DM/ha for 2024.

Due to the season, dry matter production for 2024 was limited in comparison to previous years. This made it difficult to manage rotations and allow the intended rest periods post-grazing. Rotational grazing produces the best results when the pastures are allowed to spell for a period to allow the plant to replenish the carbohydrate stores and encourage tiller development (Saul, 2012). While there was a trend towards increased growth from rotational grazed strategies compared to the continuously grazed strategy, it is likely that no significant differences were observed due to the drier than average season limiting production across the whole trial.

Table 5. *Mean percentage of phalaris frequency under different grazing strategies for 2022 and 2024.*

Grazing Type	Phalaris Frequency % 2022		Phalaris Frequency % 2024	
Continuous	46.8	ab	53.3	-
Simple rotation	41.8	b	51.3	-
Intensive rotation	60	a	68.1	-
LSD P=0.05	14.1		16.9	
p-value	0.038		0.101	
CV (%)	30.5		31.4	

Means followed by the same letter do not significantly differ (p>0.05)



LSD P=0.05:	58	306	182
p-value:	<0.001	0.001	0.001
CV (%):	30	4	14.5

Figure 2. *Mean dry matter production (kg DM/ha) for grazing treatments in 2024.*

Phalaris frequency results from 2022 showed the intensive rotation to have the highest frequency with 60% (Table 5). The simple rotation had the lowest frequency at 41.8%, significantly lower than the intensive rotation. In 2024, all three treatments were statistically similar for phalaris frequency. Like 2022, the intensive rotation trended towards being higher on average. The percentage of phalaris frequency also increased from 2022 to 2024 for all three strategies.

The intensive rotation had the highest frequency of phalaris for both years. When using an intensive rotation, selective grazing from livestock is dramatically reduced as it promotes more even grazing and generally rotational grazing favours perennial species (MLA, 2011). By reducing selective grazing from stock and favouring perennial species, this has likely promoted an increase in phalaris frequency for the intensive treatment.

Grazing strategies in 2022 were assessed for basal cover and the results showed a significant increase in percentage of onion grass in the continuously grazed treatment when compared to the two rotational strategies. While all treatments were statistically similar, the simple rotation resulted in the highest bare ground percentage on average, with 17%, while also having the lowest phalaris percentage of the three at 25%. Unimproved grasses were the largest proportions for both the rotation-based strategies.

In 2024, the same points were assessed for basal cover to evaluate the impacts of grazing strategies over a longer period, as shown in Table 7. Results indicated a significant difference in the percentage of bare ground amongst treatments. Continuous grazing had the highest bare ground percentage at 12% while the simple rotation was significantly lower with 4% on average. While not statistically significant, the continuous treatment showed trends of higher percentages of broadleaf weeds and onion grass compared with the rotation-based strategies. When comparing 2022 to 2024, the continuous grazing treatment increased in broadleaf weeds, while the percentage of phalaris reduced by 13%. By continuously grazing this paddock over time, it was evident that the pasture composition had been impacted and the phalaris was not given enough time to recover resulting in a decline, while less desirable species were given the room to increase.

The 2024 results showed both the intensive and simple rotations to be statistically similar in all categories. Comparing the two from 2022 to 2024, some trends of improved composition were observed. The simple rotation had a much higher percentage of phalaris in 2024 compared to 2022, increasing by 13% which was the opposite of the trend observed in the continuous grazing treatment, which declined. The simple and the intensive rotations also reduced the amount of bare ground between 2022 and 2024, indicating that the rotational grazing methods were allowing the phalaris adequate time to recover and increase while also outcompeting the less desirable species. The more stressful the environment, such as dry conditions experienced in 2024, the more crucial grazing management becomes for phalaris.

Table 6. *Basal cover assessment for grazing treatments in 2022.*

Grazing Type	Phalaris %		Bare Ground %		Unimproved Grasses %		Onion Grass %		Broadleaf Weeds %	
Continuous	38.3	-	11.4	-	33.6	-	12.6	a	3.4	-
Simple rotation	25.2	-	17.4	-	42.9	-	8.6	b	7.4	-
Intensive rotation	36.4	-	11.6	-	39.6	-	6.1	b	6.5	-
LSD P=0.05	19.8		8		19.2		3.3		4.3	
p-value	0.345		0.230		0.600		0.002		0.142	
CV (%)	63.8		63.6		53.3		39		38	

Means followed by the same letter do not significantly differ (p>0.05).

Table 7. *Basal cover assessment for grazing treatments in 2024.*

Grazing Type	Phalaris %		Bare Ground %		Unimproved Grasses %		Onion Grass %		Broadleaf Weeds %	
Continuous	25.2	-	12.3	a	37.5	-	12.3	-	8.4	-
Simple rotation	38.7	-	3.7	b	40.6	-	8.6	-	6.6	-
Intensive rotation	38.3	-	6.4	ab	42.5	-	8.1	-	3.6	-
LSD P=0.05	22.7		6.8		16.6		5.5		5.6	
p-value	0.385		0.044		0.818		0.245		0.216	
CV (%)	71.3		97.4		44.1		61.1		96.1	

Means followed by the same letter do not significantly differ (p>0.05).

Grazing management during spring is key to the persistence and regeneration of phalaris for the following autumn. It is recommended to avoid continually grazing during spring to allow the development of stems and crown buds which will encourage regrowth in the following autumn (Watson, McDonald, & Bourke, 2000).

CONCLUSION

The 2024 season proved to be challenging for pasture growth given the drier than average rainfall. Fertiliser management, such as applying capital rates of SSP was able to increase the Olsen P levels above the recommended levels of 15 mg/kg. However, the increase in Olsen P did not correlate with an increase in phalaris DM production when compared to the maintenance rates production as both were statistically similar for 2024, with moisture likely being the limiting factor for pasture production for the trial.

Pasture composition assessments of the grazing management strategies over multiple years showed trends towards improved phalaris vigour, reduced competition of undesirable species and less bare ground with a simple or intensive rotation. The continuous grazing treatment showed an increase in undesirable species and bare ground from 2022 to 2024.

While the difficult conditions of 2024 limited pasture growth and resulted in the three grazing strategies being statistically similar in DM production, there was a trend towards increased production of phalaris, the desired species, with the rotational grazing strategies.

ACKNOWLEDGMENTS

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