

5.3 PRODUCTION & POPULATION CHANGE OF COMMON PASTURE VARIETIES



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Southern Farming Systems

KEY MESSAGES

- Population ratings increased or remained the same for all phalaris varieties and winter active tall fescues.
- The phalaris varieties produced the highest total dry matter/kg/ha out of all species for the season.
- There was minimal to no growth in the sub-clover trial due to the lack of rainfall for the season and no cuts were taken for the entirety of 2024. Any persisting clover plants were left to flower and set seed.
- There was poor growth and population ratings in the annual and Italian ryegrass trial in its' third year.

Keywords: pasture, phalaris, tall fescue, ryegrass, sub-clover

BACKGROUND

In 2022, pasture variety trials were established at the Rokewood trial site using phalaris, tall fescue, perennial ryegrass, annual and Italian ryegrass and sub-clover cultivars. Most varieties in the trial were selected for their suitability to the local area and high rainfall zone, whilst some deemed not suitable were also included to show varietal differences within species and highlight the importance of pasture variety selection when improving pastures. In the year of establishment, unseasonably wet conditions occurred from October to November 2022.

The production results of the first year are reported in the 2022 trial results book. In 2023, an unseasonal dry period occurred from late winter (August) to early spring (October), which finished with a wetter-than-normal November and December, these results are reported in the 2023 trial results book. This report covers results from 2024, where the trial received below-average rainfall for most of the year, see Climate & Soil Data in Chapter 6.

METHOD

Trial Management

All varieties were sown in mid-May 2022. Table 1 shows the sowing rate used for each pasture species.

Table 1. Trial pasture species and their respective sowing rates.

Pasture Species	Sowing Rate/ha
Phalaris	4 kg
Tall Fescue	15 kg
Perennial Ryegrass	15 kg
Annual & Italian Ryegrass	21 kg (tetraploids) 15 kg (diploids)
Sub-Clover	10 kg

During the year there was no grazing by livestock, and biomass removal was undertaken mechanically using a catch-and-weigh mower for biomass data collection. After biomass cuts, urea fertiliser (46% N) was applied depending on the amount of average dry matter (DM) removed per plot to replace lost nitrogen. Single super phosphate (SSP) was applied at the autumn break with the rate based on dry matter removed in the previous year and soil test results. In spring, muriate of potash (MOP) was applied across all trials at 75 kg/ha to top up potassium removal from the cuts.

Varieties

Phalaris

There are two types of phalaris: prostrate, semi-winter dormant and summer dormant cultivars and newer varieties that are more erect, winter active and medium summer dormant. Winter active varieties were selected for this trial (Table 2). The variety that has been listed as unknown has previously been reported as Australian phalaris and expected to have reduced winter active growth, however, due to its growth behaviour we are undertaking genetic testing to identify and ensure we have the correct variety.

Tall Fescue

The tall fescue trial contained winter active and summer active cultivars (Table 3). The summer active varieties are well suited to heavy soil types, summer rainfall or areas with above 600 mm annual rainfall. Although Rokewood has heavy clays, summer active varieties may struggle to persist given it is generally not a summer rainfall environment.

Perennial Ryegrass

All ryegrasses are identified as diploid or tetraploid. Diploids have two chromosomes per plant cell while tetraploids have four. Diploid plants have a lower water content per cell and therefore have a greater dry matter per kilogram of pasture than tetraploid plants. Leaves are generally smaller and thinner in diploids and tend to have more tillers per plant. In comparison, tetraploid grasses are more palatable, contain marginally higher

Table 2. Phalaris varieties, the marketer and growth period.

Variety	Marketer	Growth
Amplify	Valley Seeds	Winter active
Holdfast GT	Barenbrug (bred by CSIRO)	Winter active
Holdfast	AGF Seeds	Winter active
Stockman	Upper Murray Seeds	Winter active
Unknown	N/A	N/A
Confederate	PGG Wrightson (DLF Seeds)	Winter active

Table 3. Tall fescue varieties, the marketer and growth period.

Variety	Marketer	Growth
Charlem	Upper Murray Seeds	Winter active
Temora	DLF Seeds	Winter active
Prosper	Barenbrug	Winter active
Finesse-Q	RAGT	Summer active
Fortune	Barenbrug	Summer active
Hummer	DLF Seeds	Summer active

metabolizable energy levels and have less ground cover, leaving room for clovers (DLF Seeds, n.d). In the perennial ryegrass trial, a variety of each ploidy was selected to show the difference in DM production between the two types (Table 4).

Annual & Italian Ryegrasses

Italian ryegrass varieties may persist into a second year under favourable moisture and temperature conditions over summer but have had variable results in the trial as they need low summer temperatures to persist. Annual ryegrasses (ARG) may persist with the correct grazing management and climatic conditions (Launders et al., 2010). The varieties trialled are outlined in Table 5.

Subterranean (Sub) Clover

Subterranean cover has three subspecies (ssp.). Subterranean ssp. sub-clovers are suited to well-drained, neutral to moderately acid soils, brachycalycinum ssp. sub-clovers are suited to neutral to alkaline soils, and yannicum ssp. sub-clovers are suited to poorly drained, waterlogged sandy loam and clay soils (Nichols, 2021). A variety of the three subspecies were selected for comparison (Table 6).

Data Collection & Analysis

Pasture biomass was collected during the growing season based on the height and density of the plants. Sub-sample measurements were taken using a cordless handpiece and oven-dried to determine the moisture content of each variety. A ride-on mower with a built-in weighing system was used to mow and weigh the standing pasture in each plot to determine biomass. Cuts were taken throughout the year when

the pasture reached 20 cm plus, as shown in Table 7. At each harvest, the pasture was cut to a residual height of 5 cm.

Population rating was measured by counting the number of 5 cm gaps in 4 crop rows x 1 m length. This is then subtracted from the ‘base figure’ of 80, with 80 being the highest possible score (no gaps). These scores have then been converted to a percentage to show the percentage population change from 2023 to 2024. Sub-clover was visually assessed for percentage of plot covered by clover. Trials were assessed in mid-July when pasture was short.

RESULTS & DISCUSSION

Phalaris

In 2022, there were no significant differences between varieties in the phalaris trial. They all produced between 7473 and 8296 kg DM/ha. In 2023, there were also no significant differences between varieties, all producing between 4895 and 5870 kg DM/ha. In 2024, there were again no statistical differences between varieties, producing between 2016 and 2319 kg DM/ha total for the year (Figure 1), with the lower DM production attributed to the lower rainfall experienced (decile 2) in 2024.

There was no significant difference between population ratings and varieties in 2024, similar to 2023 (Table 8). The population increased compared to last year, between 1.5 to 3.6% which is remarkable given the dry conditions, but no varieties were statistically different (Figure 2).

Table 4. Perennial ryegrass varieties, the marketer, number of chromosomes and maturity.

Variety	Marketer	Ploidy (no. of chromosomes)	Maturity
Victorian	AGF Seeds	Diploid	Mid-maturing
Avalon AR1	VicSeeds	Diploid	Mid-late maturing
RGT Hustle AR1	RAGT	Diploid	Late maturing
Reason AR37	DLF Seeds	Diploid	Mid-maturing
Base AR37	DLF Seeds	Tetraploid	Late maturing
Maxsyn NEA4	Barenbrug	Diploid	Mid-late maturing

Table 5. Annual and Italian ryegrass varieties, the marketer, number of chromosomes and maturity notes.

Variety	Marketer	Ploidy (no. of chromosomes)	Notes on maturity
Fuze	Barenbrug	Diploid	ARG - Late spring
New Tetila	Vic Seeds	Tetraploid	ARG - Late spring
Pinnacle	RAGT	Tetraploid	ARG - Late spring
Manta	DLF Seeds	Diploid	Italian ryegrass
Tempo	Barenbrug	Diploid	Italian ryegrass
Feast II	DLF Seeds	Tetraploid	Italian ryegrass

Table 6. Sub-clover varieties, the marketer, sub-clover type and maturity.

Variety	Marketer	Subspecies	Maturity
Yanco	RAGT	Yannicum	Mid
Trikkala	AGF Seeds	Yannicum	Mid
Narrikup	RAGT	Subterranean	Mid
Antas	Barenbrug	Brachycalycinum	Mid-late
Campeda	Barenbrug	Subterranean	Mid
Bindoon	DLF Seeds	Subterranean	Mid

Table 7. Cutting dates for each trial.

Season	Cutting date	Species cut
Winter 2024	15-Aug-24	Phalaris, tall fescue
Spring 2024	2-Oct-24	Italian and annual ryegrass, phalaris
	30-Oct-24	Tall fescue, perennial ryegrass
Summer 2024	4-Dec-24	Phalaris

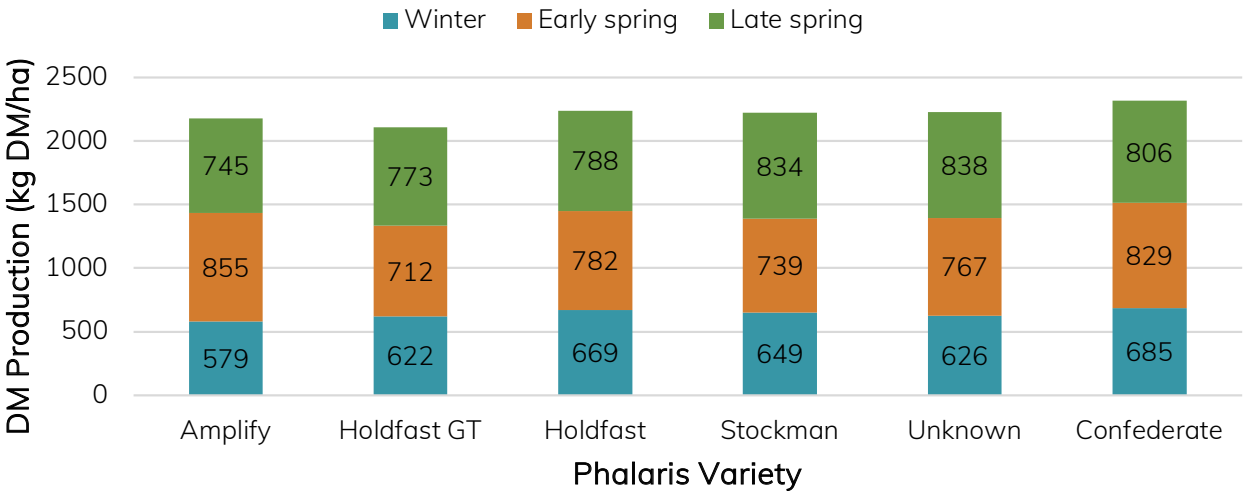


Figure 1. Phalaris varieties and their dry matter (DM) production (kg DM/ha) in 2024.

Table 8. Population rating (out of 80) for phalaris varieties.

Variety	Population Rating	
Amplify	78	-
Holdfast GT	79.3	-
Holdfast	78	-
Stockman	78.3	-
Unknown	77.8	-
Confederate	76.8	-
LSD P=0.05	1.8	
p-value	0.1667	
CV (%)	2	

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

Tall Fescue

In 2022, tall fescue varieties produced between 7913 and 9519 kg DM/ha. In 2023, the three winter active varieties (Charlem, Temora and Prosper) produced significantly more DM than the summer active species (Finesse-Q, Fortune and Hummer). The highest winter active produced 4867 kg and the lowest summer active produced 2898 kg DM/ha.

In 2024, tall fescue varieties produced far less DM than in previous years. Charlem produced the statistically highest DM (2104 kg/ha), and Finesse-Q produced the least (908 kg DM/ha) (Figure 3). Unsurprisingly, the winter actives produced the most in winter. In spring Finesse-Q produced the lowest amount of DM, which was statistically different (Table 9).

Finesse-Q and Hummer had the lowest population ratings in 2024, with all other varieties above 76 (Table 10). They also had the greatest population change, declining by 9.8% (Finesse-Q) and 8.3% (Hummer) (Figure 4). Fortune had the highest population rating and total dry matter of the summer active species, which is unsurprising as it was bred for improved survival under hot and dry conditions.

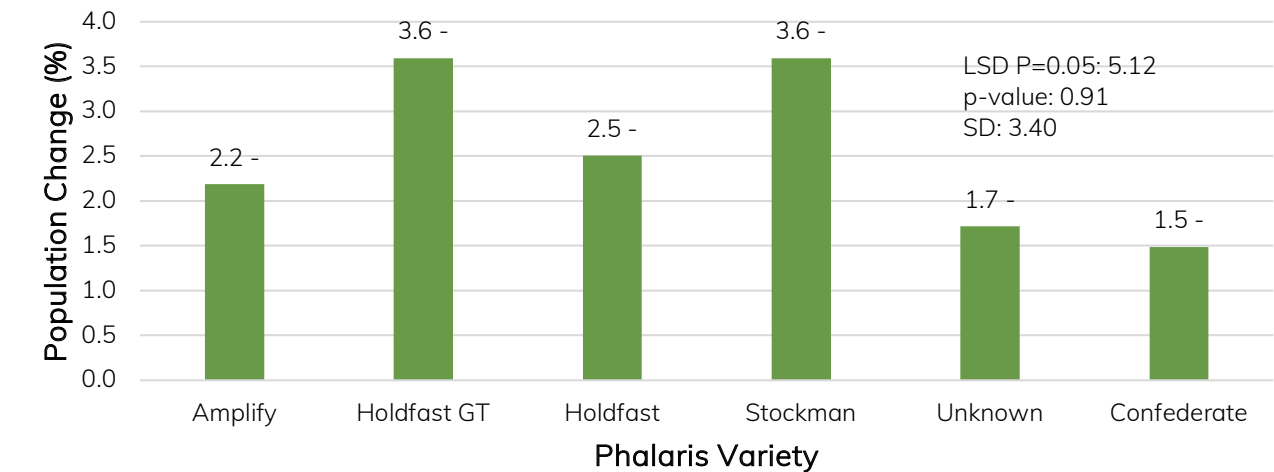


Figure 2. Change in phalaris plant population between 2023 and 2024 (%). Means followed by the same letter do not significantly differ (p>0.05).

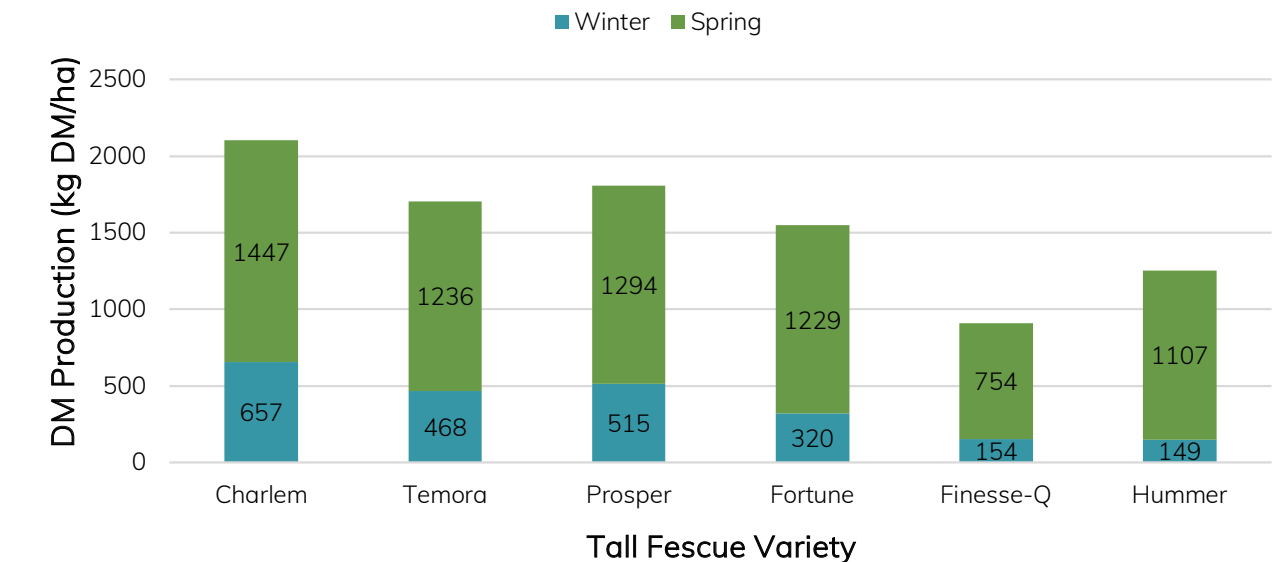


Figure 3. Tall fescue varieties and their dry matter (DM) production (kg DM/ha) in 2024.

Table 9. Dry matter production in winter and spring, and total biomass production for tall fescue in 2024.

Variety	Winter (kg DM/ha)		Spring (kg DM/ha)		Total Biomass 2024 (kg DM/ha)	
Charlem	657	a	1447	a	2104	a
Temora	468	b	1236	ab	1704	bc
Prosper	515	b	1294	ab	1809	b
Fortune	320	c	1229	ab	1549	c
Finesse-Q	154	d	754	c	908	e
Hummer	149	d	1107	b	1255	d
LSD P=0.05	68		185		211	
p-value	<0.001		<0.001		<0.001	
CV (%)	12		10		9	

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

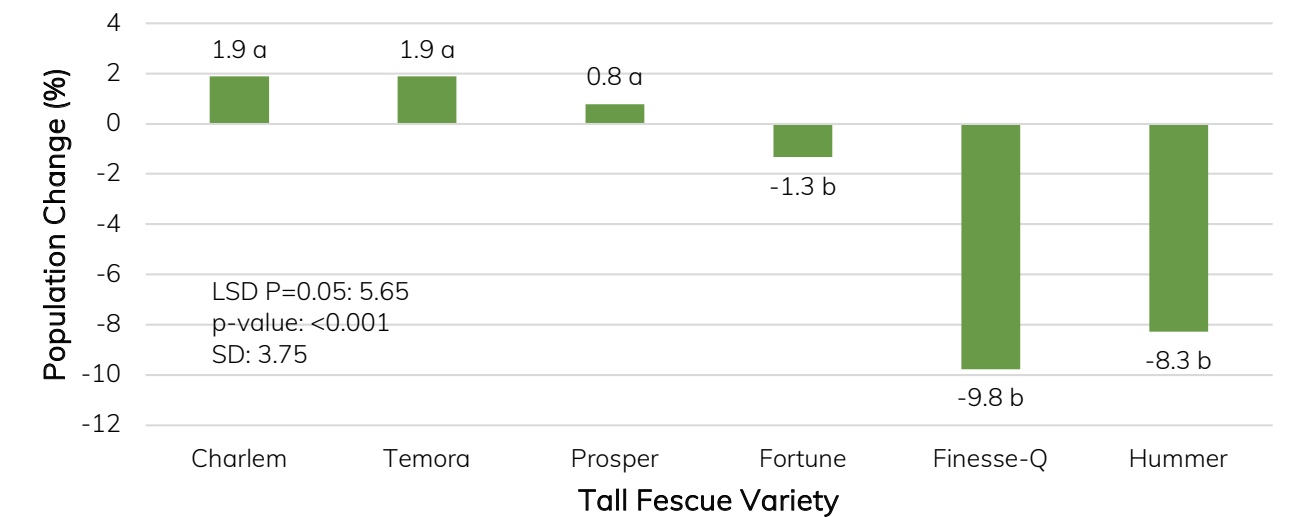


Figure 4. Change in tall fescue plant population from 2023 to 2024 (%). Means followed by the same letter do not significantly differ (p>0.05).

Table 10. Population rating (out of 80) for tall fescue varieties in 2024.

Variety	Population Rating	
Charlem	76	a
Temora	78.8	a
Prosper	79.5	a
Fortune	76.8	a
Finesse-Q	69.3	b
Hummer	70	b
LSD P=0.05	5.3	
p-value	0.007	
CV (%)	5	

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

Perennial Ryegrass

In 2022, Base AR37 produced the most DM overall at 12.5 t DM/ha. All other varieties produced between 7413 and 8646 kg DM/ha. In 2023, the total DM production was not significantly different between varieties. They all produced between 1468 and 1754 kg DM/ha which was unexpectedly poor. Soil and tissue testing was done, to explore possible nutrient deficiencies. Testing did not indicate any obvious issues, however, an adequate amount of N, P and K was applied in 2024.

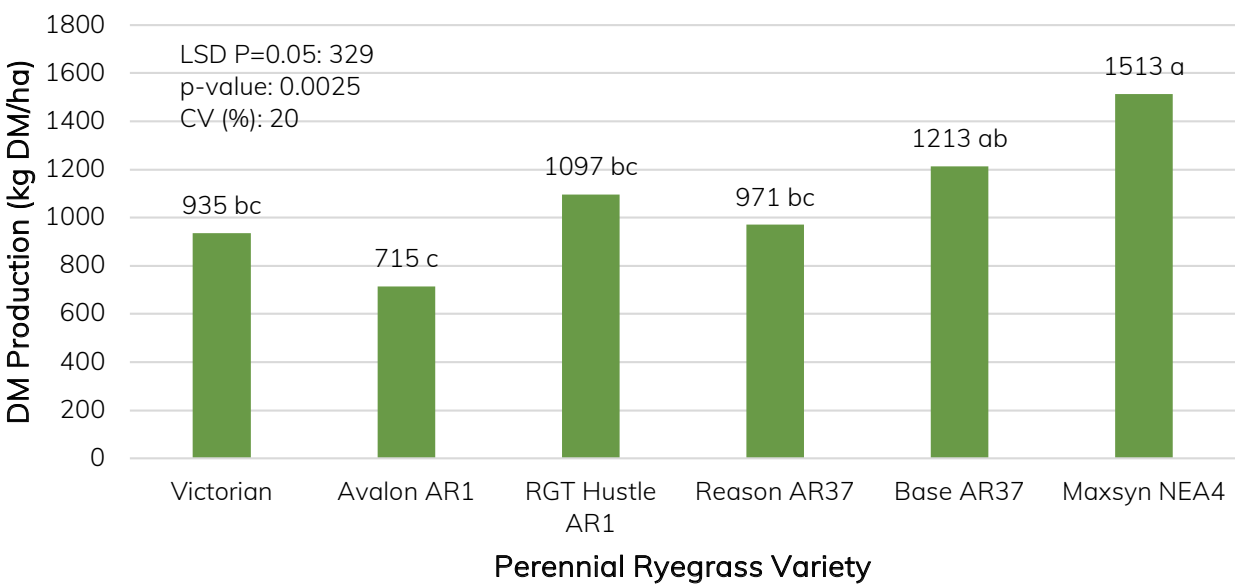


Figure 5. Perennial ryegrass varieties and their dry matter (DM) production (kg DM/ha) in 2024. Means followed by the same letter do not significantly differ ($p>0.05$).

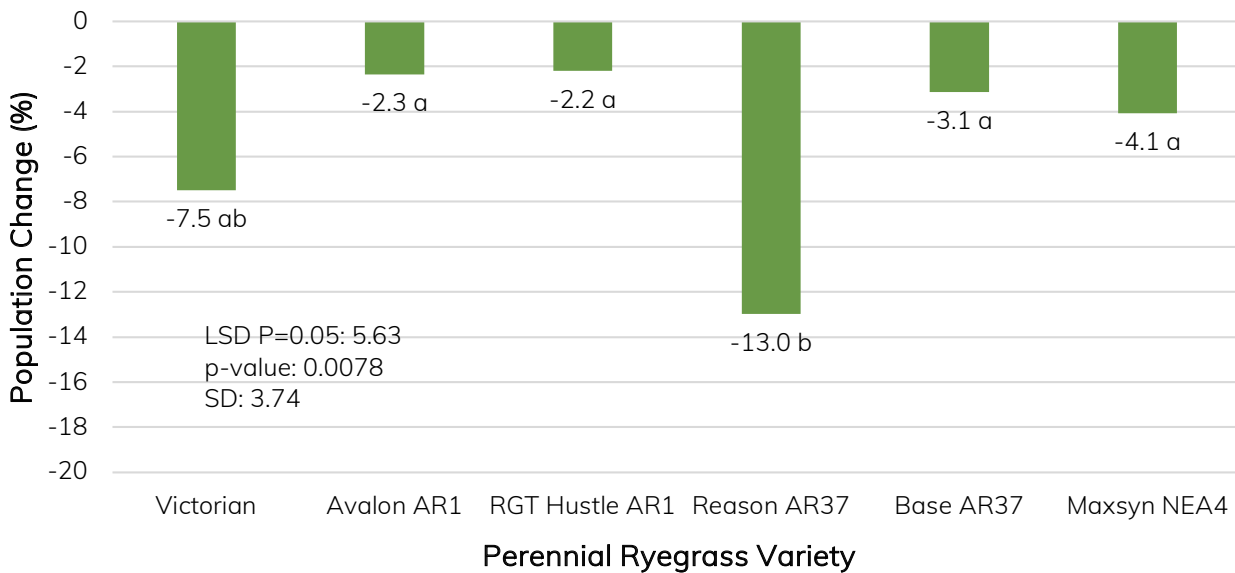


Figure 6. Change in perennial ryegrass plant population from 2023 to 2024 (%). Means followed by the same letter do not significantly differ ($p>0.05$).

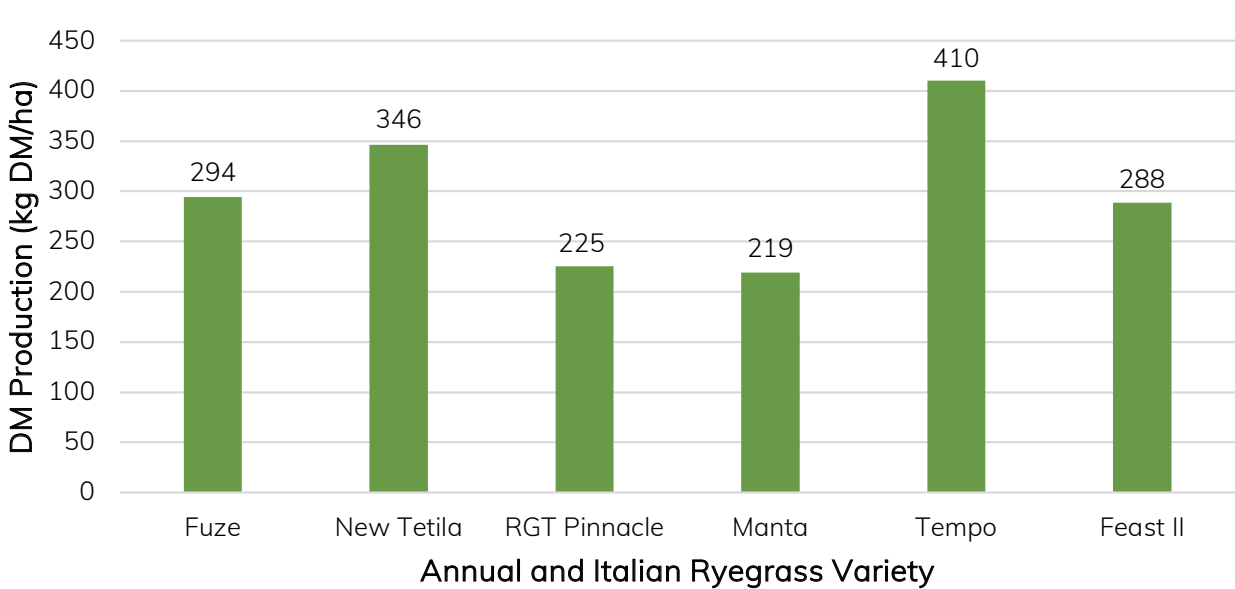


Figure 7. Annual and Italian ryegrass varieties and their dry matter production (kg DM/ha) in 2024.

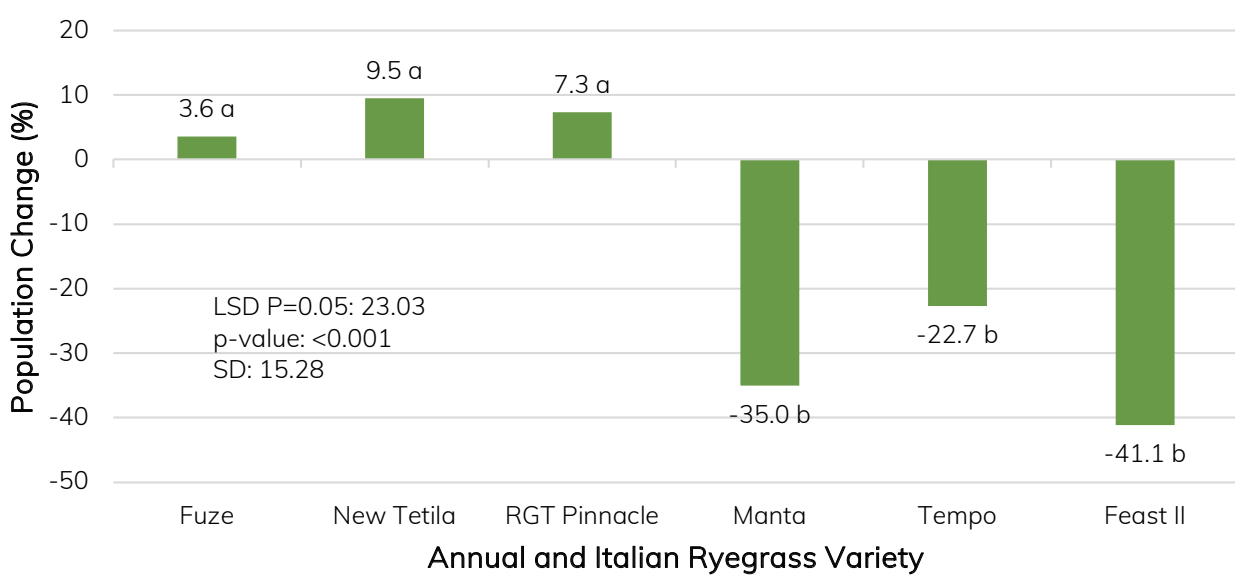


Figure 8. Change in annual and Italian ryegrass plant population from 2023 to 2024 (%). Means followed by the same letter do not significantly differ ($p>0.05$).

In 2024, the perennial ryegrass varieties produced between 935 (Avalon AR1) and 1513 kg DM/ha (Maxsyn NEA4), which were statistically different (Figure 5). The perennial ryegrass trial only had one cut for the year due to poor growth, which was attributed to restricted moisture and its poor drought tolerance.

The 2024 population ratings showed that Reason AR37 had a statistically lower score than all other varieties (Table 11). Reason AR37 dropped to a score of 65, whereas the other varieties were all above 70. All varieties decreased in population, with Reason statistically declining the most, by -13% (Figure 6).

Table 11. Population rating (out of 80) for perennial ryegrass varieties in 2024.

Variety	Population Rating	
Victorian	71.5	a
Avalon AR1	74.5	a
RGT Hustle AR1	70.8	a
Reason AR37	65	b
Base AR37	70.5	a
Maxsyn NEA4	72.5	a
LSD P=0.05	2.95	
p-value	<0.001	
CV (%)	3	

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

Annual & Italian Ryegrass

In 2022, there were no significant differences between varieties in the annual and Italian ryegrass trial for any of the cuts. All varieties produced between 6984 and 7711 kg DM/ha. In 2023, there was a significant difference between the annual and Italian ryegrass

varieties, with varieties producing between 2855 kg DM/ha (Feast II) and 3790 kg DM/ha (Fuze).

In 2024, the trial only had one cut for the year. There were no significant differences between varieties and DM production, with varieties producing between 219 (Manta) and 410 kg DM/ha (Tempo) (Figure 7).

The population ratings for 2024 showed very low populations for all varieties, with scores between 11.8 and 25.3 (Table 12). Interestingly, the annual ryegrass varieties increased in population compared to 2023, by 4 to 10% and the Italian ryegrasses had a large decrease in population, by 23 to 41% (Figure 8). Due to the poor DM production and population ratings in the trial's third year, it was decided the trial would be terminated and a new one sown in 2025.

Table 12. Population rating (out of 80) for annual ryegrass (ARG) and Italian ryegrass (IRG) varieties in 2024.

Variety	Population Rating	
Fuze (ARG)	16.5	-
New Tetila (ARG)	21.5	-
RGT Pinnacle (ARG)	11.8	-
Manta (IRG)	15.6	-
Tempo (IRG)	22.8	-
Feast II (IRG)	25.3	-
LSD P=0.05	12.3	
p-value	0.2351	
CV (%)	43	

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



Figure 9. Sub-clover trial on 23 August 2024.

Sub-clover

In 2022, the trial was only cut once to encourage seed set and burr formation. Bindoon was the highest-performing variety producing 1970 kg DM/ha. Campeda and Narrikup produced the lowest DM ~1300 kg DM/ha. In 2023, overall, Yanco produced the most amount of DM, 5313 kg DM/ha and Narrikup produced the least (1460 kg DM/ha).

In 2024, there was minimal to no growth from all the sub-clover varieties at the site (Figure 9). Therefore, no cuts were taken for the entirety of 2024, and any clover plants were left to flower and set seed. This was put down to below-average rainfall in 2024.

CONCLUSION

DM production for all species in 2024 was down compared to previous years mostly due to below-average rainfall. The phalaris varieties produced the most DM overall, proving to be tougher in a

dry season. In its third year, the annual and Italian ryegrass trial produced little DM, with poor population ratings and so the trial was terminated. Summer active tall fescue varieties produced less DM than the winter actives and declined in plant population. Phalaris varieties continue to persist well, showing how well suited they are to the soil and seasonal conditions at Rokewood.

ACKNOWLEDGMENTS

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