Outeniqua Research Farm

Western Cape Government
Agriculture
FOR YOU

Information Day 2025

Presented by: Research and Technology Development Services

DOA.Info@westerncape.gov.za | www.elsenburg.com |
#ForTheLoveOfAgriculture

Contents

Western Cape Government

FOR YOU

Agriculture

Outeniqua Research Farm Information Day 2025

17 September 2025 | Outeniqua Research Farm, George

08:30	Registration and biosecurity controls	
09:30	Welcoming (Programme Director)	Dr Ilse Trautmann
09:40	Opening with scripture	
09:50	Pasture cultivars and system fit – trial results for ryegrass, red clover and tall fescue	Sigrun Ammann
10:10	Pasture measurement: a waste of time or game changer?	Janke van der Colf
10:30	DESTiny: A Farmer's Tool for Profitable, Climate-Smart Dairy	Riana Reinecke
10:50	TEA BREAK	
11:10	Production of multi-species combinations – are there yield advantages?	Sigrun Ammann
11:30	Pasture IO: a space odyssey	Janke van der Colf
11:50	Foot and mouth disease and its prevention	Dr L Janse Van Rensburg
12:20	Concluding remarks	
12:40	LUNCH	

INTERESTED IN OUR BEEF RESEARCH?

Stop in with Bertus Myburgh at our display on your way out! Or take a stroll through some of our small plot trials at the same spot.

More Info

Janke.vandercolf@westerncape.gov.za

+ 27 82 7749164

DOA.Info@westerncape.gov.za | www.elsenburg.com | #ForTheLoveOfAgriculture

OR click below for direct links

2019 | 2020 | 2021 | 2022

2023 | 2024

Preface

As I write this final preface for the Outeniqua Information Day 2025 booklet after 22 years and a few months at the Western Cape Department of Agriculture, I am filled with deep gratitude for the time I could spend at this esteemed establishment and in the most vibrant sector in South Africa.

Over these two decades, I've had the privilege of witnessing the resilience of our sector, the brilliance of our scientists and farmers, and the unwavering commitment of all who believe in the future of sustainable agriculture.

In the past year the agricultural sector was challenged on many levels, including climate change and farming in a climate smart way to ensure sustainability and resource optimisation. But external challenges like the geopolitical situation, tariff hurdles, etc. made farming a real challenge, but our farmers stood the test of survival and drawing on support from various levels.

Our Department is committed to support our farmers, assist in increasing their production and lowering of input cost, and therefore the research portfolio is problem focused and farmer driven and we are committed to continue our support to our farmers, and in particular the farmers in the Southern Cape. We have also extended our impact with innovative tools like drone technology, spatial decision making tools and smart sensors, to name but a few.

This year our well known Outeniqua information day is again presented by a dedicated pasture and dairy research team who are not only experts in their respective fields, but who also know the researcher-farmer interface very well.

Please enjoy the day with us and thank you for your partnership with Outeniqua and its research team – jointly we can advance our productivity and sustainability.

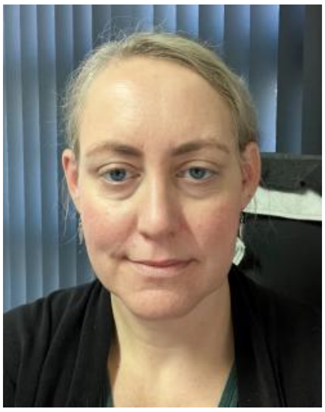
Contacts

Sigrun Ammann
Scientist: Pastures
Directorate Plant Science
Department of Agriculture
Western Cape Government
Tel: 044 803 3726 Cell no: 082 775 8836
Sigrun.Ammann@westerncape.gov.za

Janke van der Colf
Scientist: Pasture Systems
Directorate Plant Science
Department of Agriculture
Western Cape Government
Tel: 044 803 3716 Cell no: 082 774 9164
Janke.VanDerColf@westerncape.gov.za

Riana Reinecke
ASSET Research: Researcher
University of Stellenbsoch: PhD Candidate
Cell no:
riana@farmvision.co.za

Contacts



Dr Leana Janse van Rensburg
State Veterinarian: George
Directorate: Veterinary Services
Department of Agriculture
Western Cape Government
Tel: (044) 803 3771 Cell no: 083 797 0010
Leana.JanseVanRensburg@westerncape.gov.za

Dalena Lombard
Scientific technician
Directorate Plant Sciences
Department of Agriculture
Western Cape Government
Tel: (044) 803 3729 Cell no: 073 307 4287
Dalena.Lombard@westerncape.gov.za

Bertus Myburgh
Scientific technician
Directorate Animal Sciences
Department of Agriculture
Western Cape Government
Tel: (044) 803 3706 Cell no: 082 254 8369
Bertus.Myburgh@westerncape.gov.za

Contacts

Lethu Zulu
Scientific technician
Directorate Plant Sciences
Department of Agriculture
Western Cape Government
Tel: (044) 803 3714 Cell no: 083 673 9765
Lethu.Zulu@westerncape.gov.za

Pieter Cronje
Scientific technician
Directorate Animal Sciences
Department of Agriculture
Western Cape Government
Tel: (044) 803 3737 Cell no: 082 392 3612
Pieter.Cronje@westerncape.gov.za

Westerwolds ryegrass production results

Dalena Lombard[1], Sigrun Ammann[1], Lethu Zulu[1]
Western Cape Department of Agriculture, Research and Technology Development, Directorate Plant Sciences, Outeniqua Research Farm, P.O. Box 24, George 6530
*Dalena.Lombard@westerncape.gov.za

Introduction

Annual ryegrass (*Lolium multiflorum*) can be divided into Italian ryegrass and Westerwold ryegrass. Unlike Italian ryegrass, Westerwolds do not need cold night temperatures to induce flowering. An increase in day length and/or temperature will prompt flowering in the Westerwolds type. Westerwolds varieties are generally early flowering but some tend to persist longer. Therefore, Westerwolds ryegrass can also be divided into short and long season varieties. The very short season Westerwolds are true annuals going from vegetative to reproductive in the shortest possible time within the prevailing climatic conditions.

During 2024, a Westerwold small plot trial (Lm16) was conducted on the Outeniqua Research Farm. Determining production potential under irrigation was the main aim of the trial. Parameters measured and reported on included dry matter (DM) yield, rust, flowering and persistence.

Trial design and management

The trial was designed as a Randomised Block Design with four replications. Gross plot size was 2.1m x 6m and nett plot size was 1.3m x 4.7m. Diploids are sown at a rate of 25kg/ha and tetraploids at 30kg/ha, with rows spaced 15cm apart. The trial was harvested according to physiological stage, based on 3-leaf for ryegrass.

Plots are cut with a reciprocating mower (Agria) at a 5cm height. The material from the nett plot is sampled for the dry matter determination. Approximately 500g of the sample will be placed in a brown paper bag after which the weight of the cut strip will be determined. The sample in the brown paper bag will be weighed wet and dry to determine dry matter (DM) content. Samples are dried in an oven at 72°C for 72 hours to determine dry weight.

The trial was top-dressed with nitrogen and potassium after each harvest. Irrigation was applied weekly if necessary, as well as after a fertilization event. Over the course of the trial, 393mm of irrigation was received, as well as 818mm of rainfall, adding up to 1210mm.

Results and discussion

In terms of seasonal DM production for autumn and winter (see Table 1) Credence, Gapfiller, Maximus, Ribeye and Winterhawk had the highest ($p<0.05$) and similar production. None of these produced a yield in summer, and were also not in the top group for spring. Of all the varieties that produced the highest summer yield, Rampage was also in the top group for spring ($p<0.05$).

In previous Westerwold trials (Lm4 in 2017 and Lm8 in 2018), the variety Ribeye was also evaluated

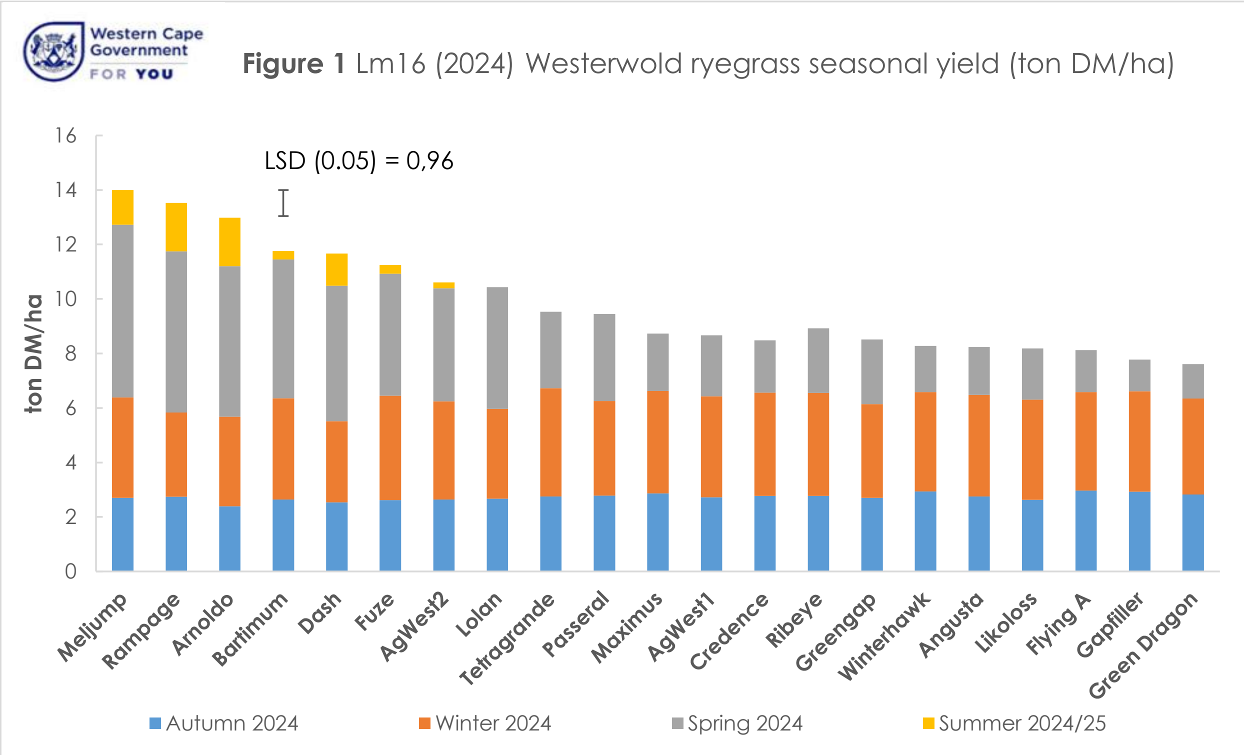
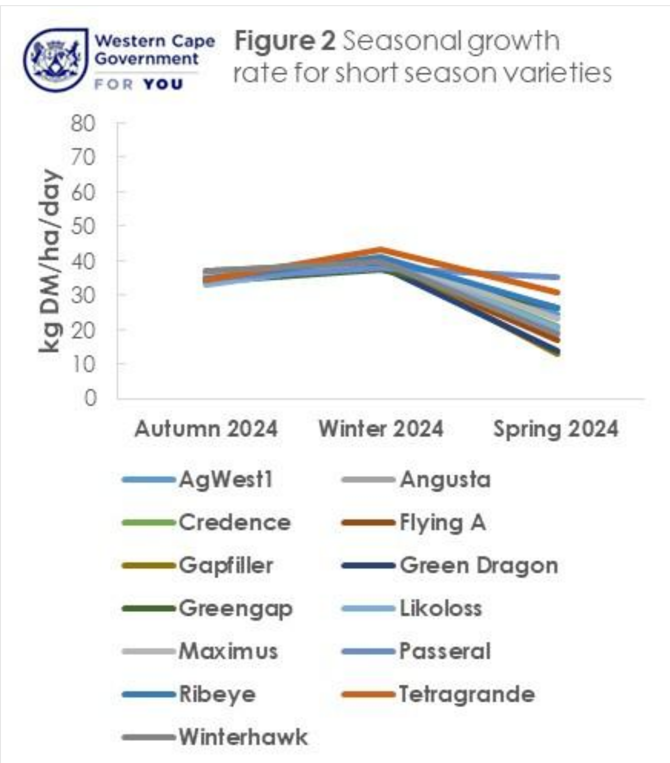
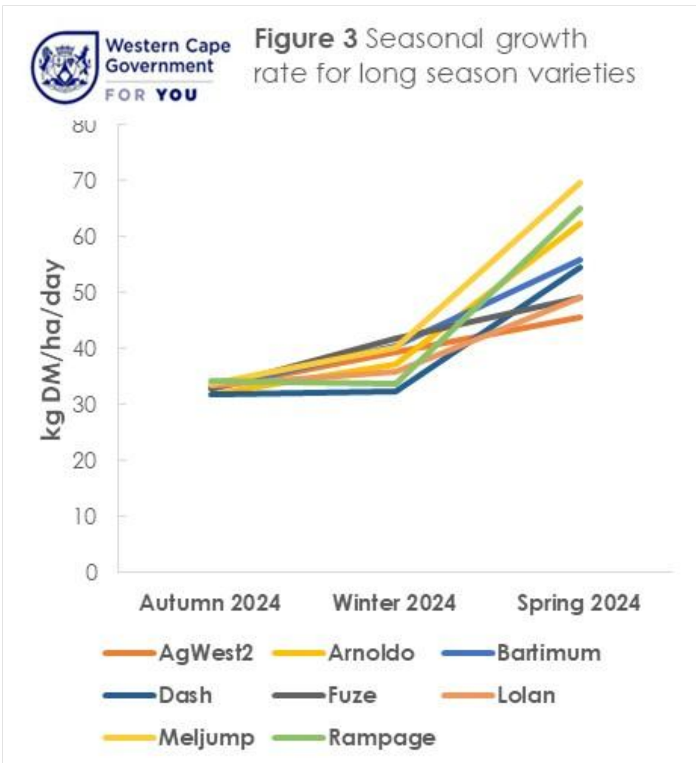


Figure 1. Seasonal yield (t DM/ha) of Westerwolds ryegrass (Lm16)

and produced 7.73 ton DM/ha in 2017 and 7.17 ton DM/ha in 2018, compared to 8.6 ton DM/ha in the LM16 (2024) trial. The average total production of all varieties for Lm4, Lm8 and Lm16 amounted to 13.26 (some varieties possibly being facultative Italian types), 9.34 and 9.82 ton DM/ha, respectively. This puts the current trial within the expected yield range.

Seasonal growth rate (kg DM/ha/day, see Table 2) ranged between 31.73 and 37.08 in autumn, 32.35 and 43.18 in winter, and 12.73 and 69.70 in spring. Figures 2 and 3 indicate the season where the short season varieties show a decline and the long season varieties shows an increase in growth rate. Table 8 can be used as a quick reference guide for production duration of different varieties.





Regarding the presence of rust (see Table 3), Angusta, Credence, Gapfiller, Green Dragon, Maximus and Winterhawk were unaffected for cuts 1 to 5 (Autumn and Winter). Rust was still not present at cut 6 for Angusta, Credence and Maximus.

All varieties flowered from cut 5 onwards (see Table 4). Flying A, Fuze, Lolan and Maximus already started flowering from cut 3 onwards. This indicates that they are very early flowering types, with the associated increase in NDF content.

In terms of sward density (see Table 5), Arnoldo, Meljump and Rampage had the highest ($p<0.05$) or similar to the highest sward density over all 8 cuts. The long season tetraploids had higher sward densities at cut 8 than the diploids. When considering the relationship between sward density and growth rate, figure 4 shows that when sward density declines, growth rate declines as well.

With regards to individual cuts (see Table 6), Flying A and Winterhawk had the highest ($p<0.05$) or similar to the highest DM production for each cut up to end of August (cuts 1-4), producing 6.17 and 6.14 ton DM/ha respectively for the cut 1-4 period. A total yield of 8.1 and 8.3 ton DM/ha was produced by Flying A and Winterhawk respectively, in 6 cuts. Meljump had the highest ($p<0.05$) or similar to the highest DM production of 8.32 ton DM/ha for cuts 5-8, with a total production of 14.0 ton DM/ha over 8 cuts. Meljump and Rampage had the highest ($p<0.05$) and similar to the highest total DM production (14.00 and 13.53 ton DM/ha, respectively).

Greengap had the highest ($p<0.05$) DM percentage over cuts 1-7 (see Table 7), while Passeral and Likoloss had the highest ($p<0.05$) or similar to the highest %DM for the same period. Agwest2 and Arnold had the highest ($p<0.05$) and Fuze similar to the highest %DM for cut 8. This was not directly correlated with the flowering percentage, and in the vegetative phase during cuts 1-3 it could possibly give an indication of the stem:leaf ratio.

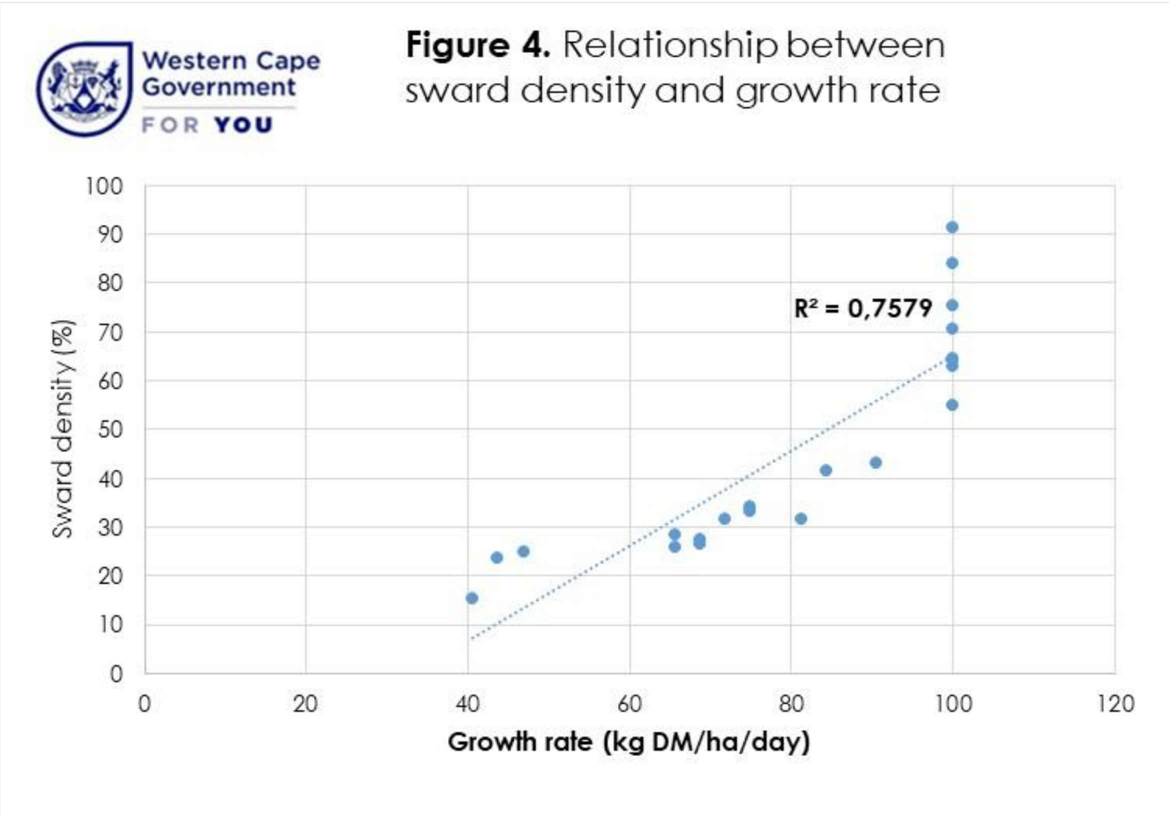


Figure 4. The relationship between sward density and growth rate for Westerwolds ryegrass

Table 1. Seasonal yield (t DM/ha) for Westerwolds ryegrass cultivars established in March 2024

Westerwold ryegrass (*Lolium multiflorum*) — Outeniqua Research Farm, Trial **Lm16**

Table 1: Seasonal yield (t DM/ha) — Planted 18 March 2024

Cultivar		Autumn 2024	Rank	Winter 2024	Rank	Spring 2024	Rank	Summer 2024	Rank	Total	Rank
AgWest1	**T**	2,72 ^{cdefg}	12	**3,71 ^{abcde}**	**8**	2,24 ^{hi}	13	0,00 ^{c}	9	8,68 ^{ghi}	12
AgWest2	**T**	2,64 ^{defg}	17	3,61 ^{bcdef}	14	4,15 ^{e}	8	0,21 ^{c}	7	10,63 ^{de}	7
Angusta	**T**	2,76 ^{bcde}	10	**3,73 ^{abcde}**	**6**	1,75 ^{ijkl}	17	0,00 ^{c}	8	8,20 ^{hij}	17
Arnoldo	**T**	2,55 ^{fg}	20	3,43 ^{efg}	18	5,68 ^{b}	3	**1,77 ^{a}**	**2**	12,98 ^{b}	3
Bartimum	**T**	2,64 ^{defg}	16	**3,72 ^{abcde}**	**7**	5,09 ^{c}	4	0,32 ^{c}	6	11,78 ^{c}	4
Credence	**T**	**2,78 ^{abcde}**	**8**	**3,79 ^{abc}**	**3**	1,92 ^{hijk}	15	0,00 ^{c}	10	8,58 ^{ghi}	14
Dash	**T**	2,54 ^{g}	21	2,98 ^{h}	21	4,97 ^{cd}	5	**1,57 ^{ab}**	**3**	11,40 ^{cd}	5
Flying A	**D**	**2,97 ^{a}**	**1**	3,62 ^{bcdef}	13	1,55 ^{klm}	19	0,00 ^{c}	16	8,10 ^{hij}	19
Fuze	**D**	2,62 ^{efg}	19	**3,83 ^{ab}**	**2**	4,48 ^{de}	6	0,32 ^{c}	5	11,25 ^{cde}	6
Gapfiller	**T**	**2,93 ^{ab}**	**3**	**3,69 ^{abcde}**	**9**	1,16 ^{m}	21	0,00 ^{c}	18	7,75 ^{ij}	20
Green Dragon	**T**	**2,82 ^{abcd}**	**5**	3,53 ^{bcdef}	15	1,26 ^{lm}	20	0,00 ^{c}	11	7,60 ^{j}	21
Greengap	**T**	2,70 ^{cdefg}	13	3,44 ^{defg}	17	2,38 ^{gh}	12	0,00 ^{c}	12	8,50 ^{hij}	15
Likoloss	**D**	2,63 ^{defg}	18	**3,68 ^{abcde}**	**11**	1,87 ^{ijk}	16	0,00 ^{c}	13	8,20 ^{hij}	18
Lolan	**T**	2,67 ^{defg}	15	3,30 ^{fgh}	19	4,46 ^{e}	7	0,00 ^{c}	14	10,43 ^{ef}	8
Maximus	**T**	**2,87 ^{abc}**	**4**	**3,76 ^{abcd}**	**5**	2,11 ^{hij}	14	0,00 ^{c}	15	8,73 ^{gh}	11
Meljump	**T**	2,70 ^{cdefg}	14	**3,68 ^{abcde}**	**10**	**6,34 ^{a}**	**1**	1,27 ^{b}	4	**14,0 ^{a}**	**1**
Passeral	**T**	**2,78 ^{abcde}**	**6**	3,47 ^{cdef}	16	3,20 ^{f}	9	0,00 ^{c}	17	9,48 ^{fg}	10
Rampage	**T**	2,74 ^{cdef}	11	3,10 ^{gh}	20	**5,92 ^{ab}**	**2**	**1,77 ^{a}**	**1**	**13,5 ^{ab}**	**2**
Ribeye	**D**	**2,78 ^{abcde}**	**7**	**3,77 ^{abcd}**	**4**	2,38 ^{gh}	11	0,00 ^{c}	19	8,58 ^{ghi}	13
Tetragrande	**T**	2,76 ^{bcde}	9	**3,97 ^{a}**	**1**	2,80 ^{fg}	10	0,00 ^{c}	20	9,53 ^{fg}	9
Winterhawk	**D**	**2,94 ^{ab}**	**2**	**3,65 ^{abcde}**	**12**	1,69 ^{jkl}	18	0,00 ^{c}	21	8,30 ^{hij}	16
LSD (0.05)		0,19		0,34		0,50		0,35		0,96	
CV%		4,9		6,7		11,0		88,2		6,9	

Yields with the same letter are statistically similar within a column

Table 2. Seasonal growth rates (t DM/ha) for Westerwolds ryegrass cultivars established in March 2024

Westerwold ryegrass (*Lolium multiflorum*) Outeniqua Research Farm, Trial **Lm16**

Table 2: Seasonal growth rate (kg DM/ha/day) Planted 18 March 2024

		Autumn 2024	Rank	Winter 2024	Rank	Spring 2024	Rank	Summer 2024	Rank
AgWest1	**T**	34,00 cdefg	12	**40,33 abcde**	**8**	24,60 hi	13		
AgWest2	**T**	32,93 defg	17	39,23 bcdef	14	45,60 e	8		
Angusta	**T**	34,43 bcde	10	**40,55 abcde**	**6**	19,23 ijkl	17		
Arnoldo	**T**	31,85 fg	20	37,28 efg	18	62,43 b	3		
Bartimum	**T**	32,95 defg	16	**40,45 abcde**	**7**	55,95 c	4		
Credence	**T**	34,52 bcde	8	**41,20 abc**	**3**	21,13 hijk	15		
Dash	**T**	31,73 g	21	32,35 h	21	54,59 cd	5		
Flying A	**D**	**37,08 a**	**1**	39,30 bcdef	13	17,00 klm	19		
Fuze	**D**	32,78 efg	19	**41,65 ab**	**2**	49,20 de	6		
Gapfiller	**T**	**36,60 ab**	**3**	**40,05 abcde**	**9**	12,73 m	21		
Green Dragon	**T**	**35,25 abcd**	**5**	38,30 bcdef	15	13,85 lm	20		
Greengap	**T**	33,78 cdefg	13	37,38 def	17	26,13 gh	11		
Likoloss	**D**	32,88 defg	18	**40,03 abcde**	**11**	20,55 ijk	16		
Lolan	**T**	33,40 defg	15	35,83 fgh	19	49,03 e	7		
Maximus	**T**	**35,88 abc**	**4**	**40,80 abcde**	**5**	23,18 hij	14		
Meljump	**T**	33,75 cdefg	14	**40,03 abcde**	**10**	**69,70 a**	**1**		
Passeral	**T**	**34,75 abcde**	**6**	37,70 cdef	16	35,15 f	9		
Rampage	**T**	34,20 cdef	11	33,68 gh	20	**65,00 ab**	**2**		
Ribeye	**D**	**34,73 abcde**	**7**	**41,05 abcd**	**4**	26,10 gh	12		
Tetragrande	**T**	34,48 bcde	9	**43,18 a**	**1**	30,78 fg	10		
Winterhawk	**D**	**36,80 ab**	**2**	**39,65 abcde**	**12**	18,55 jkl	18		
LSD (0.05)		2,38		3,69		5,48			
CV%		4,9		11,00		88,2			

Yields with the same letter are statistically similar within a column

Table 3. Rust incidence % (ratings based) for Westerwolds ryegrass cultivars established in March 2024

Westerwold ryegrass (*Lolium multiflorum*) Outeniqua Research Farm, Trial **Lm16**

Table 3: Rust % (ratings based) Planted 18 March 2024

		Cut 1 (2/5/2024)	Cut 2 (27/5/2024)	Cut 3 (15/7/2024)	Cut 4 (20/8/2024)	Cut 5 (17/9/2024)	Cut 6 (23/10/2024)	Cut 7 (25/11/2024)	Cut 8 (10/1/2025)
AgWest1	**T**	0	0	9,38 def	0	0	6,25 efg	0,00 e	-
AgWest2	**T**	0	0	25 cd	0	0	21,9 bcd	15,6 bcde	**100,0 a**
Angusta	**T**	0	0	0,00 f	0	0	0,00 g	25,0 bcd	-
Arnoldo	**T**	0	0	21,9 cd	0	0	34,4 b	3,13 e	**96,9 a**
Bartimum	**T**	0	0	46,9 b	0	0	21,88 bcd	12,5 cde	**100,0 a**
Credence	**T**	0	0	0,00 f	0	0	0,00 g	12,5 cde	-
Dash	**T**	0	0	**75,0 a**	0	0	**84,4 a**	12,5 cde	**100,0 a**
Flying A	**D**	0	0	3,13 ef	0	0	0,00 g	-	-
Fuze	**D**	0	0	9,38 def	0	0	6,25 efg	12,5 cde	**100,0 a**
Gapfiller	**T**	0	0	0,00 f	0	0	6,25 efg	-	-
Green Dragon	**T**	0	0	0,00 f	0	0	3,13 fg	-	-
Greengap	**T**	0	0	18,8 cde	0	0	6,25 efg	25,0 bcd	-
Likoloss	**D**	0	0	28,1 c	0	0	9,38 defg	**50,0 a**	-
Lolan	**T**	0	0	21,9 cd	0	0	28,13 bc	25,0 bcd	**100,0 a**
Maximus	**T**	0	0	0,00 f	0	0	0,00 g	18,8 bcde	-
Meljump	**T**	0	0	21,9 cd	0	0	21,9 bcd	12,5 cde	**93,8 a**
Passeral	**T**	0	0	25,0 cd	0	0	18,8 cde	**34,4 ab**	-
Rampage	**T**	0	0	9,38 def	0	0	25,0 bc	9,38 de	68,8 b
Ribeye	**D**	0	0	9,38 def	0	0	3,13 fg	6,25 de	-
Tetragrande	**T**	0	0	3,13 ef	0	0	15,6 cdef	29,2 bc	-
Winterhawk	**D**	0	0	0,00 f	0	0	3,13 fg	-	-
LSD (0.05)				17,73			14,24	19,36	11,617
CV%				80,2			67,0	66,1	6,2

Yields with the same letter are statistically similar within a column

Table 4. Flowering % (ratings based) for Westerwolds ryegrass cultivars established in March 2024

Westerwold ryegrass (*Lolium multiflorum*) — Outeniqua Research Farm, Trial **Lm16**

Table 4: Flowering % (ratings based) — Planted 18 March 2024

		Cut 1 (2/5/2024)	Cut 2 (27/5/2024)	Cut 3 (15/7/2024)	Cut 4 (20/8/2024)	Cut 5 (17/9/2024)	Cut 6 (23/10/2024)	Cut 7 (25/11/2024)	Cut 8 (10/1/2025)
AgWest1	**T**	0	0	**0** ^{a}	**71,9** ^{abc}	**87,5** ^{a}	**87,5** ^{a}	**100** ^{a}	-
AgWest2	**T**	0	0	**0** ^{a}	21,9 ^{fgh}	**84,4** ^{a}	**87,5** ^{a}	**93,8** ^{a}	**100** ^{a}
Angusta	**T**	0	0	**0** ^{a}	**87,5** ^{a}	**87,5** ^{a}	**87,5** ^{a}	**100,0** ^{a}	-
Arnoldo	**T**	0	0	**0** ^{a}	6,25 ^{hi}	**84,4** ^{a}	**87,5** ^{a}	**93,8** ^{a}	**100** ^{a}
Bartimum	**T**	0	0	**0** ^{a}	28,1 ^{fg}	**87,5** ^{a}	**87,5** ^{a}	**96,9** ^{a}	**100** ^{a}
Credence	**T**	0	0	**0** ^{a}	65,6 ^{bcd}	**87,5** ^{a}	**87,5** ^{a}	**100** ^{a}	-
Dash	**T**	0	0	**0** ^{a}	0,00 ^{i}	18,8 ^{c}	**87,5** ^{a}	78,1 ^{bc}	**100** ^{a}
Flying A	**D**	0	0	**3,13** ^{a}	50,0 ^{de}	**87,5** ^{a}	**87,5** ^{a}	-	-
Fuze	**D**	0	0	**3,13** ^{a}	15,63 ^{fghi}	65,6 ^{b}	**87,5** ^{a}	**90,6** ^{ab}	**100** ^{a}
Gapfiller	**T**	0	0	**0** ^{a}	59,4 ^{bcd}	**87,5** ^{a}	**87,5** ^{a}	-	-
Green Dragon	**T**	0	0	**0** ^{a}	**87,5** ^{a}	**87,5** ^{a}	**87,5** ^{a}	-	-
Greengap	**T**	0	0	**0** ^{a}	18,8 ^{fghi}	**87,5** ^{a}	**87,5** ^{a}	**100** ^{a}	-
Likoloss	**D**	0	0	**0** ^{a}	**68,8** ^{abcd}	**87,5** ^{a}	**87,5** ^{a}	**100** ^{a}	-
Lolan	**T**	0	0	**3,13** ^{a}	31,3 ^{ef}	**84,4** ^{a}	**87,5** ^{a}	**90,6** ^{ab}	**100** ^{a}
Maximus	**T**	0	0	**3,13** ^{a}	56,3 ^{cd}	**84,4** ^{a}	**87,5** ^{a}	**100** ^{a}	-
Meljump	**T**	0	0	**0** ^{a}	9,38 ^{ghi}	**78,1** ^{a}	**87,5** ^{a}	**93,8** ^{a}	**100** ^{a}
Passeral	**T**	0	0	**0** ^{a}	9,38 ^{ghi}	**78,1** ^{a}	**87,5** ^{a}	**100** ^{a}	-
Rampage	**T**	0	0	**0** ^{a}	0,00 ^{i}	28,1 ^{c}	**84,4** ^{b}	71,9 ^{c}	**100** ^{a}
Ribeye	**D**	0	0	**0** ^{a}	56,3 ^{cd}	**87,5** ^{a}	**87,5** ^{a}	**100** ^{a}	-
Tetragrande	**T**	0	0	**0** ^{a}	56,3 ^{cd}	**87,5** ^{a}	**87,5** ^{a}	**100** ^{a}	-
Winterhawk	**D**	0	0	**0** ^{a}	**78,1** ^{ab}	**87,5** ^{a}	**87,5** ^{a}	-	-
LSD (0.05)				3,76	21,48	9,45	1,93	12,66	0
CV%				446,7	36,3	8,5	1,6	7,9	0

Yields with the same letter are statistically similar within a column

Table 5. Sward density % (ratings based) for Westerwolds ryegrass cultivars established in March 2024

Western Cape Government FOR YOU

Westerwold ryegrass (*Lolium multiflorum*) — Outeniqua Research Farm, Trial **Lm16**

Table 5: Sward density % (ratings based) — Planted 18 March 2024

		Cut 1 (2/5/2024)	Cut 2 (27/5/2024)	Cut 3 (15/7/2024)	Cut 4 (20/8/2024)	Cut 5 (17/9/2024)	Cut 6 (23/10/2024)	Cut 7 (25/11/2024)	Cut 8 (10/1/2025)
AgWest1	**T**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	84,4 ^{cd}	81,3 ^{bcd}	12,5 ^{cde}	0 ^{d}
AgWest2	**T**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**93,8** ^{a}	12,5 ^{cd}
Angusta	**T**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	87,5 ^{bc}	65,6 ^{e}	3,13 ^{de}	0 ^{d}
Arnoldo	**T**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**71,9** ^{ab}
Bartimum	**T**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	28,1 ^{c}
Credence	**T**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**96,9** ^{ab}	84,4 ^{cd}	68,8 ^{de}	9,4 ^{cde}	0 ^{d}
Dash	**T**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	59,4 ^{b}
Flying A	**D**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**96,9** ^{ab}	81,3 ^{cde}	46,9 ^{f}	- -	0 ^{d}
Fuze	**D**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**87,5** ^{a}	12,5 ^{cd}
Gapfiller	**T**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	78,1 ^{de}	40,6 ^{f}	- -	0 ^{d}
Green Dragon	**T**	**100** ^{a}	**100** ^{a}	**100** ^{a}	93,8 ^{b}	68,8 ^{f}	43,8 ^{f}	- -	0 ^{d}
Greengap	**T**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	87,5 ^{bc}	75,0 ^{cde}	18,8 ^{c}	0 ^{d}
Likoloss	**D**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	75,0 ^{ef}	65,6 ^{e}	9,38 ^{cde}	0 ^{d}
Lolan	**T**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**96,9** ^{a}	**100** ^{a}	**93,8** ^{a}	15,6 ^{cd}
Maximus	**T**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**96,9** ^{ab}	87,5 ^{bc}	75,0 ^{cde}	6,25 ^{cde}	0 ^{d}
Meljump	**T**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**75,0** ^{ab}
Passeral	**T**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**93,8** ^{ab}	**90,63** ^{ab}	53,1 ^{b}	0 ^{d}
Rampage	**T**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**93,8** ^{a}
Ribeye	**D**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	84,4 ^{cd}	71,9 ^{cde}	15,6 ^{cd}	0 ^{d}
Tetragrande	**T**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	**96,9** ^{a}	84,4 ^{bc}	18,8 ^{c}	0 ^{d}
Winterhawk	**D**	**100** ^{a}	**100** ^{a}	**100** ^{a}	**100** ^{a}	87,5 ^{bc}	68,8 ^{de}	- -	0 ^{d}
LSD (0.05)		0	0	0	3,78	7,46	12,89	12,54	23,20
CV%		0	0	0	2,7	5,9	11,4	19,8	76,8

Yields with the same letter are statistically similar within a column

Table 6. Yield (t DM/ha) on a per cut basis for Westerwolds ryegrass cultivars established in March 2024

Western Cape Government FOR YOU

Westerwold ryegrass (*Lolium multiflorum*) Outeniqua Research Farm, Trial **Lm16**

Table 6: Yield (t DM/ha) individual harvests Planted 18 March 2024

		Cut 1 (2/5/2024)	Cut 2 (27/5/2024)	Cut 3 (15/7/2024)	Cut 4 (20/8/2024)	Cut 5 (17/9/2024)	Cut 6 (23/10/2024)	Cut 7 (25/11/2024)	Cut 8 (10/1/2025)	Total yield
AgWest1	**T**	1,10 ^{cdefg}	1,62 ^{cdefgh}	**1,65** ^{abcdef}	1,52 ^{bcde}	1,40 ^{defg}	1,14 ^{hij}	0,50 ^{ef}	- -	8,68 ^{ghi}
AgWest2	**T**	1,08 ^{cdefg}	1,56 ^{efgh}	**1,57** ^{abcdef}	1,42 ^{cdef}	1,58 ^{bcd}	1,98 ^{e}	1,22 ^{d}	0,84 ^{bc}	10,63 ^{de}
Angusta	**T**	1,15 ^{bcdef}	1,61 ^{cdefgh}	**1,66** ^{abcde}	**1,58** ^{abcd}	1,04 ^{hij}	1,03 ^{jhi}	0,38 ^{f}	- -	8,20 ^{hij}
Arnoldo	**T**	0,95 ^{gh}	1,60 ^{defgh}	1,45 ^{ef}	1,29 ^{fg}	**1,75** ^{abc}	2,71 ^{bc}	**1,91** ^{ab}	**1,77** ^{a}	12,98 ^{b}
Bartimum	**T**	1,15 ^{bcdef}	1,49 ^{gh}	1,50 ^{cdef}	1,50 ^{bcde}	**1,87** ^{a}	2,33 ^{d}	1,64 ^{bc}	0,63 ^{c}	11,78 ^{c}
Credence	**T**	1,13 ^{bcdef}	**1,74** ^{abcd}	**1,73** ^{ab}	**1,61** ^{abc}	1,18 ^{fghi}	0,95 ^{hij}	0,34 ^{f}	- -	8,58 ^{ghi}
Dash	**T**	0,94 ^{gh}	1,60 ^{defgh}	1,44 ^{f}	1,04 ^{h}	1,29 ^{efgh}	2,54 ^{cd}	1,66 ^{bc}	**1,57** ^{a}	11,40 ^{cd}
Flying A	**D**	**1,21** ^{abc}	**1,76** ^{abc}	**1,67** ^{abcd}	**1,53** ^{abcde}	1,08 ^{hij}	0,90 ^{ij}	- -	- -	8,10 ^{hij}
Fuze	**D**	1,01 ^{fgh}	1,62 ^{cdefgh}	**1,63** ^{abcdef}	**1,60** ^{abc}	1,53 ^{bcde}	2,31 ^{d}	1,23 ^{d}	**1,27** ^{ab}	11,25 ^{cde}
Gapfiller	**T**	**1,29** ^{ab}	1,64 ^{cdefg}	**1,78** ^{a}	1,51 ^{bcde}	0,99 ^{ij}	0,56 ^{k}	- -	- -	7,75 ^{ij}
Green Dragon	**T**	**1,34** ^{a}	1,48 ^{h}	**1,69** ^{abc}	**1,57** ^{abcd}	0,68 ^{k}	0,85 ^{jk}	- -	- -	7,60 ^{j}
Greengap	**T**	0,88 ^{h}	**1,83** ^{a}	1,52 ^{bcdef}	1,37 ^{ef}	1,40 ^{defg}	1,19 ^{ghi}	0,67 ^{ef}	- -	8,50 ^{hij}
Likoloss	**D**	1,04 ^{defgh}	1,59 ^{defgh}	**1,62** ^{abcdef}	**1,72** ^{a}	0,87 ^{jk}	0,93 ^{hij}	0,55 ^{ef}	- -	8,20 ^{hij}
Lolan	**T**	1,14 ^{bcdef}	1,54 ^{fgh}	1,47 ^{def}	1,23 ^{fg}	1,51 ^{cde}	2,26 ^{de}	1,29 ^{cd}	- -	10,43 ^{ef}
Maximus	**T**	1,14 ^{bcdef}	**1,81** ^{ab}	**1,77** ^{a}	**1,53** ^{abcde}	1,63 ^{ghi}	1,23 ^{gh}	0,36 ^{f}	- -	8,73 ^{gh}
Meljump	**T**	1,11 ^{cdefg}	1,59 ^{defgh}	**1,58** ^{abcdef}	1,39 ^{def}	**1,80** ^{ab}	**3,03** ^{ab}	**2,22** ^{a}	**1,27** ^{ab}	**14,00** ^{a}
Passeral	**T**	1,02 ^{efgh}	**1,76** ^{abc}	**1,64** ^{abcdef}	1,27 ^{fg}	1,43 ^{defg}	1,55 ^{f}	0,79 ^{e}	- -	9,48 ^{fg}
Rampage	**T**	1,04 ^{defgh}	**1,70** ^{abcde}	1,44 ^{f}	1,11 ^{gh}	1,39 ^{defg}	**3,29** ^{a}	1,79 ^{b}	**1,77** ^{a}	**13,53** ^{ab}
Ribeye	**D**	1,16 ^{bcdef}	1,67 ^{bcdef}	**1,71** ^{abc}	**1,61** ^{ab}	1,16 ^{ghi}	1,13 ^{hij}	0,54 ^{ef}	- -	8,58 ^{ghi}
Tetragrande	**T**	**1,18** ^{abcde}	1,58 ^{defgh}	**1,78** ^{a}	**1,63** ^{ab}	1,45 ^{def}	1,49 ^{fg}	0,58 ^{ef}	- -	9,53 ^{fg}
Winterhawk	**D**	**1,19** ^{abcd}	**1,76** ^{abc}	**1,66** ^{abcd}	**1,53** ^{abcde}	1,16 ^{ghi}	0,98 ^{hij}	- -	- -	8,30 ^{hij}
LSD (0.05)		0,17	3,94	0,21	0,19	0,27	0,32	0,39	0,54	0,96
CV%		11,0	6,70	9,20	9,30	14,70	13,70	19,80	16	6,90

Yields with the same letter are statistically similar within a column

Table 7. Dry matter content (%) on a per cut basis for Westerwolds ryegrass cultivars established in March 2024

Western Cape Government FOR YOU

Westerwold ryegrass (*Lolium multiflorum*) Outeniqua Research Farm, Trial **Lm16**

Table 7: DM content (%) individual harvests Planted 18 March 2024

		Cut 1 (2/5/2024)	Cut 2 (27/5/2024)	Cut 3 (15/7/2024)	Cut 4 (20/8/2024)	Cut 5 (17/9/2024)	Cut 6 (23/10/2024)	Cut 7 (25/11/2024)	Cut 8 (10/1/2025)
AgWest1	**T**	9,95 bcdef	9,38 bc	14,4 cdef	13,5 bcd	15,4 defgh	19,2 cde	20,3 cde	-
AgWest2	**T**	9,38 ef	9,28 bcd	14,5 cdef	14,1 bc	15,2 efgh	18,1 efg	19,9 cde	**32,40 a**
Angusta	**T**	9,68 cdef	9,35 bc	14,8 bcde	13,9 bc	16,1 cde	**21,2 a**	20,7 bcd	-
Arnoldo	**T**	**10,2 abcde**	9,05 cde	14,5 cdef	13,5 bcd	15,7 defg	18,4 def	20,2 cde	**33,83 a**
Bartimum	**T**	9,43 def	8,80 cde	13,6 fg	13,3 cd	14,5 h	17,2 fgh	19,4 de	28,75 bcd
Credence	**T**	**10,2 abcde**	9,30 bcd	14,2 def	13,7 bcd	15,8 defg	18,3 ef	20,9 bcd	- -
Dash	**T**	9,53 cdef	8,53 e	12,9 g	12,4 d	15,2 efgh	17,3 fgh	18,5 e	**30,87 abc**
Flying A	**D**	**10,4 abc**	**10,2 a**	**16,2 a**	**16,1 a**	18,2 b	**20,7 ab**	-	-
Fuze	**D**	**10,3 abcd**	**9,90 ab**	**15,4 abc**	14,4 bc	18,0 b	**20,4 abc**	**21,1 abcd**	**32,10 ab**
Gapfiller	**T**	9,45 def	9,00 cde	14,1 defg	14,4 bc	16,8 c	**20,7 ab**	-	-
Green Dragon	**T**	9,15 f	8,45 e	13,6 efg	13,8 bc	16,1 cde	19,3 cde	-	-
Greengap	**T**	**11,1 a**	**10,3 a**	**16,3 a**	**16,2 a**	**19,4 a**	**21,1 a**	**22,8 a**	-
Likoloss	**D**	**10,7 ab**	**10,1 a**	**16,6 a**	**16,3 a**	**19,3 a**	**21,1 a**	**21,4 abc**	-
Lolan	**T**	9,35 ef	9,33 bc	14,4 cdef	14,3 bc	15,8 cdef	17,5 fgh	19,8 cde	-
Maximus	**T**	9,85 bcdef	9,05 cde	14,7 bcdef	14,5 bc	15,9 cdef	19,1 de	**21,5 abc**	-
Meljump	**T**	10,1 bcde	9,40 bc	14,9 bcd	14,6 b	14,8 gh	16,6 h	19,8 cde	28,45 cd
Passeral	**T**	**10,8 ab**	**10,3 a**	**16,4 a**	**16,2 a**	**18,7 ab**	**21,5 a**	**22,4 ab**	-
Rampage	**T**	10,0 bcdef	9,28 bcd	13,9 defg	13,5 bcd	15,5 defgh	17,0 gh	19,4 de	26,03 d
Ribeye	**D**	10,0 bcdef	**10,3 a**	**15,8 ab**	**16,6 a**	**18,8 ab**	**21,5 a**	**21,6 abc**	-
Tetragrande	**T**	9,55 cdef	8,93 cde	14,4 cdef	13,6 bcd	15,0 fgh	19,6 bcd	**21,1 abcd**	-
Winterhawk	**D**	9,15 f	8,68 de	13,5 fg	13,4 bcd	16,28 cd	20,40 abc	-	-
LSD (0.05)		0,91	0,64	1,18	1,31	1,00	1,29	1,83	3,54
CV%		6,5	4,9	5,7	6,4	4,3	4,7	5,2	5,1

Yields with the same letter are statistically similar within a column

Table 8 Westerwold varieties grouped according to production duration.

Short season		Long season	
Variety	**Type**	**Variety**	**Type**
AgWest1	T	AgWest 2	T
Angusta	T	Arnoldo	T
Credence	T	Bartimum	T
Flying A	D	Dash	T
Gapfiller	T	Fuze	D
Green Dragon	T	Lolan	T
Greengap	T	Meljump	T
Likoloss	D	Rampage	T
Maximus	T		
Passeral	T		
Ribeye	D		
Tetragrande	T		
Winterhawk	D		

T = Tetraploid D = Diploid

Conclusions

Westerwolds ryegrass varieties can be grouped into two categories, namely short season and long season. The highest producing varieties in terms of autumn and winter were short season varieties. Short season varieties were also less prone to rust. Flowering was not affected by production duration, which was expected due to Westerwolds ryegrass depending on daylength to flower. However, all flowering started with increasing daylength. Long season varieties had a higher sward density. Growth rate declines when sward density declines. Short season Westerwolds can be taken advantage of as an additional winter pasture where summer producing pasture is planted. A disadvantage can be seed drop if the defoliation rotation is not carefully managed to prevent seed set.

References

Ammann SB. 2018. Ryegrass breeding and ryegrass types. Pasture course 2018. Outeniqua Research Farm, Directorates Plant and Animal Sciences. Pp 41-42.

Donaldson CH. 2001. A practical guide to planted pastures. Chapter 4, p 33.

Lombard MM & Ammann SB. 2019. Westerwolds ryegrass production results. Outeniqua Research Farm Information Day 2019, Milk production from planted pastures. Held on 18 September 2019

Snyman HA. 2012. Gids tot die volhoubare produksie van weiding. Chapter 15, p 399.

Italian ryegrass cultivar evaluation results for 2023 to 2024

Sigrun Ammann*, Dalena Lombard, Lethu Zulu

Western Cape Department of Agriculture, Research and Technology Development, Directorate Plant Sciences, Outeniqua Research Farm, P.O. Box 24, George 6530
*Sigrun.ammann@westerncape.gov.za

Introduction

The Italian ryegrass (Lolium multiflorum) elite cultivar evaluation trial, Lm14, was planted 13 March 2023 at the Outeniqua Research Farm. The aim of the trial is to evaluate recent Italian ryegrass cultivars being used for intensive dairy pastures or upcoming cultivars that are about to enter the market. This trial provides local data to assist farmers with choosing cultivars best suited to the region and to their specific use of Italian ryegrass in their pasture systems. Some of the information can be used for system fit, especially the data related to flowering behaviour and persistence as reflected in the sward density data. Seasonal yield distribution can also influence system fit. Preferably the cultivars evaluated in this trial should be ones that persist for at least a 12-month period, preferably 15 months, which we refer to as long duration Italian ryegrass cultivars. There is however still a use for the shorter duration cultivars in combination with other species or cultivars to fill certain gaps i.e. as a component of a mixed pasture system, depending on the requirements within a specific pasture system.

Since almost all ryegrass cultivars are imported, this data provides insight into the genetic potential and adaption, mainly for the southern Cape coastal region. This data is specific for March 2023 to Dec 2024 (final harvest 13 January 2025) which covers the full duration of the trial. For previous data refer to the Outeniqua Information Day booklets released annually and available on www.elsenburg.com and will give an indication of how cultivars perform in different years of establishment.

Cultivars evaluated

The trial consisted of 17 cultivars of which two are all Italian type festuloliums. Of these cultivars eight are diploid and nine are tetraploid.

Italian diploid: Appeal, Barcrespo, Bond, Icon, Itaka, Sukari, Tabu+, Vibe

Italian tetraploid: Barmultra II, Barnaël, Danergo, Elvis, Lush, SuperCharge, Thumpa

Festulolium Italian type tetraploid: Perseus, Rockstar

Parameters reported in this article

- Total DM yield
- Seasonal DM yield
- Flowering behaviour
- Rust incidence
- Persistence / sward density

Trial design and management

The trial was designed as a Randomised Block Design with three replications. Gross plot size is 2.1m x 6m and net plot size is 1.3m x 4.7m. Diploids are sown at a rate of 25kg/ha and tetraploids at

30kg/ha, with rows spaced 15cm apart. The trial is harvested according to physiological stage based on 3-leaf for ryegrass. In spring canopy closure is considered before leaf stage to avoid a negative impact on daughter tiler development. Since leaf emergence rate is mainly driven by temperature, as well as radiation intensity, water and nutrient availability (Chapman 2016), most cultivars reach the 3-leaf stage at a similar time.

Plots are cut with a reciprocating mower (Agria) at 5cm height. The material from the net plot is sampled for the dry matter determination with an approximately 500g wet weight sample and the rest of the material is raked together and weighed. Samples are weighed and oven dried at 70˚C.

The trials were top-dressed with nitrogen fertilizer after each harvest, and potassium fertilizer to account for nutrient removal, since all material is removed from the trial.

Irrigation was applied weekly if necessary to add to the rainfall and after fertilization. Irrigation applied during the duration of the trial was 738mm and the rainfall was 1688mm adding up to a total of 2426mm. The irrigation during year 1 was 346mm and the rainfall 870mm (March 2023 to February 2024) and for the remainder of the trial March 2024 to January 2025 was 392mm irrigation and 818mm rainfall.

Results

Total yield

Total yield (Table 1) is important, especially on farms that have the means to conserve the surplus as silage for later use. The establishment and input costs are also similar regardless of yield, hence the importance of choosing the cultivars with the best yield.

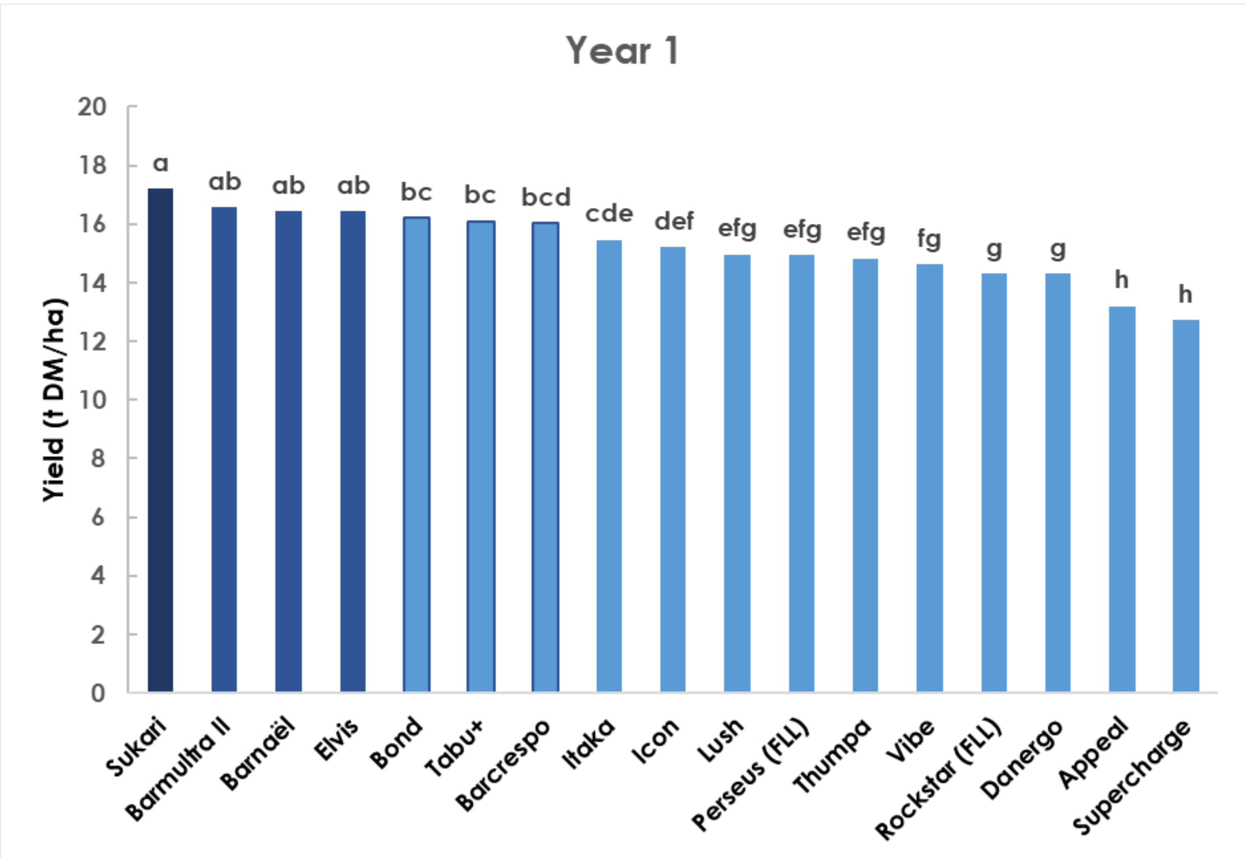


Figure 1. Yield (t DM/ha) for year 1 of trial Lm14 from establishment in March 2023 to end of February 2024. Data with the same letter are similar ($p<0.05$).

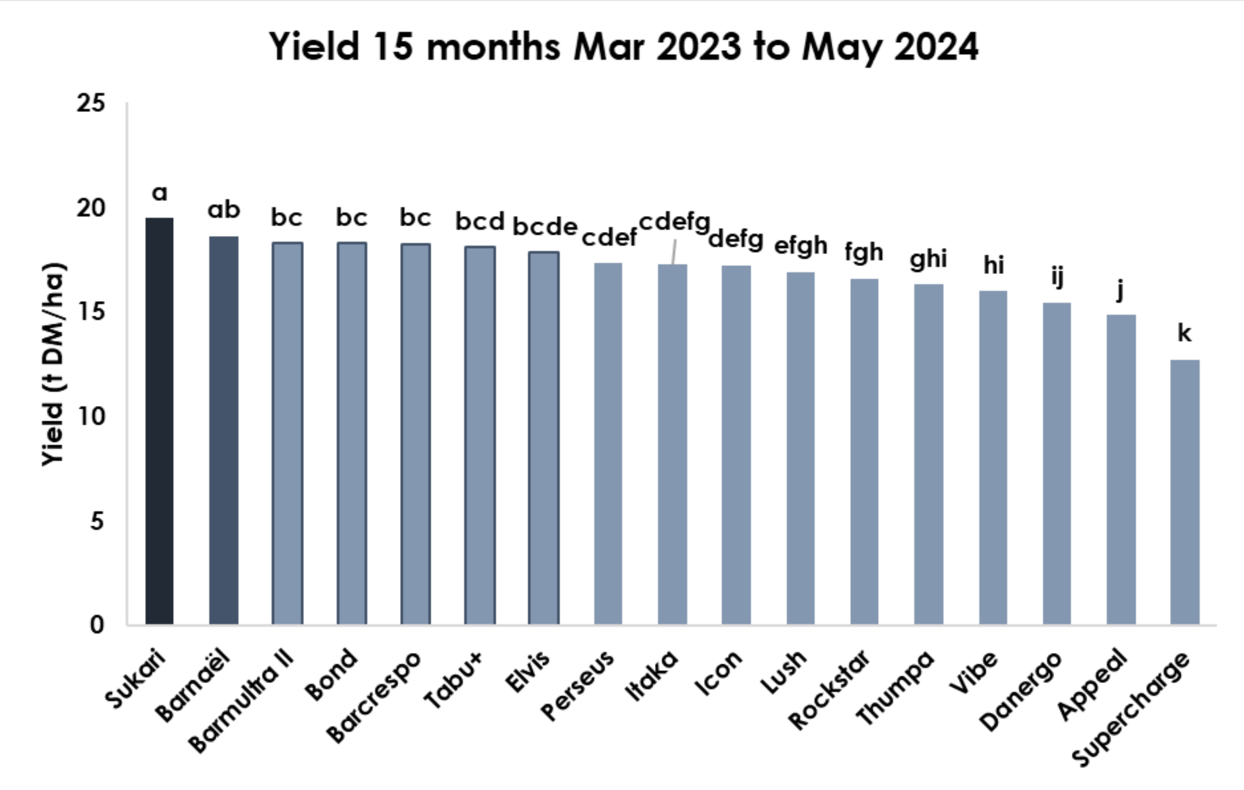


Figure 2. Yield (t DM/ha) for year 1 of trial Lm14 from establishment in March 2023 to end of May 2024. Data with the same letter are similar ($p<0.05$).

Seasonal yield data (Table 1) is of value for optimising fodder flow requirements especially for the more challenging seasons which are generally winter and summer as well as the second autumn. The question is whether there are cultivars with both good winter and summer yield. Alternatively, it is advisable to plant paddocks to different cultivars to take advantage of different seasonal yield distributions and to spread risk. A high yielding spring cultivar can for instance be considered for silage making of surplus production. Other considerations are for mixed pastures and how the seasonal yield can best be matched with the yield of the other species in the mixture. Graph 3 shows the differences between the best and worst producing cultivars for each season in relation to the mean yield of all cultivars. The graph clearly shows the advantage of choosing the highest producing cultivars.

Pick multiple cultivars for different purposes across your farm:

High winter yield to feed your cows

High spring yield for silage

Match with your companion species in a mixture

Table 1A. Total seasonal and annual yield (t DM/ha) for year 1 of trial Lm14 from establishment in March 2023 to end of May 2024.

Western Cape Government FOR YOU

Italian ryegrass (*Lolium multiflorum*) — Outeniqua Research Farm, Trial **Lm14**

Table 1: Seasonal yield (t DM/ha) Year 1 — Planted 13 March 2023

Cultivars	Type	Autumn 2023	Rank	Winter 2023	Rank	Spring 2023	Rank	Summer 2023/24	Rank	Total Year 1	Rank
Appeal	**D**	2,93 de	16	4,40 cde	11	3,66 g	17	2,19 bcd	6	13,19 h	16
Barcrespo	**D**	**3,43 a**	2	4,74 cd	6	5,64 de	10	**2,22 abcd**	5	16,03 bcd	7
Barmultra II	**T**	**3,43 a**	1	4,50 cde	8	**6,50 ab**	3	2,14 cde	8	**16,58 ab**	2
Barnaël	**T**	**3,29 abc**	10	4,46 cde	9	**6,56 ab**	2	2,11 cde	9	**16,42 ab**	3
Bond	**D**	**3,41 a**	3	4,92 bc	4	5,83 cd	5	2,05 cdef	12	16,22 bc	5
Danergo	**T**	**3,37 a**	7	3,75 fg	15	5,43 de	11	1,74 f	16	14,29 g	15
Elvis	**T**	**3,41 a**	4	4,43 cde	10	**6,65 a**	1	1,93 def	14	**16,42 ab**	4
Icon	**D**	**3,38 a**	6	4,08 ef	14	5,67 cde	8	2,07 cdef	11	15,20 def	9
Itaka	**D**	**3,36 a**	8	4,32 de	12	5,83 cd	6	1,94 def	13	15,46 cde	8
Lush	**T**	**3,26 abcd**	11	4,14 ef	13	5,28 e	13	**2,28 abcd**	4	14,97 efg	10
Perseus	**T**	2,97 cde	15	3,51 g	16	6,13 bc	4	**2,33 abc**	3	14,94 efg	11
Rockstar	**T**	**3,10 abcd**	13	3,36 g	17	5,65 de	9	2,19 bcd	7	14,30 g	14
Sukari	**D**	**3,39 a**	5	**5,46 a**	1	5,79 cd	7	**2,56 a**	1	**17,20 a**	1
Supercharge	**T**	2,67 e	17	**5,15 ab**	2	3,92 g	16	0,71 g	17	12,72 h	17
Tabu+	**D**	**3,34 ab**	9	**4,92 abc**	3	5,32 e	12	**2,52 ab**	2	16,10 bc	6
Thumpa	**T**	3,02 bcd	14	4,79 cd	5	5,22 e	14	1,79 ef	15	14,82 efg	12
Vibe	**D**	**3,24 abcd**	12	4,61 cde	7	4,69 f	15	2,08 cdef	10	14,62 fg	13
LSD (0.05)		0,33		0,54		0,47		0,36		0,84	
CV%		6,2		7,2		5,1		10,5		3,3	

Yields with the same letter are statistically similar within a column

Table 1B. Total seasonal and annual yield (t DM/ha) for year 2 of trial Lm14.

Western Cape Government FOR YOU

Italian ryegrass (*Lolium multiflorum*) — Outeniqua Research Farm, Trial **Lm14**

Table 1 cont.: Seasonal yield (t DM/ha) Year 2 — Planted 13 March 2023

Cultivars	Type	Autumn 2024	Rank	Winter 2024	Rank	Spring 2024	Rank	15 month total end of 2nd autumn	Rank	Total 21 months	Rank
Appeal	**D**	1,63 defgh	12	1,34 bcd	8	1,98 g	16	14,82 j	16	18,02 g	16
Barcrespo	**D**	**2,22 abc**	4	1,46 abc	3	**3,49 ab**	2	18,25 bc	5	**23,40 ab**	3
Barmultra II	**T**	1,68 cdefgh	11	1,32 bcd	10	3,15 bcde	7	18,26 bc	3	**22,94 ab**	6
Barnaël	**T**	**2,20 abc**	5	1,24 bcd	12	3,11 bcde	9	**18,63 ab**	2	**23,18 ab**	5
Bond	**D**	**2,04 abcd**	7	**1,56 ab**	2	3,17 bcd	6	18,26 bc	4	**23,22 ab**	4
Danergo	**T**	1,15 h	16	1,40 bcd	5	2,73 def	13	15,45 ij	15	20,38 ef	14
Elvis	**T**	1,40 fgh	14	**1,92 a**	1	**3,73 a**	1	17,83 bcde	7	**23,67 ab**	2
Icon	**D**	**2,04 abcd**	6	1,05 cd	14	3,08 bcdef	10	17,23 defg	10	21,57 cd	9
Itaka	**D**	1,82 bcdefgh	10	1,30 bcd	11	2,61 ef	14	17,28 cdefg	9	21,40 cd	11
Lush	**T**	**1,93 abcdef**	9	1,17 bcd	13	3,17 bcd	5	16,90 efgh	11	21,43 cd	10
Perseus FLL	**T**	**2,39 a**	1	0,99 cd	16	3,13 bcde	8	17,33 cdef	8	21,62 cd	8
Rockstar FLL	**T**	**2,30 ab**	2	1,00 cd	15	3,18 bcd	4	16,59 fgh	12	20,93 def	13
Sukari	**D**	**2,27 ab**	3	1,42 bcd	4	2,89 cdef	12	**19,47 a**	1	**24,05 a**	1
Supercharge	**D**	0,00 i	17	- -	-	- -	-	12,72 k	17	12,72 h	17
Tabu+	**D**	**1,97 abcde**	8	1,33 bcd	9	2,92 cdef	11	18,07 bcd	6	22,53 bc	7
Thumpa	**T**	1,48 efgh	13	1,36 bcd	7	**3,43 abc**	3	16,31 ghi	13	21,31 de	12
Vibe	**D**	1,35 gh	15	1,36 bcd	6	2,55 f	15	15,97 hi	14	20,07 f	15
LSD (0.05)		0,54		0,46		0,54		1,00		1,14	
CV%		18,4		21		10,8		3,50		3,2	

Yields with the same letter are statistically similar within a column

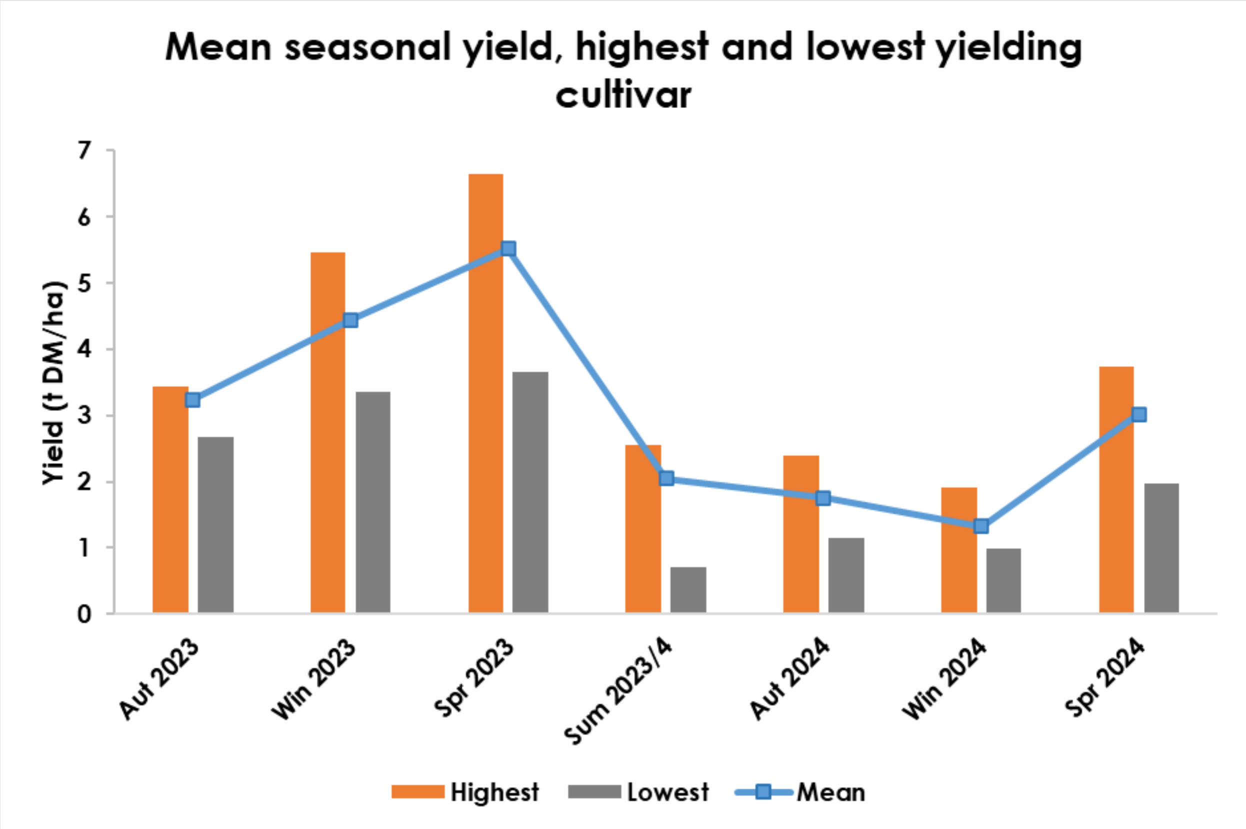


Figure 3. Seasonal yield (t DM/ha) of the highest and lowest producing cultivars in relation to the mean yield of the trial.

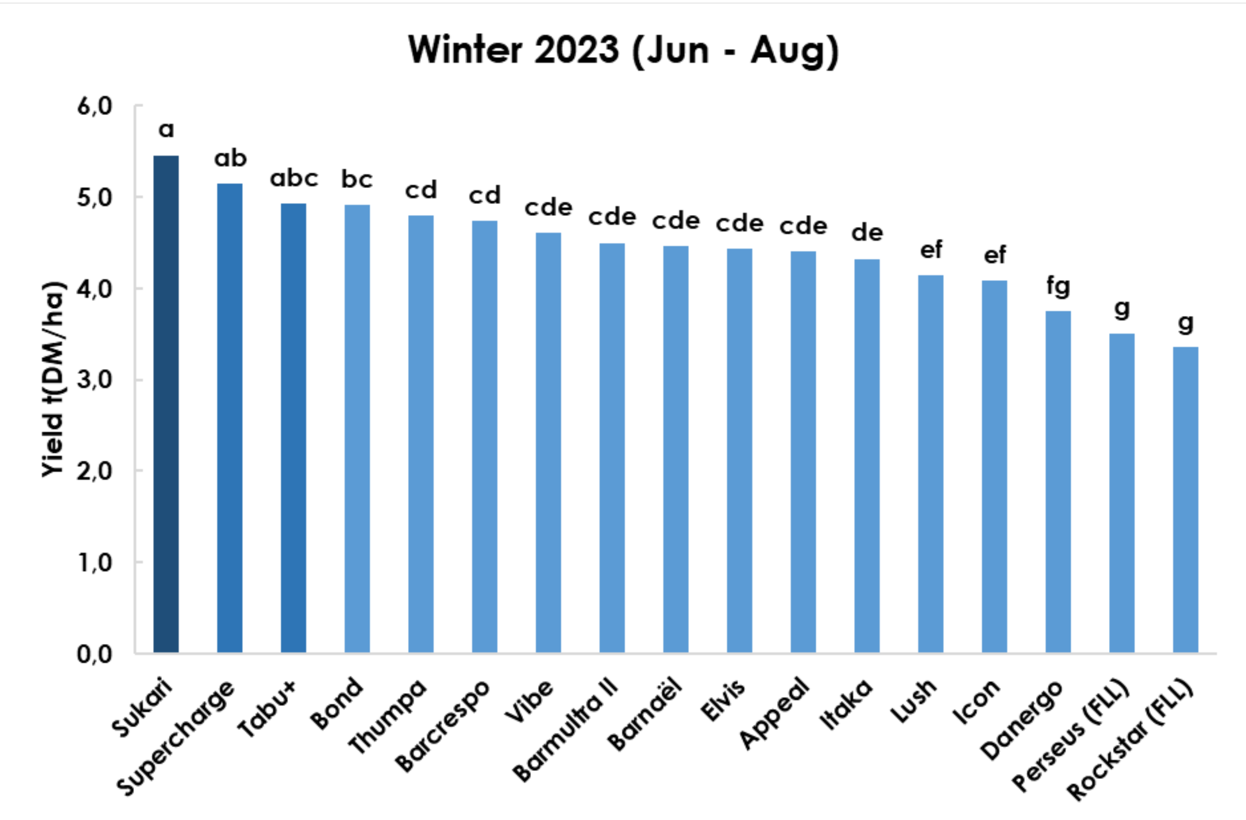


Figure 4. Dry matter yield (t DM/ha) for winter 2023. Cultivars with the same letter are statistically similar. Data with the same letter are similar ($p<0.05$).

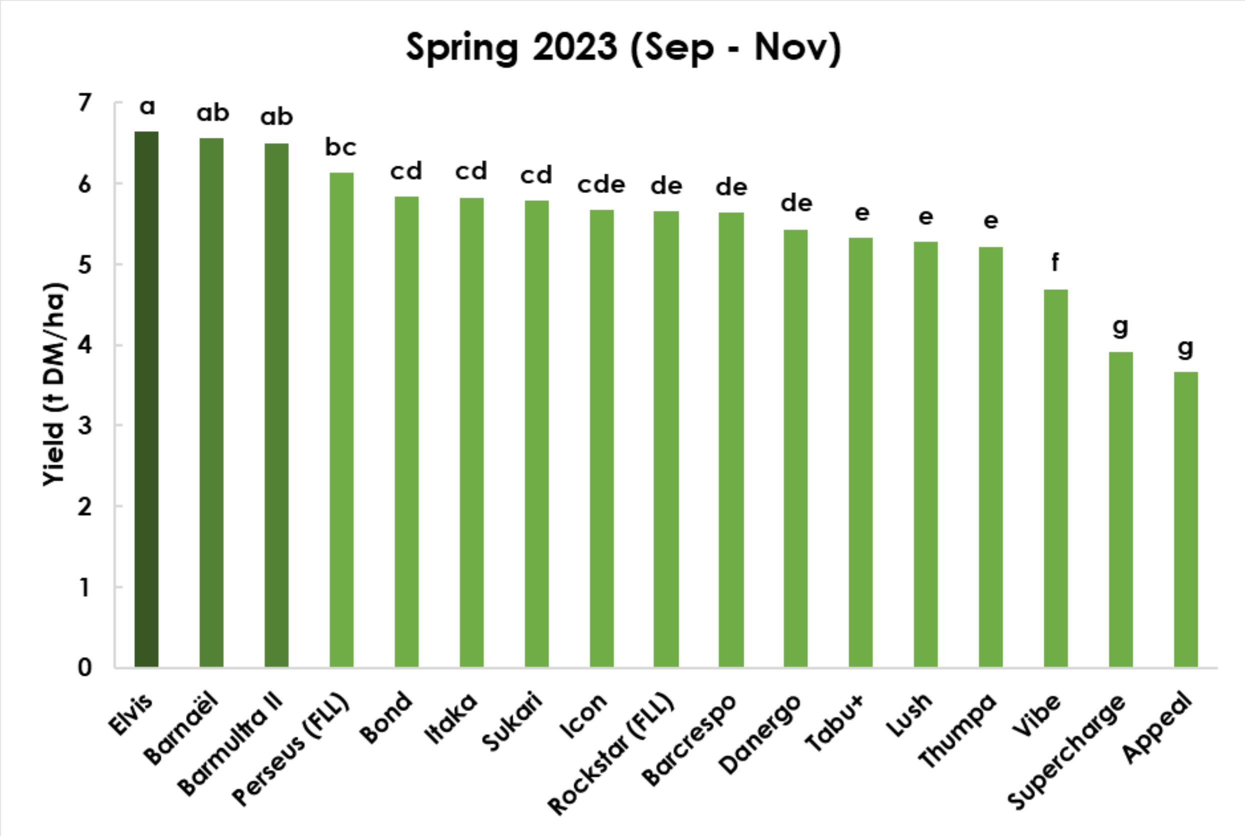


Figure 5. Dry matter yield (t DM/ha) for spring 2023. Cultivars with the same letter are statistically similar ($p<0.05$).

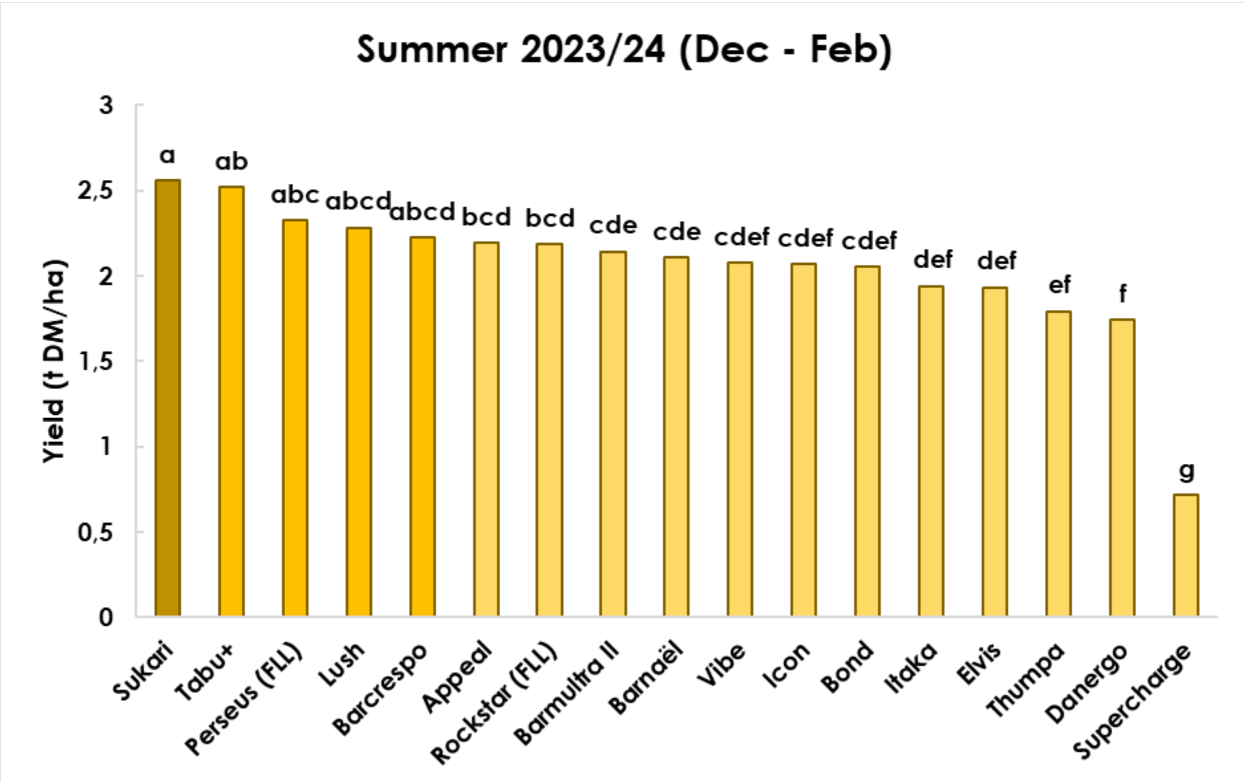


Figure 6. Dry matter yield (t DM/ha) for summer 2023/24. Cultivars with the same letter are statistically similar. Data with the same letter are similar ($p<0.05$).

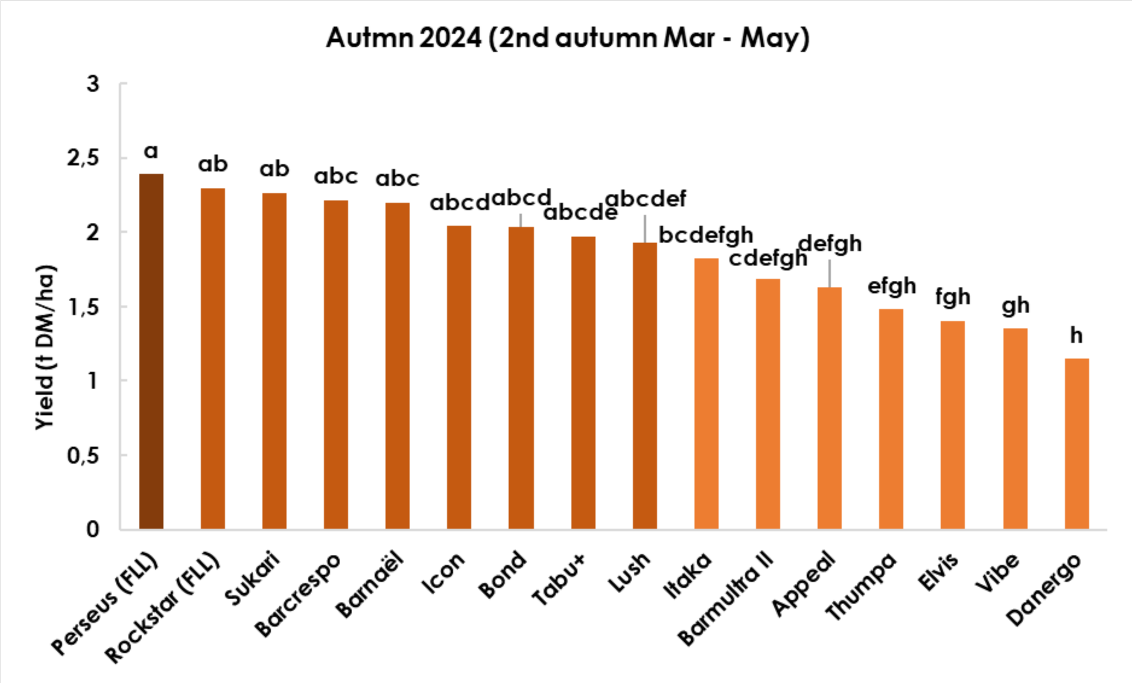


Figure 7: Dry matter yield (t DM/ha) for the second autumn March to May 2024. Cultivars with the same letter are statistically similar ($p<0.05$).

Seasonal growth rates

Seasonal growth rates **(Table 2)** are important indicators of whether there will be sufficient grazing to support the herd, especially the lactating dairy herd and their fodder flow needs. If we consider an example of what growth rate might be needed, it can look as follows. The cows will preferably be required to graze year-round. If we assume a 450kg cow (which will eat approximately 16kg DM/day of which 10kg DM/day may come from the pasture) and we assume a stocking rate of 4 cows/ha and a wastage rate of 10%, then we will require a daily growth rate of 44kg DM/ha/day throughout the year. It would mean that in the surplus months any growth above this rate would need to be ensiled for feeding back in the months with the lower growth rates.

Flowering behaviour

Flowering behaviour (Table 3) is important since it results in a higher stem component which implies a higher fibre content and thus lower nutritive value. The percentage of the sward that is reproductive varies significantly between cultivars due to vernalisation (cold days) requirements as does the duration of reproductive tillers in the sward (flowering window). Vernalisation takes place on tiller basis and not on a tuft basis. In years with more "cold days" in winter the flowering incidence will be higher. Cultivars that do have a high bolting percentage could for instance be used for paddocks that will be cut for silage although it would also affect the silage quality as opposed to cutting a non-reproductive sward that is leafy. In mixtures with species that are very competitive and tall growing in summer it might be an advantage to have a ryegrass component with a higher bolting percentage as that results in taller plants to compete with the other tall components for example chicory or lucerne.

An additional disadvantage of a cultivar with a high percentage of reproductive tillers, apart from the effects on forage quality, is the possibility that seed drop will occur if the defoliation cycle is not strictly managed in spring. This results in volunteer plants in years to come with an undesirable impact on pasture production and management.

Most Italian ryegrass cultivars that are available, do have the ability to produce new vegetative daughter tillers after the flowering phase. These are then referred to as Italian ryegrasses with a long growth duration (obligate types). There are also cultivars that do not produce vegetative tillers after the flowering phase and thus end after the bolting phase. In the current trial there is one such cultivars, SuperCharge (facultative type).

Italian ryegrass can also be used for spring-planting. However, only the cultivars with a low flowering incidence assessed from a spring-planted flowering assessment, are suitable for spring-planting since early bolting will negatively affect such a planting. Results for spring-planting are available in the Outeniqua Information Day book of 2023.

Table 2. Seasonal growth rates (kg DM/ha/day) for year 1 and 2 of trial Lm14.

Italian ryegrass (*Lolium multiflorum*) Outeniqua Research Farm, Trial **Lm14**

Table 2: Seasonal growth rates (kgDM/ha/day) Year 1 & 2 Planted 13 March 2023

Cultivars	Type	Autumn 2023	Rank	Winter 2023	Rank	Spring 2023	Rank	Summer 2023/24	Rank	Autumn 2024	Rank	Winter 2024	Rank	Spring 2024	Rank
Appeal	**D**	31,9 ^{de}	16	47,8 ^{cde}	11	40,3 ^{g}	17	24,1 ^{bcd}	6	17,7 ^{defgh}	12	14,5 ^{bcd}	8	21,7 ^{g}	16
Barcrespo	**D**	**37,3** ^{a}	2	51,5 ^{cd}	6	62,0 ^{de}	10	**24,4** ^{abcd}	5	**24,1** ^{abc}	4	**15,8** ^{abc}	3	**38,4** ^{ab}	2
Barmultra II	**T**	**37,3** ^{a}	1	48,9 ^{cde}	8	**71,5** ^{ab}	3	23,6 ^{cde}	8	18,3 ^{cdefgh}	11	14,4 ^{bcd}	10	34,6 ^{bcde}	7
Barnaël	**T**	**35,8** ^{abc}	10	48,5 ^{cde}	9	**72,1** ^{ab}	2	23,2 ^{cde}	9	**23,9** ^{abc}	5	13,5 ^{bcd}	12	34,2 ^{bcde}	9
Bond	**D**	**37,1** ^{a}	3	53,5 ^{bc}	4	64,1 ^{cd}	5	22,5 ^{cdef}	12	**22,1** ^{abcd}	6	**16,9** ^{ab}	2	34,8 ^{bcd}	6
Danergo	**T**	**36,6** ^{a}	7	40,8 ^{fg}	15	59,7 ^{de}	11	19,1 ^{f}	16	12,5 ^{h}	16	15,2 ^{bcd}	5	30,0 ^{def}	13
Elvis	**T**	**37,1** ^{a}	4	48,2 ^{cde}	10	**73,1** ^{a}	1	21,3 ^{def}	14	15,3 ^{fgh}	14	**20,8** ^{a}	1	**41,0** ^{a}	1
Icon	**D**	**36,8** ^{a}	6	44,4 ^{ef}	14	62,3 ^{cde}	8	22,7 ^{cdef}	11	**22,1** ^{abcde}	7	11,4 ^{cd}	14	33,9 ^{bcdef}	10
Itaka	**D**	**36,6** ^{a}	8	47,0 ^{de}	12	64,0 ^{cd}	6	21,4 ^{def}	13	19,8 ^{bcdefg}	10	14,1 ^{bcd}	11	28,7 ^{ef}	14
Lush	**T**	**35,5** ^{abcd}	11	45,0 ^{ef}	13	58,0 ^{e}	13	**25,1** ^{abcd}	4	**21,0** ^{abcdef}	9	12,7 ^{bcd}	13	34,9 ^{bcd}	5
rseus FLL	**T**	32,3 ^{cde}	15	38,1 ^{g}	16	67,4 ^{bc}	4	**25,5** ^{abc}	3	**26,0** ^{a}	1	10,8 ^{d}	16	34,4 ^{bcde}	8
ckstar FLL	**T**	**33,7** ^{abcd}	13	36,5 ^{g}	17	62,1 ^{de}	9	24,0 ^{bcd}	7	**25,0** ^{ab}	2	10,9 ^{cd}	15	34,9 ^{bcd}	4
Sukari	**D**	**36,8** ^{a}	5	**59,4** ^{a}	1	63,6 ^{cd}	7	**28,1** ^{a}	1	**24,7** ^{ab}	3	15,5 ^{bcd}	4	31,8 ^{cdef}	12
Supercharge	**T**	29,1 ^{e}	17	**58,9** ^{ab}	2	43,0 ^{g}	16	7,9 ^{g}	17	- -	-	- -	-	- -	-
Tabu+	**D**	36,3 ^{ab}	9	**53,5** ^{abc}	3	58,4 ^{e}	12	**27,7** ^{ab}	2	**21,4** ^{abcde}	8	14,5 ^{bcd}	9	32,1 ^{cdef}	11
Thumpa	**T**	32,8 ^{bcd}	14	52,1 ^{cd}	5	57,3 ^{e}	14	19,7 ^{ef}	15	16,1 ^{efgh}	13	14,8 ^{bcd}	6	**37,7** ^{abc}	3
Vibe	**D**	**35,2** ^{abcd}	12	50,1 ^{cde}	7	51,5 ^{f}	15	22,8 ^{cdef}	10	14,6 ^{gh}	15	14,8 ^{bcd}	7	28,0 ^{f}	15
LSD (0.05)		3,6		5,9		5,1		3,9		6,0		5,0		6,0	
CV%		6,2		7,3		5,1		10,5		17,8		20,9		10,8	

Growth rates with the same letter are statistically similar within a column

Table 3A. Reproductive tillers (%) for year 1 and 2 of trial Lm14.

Western Cape Government FOR YOU

Italian ryegrass (*Lolium multiflorum*) — Outeniqua Research Farm, Trial **Lm14**

Table 3: Reproductive tillers/bolting % (ratings based) Year 1 — Planted 13 March 2023

Cultivars	Type	Cut 1 19/4/2023	Cut 2 11/5/2023	Cut 3 23/6/2023	Cut 4 3/8/2023	Cut 5 6/9/2023	Cut 6 11/10/2023	Cut 7 15/11/2023	Cut 8 13/12/2023	Cut 9 11/1/2024	Cut 10 13/2/2024	Cut 11 20/3/2024	Flowering pattern
Appeal	D	0	0	0	0	8 g	0 d	13 g	4 f	8 fg	0 d	0 b	
Barcrespo	D	0	0	0	0	63 b	17 bc	58 bcd	58 bc	29 cd	13 bc	0 b	
Barmultra II	T	0	0	0	0	38 cde	8 cd	88 a	50 bc	25 cde	8 c	0 b	
Barnaël	T	0	0	0	0	33 cdef	17 bc	75 ab	63 b	38 c	13 bc	0 b	
Bond	D	0	0	0	0	17 efg	4 cd	38 ef	17 ef	13 efg	0 d	0 b	
Danergo	T	0	0	0	0	13 fg	8 cd	79 a	54 bc	38 c	0 d	0 b	
Elvis	T	0	0	0	0	17 efg	0 d	83 a	58 bc	54 b	17 b	6 a	
Icon	D	0	0	0	0	25 defg	17 bc	42 de	25 de	17 defg	0 d	0 b	
Itaka	D	0	0	0	0	8 g	13 bcd	17 g	13 ef	4 g	0 d	0 b	
Lush	T	0	0	0	0	17 efg	4 cd	21 fg	13 ef	17 defg	0 d	0 b	
Perseus FLL	T	0	0	0	0	13 fg	8 cd	38 ef	17 ef	21 def	0 d	0 b	
Rockstar FLL	T	0	0	0	0	13 fg	17 bc	17 g	8 ef	13 efg	0 d	0 b	
Sukari	D	0	0	0	0	42 bcd	13 bcd	71 abc	63 b	67 b	25 a	0 b	
Supercharge	T	0	0	0	0	88 a	33 a	88 a	88 a	88 a	0 d	0 b	
Tabu+	D	0	0	0	0	46 bcd	4 cd	54 cde	54 bc	54 b	17 b	8 a	
Thumpa	T	0	0	0	0	54 bc	25 ab	46 de	42 cd	29 cd	13 bc	0 b	
Vibe	D	0	0	0	0	17 efg	4 cd	13 g	8 ef	13 efg	0 d	0 b	
LSD (0.05)		NS	NS	NS	NS	23,2	13,0	17,9	18,6	14,5	5,8	4,4	

Note: lowest flowering % is most favourbale for good forage quality

Flowering % with the same letter are statistically similar within a column

Table 3A. Reproductive tillers (%) for year 1 and 2 of trial Lm14.

Western Cape Government FOR YOU

Italian ryegrass (*Lolium multiflorum*) — Outeniqua Research Farm, Trial **Lm14**

Table 3 cont.: Reproductive tillers % (ratings based) Year 2 — Planted 13 March 2023

Cultivars	Type	Cut 12 24/4/2024	Cut 13 28/5/2024	Cut 14 19/7/2024	Cut 15 12/9/2024	Cut 16 25/10/2024	Cut 17 26/11/2024	Cut 18 13/1/2025	Flowering pattern
Appeal	D	0	0	0	0	3 b	13 d	-	
Barcrespo	D	0	0	0	0	56 a	83 a	100 a	
Barmultra II	T	0	0	0	0	50 a	83 a	-	
Barnaël	T	0	0	0	0	67 a	83 a	-	
Bond	D	0	0	0	0	17 b	29 c	-	
Danergo	T	0	0	0	0	54 a	92 a	-	
Elvis	T	0	0	0	0	50 a	88 a	-	
Icon	D	0	0	0	0	50 a	46 b	88 a	
Itaka	D	0	0	0	0	17 b	29 c	-	
Lush	T	0	0	0	0	16 b	29 c	88 a	
Perseus FLL	T	0	0	0	0	8 b	17 cd	29 b	
Rockstar FLL	T	0	0	0	0	13 b	21 cd	10 c	
Sukari	D	0	0	0	0	79 a	92 a	-	
Supercharge	T	0	0	0	0	- -	- -	-	
Tabu+	D	0	0	0	0	79 a	83 a	-	
Thumpa	T	0	0	0	0	67 a	83 a	-	
Vibe	D	0	0	0	0	8 b	29 c	88 a	
LSD (0.05)		NS	NS	NS	NS	30,2	12,5	13,8	

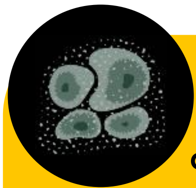
Note: lower flowering % is more favourbale for good forage quality in terms of NDF

Flowering % with the same letter are statistically similar within a column

Leaf rust incidence

Leaf rust incidence **(Table 4)** refers mainly to crown rust (*Puccinia coronata*). According to Clarke & Eagling (1994) and Webb et al (2019) crown rust causes yield loss as well as negative effects on root weight and rooting depth, tiller numbers and leaf area or photosynthetic area. Potter (2007) reported not only reduced yield but also reduced water-soluble carbohydrates and reduced digestibility. Plummer et al (1990) also refers to reduced tiller density and increased tiller death. Carr (1975) reports rust to be a water-soluble carbohydrate (WSC) sink that reduces growth and forage quality. Additionally, Carr (1975) estimates that 10% leaf rust infection could cause up to 50% decline in WSC concentration. Hence there are advantages to cultivars which are resistant or have a low incidence only.

Rust can be more severe under nutrient deficiency conditions or if growth cycles are allowed to continue beyond the 3-leaf stage. Increased dead leaf matter may also increase facial eczema (McKenzie 1971).



Ryegrass leaf rust is a fungal disease appearing as yellow-orange to reddish-brown spots (pustules) on leaves, which rupture to release a powdery spore-filled substance. Rust on pastures can negatively affect forage quality and increase risks of facial eczema.

Sward density ratings

Sward density ratings **(Table 5)** give an indication of **persistence** especially in the summer months. The cultivars that retain good sward density or plant population throughout the summer are desirable in terms of yield but also ground cover which in turn relates to weed ingression potential. It is important to look at the sward density January to March when it is at its lowest. There is some recovery as the temperatures become cooler in April/May.

***Plant counts* (Table 6)** were done after year 1 and again at the end of the trial in January 2025. The 10-point method was used consisting of a bar with 10 spikes spaced at 10cm apart. The apparatus is randomly placed four times in the plot. The number of strikes is counted i.e. the number of spikes touching a living tuft.

Leaf emergence rate

***Leaf emergence rate* (Table 6)** depends on leaf growth rate since leaves emerge consecutively, one after the other, once the previous leaf is fully extended. Growth rate is mainly dependent on temperature and soil moisture. If soil moisture is sufficient, then the growth rate is mainly a function of temperature. Defoliation or harvest at the 3-leaf stage is optimal for the plant (carbohydrate reserves, root and tiller growth) and optimal for production since the first leaf dies once the fourth leaf emerges and yield reaches a plateau after the third leaf. (Chapman 2016). The plants can at the earliest be defoliated at the 2.75-leaf stage when necessary. In spring canopy closure should be used as primary criterion to decide on the optimal defoliation time since limiting light penetration into the base of the sward can reduce daughter tiller initiation.

Table 4A. Leaf rust (%) for year 1 and 2 of trial Lm14.

Western Cape Government FOR YOU

Italian ryegrass (*Lolium multiflorum*) — Outeniqua Research Farm, Trial **Lm14**

Table 4: Leaf Rust % (ratings based) Year 1 — Planted 13 March 2023

Cultivars	Type	Cut 1 19/4/2023	Cut 2 11/5/2023	Cut 3 23/6/2023	Cut 4 3/8/2023	Cut 5 6/9/2023	Cut 6 11/10/2023	Cut 7 15/11/2023	Cut 8 13/12/2023	Cut 9 11/1/2024	Cut 10 13/2/2024	Cut 11 20/3/2024	Rust pattern
Appeal	**D**	0	0	0	0	0 c	**13** bc	0 c	0	**25** g	**4** ef	**29** de	
Barcrespo	**D**	0	0	0	0	0 c	**4** cd	0 c	0	**42** efg	**8** def	**21** ef	
Barmultra II	**T**	0	0	0	0	**8** b	**8** cd	0 c	0	**50** def	**79** ab	**69** a	
Barnaël	**T**	0	0	0	0	0 c	**4** cd	0 c	0	**29** fg	**38** c	**21** ef	
Bond	**D**	0	0	0	0	0 c	**4** cd	0 c	0	**67** abcd	**33** c	**50** bc	
Danergo	**T**	0	0	0	0	**71** a	**25** a	**54** a	0	**88** a	**83** a	**75** a	
Elvis	**T**	0	0	0	0	0 c	**4** cd	**4** bc	0	**54** cde	**67** ab	**63** ab	
Icon	**D**	0	0	0	0	0 c	**13** bc	0 c	0	**50** def	**13** def	**21** ef	
Itaka	**D**	0	0	0	0	0 c	**8** cd	0 c	0	**67** abcd	**33** c	**8** fg	
Lush	**T**	0	0	0	0	0 c	**4** cd	0 c	0	**21** gh	**8** def	**29** de	
Perseus FLL	**T**	0	0	0	0	0 c	**8** cd	**4** bc	0	**79** ab	**83** a	**63** ab	
Rockstar FLL	**T**	0	0	0	0	0 c	0 d	**8** b	0	**75** abc	**63** b	**42** cd	
Sukari	**D**	0	0	0	0	0 c	**8** cd	0 c	0	0 h	0 f	0 g	
Supercharge	**T**	0	0	0	0	0 c	0 d	0 c	0	0 h	- -	- -	
Tabu+	**D**	0	0	0	0	0 c	0 d	0 c	0	**29** fg	**21** cde	**67** a	
Thumpa	**T**	0	0	0	0	0 c	0 d	0 c	0	**67** abcd	**38** c	**22** ef	
Vibe	**D**	0	0	0	0	0 c	**21** ab	0 c	0	**63** bcde	**25** cd	**25** e	
LSD (0.05)		NS	NS	NS	NS	4,2	12,1	7,3	NS	23,5	20,7	16,1	

Note: lowest rust % is most favourbale for good forage quality and rooting

Rust % with the same letter are statistically similar within a column

Table 4B. Leaf rust (%) for year 1 and 2 of trial Lm14.

Western Cape Government FOR YOU

Italian ryegrass (*Lolium multiflorum*) — Outeniqua Research Farm, Trial **Lm14**

Table 4 cont.:Leaf Rust % (ratings based) Year 2 — Planted 13 March 2023

Cultivars	Type	Cut 12 24/4/2024	Cut 13 28/5/2024	Cut 14 19/7/2024	Cut 15 12/9/2024	Cut 16 25/10/2024	Cut 17 26/11/2024	Cut 18 13/1/2025	Rust pattern
Appeal	**D**	**25** abcd	0 b	0 -	0	**21** d	**29** ab	-	
Barcrespo	**D**	**17** cd	0 b	0 -	0	**21** d	**4** de	**12,5** b	
Barmultra II	**T**	**38** abc	0 b	**50** b	0	**50** bc	**21** bcd	-	
Barnaël	**T**	**13** d	0 b	0 -	0	**21** d	**4** de	-	
Bond	**D**	**17** cd	0 b	**8** de	0	**38** bcd	**8** cde	-	
Danergo	**T**	**39** ab	**4** ab	**63** a	0	**79** a	**42** a	-	
Elvis	**T**	**38** abc	0 b	**25** c	0	**63** ab	**17** bcde	-	
Icon	**D**	**17** cd	0 b	**4** de	0	**29** cd	**4** de	**13** b	
Itaka	**D**	**21** bcd	**4** ab	0 -	0	**29** cd	**13** bcde	-	
Lush	**T**	**21** bcd	0 b	**4** de	0	**21** d	**4** de	**21** b	
'erseus FLL	**T**	**25** abcd	0 b	**13** d	0	**29** cd	**13** bcde	**67** a	
'ockstar FLL	**T**	**38** abc	0 b	**13** d	0	**29** cd	**25** abc	**58** a	
Sukari	**D**	**4** d	0 b	0 -	0	**13** d	0 e	-	
Supercharge	**T**	-	-	-	-	-	-	-	
Tabu+	**D**	**25** abcd	**8** a	**13** d	0	**38** bcd	**29** ab	-	
Thumpa	**T**	**46** a	0 b	**25** c	0	**50** bc	**13** bcde	-	
Vibe	**D**	**21** bcd	0 b	0 -	0	**29** cd	**17** bcde	**75** a	
LSD (0.05)		21,4	5,0	10,7	NS	27,7	19,5	26,7	

Note: lowest rust % is most favourbale for good forage quality

Rust % with the same letter are statistically similar within a column

Table 5A. Sward density % (ratings based) for year 1 and 2 of trial Lm14.

Italian ryegrass (*Lolium multiflorum*) — Outeniqua Research Farm, Trial **Lm14**

Table 5: Sward density % (ratings based) — Planted 13 March 2023

Cultivars	Type	Cut 1 19/4/2023	Cut 2 11/5/2023	Cut 3 23/6/2023	Cut 4 3/8/2023	Cut 5 6/9/2023	Cut 6 11/10/2023	Cut 7 15/11/2023	Cut 8 13/12/2023	Cut 9 11/1/2024	Cut 10 13/2/2024	Cut 11 20/3/2024	Sward density Year 1
Appeal	D	100	100	100	100	100	83 [b]	100 [a]	100 [a]	100 [a]	75 [bcde]	63 [abcd]	
Barcrespo	D	100	100	100	100	100	96 [a]	100 [a]	100 [a]	100 [a]	92 [ab]	71 [abc]	
Barmultra II	T	100	100	100	100	100	100 [a]	100 [a]	100 [a]	100 [a]	79 [abcde]	50 [cd]	
Barnaël	T	100	100	100	100	100	100 [a]	100 [a]	100 [a]	100 [a]	83 [abcd]	46 [cde]	
Bond	D	100	100	100	100	100	100 [a]	100 [a]	100 [a]	100 [a]	96 [ab]	67 [abcd]	
Danergo	T	100	100	100	100	100	100 [a]	100 [a]	100 [a]	100 [a]	58 [e]	13 [f]	
Elvis	T	100	100	100	100	100	100 [a]	100 [a]	100 [a]	100 [a]	67 [cde]	19 [ef]	
Icon	D	100	100	100	100	100	96 [a]	100 [a]	100 [a]	100 [a]	92 [ab]	71 [abc]	
Itaka	D	100	100	100	100	100	92 [ab]	100 [a]	100 [a]	100 [a]	96 [ab]	54 [bcd]	
Lush	T	100	100	100	100	100	92 [ab]	100 [a]	100 [a]	100 [a]	96 [ab]	83 [a]	
Perseus FLL	T	100	100	100	100	100	92 [ab]	100 [a]	100 [a]	100 [a]	100 [a]	83 [a]	
Rockstar FLL	T	100	100	100	100	100	100 [a]	100 [a]	100 [a]	100 [a]	96 [ab]	83 [a]	
Sukari	D	100	100	100	100	100	100 [a]	100 [a]	100 [a]	100 [a]	83 [abcd]	79 [ab]	
Supercharge	T	100	100	100	100	100	92 [ab]	75 [b]	67 [b]	21 [b]	- -	- -	
Tabu+	D	100	100	100	100	100	100 [a]	100 [a]	100 [a]	100 [a]	88 [abc]	79 [ab]	
Thumpa	T	100	100	100	100	100	100 [a]	100 [a]	100 [a]	100 [a]	63 [de]	42 [de]	
Vibe	D	100	100	100	100	100	92 [ab]	100 [a]	100 [a]	100 [a]	79 [abcde]	50 [cd]	
LSD (0.05)		NS	NS	NS	NS	NS	10	-	2,9	2,9	24	27,3	
CV %							6,2		1,8	1,8	17,2	25,3	

Note: highest sward density % is most favourbale for yield

Sward density % with the same letter are statistically similar within a column

Table 5B. Sward density % (ratings based) for year 1 and 2 of trial Lm14.

Italian ryegrass (*Lolium multiflorum*) — Outeniqua Research Farm, Trial **Lm14**

Table 5 cont.: Sward density % (ratings based) — Planted 13 March 2023

Cultivars	Type	Cut 12 24/4/2024	Cut 13 28/5/2024	Cut 14 19/7/2024	Cut 15 12/9/2024	Cut 16 25/10/2024	Cut 17 26/11/2024	Cut 18 13/1/2025	Sward density Year 2
Appeal	D	67 [abc]	75 [c]	79 [cd]	75 [de]	88 [cd]	63 [d]	25 [b]	
Barcrespo	D	88 [a]	100 [a]	100 [a]	100 [a]	100 [a]	100 [a]	-	
Barmultra II	T	54 [cd]	83 [abc]	88 [abcd]	88 [bc]	100 [a]	83 [bc]	-	
Barnaël	T	75 [abc]	96 [ab]	88 [abcd]	92 [abc]	100 [a]	88 [b]	-	
Bond	D	75 [abc]	88 [abc]	92 [abc]	92 [abc]	100 [a]	100 [a]	-	
Danergo	T	42 [d]	75 [c]	75 [d]	71 [e]	83 [d]	75 [c]	-	
Elvis	T	58 [bcd]	79 [bc]	83 [bcd]	83 [cd]	96 [ab]	92 [ab]	-	
Icon	D	79 [ab]	92 [abc]	92 [abc]	96 [ab]	100 [a]	100 [a]	38 [b]	
Itaka	D	75 [abc]	92 [abc]	96 [ab]	96 [ab]	100 [a]	100 [a]	-	
Lush	T	88 [a]	96 [ab]	96 [ab]	92 [abc]	100 [a]	100 [a]	50 [ab]	
Perseus FLL	T	88 [a]	100 [a]	92 [abc]	100 [a]	100 [a]	100 [a]	88 [a]	
Rockstar FLL	T	83 [a]	96 [ab]	96 [ab]	100 [a]	100 [a]	100 [a]	88 [a]	
Sukari	D	79 [ab]	92 [abc]	96 [ab]	96 [ab]	92 [bc]	88 [b]	-	
Supercharge	T	-	-	-	-	-	-	-	
Tabu+	D	71 [abc]	96 [ab]	92 [abc]	92 [abc]	100 [a]	83 [bc]	-	
Thumpa	T	58 [bcd]	88 [abc]	83 [bcd]	88 [bc]	100 [a]	92 [ab]	-	
Vibe	D	54 [cd]	75 [c]	83 [bcd]	88 [bc]	100 [a]	83 [bc]	38 [b]	
LSD (0.05)		21,5	18,8	14,3	9,1	7,5	12,4	40,1	
CV %		18,2	12,7	9,6	6,0	4,6	8,2	19,4	

Note: highest sward density % is most favourbale for yield

Sward density % with the same letter are statistically similar within a column

Italian ryegrass cultivars that retain good sward density or plant population throughout the summer are desirable in terms of yield but also ground cover which in turn relates to weed ingression potential.

Table 6. Plant counts)%) and leaf emergence rate (days/leaf) for year 1 and 2 of trial Lm14.

Italian ryegrass (*Lolium multiflorum*) Outeniqua Research Farm, Trial **Lm14**

Table 6: Plant counts % , Leaf emergence rate (days/leaf) Planted 13 March 2023

Cultivars	Type	Plant counts 2 Apr 2024 after 1 year	31 Jan 2025
Appeal	**D**	55	3
Barcrespo	**D**	61	11
Barmultra II	**T**	36	1
Barnaël	**T**	49	3
Bond	**D**	60	12
Danergo	**T**	30	0
Elvis	**T**	31	0
Icon	**D**	66	20
Itaka	**D**	62	12
Lush	**T**	61	30
Perseus FLL	**T**	70	58
Rockstar FLL	**T**	69	53
Sukari	**D**	62	2
Supercharge	**T**	18	0
Tabu+	**D**	58	3
Thumpa	**T**	49	0
Vibe	**D**	51	11

Harvest dates	Leaf emergence rate (days/leaf)	Season
19 Apr 2023	11	Autumn
11 May 2023	9	
23 Jun 2023	12	Winter
3 Aug 2023	15	
6 Sep 2023	14	
11 Oct 2023	14	Spring
15 Nov 2023	14	
13 Dec 2023	10	Summer
11 Jan 2024	9	
13 Feb 2024	10	
20 Mar 2024	10	Autumn
24 Apr 2024	11	
28 May 2024	12	
19 Jul 2024	17	Winter
12 Sep 2024	20	
25 Oct 2024	11	Spring
26 Nov 2024	12	
13 Jan 2025	15	

Forage quality parameters

***Forage quality parameters* (Table 7)** CP, NSC, NDF, ADF, DMD, TDN and ME from the NIR analysis Dairyland are reported (www.dairylandlabs.com) for the winter cut of 3 August 2023. No flowering was evident at that harvest and all plants were vegetative.

***Dry matter (DM) content* (Table 8)** is a consideration especially early in the season when the DM content is generally low, since DM content in ryegrass can negatively influence voluntary intake if it is very low (Cabrera Estrada et al 2004, John & Ulyatt 1987, Leaver 1985, Minson 1990. The work by Vértité & Journet 1970 is widely referenced where they investigated reduced intake with decreasing DM content. According to Cabrera Estrada et al 2004, dry matter intake increases over the dry matter content range of 12 to 30%. The authors found the average increase in intake to be 134g per unit DM percentage increase up to the 30% dry matter content level. In pure stands of newly established ryegrass up to July this can have an effect. In mixtures with other species that have a very low DM content the DM content of the various components can be considered.

***Note: Yield for individual harvest for year 1 and year 2 are given in Table 9.**

Table 7. Forage quality for year 1 and 2 of trial Lm14.

Italian ryegrass (*Lolium multiflorum*) Outeniqua Research Farm, Trial **Lm14**

Table 7: Forage quality (NIR, Dairyland) Planted 13 March 2023

Samples from cut 4 of 3 Aug 2023

Cultivars	Type	CP %	NSC %	NDF %	ADF %	DMD	TDN	ME
Appeal	**D**	16,6 ^{cdef}	27,7 ^{ef}	**37,7 ^{ab}**	**23,5 ^{ab}**	77,1 ^{e}	70,6 ^{gh}	11,23 ^{gh}
Barcrespo	**D**	**18,0 ^{abc}**	28,8 ^{ef}	35,2 ^{cd}	21,8 ^{d}	**78,9 ^{abc}**	71,9 ^{f}	11,50 ^{e}
Barmultra II	**T**	16,4 ^{cdef}	34,0 ^{bc}	31,9 ^{ef}	20,2 ^{efg}	**78,6 ^{abcd}**	73,2 ^{bcde}	11,73 ^{bcd}
Barnaël	**T**	16,7 ^{cdef}	33,5 ^{cd}	32,0 ^{ef}	20,7 ^{e}	78,3 ^{bcde}	72,8 ^{e}	11,67 ^{d}
Bond	**D**	15,5 ^{ef}	34,3 ^{bc}	32,2 ^{ef}	20,7 ^{ef}	77,8 ^{bcde}	72,8 ^{de}	11,70 ^{cd}
Danergo	**T**	17,0 ^{cde}	34,0 ^{bc}	30,9 ^{fg}	19,6 ^{gh}	**79,2 ^{ab}**	**73,6 ^{abc}**	11,80 ^{bc}
Elvis	**T**	15,9 ^{def}	**37,0 ^{ab}**	29,8 ^{g}	19,1 ^{h}	**79,1 ^{ab}**	**74,1 ^{a}**	**11,93 ^{a}**
Icon	**D**	**18,0 ^{abc}**	30,0 ^{de}	33,1 ^{e}	20,7 ^{e}	77,9 ^{bcde}	72,7 ^{e}	11,67 ^{d}
Itaka	**D**	16,4 ^{cdef}	34,0 ^{bc}	31,8 ^{ef}	20,2 ^{efg}	77,9 ^{bcde}	73,2 ^{bcde}	11,73 ^{bcd}
Lush	**T**	**17,8 ^{abc}**	25,8 ^{f}	**38,6 ^{a}**	**24,3 ^{a}**	77,3 ^{de}	70,0 ^{h}	11,13 ^{h}
Perseus	**T**	**19,0 ^{ab}**	29,4 ^{e}	33,2 ^{de}	20,3 ^{efg}	**79,1 ^{abc}**	73,1 ^{cde}	11,73 ^{bcd}
Rockstar	**T**	**19,3 ^{a}**	29,7 ^{e}	32,5 ^{ef}	19,8 ^{fgh}	**79,8 ^{a}**	**73,5 ^{abcd}**	11,80 ^{bc}
Sukari	**D**	15,3 ^{ef}	**34,6 ^{abc}**	32,3 ^{ef}	20,9 ^{e}	**78,5 ^{abcd}**	72,6 ^{e}	11,67 ^{d}
Supercharge	**T**	15,0 ^{f}	**38,0 ^{a}**	30,4 ^{fg}	19,4 ^{gh}	**79,0 ^{abc}**	**73,8 ^{ab}**	**11,83 ^{ab}**
Tabu+	**D**	16,9 ^{cde}	29,0 ^{ef}	35,8 ^{bc}	22,4 ^{cd}	78,1 ^{bcde}	71,5 ^{f}	11,40 ^{ef}
Thumpa	**T**	17,5 ^{bcd}	26,7 ^{ef}	**37,7 ^{ab}**	**23,6 ^{ab}**	**78,6 ^{abcd}**	70,5 ^{gh}	11,23 ^{gh}
Vibe	**D**	17,5 ^{bcd}	27,4 ^{ef}	**36,9 ^{abc}**	23,2 ^{bc}	77,7 ^{cde}	70,8 ^{g}	11,30 ^{fg}
LSD (0.05)		1,8	3,5	2,0	0,8	1,4	0,7	0,12
CV %		6,2	6,7	3,6	2,4	1,1	0,5	0,6

Data should primarily be considered as relative between the cutlivars
Values with the same letter are statistically similar within a column

Table 8A. Dry matter content (%) for year 1 and 2 of trial Lm14.

Italian ryegrass (*Lolium multiflorum*) — Outeniqua Research Farm, Trial **Lm14**

Table 8: DM% Year 1 — Planted 13 March 2023

Cultivars	Type	Cut 1 19/4/2023	Rank	Cut 2 11/5/2023	Rank	Cut 3 23/6/2023	Rank	Cut 4 3/8/2023	Rank	Cut 5 6/9/2023	Rank	Cut 6 11/10/2023	Rank	Cut 7 15/11/2023	Rank	Cut 8 13/12/2023	Rank	Cut 9 11/1/2024	Rank	Cut 10 13/2/2024	Rank	Cut 11 20/3/2024	Rank
Appeal	D	9,3 abc	8	10,2 bcde	10	13,0 efg	13	18,5 cdef	11	19,1 ab	3	18,9 a	2	24,9 ab	3	20,2 bc	4	20,3 bcd	8	23,1 ef	14	22,8 a	1
Barcrespo	D	9,3 abc	7	10,7 ab	3	13,7 bcd	5	17,8 ef	14	17,8 bcde	7	16,6 def	8	23,1 bc	5	19,3 cde	8	20,2 bcde	9	26,3 a	2	20,5 bcdef	9
Barmultra II	T	8,8 cd	15	9,8 def	14	13,1 defg	11	18,6 cdef	10	17,2 cdef	9	16,5 def	10	18,3 g	17	17,9 ef	13	18,2 g	17	23,7 def	12	21,0 abcde	8
Barnaël	T	8,9 bcd	12	10,0 cdef	11	13,3 def	8	18,1 def	12	16,2 efg	15	16,0 f	13	20,6 def	13	17,7 f	14	18,4 fg	16	23,8 cdef	9	18,9 f	16
Bond	D	9,5 abc	5	10,7 ab	4	13,6 cde	6	20,1 abc	3	17,5 bcde	8	16,4 def	11	20,9 de	12	19,2 cde	9	20,3 bcd	7	26,2 ab	3	22,0 abc	4
Danergo	T	8,9 bcd	13	9,8 def	13	13,2 def	9	19,2 abcde	5	17,9 bcde	6	16,5 def	9	20,1 efg	15	18,1 ef	12	21,4 ab	2	23,5 def	13	22,0 abc	3
Elvis	T	9,0 bcd	11	9,7 ef	15	12,4 g	15	19,0 abcde	8	16,6 def	13	14,7 g	16	18,9 fg	16	17,2 f	17	18,9 defg	14	23,8 cdef	10	19,8 def	13
Icon	D	9,5 abc	4	10,5 bcd	6	14,1 abc	4	19,1 abcde	7	17,9 bcd	5	17,6 bcd	5	22,1 cd	7	20,0 bc	5	19,7 cdef	11	25,2 abcde	7	19,8 def	14
Itaka	D	10,3 a	1	10,7 ab	2	14,7 a	1	20,6 a	1	20,0 a	2	18,6 ab	3	23,4 bc	4	20,4 bc	3	21,1 bc	4	26,0 abc	4	21,2 abcd	6
Lush	T	8,8 cd	14	9,5 fg	16	11,7 h	16	15,3 g	16	15,5 fg	16	15,5 fg	15	21,7 cde	9	17,6 f	15	19,0 defg	13	22,2 f	17	19,3 ef	15
Perseus	T	9,2 abc	9	10,3 bcde	7	13,4 cdef	7	19,1 abcde	6	17,0 def	11	16,0 f	14	21,2 de	10	18,3 def	10	19,8 cdef	10	26,3 a	1	20,3 cdef	11
Rockstar	T	9,4 abc	6	10,2 bcde	9	13,2 def	10	18,9 bcde	9	17,1 def	10	16,1 ef	12	21,0 de	11	18,1 ef	11	20,5 bc	6	25,5 abcd	6	20,2 cdef	12
Sukari	D	10,0 ab	2	11,2 a	1	14,4 ab	3	20,4 ab	2	20,0 a	1	19,2 a	1	25,5 a	2	22,3 a	1	22,6 a	1	25,5 abcd	5	22,2 ab	2
Supercharge	T	9,1 abc	10	10,5 bc	5	14,6 a	2	19,6 abcd	4	18,9 abc	4	18,5 abc	4	26,2 a	1	20,8 b	2	19,7 cdefg	12	22,9 ef	15	-	-
Tabu+	D	9,6 abc	3	10,3 bcde	8	13,1 defg	12	17,9 ef	13	16,7 def	12	17,3 cde	7	22,0 cd	8	19,6 bcd	7	20,8 bc	5	23,9 bcdef	8	20,3 bcdef	10
Thumpa	T	7,9 d	17	8,9 g	17	11,4 h	17	15,2 g	17	14,8 g	17	14,2 g	17	20,5 def	14	17,3 f	16	18,8 efg	15	22,4 f	16	21,1 abcde	7
Vibe	D	8,7 cd	16	10,0 cdef	12	12,7 fg	14	17,2 f	15	16,6 def	14	17,5 bcd	6	22,4 cd	6	19,7 bcd	6	21,3 ab	3	23,7 def	11	21,5 abcd	5
LSD (0.05)		1,2		0,6		0,7		1,7		1,7		1,3		1,9		1,5		1,5		2,6		1,9	
CV %		7,6		3,8		3,3		5,5		6,0		4,5		5,3		4,6		4,4		5,2		4,8	

Dry matter % with the same letter are statistically similar within a column

Table 8B. Dry matter content (%) for year 1 and 2 of trial Lm14.

Italian ryegrass (*Lolium multiflorum*) — Outeniqua Research Farm, Trial **Lm14**

Table 8 cont.: DM% Year 2 — Planted 13 March 2023

Cultivars	Type	Cut 12 24/4/2024	Rank	Cut 13 28/5/2024	Rank	Cut 14 19/7/2024	Rank	Cut 15 12/9/2024	Rank	Cut 16 25/10/2024	Rank	Cut 17 26/11/2024	Rank	Cut 18 13/1/2025	Rank
Appeal	**D**	14,9 bc	3	16,0 b	2	17,9 bcdef	9	23,5 d	5	**22,4 ab**	**2**	**20,8 ab**	**2**	-	-
Barcrespo	**D**	14,6 bcd	7	15,5 bc	4	18,8 bcd	7	23,1 de	10	21,0 bcde	5	**20,2 abc**	**3**	23,5 a	6
Barmultra II	**T**	14,1 bcde	9	14,0 efg	13	17,4 def	11	22,8 de	12	19,6 ef	15	18,0 def	14	-	-
Barnaël	**T**	13,8 def	13	14,1 defg	12	17,7 cdef	10	23,7 bcd	4	19,7 ef	14	18,5 cdef	10	-	-
Bond	**D**	14,7 bcd	4	15,3 bc	6	18,9 abcd	6	24,6 bc	3	20,8 cde	6	18,2 cdef	13	-	-
Danergo	**T**	14,6 bcd	6	14,1 defg	11	16,9 ef	13	23,3 d	8	**21,3 abcd**	**4**	18,3 cdef	12	-	-
Elvis	**T**	14,0 bcde	10	13,6 fgh	14	16,5 f	14	22,0 e	14	20,2 def	11	18,4 cdef	11	-	-
Icon	**D**	13,3 ef	14	15,3 bc	5	**19,3 abc**	**4**	23,4 d	6	20,6 de	8	19,0 bcdef	7	24,6 a	4
Itaka	**D**	15,1 b	2	15,6 bc	3	**19,6 ab**	**2**	24,7 b	2	**22,3 abc**	**3**	**19,5 abcde**	**5**	-	-
Lush	**T**	12,9 f	16	13,5 gh	15	16,4 f	15	20,5 f	15	18,7 f	16	17,4 f	16	24,1 a	5
Perseus	**T**	14,5 bcd	8	15,1 bcd	7	**19,4 abc**	**3**	22,7 de	13	20,5 de	9	18,5 cdef	9	26,3 a	2
Rockstar	**T**	13,9 cdef	12	15,0 cde	8	**19,0 abcd**	**5**	23,4 d	7	20,3 def	10	18,8 bcdef	8	26,1 a	3
Sukari	**D**	**16,2 a**	**1**	**17,8 a**	**1**	**20,6 a**	**1**	**26,5 a**	**1**	**22,8 a**	**1**	**21,5 a**	**1**	-	-
Supercharge	**T**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tabu+	**D**	14,0 bcde	11	14,6 cdef	10	18,4 bcde	8	22,9 de	11	20,7 de	7	**19,7 abcd**	**4**	-	-
Thumpa	**T**	13,0 ef	15	12,9 h	16	16,4 f	16	20,3 f	16	19,8 ef	13	17,5 ef	15	-	-
Vibe	**D**	14,7 bcd	5	14,6 cdef	9	17,2 def	12	23,1 d	9	19,9 def	12	19,2 bcdef	6	26,7 a	1
LSD (0.05)		1,1		1,0		1,8		1,2		1,5		2,0		NS	
CV %		4,6		4,1		6,0		3,0		4,5		6,4		4,1	

Dry matter % with the same letter are statistically similar within a column

Table 8A. Yield for individual harvest for year 1 f trial Lm14.

Italian ryegrass (*Lolium multiflorum*)

Table 9: Yield (t DM/ha) Year 1

Outeniqua Research Farm, Trial **Lm14**

Planted 13 March 2023

Cultivars	Type	Cut 1 19/4/2023	Rank	Cut 2 11/5/2023	Rank	Cut 3 23/6/2023	Rank	Cut 4 3/8/2023	Rank	Cut 5 6/9/2023	Rank	Cut 6 11/10/2023	Rank	Cut 7 15/11/2023	Rank	Cut 8 13/12/2023	Rank	Cut 9 11/1/2024	Rank	Cut 10 13/2/2024	Rank	Cut 11 20/3/2024	Rank
Appeal	**D**	0,85 bc	15	**1,38 abcde**	**12**	**1,53 abcdef**	**10**	1,91 bcd	6	2,03 def	14	1,32 h	17	1,61 h	16	1,05 cd	15	**1,17 abc**	**4**	**0,34 abcd**	**9**	**0,47 abcd**	**6**
Barcrespo	**D**	**1,21 a**	**5**	**1,43 abcde**	**8**	**1,71 a**	**1**	1,88 bcd	7	2,36 bcd	6	2,30 ef	12	2,35 def	9	**1,45 a**	**1**	**1,13 abcd**	**6**	**0,36 abcd**	**7**	**0,43 abcd**	**7**
Barmultra II	**T**	**1,26 a**	**2**	**1,40 abcde**	**10**	**1,66 abc**	**6**	1,70 def	10	2,31 bcde	7	**2,75 ab**	**2**	**2,86 abc**	**3**	**1,29 abcd**	**6**	**1,11 abcd**	**8**	**0,34 abcd**	**10**	0,35 cd	10
Barnaël	**T**	**1,26 a**	**3**	1,34 bcde	14	1,51 bcdef	11	1,76 cde	9	2,30 bcde	8	**2,70 ab**	**3**	**2,89 ab**	**2**	**1,43 a**	**2**	1,02 bcd	11	0,27 bcde	12	0,34 cd	11
Bond	**D**	**1,09 a**	**13**	**1,56 a**	**1**	**1,63 abcd**	**8**	1,88 bcd	8	**2,63 abc**	**3**	2,31 ef	11	2,64 bcd	4	**1,21 abcd**	**8**	1,05 bcd	10	0,27 bcde	11	0,38 bcd	9
Danergo	**T**	**1,16 a**	**7**	**1,44 abcde**	**7**	**1,65 abcd**	**7**	1,45 fgh	15	1,72 f	17	2,18 f	14	2,44 de	6	**1,23 abcd**	**7**	1,01 bcd	14	0,15 e	16	0,04 e	16
Elvis	**T**	**1,12 a**	**10**	**1,50 abc**	**4**	**1,69 a**	**3**	1,67 def	11	2,25 cde	10	**2,66 abc**	**4**	**3,06 a**	**1**	**1,36 abc**	**4**	1,02 bcd	12	0,24 cde	14	0,31 de	13
Icon	**D**	**1,16 a**	**8**	**1,52 ab**	**2**	1,50 cdef	12	1,47 fg	14	2,20 cde	13	**2,65 abc**	**5**	2,24 efg	12	1,10 bcd	14	1,01 bcd	13	**0,37 abc**	**4**	**0,41 abcd**	**8**
Itaka	**D**	**1,15 a**	**9**	**1,47 abcd**	**5**	**1,61 abcde**	**9**	1,61 ef	12	2,25 bcde	9	**2,62 abcd**	**6**	2,39 def	7	**1,16 abcd**	**11**	0,92 cd	15	**0,36 abcd**	**5**	0,30 de	14
Lush	**T**	**1,24 a**	**4**	**1,35 abcde**	**13**	1,45 efg	15	1,56 ef	13	2,20 cde	12	2,20 ef	13	2,26 efg	11	**1,15 abcd**	**12**	**1,12 abcd**	**7**	**0,36 abcd**	**6**	**0,64 ab**	**2**
Perseus	**T**	0,82 c	16	**1,51 abc**	**3**	1,38 fg	16	1,19 h	17	1,91 ef	15	**2,85 a**	**1**	2,52 cde	5	1,10 bcd	13	**1,15 abcd**	**5**	**0,42 a**	**2**	**0,59 abc**	**3**
Rockstar	**T**	**1,11 a**	**11**	**1,38 abcde**	**11**	1,32 g	17	1,22 gh	16	1,73 f	16	2,58 bcd	7	2,36 def	8	1,04 d	16	1,07 bcd	9	**0,40 ab**	**3**	**0,54 abcd**	**4**
Sukari	**D**	**1,21 a**	**6**	**1,41 abcde**	**9**	**1,66 abc**	**5**	**2,10 ab**	**2**	**3,00 a**	**1**	2,45 cde	8	2,34 def	10	**1,37 ab**	**3**	**1,35 a**	**1**	**0,35 abcd**	**8**	**0,53 abcd**	**5**
Supercharge	**T**	0,65 c	17	1,24 e	17	**1,70 a**	**2**	**2,30 a**	**1**	**2,68 ab**	**2**	1,65 g	16	1,39 h	17	**1,20 abcd**	**9**	0,16 e	17	0,00 f	17	-	-
Tabu+	**D**	**1,27 a**	**1**	1,29 cde	15	**1,69 ab**	**4**	**2,07 ab**	**3**	2,37 bcd	5	2,32 ef	10	2,07 fg	13	**1,32 abcd**	**5**	**1,19 ab**	**3**	**0,43 a**	**1**	**0,67 a**	**1**
Thumpa	**T**	**1,07 ab**	**14**	1,26 de	16	1,49 cdefg	13	1,97 bc	5	2,46 bcd	4	2,38 def	9	1,99 fg	15	**1,17 abcd**	**10**	0,90 d	16	0,23 de	15	0,29 de	15
Vibe	**D**	**1,11 a**	**12**	**1,44 abcde**	**6**	1,48 defg	14	1,99 bc	4	2,22 cde	11	1,87 g	15	2,07 fg	14	1,04 d	17	**1,20 ab**	**2**	0,26 cde	13	0,32 cd	12
LSD (0.05)		0,24		0,22		0,18		0,26		0,43		0,25		0,35		0,30		0,26		0,13		0,28	
CV %		13,0		9,5		6,8		9,1		11,4		6,3		9,0		15,1		15,1		24,0		33,1	

Yields with the same letter are statistically similar within a column

Table 9B. Yield for individual harvest for year 1 and year 2 f trial Lm14.

Italian ryegrass (*Lolium multiflorum*) — Outeniqua Research Farm, Trial **Lm14**

Table 9 cont.: **Yield (t DM/ha) Year 2** — Planted 13 March 2023

Cultivars	Type	Cut 12 24/4/2024	Rank	Cut 13 28/5/2024	Rank	Cut 14 19/7/2024	Rank	Cut 15 12/9/2024	Rank	Cut 16 25/10/2024	Rank	Cut 17 26/11/2024	Rank	Cut 18 13/1/2025	Rank
Appeal	**D**	0,68 [cdef]	12	0,68 [ef]	14	0,89 [bcd]	6	0,57 [bcde]	10	0,97 [h]	16	0,76 [e]	16	-	-
Barcrespo	**D**	**0,94 [abc]**	**5**	**1,03 [ab]**	**2**	0,83 [bcd]	10	**0,80 [ab]**	**2**	**2,23 [a]**	**1**	1,09 [cd]	12	0,32 [b]	6
Barmultra II	**T**	0,71 [bcdef]	10	**0,84 [abcde]**	**10**	**0,93 [abc]**	**3**	0,50 [bcde]	12	1,74 [bcdef]	8	1,29 [c]	6	-	-
Barnaël	**T**	**0,98 [ab]**	**4**	**1,03 [ab]**	**3**	0,86 [bcd]	9	0,48 [bcde]	13	1,68 [cdefg]	10	1,33 [bc]	4	-	-
Bond	**D**	**0,86 [abcde]**	**7**	**0,96 [abc]**	**5**	**0,97 [ab]**	**2**	**0,76 [abc]**	**5**	1,69 [cdefg]	9	1,31 [bc]	5	-	-
Danergo	**T**	0,43 [f]	16	0,71 [def]	13	**0,92 [abc]**	**4**	0,60 [bcde]	9	1,45 [efg]	13	1,15 [cd]	10	-	-
Elvis	**T**	0,59 [ef]	14	0,76 [cdef]	12	**1,13 [a]**	**1**	**1,01 [a]**	**1**	**1,91 [abc]**	**3**	**1,59 [ab]**	**2**	-	-
Icon	**D**	**0,92 [abcd]**	**6**	**0,87 [abcde]**	**8**	0,71 [cd]	15	0,44 [cde]	14	1,76 [bcdef]	7	1,23 [c]	8	0,46 [b]	5
Itaka	**D**	0,71 [bcdef]	11	**0,94 [abcd]**	**6**	0,87 [bcd]	8	0,54 [bcde]	11	1,40 [fg]	14	1,09 [cd]	11	-	-
Lush	**T**	0,77 [bcde]	8	0,80 [bcdef]	11	0,68 [d]	16	0,63 [bc]	7	1,78 [bcde]	6	1,25 [c]	7	**1,04 [a]**	**2**
Perseus	**T**	**0,98 [ab]**	**3**	**1,07 [a]**	**1**	0,80 [bcd]	12	0,25 [e]	16	1,49 [defg]	11	**1,59 [ab]**	**3**	**1,12 [a]**	**1**
Rockstar	**T**	**1,05 [a]**	**1**	**0,94 [abcd]**	**7**	0,80 [bcd]	11	0,27 [de]	15	1,49 [defg]	12	**1,62 [a]**	**1**	**0,86 [a]**	**3**
Sukari	**D**	**0,98 [ab]**	**2**	**0,98 [abc]**	**4**	**0,91 [abcd]**	**5**	**0,66 [abc]**	**6**	1,82 [bcd]	5	0,93 [de]	14	-	-
Supercharge	**T**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tabu+	**D**	0,72 [bcde]	9	**0,87 [abcde]**	**9**	0,73 [bcd]	13	**0,76 [abc]**	**4**	1,83 [bcd]	4	0,93 [de]	15	-	-
Thumpa	**T**	0,64 [def]	13	0,67 [ef]	15	0,73 [bcd]	14	**0,80 [ab]**	**3**	**2,09 [ab]**	**2**	1,17 [cd]	9	-	-
Vibe	**D**	0,58 [ef]	15	0,59 [f]	16	0,88 [bcd]	7	0,62 [bcd]	8	1,34 [g]	15	1,07 [cd]	13	0,48 [b]	4
LSD (0.05)		0,28		0,24		0,24		0,35		0,36		0,29		0,35	
CV %		21,5		16,7		16,6		35,0		12,8		14,2		12,7	

Yields with the same letter are statistically similar within a column

Summary

Total yield

Total yield year 1, highest yielding: Sukari, Barmultra II, Barnaël, Elvis

Total yield over 15 months, highest yielding: Sukari, Barnaël

Total yield

Best winter yield: Sukari, SuperCharge, Tabu+

Best spring yield: Elvis, Barnaël, Barmultra II

Best summer yield: Sukari, Tabu+, Perseus (FLL), Lush, Barcrespo

Best second autumn yield: Perseus (FLL), Rockstar (FLL), Sukari, Barcrespo, Barnaël, Icon, Bond, Tabu+, Lush.

Only two cultivars were in the best yielding group both in winter and summer namely Tabu+ and Sukari. However, both those cultivars had a relatively high flowering incidence and a long flowering window. For better forage quality in the summer the cultivars with low flowering incidence and a reasonable yield would be more suitable.

The two Festuloliums showed their persistence potential reflected in the second autumn yield. However, their winter yield is significantly lower ($p<0.05$) than almost all Italian ryegrass cultivars in the trial.

Flowering incidence

Lowest flowering incidence: Appeal, Bond, Itaka, Lush, Perseus, Rockstar, Vibe

Bolting started towards the end of August and lasted to mid-January with some cultivars continuing to mid-February.

Rust incidence

Lowest leaf rust incidence: Sukari, SuperCharge, Lush, Barnaël, Appeal, Icon

Rust incidence peaked from January to April.

Persistence

Best persistence though summer and into second autumn: Perseus (FLL), Lush, Rockstar (FLL), Barcrespo, Icon, Sukari, Tabu+, Bond.

Even though these cultivars persisted, their yield in February and March was negligible with the best cultivar yielding 0.43 and 0.67 t DM/ha respectively. The yield in January ranged from 1.12 to 1.35 t DM/ha.

References:

Cabrera Estrada JI, Delagarde R, Faverdin RP, Peyraud JL. 2004. Dry matter intake and eating rate of grass by dairy cows is restricted by internal, but not external water. Animal Feed Science and Technology 114: 59- 74.

Carr JH. 1975. Disease of herbage crops – some problems and progress. Annals of Applied Biology 81: 235 – 279.

Chapman DF. 2016. Using Ecophysiology to Improve Farm Efficiency: Application in Temperate Dairy Grazing Systems. In: Forage Plant Ecophysiology (ed Matthews C). Agriculture 6, 17: 122 – 140.

John A and Ulyatt MJ. 1987. Importance of dry matter content to voluntary intake of fresh grass forages. Proceedings of the New Zealand Society of Animal Production 47: 13 – 16.

Leaver JD 1985. Milk production from grazed temperate grassland. Journal of Dairy Research 52: 313-344

McKenzie EHC. 1971. Seasonal changes of fungal spore numbers in ryegrass-white clover pasture, and the effect of benomyl on pasture fungi. New Zealand Journal of Agricultural Research 14: 371 – 392.

Minson DJ. 1990. Forages in ruminant nutrition. Animal feeding and nutrition. A Series of Monographs and Treatises (Cunha TJ, Ed.)

Plummer RM, Hall RL and Watt TA. 1990. The influence of crown rust (*Puccinia coronata*) on tiller production and survival of perennial ryegrass (*Lolium perenne*) plants in simulated swards. Grass and Forage Science 45: 9 – 16.

Verite R and Journet M. 1970. Effect of the Water Content of Grass and Dehydration at Low Temperature upon Its Feeding Value for Dairy Cows. Annales de Zootechnie, 19, 255-268.

Webb C, Stewart A and Harmer M. 2019. Progress in breeding for crown rust (*Puccinia coronata* f.sp. *lolii*) resistance in perennial ryegrasses. Proceedings of the 2019 Agronomy Australia Conference, 25 – 29 August 2019, Wagga Wagga, Australia.

Italian ryegrass cultivar evaluation results for autumn 2024 to autumn 2025 (Lm15)

Sigrun Ammann*, Dalena Lombard, Lethu Zulu

Western Cape Department of Agriculture, Research and Technology Development, Directorate Plant Sciences, Outeniqua Research Farm, P.O. Box 24, George 6530
*Sigrun.ammann@westerncape.gov.za

Introduction

The Italian ryegrass (Lolium multiflorum) elite cultivar evaluation trial, Lm15, was planted 14 March 2024 at the Outeniqua Research Farm. The aim of the trial is to evaluate the recent Italian ryegrass cultivars being used for intensive dairy pastures or upcoming cultivars that are about to enter the market. This trial provides local data to assist farmers with choosing cultivars best suited to the region and to their specific use of Italian ryegrass in their pasture systems. Some of the information can be used for system fit, especially the data related to flowering behaviour and persistence as reflected in the sward density data. Seasonal yield distribution can also influence system fit. Preferably the cultivars evaluated in this trial should be ones that persist for at least a 12-month period, preferably 15 months, which we refer to as long duration Italian ryegrass cultivars. There is however still a use for the shorter duration cultivars in combination with other species or cultivars to fill certain gaps i.e. as a component of a mixed pasture system, depending on the requirements within a specific pasture system.

Since almost all ryegrass cultivars are imported, this data provides insight into the genetic potential and adaption, mainly for the southern Cape coastal region. This data is specific for March 2024 to May 2025 which covers the first 15 months of the trial. For previous data on Italian ryegrass refer to the Outeniqua Information Day booklets released annually and available on www.elsenburg.com. This will give an indication of how cultivars perform in different years of establishment.

Cultivars evaluated

The trial consisted of 18 cultivars of which one is an Italian-type hybrid ryegrass. Of these cultivars eight are diploid and 10 are tetraploid.

Italian diploid: Appeal, Barcrespo, Contest, Fox, Inducer, Itaka, Sendero, Sirmione

Italian tetraploid: Arise, Barmultra II, Barnaël, Dolomit, Impact, Kingsgreen, Lush, Nana, Sezina

Hybrid ryegrass Italian type tetraploid: Frenzy

Parameters reported in this article

- Total DM yield
- Seasonal DM yield
- Flowering behaviour
- Rust incidence
- Persistence / sward density

Trial design and management

The trial was designed as a Randomised Block Design with three replications. Gross plot size is 2.1m x 6m and net plot size is 1.3m x 4.7m. Diploids are sown at a rate of 25kg/ha and tetraploids at 30kg/ha, with rows spaced 15cm apart. The trial is harvested according to physiological stage based on 3-leaf for ryegrass. In spring canopy closure is considered before leaf stage to avoid a negative impact on daughter tiler development. Since leaf emergence rate is mainly driven by temperature, as well as radiation intensity, water and nutrient availability (Chapman 2016), most cultivars reach the 3-leaf stage at a similar time.

Plots are cut with a reciprocating mower (Agria) at 5cm height. The material from the net plot is sampled for the dry matter determination with an approximately 500g wet weight sample and the rest of the material is raked together and weighed. Samples are weighed and oven dried at 70˚C.

The trials were top-dressed with nitrogen fertilizer after each harvest, and potassium fertilizer to account for nutrient removal, since all material is removed from the trial.

Irrigation was applied weekly if necessary to add to the rainfall and after fertilization. Irrigation applied during the 15 months of the trial was 552mm and the rainfall was 1052mm adding up to a total of 1604mm. During the first year from March 2024 to February 2025 irrigation applied was 440mm and rainfall of 890mm while in the three months from March 2025 to May 20205 112mm irrigation was plied and 162mm rainfall was received.

Results

Total yield

Total yield (Table 1) is important, especially on farms that have the means to conserve the surplus as silage for later use. The establishment and input costs are also similar regardless of yield, hence the importance of choosing the cultivars with the best yield.

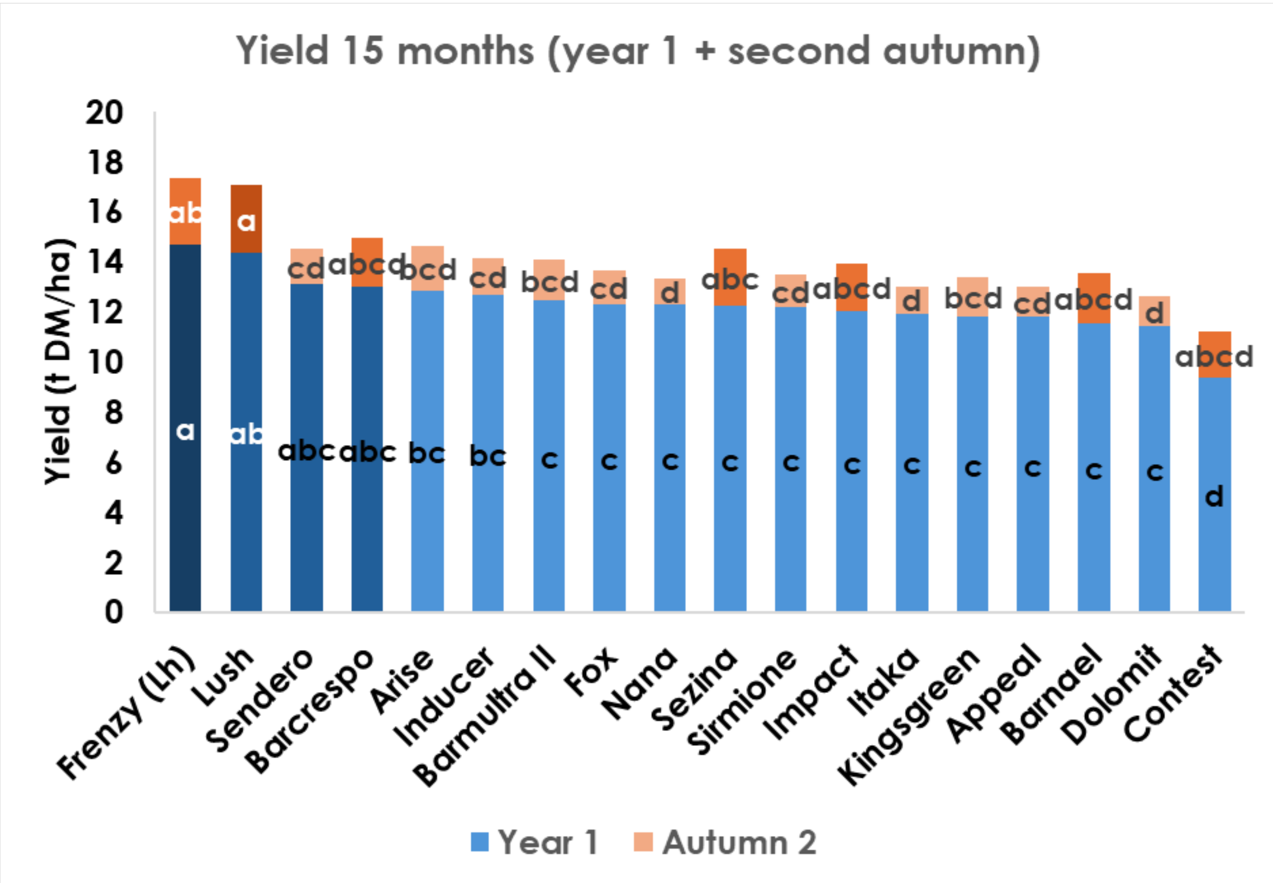


Figure 1. Total yield (t DM/ha) over 15 months of trial Lm15 from establishment in March 2024. Data with the same letter are similar (p<0.05).

Table 1. Seasonal yield (t DM/ha) over 15 months of trial Lm15 from establishment in March 2024. Data with the same letter within a column are similar (p<0.05).

Italian ryegrass (*Lolium multiflorum*) — Outeniqua Research Farm, Trial **Lm15**

Table 1: Seasonal yield (t DM/ha) 15 months — Planted 14 March 2024

Cultivars	Type	Autumn 2024	Rank	Winter 2024	Rank	Spring 2024	Rank	Summer 2024/25	Rank	Autumn 2025	Rank	Total Year 1	Rank	Total 15 months	Rank
Appeal	**D**	2,38 ^{defg}	10	**3,16** ^{abc}	8	4,93 ^{de}	17	1,33 ^{bcd}	6	1,21 ^{cd}	15	11,79 ^{c}	15	12,60 ^{cde}	16
Arise	**T**	2,43 ^{cdef}	9	**3,19** ^{ab}	5	4,25 ^{e}	18	1,61 ^{b}	3	1,78 ^{bcd}	8	12,84 ^{bc}	5	14,62 ^{bc}	4
Barcrespo	**D**	2,54 ^{bcd}	7	**3,19** ^{ab}	6	**5,86** ^{abc}	5	1,40 ^{bc}	4	**1,97** ^{abcd}	5	**12,99** ^{abc}	4	**14,96** ^{abc}	3
Barmultra II	**T**	2,55 ^{bcd}	5	**3,26** ^{ab}	4	**5,68** ^{abcd}	11	0,95 ^{bcde}	12	1,64 ^{bcd}	9	12,45 ^{c}	7	14,08 ^{cd}	8
Barnael	**T**	2,34 ^{efgh}	12	2,91 ^{bc}	14	**5,88** ^{abc}	3	0,44 ^{ef}	17	**2,00** ^{abcd}	4	11,57 ^{c}	16	12,90 ^{cd}	14
Contest	**D**	2,24 ^{ghi}	16	2,66 ^{c}	18	4,25 ^{e}	18	0,20 ^{f}	18	**1,89** ^{abcd}	6	9,35 ^{d}	18	9,98 ^{e}	18
Dolomit	**T**	**2,77** ^{a}	1	2,76 ^{bc}	17	5,08 ^{cde}	16	0,86 ^{cdef}	15	1,15 ^{d}	16	11,46 ^{c}	17	11,85 ^{de}	17
Fox	**D**	2,17 ^{hi}	17	**3,12** ^{abc}	10	**5,74** ^{abcd}	8	1,26 ^{bcd}	7	1,39 ^{cd}	13	12,29 ^{c}	8	13,22 ^{cd}	11
Frenzy Lh	**T**	2,34 ^{efgh}	11	**3,27** ^{ab}	2	**6,11** ^{ab}	2	**2,98** ^{a}	2	**2,66** ^{ab}	2	**14,71** ^{a}	1	**17,36** ^{a}	1
Impact	**T**	2,14 ^{i}	18	**3,14** ^{abc}	9	**5,86** ^{abc}	4	0,89 ^{cdef}	13	**1,88** ^{abcd}	7	12,03 ^{c}	12	13,92 ^{cd}	9
Inducer	**D**	2,28 ^{fghi}	14	**3,27** ^{ab}	3	**5,73** ^{abcd}	9	1,38 ^{bc}	5	1,50 ^{cd}	11	12,66 ^{bc}	6	14,16 ^{cd}	7
Itaka	**D**	2,54 ^{bcd}	6	2,92 ^{bc}	13	5,24 ^{bcd}	15	1,24 ^{bcd}	8	1,06 ^{d}	18	11,95 ^{c}	13	13,01 ^{cd}	12
Kingsgreen	**T**	**2,72** ^{ab}	2	2,83 ^{bc}	16	**5,62** ^{abcd}	12	0,64 ^{def}	16	1,61 ^{bcd}	10	11,80 ^{c}	14	12,88 ^{cd}	15
Lush	**T**	2,48 ^{cde}	8	**3,17** ^{abc}	7	**5,38** ^{abcd}	14	**3,31** ^{a}	1	**2,75** ^{a}	1	**14,34** ^{ab}	2	**17,09** ^{ab}	2
Nana	**T**	2,56 ^{bcd}	4	**2,98** ^{abc}	11	**5,85** ^{abc}	6	0,88 ^{cdef}	14	1,07 ^{d}	17	12,28 ^{c}	9	12,99 ^{cd}	13
Sendero	**D**	2,27 ^{fghi}	15	**3,48** ^{a}	1	**6,19** ^{a}	1	1,14 ^{bcde}	10	1,42 ^{cd}	12	**13,09** ^{abc}	3	14,51 ^{bc}	6
Sezina	**T**	**2,59** ^{abc}	3	2,94 ^{bc}	12	**5,68** ^{abcd}	10	1,01 ^{bcde}	11	**2,29** ^{abc}	3	12,23 ^{c}	10	14,52 ^{bc}	5
Sirmione	**D**	2,28 ^{fghi}	13	2,89 ^{bc}	15	**5,78** ^{abcd}	7	1,21 ^{bcd}	9	1,29 ^{cd}	14	12,19 ^{c}	11	13,48 ^{cd}	10
LSD (0,05)		0,19		0,52		0,91		0,71		1,11		1,77		2,64	
CV%		4,7		10,3		9,8		34,0		32,7		8,7		11,6	

Lh Hybrid ryegrass (*Lolium hybridum*)
Yields with the same letter are statistically similar within a column

Seasonal yield data **(Table 1)** is of value for optimising fodder flow requirements especially for the more challenging seasons which are generally winter and summer as well as the second autumn. The question is whether there are cultivars with both good winter and summer yield. Alternatively, it is advisable to plant paddocks to different cultivars to take advantage of different seasonal yield distributions and to spread risk. A high yielding spring cultivar can for instance be considered for silage making of surplus production. Other considerations are for mixed pastures and how the seasonal yield can best be matched with the yield of the other species in the mixture. Seasonal yield should be considered in conjunction with the **flowering behaviour in Table 4** and the associated forage quality by way of flowering incidence being associated with higher NDF.

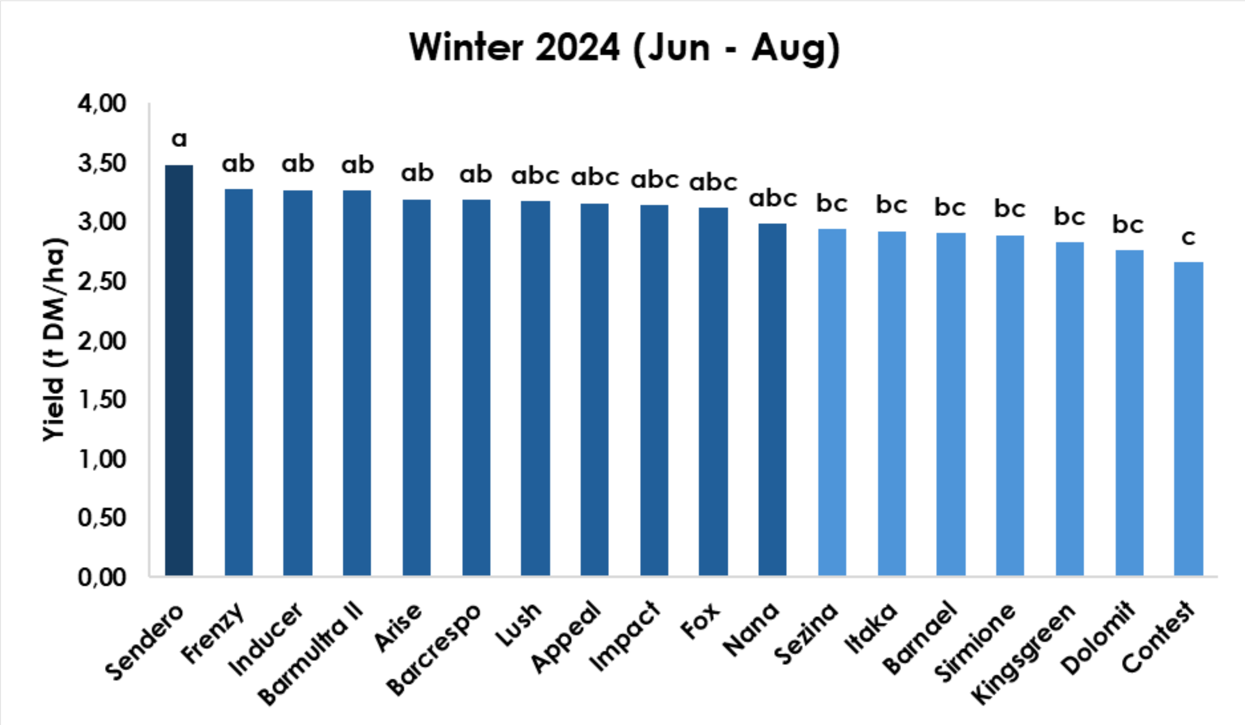


Figure 2. Winter yield (t DM/ha) trial Lm15 from establishment in March 2024. Data with the same letter are similar (p<0.05).

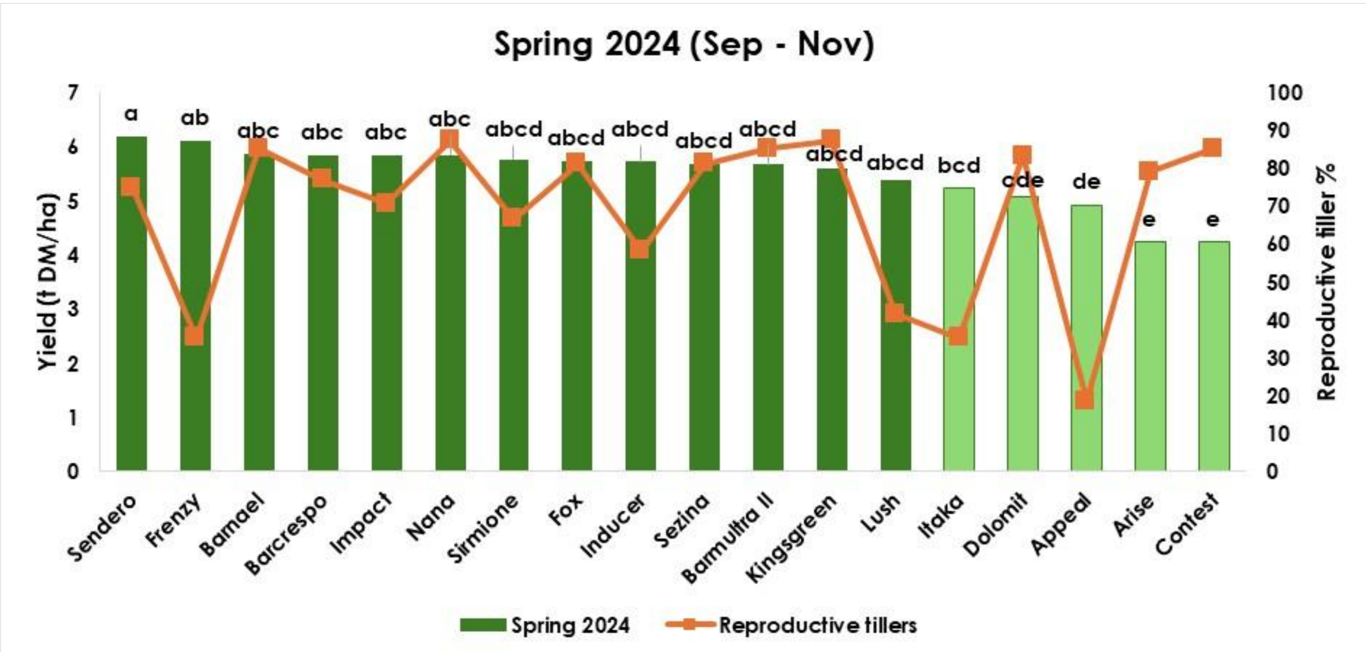


Figure 3. Spring dry matter yield (t DM/ha) shown together with the flowering incidence as the reproductive tiller % which is a ratings-based value.

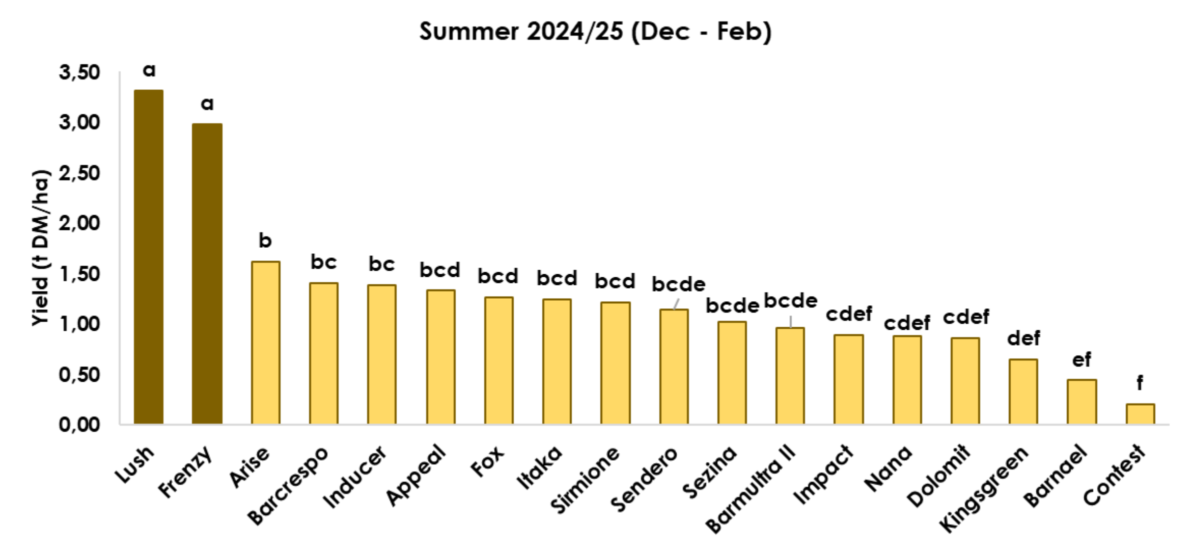


Figure 4. Dry matter yield (t DM/ha) for summer 2024/25.

Seasonal growth rates

Seasonal growth rates **(Table 2)** are important indicators of whether there will be sufficient grazing to support the herd, especially the lactating dairy herd and their fodder flow needs. If we consider an example of what growth rate might be needed, it can look as follows. The cows will preferably be required to graze year-round. If we assume a 450kg cow (which will eat approximately 16kg DM/day of which 10kg DM/day may come from the pasture) and we assume a stocking rate of 4 cows/ha and a wastage rate of 10%, then we will require a daily growth rate of 44kg DM/ha/day throughout the year. It would mean that in the surplus months any growth above this rate would need to be ensiled for feeding back in the months with the lower growth rates.

Table 2. Seasonal growth rates (kg DM/ha/day) for Lm15 established in March 2024

Italian ryegrass (*Lolium multiflorum*) Outeniqua Research Farm, Trial **Lm15**

Table 2: Seasonal growth rates (kgDM/ha/day) 15 mo Planted 14 March 2024

Cultivars	Type	Autumn 2024	Rank	Winter 2024	Rank	Spring 2024	Rank	Summer 2024/25	Rank	Autumn 2025	Rank
Appeal	**D**	30,5 ^{defg}	10	**34,4** ^{abc}	8	54,2 ^{de}	17	14,7 ^{bcd}	6	13,1 ^{cd}	15
Arise	**T**	31,2 ^{cdef}	9	**34,7** ^{ab}	5	61,6 ^{abcd}	13	17,9 ^{b}	3	19,3 ^{abcd}	8
Barcrespo	**D**	32,6 ^{bcd}	7	**34,6** ^{ab}	6	**64,4** ^{abc}	5	15,6 ^{bc}	4	**21,4** ^{abcd}	5
Barmultra II	**T**	32,8 ^{bcd}	5	**35,4** ^{ab}	4	**62,4** ^{abcd}	10	10,6 ^{bcde}	12	17,8 ^{bcd}	9
Barnael	**T**	30,0 ^{efgh}	12	31,6 ^{bc}	14	**64,6** ^{abc}	3	4,9 ^{ef}	17	**21,8** ^{abcd}	4
Contest	**D**	28,7 ^{ghi}	16	28,9 ^{c}	18	46,7 ^{e}	18	2,2 ^{f}	18	**20,5** ^{abcd}	6
Dolomit	**T**	**35,5** ^{a}	1	30,0 ^{bc}	17	55,8 ^{cde}	16	9,6 ^{cdef}	15	12,5 ^{d}	16
Fox	**D**	27,9 ^{hi}	17	**33,9** ^{abc}	10	**63,1** ^{abcd}	8	14,0 ^{bcd}	7	15,1 ^{cd}	13
Frenzy Lh	**T**	30,0 ^{efgh}	11	**35,6** ^{ab}	2	**67,1** ^{ab}	2	**33,2** ^{a}	2	**28,8** ^{ab}	2
Impact	**T**	27,5 ^{i}	18	**34,1** ^{abc}	9	**64,4** ^{abc}	4	9,8 ^{cdef}	13	**20,5** ^{abcd}	7
Inducer	**D**	29,2 ^{fghi}	14	**35,5** ^{ab}	3	**63,0** ^{abcd}	9	15,4 ^{bc}	5	16,3 ^{cd}	11
Itaka	**D**	32,6 ^{bcd}	6	31,8 ^{bc}	13	57,6 ^{bcd}	15	13,8 ^{bcd}	8	11,5 ^{d}	18
Kingsgreen	**T**	**34,9** ^{ab}	2	30,8 ^{bc}	16	**61,7** ^{abcd}	12	7,2 ^{def}	16	17,5 ^{bcd}	10
Lush	**T**	31,7 ^{cde}	8	**34,5** ^{abc}	7	**59,1** ^{abcd}	14	**36,8** ^{a}	1	**29,9** ^{a}	1
Nana	**T**	32,9 ^{bcd}	4	**32,4** ^{abc}	11	**64,3** ^{abc}	6	9,8 ^{cdef}	14	11,6 ^{d}	17
Sendero	**D**	29,1 ^{fghi}	15	**37,8** ^{a}	1	**68,1** ^{a}	1	12,7 ^{bcde}	10	15,5 ^{cd}	12
Sezina	**T**	**33,2** ^{abc}	3	32,0 ^{bc}	12	**62,4** ^{abcd}	11	11,3 ^{bcde}	11	**24,9** ^{abc}	3
Sirmione	**D**	29,3 ^{fghi}		31,4 ^{bc}	15	**63,5** ^{abcd}	7	13,5 ^{bcd}	9	14,1 ^{cd}	14
LSD (0,05)		2,42		5,68		9,97		7,93		12,13	
CV%		4,7		10,3		9,8		34,0		32,7	

Lh Hybrid ryegrass (*Lolium hybridum*)
Growth rates with the same letter are statistically similar within a column

Leaf rust incidence

Leaf rust incidence **(Table 3)** refers mainly to crown rust (*Puccinia coronata*). According to Clarke & Eagling (1994) and Webb et al (2019) crown rust causes yield loss as well as negative effects on root weight and rooting depth, tiller numbers and leaf area or photosynthetic area. Potter (2007) reported not only reduced yield but also reduced water-soluble carbohydrates and reduced digestibility. Plummer et al (1990) also refers to reduced tiller density and increased tiller death. Carr (1975) reports rust to be a water-soluble carbohydrate (WSC) sink that reduces growth and forage quality. Additionally, Carr (1975) estimates that 10% leaf rust infection could cause up to 50% decline in WSC concentration. Hence there are advantages to cultivars which are resistant or have a low incidence only.

Rust can be more severe under nutrient deficiency conditions or if growth cycles are allowed to continue beyond the 3-leaf stage. Increased dead leaf matter may also increase facial eczema (McKenzie 1971).

Flowering behaviour

Flowering behaviour **(Table 4)** is important since it results in a higher stem component which implies a higher fibre content and thus lower nutritive value. The percentage of the sward that is reproductive varies significantly between cultivars due to vernalisation (cold days) requirements as does the duration of reproductive tillers in the sward (flowering window). Vernalisation takes place on tiller basis and not on a tuft basis. In years with more "cold days" in winter the flowering incidence will be higher. Cultivars that do have a high bolting percentage could for instance be used for paddocks that will be cut for silage although it would also affect the silage quality as opposed to cutting a non-reproductive sward that is leafy. In mixtures with species that are very competitive and tall growing in summer it might be an advantage to have a ryegrass component with a higher bolting percentage as that results in taller plants to compete with the other tall components for example chicory or lucerne.

An additional disadvantage of a cultivar with a high percentage of reproductive tillers, apart from the effects on forage quality, is the possibility that seed drop will occur if the defoliation cycle is not strictly managed in spring. This results in volunteer plants in years to come with an undesirable impact on pasture production and management.

Most Italian ryegrass cultivars that are available, do have the ability to produce new vegetative daughter tillers after the flowering phase. These are then referred to as Italian ryegrasses with a long growth duration (obligate types). There are also cultivars that do not produce vegetative tillers after the flowering phase and thus end after the bolting phase. In the current trial there is one such cultivars, SuperCharge (facultative type).

Italian ryegrass can also be used for spring-planting. However, only the cultivars with a low flowering incidence assessed from a spring-planted flowering assessment, are suitable for spring-planting since early bolting will negatively affect such a planting.

Results for spring-planting are available in the Outeniqua Information Day book of 2023.

Sward density

Sward density ratings **(Table 5)** give an indication of **persistence** especially in the summer months. The cultivars that retain good sward density or plant population throughout the summer are desirable in terms of yield but also ground cover which in turn relates to weed ingression potential.

Yield for individual harvest for year 1 and year 2 are given in Table 6.

Table 3. Rust incidence (%) for Lm15 established in March 2024

Italian ryegrass (*Lolium multiflorum*) Outeniqua Research Farm, Trial **Lm15**

Table 3: Rust % (ratings based) Planted 14 March 2024

Cultivars	Type	Cut 1 (30 Apr 2024)	Cut 2 (21 May 2024)	Cut 3 (1 Jul 2024)	Cut 4 (19 Aug 2024)	Cut 5 (25 Sep 2024)	Cut 6 (1 Nov 2024)	Cut 7 (28 Nov 2024)	Cut 8 (9 Jan 2025)	Cut 9 (17 Feb 2025)	Cut 10 (24 Mar 2025)	Cut 11 (24 Apr 2025)	Cut 12 (29 May 2025)
Appeal	**D**	0	0	0	0	4,2^{b}	0	4,2^{ab}	70,8^{abcde}	0	12,5^{a}	0	2,5^{de}
Arise	**T**	0	0	0	0	0	4,2^{de}	0	62,5^{bcdef}	0	12,5^{a}	0	0
Barcrespo	**D**	0	0	0	0	0	4,2^{de}	0	41,7^{fgh}	0	12,5^{a}	0	0
Barmultra II	**T**	0	0	0	4,2^{cd}	4,2^{b}	33,3^{c}	4,2^{ab}	83,3^{ab}	0	-	0	16,7^{bc}
Barnael	**T**	0	0	0	4,2^{cd}	0	0	0	50,0^{efgh}	0	0	0	0
Contest	**D**	0	0	0	0	4,2^{b}	16,7^{d}	4,2^{ab}	87,5^{a}	0	-	0	25,0^{b}
Dolomit	**T**	0	0	12,5^{a}	58,3^{a}	25,0^{a}	75,0^{a}	12,5^{a}	87,5^{a}	0	-	0	50,0^{a}
Fox	**D**	0	0	0	0	0	12,5^{de}	10,0^{a}	54,2^{defgh}	0	12,5^{a}	0	12,5^{cd}
Frenzy Lh	**T**	0	0	0	0	1,7^{b}	12,5^{de}	3,3^{ab}	66,7^{abcde}	0	25^{a}	0	0
Impact	**T**	0	0	0	0	0	4,2^{de}	0	37,5^{gh}	0	0	0	1,7^{de}
Inducer	**D**	0	0	0	0	1,7^{b}	8,3^{de}	0	54,2^{defgh}	0	-	0	0
Itaka	**D**	0	0	0	0	3,3^{b}	37,5^{bc}	4,2^{ab}	50,0^{efgh}	0	-	0	0
Kingsgreen	**T**	0	0	4,2^{b}	12,5^{bc}	5,8^{b}	45,8^{bc}	4,2^{ab}	87,5^{a}	0	-	0	8,8^{cde}
Lush	**T**	0	0	0	0	0	0	0	33,3^{h}	0	8,3^{a}	0	4,2^{de}
Nana	**T**	0	0	0	21^{b}	4,2^{b}	50,0^{b}	0	79,2^{abc}	0	-	0	-
Sendero	**D**	0	0	0	4^{cd}	0	8,3^{de}	5,8^{ab}	75,0^{abcd}	0	-	0	3,3^{de}
Sezina	**T**	0	0	0	0	0	5,8^{de}	4,2^{ab}	75,0^{abcd}	0	12,5^{a}	0	1,7^{de}
Sirmione	**D**	0	0	0	0	0	8,3^{de}	4,2^{ab}	58,3^{cdefg}	0	12,5^{a}	0	4,2^{de}
LSD (0,05)		NS	NS	2,8	9,8	5,93	13,9	9,5	22,9	NS	57,8	NS	11,0
CV%				184	101,6	119	46,2	170,1	21,5		82		106

Lh Hybrid ryegrass (*Lolium hybridum*)
Rust % with the same letter are statistically similar within a column

Table 4. Reproductive tillers % (ratings based) for Lm15 established in March 2024

Italian ryegrass (*Lolium multiflorum*) Outeniqua Research Farm, Trial **Lm15**

Table 4: Reproductive tillers % (ratings based) Planted 14 March 2024

Cultivars	Type	Cut 1 (30 Apr 2024)	Cut 2 (21 May 2024)	Cut 3 (1 Jul 2024)	Cut 4 (19 Aug 2024)	Cut 5 (25 Sep 2024)	Cut 6 (1 Nov 2024)	Cut 7 (28 Nov 2024)	Cut 8 (9 Jan 2025)	Cut 9 (17 Feb 2025)	Cut 10 (24 Mar 2025)	Cut 11 (24 Apr 2025)	Cut 12 (29 May 2025)
Appeal	D	0	0	0	0	0	21 c	17 h	13 h	0	0	0	0
Arise	T	0	0	0	0	0	83 a	75 ab	63 abcd	0	0	0	0
Barcrespo	D	0	0	0	0	0	88 a	67 bc	29 fgh	0	0	0	0
Barmultra II	T	0	0	0	0	0	88 a	83 a	54 cde	0	0	0	0
Barnael	T	0	0	0	0	0	88 a	83 a	42 defg	0	0	0	0
Contest	D	0	0	0	0	0	88 a	83 a	83 a	0	0	0	0
Dolomit	T	0	0	0	0	0	83 a	83 a	75 abc	0	0	0	0
Fox	D	0	0	0	0	0	88 a	75 ab	46 def	0	0	0	0
Frenzy Lh	T	0	0	0	0	0	29 c	42 ef	17 h	0	0	0	0
Impact	T	0	0	0	0	0	83 a	58 cd	21 gh	0	0	0	0
Inducer	D	0	0	0	0	0	75 ab	42 ef	17 h	0	0	0	0
Itaka	D	0	0	0	0	0	38 c	33 fg	13 h	0	0	0	0
Kingsgreen	T	0	0	0	0	0	88 a	88 a	79 ab	0	0	0	0
Lush	T	0	0	0	0	0	58 b	25 gh	29 fgh	0	0	0	0
Nana	T	0	0	0	0	0	88 a	88 a	58 bcd	0	0	0	0
Sendero	D	0	0	0	0	0	83 a	67 bc	33 efgh	0	0	0	0
Sezina	T	0	0	0	0	0	88 a	75 ab	50 def	0	0	0	0
Sirmione	D	0	0	0	0	0	83 a	50 de	21 gh	0	0	0	0
LSD (0,05)		NS	NS	NS	NS	NS	18,0	16,3	22,9	NS	NS	NS	NS
CV%							14,6	15,6	33,5				

Lh Hybrid ryegrass (*Lolium hybridum*)
Reproductive tiller % with the same letter are statistically similar within a column

Table 5. Sward density % (ratings based) for Lm15 established in March 2024

Italian ryegrass (*Lolium multiflorum*) Outeniqua Research Farm, Trial **Lm15**

Table 5: Sward density % (ratings based) Planted 14 March 2024

Cultivars	Type	Cut 1 (30 Apr 2024)	Cut 2 (21 May 2024)	Cut 3 (1 Jul 2024)	Cut 4 (19 Aug 2024)	Cut 5 (25 Sep 2024)	Cut 6 (1 Nov 2024)	Cut 7 (28 Nov 2024)	Cut 8 (9 Jan 2025)	Cut 9 (17 Feb 2025)	Cut 10 (24 Mar 2025)	Cut 11 (24 Apr 2025)	Cut 12 (29 May 2025)
Appeal	D	100	100	100	100	92 b	100	100 a	92 abc	27 bcd	8 bc	21 efg	20 bc
Arise	T	100	100	100	100	100 a	100	99 b	79 bcde	13 cde	17 b	58 abcde	71 ab
Barcrespo	D	100	100	100	100	100 a	100	100 a	83 abcde	33 bc	17 b	58 abcde	75 ab
Barmultra II	T	100	100	100	100	100 a	100	100 a	75 cdef	4 de	4 bc	28 defg	67 abc
Barnael	T	100	100	100	100	100 a	100	100 a	67 ef	3 de	4 bc	48 bcde	60 abc
Contest	D	100	100	100	100	100 a	100	87 c	38 h	0	0	8 fg	28 bc
Dolomit	T	100	100	100	100	96 ab	100	100 a	58 fg	0	0	4 g	12 c
Fox	D	100	100	100	100	100 a	100	100 a	88 abcd	25 bcde	17 b	46 bcdef	43 abc
Frenzy Lh	T	100	100	100	100	96 ab	100	100 a	100 a	79 a	83 a	79 ab	75 ab
Impact	T	100	100	100	100	100 a	100	100 a	79 bcde	4 de	4 bc	63 abcd	60 abc
Inducer	D	100	100	100	100	96 ab	100	100 a	88 abcd	29 bcd	0	42 bcdefg	54 abc
Itaka	D	100	100	100	100	96 ab	100	100 a	96 ab	39 bc	4 bc	42 cdefg	43 abc
Kingsgreen	T	100	100	100	100	100 a	100	100 a	42 gh	0	0	29 defg	28 bc
Lush	T	100	100	100	100	100 a	100	100 a	100 a	83 a	88 a	96 a	96 a
Nana	T	100	100	100	100	100 a	100	100 a	71 def	0	0	27 defg	31 bc
Sendero	D	100	100	100	100	96 ab	100	100 a	92 abc	2 de	0	38 cdefg	28 bc
Sezina	T	100	100	100	100	100 a	100	100 a	71 def	4 de	7 bc	71 abc	60 abc
Sirmione	D	100	100	100	100	92 b	100	100 a	92 abc	42 b	8 bc	50 bcde	50 abc
LSD (0,05)		NS	NS	NS	NS	6,81	NS	0,3	18,3	28,6	16,5	38,1	55,4
CV%						4,2		0,4	14,0	79,5	68,3	51,3	66,6

Lh Hybrid ryegrass (*Lolium hybridum*)
Sward density % with the same letter are statistically similar within a column

Table 6. Individual harvest yields (t DM/ha) for Lm15 established in March 2024

Italian ryegrass (*Lolium multiflorum*) — Outeniqua Research Farm, Trial **Lm15**

Table 6: Yield (t DM/ha) Individual harvests — Planted 14 March 2024

Cultivars	Type	Cut 1 (30 Apr 2024)	Cut 2 (21 May 2024)	Cut 3 (1 Jul 2024)	Cut 4 (19 Aug 2024)	Cut 5 (25 Sep 2024)	Cut 6 (1 Nov 2024)	Cut 7 (28 Nov 2024)	Cut 8 (9 Jan 2025)	Cut 9 (17 Feb 2025)	Cut 10 (24 Mar 2025)	Cut 11 (24 Apr 2025)	Cut 12 (29 May 2025)
Appeal	**D**	0,95 ^{bcdef}	1,03 ^{bcde}	**1,66** ^{a}	**1,39** ^{abcd}	1,56 ^{fg}	2,57 ^{de}	1,31 ^{bcdef}	1,03 ^{cd}	0,38 ^{bc}	0,40 ^{cd}	0,18 ^{e}	0,98 ^{bc}
Arise	**T**	**1,16** ^{a}	0,90 ^{f}	**1,53** ^{abc}	**1,34** ^{abcde}	**2,16** ^{abc}	**3,04** ^{abcd}	1,10 ^{ef}	**1,40** ^{abc}	0,45 ^{bc}	0,56 ^{bcd}	0,33 ^{cde}	**1,33** ^{abc}
Barcrespo	**D**	**1,06** ^{abcd}	1,11 ^{b}	**1,56** ^{abc}	**1,27** ^{abcde}	**2,29** ^{ab}	**2,99** ^{abcd}	1,32 ^{bcdef}	1,05 ^{cd}	0,44 ^{bc}	0,50 ^{bcd}	0,45 ^{cd}	**1,41** ^{abc}
Barmultra II	**T**	**1,08** ^{abc}	1,08 ^{bc}	**1,61** ^{abc}	**1,44** ^{abc}	1,86 ^{bcdefg}	**3,00** ^{abcd}	**1,43** ^{abcd}	0,95 ^{cde}	0	0	0,50 ^{bc}	**1,30** ^{abc}
Barnael	**T**	**1,06** ^{abcd}	0,92 ^{def}	**1,46** ^{abc}	1,13 ^{cde}	**2,07** ^{abcde}	**3,15** ^{abc}	1,33 ^{bcdef}	0,40 ^{ef}	0	0,40 ^{cd}	0,51 ^{abc}	**1,36** ^{abc}
Contest	**D**	**1,04** ^{abcd}	0,90 ^{f}	1,24 ^{d}	1,17 ^{cde}	1,70 ^{defg}	2,43 ^{e}	0,67 ^{g}	0,20 ^{f}	0	0	0,20 ^{de}	**1,69** ^{a}
Dolomit	**T**	**1,17** ^{a}	**1,25** ^{a}	1,44 ^{bcd}	1,20 ^{bcde}	1,44 ^{g}	2,67 ^{cde}	**1,43** ^{abcd}	0,86 ^{cde}	0	0	0	**1,15** ^{abc}
Fox	**D**	0,79 ^{f}	0,98 ^{cdef}	**1,63** ^{ab}	**1,26** ^{abcde}	**1,93** ^{abcdef}	**3,09** ^{abc}	1,35 ^{bcde}	1,09 ^{bcd}	0,43 ^{bc}	0,21 ^{d}	0,31 ^{cde}	1,02 ^{bc}
Frenzy Lh	**T**	**1,07** ^{abcd}	0,91 ^{f}	**1,47** ^{abc}	**1,55** ^{a}	1,90 ^{bcdef}	**3,27** ^{ab}	**1,56** ^{ab}	**1,66** ^{ab}	**0,97** ^{ab}	**1,14** ^{ab}	**0,55** ^{abc}	**1,32** ^{abc}
Impact	**T**	0,84 ^{ef}	0,92 ^{ef}	**1,62** ^{abc}	**1,12** ^{abcde}	**2,17** ^{abc}	**3,23** ^{ab}	1,16 ^{def}	0,85 ^{cde}	0	0,38 ^{cd}	0,36 ^{cde}	**1,44** ^{abc}
Inducer	**D**	0,88 ^{def}	1,02 ^{bcdef}	**1,54** ^{abc}	**1,43** ^{abc}	**2,09** ^{abcd}	**3,02** ^{abcd}	1,30 ^{bcdef}	1,12 ^{bcd}	0,39 ^{bc}	0	0,42 ^{cde}	**1,22** ^{abc}
Itaka	**D**	**1,06** ^{abcd}	1,11 ^{b}	**1,53** ^{abc}	**1,25** ^{abcde}	1,62 ^{efg}	2,87 ^{bcde}	1,27 ^{cdef}	1,07 ^{cd}	0,26 ^{c}	0	0,32 ^{cde}	**1,27** ^{abc}
Kingsgreen	**T**	**1,18** ^{a}	**1,13** ^{ab}	**1,66** ^{ab}	1,04 ^{e}	1,64 ^{defg}	2,79 ^{bcde}	**1,71** ^{a}	0,64 ^{def}	0	0	0,23 ^{de}	**1,38** ^{abc}
Lush	**T**	**1,02** ^{abcd}	1,08 ^{bc}	**1,55** ^{abc}	**1,43** ^{abc}	1,76 ^{cdefg}	2,91 ^{bcde}	1,28 ^{bcdef}	**1,83** ^{a}	**1,10** ^{a}	**1,22** ^{a}	**0,75** ^{a}	**1,41** ^{abc}
Nana	**T**	**1,18** ^{a}	1,04 ^{bcd}	1,41 ^{cd}	**1,34** ^{abcde}	1,78 ^{cdefg}	**3,01** ^{abcd}	**1,64** ^{a}	0,88 ^{cde}	0	0	0,34 ^{cde}	0,90 ^{c}
Sendero	**D**	0,84 ^{ef}	1,05 ^{bc}	**1,57** ^{abc}	**1,53** ^{ab}	**2,37** ^{a}	**3,07** ^{abcd}	**1,51** ^{abc}	1,14 ^{bcd}	0	0	0,24 ^{de}	**1,18** ^{abc}
Sezina	**T**	**1,12** ^{ab}	1,11 ^{b}	**1,52** ^{abc}	**1,22** ^{abcde}	1,78 ^{cdefg}	**3,06** ^{abcd}	1,27 ^{cdef}	0,92 ^{cde}	0	**0,92** ^{abc}	**0,70** ^{ab}	**1,47** ^{ab}
Sirmione	**D**	0,91 ^{cdef}	0,93 ^{def}	**1,62** ^{abc}	1,07 ^{de}	1,84 ^{bcdefg}	**3,48** ^{a}	1,06 ^{f}	0,87 ^{cde}	0,45 ^{bc}	0,46 ^{cd}	0,37 ^{cde}	0,94 ^{bc}
LSD (0,05)		0,20	0,12	0,22	0,35	0,46	0,5	0,3	0,6	0,6	0,7	0,2	0,6
CV%		11,6	7,0	8,6	16,3	14,6	10,5	13,0	34,7	40,6	15,0	27,6	27,2

Lh Hybrid ryegrass (*Lolium hybridum*)
Yields with the same letter are statistically similar within a column

Table 7. Dry matter content (%) for Lm15 established in March 2024

Italian ryegrass (*Lolium multiflorum*) — Outeniqua Research Farm, Trial **Lm15**

Table 7: DM% Individual harvests — Planted 14 March 2024

Cultivars	Type	Cut 1 (30 Apr 2024)	Cut 2 (21 May 2024)	Cut 3 (1 Jul 2024)	Cut 4 (19 Aug 2024)	Cut 5 (25 Sep 2024)	Cut 6 (1 Nov 2024)	Cut 7 (28 Nov 2024)	Cut 8 (9 Jan 2025)	Cut 9 (17 Feb 2025)	Cut 10 (24 Mar 2025)	Cut 11 (24 Apr 2025)	Cut 12 (29 May 2025)
Appeal	D	10,5 abc	10,5 bcd	12,4 efghi	16,1 ef	18,2 ab	21,3 a	19,9 a	27,8 b	19,1 ab	18,2 a	15,9 a	15,9 abcde
Arise	T	9,6 de	10,4 bcde	11,7 jk	15,8 f	15,1 fg	17,4 gh	16,4 efg	25,7 bcde	17,6 b	13,9 g	13,6 abc	14,6 defg
Barcrespo	D	11,0 a	10,7 abc	13,4 abc	17,9 bcd	16,3 cdef	19,1 cd	17,3 cd	28,0 b	18,9 ab	16,6 b	15,6 ab	15,9 abcde
Barmultra II	T	9,5 de	10,1 cdef	12,1 ghij	17,6 bcde	16,5 cdef	17,5 fgh	16,1 fgh	28,1 b	-	-	13,8 abc	14,7 cdefg
Barnael	T	9,6 de	10,5 bcd	12,6 defgh	17,5 bcde	15,3 efg	16,0 i	15,9 fghi	24,8 de	-	15,5 e	12,8 bc	13,9 g
Contest	D	9,9 cd	10,8 abc	12,8 cdefg	16,6 cdef	16,8 bcde	20,0 bc	17,9 bc	24,3 e	-	-	14,3 abc	15,0 bcdefg
Dolomit	T	9,8 de	9,9 def	11,9 hij	16,9 cdef	15,7 defg	18,5 def	15,2 i	31,5 a	-	-	-	15,3 bcdefg
Fox	D	11,2 a	11,9 ab	13,1 bcd	18,7 ab	18,4 a	19,3 cd	17,2 cde	28,2 b	20,4 a	14,8 f	15,3 abc	16,3 abc
Frenzy Lh	T	9,6 de	10,4 bcdef	11,8 ij	16,5 def	16,7 cde	17,9 efg	16,6 def	25,7 bcde	18,1 ab	15,8 d	15,0 abc	14,8 bcdefg
Impact	T	9,7 de	10,5 bcd	12,3 fghij	18,0 bc	15,7 defg	17,3 gh	15,7 ghi	24,9 cde	-	16,5 bc	14,1 abc	14,5 efg
Inducer	D	10,1 bcd	10,5 bcde	12,9 cdef	17,5 bcde	17,0 abcd	18,7 de	17,2 cde	27,6 bc	18,7 ab	-	14,7 abc	15,9 abcdef
Itaka	D	10,7 ab	11,3 a	14,0 a	20,0 a	18,3 ab	20,5 ab	18,3 b	27,1 bcd	18,6 ab	-	15,2 abc	17,2 a
Kingsgreen	T	9,8 cde	9,8 ef	12,1 jih	17,5 bcde	16,1 cdefg	17,6 fg	16,0 fghi	26,5 bcde	-	-	13,4 abc	14,1 g
Lush	T	9,1 e	9,8 f	11,0 k	14,2 g	14,6 g	16,5 hi	15,7 ghi	24,4 e	18,5 ab	15,7 de	12,7 c	14,3 fg
Nana	T	9,8 cde	10,0 def	12,5 defgh	17,3 bcde	16,2 cdef	17,1 gh	15,4 hi	27,1 bcd	-	-	13,1 abc	14,9 bcdefg
Sendero	D	10,8 ab	10,8 abc	13,1 bcd	18,7 ab	17,4 abc	19,3 cd	17,3 cd	27,8 b	-	-	15,4 abc	16,2 abcd
Sezina	T	9,9 cd	10,3 bcdef	13,0 bcde	17,4 bcde	15,8 defg	17,0 ghi	15,9 fghi	26,1 bcde	-	14,9 f	13,6 abc	15,1 bcdefg
Sirmione	D	10,9 a	11,2 a	13,7 ab	19,9 a	18,3 ab	20,1 bc	18,3 b	27,1 bcd	18,7 ab	16,2 c	14,5 abc	16,4 ab
LSD (0,05)		0,75	0,64	0,67	1,47	1,51	1,1	0,8	2,7	2,5	0,3	2,9	1,7
CV%		4,5	3,7	3,2	5,1	5,5	3,6	2,9	6,0	5,3	0,4	9,4	5,4

Lh Hybrid ryegrass (*Lolium hybridum*)
DM%'s with the same letter are statistically similar within a column

***Dry matter (DM) content* (Table 7)** is a consideration especially early in the season when the DM content is generally low, since DM content in ryegrass can negatively influence voluntary intake if it is very low (Cabrera Estrada et al 2004, John & Ulyatt 1987, Leaver 1985, Minson 1990. The work by Vértité & Journet 1970 is widely referenced where they investigated reduced intake with decreasing DM content. According to Cabrera Estrada et al 2004, dry matter intake increases over the dry matter content range of 12 to 30%. The authors found the average increase in intake to be 134g per unit DM percentage increase up to the 30% dry matter content level. In pure stands of newly established ryegrass up to July this can have an effect. In mixtures with other species that have a very low DM content the DM content of the various components can be considered.

Summary

Total yield

Total yield year 1, highest yielding: Frenzy (Lh), Lush, Sendero, Barcrespo

Total yield over 15 months, highest yielding: Frenzy (Lh), Lush, Barcrespo

Seasonal yield

Best winter yield: Sendero, Frenzy (Lh), Inducer, Barmultra II, Arise, Barcrespo, Lush, Appeal, Impact, Fox, Nana

Best spring yield: Sendero, Frenzy (Lh), Barnael, Barcrespo, Impact, Nana, Sirmione, Fox, Inducer, Sezina, Barmultra II, Kingsgreen, Lush

Best summer yield: Lush, Frenzy (Lh)

Both these were also in the top yielding group for winter and spring.

Best second autumn yield: Lush, Frenzy (Lh), Sezina, Barnael, Barcrespo, Contest, Impact.

Of the best producing cultivars showing yield stability into the second autumn, only Lush and Frenzy were in the top yielding group throughout the other seasons while Barcrespo and Impact were in the top group in winter and spring.

Flowering incidence

Lowest flowering: Appeal, Frenzy, Itaka, Lush

Lowest leaf rust incidence: Lush, Impact, Barneal, Barcrespo

Flowering incidence

Best persistence: Lush, Frenzy

Several cultivars recovered their sward density as the temperatures became cooler in autumn from April onwards.

Summary

Cabrera Estrada JI, Delagarde R, Faverdin RP, Peyraud JL. 2004. Dry matter intake and eating rate of grass by dairy cows is restricted by internal, but not external water. Animal Feed Science and Technology 114: 59- 74.

Carr JH. 1975. Disease of herbage crops – some problems and progress. Annals of Applied Biology 81: 235 – 279.

Chapman DF. 2016. Using Ecophysiology to Improve Farm Efficiency: Application in Temperate Dairy Grazing Systems. In: Forage Plant Ecophysiology (ed Matthews C). Agriculture 6, 17: 122 – 140.

John A and Ulyatt MJ. 1987. Importance of dry matter content to voluntary intake of fresh grass forages. Proceedings of the New Zealand Society of Animal Production 47: 13 – 16.

Leaver JD 1985. Milk production from grazed temperate grassland. Journal of Dairy Research 52: 313-344

McKenzie EHC. 1971. Seasonal changes of fungal spore numbers in ryegrass-white clover pasture, and the effect of benomyl on pasture fungi. New Zealand Journal of Agricultural Research 14: 371 – 392.

Minson DJ. 1990. Forages in ruminant nutrition. Animal feeding and nutrition. A Series of Monographs and Treatises (Cunha TJ, Ed.)

Plummer RM, Hall RL and Watt TA. 1990. The influence of crown rust (*Puccinia coronata*) on tiller production and survival of perennial ryegrass (*Lolium perenne*) plants in simulated swards. Grass and Forage Science 45: 9 – 16.

Verite R and Journet M. 1970. Effect of the Water Content of Grass and Dehydration at Low Temperature upon Its Feeding Value for Dairy Cows. Annales de Zootechnie, 19, 255-268.

Webb C, Stewart A and Harmer M. 2019. Progress in breeding for crown rust (*Puccinia coronata* f.sp. *lolii*) resistance in perennial ryegrasses. Proceedings of the 2019 Agronomy Australia Conference, 25 – 29 August 2019, Wagga Wagga, Australia.

Perennial ryegrass initial cultivar evaluation results for the trial established in 2024

Sigrun Ammann*, Dalena Lombard, Lethu Zulu

Western Cape Department of Agriculture, Research and Technology Development, Directorate Plant Sciences, Outeniqua Research Farm, P.O. Box 24, George 6530
*Sigrun.ammann@westerncape.gov.za

Introduction

The perennial ryegrass (*Lolium perenne*) elite cultivar evaluation trial, Lp7, was planted on 12 March 2024 at the Outeniqua Research Farm and is still ongoing. The aim of the trial is to evaluate the recent perennial ryegrass cultivars being used for intensive dairy pastures or ones that are about to enter the market, together with cultivars that have shown promising results in the previous evaluation trial. This trial provides local data to assist farmers with choosing cultivars best adapted to the coastal region. Since all perennial ryegrass cultivars are imported, this data provides insight into the genetic potential and adaption for the southern Cape region. According to long-term data the region is characterised by year-round rainfall. However dry spells are common, especially during the summer months, and at times also in spring.

Perennial ryegrass is an important component of dairy pasture production. However, persistence and resilience to conditions during the summer months can be challenging. Hence important aspects of the evaluation process, over and above yield and especially the yield potential in the warmer months, are persistence, rust resistance and low flowering incidence. Due to the milder minimum temperatures in winter, vernalization is often limited and for may cultivars the requirements for flowering are only partially met. This has the advantage that the forage quality is better maintained due to lower flowering incidence, however the NDF values may nonetheless be higher than expected from perennial ryegrass in the summer months when conditions are limiting for optimal growth. Ideally perennial ryegrass should also be utilized in multi-species swards to add a level of resilience especially for the summer months.

The data reported on below are for the first 15 months of the trial. Some of the cultivars have been in previous trials and can be found in the Outeniqua Information Day books of 2018 to 2023 on the website www.elsenburg.com website, under the Resource Library tab under Publications. It is important to compare the performance of different establishment years to account for climatic variations.

Cultivars evaluated

The trial consists of 22 cultivars of which 17 are diploid and five are tetraploid.

- **Diploid cultivars**: 24Seven, Array, Bowie, Delika, Donner, Fifty50, Govenor, Goyave, Legion, Maxsyn, One50, Platform, Reason, Stampede, Tactic, Three60, Ultra
- **Tetraploid cultivars**: 4Front, Base, Chevalier, Payday, Tetragain.

Parameters reported in this article

- Total DM yield
- Seasonal DM yield
- Dry matter content
- Flowering behaviour
- Persistence / sward density
- Disease incidence (mainly crown rust)

Trial design and management

The trial was designed as a Randomised Block Design with three replications. Gross plot size is 2.1m x 6m and net plot size is 1.3m x 4.7m. Diploids are sown at a rate of 25kg/ha and tetraploids at 30kg/ha, with rows spaced 15cm apart. The trial is harvested according to physiological stage based on 3-leaf for ryegrass. In spring canopy closure is considered before leaf stage to avoid a negative impact on daughter tiller development. Since leaf emergence rate is mainly driven by temperature, as well as radiation intensity, water and nutrient availability (Chapman 2016), most cultivars reach the 3-leaf stage at a similar time.

Plots are cut with a reciprocating mower (Agria) at 5cm height. The material from the net plot is sampled for the dry matter determination with an approximately 500g wet weight sample and the rest of the material is raked together and weighed. Samples are weighed and oven dried at 70˚C.

The trials were top-dressed with nitrogen fertilizer after each harvest, and potassium fertilizer to account for nutrient removal, since all material is removed from the trial.

Irrigation was applied weekly if necessary to add to the rainfall and after fertilization. Irrigation applied during the 15 months of the trial was 552mm and the rainfall was 1052mm adding up to a total of 1604mm. During the first year from March 2024 to February 2025 ,irrigation applied was 440mm and rainfall amounted to 890mm while in the three months from March 2025 to May 20205 112mm irrigation was applied and 162mm rainfall was received. To put the data in perspective with the previous trial, Lp6 (reported on in the 2024 book), the current trial, Lp7, over 15 months received 100mm more irrigation and 151mm more rainfall. Importantly Lp7 receive 67mm more water during the first summer than Lp6 (393mm vs 326mm).

Rainfall + Irrigation applied (mm)			
Trial Lp6 planted March 2022		**Trial Lp7 planted March 2024**	
Autumn 2022	244	**Autumn 2024**	264
Winter 2022	236	**Winter 2024**	244
Spring 2022	188	**Spring 2024**	429
Summer 2022/23	326	**Summer 2024/25**	393
Autumn 2023	350	**Autumn 2025**	274
Total Year 1	994	**Total Year 1**	1330
Total 15 months	1344	**Total 15 months**	1604

Results

Total yield

Total yield **(Table 1)** is important, especially on farms that have the means to conserve the surplus as silage for later use. The establishment and input costs are also similar regardless of yield, hence the importance of choosing the cultivars with the best yield to get a better return on the establishment and input costs. The input costs being mainly fertilizer and irrigation. Total yield, considering that this trial is still in progress, is given for both year 1 and for 15 months. Once year two is completed, yield stability over years can be considered, i.e. how do the various cultivars perform in the first year compared with the second year. Generally, the trend is that the yield in the second year is lower than the first year, but some cultivars have a lesser yield reduction than others.

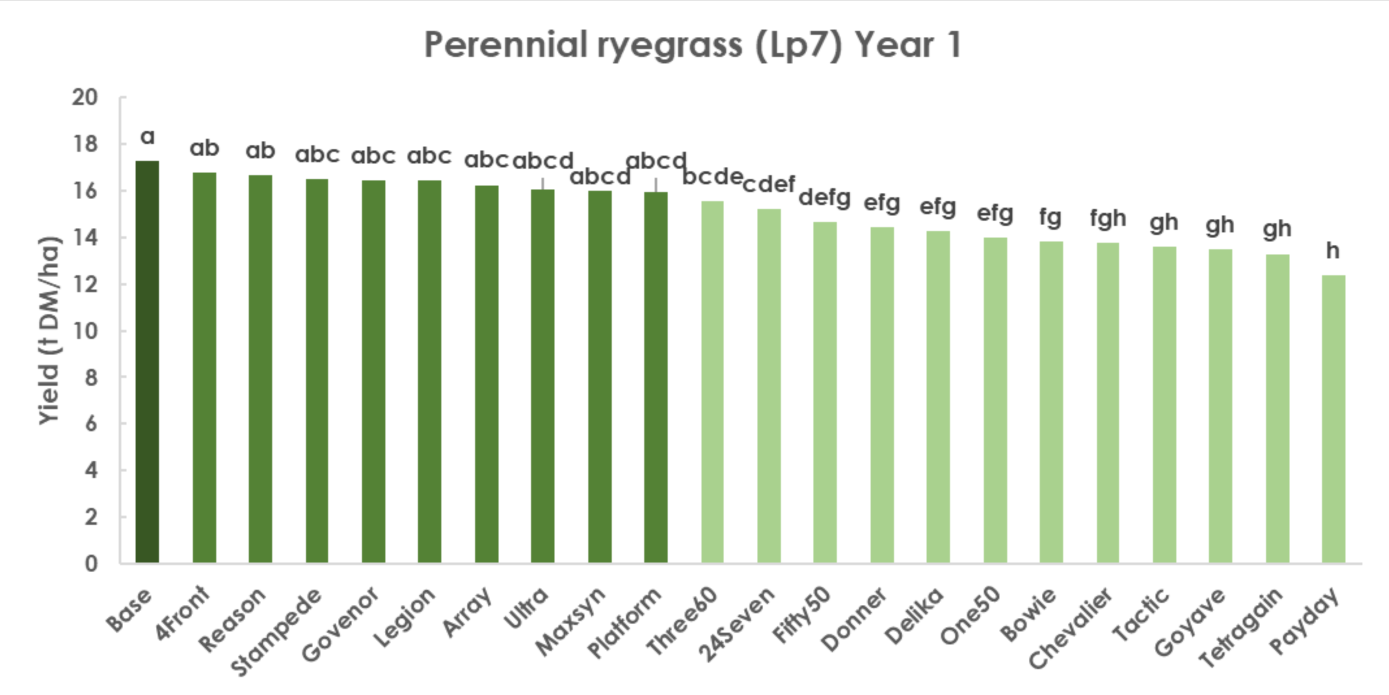


Figure 1. Total yield (t DM/ha) for year one. Yields with the same letter are similar (p<0.05).

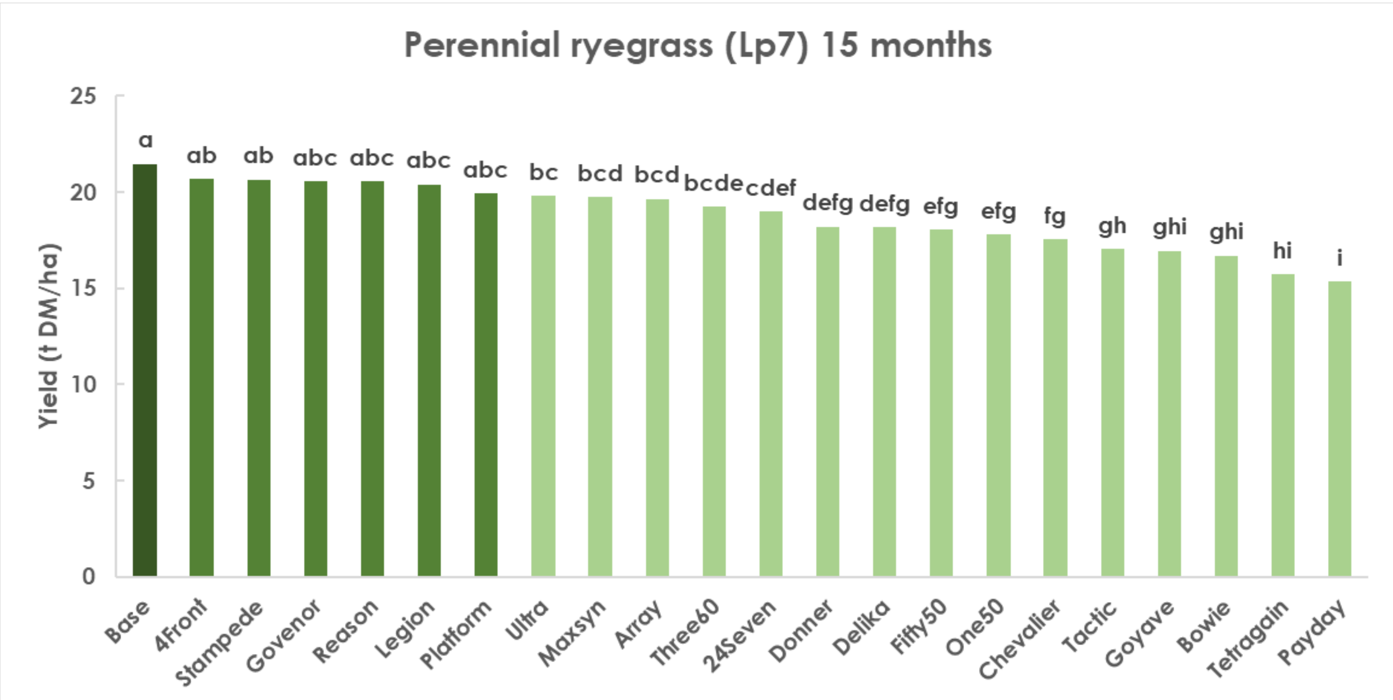


Figure 2. Total yield (t DM/ha) for the first 15 months of the trial consisting of five seasons including the second autumn. Yields with the same letter are similar (p<0.05).

Seasonal yield

Seasonal yield data **(Table 1)** is of value for optimising fodder flow requirements especially for the more challenging seasons which are generally winter and summer/beginning of autumn. The question is whether there are cultivars with both good winter and summer yield. Alternatively, it is advisable to plant paddocks to different cultivars to take advantage of different seasonal yield distributions and to spread risk or plant a combination. Incorporating other species like forage herbs in a mixed sward with the ryegrass can be used to boost summer production, for instance. A high yielding spring cultivar can for instance be considered for silage making of the surplus production. Mixed swards do improve the resilience of the pasture.

For perennial ryegrass it is additionally important to assess how the seasonal yield distribution changes over years, i.e. is the seasonal yield distribution different in the second year compared to the first year. The seasons most affected by reduced yield in the second year are winter and summer. This data will be presented once the trial has been completed.

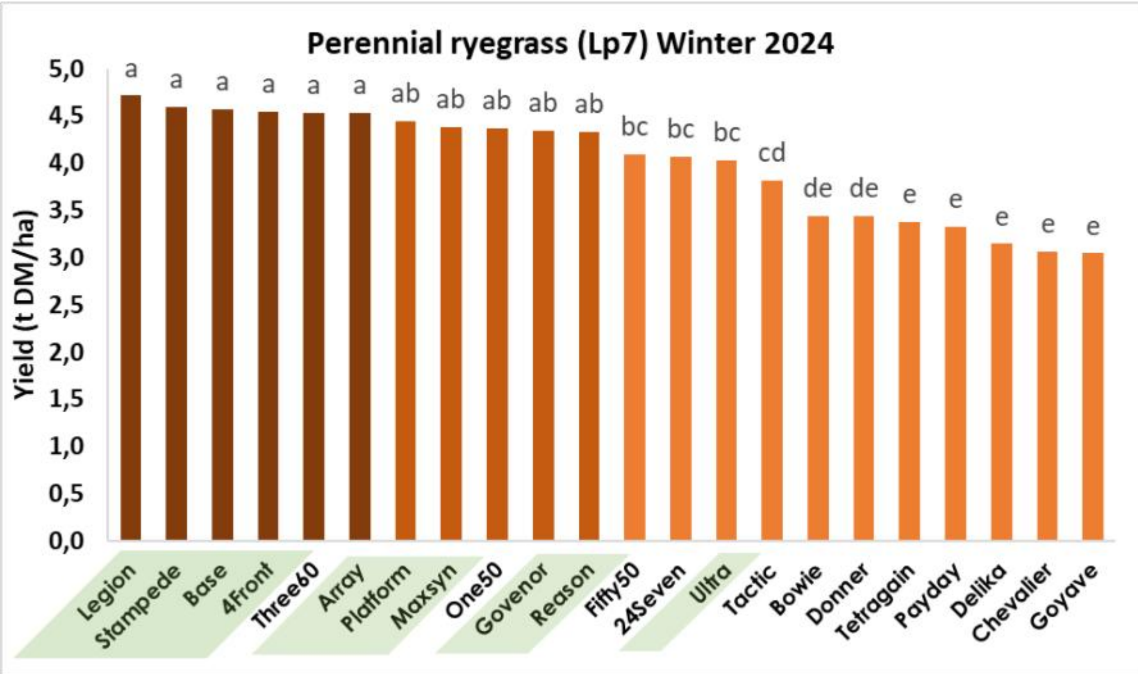


Figure 3. Dry matter yield for the first winter (t DM/ha). Cultivar names indicated in green are in the highest producing group for year one. Yields with the same letter are similar (p<0.05).

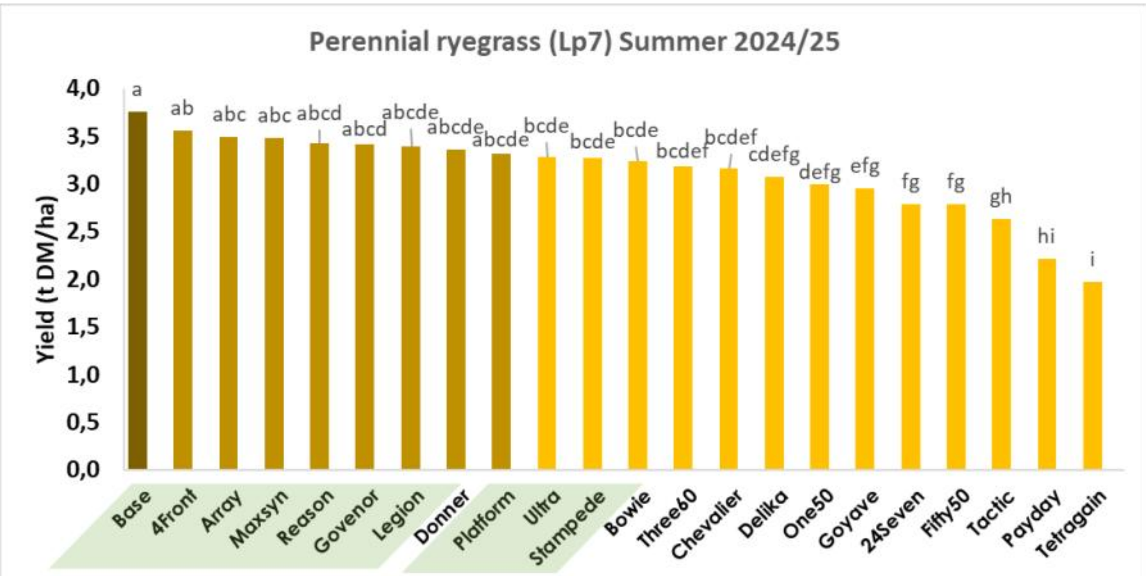


Figure 4. Dry matter yield for the first summer (t DM/ha). Cultivar names indicated in green are in the highest producing group for year one. Yields with the same letter are similar (p<0.05).

Table 1. Total seasonal yield (t DM/ha) for Lp7.

Perennial ryegrass (*Lolium perenne*) Outeniqua Research Farm, Trial **Lp7**

Table 1: Seasonal yield (t DM/ha) Planted 12 March 2024

Cultivars	Type	Autumn 2024	Rank	Winter 2024	Rank	Spring 2024	Rank	Summer 2024/25	Rank	Autumn 2025	Rank	Total Year 1	Rank	Total 15 months	Rank
24Seven	D	2,87 ^{abc}	5	4,07 ^{bc}	13	5,49 ^{abcde}	10	2,78 ^{fg}	19	3,78 ^{abc}	11	15,21 ^{cdef}	12	18,99 ^{cdef}	12
4Front	T	2,65 ^{abc}	10	4,55 ^{a}	4	5,99 ^{ab}	3	3,56 ^{ab}	2	3,92 ^{abc}	6	16,76 ^{ab}	2	20,68 ^{ab}	2
Array	D	2,27 ^{cd}	19	4,53 ^{a}	6	5,95 ^{ab}	4	3,49 ^{abc}	3	3,41 ^{bcd}	18	16,25 ^{abc}	7	19,66 ^{bcd}	10
Base	T	2,94 ^{ab}	4	4,58 ^{a}	3	6,00 ^{ab}	2	3,76 ^{a}	1	4,20 ^{a}	1	17,27 ^{a}	1	21,47 ^{a}	1
Bowie	D	2,27 ^{cd}	20	3,45 ^{de}	16	4,89 ^{efgh}	17	3,24 ^{bcde}	12	2,84 ^{ef}	21	13,85 ^{fg}	17	16,69 ^{ghi}	20
Chevalier	T	2,73 ^{abc}	6	3,07 ^{e}	21	4,84 ^{fgh}	18	3,16 ^{bcdef}	14	3,77 ^{abc}	14	13,79 ^{fgh}	18	17,56 ^{fg}	17
Delika	D	2,59 ^{abcd}	13	3,15 ^{e}	20	5,45 ^{bcde}	13	3,07 ^{cdefg}	15	3,89 ^{abc}	8	14,27 ^{efg}	15	18,16 ^{defg}	14
Donner	D	2,24 ^{cd}	21	3,44 ^{de}	17	5,41 ^{bcdef}	14	3,36 ^{abcde}	8	3,75 ^{abc}	15	14,46 ^{efg}	14	18,20 ^{defg}	13
Fifty50	D	2,51 ^{abcd}	15	4,09 ^{bc}	12	5,27 ^{cdef}	15	2,78 ^{fg}	18	3,38 ^{cde}	19	14,66 ^{defg}	13	18,04 ^{efg}	15
Govenor	D	2,64 ^{abc}	11	4,34 ^{ab}	10	6,06 ^{a}	1	3,41 ^{abcd}	6	4,10 ^{a}	3	16,46 ^{abc}	5	20,56 ^{abc}	4
Goyave	D	2,67 ^{abc}	8	3,05 ^{e}	22	4,83 ^{fgh}	20	2,95 ^{efg}	17	3,46 ^{bcd}	17	13,50 ^{gh}	20	16,95 ^{ghi}	19
Legion	D	2,64 ^{abcd}	12	4,72 ^{a}	1	5,70 ^{abc}	6	3,39 ^{abcde}	7	3,96 ^{ab}	4	16,44 ^{abc}	6	20,40 ^{abc}	6
Maxsyn	D	2,58 ^{abcd}	14	4,38 ^{ab}	8	5,53 ^{abcd}	9	3,48 ^{abc}	4	3,78 ^{abc}	12	15,98 ^{abcd}	9	19,75 ^{bcd}	9
One50	D	2,00 ^{d}	22	4,37 ^{ab}	9	4,64 ^{gh}	21	3,00 ^{defg}	16	3,81 ^{abc}	10	14,00 ^{efg}	16	17,81 ^{efg}	16
Payday	T	2,48 ^{abcd}	17	3,33 ^{e}	19	4,34 ^{h}	22	2,21 ^{hi}	21	2,98 ^{def}	20	12,37 ^{h}	22	15,35 ^{i}	22
Platform	D	2,72 ^{abc}	7	4,44 ^{ab}	7	5,48 ^{abcde}	11	3,32 ^{abcde}	9	3,96 ^{ab}	5	15,96 ^{abcd}	10	19,92 ^{abc}	7
Reason	D	2,98 ^{a}	3	4,33 ^{ab}	11	5,94 ^{ab}	5	3,43 ^{abcd}	5	3,88 ^{abc}	9	16,67 ^{ab}	3	20,56 ^{abc}	5
Stampede	D	3,05 ^{a}	1	4,59 ^{a}	2	5,58 ^{abc}	8	3,27 ^{bcde}	11	4,15 ^{a}	2	16,50 ^{abc}	4	20,65 ^{ab}	3
Tactic	D	2,32 ^{bcd}	18	3,82 ^{cd}	15	4,83 ^{fgh}	19	2,63 ^{gh}	20	3,46 ^{bcd}	16	13,60 ^{gh}	19	17,06 ^{gh}	18
Tetragain	T	2,49 ^{abcd}	16	3,38 ^{e}	18	5,46 ^{bcde}	12	1,97 ^{i}	22	2,42 ^{f}	22	13,29 ^{gh}	21	15,71 ^{hi}	21
Three60	D	2,67 ^{abc}	9	4,54 ^{a}	5	4,96 ^{defg}	16	3,18 ^{bcdef}	13	3,90 ^{abc}	7	15,53 ^{bcde}	11	19,26 ^{bcde}	11
Ultra	D	3,05 ^{a}	2	4,03 ^{bc}	14	5,69 ^{abc}	7	3,28 ^{bcde}	10	3,77 ^{abc}	13	16,05 ^{abcd}	8	19,82 ^{bc}	8
LSD (0.05)		0,64		0,43		0,60		0,44		0,56		1,43		1,61	
CV%		14,9		6,5		6,8		8,6		9,30		5,7		5,20	

Yields with the same letter are statistically similar within a column

Table 2. Seasonal growth rates (kg DM/ha/day) of perennial ryegrass established in March 2024

Western Cape Government FOR YOU

Perennial ryegrass (*Lolium perenne*) Outeniqua Research Farm, Trial **Lp7**

Table 2: Seasonal growth rates (kg DM/ha/day) Planted 12 March 2024

Cultivars	Type	Autumn 2024	Rank	Winter 2024	Rank	Spring 2024	Rank	Summer 2024/25	Rank	Autumn 2025	Rank
24Seven	D	**35,9** ^{abc}	**5**	44,2 ^{bc}	13	**60,3** ^{abcd}	**10**	31,0 ^{fg}	18	**41,1** ^{abc}	**11**
4Front	T	**33,1** ^{abc}	**10**	**49,5** ^{a}	**4**	**65,9** ^{ab}	**3**	**39,6** ^{ab}	**2**	**42,6** ^{abc}	**6**
Array	D	28,4 ^{cd}	19	**49,2** ^{a}	**6**	**65,4** ^{ab}	**4**	**38,8** ^{abc}	**3**	37,1 ^{bcd}	18
Base	T	**36,8** ^{ab}	**4**	**49,8** ^{a}	**3**	**66,0** ^{ab}	**2**	**41,7** ^{a}	**1**	**45,7** ^{a}	**1**
Bowie	D	28,4 ^{cd}	20	37,5 ^{de}	16	53,7 ^{efgh}	17	36,0 ^{bcde}	12	30,9 ^{ef}	21
Chevalier	T	**34,1** ^{abc}	**6**	33,3 ^{e}	21	53,2 ^{fgh}	18	35,1 ^{bcdef}	14	41,0 ^{abc}	14
Delika	D	**32,4** ^{abcd}	**13**	34,2 ^{e}	20	59,9 ^{bcde}	12	34,1 ^{cdef}	15	**42,3** ^{abc}	**8**
Donner	D	28,0 ^{cd}	21	37,4 ^{de}	17	59,5 ^{bcdef}	14	**37,3** ^{abcde}	**8**	40,7 ^{abc}	15
Fifty50	D	**31,4** ^{abcd}	**15**	44,4 ^{bc}	12	57,9 ^{cdef}	15	30,9 ^{fg}	19	36,8 ^{cde}	19
Govenor	D	**33,0** ^{abc}	**11**	**47,3** ^{ab}	**10**	**66,6** ^{a}	**1**	**37,9** ^{abcd}	**6**	**44,6** ^{a}	**3**
Goyave	D	**33,4** ^{abc}	**8**	33,1 ^{e}	22	53,0 ^{fgh}	20	32,8 ^{efg}	17	37,6 ^{bcd}	17
Legion	D	**33,0** ^{abcd}	**12**	**51,3** ^{a}	**1**	**62,6** ^{abc}	**6**	**37,7** ^{abcd}	**7**	**43,1** ^{ab}	**4**
Maxsyn	D	**32,3** ^{abcd}	**14**	**47,6** ^{ab}	**8**	**60,8** ^{abcd}	**9**	**38,6** ^{abc}	**4**	**41,0** ^{abc}	**12**
One50	D	25,0 ^{d}	22	**47,5** ^{ab}	**9**	51,0 ^{gh}	21	33,3 ^{defg}	16	**41,4** ^{abc}	**10**
Payday	T	**31,1** ^{abcd}	**17**	36,2 ^{e}	19	47,7 ^{h}	22	24,6 ^{hi}	21	32,4 ^{def}	20
Platform	D	**34,1** ^{abc}	**7**	**48,3** ^{ab}	**7**	**60,2** ^{abcde}	**11**	**36,8** ^{bcde}	**9**	**43,0** ^{ab}	**5**
Reason	D	**37,2** ^{a}	**3**	**47,0** ^{ab}	**11**	**65,2** ^{ab}	**5**	**38,1** ^{abcd}	**5**	**42,2** ^{abc}	**9**
Stampede	D	**38,1** ^{a}	**1**	**49,9** ^{a}	**2**	**61,4** ^{abc}	**8**	36,3 ^{bcde}	11	**45,1** ^{a}	**2**
Tactic	D	29,0 ^{bcd}	18	41,5 ^{cd}	15	53,1 ^{fgh}	19	29,2 ^{gh}	20	37,6 ^{bcd}	16
Tetragain	T	**31,1** ^{abcd}	**16**	36,7 ^{e}	18	59,9 ^{bcde}	13	21,9 ^{i}	22	26,3 ^{f}	22
Three60	D	**33,4** ^{abc}	**9**	**49,4** ^{a}	**5**	54,5 ^{defg}	16	35,3 ^{bcdef}	13	**42,4** ^{abc}	**7**
Ultra	D	**38,1** ^{a}	**2**	43,9 ^{bc}	14	**62,5** ^{abc}	**7**	36,4 ^{bcde}	10	**41,0** ^{abc}	**13**
LSD (0.05)		8,0		4,7		6,6		4,9		6,1	
CV%		14,9		6,5		6,8		8,6		9,30	

Yields with the same letter are statistically similar within a column

***Seasonal growth rates* (Table 2)** are important indicators of whether there will be sufficient grazing to support the herd, especially the lactating dairy herd and their fodder flow needs. If we consider an example of what growth rate might be needed, it can look as follows. The cows will preferably be required to graze year-round. If we assume a 450kg cow which will eat approximately 16kg DM/day of which 10kg DM/day may come from the pasture and we assume a stocking rate of 4 cows/ha and a wastage rate of 10%, then we will require a daily growth rate of 44kg DM/ha/day throughout the year. It would mean that in the surplus months any growth above this rate would need to be ensiled for feeding back in the months with the lower growth rates.

Flowering behaviour

***Flowering behaviour* (Table 3)** is important since it results in a higher stem component which implies a higher fibre content and thus lower nutritive value. The percentage of the sward that is reproductive varies significantly between cultivars due to vernalisation (cold days) requirements as does the duration of reproductive tillers in the sward (flowering window). Vernalisation takes place on tiller basis and not on a tuft basis. In years with more "cold days" in winter the flowering incidence will be higher. Cultivars that do have a high bolting percentage could for instance be used for paddocks that will be cut for silage although it would also affect the silage quality as opposed to cutting a non-reproductive sward that is leafy. Cutting silage from a vegetative sward is desirable in terms of milk production.

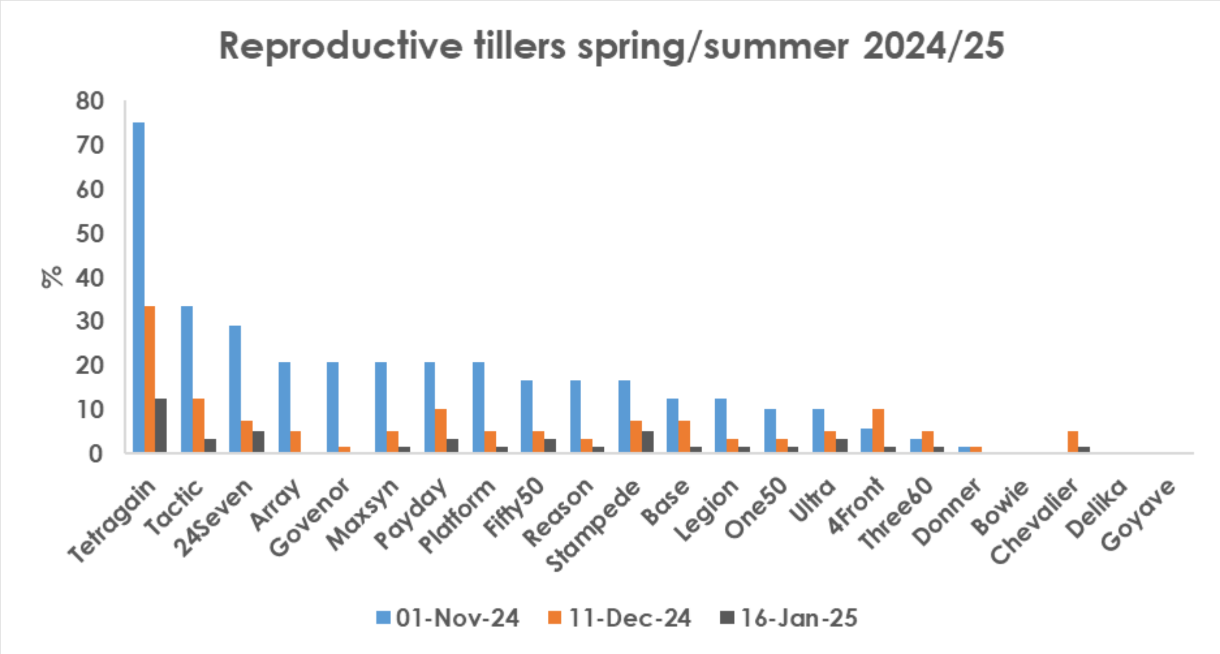


Figure 5. Reproductive tiller percentage over three harvests from November to January. The number of reproductive tillers was assessed using ratings.

Table 3. Reproductive tiller percentage (based on ratings) for perennial ryegrass established in March 2024

Perennial ryegrass (*Lolium perenne*) — Outeniqua Research Farm, Trial **Lp7**

Table 3: Reprodoctive tillers % (ratings based) — Planted 12 March 2024

Cultivars	Type	Cut 1 (23 Apr 2024)	Cut 2 (20 May 2024)	Cut 3 (26 Jun 2024)	Cut 4 (6 Aug 2024)	Cut 5 (16 Sep 2024)	Cut 6 (1 Nov 2024)	Cut 7 (11 Dec 2024)	Cut 8 (16 Jan 2025)	Cut 9 (20 Feb 2025)	Cut 10 (27 Mar 2025)	Cut 11 (6 May 2025)	Cut 12 (11 Jun 2025)	Cut 6 to 8
24Seven	**D**	0	0	0	0	0	29 bc	8 cd	5 b	0	0	0	0	
4Front	**T**	0	0	0	0	0	6 fgh	10 bc	2 cd	0	0	0	0	
Array	**D**	0	0	0	0	0	21 cd	5 de	0 d	0	0	0	0	
Base	**T**	0	0	0	0	0	13 def	8 cd	2 cd	0	0	0	0	
Bowie	**D**	0	0	0	0	0	0 h	0 f	0 d	0	0	0	0	
Chevalier	**T**	0	0	0	0	0	0 h	5 de	2 cd	0	0	0	0	
Delika	**D**	0	0	0	0	0	0 h	0 f	0 d	0	0	0	0	
Donner	**D**	0	0	0	0	0	2 gh	2 ef	0 d	0	0	0	0	
Fifty50	**D**	0	0	0	0	0	17 de	5 de	3 bc	0	0	0	0	
Govenor	**D**	0	0	0	0	0	21 cd	2 ef	0 d	0	0	0	0	
Goyave	**D**	0	0	0	0	0	0 h	0 f	0 d	0	0	0	0	
Legion	**D**	0	0	0	0	0	13 def	3 def	2 cd	0	0	0	0	
Maxsyn	**D**	0	0	0	0	0	21 cd	5 de	2 cd	0	0	0	0	
One50	**D**	0	0	0	0	0	10 efg	3 def	2 cd	0	0	0	0	
Payday	**T**	0	0	0	0	0	21 cd	10 bc	3 bc	0	0	0	0	
Platform	**D**	0	0	0	0	0	21 cd	5 de	2 cd	0	0	0	0	
Reason	**D**	0	0	0	0	0	17 de	3 def	2 cd	0	0	0	0	
Stampede	**D**	0	0	0	0	0	17 de	8 cd	5 b	0	0	0	0	
Tactic	**D**	0	0	0	0	0	33 b	13 b	3 bc	0	0	0	0	
Tetragain	**T**	0	0	0	0	0	**75 a**	**33 a**	**13 a**	0	0	0	0	
Three60	**D**	0	0	0	0	0	3 fgh	5 de	2 cd	0	0	0	0	
Ultra	**D**	0	0	0	0	0	10 efg	5 de	3 bc	0	0	0	0	
LSD (0.05)							9,2	5	2,8					
CV%							35,4	44,4	74,0					

Reproductive tillers % with the same letter are statistically similar within a column

Leaf rust incidence

Leaf rust incidence **(Table 4)** refers mainly to crown rust (*Puccinia coronata*). According to Clarke & Eagling (1994) and Webb et al (2019) crown rust causes yield loss as well as negative effects on root weight and rooting depth, tiller numbers and leaf area or photosynthetic area. Potter (2007) reported not only reduced yield but also reduced water-soluble carbohydrates and reduced digestibility. Plummer et al (1990) also refers to reduced tiller density and increased tiller death. Carr (1975) reports rust to be a water-soluble carbohydrate (WSC) sink that reduces growth and forage quality. Additionally, Carr (1975) estimates that 10% leaf rust infection could cause up to 50% decline in WSC concentration. Hence there are advantages to cultivars which are resistant or have a low incidence only.

Rust can be more severe under nutrient deficiency conditions or if growth cycles are allowed to continue beyond the 3-leaf stage. Increased dead leaf matter may also increase facial eczema (McKenzie 1971).

Dry matter content

Dry matter (DM) content **(Table 5)** is a consideration especially early in the season when the DM content is generally low, since DM content in ryegrass can negatively influence voluntary intake if it is very low (Cabrera Estrada et al 2004, John & Ulyatt 1987, Leaver 1985, Minson 1990. The work by Vértité & Journet 1970 is widely referenced where they investigated reduced intake with decreasing DM content. According to Cabrera Estrada et al 2004, dry matter intake increases over the dry matter content range of 12 to 30%. The authors found the average increase in intake to be 134g per unit DM percentage increase up to the 30% dry matter content level. In pure stands of newly established ryegrass up to July this can have an effect. In mixtures with other species that have a very low DM content the DM content of the various components can be considered.

Leaf emergence rate

Leaf emergence rate **(Table 7)** depends on leaf growth rate since leaves emerge consecutively, one after the other, once the previous leaf is fully extended. Growth rate is mainly dependent on temperature and soil moisture. If soil moisture is sufficient, then the growth rate is mainly a function of temperature. Defoliation or harvest at the 3-leaf stage is optimal for the plant (carbohydrate reserves, root and tiller growth) and optimal for production since the first leaf dies once the fourth leaf emerges and yield reaches a plateau after the third leaf. (Chapman 2016). The plants can at the earliest be defoliated at the 2.75-leaf stage when necessary. In spring canopy closure should be used as primary criterion to decide on the optimal defoliation time since limiting light penetration into the base of the sward can reduce daughter tiller initiation.during winter 2024 and the observed growth forms are given in **Table 8.**

Table 7
Leaf emergence (days/leaf)

Harvest dates		Leaf emergence rate (days/leaf)	Season
23 Apr 2024	1	13	Autumn
20 May 2024	2	10	
26 Jun 2024	3	11	Winter
6 Aug 2024	4	15	
16 Sep 2024	5	15	
1 Nov 2024	6	12	Spring
11 Dec 2024	7	15*	
16 Jan 2025	8	11	Summer
20 Feb 2025	9	12	
27 Mar 2025	10	12	Autumn
6 May 2025	11	12	
11 Jun 2025	12	13	

* leaf disease

*** Note: Yield for individual harvest are given in Table 6.**

Table 4. Leaf rust incidence (based on ratings) for perennial ryegrass established in March 2024

Western Cape Government FOR YOU

Perennial ryegrass (*Lolium perenne*) — Outeniqua Research Farm, Trial **Lp7**

Table 4:Leaf Rust % (ratings based) — Planted 12 March 2024

Cultivars	Type	Cut 1 (23 Apr 2024)	Cut 2 (20	Cut 3 (26 Jun 2024)	Cut 4 (6 Aug 2024)	Cut 5 (16	Cut 6 (1 Nov 2024)	Cut 7 (11 Dec 2024)	Cut 8 (16 Jan 2025)	Cut 9 (20 Feb 2025)	Cut 10 (27 Mar 2025)	Cut 11 (6 May 2025)	Cut 12 (11 Jun 2025)
24Seven	**D**	0	0	21 b	0	0	21 c	**63 bcde**	21 cde	17 efghi	17 cde	**29 abcde**	0
4Front	**T**	0	0	8 cd	0	0	2 de	**38 fg**	13 def	25 defg	14 cde	17 cdef	0
Array	**D**	0	0	8 cd	0	0	17 cd	**46 efg**	17 def	17 efghi	13 de	17 cdef	0
Base	**T**	0	0	17 bc	0	0	**63 b**	**83 ab**	25 bcd	**46 bc**	**42 ab**	**38 abcd**	0
Bowie	**D**	0	0	**38 a**	0	0	**79 a**	**83 ab**	**38 abc**	**42 cd**	**42 ab**	**54 a**	4
Chevalier	**T**	0	0	4 d	0	0	0 e	**33 gh**	13 def	21 efgh	8 de	17 cdef	0
Delika	**D**	0	0	0 d	0	0	0 e	13 h	2 f	0 i	0 e	0 f	0
Donner	**D**	0	0	0 d	0	0	13 cde	13 h	8 def	13 fghi	6 de	4 ef	0
Fifty50	**D**	0	0	17 bc	0	0	21 c	**58 cdef**	13 def	25 defg	8 de	**29 abcde**	0
Govenor	**D**	0	0	0 d	0	0	8 cde	**46 defg**	13 def	4 hi	29 abcd	21 bcdef	0
Goyave	**D**	0	0	4 d	0	0	0 e	**46 efg**	2 f	21 efgh	10 de	13 def	0
Legion	**D**	0	0	0 d	0	0	2 de	**67 abcde**	12 def	8 ghi	4 e	8 ef	0
Maxsyn	**D**	0	0	10 cd	0	0	13 cde	**63 bcde**	14 def	13 fghi	21 bcde	**38 abcd**	0
One50	**D**	0	0	17 bc	0	0	**54 b**	**79 abc**	17 def	29 cdef	**38 abc**	**42 abc**	4
Payday	**T**	0	0	17 bc	0	0	**83 a**	**88 a**	**50 a**	**67 a**	**38 abc**	**46 ab**	0
Platform	**D**	0	0	2 d	0	0	6 cde	**71 abcd**	12 def	8 ghi	8 de	0 f	0
Reason	**D**	0	0	0 d	0	0	4 de	**58 cdef**	2 f	8 ghi	4 e	8 ef	0
Stampede	**D**	0	0	4 d	0	0	8 cde	**63 bcde**	14 def	25 defg	**46 a**	**38 abcd**	0
Tactic	**D**	0	0	0 d	0	0	4 de	**50 defg**	13 def	**33 cde**	**46 a**	17 cdef	0
Tetragain	**T**	0	0	17 bc	0	0	**54 b**	**50 defg**	**42 ab**	**63 ab**	**50 a**	25 bcdef	4
Three60	**D**	0	0	4 d	0	0	4 de	**63 bcde**	3 ef	4 hi	4 e	4 ef	0
Ultra	**D**	0	0	4 d	0	0	6 cde	**50 defg**	**38 abc**	**42 cd**	21 bcde	17 cdef	0
LSD (0.05)				10,4			15,1	23,2	17,7	18,3	23,6	25,8	NS
CV%				72,6			43,7	25,3	62,6	46,2	67,4	72,0	

Rust % with the same letter are statistically similar within a column

Cut 7 had unusually high leaf rust and leaf disease incidence.

Table 5. Dry matter content (%) for perennial ryegrass established in March 2024

Western Cape Government FOR YOU

Perennial ryegrass (*Lolium perenne*) — Outeniqua Research Farm, Trial **Lp7**

Table 5: DM % — Planted 12 March 2024

Cultivars	Type	Cut 1 (23 Apr 2024)	Cut 2 (20 May 2024)	Cut 3 (26 Jun 2024)	Cut 4 (6 Aug 2024)	Cut 5 (16 Sep 2024)	Cut 6 (1 Nov 2024)	Cut 7 (11 Dec 2024)	Cut 8 (16 Jan 2025)	Cut 9 (20 Feb 2025)	Cut 10 (27 Mar 2025)	Cut 11 (6 May 2025)	Cut 12 (11 Jun 2025)
24Seven	**D**	10,2	10,9 cdefg	12,4 cde	17,2 def	20,3 bcd	**23,4 abc**	**27,8 abc**	**25,0 abcd**	**26,2 a**	**21,5 a**	18,1 bcd	15,6 bcd
4Front	**T**	9,3	9,8 i	11,5 gh	15,3 hi	18,5 fg	20,3 fg	23,7 i	21,3 j	22,8 fg	17,8 cd	15,6 g	13,1 h
Array	**D**	9,0	**11,6 abcd**	12,4 cde	16,6 fgh	19,6 cdef	22,8 bcde	26,8 bcdef	24,0 cdefg	24,5 cde	**19,8 ab**	17,7 cd	14,9 cdefg
Base	**T**	10,2	10,2 ghi	11,0 h	15,0 i	18,6 fg	21,4 def	24,1 hi	21,6 j	22,8 fg	18,8 bcd	16,5 efg	13,9 gh
Bowie	**D**	9,3	**12,0 ab**	**14,1 a**	**20,1 a**	**21,7 a**	23,0 bcd	**27,3 abcd**	**25,2 abc**	**26,1 ab**	**20,5 ab**	**18,8 abc**	15,3 cde
Chevalier	**T**	9,8	10,2 ghi	12,2 def	18,1 bcd	19,5 def	18,9 g	24,0 hi	22,2 ij	23,9 def	**19,7 abc**	17,6 de	15,3 cdef
Delika	**D**	9,7	11,4 bcdef	12,6 bcde	18,7 bc	**21,2 ab**	22,2 cde	25,2 fghi	24,5 bcdefg	**25,4 abcd**	**20,8 a**	17,9 bcd	**15,8 abc**
Donner	**D**	8,8	**11,7 abc**	**14,2 a**	**20,4 a**	**21,3 ab**	21,5 def	26,3 cdefg	24,6 bcdef	**26,3 a**	**21,4 a**	**19,3 a**	**17,0 a**
Fifty50	**D**	9,1	11,5 bcde	12,6 bcde	18,1 cde	19,5 def	**23,6 abc**	**28,1 ab**	**25,7 ab**	**25,6 abc**	**19,8 ab**	18,0 bcd	14,4 efg
Govenor	**D**	9,0	11,2 cdef	13,0 bc	17,1 def	20,0 cde	23,0 bcd	25,9 defg	23,7 efgh	24,4 cde	**19,7 ab**	18,0 bcd	15,3 cdef
Goyave	**D**	10,3	11,4 bcdef	13,2 b	**19,5 ab**	**20,7 abc**	22,9 bcde	26,9 bcde	**24,9 abcde**	**25,7 abc**	**20,5 ab**	**19,0 ab**	**16,7 ab**
Legion	**D**	10,0	10,7 fgh	11,7 fg	16,8 efg	19,8 cde	23,3 abc	26,3 cdefg	23,8 cdefgh	24,4 cde	**20,5 ab**	17,3 def	14,4 efg
Maxsyn	**D**	10,0	10,8 defgh	12,1 efg	17,5 cdef	19,2 defg	23,0 bcde	25,5 efgh	22,6 hij	24,6 bcde	**20,1 ab**	17,9 cd	14,4 efg
One50	**D**	9,3	**12,3 a**	13,2 b	17,6 cdef	**20,8 abc**	**25,0 a**	**28,6 a**	**26,2 a**	**25,8 abc**	18,9 bcd	17,4 de	14,9 cdefg
Payday	**T**	9,6	10,2 ghi	12,2 def	18,0 cde	19,8 cde	23,3 bc	**27,1 abcd**	24,8 bcdef	23,0 efg	18,7 bcd	16,2 fg	14,3 efg
Platform	**D**	9,2	10,8 defgh	11,6 fgh	16,8 efg	20,3 bcd	**24,2 ab**	26,6 bcdef	22,5 hij	**24,9 abcd**	**19,9 ab**	15,6 g	14,1 fgh
Reason	**D**	9,7	10,8 efgh	11,5 gh	15,3 hi	19,2 defg	22,8 bcde	24,7 ghi	23,4 fghi	**24,8 abcd**	**20,0 ab**	17,4 de	14,2 efgh
Stampede	**D**	10,3	10,8 efgh	12,2 def	15,6 ghi	19,1 efg	**24,1 ab**	**27,6 abc**	24,2 cdefg	**25,6 abc**	**20,8 a**	**19,0 ab**	15,1 cdef
Tactic	**D**	8,5	11,2 bcdef	12,6 bcde	17,1 def	20,1 bcde	**24,2 ab**	**27,4 abcd**	24,0 cdefg	**25,9 abc**	**20,8 a**	18,2 bcd	**15,9 abc**
Tetragain	**T**	8,9	11,3 bcdef	12,8 bcd	17,6 cdef	18,1 g	21,3 ef	23,8 i	23,1 ghi	22,1 g	**17,2 d**	15,6 g	14,6 defg
Three60	**D**	9,6	11,2 bcdef	12,5 cde	16,9 defg	20,3 bcd	**24,0 ab**	**27,3 abcd**	24,1 cdefg	**25,7 abc**	**20,3 ab**	17,5 de	14,7 defg
Ultra	**D**	9,6	10,1 hi	12,0 efg	16,3 fghi	19,9 cde	**23,9 ab**	26,3 cdefg	23,5 efghi	**25,2 abcd**	**21,0 a**	**18,2 abcd**	14,9 cdefg
LSD (0.05)		NS	0,8	0,6	1,3	1,2	1,7	1,7	1,4	1,6	1,9	1,1	1,2
CV%		13,0	4,2	3,1	4,7	3,7	4,5	3,8	3,6	3,9	5,7	3,8	4,7

DM%'s with the same letter are statistically similar within a column

Table 6. Yield (t DM/ha) for individual harvests of perennial ryegrass established in March 2024

Perennial ryegrass (*Lolium perenne*)

Table 6: Yield (t DM/ha) individual harvests

Outeniqua Research Farm, Trial **Lp7**

Planted 12 March 2024

Cultivars	Type	Cut 1 (23 Apr 2024)	Cut 2 (20 May 2024)	Cut 3 (26 Jun 2024)	Cut 4 (6 Aug 2024)	Cut 5 (16 Sep 2024)	Cut 6 (1 Nov 2024)	Cut 7 (11 Dec 2024)	Cut 8 (16 Jan 2025)	Cut 9 (20 Feb 2025)	Cut 10 (27 Mar 2025)	Cut 11 (6 May 2025)	Cut 12 (11 Jun 2025)
24Seven	D	**0,7** abc	**1,66** ab	**1,74** abcd	1,19 efgh	1,96 cd	3,25 cde	2,03 cdefg	1,06 ghi	0,80 cd	**1,60** abc	**1,56** abcd	1,42 cdef
4Front	T	**0,7** abcd	**1,50** ab	1,62 cdefg	**1,48** ab	**2,47** ab	3,18 cde	**2,54** a	**1,48** abc	**1,03** abc	**1,54** abcd	**1,64** abcd	**1,58** abcd
Array	D	0,5 defgh	**1,29** ab	**1,68** abcdef	**1,41** abcd	**2,46** ab	**3,49** abc	2,08 cdef	**1,54** ab	**1,05** ab	1,44 bcd	1,32 cde	1,41 defg
Base	T	**0,7** abc	**1,69** a	**1,82** a	**1,44** abc	**2,26** abc	**3,38** abc	**2,40** ab	**1,58** a	**1,11** a	**1,78** a	**1,73** ab	**1,58** abcd
Bowie	D	0,4 fgh	**1,33** ab	**1,72** abcde	1,04 hi	1,22 ef	2,96 defg	2,02 cdefg	**1,42** abcd	**0,99** abc	1,24 de	1,04 ef	1,23 ghi
Chevalier	T	**0,7** abcde	**1,57** ab	**1,70** abcde	0,80 k	1,02 f	2,85 efg	2,20 bcd	1,25 cdefg	**0,93** abcd	**1,66** ab	**1,53** abcd	1,38 efgh
Delika	D	0,5 defgh	**1,64** ab	1,58 efgh	0,84 jk	1,29 ef	3,30 bcd	2,28 bc	1,15 efg	**0,93** abcd	**1,62** abc	**1,64** abcd	1,44 bcdef
Donner	D	0,3 h	**1,43** ab	1,66 bcdefg	1,01 ij	1,36 ef	**3,34** abcd	2,12 cde	**1,42** abcd	**1,00** abc	**1,58** abc	**1,55** abcd	1,41 defg
Fifty50	D	0,5 defgh	**1,53** ab	**1,75** abcd	1,09 ghi	**2,16** abc	3,11 cde	1,82 ghi	1,11 fgh	0,84 bcd	**1,46** abcd	1,41 bcde	1,21 hi
Govenor	D	**0,6** abcdef	**1,53** ab	**1,73** abcde	1,34 bcde	**2,20** abc	**3,73** a	2,04 cdefg	1,31 bcdefg	**1,16** a	**1,67** ab	**1,68** abc	**1,64** a
Goyave	D	0,5 bcdefg	**1,68** a	1,54 fgh	0,86 jk	1,14 f	2,96 defg	1,95 defg	1,20 defg	**0,92** abcd	1,31 cde	1,36 bcde	**1,57** abcde
Legion	D	**0,6** abcde	**1,48** ab	**1,80** ab	**1,48** ab	**2,59** a	3,30 bcd	1,91 efgh	**1,57** a	**0,93** abcd	**1,61** abc	**1,67** abcd	**1,52** abcde
Maxsyn	D	**0,6** abcdefg	**1,51** ab	**1,71** abcde	**1,40** abcd	**2,18** abc	3,22 cde	2,01 defg	**1,49** abc	**1,10** a	1,46 bcd	**1,49** abcd	**1,68** a
One50	D	0,4 gh	1,08 b	**1,80** ab	1,26 defg	**2,24** abc	2,55 g	1,67 hi	1,14 efg	**1,05** abc	**1,55** abcd	**1,63** abcd	1,42 cdef
Payday	T	**0,7** ab	**1,30** ab	1,60 defgh	1,01 ij	1,28 ef	2,71 fg	1,56 ij	0,85 i	0,70 de	1,03 e	1,28 de	1,29 fgh
Platform	D	0,5 cdefgh	**1,71** a	**1,72** abcde	**1,41** abcd	**2,27** abc	3,13 cde	2,02 defg	**1,36** abcde	**1,06** ab	**1,48** abcd	**1,71** abc	**1,60** abc
Reason	D	**0,6** abcdef	**1,87** a	**1,70** abcdef	1,30 cdef	**2,29** abc	**3,52** abc	2,10 cde	**1,49** abc	**1,03** abc	**1,47** abcd	**1,70** abc	**1,52** abcde
Stampede	D	**0,7** ab	**1,80** a	**1,82** a	**1,45** abc	**2,29** abc	3,20 cde	2,05 cdefg	**1,37** abcde	**0,98** abc	**1,56** abcd	**1,82** a	**1,62** ab
Tactic	D	0,5 efgh	**1,36** ab	**1,72** abcde	1,15 fghi	1,66 de	2,86 efg	1,83 fgh	1,13 efg	0,69 de	1,33 cde	1,35 bcde	**1,56** abcde
Tetragain	T	**0,6** abcdef	**1,45** ab	1,46 h	0,73 k	2,03 bcd	**3,69** ab	1,34 j	0,87 hi	0,50 e	1,03 e	0,88 f	1,07 i
Three60	D	0,5 efgh	**1,69** a	**1,76** abc	**1,54** a	**2,14** abc	2,70 fg	1,96 defg	1,30 bcdefg	**1,01** abc	**1,47** abcd	**1,65** abcd	**1,62** ab
Ultra	D	**0,8** a	**1,84** a	1,51 gh	1,15 fghi	**2,34** abc	3,29 bcd	2,05 cdefg	**1,36** abcdef	**1,02** abc	**1,49** abcd	**1,54** abcd	1,56 abcde
LSD (0.05)		0,2	0,59	0,15	0,18	0,45	0,41	0,26	0,25	0,24	0,32	0,40	0,19
CV%		21,7	23,1	5,6	9,1	14,0	7,9	7,8	11,8	15,6	13,4	16,0	7,8

DM%'s with the same letter are statistically similar within a column

Table 8. Growth form of perennial ryegrass cultivars assessed during winter 2024

Table 8 (winter 2024)

Observed growth form in cutting trial

Prostrate	Semi-prostrate	Semi-upright	Upright
Chavelier	24Seven	Fifty50	4Front
	Bowie	One50	Array
	Delika	Reason	Base
	Donner	Tactic	Govenor
	Goyave	Three60	Legion
	Payday	Ultra	Maxsyn
	Tetragain		Platform
			Stampede
			

Results

Cabrera Estrada JI, Delagarde R, Faverdin RP, Peyraud JL. 2004. Dry matter intake and eating rate of grass by dairy cows is restricted by internal, but not external water. Animal Feed Science and Technology 114: 59- 74.

Carr JH. 1975. Disease of herbage crops – some problems and progress. Annals of Applied Biology 81: 235 – 279.

Chapman DF. 2016. Using Ecophysiology to Improve Farm Efficiency: Application in Temperate Dairy Grazing Systems. In: Forage Plant Ecophysiology (ed Matthews C). Agriculture 6, 17: 122 – 140.

John A and Ulyatt MJ. 1987. Importance of dry matter content to voluntary intake of fresh grass forages. Proceedings of the New Zealand Society of Animal Production 47: 13 – 16.

Leaver JD 1985. Milk production from grazed temperate grassland. Journal of Dairy Research 52: 313-344.

McKenzie EHC. 1971. Seasonal changes of fungal spore numbers in ryegrass-white clover pasture, and the effect of benomyl on pasture fungi. New Zealand Journal of Agricultural Research 14: 371 – 392.

Minson DJ. 1990. Forages in ruminant nutrition. Animal feeding and nutrition. A Series of Monographs and Treatises (Cunha TJ, Ed.)

Plummer RM, Hall RL and Watt TA. 1990. The influence of crown rust (*Puccinia coronata*) on tiller production and survival of perennial ryegrass (*Lolium perenne*) plants in simulated swards. Grass and Forage Science 45: 9 – 16.

Verite R and Journet M. 1970. Effect of the Water Content of Grass and Dehydration at Low Temperature upon Its Feeding Value for Dairy Cows. Annales de Zootechnie, 19, 255-268.

Webb C, Stewart A and Harmer M. 2019. Progress in breeding for crown rust (*Puccinia coronata* f.sp. *lolii*) resistance in perennial ryegrasses. Proceedings of the 2019 Agronomy Australia Conference, 25 – 29 August 2019, Wagga Wagga, Australia.

Tall Fescue cultivar evaluation results 2024: initial results

Sigrun Ammann*, Dalena Lombard, Lethu Zulu

Western Cape Department of Agriculture, Research and Technology Development, Directorate Plant Sciences, Outeniqua Research Farm, P.O. Box 24, George 6530

*Sigrun.ammann@westerncape.gov.za

Introduction

In autumn 2024 a new elite tall fescue evaluation trial was established at Outeniqua Research Farm planted on 11 March 2024, with the trial number Fa3. The trial is aimed at evaluating agronomic traits such as DM yield, disease tolerance and forage quality, and additionally provide data on interaction traits such as seasonal yield distribution, flowering behaviour, growth form and persistence. The evaluation is aimed at what can be considered recent and high-end varieties or varieties with unique characteristics that may have a beneficial application for local pasture systems and are accordingly submitted by the various seed companies. This information provides local data for choosing pasture cultivars. The interaction traits can be used to assist in selecting varieties for pasture mixes.

There are various advantages that tall fescue has over the other commonly used dairy pasture species, which makes it an interesting option for the climatic and soil conditions of the southern Cape region.

Tall fescue has a higher temperature tolerance for active growth than perennial ryegrass does. White (1973) gives the optimal temperature range for growth in temperate species as 20 to 25°C. According to Raeside et al (2012), the temperature range for active growth in tall fescue is 30 to 35°C, at which sward density is also retained. Tall fescue can tolerate both dry and wet conditions (Dairy Australia Tall Fescue Factsheet) and responds more effectively to summer rainfall than perennial ryegrass does (Raeside et al 2012).

Tall fescue has a deeper root system than perennial ryegrass and can extract soil moisture from lower soil levels (Garwood and Sinclair 1979). This imparts greater drought tolerance associated with the volume of roots present at lower soil levels than is the case for perennial ryegrass (Garwood and Sinclair 1979).

Other beneficial characteristics are tolerance of lower pH soils and salinity than other commonly used species for intensive dairy pastures. It has a high responsiveness to irrigation or rainfall and responds more quickly than perennial ryegrass (Lowe & Bondler 1995, Nie et al 2008, Raeside et al 2012) and a better water use efficiency than perennial ryegrass (Minnee et al 2010).

Overall, these characteristics point to a more robust species that is adapted to a wide range of conditions. This can be of value in the Southern Cape, which is not a summer rainfall area, but rather year-round rainfall skewed towards being drier in summer.

BENEFICIAL CHARACTERISTICS OF TALL FESCUE

Higher temperature tolerance

Deeper root system

Tolerance to low soil pH and salinity

Parameters measured and assessed

- DM yield (harvested according to leaf-stage)
- Seasonal yield patterns
- Dry matter (DM) content
- Disease incidence (mainly rust)
- Flowering behaviour (reproductive tillers)
- Persistence/ plant population (not applicable in the current report)
- Forage quality (not in the current report)
- General growth form (will be reported at the end of the trial)

Cultivars under evaluation

All cultivars in the current trial are continental types (summer active growth) however some may have more winter growth activity, which will be considered an advantage in terms of use in dairy systems. Another advantage is softer leaves.

Apalona, Aurora, Cowgirl, Elodie, Fortuna, Kora, Pastoral, Quantica, Roscati, Rosparon, Tower, Triumphant

Trial design and management

The trial was designed as a Randomised Block Design with three replications. Gross plot size is 2.1m x 6m and net plot size is 1.3m x 4.7m. A sowing rate of 25kg/ha with rows spaced 15cm apart, is used. Soil temperature at sowing should consistently be >12°C for rapid germination and consequently successful establishment (Dairy NZ 2010). Hence establishment is aimed at early autumn or even late summer depending on the climate. This trial was planted on 11 March 2024.

The *Festuca* trial is harvested when the first cultivars reach the 2 to 2.5 leaf stage or in spring at canopy closure if necessary. The grazing interval linked to the 2 to 2.5-leaf stage fits with the pasture systems used and the other species that are often planted in combination with tall fescue. According to Chapman et al (2014), tall fescue carbohydrate reserves are replenished between the 2 and 4 leaf stage and maximum growth rate is achieved at the 2.5 leaf stage. Leaf appearance rate is determined mainly by temperature and hence most varieties reach the required leaf stage at a similar time. This harvest interval is used even though tall fescue is known to be a four-leaf plant, however with the larger root system, root growth recommencing almost immediately after defoliation and greater tolerance of higher temperatures, the plants tend to have sufficient storage carbohydrates to be harvested before the maximum leaf number is reached. Previous trials have shown no apparent adverse effects in terms of persistence when swards are harvested at the 2-leaf stage. There could however be an advantage in having a slightly longer defoliation interval at certain times of the year to allow for additional carbohydrate reserve accumulation, especially in autumn. The advantage of tall fescue in terms of leaf stage is the greater flexibility compared with ryegrass since the sward can be grazed between the 2 and 4-leaf stage without leaf death. According to Donaghy et al (2008) forage quality is highest at the 2-leaf stage and lowest at the 4-leaf stage. Hence the compromise to graze between the two and three leaf stage is sensible in terms of forage quality and complementarity with other species.

Plots are cut with a reciprocating mower (Agria) at 5cm height. The material from the net plot is sampled for the dry matter determination with an approximately 500g wet weight sample and the rest of the material is raked together and weighed. Samples are weighed and oven dried at 70˚C.

The trials were top-dressed with nitrogen fertilizer after each harvest, and potassium fertilizer to account for nutrient removal, since all material is removed from the trial.

Results

Total and seasonal yield (Table 1) gives an important overview of what to expect from different cultivars. This is especially important for tall fescue since there are distinct types in terms of summer and winter active growth and fewer cultivars on the market as is the case for the ryegrasses. More recently there are continental types with improved winter growth activity. Tall fescue more than the ryegrasses has more pronounced seasonal growth patterns which are important to quantify so that the species can be combined with other species either in a monoculture or mixtures for more optimal fodder flow or excess forage conserved as silage for feeding out in the lower producing season, typically winter. **Mean seasonal growth rates** are given in **Table 2.**

Rust and flowering incidence is given in **Tables 3 and 4.**

Yield and growth rates *for* **individual harvests** are given in **Tables 5 and 6.**

DM% is given in **Table 7.**

The cultivars that stand out at this stage of the trial for dry matter yield are Quantica and Rosparon. Quantica was in the highest yielding group (p<0.05) in all seasons while Rosparon was in the best yielding group from spring onwards through summer and the second autumn. The trial is ongoing and the coming two years will be important for assessing yield stability over time.

Rosparon had the lowest rust incidence.

In terms of flowering incidence Rosparon was second highest but all still at a low level. The cultivars Apalona, Kora, Pastoral, Quantica, Roscati and Tower had 10% or less flowering incidence, while Elodie had zero reproductive tillers.

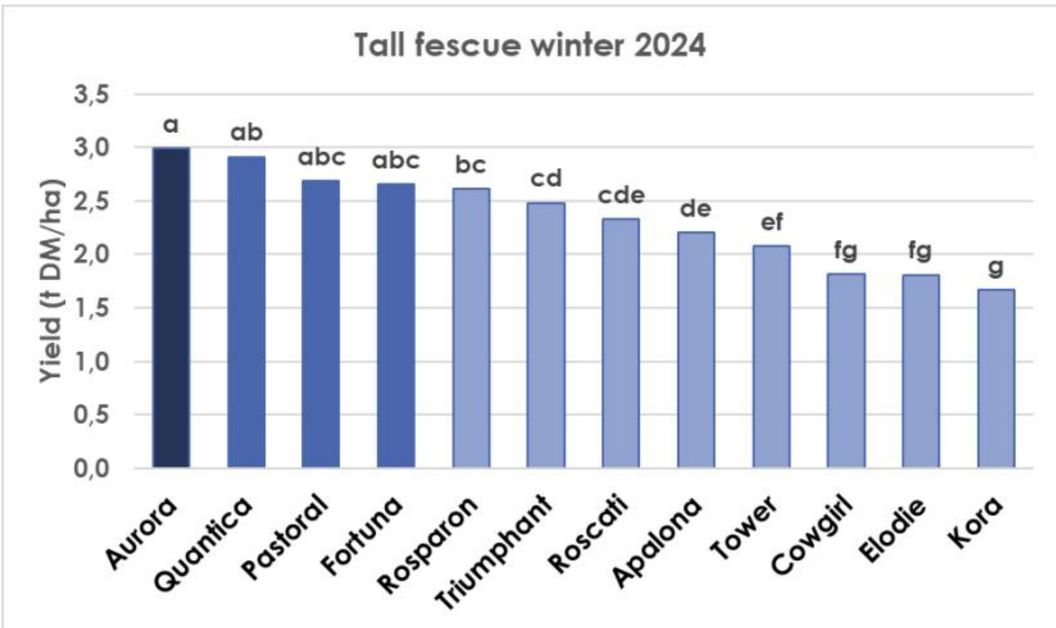


Figure 1. Tall fescue dry matter yield (t DM/ha) for the first winter (2024). Yields with the same letter are similar (p<0.05).

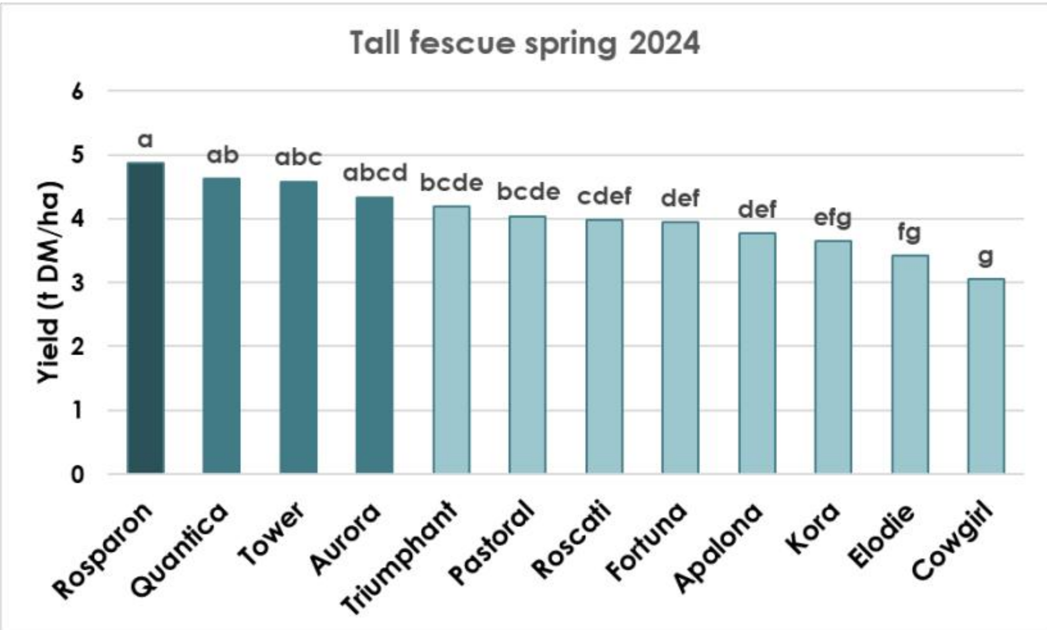


Figure 2. Tall fescue dry matter yield (t DM/ha) for the spring 2024. Yields with the same letter are similar (p<0.05).

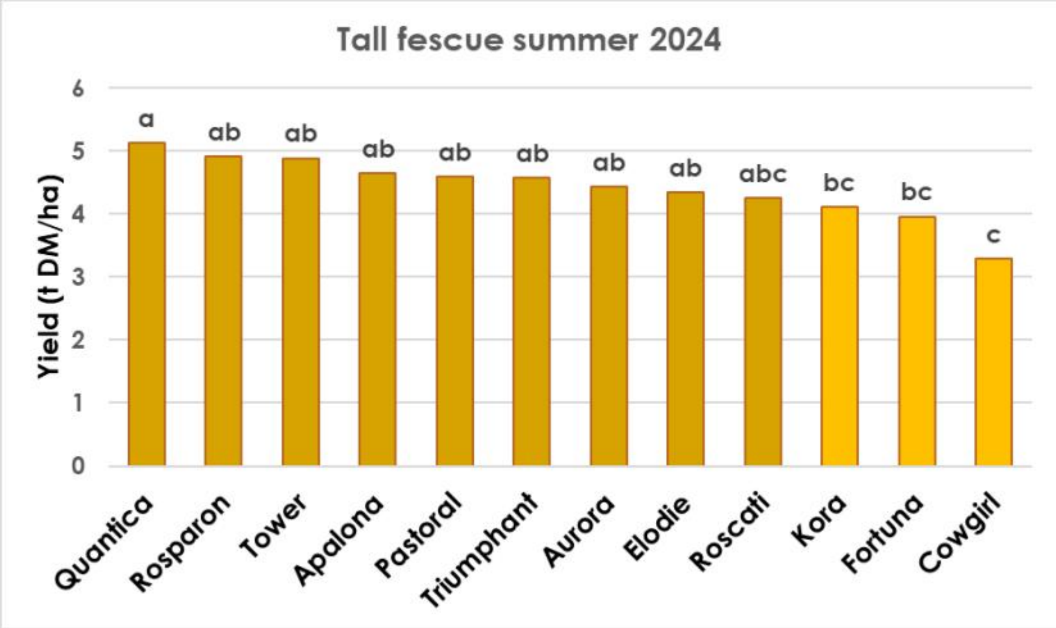


Figure 3. Tall fescue dry matter yield (t DM/ha) for the summer 2024/25. Yields with the same letter are similar (p<0.05).

Figure 4. Tall fescue dry matter yield (t DM/ha) for the second autumn (2025). Yields with the same letter are similar (p<0.05).

References

Chapman DF, Lee JM and Waghorn GC. 2014. Interaction between plant physiology and pasture feeding value: a review. Crop and Pasture Science 65: 721 – 734

DairyNZ (2010). Tall fescue establishment and management. DairyNZ Farmfact 1-28.

Donaghy DJ, Turner LR, Adamczewski KA. 2008. Effect of Defoliation Management on Water-Soluble Carbohydrate energy reserves, dry matter yields, and herbage quality of tall fescue. Agronomy Journal 100: 122 – 127.

Lowe KF and Bowdler TM. 1995. Growth, persistence, and rust sensitivity of irrigated perennial temperate grasses in the Queensland subtropics. Australian Journal of Experimental Agriculture, 35: 571–578.

Minneé EMK, Knight TL, Sutherland BL, Vlaming JB, Fletcher LR and Clark DA. 2010. Herbage production from perennial ryegrass and tall fescue pastures under irrigation in the Canterbury and Waikato regions of New Zealand. Proceedings of the New Zealand Grassland Association 72: 185 – 190.

Nie ZN, Miller S, Moore GA, Hackney BF, Boschma SP, Reed KFM, Mitchell M, Albertsen TO, Clark S, Craig AD, Kearney G, Li GD, Dear BS. 2008. Field evaluation of perennial grasses and herbs in southern Australia. 2. Persistence, root characteristics and summer activity. Australian Journal of Experimental Agriculture 48: 424 – 435.

Raeside MC, Friend MA, Behrendt R, Lawson AR, Clarke SG. 2012. A review of summer-active tall fescue use and management in Australia's high-rainfall zone. New Zealand Journal of Agricultural Research 55: 393 – 411.

Table 1. Tall fescue seasonal and annual dry matter yield (t DM/ha)

Tall fescue (*Festuca arundinacea*) — Outeniqua Research Farm, Trial **Fa3**

Table 1: Seasonal yield (t DM/ha) — Planted 11 March 2024

Cultivars	Type	Autumn 2024	Rank	Winter 2024	Rank	Spring 2024	Rank	Summer 2024/25	Rank	Autumn 2025	Rank	Total Year 1	Rank	Total 15 months	Rank
Apalona	C	2,06 ^{bc}	6	2,20 ^{de}	8	3,77 ^{def}	9	**4,65** ^{ab}	4	3,39 ^{de}	9	12,67 ^{cd}	7	16,17 ^{def}	7
Aurora	C	2,13 ^{bc}	4	**2,99** ^{a}	1	**4,34** ^{abcd}	4	**4,44** ^{ab}	7	3,68 ^{bc}	3	**14,00** ^{ab}	3	17,67 ^{bc}	3
Cowgirl	C	**2,18** ^{ab}	2	1,82 ^{fg}	10	3,05 ^{g}	12	3,29 ^{c}	12	3,03 ^{gh}	11	10,33 ^{f}	12	13,37 ^{h}	12
Elodie	C	2,13 ^{bc}	5	1,81 ^{fg}	11	3,43 ^{fg}	11	**4,35** ^{ab}	8	3,38 ^{de}	5	11,70 ^{de}	10	15,10 ^{fg}	10
Fortuna	C	1,92 ^{c}	11	**2,65** ^{abc}	4	3,95 ^{def}	8	3,96 ^{bc}	11	3,08 ^{fg}	10	12,50 ^{cde}	8	15,60 ^{ef}	8
Kora	C	1,97 ^{bc}	10	1,67 ^{g}	12	3,64 ^{efg}	10	4,11 ^{bc}	10	2,79 ^{h}	12	11,37 ^{ef}	11	14,17 ^{gh}	11
Pastoral	C	2,16 ^{b}	3	**2,69** ^{abc}	3	4,04 ^{bcde}	6	**4,60** ^{ab}	5	3,61 ^{cd}	4	13,50 ^{bc}	5	17,10 ^{cd}	4
Quantica	C	**2,39** ^{a}	1	**2,91** ^{ab}	2	**4,62** ^{ab}	2	**5,13** ^{a}	1	**3,90** ^{ab}	2	**15,07** ^{a}	1	**18,97** ^{a}	1
Roscati	C	1,90 ^{c}	12	2,33 ^{cde}	7	3,98 ^{cdef}	7	**4,26** ^{abc}	9	3,21 ^{efg}	8	12,37 ^{cde}	9	15,57 ^{ef}	9
Rosparon	C	2,04 ^{bc}	8	2,61 ^{bc}	5	**4,87** ^{a}	1	**4,92** ^{ab}	2	**4,07** ^{a}	1	**14,43** ^{ab}	2	**18,50** ^{ab}	2
Tower	C	2,05 ^{bc}	7	2,08 ^{ef}	9	**4,58** ^{abc}	3	**4,89** ^{ab}	3	3,39 ^{de}	6	13,60 ^{bc}	4	16,97 ^{cd}	5
Triumphant	C	2,00 ^{bc}	9	2,48 ^{cd}	6	4,19 ^{bcde}	5	**4,57** ^{ab}	6	3,33 ^{ef}	7	13,27 ^{bc}	6	16,57 ^{cde}	6
LSD (0.05)		0,23		0,36		0,61		0,98		0,26		1,24		1,29	
CV%		6,6		9,1		8,9		13,1		4,5		5,65		4,7	

Yields with the same letter are statistically similar within a column

Table 2. Tall fescue seasonal growth rates (kg DM/ha/day)

Tall fescue (*Festuca arundinacea*) Outeniqua Research Farm, Trial **Fa3**

Table 2: Growth rates (kg DM/ha/day) Planted 11 March 2024

Cultivars	Type	Autumn 2024	Rank	Winter 2024	Rank	Spring 2024	Rank	Summer 2024/25	Rank	Autumn 2025	Rank
Apalona	C	25,4 ^{bc}	6	23,9 ^{de}	8	41,5 ^{def}	9	**51,6** ^{ab}	4	33,91 ^{def}	9
Aurora	C	26,3 ^{bc}	4	**36,2** ^{a}	1	**47,7** ^{abcd}	4	**49,3** ^{ab}	7	40,03 ^{b}	3
Cowgirl	C	**26,9** ^{ab}	2	19,7 ^{fg}	10	33,5 ^{g}	12	36,5 ^{c}	12	32,90 ^{fg}	11
Elodie	C	26,3 ^{bc}	5	19,7 ^{fg}	11	37,7 ^{fg}	11	**48,3** ^{ab}	8	36,80 ^{cd}	5
Fortuna	C	23,7 ^{c}	11	**28,3** ^{bc}	4	43,4 ^{def}	8	44,0 ^{bc}	11	33,50 ^{efg}	10
Kora	C	24,4 ^{bc}	10	18,1 ^{g}	12	40,0 ^{efg}	10	45,7 ^{bc}	10	30,33 ^{g}	12
Pastoral	C	26,6 ^{b}	3	**29,2** ^{bc}	3	44,4 ^{bcde}	6	**51,1** ^{ab}	5	39,23 ^{bc}	4
Quantica	C	**29,6** ^{a}	1	**31,6** ^{b}	2	**50,8** ^{ab}	2	**57,0** ^{a}	1	**42,43** ^{ab}	2
Roscati	C	23,5 ^{c}	12	25,3 ^{cde}	7	43,7 ^{cdef}	7	**47,3** ^{abc}	9	34,97 ^{def}	8
Rosparon	C	22,2 ^{bc}	8	28,4 ^{bc}	5	**53,5** ^{a}	1	**54,6** ^{ab}	2	**44,27** ^{a}	1
Tower	C	25,3 ^{bc}	7	22,6 ^{ef}	9	**50,3** ^{abc}	3	**54,3** ^{ab}	3	36,77 ^{cd}	6
Triumphant	C	24,7 ^{bc}	9	27,0 ^{cd}	6	46,0 ^{bcde}	5	**50,8** ^{ab}	6	36,13 ^{cd}	7
LSD (0.05)		2,9		4,1		6,7		10,9		3,20	
CV%		6,6		9,4		8,9		13,1		5,1	

Growth rates with the same letter are statistically similar within a column

Table 3. Rust incidence of Tall fescue varieties established in March 2024.

Tall fescue (*Festuca arundinacea*) Outeniqua Research Farm, Trial **Fa3**

Table 3: Rust % (ratings-based) Planted 11 March 2024

Cultivars	Type	Cut 1 (16 May 2024)	Cut 2 (16 Jul 2024)	Cut 3 (23 Sep 2024)	Cut 4 (8 Nov 2024)	Cut 5 (2 Jan 2025)	Cut 6 (15 Feb 2025)	Cut7 (25 Mar 2025)	Cut 8 (12 May 2025)
Apalona	C	0	21 ^{de}	0 ^{c}	17 ^{b}	**33** ^{b}	4 ^{cd}	6 ^{bc}	5 ^{c}
Aurora	C	0	8 ^{fg}	0 ^{c}	2 ^{d}	0 ^{e}	4 ^{cd}	4 ^{bc}	2 ^{c}
Cowgirl	C	0	**42** ^{b}	**13** ^{a}	21 ^{b}	**33** ^{b}	**33** ^{a}	**38** ^{a}	25 ^{a}
Elodie	C	0	0 ^{g}	0 ^{c}	6 ^{cd}	4 ^{e}	d ^{d}	0 ^{c}	0 ^{c}
Fortuna	C	0	0 ^{g}	0 ^{c}	0 ^{d}	0 ^{e}	0 ^{d}	8 ^{bc}	4 ^{c}
Kora	C	0	**54** ^{a}	**13** ^{a}	**33** ^{a}	**33** ^{b}	4 ^{cd}	14 ^{b}	4 ^{c}
Pastoral	C	0	**33** ^{bc}	4 ^{b}	**33** ^{a}	**46** ^{a}	**38** ^{a}	**38** ^{a}	18 ^{ab}
Quantica	C	0	3 ^{fg}	0 ^{c}	13 ^{bc}	25 ^{bc}	21 ^{b}	17 ^{b}	10 ^{bc}
Roscati	C	0	2 ^{fg}	0 ^{c}	14 ^{bc}	17 ^{cd}	8 ^{cd}	8 ^{bc}	6 ^{c}
Rosparon	C	0	2 ^{fg}	0 ^{c}	0 ^{d}	8 ^{de}	0 ^{d}	0 ^{c}	2 ^{c}
Tower	C	0	13 ^{ef}	0 ^{c}	14 ^{bc}	8 ^{de}	13 ^{bc}	4 ^{bc}	10 ^{bc}
Triumphant	C	0	29 ^{cd}	0 ^{c}	13 ^{bc}	**33** ^{b}	**33** ^{a}	**42** ^{a}	25 ^{a}
LSD (0.05)		NS	11,2	3,528	10,7	11,0	11,5	13,8	11,3
CV%			38,4	85,71	46,1	32,3	51,3	54,9	72,0

Rust with the same letter are statistically similar within a column

Table 4. Reproductive tiller percentage (ratings based) of Tall fescue varieties established in March 2024.

Tall fescue (*Festuca arundinacea*) Outeniqua Research Farm, Trial **Fa3**

Table 4: Reproductive tillers % (ratings-based) Planted 11 March 2024

Cultivars	Type	Cut 1 (16 May 2024)	Cut 2 (16 Jul 2024)	Cut 3 (23 Sep 2024)	Cut 4 (8 Nov 2024)	Cut 5 (2 Jan 2025)	Cut 6 (15 Feb 2025)	Cut7 (25 Mar 2025)	Cut 8 (12 May 2025)
Apalona	C	0	0	0 d	2 d	0	0	0 b	0
Aurora	C	0	0	**10 ab**	8 cd	0	0	**3 a**	0
Cowgirl	C	0	0	2 cd	**29 a**	0	0	**3 a**	0
Elodie	C	0	0	0 d	0 d	0	0	0 b	0
Fortuna	C	0	**8 a**	**14 a**	10 cd	0	0	**3 a**	0
Kora	C	0	0	0 d	2 d	0	0	0 b	0
Pastoral	C	0	0	8 bc	5 d	0	0	**2 ab**	0
Quantica	C	0	0	2 cd	3 d	0	0	0 b	0
Roscati	C	0	0	0 d	5 d	0	0	0 b	0
Rosparon	C	0	0	3 cd	**21 ab**	0	0	**2 ab**	0
Tower	C	0	0	0 d	10 cd	0	0	0 b	0
Triumphant	C	0	0	5 bcd	17 bc	0	0	0 b	0
LSD (0.05)		NS	-	6,4	10,1	NS	NS	3,3	NS
CV%			200	105	64,6			174	

Reproductive tillers/flowering % with the same letter are statistically similar within a column

Table 5. Individual harvest yields (t DM/ha) of Tall fescue varieties established in March 2024.

Tall fescue (*Festuca arundinacea*) Outeniqua Research Farm, Trial **Fa3**

Table 5: Yield (t DM/ha) individual harvests Planted 11 March 2024

Cultivars	Type	Cut 1 (16 May 2024)	Rank	Cut 2 (16 Jul 2024)	Rank	Cut 3 (23 Sep 2024)	Rank	Cut 4 (8 Nov 2024)	Rank	Cut 5 (2 Jan 2025)	Rank	Cut 6 (15 Feb 2025)	Rank	Cut7 (25 Mar 2025)	Rank	Cut 8 (12 May 2025)	Rank
Apalona	C	1,51 [bcde]	9	**2,27** [ab]	2	0,78 [gh]	9	2,35 [cd]	10	**2,90** [ab]	3	**2,15** [ab]	6	2,12 [cd]	7	2,03 [cde]	6
Aurora	C	**1,61** [abcd]	5	2,11 [bc]	5	**2,23** [a]	1	2,56 [cd]	5	**2,58** [abc]	7	**2,08** [ab]	8	2,25 [bc]	4	2,24 [bc]	3
Cowgirl	C	**1,75** [ab]	2	1,76 [ed]	11	0,73 [gh]	10	2,15 [d]	12	1,65 [d]	12	1,62 [b]	12	1,91 [f]	11	1,80 [ef]	11
Elodie	C	**1,69** [abc]	3	1,79 [de]	10	0,69 [h]	11	2,03 [d]	11	**2,48** [abc]	9	**2,11** [ab]	7	2,08 [de]	8	2,05 [cde]	5
Fortuna	C	1,40 [de]	11	**2,13** [abc]	4	1,57 [cd]	4	2,54 [cd]	6	2,21 [cd]	11	**1,95** [ab]	10	1,92 [f]	10	1,86 [def]	10
Kora	C	1,57 [bcde]	7	1,62 [e]	12	0,67 [h]	12	2,39 [cd]	9	**2,58** [abc]	6	**1,97** [ab]	9	1,67 [g]	12	1,72 [f]	12
Pastoral	C	**1,68** [abc]	4	1,94 [cd]	8	1,84 [bc]	3	2,51 [cd]	7	2,30 [bcd]	10	**2,35** [a]	2	**2,41** [ab]	2	2,07 [cd]	4
Quantica	C	**1,86** [a]	1	**2,16** [abc]	3	**1,92** [ab]	2	2,77 [bc]	3	**3,02** [a]	2	**2,43** [a]	1	**2,45** [a]	1	**2,34** [ab]	2
Roscati	C	1,30 [e]	12	1,99 [bcd]	6	1,24 [ef]	6	2,48 [cd]	8	**2,71** [abc]	5	**1,94** [ab]	11	1,93 [ef]	9	1,98 [def]	8
Rosparon	C	1,46 [cde]	10	**2,37** [a]	1	1,24 [ef]	7	**3,30** [a]	1	**2,88** [ab]	4	**2,34** [a]	3	**2,38** [ab]	3	**2,55** [a]	1
Tower	C	**1,60** [abcd]	6	1,84 [de]	9	1,04 [fg]	8	**3,01** [ab]	2	**3,06** [a]	1	**2,27** [a]	4	2,19 [cd]	6	1,98 [de]	7
Triumphant	C	1,51 [bcde]	8	1,98 [bcd]	7	1,49 [de]	5	2,68 [bc]	4	**2,52** [abc]	8	**2,27** [a]	5	2,22 [cd]	5	1,90 [def]	9
LSD (0.05)		0,27		0,26		0,32		0,44		0,67		0,61		0,16		0,26	
CV%		10,2		7,7		14,77		10,1		15,3		17,1		4,4		7,4	

Yield values with the same letter are statistically similar within a column

Table 6. Growth rates (t DM/ha) of Tall fescue varieties established in March 2024.

Tall fescue (*Festuca arundinacea*) — Outeniqua Research Farm, Trial **Fa3**

Table 6: Growth rates (kg DM/ha/day) — Planted 11 March 2024

Cultivars	Type	Cut 1 (16 May 2024)	Rank	Cut 2 (16 Jul 2024)	Rank	Cut 3 (23 Sep 2024)	Rank	Cut 4 (8 Nov 2024)	Rank	Cut 5 (2 Jan 2025)	Rank	Cut 6 (15 Feb 2025)	Rank	Cut7 (25 Mar 2025)	Rank	Cut 8 (12 May 2025)	Rank
Apalona	C	22,8 bcde	9	**36,5 ab**	2	11,3 gh	9	51 cd	10	**52,7 ab**	**3**	**49,9 ab**	**6**	54,5 de	7	42,3 cde	6
Aurora	C	**24,4 abcd**	5	34,6 bc	5	**32,3 a**	1	56 cd	5	**46,9 abc**	**6**	**48,3 ab**	**8**	57,7 bcd	4	46,7 bc	3
Cowgirl	C	**26,5 ab**	2	28,9 de	11	10,6 gh	10	47 d	12	29,9 d	12	37,5 b	12	48,9 g	11	37,6 ef	11
Elodie	C	**25,6 abc**	3	29,4 de	10	10,0 h	11	48 d	11	**45,1 abc**	**9**	**49,1 ab**	**7**	53,4 ef	8	42,7 cde	5
Fortuna	C	21,2 de	11	**35,0 abc**	4	22,7 cd	4	55 cd	6	40,1 cd	11	**45,3 ab**	**10**	49,1 g	10	38,7 def	10
Kora	C	23,8 bcd	7	26,5 e	12	9,7 h	12	52 cd	9	**46,9 abc**	**7**	**45,8 ab**	**9**	42,8 h	12	35,8 f	12
Pastoral	C	**25,4 abc**	4	31,9 cd	8	26,6 bc	3	55 cd	7	41,8 bcd	10	**54,7 a**	**2**	**61,7 a**	**2**	43,1 cd	4
Quantica	C	**28,2 a**	1	**35,4 abc**	3	**27,9 ab**	2	60 bc	3	**55,0 a**	**2**	**56,6 a**	**1**	**62,8 a**	**1**	**48,8 ab**	2
Roscati	C	19,7 e	12	32,6 bcd	6	18,1 def	6	54 cd	8	**49,2 ab**	**5**	**45,1 ab**	**11**	49,6 fg	9	41,2 def	8
Rosparon	C	22,0 cde	10	**38,9 a**	1	17,9 ef	7	**72 a**	**1**	**52,3 ab**	**4**	**54,3 a**	**3**	**61,0 abc**	**3**	**53,0 a**	1
Tower	C	**24,2 abcd**	6	30,1 de	9	15,1 fg	8	**65 ab**	**2**	**55,6 a**	**1**	**52,7 a**	**4**	56,2 de	6	41,3 de	7
Triumphant	C	22,9 bcde	8	32,4 bcd	7	21,6 de	5	58 bc	4	**45,8 abc**	**8**	**52,7 a**	**5**	57,0 cde	5	39,6 def	9
LSD (0.05)		4,1		4,25		4,67		9,6		12,14		###		4,08		5,36	
CV%		10,2		7,7		14,79		10,1		15,3		17,1		4,4		7,4	

Growth rates with the same letter are statistically similar within a column

Table 7. Dry matter content (%) of Tall fescue cultivars established in March 2024

Tall fescue (*Festuca arundinacea*) Outeniqua Research Farm, Trial **Fa3**

Table 7: DM% Planted 11 March 2024

Cultivars	Type	Cut 1 (16 May 2024)	Cut 2 (16 Jul 2024)	Cut 3 (23 Sep 2024)	Cut 4 (8 Nov 2024)	Cut 5 (2 Jan 2025)	Cut 6 (15 Feb 2025)	Cut7 (25 Mar 2025)	Cut 8 (12 May 2025)
Apalona	C	13,3 ^{bc}	**18,6 ^{abc}**	**24,3 ^{ab}**	22,0 ^{de}	26,4 ^{c}	**21,3 ^{abc}**	18,2 ^{cd}	18,2 ^{ef}
Aurora	C	12,7 ^{cd}	17,3 ^{f}	22,3 ^{cde}	22,6 ^{cd}	27,5 ^{bc}	**21,8 ^{abc}**	**18,5 ^{abcd}**	**19,5 ^{ab}**
Cowgirl	C	**13,4 ^{abc}**	**18,5 ^{abcd}**	**24,5 ^{a}**	**24,2 ^{ab}**	**29,1 ^{a}**	**22,6 ^{ab}**	**19,1 ^{ab}**	**19,2 ^{abc}**
Elodie	C	13,2 ^{bc}	**18,9 ^{ab}**	**24,2 ^{ab}**	22,6 ^{cd}	26,9 ^{c}	**21,7 ^{abc}**	**18,8 ^{abc}**	18,3 ^{ef}
Fortuna	C	**13,3 ^{abc}**	17,7 ^{def}	**23,9 ^{ab}**	**25,0 ^{a}**	**29,3 ^{a}**	**22,5 ^{abc}**	**19,0 ^{abc}**	**19,9 ^{a}**
Kora	C	**13,6 ^{ab}**	**19,0 ^{ab}**	**23,4 ^{abcd}**	23,2 ^{bc}	**28,6 ^{ab}**	**21,5 ^{abc}**	18,4 ^{bcd}	18,2 ^{ef}
Pastoral	C	13,1 ^{bc}	17,7 ^{def}	22,2 ^{de}	22,8 ^{cd}	**29,3 ^{a}**	**21,5 ^{abc}**	18,3 ^{bcd}	18,6 ^{cde}
Quantica	C	12,2 ^{d}	17,1 ^{g}	22,2 ^{e}	22,7 ^{cd}	26,4 ^{c}	20,8 ^{c}	17,7 ^{d}	17,7 ^{f}
Roscati	C	**13,8 ^{ab}**	17,9 ^{cdef}	23,0 ^{bcde}	21,2 ^{e}	26,6 ^{c}	**21,8 ^{abc}**	18,2 ^{cd}	18,3 ^{def}
Rosparon	C	**14,0 ^{a}**	**19,3 ^{a}**	**23,6 ^{abc}**	23,2 ^{bc}	27,2 ^{c}	**22,9 ^{a}**	**19,2 ^{a}**	**19,7 ^{ab}**
Tower	C	**13,3 ^{abc}**	17,6 ^{ef}	23,2 ^{bcde}	21,3 ^{e}	26,6 ^{c}	21,0 ^{bc}	**18,7 ^{abc}**	19,0 ^{bcde}
Triumphant	C	**13,6 ^{ab}**	18,3 ^{bcde}	**23,5 ^{abcd}**	23,4 ^{bc}	**28,9 ^{a}**	**22,3 ^{abc}**	**19,2 ^{a}**	**19,2 ^{abcd}**
LSD (0.05)		0,76	0,86	1,27	1,16	1,3	1,8	0,81	0,9
CV%		3,4	2,8	3,212	2,99	2,7	4,8	2,57	2,7

Rust with the same letter are statistically similar within a column

Red clover: two years of results evaluating grazing-type cultivars

Sigrun Ammann*, Janke van der Colf, Dalena Lombard, Lethu Zulu

Western Cape Department of Agriculture, Research and Technology Development, Directorate Plant Sciences, Outeniqua Research Farm, P.O. Box 24, George 6530

Sigrun.ammann@westerncape.gov.za

Introduction

Until recently the red clover varieties used in South Africa were all the annual-type which typically lasts at best 18 months. The work done on pasture systems for dairy using mixed pastures clearly showed the limitations of these annual type red clovers for such systems, where the other components such as plantain and tall fescue are more perennial and persistent over years. The loss of the legume component is thus a limitation for an otherwise high potential mixed pasture. (van der Colf, Ammann, Meeske 2021; van der Colf, Ammann, Meeske 2022). After a visit from Prof Stansilav Hejduk from Mendel University, who showed us their data on grazing-type red clover cultivars, we decided to start evaluation trials of such cultivars at Outeniqua Research Farm. Various South African seed companies contributed seed to the trials, of cultivars originating from Eastern Europe (15 cultivars), New Zealand (3 cultivars) and USA (2 cultivars). Of these three are tetraploid and 12 are diploid types.

The use of red clover in intensive dairy pastures for the southern Cape region is mainly in multi-species pastures where the focus is on improved resilience. This is primarily in terms of temperature, water availability and the important aspect of improved forage quality during the warmer seasons with an associated improvement in fodder flow. Improved environmental sustainability in terms of reduced nitrogen inputs and improved water use efficiency linked to deeper rooted species is another aspect of the resilience aim.

Since red clover is used in mixed swards, the complementarity between components is an important consideration and links to system fit. As mentioned above the annua-type red clovers have a limitation for system fit in pastures mixtures where the red clover does not match the persistence of the other components.

Cultivars under evaluation

Two aspects of the current evaluation trials are of particular importance for system fit in dairy pastures in the Southern Cape, one is the yielding potential of grazing-type red clover cultivars over years in a frequent defoliation system and the second is the persistence over years including the ability to provide ground cover in mixed pastures to reduce the potential for weed ingression.

Eastern European varieties

Bonus, Chaldene, DFL-TDP, Euphoria, Garant, Gert, Gregale, Hajan, Hammon, Himalia, Kallichore, Megalic, Pasima, Respect, SG-C91

New Zealand varieties

Amigain, Morrow, Relish

USA varieties

Barduro, Dynamite

According to the 2023 recommended list publication of Agroscope, Switzerland (Suter et al 2023), the cultivars Bonus, Garant, Hammon and Respect are annual types.

Suter et al (2023) report that the red clover grazing types in a mixture with grass, at infrequent defoliation and without added N, produce 10% higher yield than a white clover/grass mixed pasture.

In Australia the Dairy Aus 3030 project (2020) recommends red cover for improved summer production especially in mixed pastures with plantain or chicory and a grass. It is considered more adaptable than lucerne and tolerant of more frequent grazing. Red clover is not as drought tolerant as lucerne but can tolerate wet conditions better.

Characteristics of red clover as the legume component of a mixed pasture that are relevant to their fit and complementing other species in the mixture are its deeper root system and taller growth than white clover and does not become dominant over the grass component as the white clover tends to do. Red clover is more competitive in a mixture with a grass and herb component than lucerne is. In terms of nitrogen fixation red clover shares more N than lucerne with other components in the pasture, due root system structure (Pirhofer-Walzl et al 2012). Red clover also produces more milk than lucerne (polyphenoloxidase) (Broderick 2018) due to bypass protein.

Evaluation procedures

Parameters determined and assessed:

- Yield
- Flowering (ratings)
- Disease incidence (ratings)
- Sward density (ratings)
- Sward height at harvest to nearest 5cm

Plot size: 2.1 m x 6m, net plot size 1.3m x 4.7m

Mower blade height: 5cm (Agria mower)

A sample of approximately 500g is taken across the length of each net plot for DM determination, after which the total net plot material is raked and weighed. Samples for DM are dried at 70°C.

Establishment dates and locations:

Trial Tp1: 14 March 2023 at Outeniqua Research farm, field LH2-6

Trial Tp2: 12 April 2023 at Outeniqua Research farm, field LH2-8

The cultivars were planted in two sperate trials and on different dates due to unforeseen delays in the seed importation process.

Plots were sown in 15cm rows at a depth of 3cm.

Harvest intervals for red clover trials conducted on the Outeniqua Research Farm:

Cut dates	Tp1 Cut number	No. of days to harvest	Tp2 Cut number
8/5/2023	Cut 1	*	
14/7/2023	Cut 2	67	Cut 1 *
12/9/2023	Cut 3	71	Cut 2
18/10/2023	Cut 4	36	Cut 3
22/11/2023	Cut 5	35	Cut 4
19/12/2023	Cut 6	27	Cut 5
18/1/2023	Cut 7	30	Cut 6
26/2/2024	Cut 8	39	Cut 7
29/4/2024	Cut 9	62	Cut 8
31/7/2024	Cut 10	94	Cut 9
24/10/2024	Cut 11	58	Cut 10
10/12/2024	Cut 12	47	Cut 11
22/1/2025	Cut 13	43	Cut 12
17/3/2025	Cut 14	54	Cut 13
13/5/2025	Cut 15	57	Cut 14

*The first harvest was not weighed due to weed content

Results

The yield results for the first two years show a decrease in yield in both trials. In Tp1 is on average a 40% decrease while in Tp2 is an average of 34%. In must be borne in mind though that Tp2 has had one harvest less than Tp1 due to being planted later, hence a direct comparison is not possible which can be seen based on the cultivars that are common to both trials.

Even though the yield of the annual type, Oregon Red was comparable at this stage of the trials, subsequent data shows when the Oregon Red persistence drops and the associated yield with it. This is shown by the plant counts in the figure 3 and 4 below, done during August 2025.

The yield decrease in spring (Figure 5) between year 1 and year 2 is greater than the decrease in summer (Figure 6) 55% and 34% respectively. .

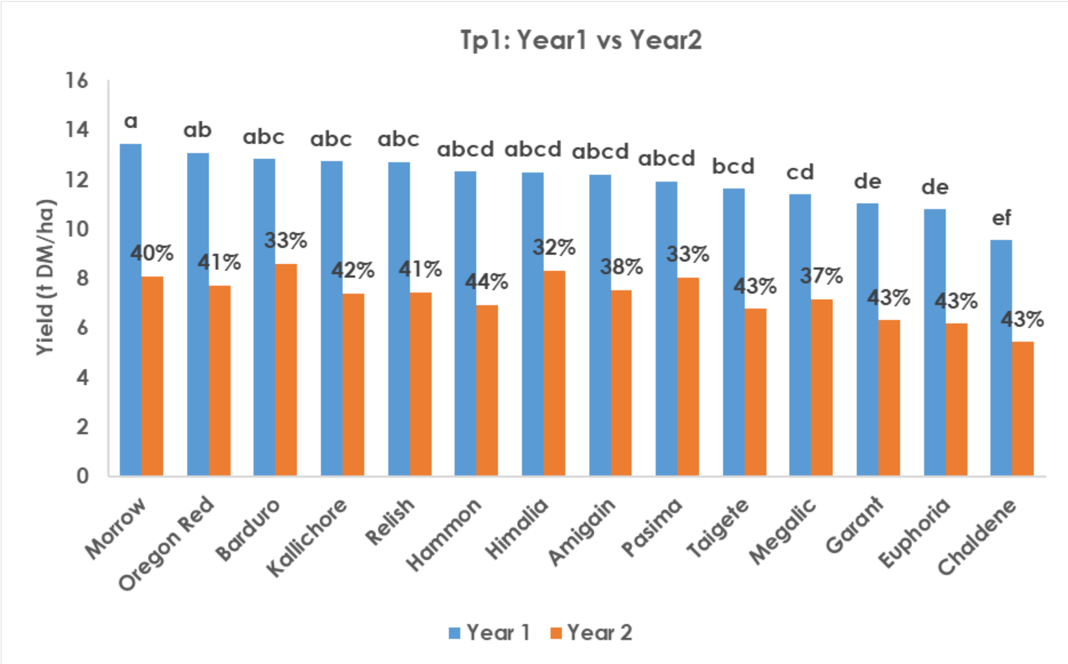


Figure 1. Total yield (t DM/ha) of trial Tp1 for Year 1 and Year 2 and indicating the percentage yield decrease between the two years. Yield data with the same letter are similar ($p<0.05$)

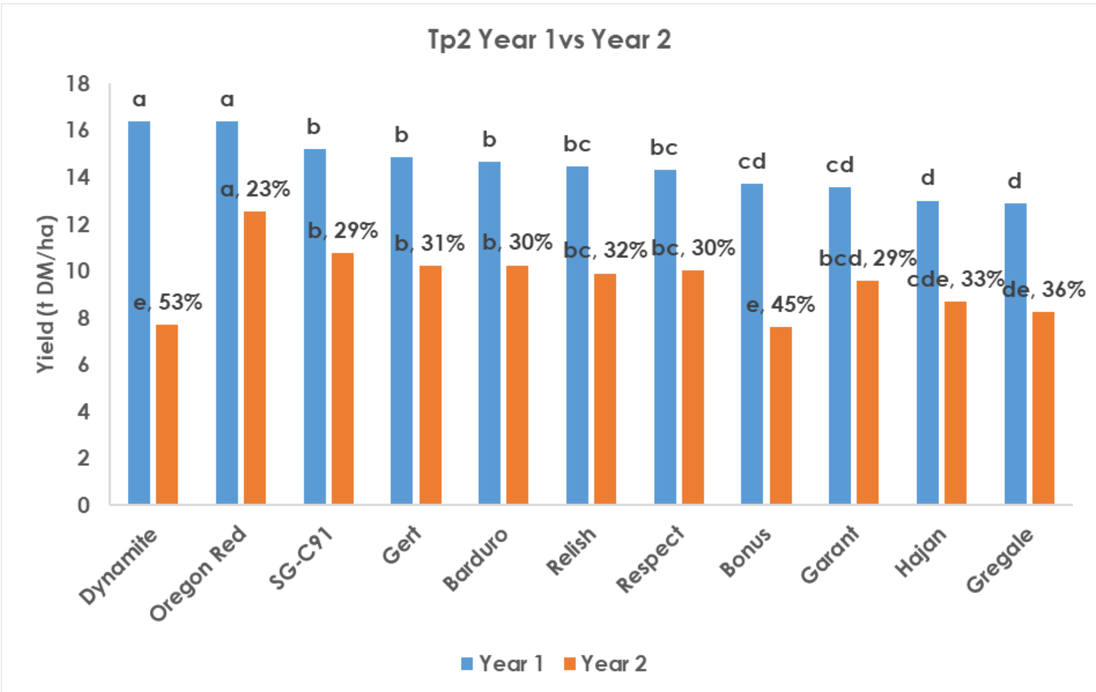


Figure 2. Total yield (t DM/ha) of trial Tp2 for Year 1 and Year 2 and indicating the percentage yield decrease between the two years. Yield data with the same letter are similar ($p<0.05$)

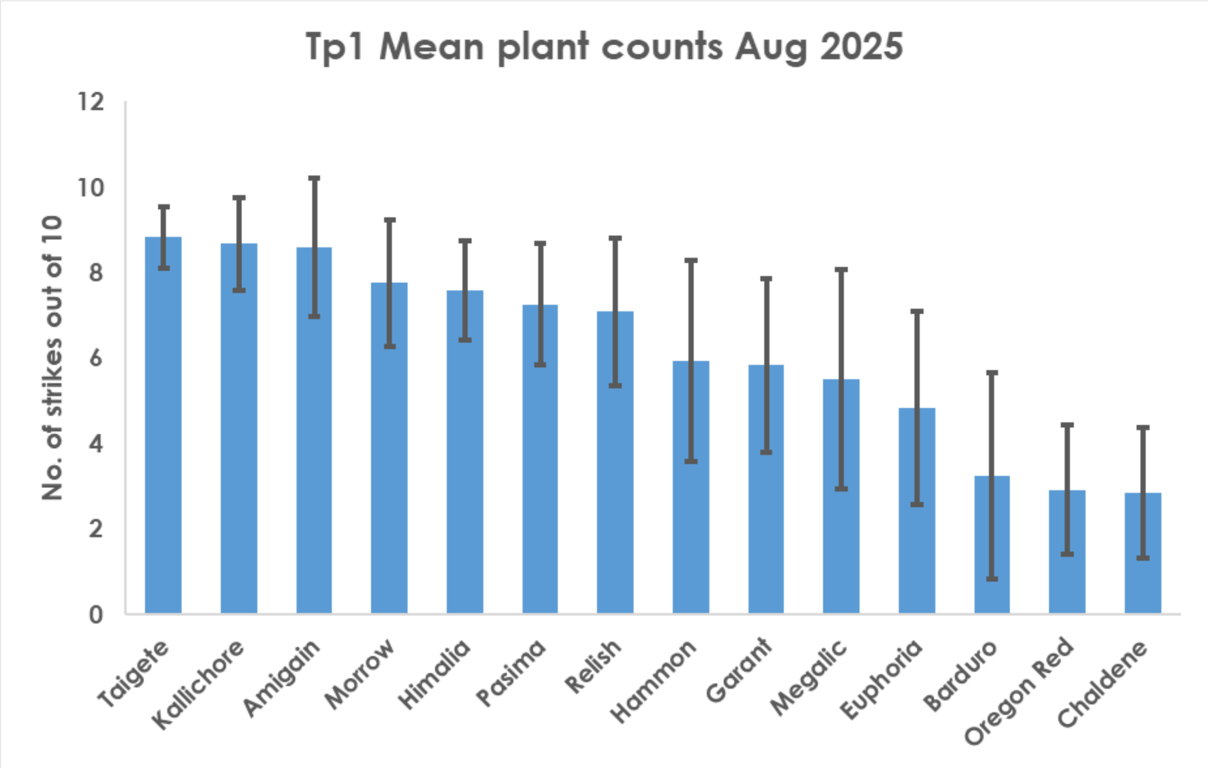


Figure 3. Plant counts for Tp1 during August 2025 using 40 points at 10cm distance between points and recording the number of strikes. The error bars are the standard deviation giving an indication of variability

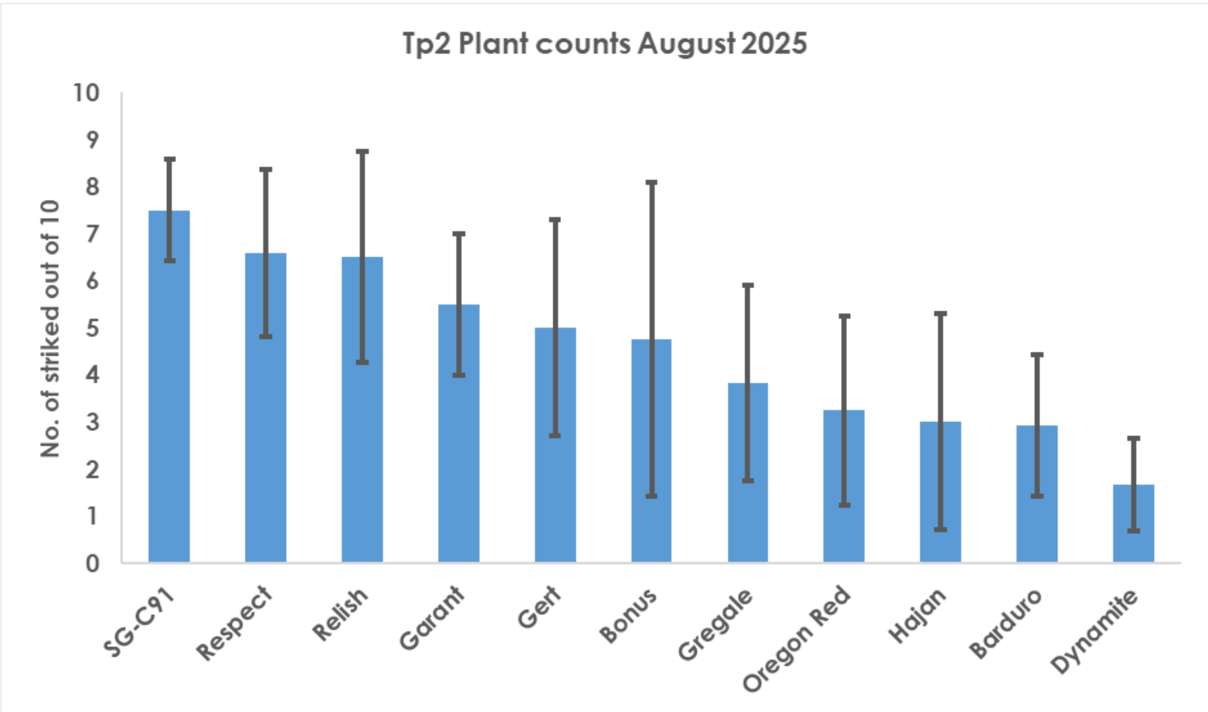


Figure 4. Plant counts for Tp2 during August 2025 using 40 points at 10cm distance between points and recording the number of strikes. The error bars are the standard deviation giving an indication of variability.

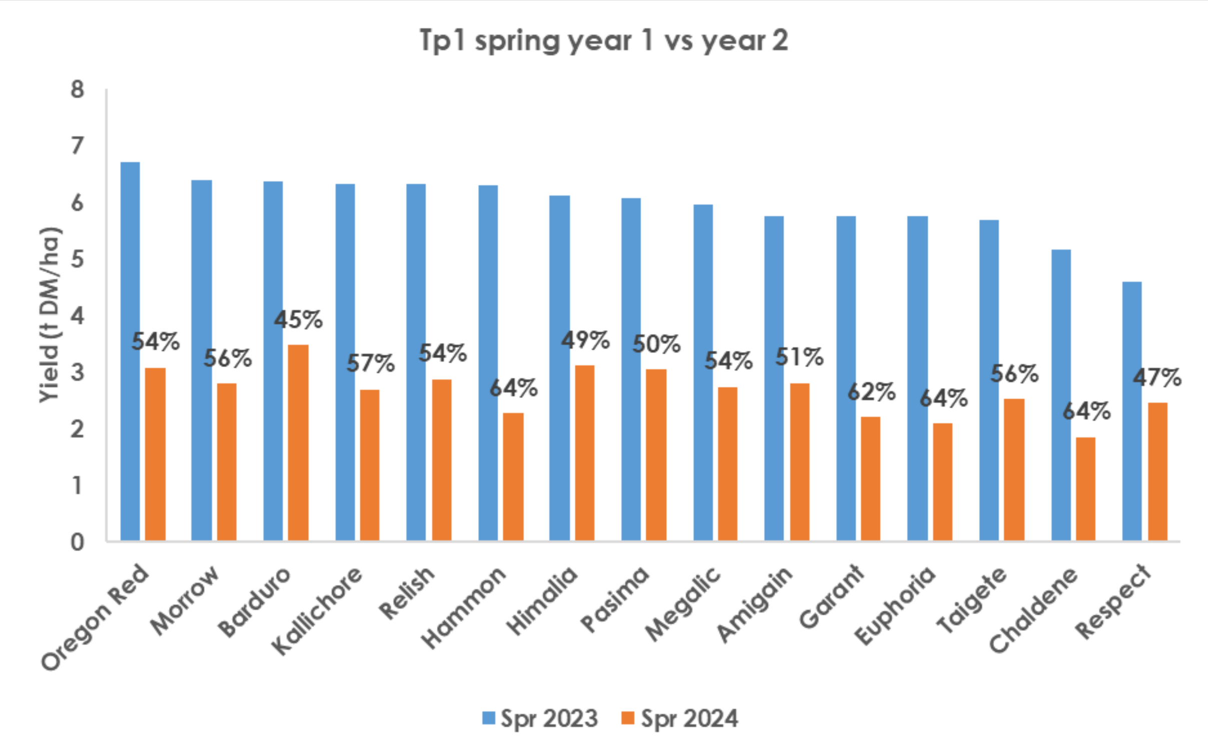


Figure 5. Spring yield (t DM/ha) of trial Tp1 for Year 1 and Year 2 and indicating the percentage yield decrease between the two years.

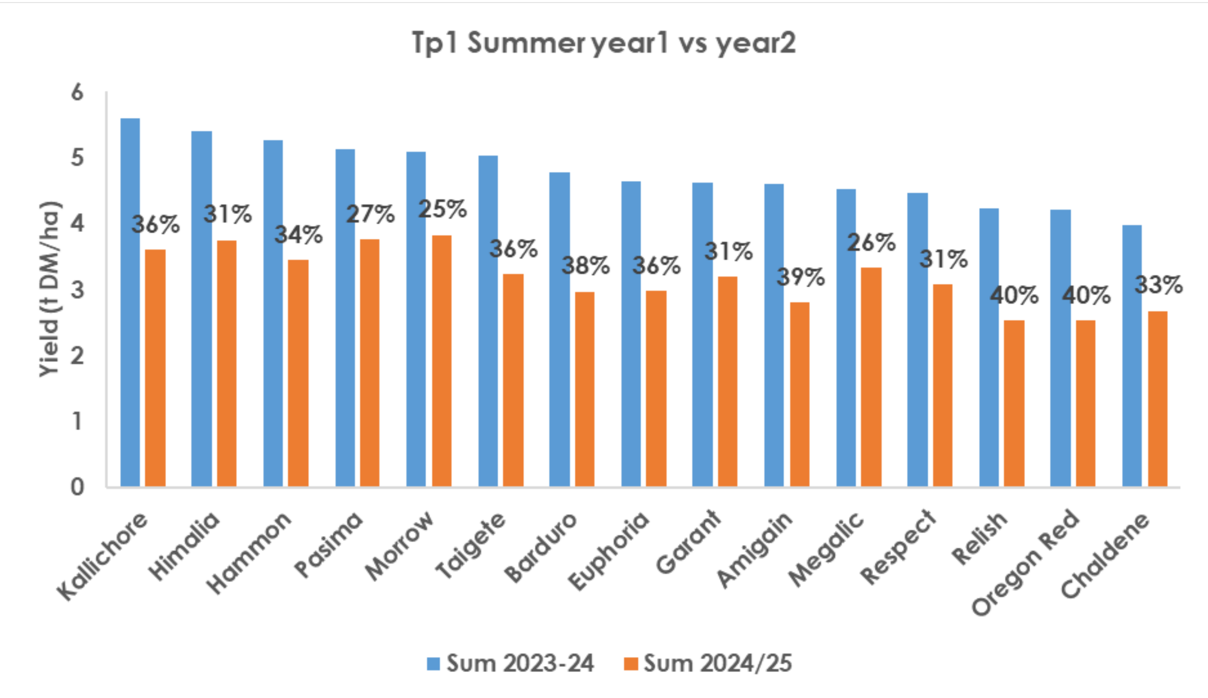


Figure 6. Summer yield (t DM/ha) of trial Tp1 for Year 1 and Year 2 and indicating the percentage yield decrease between the two years.

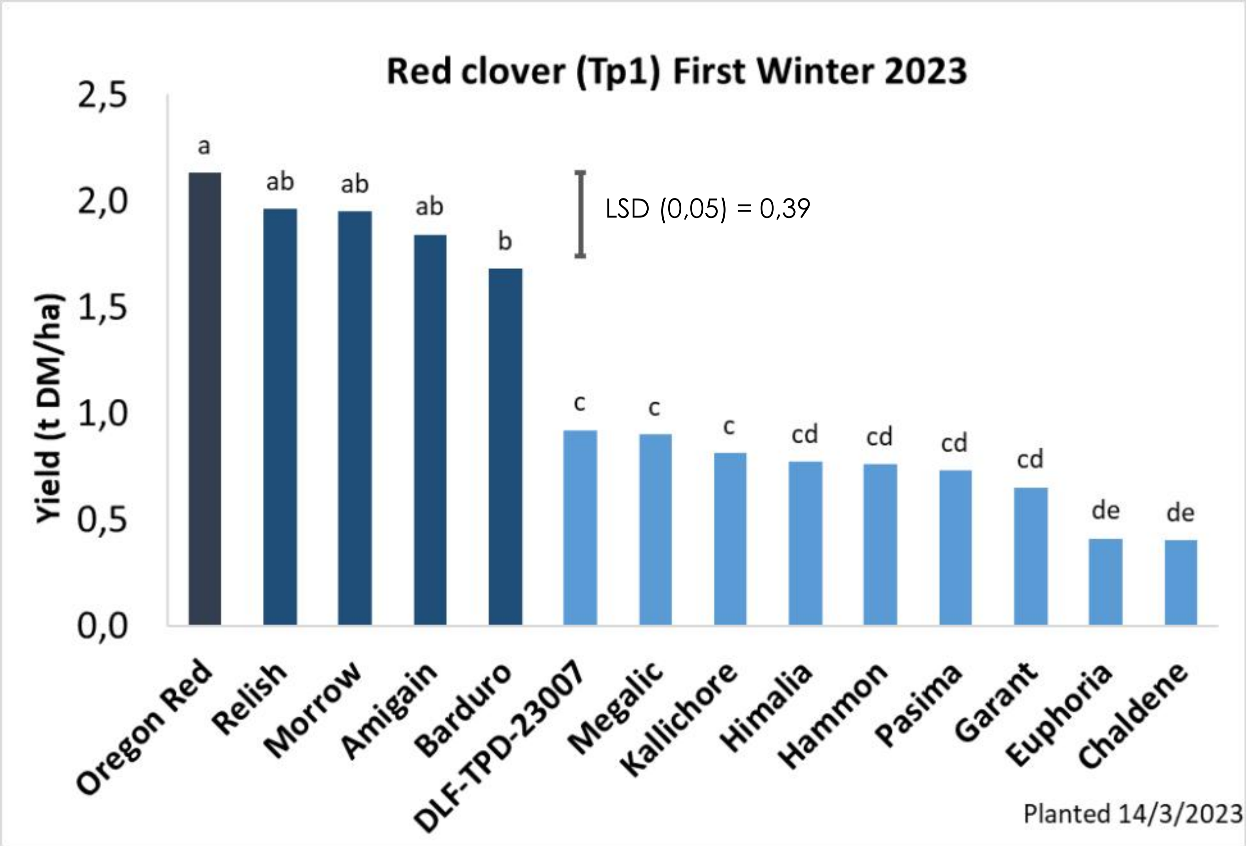


Figure 7. Winter yield (tDM/ha) for red clover trial Tp1 planted on 14 March 2023

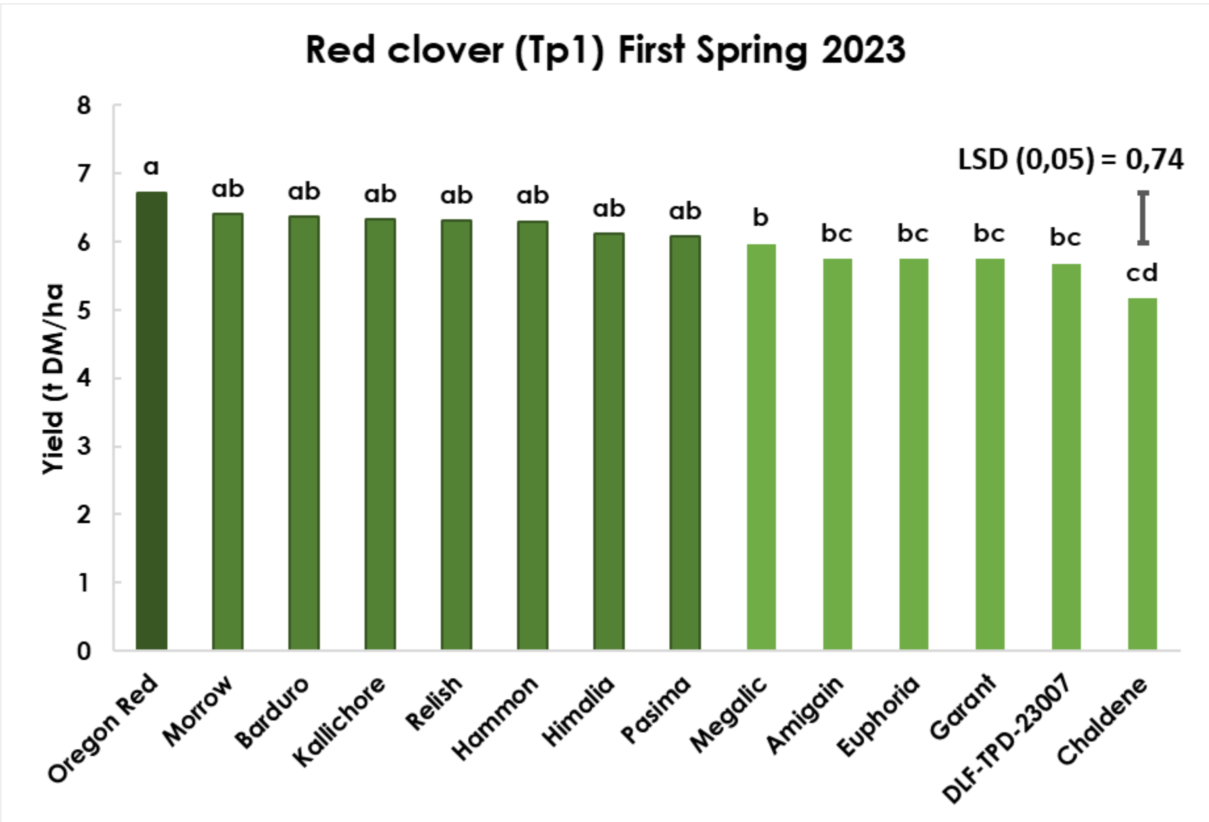


Figure 8. Spring yield (tDM/ha) for red clover trial Tp1 planted on 14 March 2023.

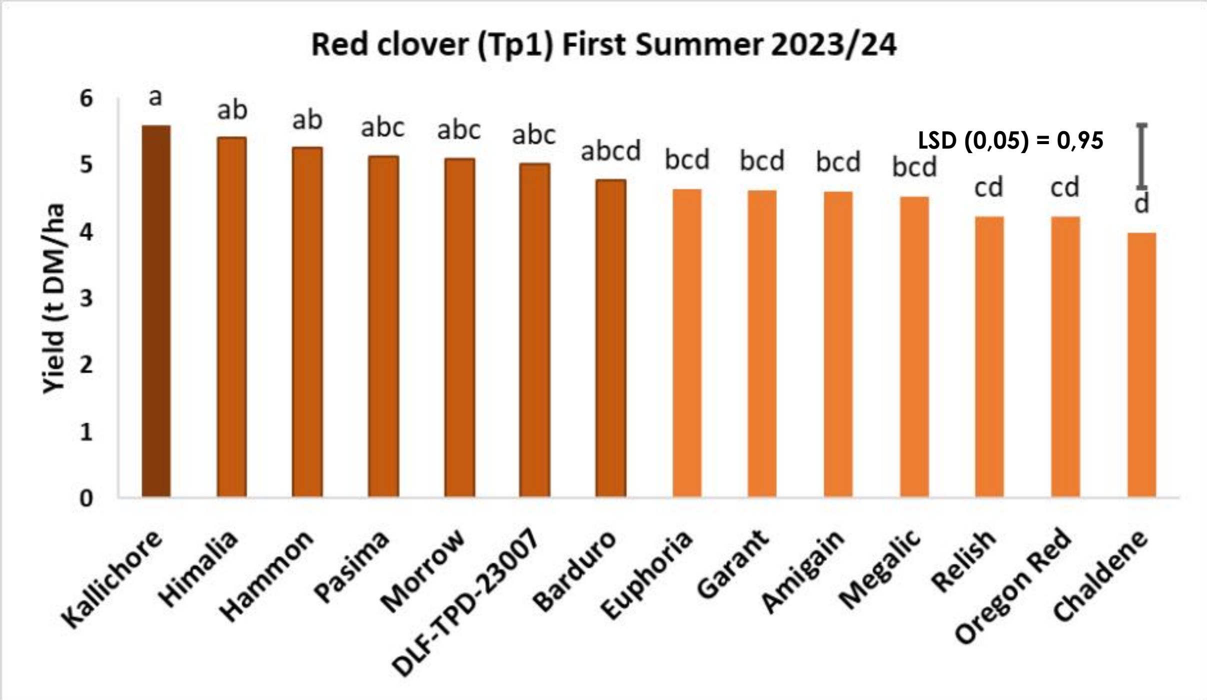


Figure 9. Summer yield (t DM/ha) (year 1) for red clover trial Tp1 planted on 14 March 2023.

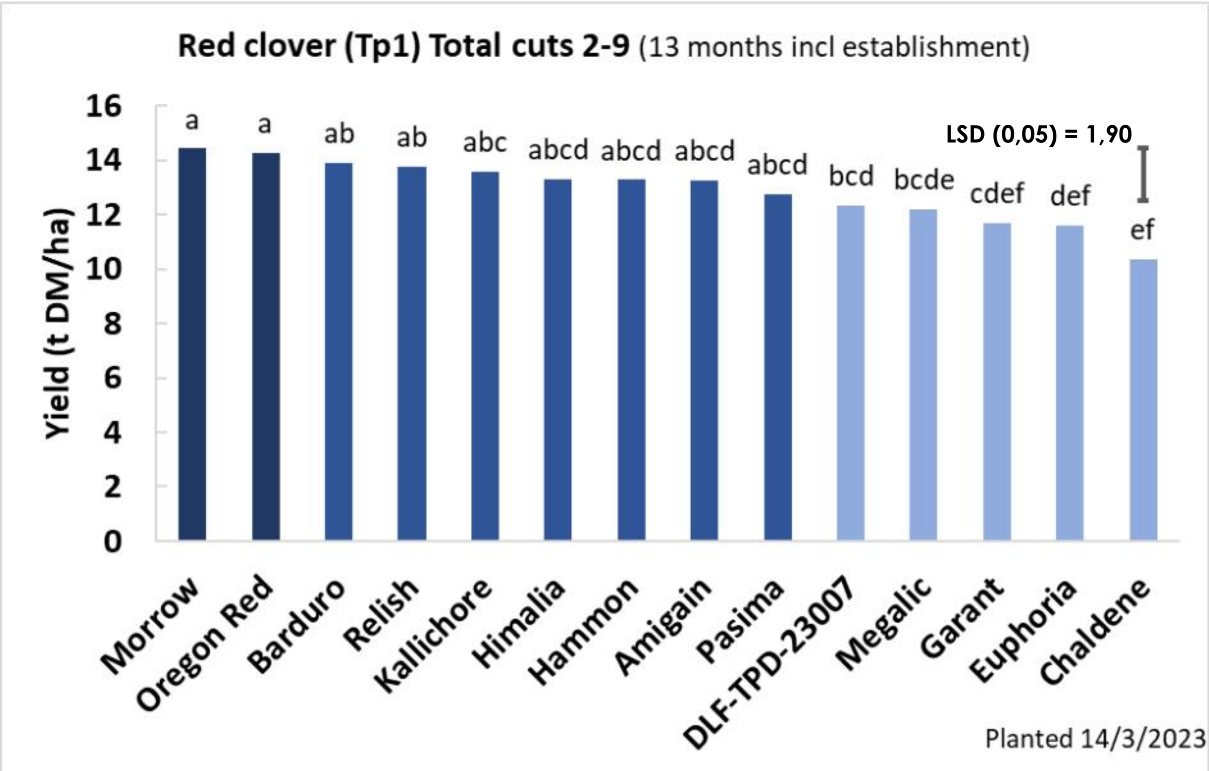


Figure 10. Total yield (tDM/ha) for harvests 2 to 9 for red clover trial Tp1 planted on 14 March 2023. Harvest 1 was excluded from the data due to weed content.

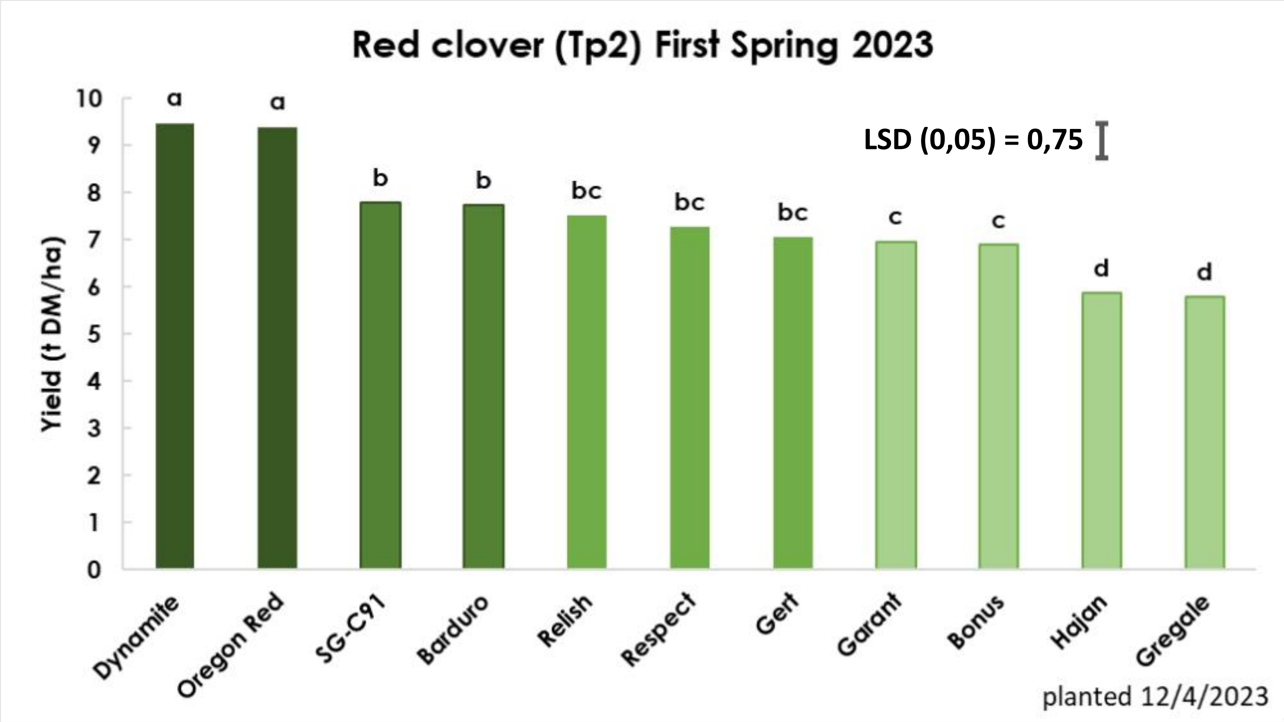


Figure 11. Spring yield (t DM/ha) for red clover trial Tp2 planted on 12 April 2023.

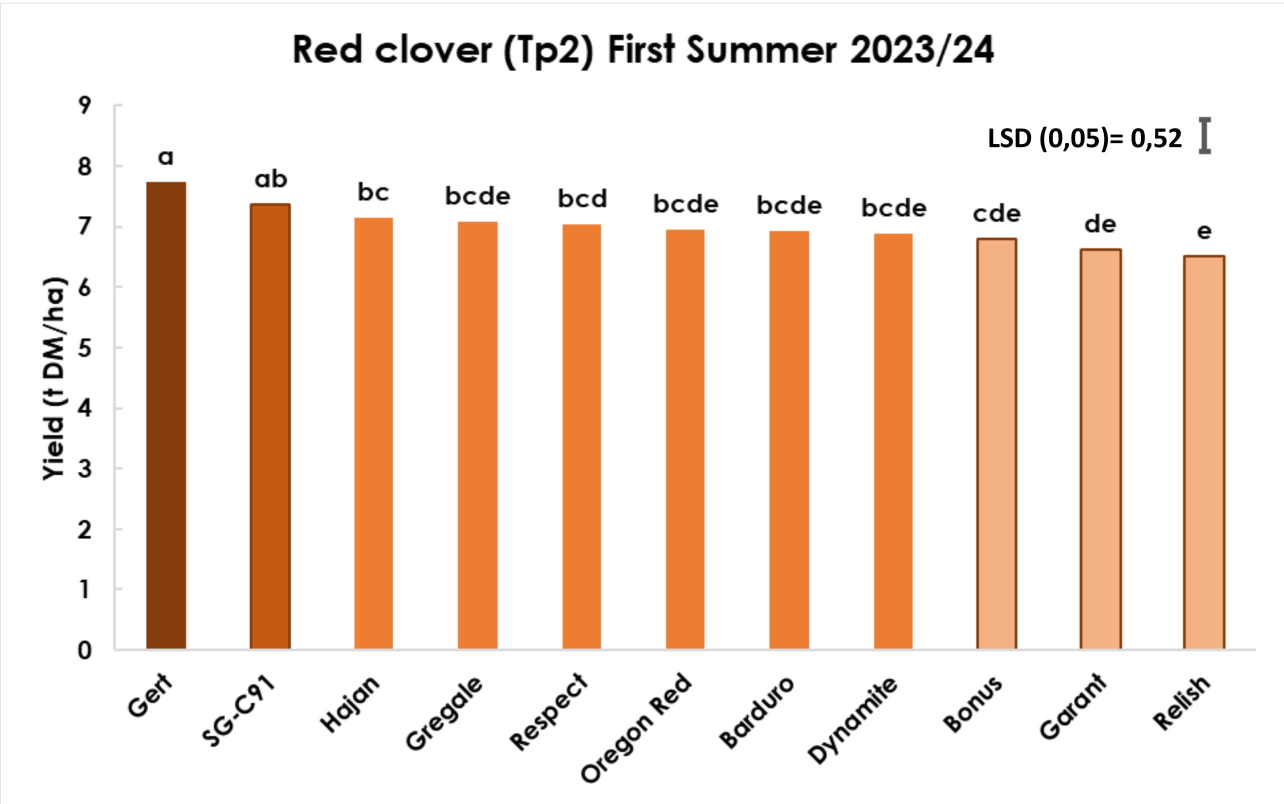


Figure 12. Summer yield (tDM/ha) (year 1) for red clover trial Tp2 planted on 12 April 2023.

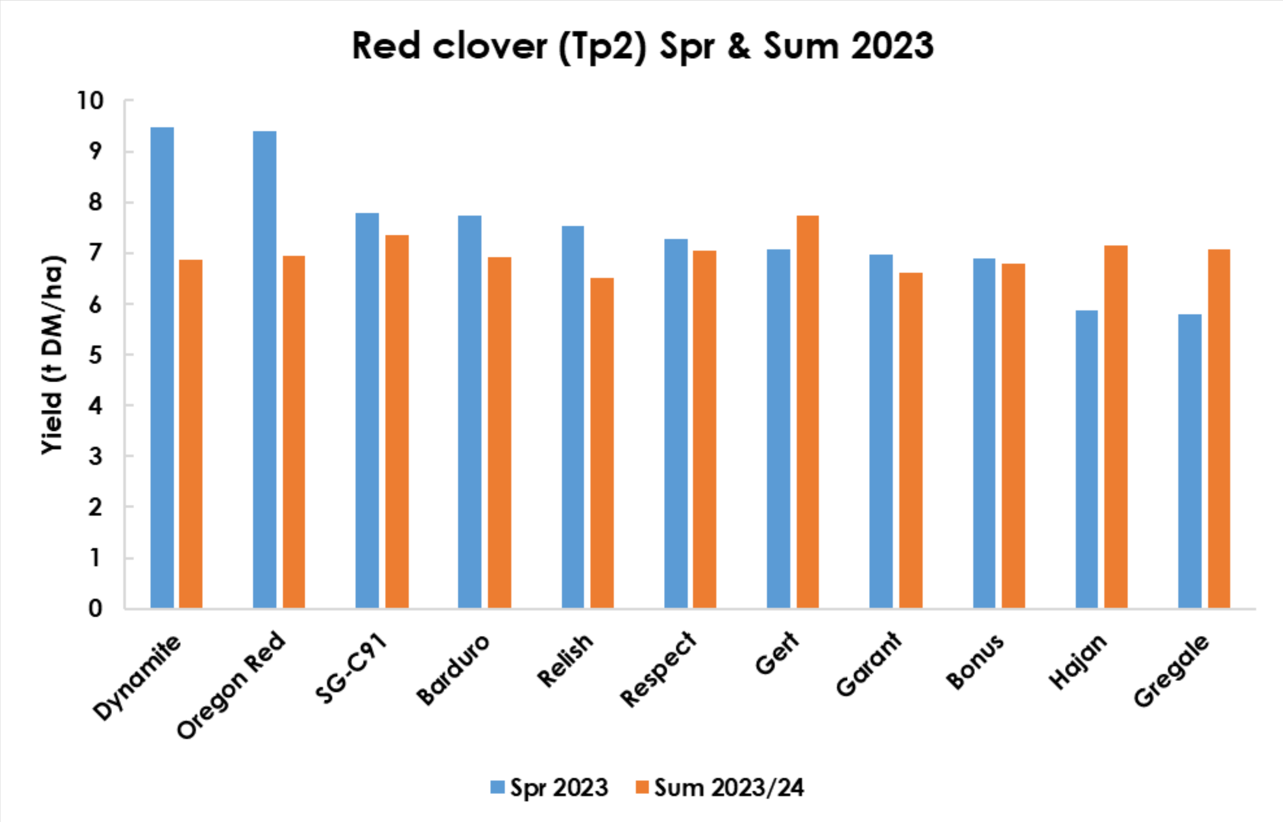


Figure 13. Spring and summer yield of Tp2 with most cultivars having a superior yield in spring except Gert, Hajan and Gregale with a higher summer yield.

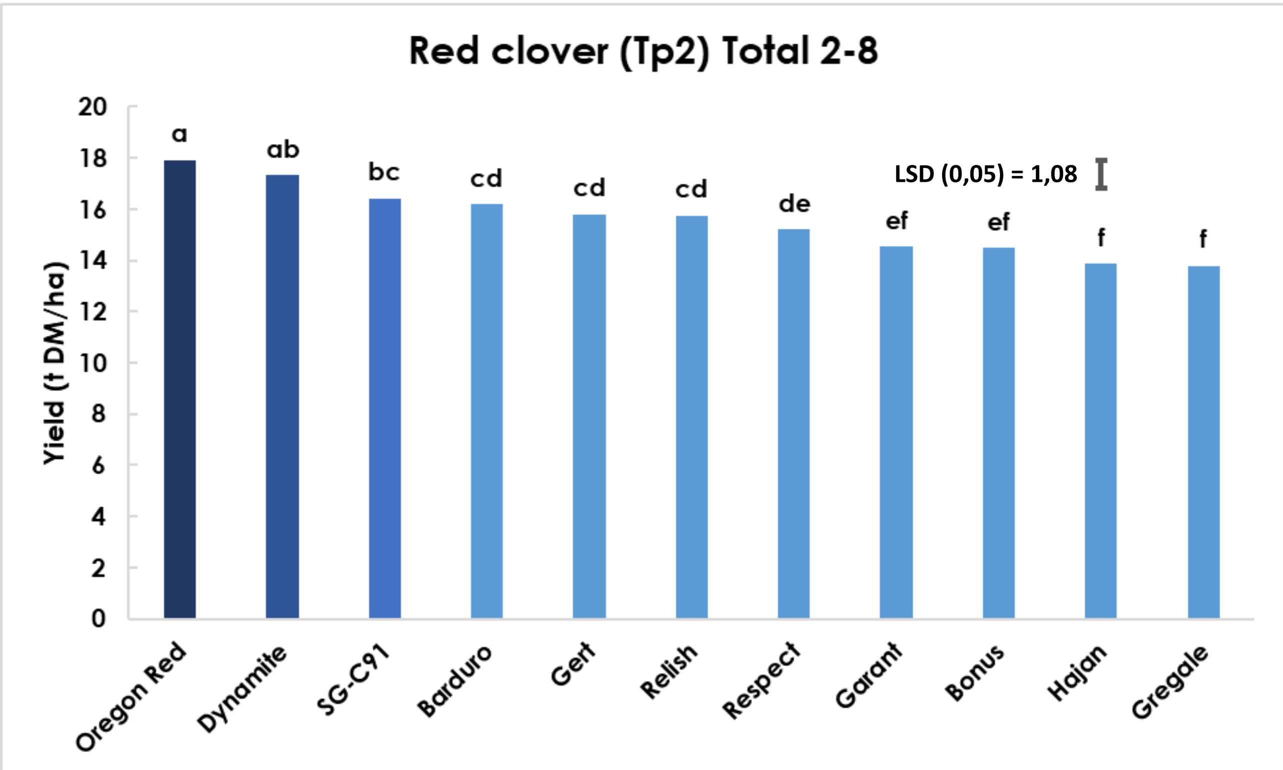


Figure 14. Total yield (tDM/ha) for harvests 2 to 8 for red clover trial Tp2 planted on 12 April 2023. Harvest 1 was excluded from the data due to weed content.

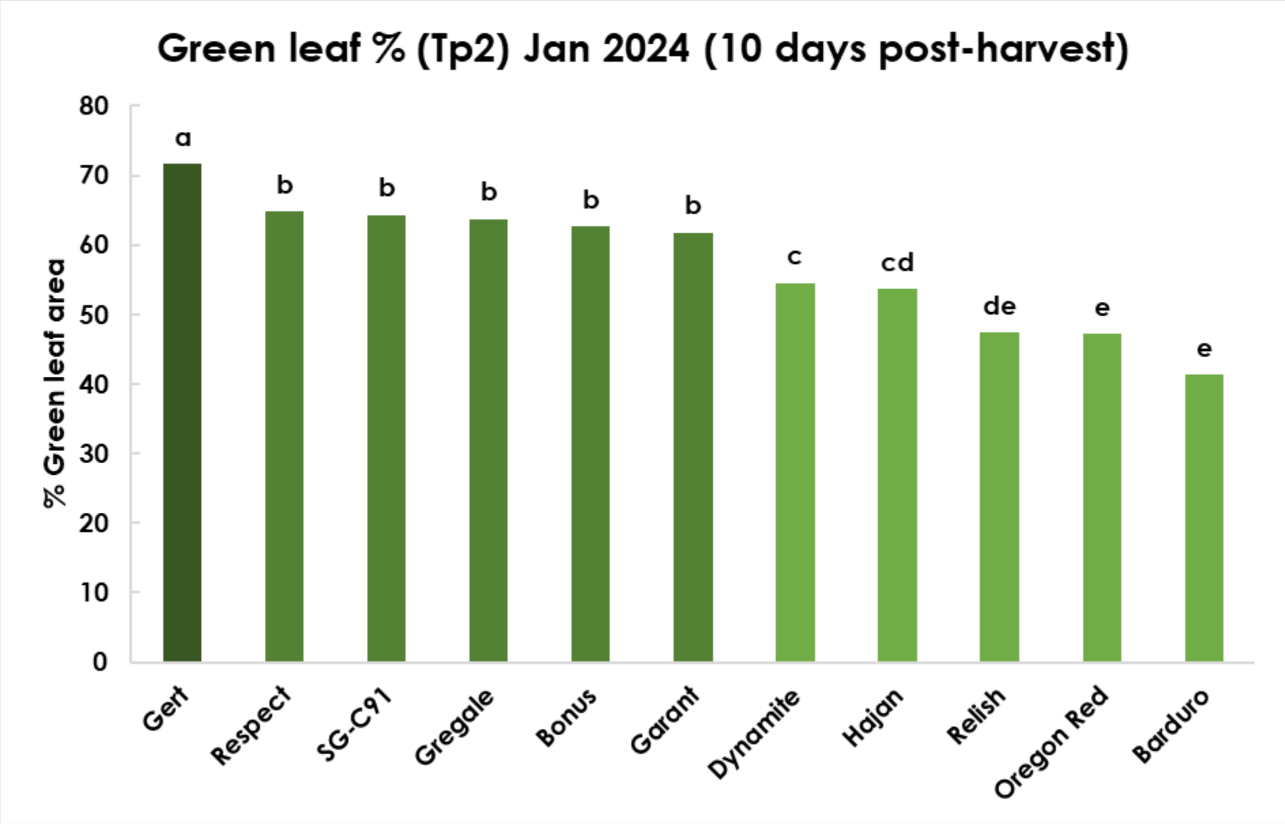


Figure 15. Green leaf area measured with the Canopeo App for trial Tp2 at 10 days regrowth in January 2024.

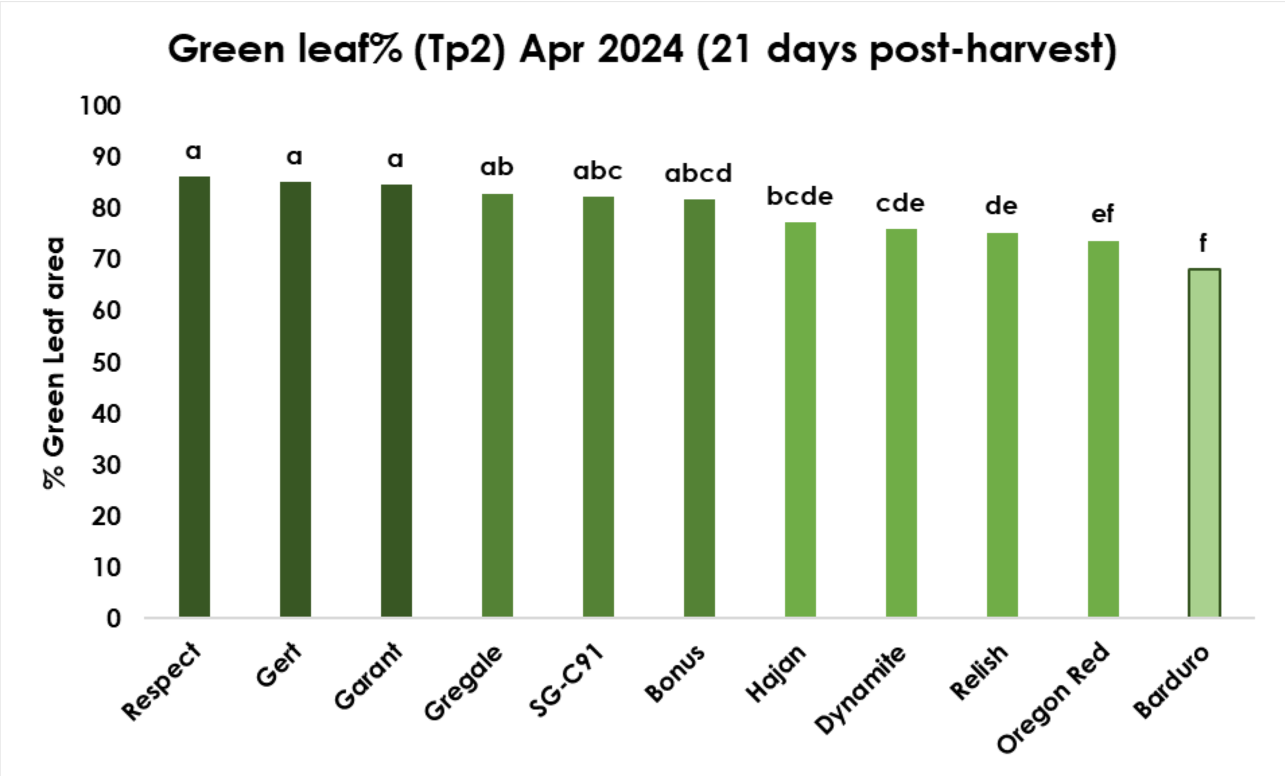


Figure 16. Green leaf area measured with the Canopeo App for trial Tp2 at 21 days regrowth in April 2024.

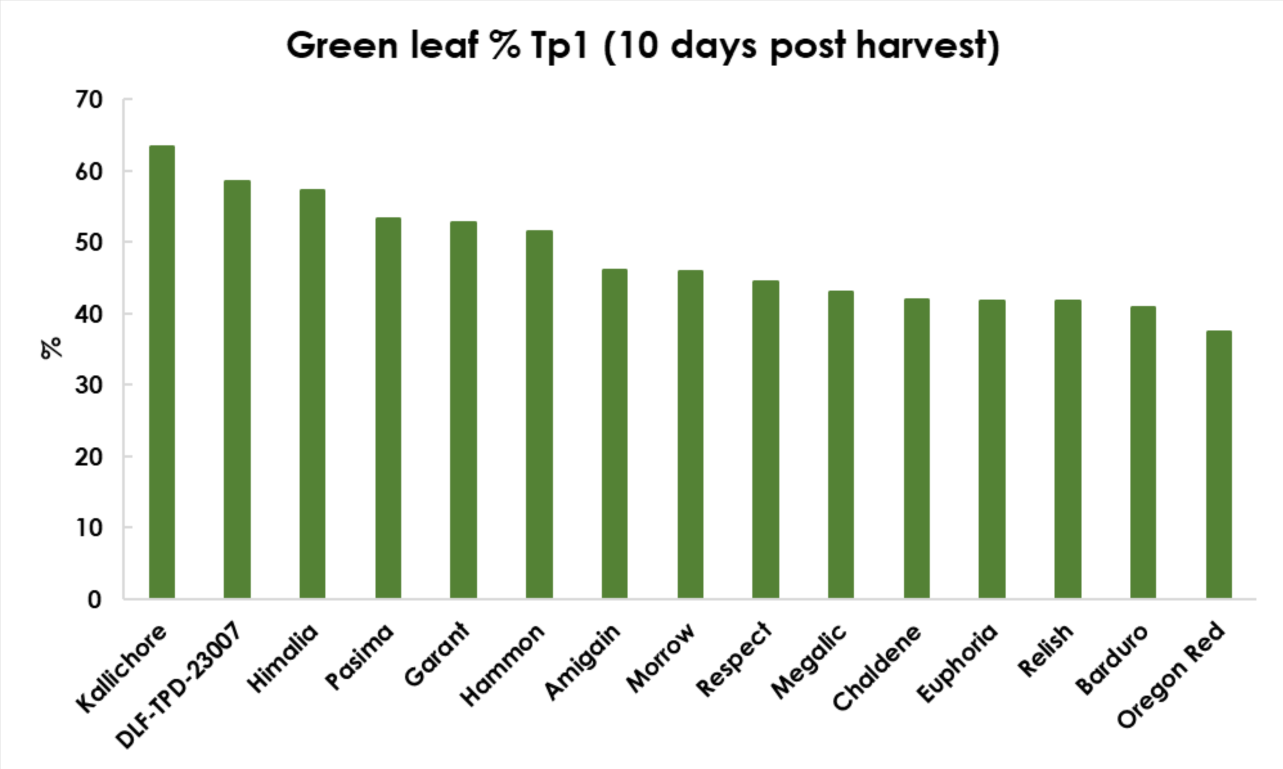


Figure 17. Green leaf area measured with the Canopeo App for trial Tp1 at 10 days regrowth in January 2024.

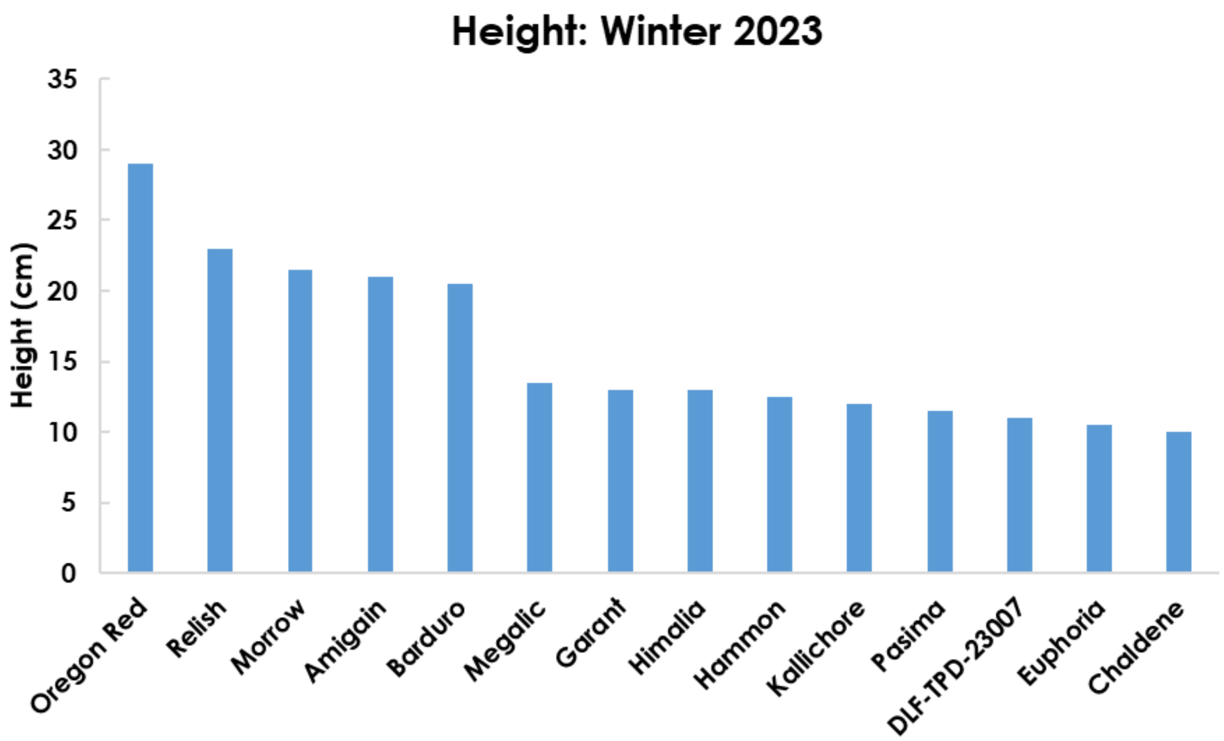


Figure 18. Plant height for Tp1 in winter 2023.

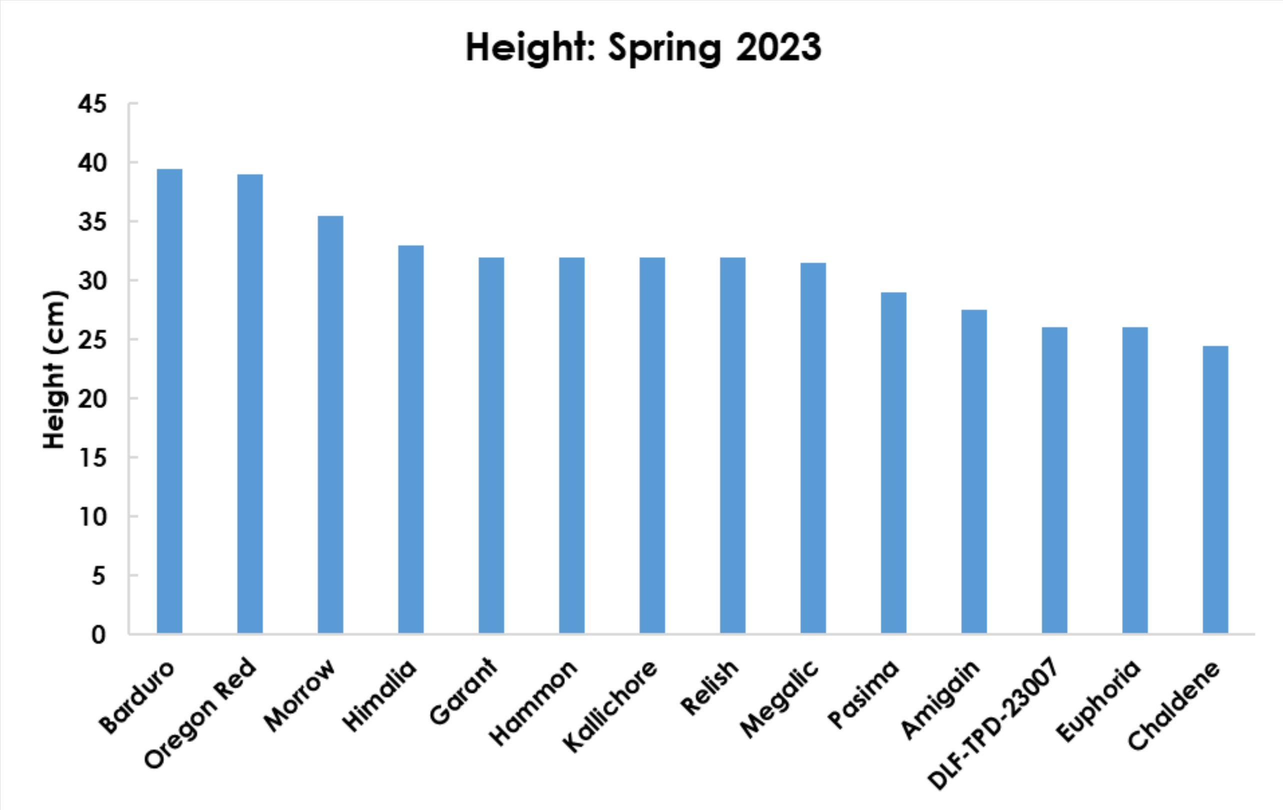


Figure 19. Plant height for Tp1 in spring 2023

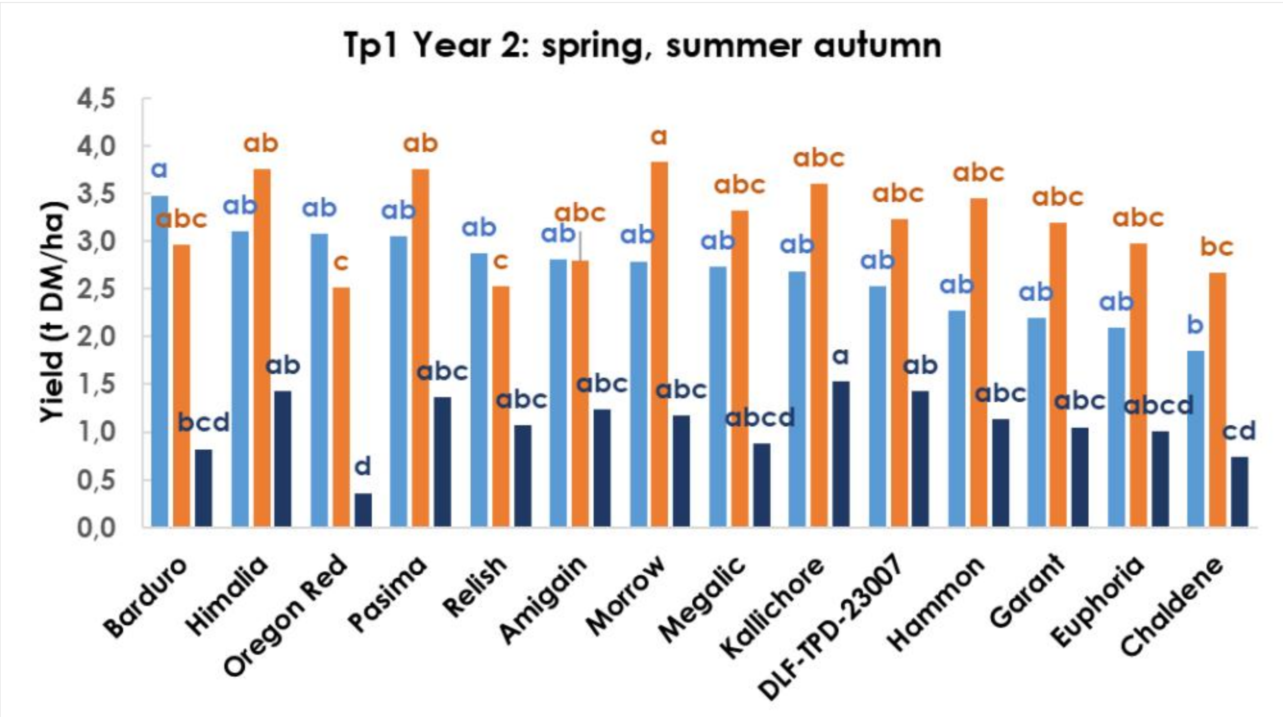


Figure 20. Spring, summer and autumn yield (t DM/ha) of the second year for trial Tp1. The letters indicating the differences ($p<0.05$) are indicated for each season.

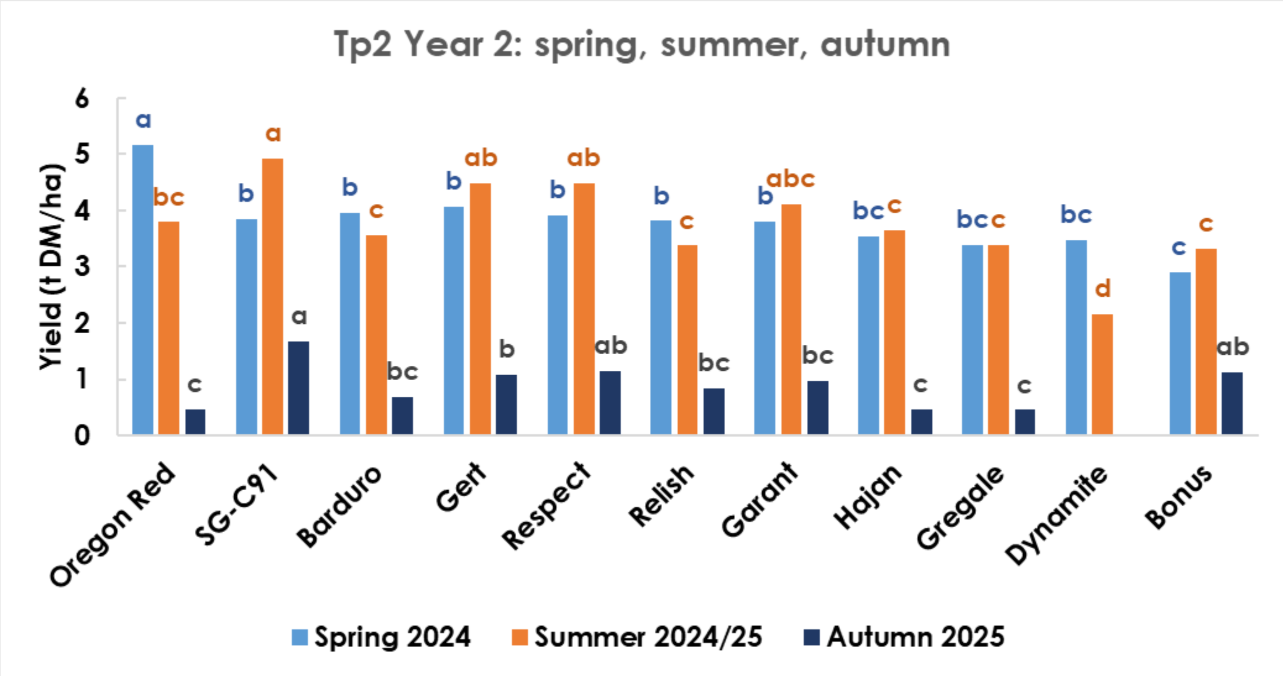


Figure 21. Spring, summer and autumn yield (t DM/ha) of the second year for trial Tp2. The letters indicating the differences (p<0.05) are indicated for each season.

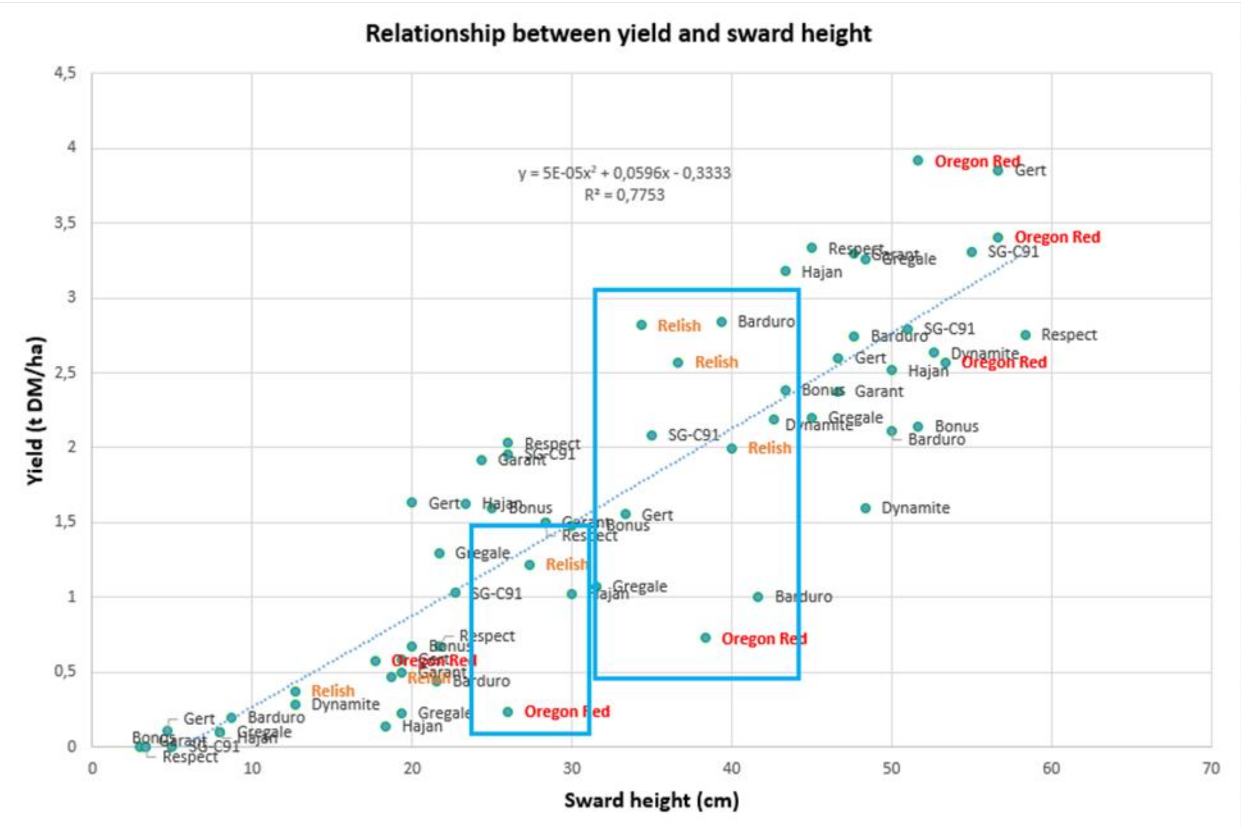


Figure 22. The relationship between sward height and yield is influenced by cultivar.

The relationship between sward height and cultivar as shown in Figure 22, shows substantial differences in yield between annual versus grazing types. In the current red clover trials, the graph shows that between the sward height of 25 cm to 40cm Relish has a substantially higher yield than Oregon Red at the same height. This is linked to the growth form of the different types, where the grazing types form a denser sward than the annual types. This may have implications for pasture measurement.

Table 1. Total seasonal yield (t DM/ha) for Tp 1

Western Cape Government FOR YOU

Red clover (*Trifolium pratense*) Outeniqua Research Farm, Trial **Tp1**

Table 1: Seasonal yield (t DM/ha) Planted 14 March 2023

Cultivars	Type	Winter 2023	Rank	Spring 2023	Rank	Summer 2023/24	Rank	Autumn 2024	Rank	Winter 2024	Rank	Spring 2024	Rank	Summer 2024/25	Rank	Autumn 2025	Rank
Amigain	**D**	**1,84** ab	4	5,75 bc	10	4,60 bcd	10	**1,12** ab	4	**0,79** abc	4	**2,81** ab	6	**2,80** abc	11	**1,24** abc	5
Barduro	**D**	1,68 b	5	**6,37** ab	3	**4,77** abcd	7	**1,16** ab	2	**0,98** a	1	**3,48** a	1	**2,97** abc	10	0,82 bcd	12
Chaldene	**D**	0,50 de	13	5,17 cd	14	3,98 d	14	**0,79** ab	12	0,12 d	14	1,85 b	14	2,67 bc	12	0,73 cd	13
DLF-TPD-23007	**D**	0,92 c	6	5,68 bc	13	**5,02** abc	6	**0,72** ab	13	0,28 cd	9	**2,53** ab	10	**3,23** abc	7	**1,43** ab	3
Euphoria	**D**	0,41 de	14	5,75 bc	11	4,64 bcd	8	**0,81** ab	10	0,27 cd	10	**2,09** ab	13	**2,98** abc	9	**1,01** abcd	10
Garant	**D**	0,65 cd	12	5,75 bc	12	4,62 bcd	9	0,68 b	14	0,22 cd	13	**2,20** ab	12	**3,19** abc	8	**1,05** abc	9
Hammon	**T**	0,76 cd	10	**6,30** ab	6	**5,25** ab	3	**0,95** ab	7	0,25 cd	12	**2,28** ab	11	**3,45** abc	5	**1,13** abc	7
Himalia	**D**	0,77 cd	9	**6,12** ab	7	**5,40** ab	2	**1,00** ab	5	**0,47** abcd	6	**3,11** ab	2	**3,75** ab	3	**1,43** ab	2
Kallichore	**D**	0,81 c	8	**6,33** ab	4	**5,60** a	1	**0,83** ab	9	0,27 cd	11	**2,69** ab	9	**3,60** abc	4	**1,53** a	1
Megalic	**D**	0,90 c	7	5,97 b	9	4,52 bcd	11	**0,80** ab	11	0,29 bcd	8	**2,74** ab	8	**3,32** abc	6	**0,88** abcd	11
Morrow	**D**	**1,95** ab	3	**6,40** ab	2	**5,09** abc	5	**0,99** ab	6	**0,48** abcd	5	**2,79** ab	7	**3,83** a	1	**1,17** abc	6
Oregon Red	**D**	**2,13** a	1	**6,72** a	1	4,22 cd	13	**1,24** a	1	**0,88** ab	2	**3,08** ab	3	2,52 c	14	0,36 d	14
Pasima	**D**	0,73 cd	11	**6,07** ab	8	**5,12** abc	4	**0,83** ab	8	**0,40** abcd	7	**3,05** ab	4	**3,76** ab	2	**1,37** abc	4
Relish	**D**	**1,96** ab	2	**6,31** ab	5	4,23 cd	12	**1,16** ab	3	**0,87** ab	3	**2,87** ab	5	2,52 c	13	**1,07** abc	8
LSD (0.05)		0,39		0,74		0,95		0,54		0,59		1,42		1,15		0,67	
CV%		21,7		7,5		11,9		35,0		76,4		31,8		21,7		37,0	

Yields with the same letter are statistically similar within a column

Table 2. Total annual yield (t DM/ha) for Tp 1

Western Cape Government FOR YOU

Red clover (*Trifolium pratense*) Outeniqua Research Farm, Trial Tp1

Table 2: Total yield (t DM/ha) Planted 14 March 2023

Cultivars	Type	Year 1	Rank	Year 2	Rank	Year 1 + 2	Rank	Total cuts 1-15	Rank
Amigain	**D**	**12,20** abcd	8	7,52 a	6	**19,71** abc	8	**20,95** abc	8
Barduro	**D**	**12,82** abc	3	8,59 a	1	**21,41** ab	2	**22,23** ab	2
Chaldene	**D**	9,55 ef	14	5,42 a	15	14,98 d	14	15,71 d	14
DLF-TPD-23007	**D**	11,62 bcd	10	6,76 a	11	**18,37** abcd	11	**19,80** abcd	10
Euphoria	**D**	10,79 de	13	6,15 a	14	16,94 bcd	13	17,96 bcd	13
Garant	**D**	11,02 de	12	6,30 a	13	**17,32** abcd	12	**18,37** abcd	12
Hammon	**T**	**12,31** abcd	6	6,93 a	10	**19,24** abcd	9	**20,37** abcd	9
Himalia	**D**	**12,29** abcd	7	8,32 a	2	**20,60** ab	4	**22,04** ab	3
Kallichore	**D**	**12,74** abc	4	7,39 a	8	**20,12** abc	6	**21,65** ab	4
Megalic	**D**	11,39 cd	11	7,15 a	9	**18,55** abcd	10	**19,43** abcd	11
Morrow	**D**	**13,44** a	1	8,08 a	3	**21,51** a	1	**22,68** a	1
Oregon Red	**D**	**13,07** ab	2	7,71 a	5	**20,78** ab	3	**21,14** abc	7
Pasima	**D**	**11,92** abcd	9	8,03 a	4	**19,95** abc	7	**21,32** abc	5
Relish	**D**	**12,71** abc	5	7,44 a	7	**20,14** abc	5	**21,21** abc	6
LSD (0.05)		1,53		NS		4,51		4,70	
CV%		7,7		26,3		14,2		14,0	

Yields with the same letter are statistically similar within a column

Table 3. Seasonal growth rates (kg DM/ha/day) for Tp 1

Red clover (*Trifolium pratense*) — Outeniqua Research Farm, Trial Tp1

Table 3: Seasonal growth rates (kg DM/ha/day) — Planted 14 March 2023

Cultivars	Type	Winter 2023	Rank	Spring 2023	Rank	Summer 2023/24	Rank	Autumn 2024	Rank	Winter 2024	Rank	Spring 2024	Rank	Summer 2024/25	Rank	Autumn 2025	Rank
Amigain	D	**20,0** ab	4	63,2 bc	10	51,1 bcd	10	**12,2** ab	4	**8,5** abc	4	**30,8** ab	6	**31,2** abc	11	**13,4** abc	5
Barduro	D	18,3 b	5	**70,0** ab	3	**53,0** abcd	7	**12,7** ab	2	**10,6** a	1	**38,2** a	1	**32,9** abc	10	8,9 bcd	12
Chaldene	D	5,4 de	13	56,8 cd	14	44,2 d	14	**8,6** ab	12	1,3 d	14	20,3 b	14	29,7 bc	12	8,0 cd	13
DLF-TPD-23007	D	10,0 c	6	62,4 bc	13	**55,8** abc	6	**7,8** ab	13	3,1 cd	9	**27,8** ab	10	**35,9** abc	7	**15,5** ab	3
Euphoria	D	4,5 de	14	63,2 bc	11	51,6 bcd	8	**8,7** ab	10	3,0 cd	10	**23,0** ab	13	**33,1** abc	9	**11,0** abcd	10
Garant	D	7,1 cd	12	63,2 bc	12	51,3 bcd	9	7,5 b	14	2,4 cd	13	**24,2** ab	12	**35,4** abc	8	**11,4** abc	9
Hammon	T	8,3 cd	10	**69,2** ab	6	**58,3** ab	3	**10,4** ab	7	2,7 cd	12	**25,0** ab	11	**38,4** abc	5	**12,3** abc	7
Himalia	D	8,4 cd	9	**67,3** ab	7	**60,0** ab	2	**10,8** ab	5	**5,1** abcd	6	**34,1** ab	2	**41,7** ab	3	**15,6** ab	2
Kallichore	D	8,8 c	8	**69,6** ab	4	**62,2** a	1	**9,0** ab	9	3,0 cd	11	**29,5** ab	9	**40,0** abc	4	**16,7** a	1
Megalic	D	9,8 c	7	65,6 b	9	50,2 bcd	11	**8,7** ab	11	3,2 bcd	8	**30,1** ab	8	**36,9** abc	6	**9,6** abcd	11
Morrow	D	**21,2** ab	3	**70,3** ab	2	**56,6** abc	5	**10,7** ab	6	**5,2** abcd	5	**30,6** ab	7	**42,5** a	1	**12,7** abc	6
Oregon Red	D	**23,2** a	1	**73,8** a	1	46,9 cd	13	**13,4** a	1	**9,5** ab	2	**33,8** ab	3	28,0 c	14	3,9 d	14
Pasima	D	7,9 cd	11	**66,7** ab	8	**56,9** abc	4	**9,1** ab	8	**4,4** abcd	7	**33,5** ab	4	**41,7** ab	2	**14,8** abc	4
Relish	D	**21,3** ab	2	**69,3** ab	5	47,0 cd	12	**12,6** ab	3	**9,5** ab	3	**31,6** ab	5	28,1 c	13	**11,6** abc	8
LSD (0.05)								8,4		6,4		15,6		12,8		7,25	
CV%		21,7		7,5		11,9		35,0		76,4		31,8		21,7		37,0	

Growth rates with the same letter are statistically similar within a column

Table 4. Sward height (cm) for Tp 1

Red clover (*Trifolium pratense*) — Outeniqua Research Farm, Trial **Tp1**

Table 4: Sward height (cm) — Planted 14 March 2023

Cultivars	Type	Winter 2023	Rank	Spring 2023	Rank	Summer 2023/24	Rank	Winter 2024	Rank	Spring 2024	Rank	Early summer 2024	Rank	Mid Summer 2024/25	Rank	Early Autumn 2025	Rank	Late Autumn 2025	Rank
Amigain	D	21,0	4	27,5	11	30,3	13	9,7 bc	3	28,3 abc	3	41,7 def	10	34,3 e	14	25,0 d	13	20,0 cde	6
Barduro	D	20,5	5	39,5	1	37,7	3	9,7 bc	4	36,0 a	1	50,0 abc	3	51,0 ab	2	39,3 a	1	24,3 ab	2
Chaldene	D	10,0	14	24,5	14	27,0	14	3,3 e	11	13,7 e	14	36,0 ef	13	36,0 e	13	25,0 d	14	18,3 de	12
DLF-TPD-23007	D	11,0	12	26,0	12	31,7	10	3,3 e	12	16,0 de	13	41,7 def	11	40,0 cde	10	31,7 bc	4	20,0 cde	9
Euphoria	D	10,5	13	26,0	13	31,3	11	4,3 de	9	17,0 de	11	36,7 ef	12	36,7 de	12	28,3 cd	9	20,3 cde	5
Garant	D	13,0	7	32,0	5	36,3	6	5,0 de	8	18,3 cde	10	46,7 abcd	4	50,0 abc	3	30,0 cd	6	20,0 cde	10
Hammon	T	12,5	9	32,0	6	37,3	4	5,7 de	6	18,7 cde	8	45,0 abcd	7	48,3 abc	6	28,3 cd	11	20,0 cde	7
Himalia	D	13,0	8	33,0	4	38,0	2	5,7 de	7	22,7 cde	6	51,7 a	1	43,3 bcde	8	31,0 c	5	20,0 cde	8
Kallichore	D	12,0	10	32,0	7	36,0	7	3,0 e	13	16,0 de	12	46,0 abcd	5	41,0 bcde	9	31,7 bc	3	18,3 de	13
Megalic	D	13,5	6	31,5	9	33,0	8	4,3 de	10	18,7 cde	9	43,3 bcde	8	46,7 abcd	7	28,7 cd	8	21,0 bcde	4
Morrow	D	21,5	3	35,5	3	37,3	5	3,0 e	14	23,7 cde	5	45,0 abcd	6	48,3 abc	5	29,3 cd	7	17,7 e	14
Oregon Red	D	29,0	1	39,0	2	41,7	1	13,7 a	1	35,0 ab	2	51,0 ab	2	56,7 a	1	37,0 ab	2	23,3 abc	3
Pasima	D	11,5	11	29,0	10	33,0	9	7,3 cd	5	20,0 cde	7	42,7 cdef	9	48,3 abc	4	28,3 cd	10	19,3 de	11
Relish	D	23,0	2	32,0	8	31,3	12	11,7 ab	2	25,0 bcd	4	35,0 f	14	37,7 de	11	28,3 cd	12	25,0 a	1
LSD (0.05)								3,9		10,8		7,8		10,4		5,76		3,51	
CV%								37,8		29,7		10,7		14,1		11,4		10,2	

Sward heights with the same letter are statistically similar within a column

Table 5. Green leaf % for Tp 1

Red clover (*Trifolium pratense*) Outeniqua Research Farm, Trial **Tp1**

Table 5: Green leaf % Planted 14 March 2023

Cultivars	Type	Jan 2024 10 days regrowth	Apr 2024 21 days regrowth
Amigain	**D**	46,1 [cde]	72,3 [bcd]
Barduro	**D**	40,9 [ef]	60,7 [e]
Chaldene	**D**	42,0 [ef]	68,3 [cde]
DLF-TPD-23007	**D**	**58,7** [ab]	**79,9** [ab]
Euphoria	**D**	41,8 [ef]	64,0 [de]
Garant	**D**	52,9 [bcd]	**75,7** [abc]
Hammon	**T**	51,5 [bcd]	**80,4** [ab]
Himalia	**D**	**57,3** [ab]	73,1 [bcd]
Kallichore	**D**	**63,4** [a]	**85,0** [a]
Megalic	**D**	39,5 [ef]	73,8 [bcd]
Morrow	**D**	46,0 [cde]	**81,7** [ab]
Oregon Red	**D**	37,5 [f]	61,9 [e]
Pasima	**D**	53,3 [bc]	**81,9** [ab]
Relish	**D**	41,8 [ef]	67,4 [cde]
LSD (0.05)		8,4	
CV%		10,5	

Green leaf % with the same letter are statistically similar within a column

Green leaf area was determined with the Canopeo App (www.canopeoapp.com)

Table 6. Ground cover % for Tp 1

Red clover (*Trifolium pratense*) Outeniqua Research Farm, Trial Tp1

Table 6: Ground cover % Planted 14 March 2023

Cultivars	Type	Cut 10 (31 Jul 2024)	Rank	Cut 11 (24 Oct 2024)	Rank	Cut 12 (10 Dec 2024)	Rank	Cut 13 (22 Jan 2025)	Rank	Cut 14 (17 Mar 2025)	Rank	Cut 15 (13 May 2025)	Rank	Plant count % 27 Aug 2025	SE
Amigain	**D**	**100** [a]	1	**100** [a]	1	**91,7** [abc]	8	**95,8** [ab]	9	**87,5** [ab]	8	**79,2** [abc]	8	85,8	7,1
Barduro	**D**	83,3 [c]	14	87,5 [bcd]	10	87,5 [bc]	9	79,2 [d]	13	62,5 [b]	13	45,8 [cd]	13	32,5	13,9
Chaldene	**D**	**91,7** [abc]	10	79,2 [d]	14	87,5 [bc]	12	87,5 [bcd]	11	**83,3** [ab]	10	58,3 [bcd]	12	28,3	7,3
DLF-TPD-23007	**D**	**100** [a]	4	**100** [a]	2	**100** [a]	2	**100** [a]	4	**100** [a]	2	**100** [a]	2	88,3	3,0
Euphoria	**D**	87,5 [bc]	13	83,3 [cd]	13	83,3 [c]	14	**91,7** [abc]	10	**75,0** [ab]	11	**70,8** [abc]	11	48,3	7,9
Garant	**D**	**100** [a]	2	87,5 [bcd]	12	**95,8** [ab]	6	**100** [a]	6	**91,7** [ab]	7	**83,3** [abc]	6	58,3	10,4
Hammon	**T**	**95,8** [ab]	9	**91,7** [abc]	9	**91,7** [abc]	7	**100** [a]	7	**95,8** [a]	6	**79,2** [abc]	7	59,2	11,2
Himalia	**D**	**100** [a]	6	**95,8** [ab]	7	**100** [a]	4	**100** [a]	8	**100** [a]	4	**95,8** [ab]	3	75,8	5,1
Kallichore	**D**	**100** [a]	7	**100** [a]	5	**100** [a]	1	**100** [a]	1	**100** [a]	1	**100** [a]	1	86,7	1,7
Megalic	**D**	**95,8** [ab]	8	87,5 [bcd]	11	87,5 [bc]	10	**100** [a]	2	**83,3** [ab]	9	**70,8** [abc]	10	55,0	8,8
Morrow	**D**	**100** [a]	3	**100** [a]	3	**100** [a]	3	**100** [a]	3	**100** [a]	3	**91,7** [ab]	4	77,5	7,6
Oregon Red	**D**	87,5 [bc]	12	**91,7** [abc]	8	87,5 [bc]	11	83,3 [cd]	12	20,8 [c]	14	26,7 [d]	14	29,2	6,5
Pasima	**D**	**100** [a]	5	**100** [a]	4	**100** [a]	5	**100** [a]	5	**100** [a]	5	**91,7** [ab]	5	72,5	4,3
Relish	**D**	87,5 [bc]	11	**95,8** [ab]	6	87,5 [bc]	13	79,2 [d]	14	**70,8** [ab]	12	**75,0** [abc]	9	70,8	5,8
LSD (0.05)		10,4		12,1		10,5		11,4		29,4		39,1			
CV%		6,6		7,9		6,7		7,2		21,4		31,0			

Ground cover percentages with the same letter are statistically similar within a column

Table 7. Flower heads % for Tp 1

Red clover (*Trifolium pratense*) — Outeniqua Research Farm **Tp1**

Table 7: Flower heads (%) (ratings based) — Planted: 14 March 2023

Cultivars	Type	Cut 2 14/7/2023	Cut 3 12/9/2023	Cut 4 18/10/2023	Cut 5 22/11/2023	Cut 6 19/12/2023	Cut 7 18/1/2024	Cut 8 26/2/2024	Cut 8 Leaf:stem ratio*	Cut 9 29/4/2024
Amigain	D	0	0	3.3 ^{bc}	0	0	18.3 ^{c}	30.6 ^{c}	-	14.2 ^{bc}
Barduro	D	0	0	**7.5 ^{a}**	0	3.3 ^{b}	**54.2 ^{a}**	**66.7 ^{a}**	0.79	**29.6 a**
Chaldene	D	0	0	1.7 ^{bc}	0	0	1.7 ^{e}	20.8 ^{cd}	-	12.5 ^{bc}
DLF-TPD 23007	D	0	0	1.7 ^{bc}	0	0	3.3 ^{e}	16.7 ^{d}	1.50	3.3 ^{d}
Euphoria	D	0	0	1.7 ^{bc}	0	0	12.5 ^{cd}	45.8 ^{b}	-	10.0 ^{bcd}
Garant	D	0	0	0	0	0	7.5 ^{de}	16.7 ^{d}	1.34	3.3 ^{d}
Hammon	T	0	0	0	0	0	5.8 ^{de}	12.5 ^{d}	-	1.7 ^{d}
Himalia	D	0	0	0	0	0	4.2 ^{e}	16.7 ^{d}	-	7.5 ^{cd}
Kallichore	D	0	0	1.7 ^{bc}	0	0	3.3 ^{e}	12.5 ^{d}	1.22	1.7 ^{d}
Megalic	D	0	0	0	0	0	5.8 ^{de}	14.2 ^{d}	-	1.7 ^{d}
Morrow	D	0	0	**5 ^{ab}**	0	**5 ^{a}**	41.4 ^{b}	**66.7 ^{a}**	0.92	**29.2 ^{a}**
Oregon Red (C)	D	0	0	0	0	0	12.5 ^{cd}	**58.1 ^{ab}**	1.94	16.7 ^{b}
Pasima	D	0	0	1.7 ^{bc}	0	0	3.3 ^{e}	10.0 ^{d}	-	2.2 ^{d}
Relish	D	0	0	3.3 ^{bc}	0	0	16.7 ^{c}	**57.9 ^{ab}**	1.33	16.7 ^{b}
LSD (0.05)		-	-	3.7	-	1.3	8.2	12.3	-	8.6
CV %		-	-	113.9	-	134	37.5	23.8	-	49.2

Treatments with the same letter are similar i.e. not significantly different. NS = non-significant

* only determined for some cultivars

Red clover (*Trifolium pratense*) — Outeniqua Research Farm, Trial Tp1

Table 7: Flower heads % (ratings based) — Planted 14 March 2023

Cultivars	Type	Cut 10 (31 Jul 2024)	Cut 11 (24 Oct 2024)	Rank	Cut 12 (10 Dec 2024)	Rank	Cut 13 (22 Jan 2025)	Rank	Cut 14 (17 Mar 2025)	Rank	Cut 15 (13 May 2025)	Rank
Amigain	**D**	0	5,0 ^{bc}	5	**47,5 ^{ab}**	2	20,8 ^{bcd}	7	14,2 ^{bc}	3	**1,7 ^{ab}**	2
Barduro	**D**	0	**16,7 ^{a}**	2	41,7 ^{bc}	3	**29,2 ^{abc}**	3	**29,2 ^{a}**	1	**1,7 ^{ab}**	4
Chaldene	**D**	0	0 ^{c}	11	5,0 ^{e}	14	18,3 ^{bcd}	8	7,5 ^{cd}	10	0 ^{b}	11
DLF-TPD-23007	**D**	0	0 ^{c}	12	14,2 ^{de}	7	10,0 ^{cd}	12	12,5 ^{bcd}	4	0 ^{b}	6
Euphoria	**D**	0	0 ^{c}	6	12,5 ^{de}	10	16,7 ^{bcd}	9	10,0 ^{bcd}	5	0 ^{b}	5
Garant	**D**	0	0 ^{c}	14	10,0 ^{de}	11	**25,0 ^{abcd}**	6	7,5 ^{cd}	6	0 ^{b}	14
Hammon	**T**	0	0 ^{c}	7	20,8 ^{cde}	5	**25,0 ^{abcd}**	5	5,0 ^{d}	14	0 ^{b}	7
Himalia	**D**	0	0 ^{c}	8	14,2 ^{de}	8	5,0 ^{d}	14	5,0 ^{d}	13	0 ^{b}	8
Kallichore	**D**	0	0 ^{c}	9	14,2 ^{de}	9	10,0 ^{cd}	13	7,5 ^{cd}	8	0 ^{b}	9
Megalic	**D**	0	0 ^{c}	10	7,5 ^{de}	13	14,2 ^{bcd}	10	7,5 ^{cd}	9	0 ^{b}	10
Morrow	**D**	0	**16,7 ^{a}**	1	**66,7 ^{a}**	1	**45,8 ^{a}**	1	16,7 ^{b}	2	**1,7 ^{ab}**	3
Oregon Red	**D**	0	7,5 ^{b}	3	7,5 ^{de}	12	**33,3 ^{ab}**	2	7,5 ^{cd}	7	0 ^{b}	12
Pasima	**D**	0	0 ^{c}	13	18,3 ^{cde}	6	14,2 ^{bcd}	11	7,5 ^{cd}	12	0 ^{b}	13
Relish	**D**	0	7,5 ^{b}	4	30,8 ^{bcd}	4	**29,2 ^{abc}**	4	7,5 ^{cd}	11	**3,3 ^{a}**	1
LSD (0.05)		NS	5,1		24,3		21,6		8,6		2,4	
CV%			85,4		67,9		60,1		50,4		261,0	

Flower heads percentages with the same letter are statistically similar within a column

Table 8. Growth rates on a per cut basis for Tp 1

Red clover (*Trifolium pratense*)
Table 8 : **Growth rates** (kg DM/ha/day)

Outeniqua Research Farm, Trial **Tp1**
Planted: 14 March 2023

Cultivars	Type	Cut 2 14/7/2023	Cut 3 12/9/2023	Cut 4 18/10/2023	Cut 5 22/11/2023	Cut 6 19/12/2023	Cut 7 18/1/2024	Cut 8 26/2/2024	Cut 9 29/4/2024
Amigain	D	**7.2** ^{ab}	**28.4** ^{a}	**74.5** ^{abc}	62.1 ^{d}	69.6 ^{cd}	**66.3** ^{abc}	**33.1** ^{abcd}	17.0 ^{a}
Barduro	D	2.5 ^{cdef}	**31.5** ^{a}	**78.3** ^{abc}	**76.2** ^{abc}	63.2 ^{d}	**70.5** ^{ab}	**37.2** ^{abc}	17.6 ^{a}
Chaldene	D	2.2 ^{ef}	5.3 ^{bc}	59.9 ^{d}	67.0 ^{cd}	75.1 ^{bcd}	50.1 ^{d}	27.0 ^{cd}	12.7 ^{a}
DLF-TPD 23007	D	5.0 ^{bc}	12.1 ^{b}	65.5 ^{cd}	71.2 ^{bcd}	**85.8** ^{ab}	**69.0** ^{ab}	**34.0** ^{abcd}	11.5 ^{a}
Euphoria	D	1.7 ^{ef}	6.0 ^{bc}	65.9 ^{bcd}	**75.2** ^{abc}	**83.4** ^{abc}	**64.6** ^{abcd}	28.7 ^{cd}	13.0 ^{a}
Garant	D	2.4 ^{def}	10.2 ^{bc}	**72.5** ^{abcd}	66.6 ^{cd}	**86.0** ^{ab}	**63.7** ^{abcd}	27.6 ^{cd}	11.0 ^{a}
Hammon	T	3.4 ^{cdef}	11.2 ^{bc}	**77.8** ^{abc}	**74.2** ^{abc}	**95.6** ^{a}	**75.9** ^{a}	**35.2** ^{abcd}	15.4 ^{a}
Himalia	D	4.2 ^{cdef}	10.1 ^{bc}	**76.7** ^{abc}	72.6 ^{bcd}	**87.2** ^{ab}	**69.3** ^{ab}	**42.6** ^{a}	16.1 ^{a}
Kallichore	D	3.3 ^{cdef}	12.1 ^{b}	**76.8** ^{abc}	**76.9** ^{abc}	**82.7** ^{abc}	**75.3** ^{a}	**41.7** ^{ab}	13.4 ^{a}
Megalic	D	4.6 ^{cdef}	12.3 ^{b}	67.6 ^{bcd}	**79.4** ^{ab}	76.4 ^{bcd}	**62.1** ^{abcd}	31.0 ^{bcd}	12.9 ^{a}
Morrow	D	**8.2** ^{a}	**29.0** ^{a}	**81.3** ^{a}	71.7 ^{bcd}	77.0 ^{bcd}	**65.7** ^{abc}	**42.4** ^{a}	15.9 ^{a}
Oregon Red (C)	D	**7.6** ^{a}	**33.9** ^{a}	**76.1** ^{abc}	**83.8** ^{a}	80.1 ^{bc}	51.6 ^{cd}	29.5 ^{cd}	18.9 ^{a}
Pasima	D	3.4 ^{cdef}	10.5 ^{bc}	**72.1** ^{abcd}	**75.4** ^{abc}	**88.5** ^{ab}	**76.0** ^{a}	29.7 ^{cd}	13.4 ^{a}
Relish	D	**7.5** ^{ab}	**32.2** ^{a}	**78.6** ^{ab}	**72.5** ^{abc}	69.8 ^{cd}	59.1 ^{bcd}	28.9 ^{cd}	17.1 ^{a}
LSD (0.05)		2.6	7.5	12.8	10.4	15.1	14.8	11.1	NS
CV %		36.8	26.9	10.8	8.4	11.3	13.5	20.2	33.4

Note: treatments with the same letter are similar i.e. not significantly different. NS = non-significant

Red clover (*Trifolium pratense*)
Table 8: Growth rates

Outeniqua Research Farm, Trial Tp1
Planted 14 March 2023

Cultivars	Type	Cut 10 (31 Jul 2024)	Rank	Cut 11 (24 Oct 2024)	Rank	Cut 12 (10 Dec 2024)	Rank	Cut 13 (22 Jan 2025)	Rank	Cut 14 (17 Mar 2025)	Rank	Cut 15 (13 May 2025)	Rank
Amigain	**D**	3,5 ^{a}	3	**20,8** ^{abcd}	4	**45,5** ^{ab}	11	33,9 ^{b}	13	**24,1** ^{abc}	7	**14,5** ^{abc}	5
Barduro	**D**	3,6 ^{a}	2	**26,8** ^{a}	1	**54,9** ^{ab}	6	**40,2** ^{ab}	9	**18,6** ^{abc}	12	8,8 ^{bcd}	13
Chaldene	**D**	-		3,9 ^{e}	14	**44,3** ^{ab}	13	**35,0** ^{ab}	12	**19,4** ^{abc}	11	7,1 ^{cd}	14
DLF-TPD-23007	**D**	-		9,1 ^{cde}	9	**55,0** ^{ab}	5	**36,6** ^{ab}	11	**29,9** ^{ab}	2	**16,1** ^{ab}	3
Euphoria	**D**	-		8,9 ^{cde}	10	43,5 ^{b}	14	**39,4** ^{ab}	10	**22,9** ^{abc}	9	**10,9** ^{abcd}	11
Garant	**D**	-		7,3 ^{de}	13	**49,0** ^{ab}	9	**42,7** ^{ab}	8	**23,4** ^{abc}	8	**11,5** ^{abcd}	10
Hammon	**T**	-		8,1 ^{cde}	12	**49,8** ^{ab}	8	**45,1** ^{ab}	4	**27,4** ^{abc}	6	**11,7** ^{abcd}	8
Himalia	**D**	-		**15,1** ^{abcde}	6	**62,0** ^{ab}	2	**47,3** ^{ab}	3	**29,6** ^{ab}	3	**16,3** ^{ab}	2
Kallichore	**D**	-		8,7 ^{cde}	11	**59,9** ^{ab}	4	**44,6** ^{ab}	6	**29,2** ^{abc}	4	**18,2** ^{a}	1
Megalic	**D**	-		9,4 ^{cde}	8	**60,3** ^{ab}	3	**44,8** ^{ab}	5	**21,5** ^{abc}	10	9,0 ^{bcd}	12
Morrow	**D**	-		**15,5** ^{abcde}	5	**52,9** ^{ab}	7	**50,4** ^{a}	1	**30,5** ^{a}	1	**11,5** ^{abcd}	9
Oregon Red	**D**	2,9 ^{a}	4	**24,4** ^{ab}	2	**47,5** ^{ab}	10	**43,4** ^{ab}	7	4,8 ^{d}	14	4,9 ^{d}	15
Pasima	**D**	-		**12,9** ^{abcde}	7	**63,6** ^{a}	1	**47,4** ^{ab}	2	**29,2** ^{abc}	5	**15,2** ^{abc}	4
Relish	**D**	4,6 ^{a}	1	**22,3** ^{abc}	3	**45,2** ^{ab}	12	33,3 ^{b}	14	17,3 ^{c}	13	**13,5** ^{abc}	6
LSD (0.05)		14,6		19,9		19,9		15,9		12,2		8,6	
CV%		64,1		22,8		22,8		22,6		31,6		42,7	

Growth rates with the same letter are statistically similar within a column

Table 9. Seasonal yield (t DM/ha) of Tp2

Western Cape Government FOR YOU

Red clover (*Trifolium pratense*) — Outeniqua Research Farm **Tp2**

Table 9: Seasonal Yield (t DM/ha) — Planted: 12 April 2023

Cultivars	Type	Spring 2023		Summer 2023/24		Total Cuts 2-8	Green leaf area Jan 2024 10 days regrowth	Green leaf area Apr 2024 21 days regrowth
		Yield	Height (cm)	Yield	Height (cm)	Yield	%	%
Barduro	D	7.73 b	32	6.93 bcde	50	16.19 cd	41.3 e	68.1 f
Bonus	D	6.90 c	23	6.79 cde	43	14.47 ef	62.7 b	**81.7** abcd
Dynamite	D	**9.48** a	36	6.88 bcde	49	**17.34** ab	54.5 c	76.0 cde
Garant	D	6.97 c	24	6.61 de	44	14.54 ef	61.8 b	**84.6** a
Gert	T	7.07 bc	23	**7.74** a	49	15.80 cd	**71.6** a	**85.1** a
Gregale	T	5.79 d	22	7.07 bcde	46	13.79 f	63.7 b	**82.9** ab
Hajan	D	5.87 d	22	7.14 bc	44	13.87 f	53.7 cd	77.2 bcde
Oregon Red (C)	D	**9.40** a	37	6.95 bcde	50	**17.92** a	47.2 e	73.7 ef
Relish	D	7.52 bc	28	6.51 e	40	15.75 cd	47.4 de	75.3 de
Respect	D	7.27 bc	26	7.04 bcd	46	15.21 de	64.8 b	**86.1** a
SG-C91	D	7.80 b	25	**7.36** ab	49	16.42 bc	64.3 b	**82.3** abc
LSD (0.05)		0.75		0.52		1.08	6.35	6.75
CV %		5.92		4.37		4.08	6.48	5.0

Treatments with the same letter are similar i.e. not significantly different NS = non-significant.

Green leaf area was determined with the Canopeo app (www.canopeoapp.com)

Western Cape Government FOR YOU

Red clover (*Trifolium pratense*) — Outeniqua Research Farm, Trial **Tp2**

Table 9: Seasonal yield 2nd year (t DM/ha) — Planted 14 March 2023

Cultivars	Type	Autumn 2024	Rank	Winter 2024	Rank	Spring 2024	Rank	Summer 2024/25	Rank	Autumn 2025	Rank	Year 1	Rank	Year 2	Rank	Total Year 1+2	Rank
Barduro	**D**	**1,57** ab	2	1,12 bc	3	3,96 b	3	3,57 c	7	0,69 bc	7	14,7 b	5	10,2 b	3	24,9 bc	4
Bonus	**D**	0,79 e	11	0,58 e	10	2,89 c	11	3,32 c	10	**1,13** ab	3	13,7 cd	8	7,6 e	11	21,3 de	10
Dynamite	**D**	1,07 cde	5	0,98 cd	4	3,47 bc	9	2,16 d	11	-		**16,4** a	1	7,7 e	10	24,0 bc	7
Garant	**D**	0,96 de	8	0,70 e	7	3,81 b	7	**4,10** abc	4	0,97 bc	5	13,6 cd	9	9,6 bcd	7	23,2 cd	8
Gert	**T**	1,00 de	6	0,64 e	8	4,07 b	2	**4,49** ab	3	1,07 b	4	14,8 b	4	10,2 b	4	25,0 bc	3
Gregale	**T**	0,96 de	7	0,52 e	11	3,39 bc	10	3,38 c	8	0,45 c	10	12,9 d	11	8,2 de	9	21,1 e	11
Hajan	**D**	0,87 de	10	0,64 e	9	3,53 bc	8	3,66 c	6	0,46 c	9	13,0 d	10	8,7 cde	8	21,7 de	9
Oregon Red	**D**	**1,77** a	1	**1,81** a	1	**5,17** a	1	3,79 bc	5	0,46 c	8	**16,4** a	2	**12,5** a	1	**28,9** a	1
Relish	**D**	**1,41** abc	3	1,27 b	2	3,81 b	6	3,37 c	9	0,85 bc	6	14,5 bc	6	9,9 bc	6	24,3 bc	6
Respect	**D**	0,89 de	9	0,74 de	5	3,91 b	4	**4,49** ab	2	**1,14** ab	2	14,3 bc	7	10,0 bc	5	24,4 bc	5
SG-C91	**D**	1,25 bcd	4	0,71 e	6	3,85 b	5	**4,93** a	1	**1,68** a	1	15,2 b	3	10,8 b	2	25,9 b	2
LSD (0.05)		0,39		0,26		0,79		0,82		0,58		0,92		1,48		2,04	
CV%		20,0		17,6		12,2		12,9		37,2		3,7		9,0		5,0	

Yields with the same letter are statistically similar within a column

Table 10. Growth rates Tp2

Red clover (*Trifolium pratense*) Outeniqua Research Farm **Tp2**

Table 10. Growth rates (kg DM/ha/day) Planted: 12 April 2023

Cultivars	Type	Cut 2 14/7/2023	Cut 3 12/9/2023	Cut 4 18/10/2023	Cut 5 22/11/2023	Cut 6 19/12/2023	Cut 7 18/1/2024	Cut 8 26/2/2024
Barduro	D	13.7 bc	**90.9 abc**	**77.5 ab**	97.3 c	90.9 bcd	**60.3 ab**	**24.6 a**
Bonus	D	7.4 cde	73.9 d	**79.0 ab**	**117.8 ab**	96.4 bc	42.4 d	12.7 d
Dynamite	D	**30.2 a**	**100.3 a**	**78.1 ab**	**124.6 ab**	83.0 d	**51.8 abcd**	15.7 bcd
Garant	D	7.7 cde	74.5 d	**79.3 ab**	**120.0 ab**	92.6 bcd	40.0 d	15.4 bcd
Gert	T	10.3 cd	70.6 d	**82.3 ab**	**115.5 abc**	**103.0 ab**	**63.1 a**	15.8 bcd
Gregale	T	4.6 de	49.3 e	**80.3 ab**	**109.3 abc**	**102.3 ab**	49.2 bcd	15.1 bcd
Hajan	D	2.1 e	50.8 e	**86.6 ab**	**108.6 abc**	**112.2 a**	43.9 d	13.7 d
Oregon Red (C)	D	**30.2 a**	**92.1 ab**	**84.8 ab**	**121.9 a**	88.0 cd	**51.1 abcd**	**25.3 a**
Relish	D	17.5 b	82.6 bcd	74.9 b	101.0 bc	91.8 bcd	47.1 cd	**20.7 ab**
Respect	D	10.3 cd	76.9 cd	**80.5 ab**	**118.4 ab**	98.0 bc	47.6 bcd	14.4 cd
SG-C91	D	13.0 bc	**85.4 abcd**	**80.6 ab**	**122.6 a**	92.3 bcd	**58.1 abc**	**20.2 abc**
LSD (0.05)		7.1	15.1	10.3	18.4	12.3	13.0	6.2
CV%		31.1	11.6	7.5	9.5	7.6	15.1	20.7

Treatments with the same letter are similar i.e. not significantly different. NS = non-significant

Red clover (*Trifolium pratense*) Outeniqua Research Farm, Trial **Tp2**

Table 10: Growth rates 2nd year (kg DM/ha/day) Planted 14 March 2023

Cultivars	Type	Autumn 2024	Rank	Winter 2024	Rank	Spring 2024	Rank	Summer 2024/25	Rank	Autumn 2025	Rank
Barduro	**D**	**17,1 ab**	2	12,2 bc	3	43,6 b	3	39,6 c	7	7,5 bc	7
Bonus	**D**	8,5 e	11	6,3 e	10	31,8 c	11	37,0 c	10	**8,2 bc**	6
Dynamite	**D**	11,6 cde	5	10,7 cd	4	38,1 bc	9	24,0 d	11	-	
Garant	**D**	10,4 de	8	7,6 e	7	41,9 b	7	**45,6 bc**	4	10,5 bc	4
Gert	**T**	10,9 de	6	6,9 e	8	44,7 b	2	**49,8 ab**	3	11,7 b	3
Gregale	**T**	10,4 de	7	5,6 e	11	37,3 bc	10	37,6 c	8	4,9 c	10
Hajan	**D**	9,5 de	10	6,9 e	9	38,8 bc	8	40,6 c	6	5,0 c	9
Oregon Red	**D**	**19,2 a**	1	**19,6 a**	1	**56,8 a**	1	42,1 bc	5	5,0 c	8
Relish	**D**	**15,3 abc**	3	13,8 b	2	41,9 b	6	37,5 c	9	9,2 bc	5
Respect	**D**	9,7 de	9	8,0 e	5	43,0 b	4	**49,9 ab**	2	**12,4 ab**	2
SG-C91	**D**	13,6 bcd	4	7,8 e	6	42,3 b	5	**54,7 a**	1	**18,3 a**	1
LSD (0.05)		4,2		2,8		8,6		9,1		6,4	
CV%		20,0		17,5		12,2		12,9		44,5	

Growth rates with the same letter are statistically similar within a column

Table 11. Ground cover % Tp2

Western Cape Government FOR YOU

Red clover (*Trifolium pratense*) — Outeniqua Research Farm, Trial **Tp2**

Table 11: Ground cover % (ratings based) — Planted 14 March 2023

Cultivars	Type	Cut 9 (31 Jul 2024)	Rank	Cut 10 (24 Oct 2024)	Rank	Cut 11 (10 Dec 2024)	Rank	Cut 12 (22 Jan 2025)	Rank	Cut 13 (17 Mar 2025)	Rank	Cut 14 (13 May 2025)	Rank
Barduro	**D**	**87,5 ab**	9	**96,6 ab**	7	**91,7 a**	9	**83,3 ab**	10	66,7 bcde	7	39,2 de	9
Bonus	**D**	**91,7 ab**	6	**95,8 ab**	8	**94,8 a**	8	**87,5 ab**	9	**80,9 abcd**	5	55,8 bcd	6
Dynamite	**D**	83,3 b	11	87,5 c	11	75,0 b	11	70,8 b	11	0	-	0	-
Garant	**D**	**95,8 a**	3	**100 a**	4	**100 a**	4	**100 a**	4	**95,8 ab**	2	**83,3 abc**	3
Gert	**T**	**87,5 ab**	7	**100 a**	5	**100 a**	1	**100 a**	1	**87,5 abc**	4	**66,7 abcd**	5
Gregale	**T**	**95,8 a**	4	91,7 bc	9	**100 a**	5	**91,7 a**	6	58,3 cde	8	45,8 cd	7
Hajan	**D**	**87,5 ab**	8	88,6 c	10	**95,8 a**	6	**91,7 a**	5	54,2 de	9	41,7 de	8
Oregon Red	**D**	**87,5 ab**	10	**100 a**	6	**95,8 a**	7	**91,7 a**	7	37,5 e	10	**37,5 de**	10
Relish	**D**	**95,8 a**	1	**100 a**	1	**87,5 ab**	10	**87,5 ab**	8	**79,2 abcd**	6	**70,8 abcd**	4
Respect	**D**	**95,8 a**	2	**100 a**	2	**100 a**	2	**100 a**	2	**91,7 ab**	3	**91,7 ab**	2
SG-C91	**D**	**91,7 ab**	5	**100 a**	3	**100 a**	3	**100 a**	3	**100 a**	1	**100 a**	1
LSD (0.05)		8,8		5,9		13,9		17,3		29,4		39,3	
CV%		5,7		3,6		8,6		11,2		25,1		39,8	

Ground cover with the same letter are statistically similar within a column

Table 12. Yield per cut (t DM/ha) for Tp2

Western Cape Government FOR YOU

Red clover (*Trifolium pratense*) — Outeniqua Research Farm, Trial **Tp2**

Table 12: Yield (t DM/ha) — Planted 14 March 2023

Cultivars	Type	Cut 9 (31 Jul 2024)	Rank	Cut 10 (24 Oct 2024)	Rank	Cut 11 (10 Dec 2024)	Rank	Cut 12 (22 Jan 2025)	Rank	Cut 13 (17 Mar 2025)	Rank	Cut 14 (13 May 2025)	Rank
Barduro	**D**	0,20 bc	4	2,84 b	2	2,74 cde	8	2,11 de	9	1,00 cd	9	0,44 cd	7
Bonus	**D**			1,59 cd	10	2,39 e	11	2,14 cde	8	1,48 b	5	0,67 b	3
Dynamite	**D**	0,28 bc	3	2,19 c	4	2,63 de	9	1,60 f	11	-	-	-	-
Garant	**D**			1,92 cd	7	**3,29 abc**	5	**2,38 abcde**	6	1,50 b	3	0,50 bc	5
Gert	**T**	0,11 c	5	1,63 cd	8	**3,85 a**	1	**2,60 ab**	3	1,55 b	2	0,58 bc	4
Gregale	**T**	0,10 c	6	1,30 d	11	3,26 bc	6	2,20 bcde	7	1,07 cd	7	0,23 de	9
Hajan	**D**	0,10 c	7	1,63 cd	9	3,18 bcd	7	**2,52 abcd**	5	1,02 cd	8	0,13 e	10
Oregon Red	**D**	**0,57 a**	1	**3,92 a**	1	**3,40 ab**	2	**2,57 abc**	4	0,73 d	10	0,23 de	8
Relish	**D**	0,37 ab	2	2,82 b	3	2,57 e	10	2,00 ef	10	1,22 bc	6	0,46 bc	6
Respect	**D**			2,03 c	5	**3,33 abc**	3	**2,75 a**	2	1,50 b	4	0,67 b	2
SG-C91	**D**			1,96 c	6	**3,31 abc**	4	**2,80 a**	1	**2,08 a**	1	**1,03 a**	1
LSD (0.05)		0,2		0,6		0,6		0,4		0,4		0,2	
CV%		40,2		16,8		11,3		10,9		16,4		25,4	

Ground cover with the same letter are statistically similar within a column

Table 12. Sward height (cm) for Tp2 during year 2

Western Cape Government FOR YOU

Red clover (*Trifolium pratense*) — Outeniqua Research Farm, Trial **Tp2**

Table 13: Sward height (cm) 2nd year — Planted 14 March 2023

Cultivars	Type	Cut 9 (31 Jul 2024)	Rank	Cut 10 (24 Oct 2024)	Rank	Cut 11 (10 Dec 2024)	Rank	Cut 12 (22 Jan 2025)	Rank	Cut 13 (17 Mar 2025)	Rank	Cut 14 (13 May 2025)	Rank
Barduro	**D**	8,7 ^{c}	4	39,3 ^{bc}	3	47,7 ^{bcd}	7	50,0 ^{bc}	5	**41,7 ^{a}**	1	**21,5 ^{ab}**	4
Bonus	**D**	3,0 ^{d}	11	25,0 ^{d}	7	43,3 ^{de}	10	**51,7 ^{abc}**	3	30,0 ^{bc}	7	20,0 ^{b}	5
Dynamite	**D**	12,7 ^{b}	3	42,7 ^{b}	2	**52,7 ^{abc}**	4	48,3 ^{bc}	7	-	-	-	-
Garant	**D**	3,3 ^{d}	10	24,3 ^{d}	8	47,7 ^{bcd}	6	46,7 ^{bcd}	8	28,3 ^{c}	8	19,3 ^{b}	7
Gert	**T**	4,7 ^{d}	8	20,0 ^{d}	11	**56,7 ^{a}**	1	46,7 ^{bcd}	9	**33,3 ^{abc}**	4	19,3 ^{b}	6
Gregale	**T**	8,0 ^{c}	5	21,7 ^{d}	10	48,3 ^{bcd}	5	45,0 ^{cd}	10	31,5 ^{bc}	5	19,3 ^{b}	8
Hajan	**D**	8,0 ^{c}	6	23,3 ^{d}	9	43,3 ^{de}	9	50,0 ^{bc}	6	30,0 ^{bc}	6	18,3 ^{b}	10
Oregon Red	**D**	**17,7 ^{a}**	1	**51,7 ^{a}**	1	**56,7 ^{a}**	2	**53,3 ^{ab}**	2	**38,3 ^{ab}**	2	**26,0 ^{a}**	1
Relish	**D**	12,7 ^{b}	2	34,3 ^{c}	4	36,7 ^{e}	11	40,0 ^{d}	11	27,3 ^{c}	10	18,7 ^{b}	9
Respect	**D**	3,3 ^{d}	9	26,0 ^{d}	5	45,0 ^{cd}	8	**58,3 ^{a}**	1	28,3 ^{c}	9	**21,7 ^{ab}**	3
SG-C91	**D**	5,0 ^{d}	7	26,0 ^{d}	6	**55,0 ^{ab}**	3	51,0 ^{bc}	4	**35,0 ^{abc}**	3	**22,7 ^{ab}**	2
LSD (0.05)		2,5		6,6		8,0		7,1		8,8		4,6	
CV%		18,2		12,8		9,7		8,5		14,5		12,6	

Height with the same letter are statistically similar within a column

Table 13. Flower heads (%) for Tp2 during year 2

Western Cape Government FOR YOU

Red clover (*Trifolium pratense*) — Outeniqua Research Farm, Trial **Tp2**

Table 14: Flower heads (%) (ratings) 2nd year — Planted 14 March 2023

Cultivars	Type	Cut 9 (31 Jul 2024)	Cut 10 (24 Oct 2024)	Rank	Cut 11 (10 Dec 2024)	Rank	Cut 12 (22 Jan 2025)	Rank	Cut 13 (17 Mar 2025)	Rank	Cut 14 (13 May 2025)
Barduro	**D**	0	**14,4 ^{a}**	1	**15,6 ^{a}**	1	**45,8 ^{a}**	1	**45,8 ^{a}**	1	0
Bonus	**D**	0	0 ^{d}	6	7,5 ^{bc}	3	**37,5 ^{a}**	2	10,0 ^{b}	2	0
Dynamite	**D**	0	7,5 ^{b}	2	5,0 ^{c}	11	20,8 ^{bc}	5	-	-	-
Garant	**D**	0	0 ^{d}	8	5,0 ^{c}	6	20,8 ^{bc}	6	10,0 ^{b}	3	0
Gert	**T**	0	0 ^{d}	9	5,0 ^{c}	9	5,0 ^{d}	11	**5,0 ^{b}**	8	0,2
Gregale	**T**	0	0 ^{d}	7	5,0 ^{c}	7	5,0 ^{d}	10	5,0 ^{b}	7	0
Hajan	**D**	0	1,7 ^{cd}	5	**10,4 ^{ab}**	2	20,8 ^{bc}	7	5,0 ^{b}	6	0
Oregon Red	**D**	0	5,0 ^{bc}	4	5,0 ^{c}	8	12,5 ^{cd}	8	**7,5 ^{b}**	5	0
Relish	**D**	0	7,5 ^{b}	3	7,3 ^{bc}	5	25,0 ^{b}	3	10,0 ^{b}	4	0,2
Respect	**D**	0	0 ^{d}	10	5,0 ^{c}	10	25,0 ^{b}	4	5,0 ^{b}	9	0
SG-C91	**D**	0	0 ^{d}	11	7,5 ^{bc}	4	7,5 ^{d}	9	**5,0 ^{b}**	10	0
LSD (0.05)		NS	3,7		5,4		12,3		6,4		NS
CV%			65,4		44,3		35,3		31,1		

Height with the same letter are statistically similar within a column

Summary

Some grazing type cultivars are winter active, while most are winter dormant.

Peak yield is in spring during year 1 and in summer in year 2.

Winter dormant cultivars have the best summer yield.

Green leaf and ground cover are best in grazing types.

All cultivars had a reduced yield in the second year, with spring affected more than summer.

Grazing type cultivars in the first year that originate from NZ and USA (Amigain, Barduro, Morrow, Pasima, Relish,) and one European type (SG-C91) are faster growing in spring while the best European types are higher producing in summer. In the second year, most cultivars were statistically similar ($p<0.05$) in spring while in the second summer origin did not have such a distinct an influence on production. Individual cultivars that were highest yielding in the second summer were SG-C91, Gert, Respect, Garant, Morrow, Himalia, Pasima, Hammon, Amigain, while also considering total yield.

Possibly a mixture of the two types would give a good yield distribution and ground cover

The best persistence after two years were the cultivars: Taigete (DLF23007), Kallichore, Amigain, Morrow, Himalia, SG-C91, Pasima and Relish. (Figures 3 and 4). This is expected to have a defining influence on the third years productivity.

References

Broderick GA. 2018. Utilization of protein in red clover and alfalfa silages by lactating dairy cows and growing lambs. J Dairy Sci. 101: 1190-1205

Dairy Australia 3030 Project (2020). www.dairyaustralia.com.au

Pirhofer-Walzl K, Rasmussen J, Hogh-Jensen H, Erikson J, Søegaard K, Rasmussen J. 2012. Nitrogen transfer from forage legumes to nine neighbouring plants in a multi-species grassland. Plant Soil 350: 71-84

Suter D, Frick R, Hirschi H-U. 2023. Liste der empfohlenen Sorten von Futterpflanzen 2023-2024. Agroscope Transfer Nr. 460/2023

Van der Colf J, Ammann SB, Meeske R. 2021. The integration of forage herbs into systems: lessons learnt from farmlet studies. Outeniqua Information Day, Milk Production from Planted Pastures 2021.

Van der Colf J, Ammann SB, Meeske R. 2022. Forage herbs and mixtures: impact of inclusion on pasture system productivity. Outeniqua Information Day, Milk Production from Planted Pastures 2022.

Production over three years of multi-species combinations – are there yield advantages?

Sigrun Ammann*, Janke van der Colf, Dalena Lombard, Lethu Zulu

Western Cape Department of Agriculture, Research and Technology Development, Directorate Plant Sciences, Outeniqua Research Farm, P.O. Box 24, George 6530

*Sigrun.ammann@westerncape.gov.za

Introduction

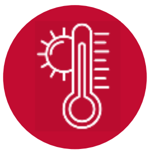
Multispecies pastures for dairy production are used in the southern Cape region to improve resilience and forage quality, especially during the warmer months of the year. Research on these alternatives has been ongoing at the Outeniqua Research Farm since 2016. The goal of resilience for pastures in the southern Cape are species and combinations of species that can provide grazing year-round of high quality forage that supports milk production, considering the resource constraints of water, both rainfall and irrigation, and temperatures. The temperature constraints is both maximum temperatures in the summer months which tend to be drier and warm night temperatures that put strain on the plant reserves. Resilience is also about sufficient growth rates in winter, to limit the amount of feed that to be bought in.

The aim of the multi-species combinations is about improved resilience, improved dry matter production and improved forage quality especially for the warmer months of the year. This is achieved through functional mixtures that avoid redundancy and consist of species that complement each other where each component contributes significantly to the biomass production for the cows to graze. In the current research trials, the functional mixtures consist of a grass species, a forage herb species and a legume species.

The general characteristics of resilient pasture species are:

Deep root system for improved rooting depth.

Efficient response to water to achieve best possible response of yield and forage quality for the available water, both rainfall and irrigation.



Higher temperature tolerance especially during summer and early autumn. Preferably there should be winter growth activity.

Improved forage quality especially in the warmer and drier months.

Persistence with yield stability over years.

These are quite substantial requirements and can best be achieved in multi-species combinations.

Complementarity when deciding on species combinations is an important consideration to ensure functional mixtures that can achieve improved biomass production, are selected. A trial conducted at Outeniqua Research Farm from autumn 2022 onwards consisted of combinations of a grass, a forage herb and red clover (RC) (*Trifolium pratense*) as the legume. The lucerne treatments was not successful in the current trial. The grass was either Tall fescue (TF) (*Festuca arundinacea*) or Cocksfoot (CF) (*Dactylis glomerata*), while the forage herb was either plantain (P) (*Plantago lanceolata*) or Chicory (C) (*Cichorium intybus*). Biomass and botanical composition based on dry matter were determined at each harvest. The first three years had a total of 27 harvests.

Basic trial management overview

The composition of mixtures evaluated, varieties and seeding rates are shown in Table 1.

The cutting rotation was determined by leaf stage of tall fescue at 2 to 2,5 leaves which corresponded to 4 to 4,5 leaves in cocksfoot. All plots were harvested simultaneously cut with a reciprocating mower (Agria) at a blade height of 5cm. Samples for DM determination were taken and oven dried at 70˚C. Samples for fractioning of the components were cut as quadrats before the plots were cut. The remaining material was weighed. Fractioning for species composition was on a dry matter biomass basis.

Fertilizer N and K were applied after each harvest for nutrient replacement since all the material is removed.

Results

The highest producing combinations for the first year were CF/P/RC, TF/P/RC and RC ($p<0.05$) with 19.2, 18.9 and 18.4 t DM ha-1 respectively. The botanical compositions at the end of year 1 was 34% CF, 21% P, 44% RC for treatment CF/P/RC and 22% TF, 24% P, 52% RC for treatment TF/P/RC. The combinations with chicory yielded significantly lower ($p<0.05$). For the second year the same three -way combinations were in the highest yielding group together with CF/P and TF ($p<0.05$) with 19.5, 18.5, 18.2 and 16.9 t DM ha-1. In terms of composition the grass component remained relatively constant for the treatments CF/P/RC and TF/P/RC however the red clover increased to above 60% while the plantain reduced to below 10% in the second year. The CF/P combination consisted of 75% cocksfoot and 17% plantain. During the third year the three-way combination were no longer in the top yield group ($p<0.05$) and had lost most of their broadleaf components to below 10%. The highest yielding treatments in year three were CF/P (17.0 t DM ha-1) with the same composition as in year 2; TF (16.4 t DM ha-1); TF/C (14.6 t DM ha-1) although the chicory component was at zero, and CF (14.5 t DM ha-1) ($p<0.05$).

Table 1. Treatments in terms of species composition, cultivar and seeding rate

Classification	Species	Abbreviation	Cultivar	Pure stand (kg/ha)	Binary mix (kg/ha)	Three-way mix (kg/ha)
Grass	Tall fescue	TF	Royal Q	30	25	20
	Cocksfoot	CF	Adremo	18	15	12
Forage herb	Chicory	C	Commander	8	3	3
	Plantain	P	Agritonic	10	3	3
Legume	Red clover	RC	Kenland red	10	-	3
	Lucerne	L	WL 458 HQ	20	-	6

* The legumes were inoculated with Rhizobium in the form of GraphEx.

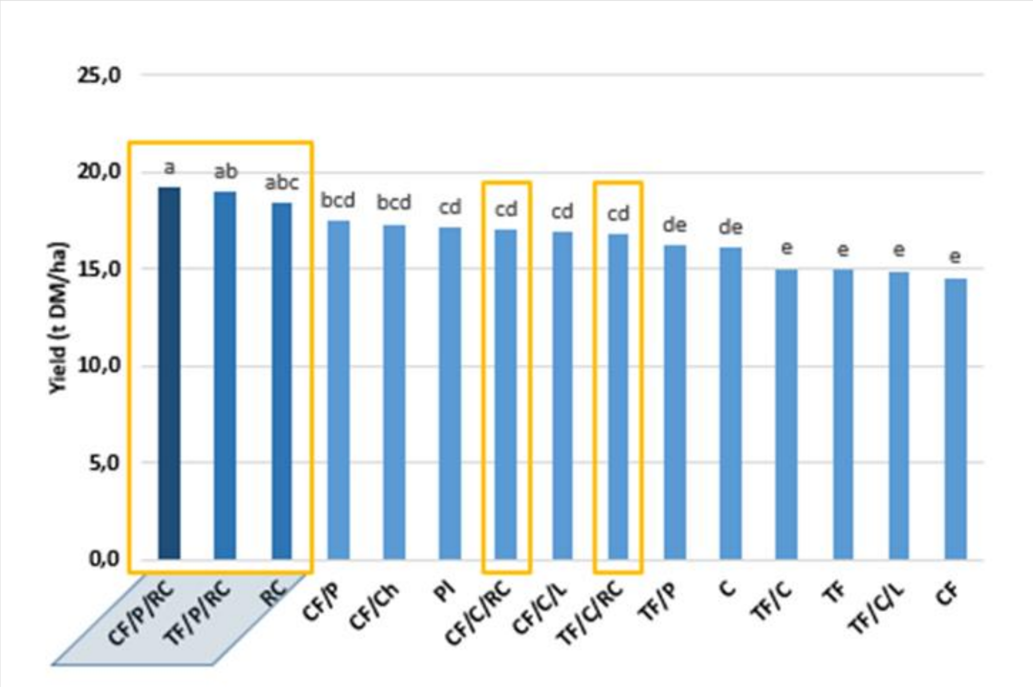


Figure 1. Dry matter yield (t DM/ha) for year 1 trial Fh10.

In the first year the three-way mixes including plantain as the forage herb were in the top producing group while those containing chicory were not. During the first summer the broad-leaf components (plantain and red clover) were dominant going from 44% in spring to 65% in summer in the CF/P/RC mix. While in the TF/P/RC mix the composition went from 25% to 76% broadleaf component.

In the second year the same three-way mixtures were the best producing combinations together with the CF/P mixture and the TF pure stand now also in the top group. Again, the mixtures with the chicory had the lower yields. The composition in the second year for the cocksfoot mixture (CF/P/RC) was dominated by the broad-leaf species with the plantain dominant in winter (48%) and the red clover in summer (62%). This was similar for the tall fescue mixture with the plantain dominant in winter (38%) and the red clover dominant in summer (66%).

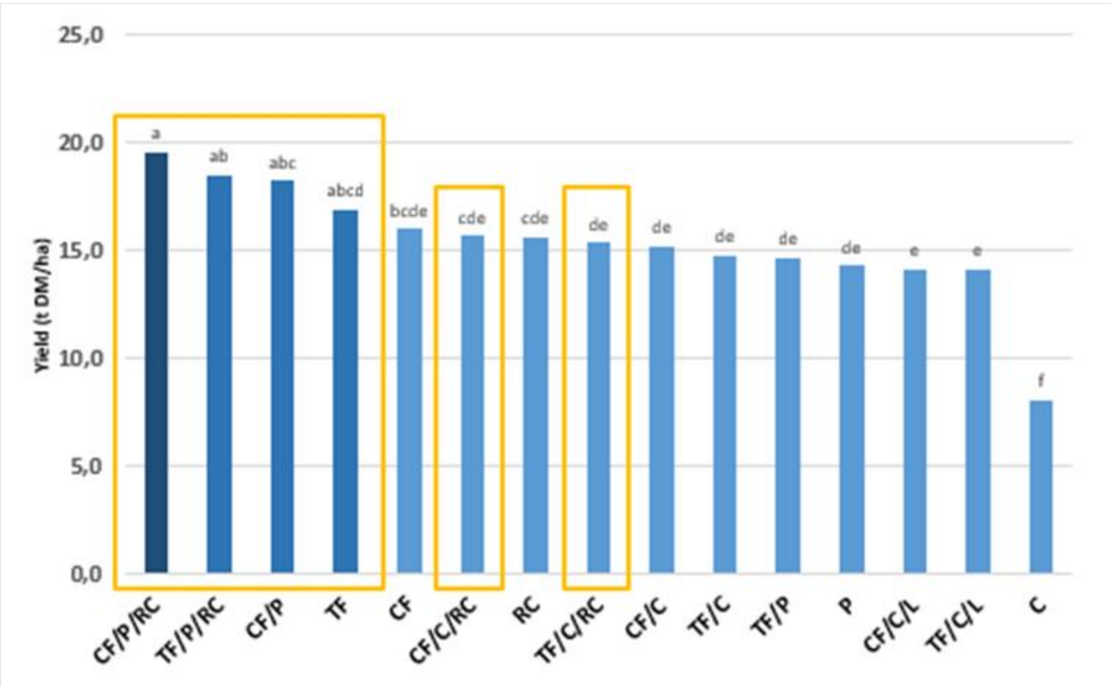


Figure 2. Dry matter yield (t DM/ha) for year 2 trial Fh10.

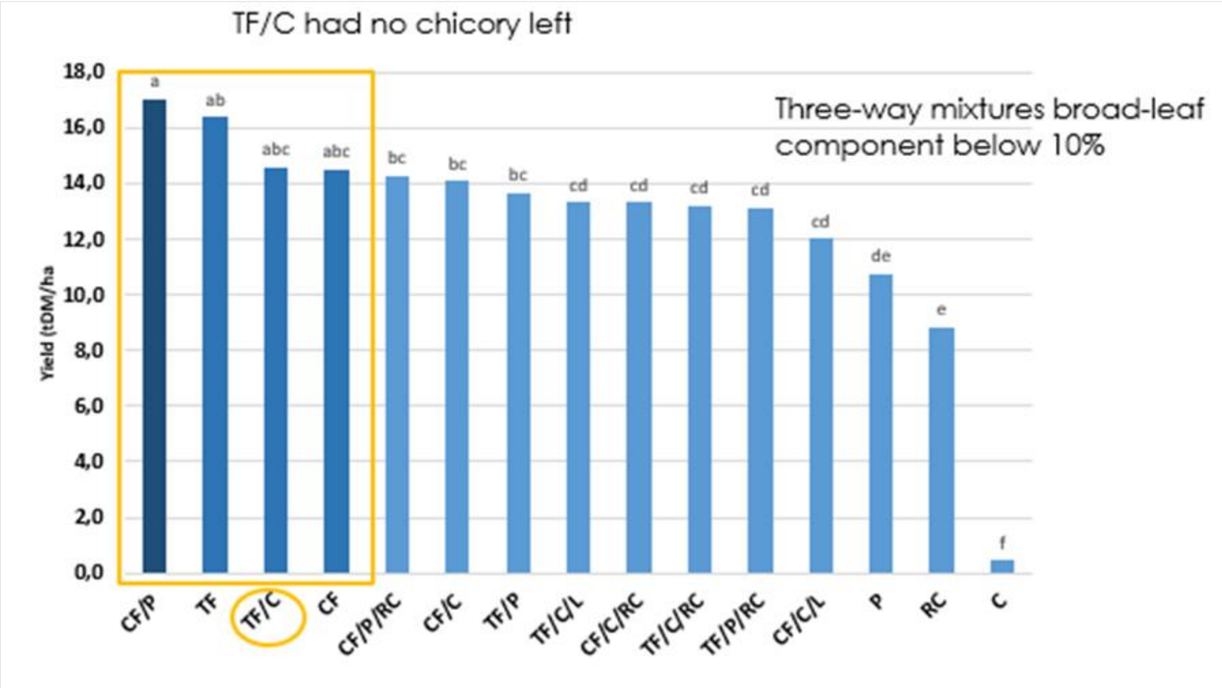


Figure 3. Dry matter yield (t DM/ha) for year 3 trial Fh10.

In the third year the three-way mixtures were no longer in the top-yielding group but instead the binary mixture CF/P was producing the most biomass as well as the pure grass treatments (TF and CF). The TF/C treatment consisted of tall fescue only since there was no chicory left in the third year. In the third winter the three-way mixture CF/P/RC still had a dominant broadleaf component with plantain at 37% and red clover at 15%. However, by the end of spring the plantain and red clover component was down to 25% and during summer there was no red clover left, and the plantain was at 7%. The composition of the tall fescue-based mixture in the third year was very similar where the winter still had 29% plantain and red clover while in spring that decreased to 8% plantain and 21 % red clover. During the third summer it consisted of 9% plantain and 5 % red clover. The decrease in the red clover composition was expected since Kenland Red is short duration type red clover.

The results show that plantain as part of the three-way mixture yields higher than chicory, and that the three-way mixture is only superior for biomass while the broadleaf component, plantain and red clover, is above 50 to 60%. For dairy systems it is thus important to development management strategies to maintain the plantain and red clover components in the pasture either through annual under-sowing or using cultivars that have improved persistence. The timing of the under-sowing needs more investigation. Additionally, it is important to test grazing-type red clover cultivars in mixed swards to determine their competitiveness and complementarity in mixed pastures.

Overall, the results show a significant yield advantage of mixed swards with a substantial broadleaf component. Forage quality samples were also taken and will still be analysed.

Pasture measurement: a waste of time or game changer?

Janke van der Colf
Western Cape Department of Agriculture, Research and Technology Development, Directorate Plant Sciences, Outeniqua Research Farm, P.O. Box 24, George 6530
Janke.vandercolf@westerncape.gov.za

Introduction

Pasture measurement– the bane of time pressured dairy producers worldwide. It invokes visions of hours spent walking the farm, doing what feels like a hundred complicated calculations, staring at a feed wedge and then asking oneself: what am I really getting out of this?

And therein lies an important lesson: pasture measurement is often poorly adopted by producers due to the information overload and decision making fatigue associated with it, with little to no perceived on the ground benefits.

This article will aim to unpack some of the common values that pasture measurement allows you to calculate, how to interpret them and eventually provide a quick "one glance tool" to make pasture management decisions.

Numbers all over: what do they mean?

Pasture measurement and grazing/fodderflow management is all a numbers game once your weekly walk readings have been done. The following section will show you how to **CALCULATE** these parameters and then how to **INTERPRET** them.

Average Farm Cover:

Step 1: Calculate yield available per paddock

Pasture yield of each paddock X **Size of each paddock**

Paddock A = 2500 kg DM/ha X 5 ha **= 12 500**

Step 2: Add individual yield for ALL paddocks together

Paddock A + **Paddock B** + **Paddock C**

12 500 + 20 000 + 32 200 **= 64 700 kg DM/ha**

Step 3: Calculate average farm cover:

Total paddock yields ÷ **Size of entire platform**

Average farm cover = 64 700 kg DM/ha x 22 ha **=**

2491 kg DM/ha

Average farm cover gives a quick snapshot of where your farm is at in terms pasture supply currently. In other words it should be able to tell you whether:

- **Supply equals demand:** just keep grazing.
- **Cover is too low:** feed additional roughage .
- **Cover is too high:** consider cutting for silage or hay.

However, to make these decisions, average farm cover will need to be weighed against **DESIRED FARM COVER.** The infographic below shows how to calculate this parameter. Most software programs use the alternative value of "target cover"- but this is more paddock based than farm based.

Take particular note of the pitfalls when calculating the various component parameters in this sense. Remember: junk in = junk out. In this example the average farm cover and desired farm cover are well aligned = animals can keep grazing.

Desired farm cover

Input parameter	Formula	Pitfalls and tips
Stocking rate Cows/ha	**Cows in herd (number)** ÷ **Size of grazing platform (ha)**	• Ensure the hectares used are what is **actually** available. Platforms can shrink and swell throughout the year as paddocks are taken into and out of rotation (for example drylands). • In year round calving systems stocking rate would remain relatively constant, but can be variable in seasonal calving systems and should be adapted accordingly.
Pasture intake per cow per day	**kg DM/cow/day**	• Determining the required intake per cow can be a delicate balance between pasture and animal traits. See the sections on pasture intake requirement and potential dry matter intake to guide you on this decision.
Leaf emergence rate (days)	**Leaf number** ÷ **Days last grazed**	• Accurate leaf emergence rates can only be determined by doing leaf counts– so bend those knees and get counting. • Leaf emergence is primarily driven by temperature, but can also be affected by soil moisture and nutrient status. • Ryegrass, unlike forage herbs and Tall Fescue is particularly sensitive to grazing at the right time and can be your "go to" species when setting this "standard".
Target residual (kg DM/ha)	**Target pasture height (RPM) >> Input into calibration equation**	• This value is only as good as the calibration equation you use. For example, if it over-estimates pasture yield, high residuals will result in an over-estimation of pasture cover. • You will need to "set" the height for residuals. Keep in mind that pasture type can affect potential residuals i.e. higher residuals on kikuyu and lower residuals on forage herb dominant pastures.

(3.8 cows/ha x 14 kg DM/cow/day x 10 days) + 1900 kg DM/ha

Desired farm cover = 2432 kg DM/ha

Pasture intake requirement

There are a lot of equations to calculate the intake requirement of dairy cows, with almost as many parameters you can take into consideration.

The simplest equations relate intake to body weight, for example:

Intake requirement = Body weight (kg) x 4%

Although great in a pinch, the issue with this approach is that with dairy cows there is often more going on with the cow that requires additional energy to happen: milk production (milk liters and milk solids); pregnancy; body condition score gain; growth in heifers and 1st lactation cows; and on large farms even daily walks between the dairy and pastures. Pasture management for Tasmanian Dairy farmers (click here to access) has a very useful table that allows you to take some of these parameters into account (Table 1).

What should I keep in mind with this approach?

- In year round calving systems, it may be hard to define a "herd average" requirement for parameters like liveweight gain and pregnancy status.
- Does one base intake requirement on actual milk production (litres and milk solids) or what you aim to achieve?
- Even if we can accurately determine what our herd requires, can we get enough pasture through our cows based on pasture parameters like potential dry matter intake? And to play devil's advocate: are there species where we can get more pasture through our animals, like plantain?

Figure 1. Feed requirement for livestock (Pasture management for Tasmanian Dairy farmers)

Requirement parameter	Stock class	Energy requirement (MJ of ME/day)	Requirements (kg DM/ha/day)
Maintenance (based on liveweight)	200 kg	32	3.0
	350 kg	49	4.5
	400 kg (average Jersey)	54	5.0
	500 kg (average Friesian)	63	6.0
	600 kg (large Friesian)	73	7.0
Pregnancy (months)	6 months	8	0.5 kg extra
	7 months	14	1 kg extra
	8 month	25	2 kg extra
	9 months pregnant	43	3-4 kg extra
Liveweight gain (to gain one kg liveweight)	During lactation	34	6 kg extra
	Dry period	43	
	Jersey cow(1 CS = 26 kg)		156 kg*
	Friesian (1 CS = 42 kg)		252 kg*
Milk parameters	Milk yield liter	5.5	0.5 kg/litre milk
	Butter fat per kg	125	11 kg/kg butterfat
	Milk soldis per kg	85	6.5 kg/kg milk solids

Tips on using this table:

- Pregnancy and weight gain: in non seasonal herds you may need to "average" this value for intake requirement. Add about 1 kg/day
- Total liveweight gain requirement in seasonal herds can be calculated more accurately. Divide this figure above by the number of days the cows have to gain weight. For example, if the cows (Jersey) need to gain one condition score in 4 weeks, divide 156 by 28 days (6 kg DM/day).
- Milk production parameters: use only one of these as your "calculator". Your choice will be largely based on your main milk price driver: milk yield (milk yield per litre), butterfat content (butter fat/kg) or milk solids (milk solids/kg).

Potential pasture dry matter intake

Whereas pasture intake requirement is a parameter determined by the cow, potential pasture dry matter intake (DMI) is a parameter calculated from the neutral detergent fibre (NDF) content of the pasture. The most commonly used equation is:

Potential dry matter intake
= (120/NDF %)x (cow liveweight/100)

What should I keep in mind with this approach?

- Sampling of pastures under grazing can often give an inaccurate NDF value due to the sampling process itself.
- For example, in a spatially variable pasture (across the paddock) - where does one sample? On the highest, medium or lowest spot? In such cases, more samples are warranted.
- In a mixed pasture- is the sample on average representative of the pasture or are only some components sampled?
- Is the sample collected by "plucking" or cutting? Cutting is a better, since plucking can often only sample the top layer of the sward.
- Down to what height above ground level are samples cut/plucked- standard height above ground or the height pastures are typically grazed to?
- Cow grazing behaviour should not be ignored during sampling. Cows can (and will) graze selectively. This includes avoidance of moribund material (often in kikuyu), grazing certain species lower than expected (like chicory and plantain) and avoiding stems (reproductive grasses and lucerne). Sampling cannot take this into account.
- Novel species like forage herbs could have a much higher digestibility than the what the equation allows for. Higher digestibility = more rapid flow through rumen = higher intake potential.

How do I marry intake requirement and potential dry matter intake?

Approach both intake requirement and potential pasture intake as co-operating guidelines, with one additional tool: your observation skills. Use equations to calculate what your cows need and what the pasture can supply, but be logical:

Check your milk tank: Your best gauge of whether animals are getting enough feed! A drop in milk means you are not meeting requirements.

Observe cows mid-morning: In a well-fed herd, a proportion of your herd should be laying down and ruminating mid-morning. (Note: a high forage herb component in pastures may change this behaviour, with animals stopping grazing a bit earlier, then resuming sometime later).

Keep an eye on post graze residuals

1. Not just height, but what is left behind… selective grazing can be indicative of over-allocation. This may be less of an issue where followers can mop up high residuals.

2. However, if residuals are high and milk yield continues to drop, high NDF may be limiting intake.

Pasture wedges: the good , the bad and the ugly

Most pasture management software has a strong focus on the feed wedge, and with good reason. It is a excellent visual aid, with all data across the farm summarised in one place. But have you ever given thought to how the pasture wedge functions? The next section will unpack how the pasture wedge is constructed, how it can be used and some pitfalls to avoid when using it.

Building your feed wedge: An example

Step 1: Set your target cover

Target cover aims to calculate how much pasture (kg DM/ha) you require on a paddock to feed you herd.

Target cover = Stocking rate x Intake per cow x rotation length + target residual

= 3,8 cows/ha x 14 kg DM/cow/day x 30 days + 1900 kg DM/ha

Target cover: 3 496 kg DM/ha

Isn't this just the same as desired cover? No– desired cover indicates what we want on FARM SCALE; while target cover indicates what we want on PADDOCK SCALE.

Step 2. Decide on your target post graze residual

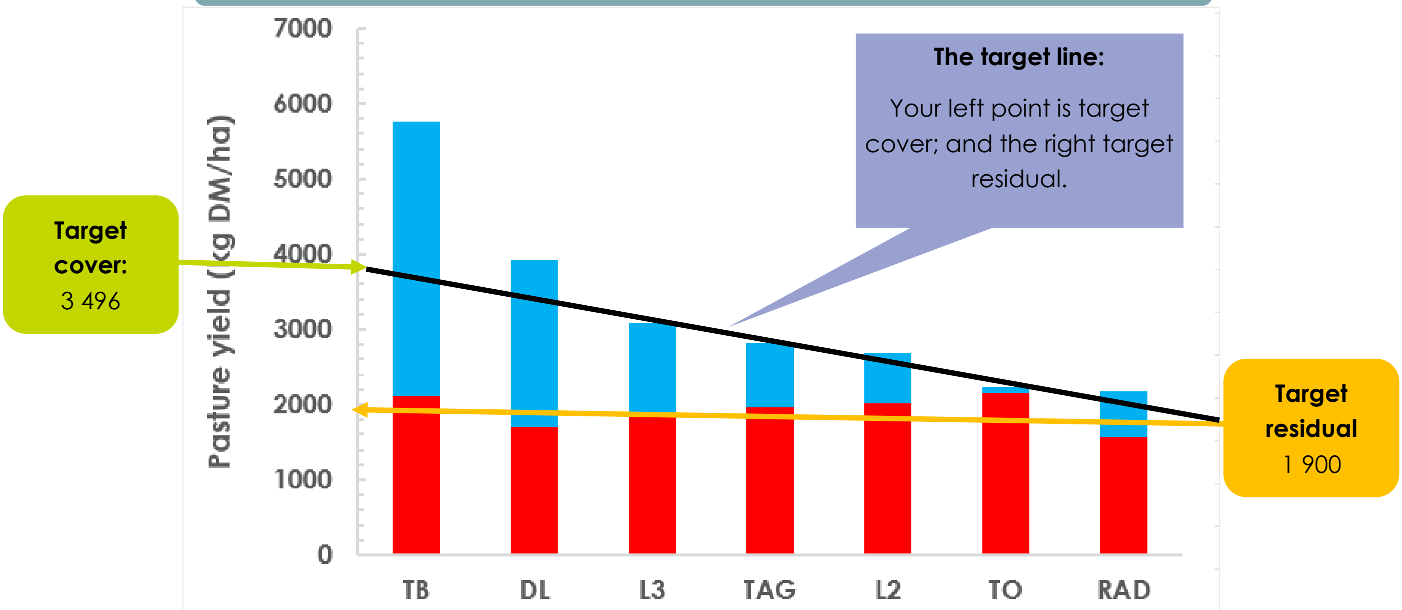
Your target residual is calculated by setting the "height" you want your pastures to be grazed to and then calculating the pasture yield at the set height. For example:

10 (rising plate meter height) x 140 + 500

Target residual: 1 900 kg DM/ha

Step 3: Plot your target line and paddock yields from the weekly walk

Example of a spring pasture wedge



Leaf #	2,75	2,25	2	1,75	1,25	0,75	-
Days	35	27	22	18	16	6	10

What can the pasture wedge tell you?

The target line is just that: when a paddock "bar" just touches it, that paddock is ready for grazing. If a paddock bar goes above the target line, it should have already been grazed or can be selected to cut for silage. In winter, your wedge will look a bit different. If all bars are well below the target line, animals will have to be supplemented with other roughage or feed sources.

What does the feed wedge NOT tell me?

- **When a paddock is ready to be grazed:** The wedge simply ranks paddocks based on yield. As result, where yield is lowered due to poor irrigation, nutrient deficiencies etc. the wedge may place some paddocks incorrectly in your "grazing queue ".
- **When to graze in the winter:** During winter, you may never reach "target pasture cover".
- **A wedge does not take into account paddock sizes:** This may seem irrelevant, but it means a pasture wedge cannot indicate how long animals need to be on supplements when below target cover or the area that needs to be cut for silage when above target cover.

Using herd or grazing days for fodderflow planning

The calculation of herd days is a great approach to making fodderflow decisions, and utilises data you should already have at hand if measuring your pastures.

Calculating herd days for the farm	
Yield per paddock	Available yield x paddock size
Herd requirement	Animal numbers x intake
Grazing days	Yield per paddock ÷ Herd requirement
Farm grazing days	Add grazing days for all paddocks

Using grazing days during spring

Note: These values are calculated using Outeniqua calibrations (see section on calibration equations in the next article). If you use other calibrations, you will need to subtract the target residual from measured yield first.

Name	RPM	kg DM/ha	Size (ha)	Yield/paddock	Herd days	Days LG	Leaf #
TB	38	2182	3,3	7189	8	35	2.75
DL	25	1385	5,9	8215	9	27	2.25
L3	18	1016	3,7	3734	4	22	2
TAG	17	905	4,5	4094	5	18	1.75
L2	16	840	3,8	3224	4	16	1.25
RAD	12	618	2,0	1223	1	10	0.75
TO	12	646	3,5	2244	2	6	-
Herd requirement = 100 cows * 9kg/day				Total herd days available	33		
Planned rotation: 28							

DECISIONS:

- **Herd days available (33 days) exceeds the planned rotation (28 days) by 5 days.**
- **The paddock "TB" can be cut for silage.**

Using grazing days during winter

Name	RPM	kg DM/ha	Size (ha)	Yield/paddock	Herd days	Days LG	Leaf #
TB	16	837	3,3	2757	3	18	1.25
DL	15	796	5,9	4723	4	13	0.90
L3	10	515	3,7	1893	2	7	0.75
TAG	12	644	4,5	2911	3	24	2.50
L2	20	1089	3,8	4179	4	-	3.00
RAD	20	1088	2,0	2153	2	28	2.75
TO	17	919	3,5	3194	3	30	3.00
Herd requirement = 100 cows * 10.8 kg/day				Total herd days available	20		
Planned rotation: 40							

DECISIONS:

- **Herd days available (20 days) is only half of planned rotation (40 days) .**
- **Animals should be on bales for half the day.**

Allocation of pasture

Pasture allocation on a day to day basis is one of the management decisions that can be notably improved upon by using pasture measurement data.

An added advantage of using the "herd days" approach is that you now have a easy tool to **allocate pasture to your animals**. Simply divide the are of the paddock by the double the herd days. For example Area to allocate = 3.3 ha/ (8 herd days X2) = 0.2 ha/grazing.

Concluding remarks

Developing insights into how common pasture "goals" are calculated from pasture measurements and herd parameters is a great way to get more out of your weekly walk. To make pasture measurement worth the time and effort, ensure you make use of it in all possible ways: deciding when and where to cut silage; deciding when to feed silage and for how long; and lastly to do allocate pastures.

The key to success is to make data driven decisions, but also observe what is happening on the ground in terms of milk yield and residuals to tweak targets.

Measuring pastures with satellites: what you need to consider

Janke van der Colf

Western Cape Department of Agriculture, Research and Technology Development, Directorate Plant Sciences, Outeniqua Research Farm, P.O. Box 24, George 6530

Janke.vandercolf@westerncape.gov.za

Introduction

Technology development and adoption has been a major driver of efficiency in the broader agricultural industry. "Precision farming" is the new buzz word– and automation is at the centre of it.

Yet, in pasture based dairy systems the most widely used measurement method still remains the rising plate meter. Weekly farm walks, and the huge amount of time they can take on very large farms, is often the primary reason pastures yields are not measured. So are there options to automate this process? Yes! Pasture IO is a company that provides a platform whereby pasture yield is measured using satellite imagery. (Visit their site for more information).

The question of course remains: does it work? The purpose of this article is to discuss some lessons learnt in the early "on boarding" phase of the Outeniqua Research Farm onto the Pasture IO platform.

Getting the most out of Pasture IO

So you have decided to adopt Pasture IO onto your farm– now you can stop manually measuring pastures, right? Unfortunately not. To get the most out of the Pasture IO, you will still have to measure manually to "proof" the system.

Pasture IO has a strong focus on machine learning- and herein lies its strength. The models used to predict pasture yield from satellite imagery are constantly adapted to maximise accuracy for your particular farm and paddocks. But the model needs data to learn from, and this is where your success with Pasture IO is largely dependant on what you "teach" it. Think of it as learning a new language. If you want to learn French, it is no use buying a Italian phrase book…

Pasture IO recommends that you read in at least 6 months historical pasture data (from rising plate meter readings) once you have subscribed to the software. This allows the program to "learn the language" of your particular farm. Although it may seem logical, the more data you feed it, the more accurate it gets– so going beyond the six months could be of value.

The other major input that is integral to improving the accuracy of Pasture IO estimations the recording of "Grazing". The cyclical removal and re-growth of green material in a grazed system is one of the major challenges when developing models for pasture based systems, and seems to have been solved by Pasture IO.

Junk in = Junk out: Calibration equations

Figure 1 shows different ways to cut samples for calibration development of the rising plate meter. On the Outeniqua Research Farm, calibration equations for research are cut at 50 cm above ground. Although these calibration equations are good for research and pasture allocation, they are a poor fit for most software programs where residuals form a large part of outputs and calculations (target cover and available biomass). The same is true with Pasture IO.

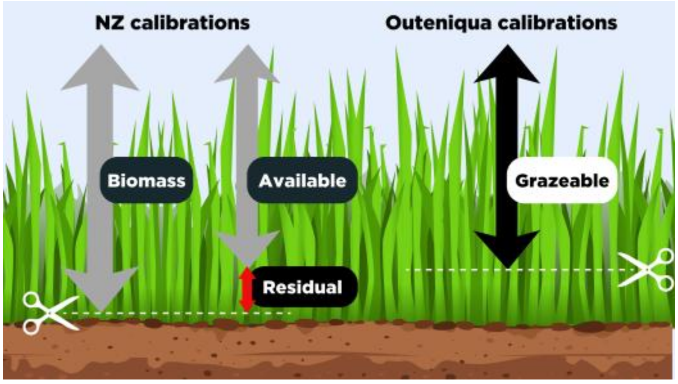


Figure 3. The difference between Outeniqua and typical NZ calibrations for the rising plate meter

Which led us to ask the most difficult question when measuring with a rising plate meter: which calibration equation should I use? Should it be adapted according to pasture type? Should it be adapted seasonally?

With this in mind, grazing and animal data collected during a system trial conducted on the Outeniqua Research Farm from 2019 to 2022 was used to determine how intake calculated from different calibration equations compared to intake calculated from potential pasture dry matter intake (based on NDF) and intake back calculated from milk data on a monthly basis. Below are the equations used:

- **Measured intake** = [(Pre-grazing pasture yield (kg DM/ha) - Post-graze pasture yield (kg DM/ha) x Paddock size (ha)]/cow days
- **Potential DMI** = [120/NDF content (%)] X [Average cow weight (kg)/100]
- **Intake based on milk** was back calculated using the values indicated in the previous article

Two pasture types were included to determine whether pasture type should be considered important when selecting a calibration equation:

- Tall Fescue_Plantain_Red clover mixture
- Ryegrass_Chicory_Lucern Mixture.

The calibration equations used were obtained on the Pasture IO website:

- A general equation recommended by Pasture IO of ***RPM height x 140 +50***
- TRU-test seasonal equations
- Dairy NZ seasonal equations

The total pasture yield (t DM/ha) data for the Tall Fescue_Plantain_Red clover mixtures is shown in Figure 2 and the Ryegrass_Chicory_Lucerne Mixtures in Figure 3. Both figures show that the difference in total yield is often negligible when varying calibration equations seasonally. Thus the general equation (Height x 140 +500) should suffice.

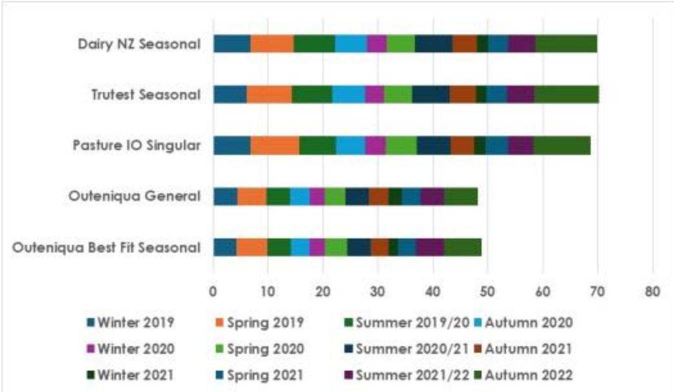


Figure 3. Total yield (t DM/ha) over three years for a Tall Fescue_Plantain_Red Clover mixture calculated with different calibration equations.

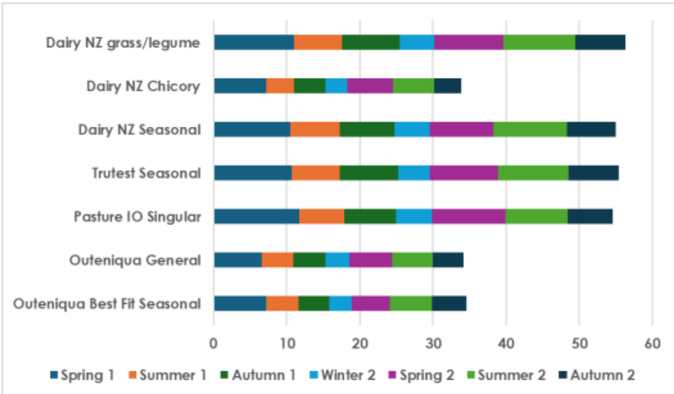


Figure 4. Total yield (t DM/ha) over three years for a Ryegrass_Chicory_Lucerne mixture calculated with different calibration equations.

The question is though– is there something one should adapt? The easiest and most logical parameter would be the amount of pasture you allocate… In order to determine what these allocation values could be, the Potential DMI, Intake based on milk and intake calculated by the Pasture IO calibration were plotted for the Tall Fescue_Plantain_Red clover mixture (Figure 5) and the Ryegrass_Chicory_Lucerne mixture (Figure 6).

Under ideal conditions Intake predicted from milk yield and potential DMI should be as close to each other as possible. If intake predicted from milk yield is well below potential DMI, it could indicate that

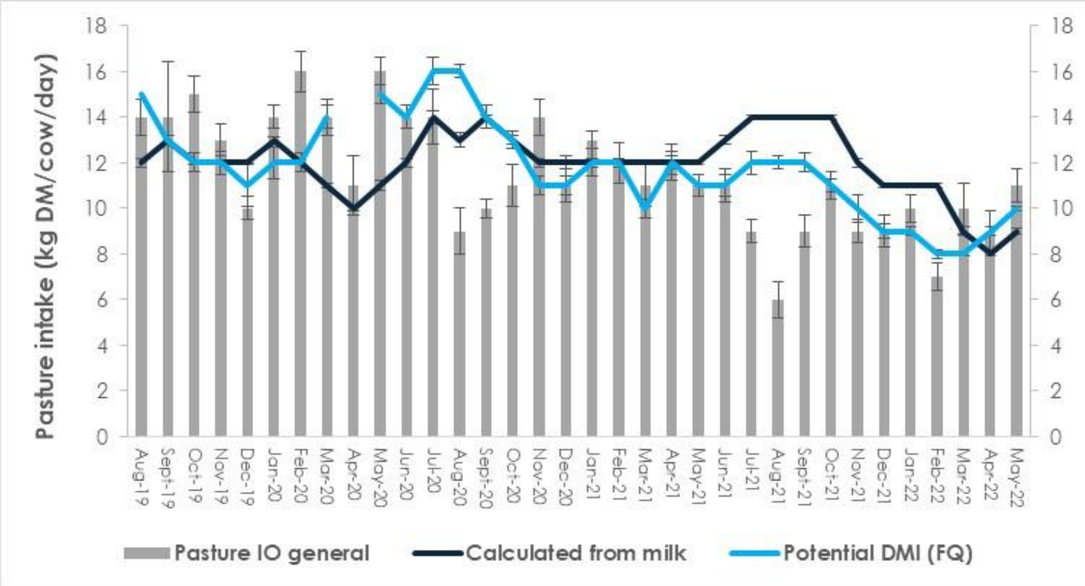


Figure 5. Intake estimation (kg/cow/day) over three years for a Tall Fescue_Plantain_Red Clover mixture

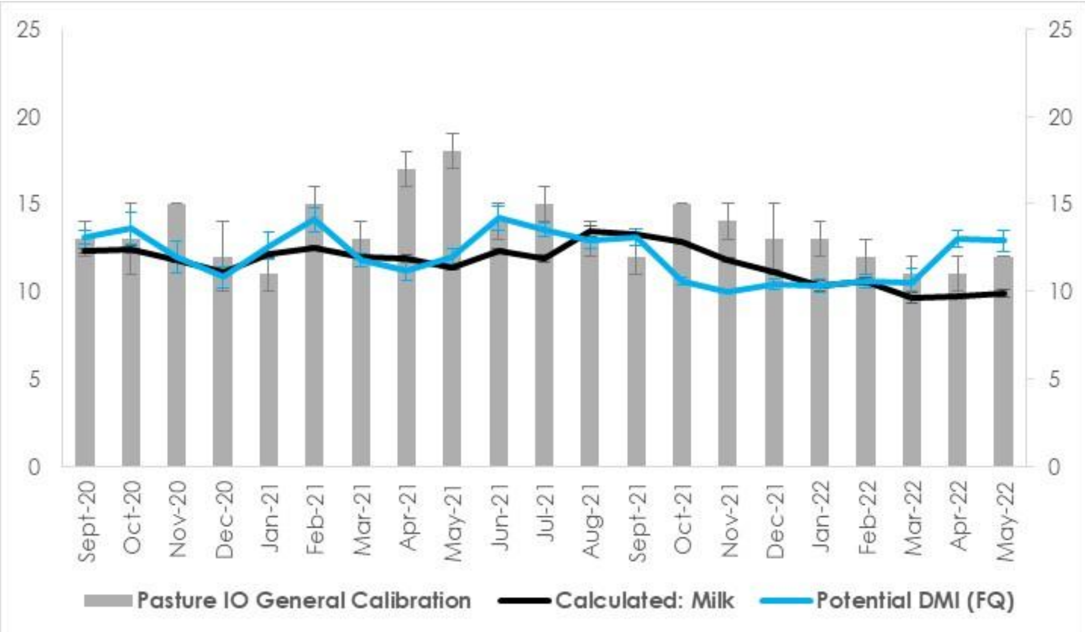


Figure 6. Intake estimation (kg/cow/day) over three years for a Ryegrass_Chicory_Lucerne mixture

pasture allocation was too low. This was used to "tweak" what is allocate per cow per day in a particular month. So why is this all important? Within Pasture IO you will need to set up monthly targets, of which target cover is one, a parameter calculated with Pasture intake as one of the inputs. Accurate target inputs will allow you to make use of the "grazing days" feature in the application– a great tool to help you manage pasture allocation and fodder flow.

On Outeniqua we will likely allocate between 12 and 13 kg DM/ha/day, lowering it to 10 kg when kikuyu is a major component and increasing it to 14 kg when chicory is a major component.

Concluding remarks

Thus far estimations of pasture yield from Pasture IO have been very close to measured yields on the Outenqiau Research Farm. However, this is likely because of the continued input of data, both grazing and manual readings. Pasture IO should thus not be viewed as a replacement for weekly walks– but an additional tool to aid in decision making processes and take some pressure of by maybe only needing "bi-weekly" walks.

We would like to Acknowledge Nova Feeds for sponsoring our subscription to Pasture IO for the first year.

Unlocking Profit and Sustainability with the DESTiny Model

Riana Reinecke
ASSET Research & University of Stellenbsoch
riana@farmvision.co.za

Introduction

As a dairy farmer, you've likely heard the constant drumbeat about greenhouse gas emissions from livestock. For years, the story has been simple: cows produce methane, manure and fertilizer lead to nitrous oxide, and your farm is part of the climate problem. It's a linear tale. One where inputs go in, emissions come out, and the focus is solely on cutting those outputs to meet regulations or market demands. But what if that story is missing half the picture? What if your farm isn't just an emitter, but a living ecosystem that captures carbon, builds soil, and even turns a profit while doing it?

Today, many approaches to dairy sustainability still rely on a linear, 'emission-only' mindset; counting what leaves the farm but missing how carbon is also cycled and captured within the system. DESTiny (Dairy Environmental Sustainability Tool) directly challenges this by adopting an integrated system dynamics approach that treats the farm as a living web of cycles, where nutrients, carbon, water, and economics are all connected. DESTiny was developed as part of a PhD research in the Agronomy Department at Stellenbosch University, supported by funding from Milk SA. This is the first tool that accounts for biogenic carbon, measuring not only emissions but also the positive effect of carbon stored in pastures and soils (Reinecke et al., 2024; 2025). Freely available at the ASSET Research website (assetresearch.org.za/destiny-tool/), DESTiny empowers pasture-based dairy farmers to see their whole system. By tracking emissions, carbon flows, soil health, and profit together, farmers gain a comprehensive understanding of their operations, enabling them to optimize both environmental sustainability and economic returns.

Counting Emissions Without the Full Cycle

For decades, the way we've measured dairy farm impacts has been straightforward but limited. Traditional carbon accounting, think life-cycle assessments (LCAs) or standard GHG calculators, focuses on a one-way flow. Feed goes in, milk comes out, and emissions (like methane from cow burps or nitrous oxide from soil) are tallied up. These methods often report emission intensities for pasture-based systems around 1.02 to 1.40 kg CO_2-equivalent (CO_2e) per kg of fat- and protein-corrected milk (FPCM). It's a linear view: emissions are harmful, so reduce them by cutting herd sizes, switching feeds, or adding inhibitors.

This approach has its roots in early climate science, as seen in the IPCC guidelines from 2006, which emphasized quantifying sources without fully integrating the farm's natural sinks. It's like balancing your books by only looking at expenses, ignoring income from ecosystem services, such as carbon storage. As a farmer, this leaves you defensive: you're labelled a polluter, facing policies that might penalize production without rewarding the good you're already doing, like building healthy pastures that pull CO_2 from the air.

But farms aren't factories; they're dynamic ecosystems. Enter system dynamics thinking, inspired by models like those in ecology and economics. This holistic view encompasses feedback loops: better soil health leads to more productive pastures, which in turn feed healthier cows, resulting in reduced emissions per liter of milk while capturing more carbon in roots and biomass. It's cyclical, not linear. Actions in one area ripple through the whole system. Tools like DESTiny embody this by simulating these loops, using data from your farm to predict not just emissions, but net impacts, including sequestration.

Figure 1 highlights the web of connections within a dairy farm, where tweaking one part, like pasture or management, ripples through the whole system.

Here's how the main factors interact to shape outcomes on a real pasture-based operation:

Grass and legumes help store more carbon in your soils and lower greenhouse gases.

Better management means healthier pastures, better milk production, and stronger farm finances.

Emissions from cows and manure can be managed and reduced with wise choices.

Regulations and markets encourage farms to run cleaner and more profitably.

When carbon is balanced, a farm can benefit both the climate and its bottom line.

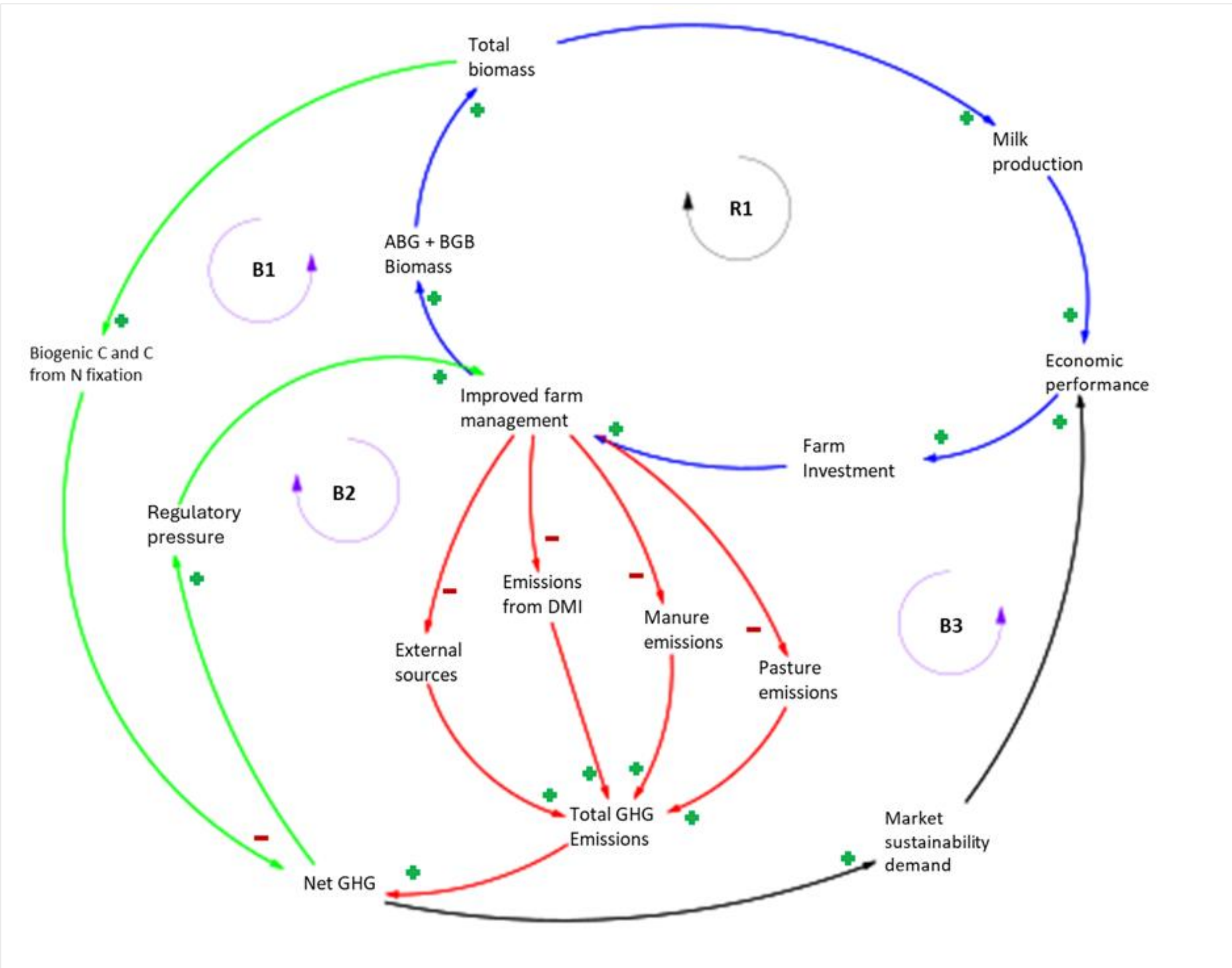


Figure 1. Feedback Loops in Dairy Farm Carbon Balance

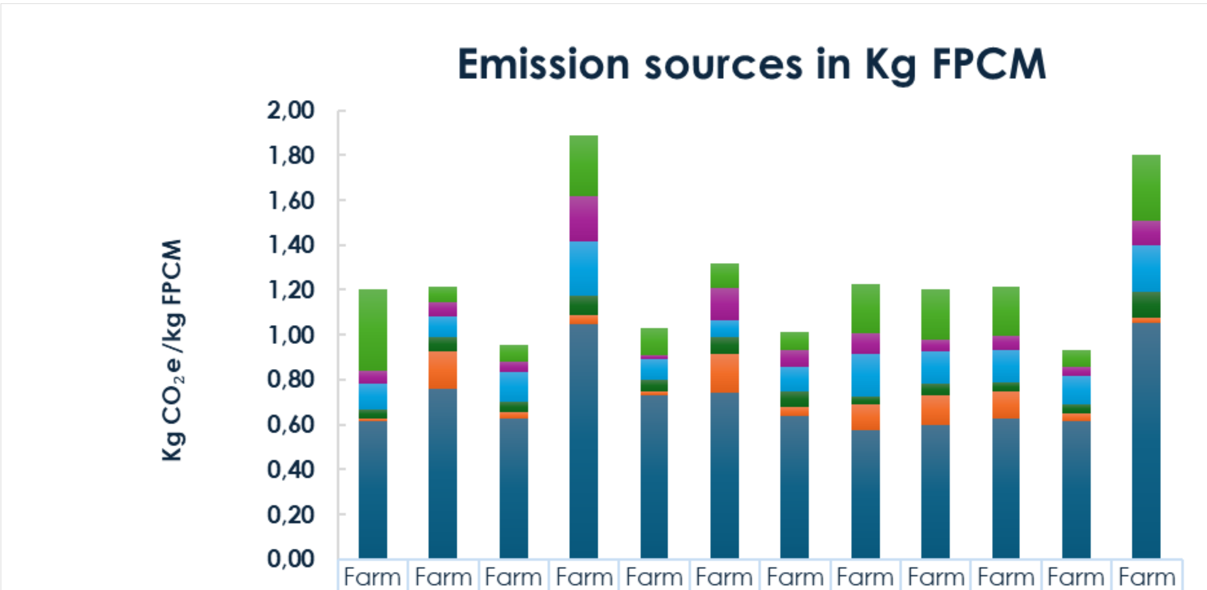
DESTiny's Take on Emissions: Lower Than Expected, Driven by Efficiency

When DESTiny was applied to 12 pasture-based farms along the Garden Route in South Africa, the results defied expectations (Figure 2). Traditional methods might estimate emissions at 1-1.4 kg CO_2e/kg FPCM, but DESTiny's detailed breakdown revealed sources like enteric methane (from cow digestion) accounting for about 57.7% of total emissions across the farms. Manure and soil nitrous oxide contributed additional portions, with external inputs, such as fuel and fertilizer, accounting for up to 14% of the total.

But here's the surprise: actual emissions were often lower than the linear benchmarks suggested, especially on well-managed farms. Why? Efficiency factors traditional tools overlook. DESTiny highlights how tweaking animal, pasture, and soil indicators can slash emissions without sacrificing yield.

Take animal-related efficiencies. Feed efficiency, measured as kg FPCM per kg dry matter intake (DMI), emerged as a game-changer. Farms with efficiencies above 1.15 saw a 10-20% drop in enteric methane compared to lower performers. Why? Cows convert feed to milk more effectively, producing less waste gas. Neutral detergent fiber (NDF) intake also matters; moderate NDF levels (around 40-50% of DMI) reduce manure methane by supporting better digestion. For example, one low-input farm with 42% NDF in farm-produced feed had volatile solids (undigested waste) at just 6 kg/cow/day, well below the study average, cutting emissions. As a farmer, this means focusing on balanced rations, mixing high-quality forages with targeted concentrates, to hit that sweet spot of 1.2+ feed efficiency.

On the pasture side, yield per hectare tells a big story. Farms averaging 15-19 tons DM/ha/year had lower emissions per kg milk because more homegrown forage means less purchased feed (and its embedded emissions). No-till adoption, seen in 79% of low- and moderate-input farms,



	Farm 1	Farm 2	Farm 3	Farm 4	Farm 5	Farm 6	Farm 7	Farm 8	Farm 9	Farm 10	Farm 11	Farm 12
External inputs	0,37	0,07	0,08	0,27	0,12	0,11	0,08	0,22	0,22	0,22	0,08	0,29
Pasture management	0,06	0,06	0,04	0,20	0,02	0,14	0,07	0,09	0,06	0,06	0,04	0,11
Soil N_2O	0,12	0,09	0,14	0,24	0,09	0,08	0,11	0,19	0,14	0,14	0,13	0,21
Manure N_2O	0,04	0,06	0,04	0,09	0,05	0,07	0,07	0,04	0,05	0,04	0,04	0,11
Manure CH_4	0,01	0,17	0,03	0,04	0,02	0,17	0,04	0,11	0,13	0,12	0,03	0,02
Enteric CH_4	0,61	0,76	0,63	1,05	0,73	0,74	0,64	0,58	0,60	0,62	0,62	1,05

Figure 2. Greenhouse gas emission sources across 12 studied farms

reduced soil disturbance, cutting nitrous oxide by up to 20%. A negative correlation between tillage intensity and soil N_2O emissions backs this: less ploughing preserves soil microbes that lock away gases.

Soil-related indicators bring the whole picture together. DESTiny calculates nitrogen use efficiency, which recent results put at about 29–30%, to show how much applied nitrogen is actually used in production versus lost to the environment. Farms that recycle manure effectively, applying it back onto pastures, generally see lower N_2O emissions, since plants take up more nitrogen and less is left over to escape as gas. For practical steps, DESTiny encourages close tracking of nutrient flows, improved manure recycling, and good soil management to support both productivity and sustainability.

DESTiny's insight? Emissions aren't fixed, they drop when efficiencies rise. Low-input farms averaged -1.55 kg CO_2e/kg FPCM net (a sink!), proving regenerative tweaks outperform linear cuts.

Enhancing Sequestration: Biomass Capture and Legumes as Your Allies

The real revolution happens when we incorporate carbon capture into the equation. Linear thinking overlooks this, but system dynamics includes it: pastures aren't just feed sources; they're carbon sinks. DESTiny calculates aboveground biomass (AGB) from forage growth and belowground biomass (BGB) from roots, turning your land into a carbon sink (Figure 3).

Across the 12 farms, AGB captured 50.8% of total sequestration (-126,000 tonnes CO_2e), driven by vigorous pasture growth under rotational grazing. BGB contributed 19.6% (-48,519 tonnes), as deep roots store carbon long-term. Legumes enhance this process: by fixing nitrogen from the air (up to 0.02 kg CO_2e/kg FPCM sequestered), they reduce fertilizer needs while increasing biomass. Farms with 20-35% legumes in pastures saw sequestration rise 15-30%, with yields remaining steady at 11-19 tons DM/ha.

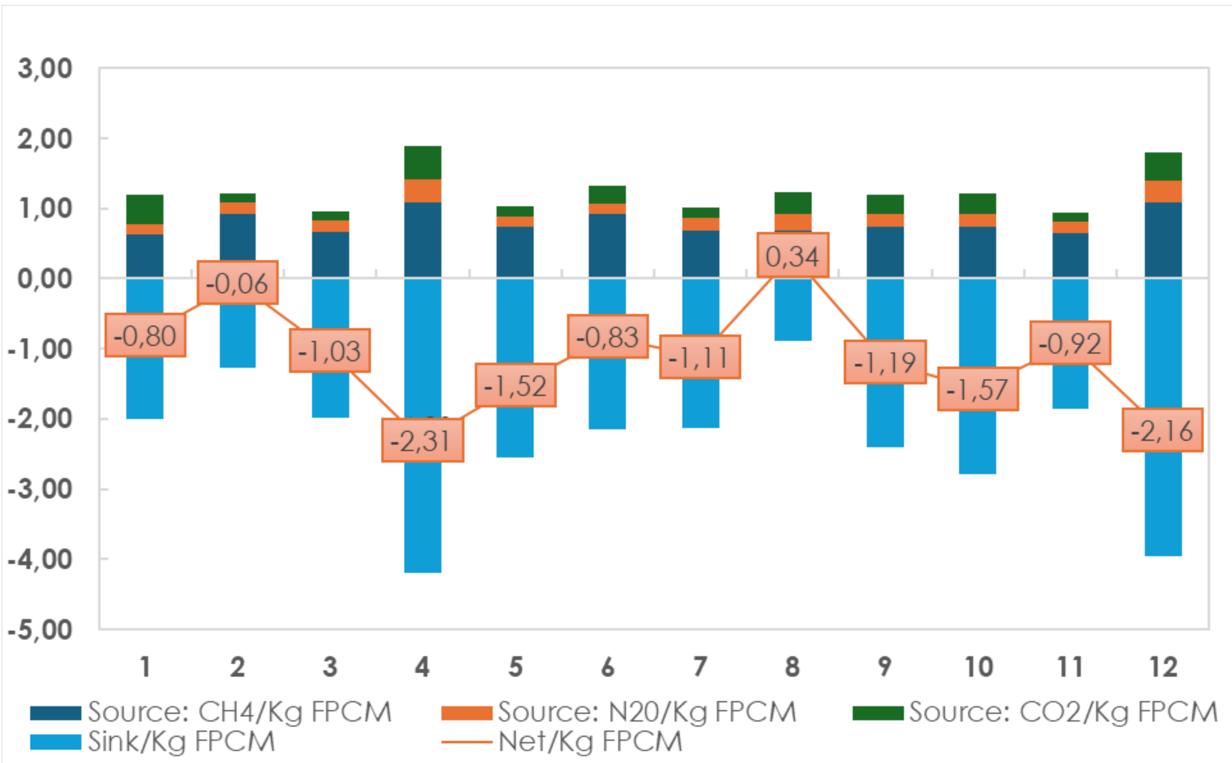


Figure 3. Carbon Sequestration Components by Management System in kg CO_2e/kg FPCM and Net GHG per farm

For farmers, this means practical upgrades: incorporate clovers or lucerne into mixes for N fixation (aim for 25-30% legumes), adopt no-till to protect roots, and optimize stocking (2-3 LSU/ha) for even grazing. One study farm went from emitter to sink by adding legumes, capturing an extra 0.5-1 kg CO_2e/kg FPCM. It's ecosystem thinking in action. Legumes feed soil microbes, which build aggregates, improving water infiltration and resilience to droughts.

Net GHG and the Economic Payoff: Profit from Being a Sink

DESTiny adds up both sides of the carbon equation, greenhouse gas (GHG) emissions minus sequestration, revealing that 11 of 12 farms were net sinks, not sources. Across all systems, net GHG fluxes ranged from about +0.34 to -2.31 kg CO_2e/kg FPCM. Low-input farms led the way with a median of -1.55 kg CO_2e/kg FPCM, while moderate-input farms reached -1.07 and high-input farms -0.43, directly challenging the outdated view that all dairies are 1+ kg emitters per FPCM.

DESTiny's results show a strong link between climate -smart farming and financial returns when measured per kilogram of milk (Figure 4). As net GHG emissions per kg FPCM drop, profit per kg

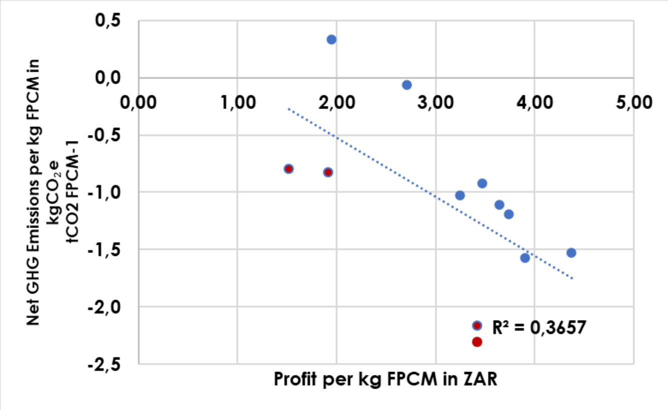


Figure 4. Net GHG Emissions vs. Profit per kg FPCM (ZAR)

FPCM rises, with farms capturing more carbon, consistently earning better margins in rands. In this group, profits ranged from about R1.52 to R4.37 per kg FPCM, and those with the lowest (most negative) net emissions were among the most profitable. In short, making the farm a carbon sink not only lowers environmental impact but also boosts profit per litre of milk produced.

Your Farm's Future: Embrace the Cycles

The waterfall diagram (Figure 5) is a powerful visual tool that reveals exactly where carbon is gained and lost on dairy farms, helping farmers identify which parts of their operation offer the most

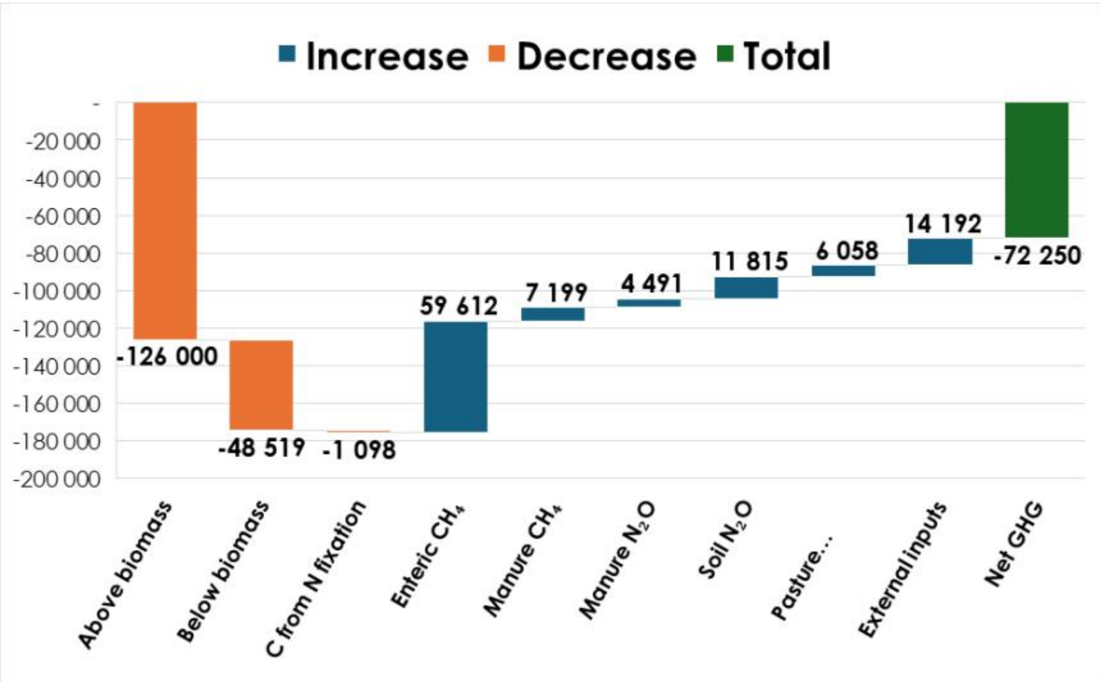


Figure 5. Waterfall Diagram of Total sinks and sources in t CO_2e

significant potential for both climate and business benefits. Each bar in this diagram represents a substantial step in the farm's annual carbon cycle. The large orange bars on the left, above- and belowground biomass, highlight the true strength of pasture-based dairies: capturing and storing carbon in grass, deep roots, and healthy soils. The smaller blue bars in the middle, including emissions from enteric methane (from cows), manure, soil processes, and external inputs, represent the well-known sources of greenhouse gases. The green bar at the far right shows the net greenhouse gas result after all gains and losses are accounted for. In this study, the total for all twelve farms combined was –72,250 tonnes of CO_2e, meaning these operations, in total, removed more carbon from the atmosphere than they emitted.

For farmers, this diagram demonstrates that the cows and the land they graze are not simply emission sources, but can be part of the solution. Healthy pastures, thriving roots, and well-managed legumes make the orange carbon-storage bars larger, tipping the balance in favour of the climate. When manure is recycled back onto fields, external feed and fertiliser inputs are moderated, and cows graze productively, the blue emissions bars shrink, and the farm's net carbon footprint improves. Seeing cows as part of the solution flips the old narrative. With intelligent management and the help of tools like DESTiny, many South African pasture-based dairy farms already operate as net carbon sinks. This approach puts complex numbers to the climate story behind the milk, proving that good stewardship not only supports sustainability but also makes business sense and enhances the standing of dairy in broader society.

Every choice, from pasture mix to manure handling, feeds into both the climate footprint and the business results. By seeing the connections, farmers can make improvements that benefit the whole farm and secure better market prices. Let's build dairy's sustainable future, one cycle at a time.

Shifting from linear emissions tracking to system dynamics isn't just science; it's smart farming. DESTiny, free online at assetresearch.org.za/destiny-tool/, lets you plug in your data for custom scenarios. Start small: test legume mixes, track feed efficiency, minimize tillage. The payoff? Resilient, profitable farms that fight climate change. Visit today and turn your farm into a carbon sink.

Acknowledgements:

This research reflects the combined contributions of several key groups and individuals. The project was conducted through the Department of Agronomy at Stellenbosch University, with academic leadership from Prof. Pieter Swanepoel and Prof. James Blignaut (ASSET Research), both of whom served as study leaders and co-authors. Funding and research input were provided by Milk SA, with Dr. Heinz Meissner (Research and Development) also acting as co-author. The participation and cooperation of the involved farmers, who contributed essential data and insights, are gratefully acknowledged.

References

Reinecke, R., Blignaut, J., Meissner, H., and Swanepoel, P.A. 2024. Advancing carbon sequestration and nutrient management in the South African dairy industry for sustainable growth. Front. Sustain. Food Syst. 8:1397305. https://doi.org/10.3389/fsufs.2024.1397305.

Reinecke, R., Blignaut, J., Meissner, H., and Swanepoel, P. 2025. DESTiny, an online farm-wide tool to estimate the net carbon emissions of a pasture-based dairy farm in South Africa. Front. Sustain. Food Syst., 9:1491973. doi: 10.3389/fsufs.2025.1491973.