High Production Annual Forage in Perennial Systems

INTERIM REPORT 2; Date: 20/06/19 **Project Code: L.PDS.1708**

Report prepared by Rob Shea PPS & Lisa Miller Project consultant

Background

Perennial pasture establishment is an important part of the productive lamb producing systems in the region but it is an expensive process ($450/ha estimate) and carries significant risk of failure due to the possibility of lower than average annual rainfall with late autumn breaks. Many producers are complimenting their perennial pastures by sowing a small percentage of their farms to high producing annual forage. This is evident in the PPS pasture survey from 2016 which showed a large increase in the establishment of short term ryegrass based pastures in the region; this trend has continued since the first survey in 2012.

This reflects producers attempting to fill a feed deficit during winter and early spring when high quality pasture is required for pregnant or lactating ewes. This process also gives producers the ability to protect their long term perennial pastures from overgrazing early in the season.

While a number of PPS members are using high production annual forages, the observation was that they are often achieving sub optimal results due to sub optimal soil fertility and sowing rates of the annual forages. Significant production opportunities are being missed in the pursuit of reducing establishment costs.

Other considerations such as including sub clovers or attempting to salvage grain from grazing cereal can also compromise the results. Research has determined the economic optimum sowing rate in Annual and Italian ryegrass but these rates are rarely applied to lamb grazing enterprises in the drier regions of Central Victoria.

It is often believed that lower rainfall requires a lower annual forage sowing rate. However Harmer *et a*l. found a high sowing rate in annual forage increases production during winter when water is non-limiting, fulfilling the intended purpose of sowing the annual forage. The producers who are currently using high producing annual forage have recorded production and management system gains but they are looking to quantify the economic gains from its use.

The aim of this project is to demonstrate the production, financial and grazing management benefits of high production annual forage systems in perennial grazing systems in low to medium rainfall regions (500 to 550 mm) of Central Western Victoria. Analysis of production, economics and control comparisons will be completed in 2017, 2018 and 2019; a full report will be completed at the conclusion of the demonstration.

Methodology

PPS appointed an advisory group to oversee the project. This group includes PPS members Charlie de Fegely, Lachie Green, Duncan Thomas and PPS manager Rob Shea and project consultant Lisa Miller.

In 2017 three already established sites were chosen in May after the project was accepted in the MLA PDS program. Two grazing cereal sites and one ryegrass site were included in the 2017 demonstration. Five sites were established for the 2018 demonstration (Fig. 1 & Table 1).

2018 had below average rainfall at all sites, although the Pigeon Ponds site was closet to average having good autumn and early winter rains. September had very much below average rainfall that affected spring production at all sites.

Dry matter production and feed quality was measured at all sites.

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Table 1. Demonstration summary

High production annual forage	Control	Site
High Production Annual Ryegrass Pasture	Current practice annual grass pasture. (lower seed rates, standard fertiliser).	Mokepilly South; Lake Fyans
Grazing cereal – Moby Barley	Grazing cereal – Winteroo oats	Overdale; Concongella
Grazing cereal – Winteroo oats	Degraded pasture	South Glengowan; Joel Joel
(1) Tetilla ryegrass (2) Moby Barley	Phalaris based pasture	Paradoo; Pigeon Ponds
Barberia Ryegrass	Phalaris based pasture	Quamby; Dobie

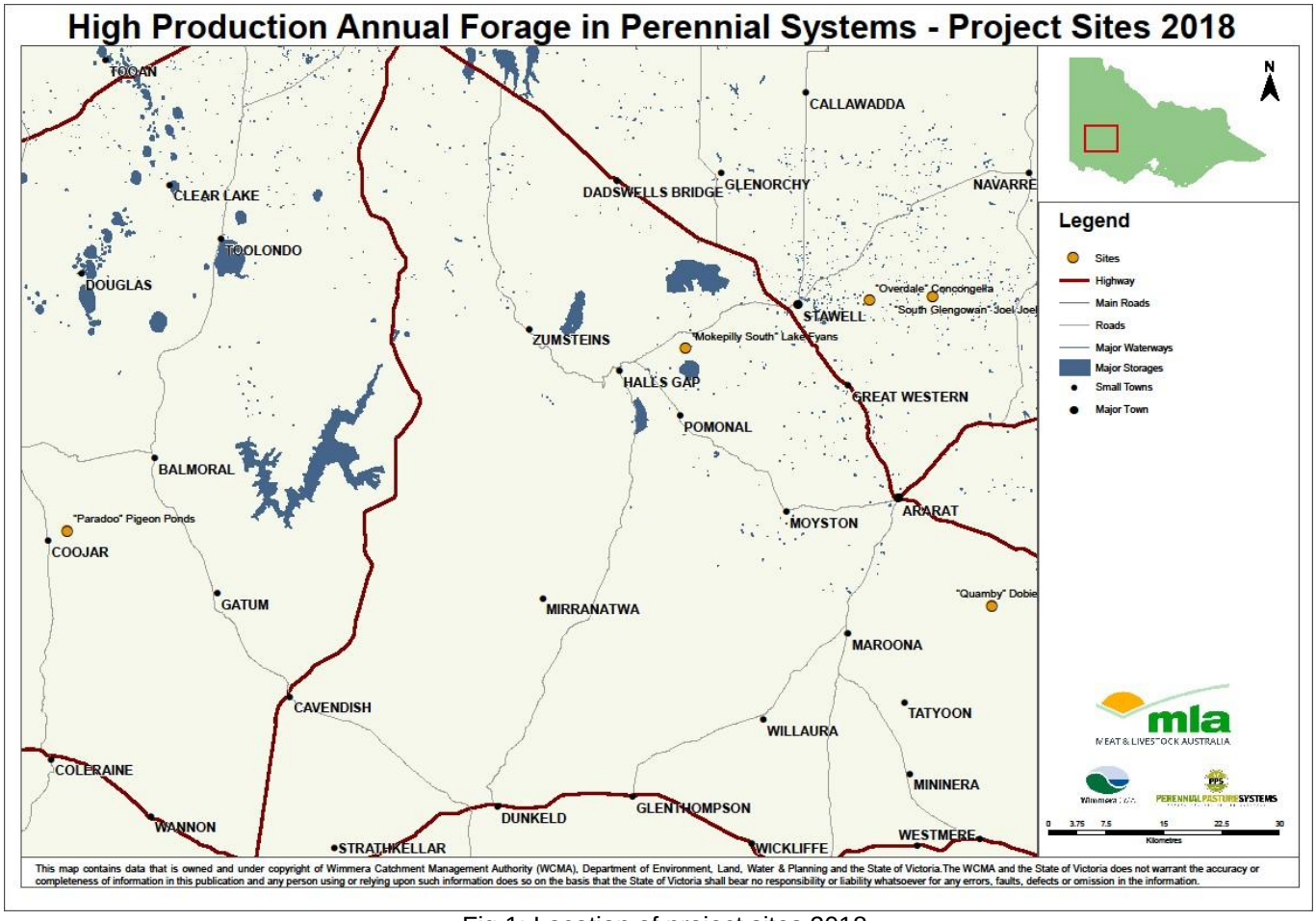

Fig.1: Location of project sites 2018

The graph below shows the 2018 rainfall for Stawell

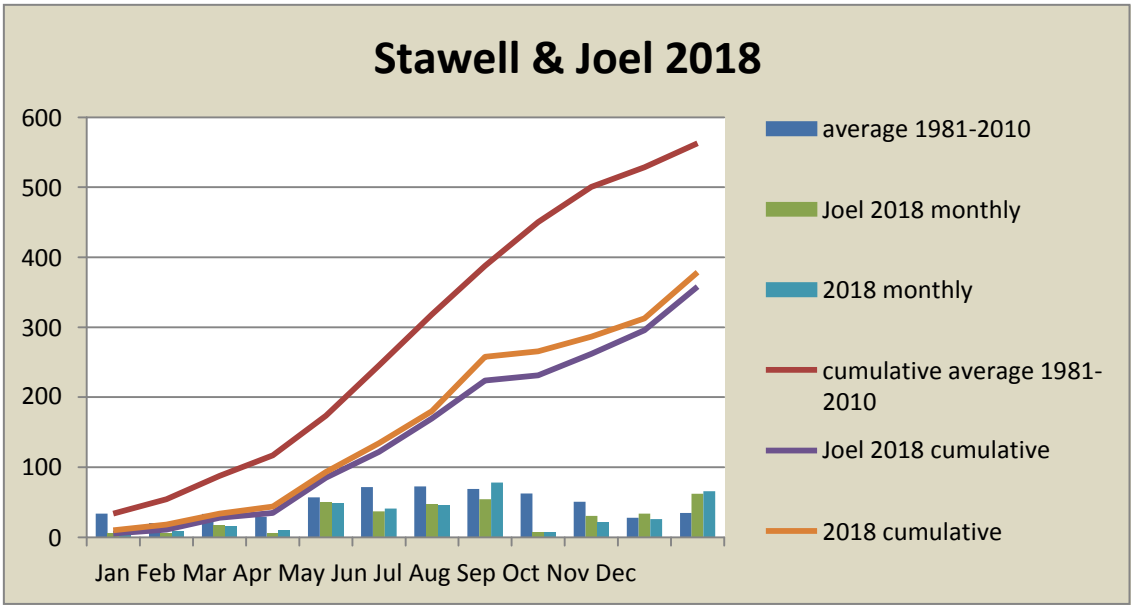

Fig.2. Stawell rainfall 2018

Annual gross margins have been estimated for some paddocks using variable costs such as animal health, selling costs, shearing costs and supplementary feed costs. These costs have been taken from Livestock monitor 2017/2018 program results for South West Victoria Prime Lamb enterprises using variable costs taken from the top 20% figures.

Demo Site 1. Italian Ryegrass

Location: "Martang South/Mokepilly South" Lake Fyans
Owners, Lachie and Minnie Green

Background
It is known that higher sowing rates grow more early feed provided moisture and fertility is not constraining production (Harmer, 2015). This demonstration investigates the costs and benefits of sowing higher seeding rates of annual ryegrass and the strategic use of nitrogen in a drier region.

Trial Inputs and Design
Tetila short term ryegrass (Italian diploid ryegrass) sown at "conventional" rate of 16 kg/Ha and compared with the "double" rate of 32 kg/Ha. Different fertiliser rates were also compared as was the use of nitrogen in early spring.

A trial strip of Ortet ryegrass, sown at 16 kg/Ha was also measured as a comparison to the Tetila. The ryegrass establishment is part of a medium term plan to increase the paddock's fertility and production.

The paddock was sown on May 20th with 100 kg/Ha DAP fertiliser (Nitrogen 18%, Phosphorus 20%, Sulphur 1.6%) and also a double fertiliser rate at sowing strip applied. The paddock establishment was late due to the late autumn break and lack of soil moisture on Martang South. Grazing commenced in August.

Table 2; Average monthly stocking rate at "Martang South" and grazing times

Month	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Av. Year
DSE/ha					10.4	16.6	2.8	2.4		**6.3**

Liquid N was applied to to the paddock in early August. Pasture cages were placed in the paddock to allow the collection of pasture cuts for DM measurement. Nitrogen in the form of urea was applied to some of the cages in each treatment in early September.

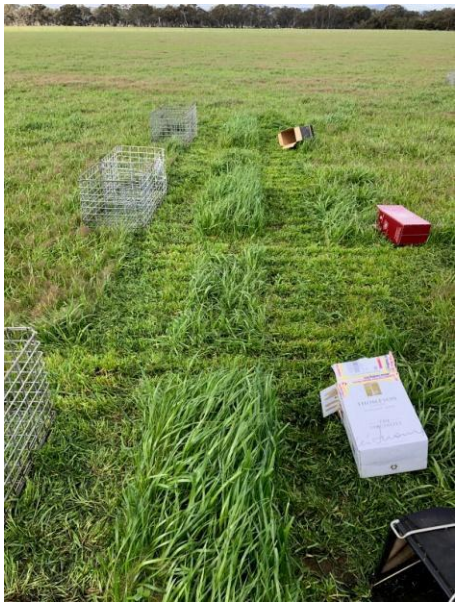

Fig.3. Italian ryegrass site at Martang South September 2018

Results

Dry Matter production

The dry matter production results are shown in the graphs below. The demonstration strips were not replicated. (S1 – Tetila 16 kg/ha, S2 – Tetila 32 kg/ha, F1 – MAP 100 kg/ha, F2 - MAP 200 kg/ha).

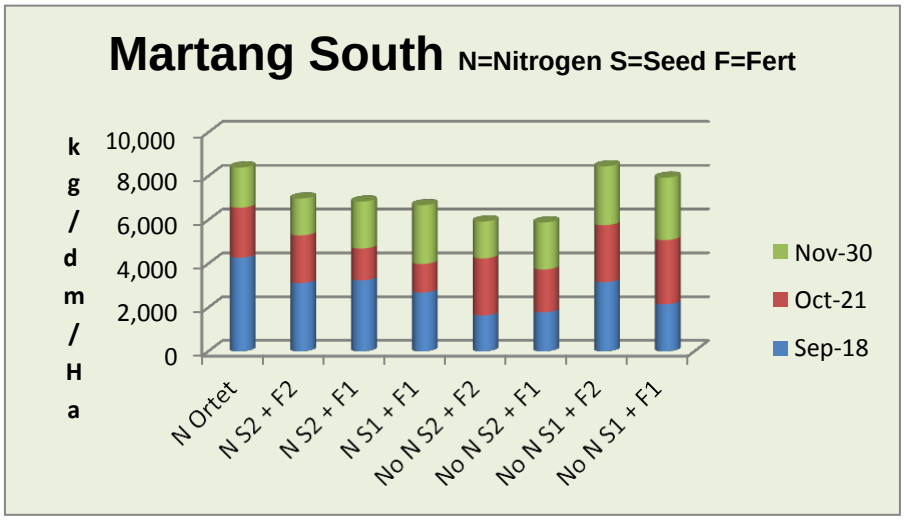

Fig.4. Total Dry Matter results; Martang South

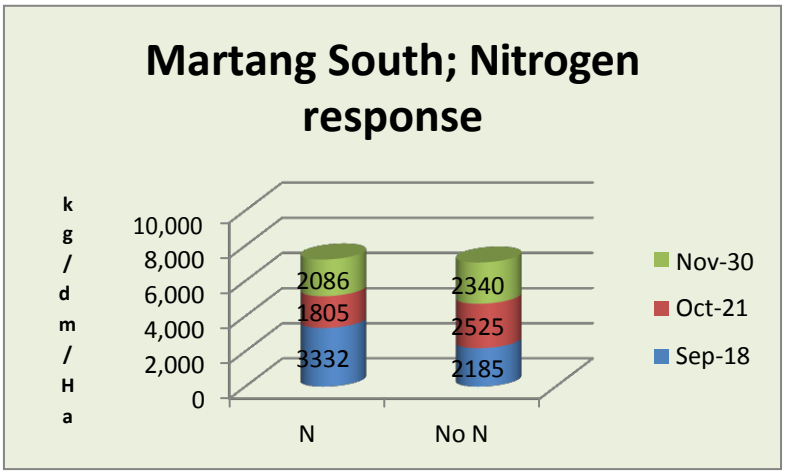

Fig.5. Summary of +N (Aug application) and no N plots

The average total DM of the +N plots was only slightly better than the average of the No N plots (+N 7223 kg/DM/Ha, No N 7050 kg/DM/Ha); this was an unexpected result.

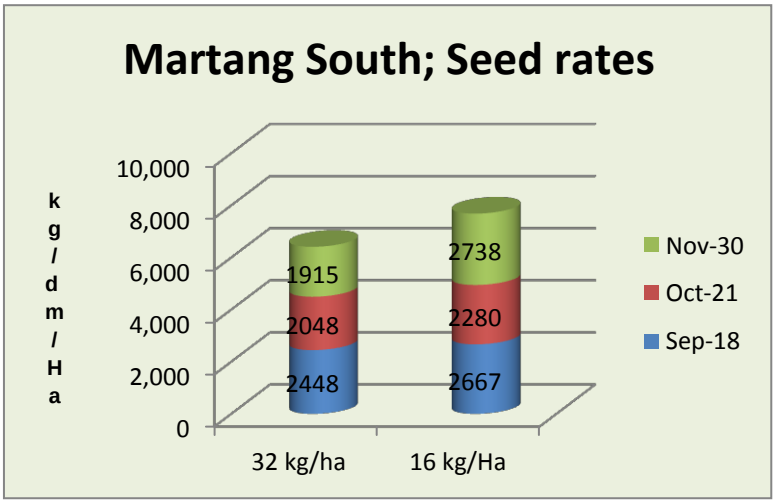

Fig.6. Summary of the seed rate comparison plots

Again this was an unexpected result possibly affected by the late autumn break and the subsequent late sowing time.

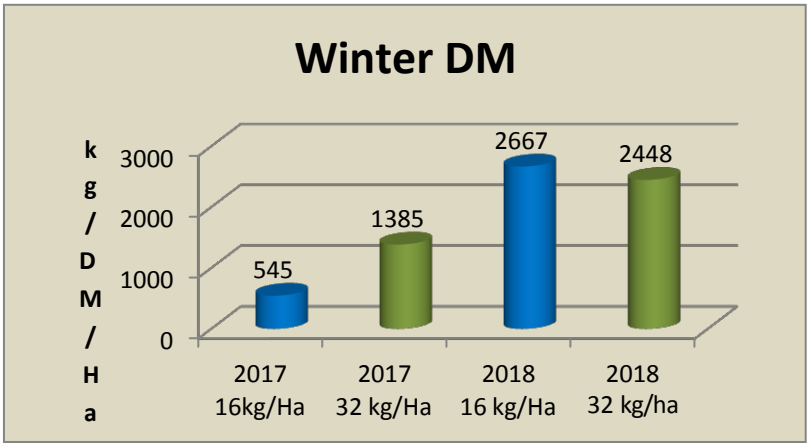

Fig.7; Sowing rate comparison for 2017 & 2018.

In 2017 the demonstration was established on April 22nd, while in 2018 it was delayed until May 20th. The sowing date comparisons would suggest that to get a benefit from higher seed rates in the drier region of the Southern Wimmera pasture establishment needs to be early in the autumn.
It should be noted that the demonstration was not conducted in the same paddock in 2017 and 2018.

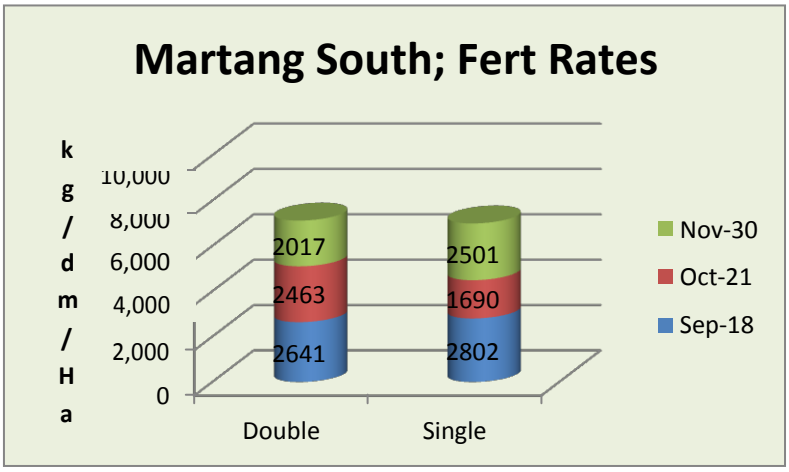

Fig.8; Summary of the fertiliser treatments

The average of the higher fertiliser plots was only 127 kg/DM/Ha than the control, an unexpected result as the site chosen for the 2018 site is a low fertility paddock currently in a phase of increasing soil pH, phosphorus and sulphur levels.

Feed quality
Feedtest results were conducted on August 17th and the results are shown in the table 3. They show the high digestibility and energy content of Italian ryegrass.

There was little difference in the estimated energy (MJ/kg DM) between treatments.

Table 3; Tetila feed test results for August at demo site 1;Martang South

Italian ryegrass	16 kg/Ha Single fert + N	16 kg/Ha Single fert No N	16 kg/Ha Double fert + N	16 kg/Ha Double fert No N	Average
Crude Protein	21.6	24.7	N/A	23.1	23.1
Neutral Detergent Fibre (NDF)	32.9	35.5	N/A	36.1	34.8
Digestibility (DMD) (% of DM)	88.4	85.6	N/A	85.2	86.4
Est. Energy (MJ/kg DM)	13.6	13.1	N/A	13.0	13.2

Italian ryegrass	32 kg/Ha Single fert + N	32 kg/Ha Single fert No N	32 kg/Ha Double fert + N	32 kg/Ha Double fert No N	Average
Crude Protein	19.3	19.8	18.7	20.8	19.7
Neutral Detergent Fibre (NDF)	34.8	34.7	36.5	33.9	35.0
Digestibility (DMD) (% of DM)	87.0	87.2	85.4	86.8	86.6
Est. Energy (MJ/kg DM)	13.4	13.4	13.1	13.3	13.3

Financials

Costs of establishment
The costs of the additional rate of DAP fertiliser (100 kg/ha) in the double rate treatment has been excluded as the additional P is considered a capital cost rather than an establishment cost. The additional N in the DAP 200 kg/ha treatment was 36 kg/ha applied at sowing. It's not known if this affected germination but the rate exceeds the recommended safe rate of starter nitrogen which is normally 10 to 20 kg N/ha.

Table 4; Establishment costs used at Martang South.

	Item	Rate	Input Unit	Price	Price Unit	Cost/ha
Seed	Tetila short term ryegrass	16 or 32	kg/ha	$ 2.80	$/kg	$44.80 or $89.60
Fertiliser	DAP+Zinc	100	kg/ha	$ 580	$/t	$ 58.00
	Liquid urea	30	L/ha			$17.10
Chemicals	Roundup	1.2	L/ha	$ 6.70	$/L	$ 8.04
	Striker	80	g/ha	$ 8.75	$/L	$ 0.70
	Fastac	100	mL/ha	$ 11.65	$/L	$ 1.17
Operations	Sowing	1	application	$ 50.00	$/ha	$ 50.00
	Spraying	2	application	$ 12.00	$/ha	$ 24.00
Total Costs/ha						$218 or $263

Note: Lime was applied at 2t/ha in 2018 at a cost of $53 per tonne spread.

Table 5; Additional costs of high input versus standard inputs

Activity management costs	Additional costs	Comment
Establishment costs	$218/ha vs. $263/ha	Difference of $45/ha which is the seed cost
Costs of urea applied to plots	$61/ha	Urea delivered $490/ha, Spreading $12/ha
Costs of double fertiliser	$116/ha	The costs of double rate fertiliser (200 kg/ha) to provide extra phosphorus would be considered a capital cost rather than an establishment cost.
Extra time for establishment	Estimated to be similar	Took 10 weeks to establish before it could be grazed
Extra risk of failure to establish	Estimated to be similar	
Extra nutrient removal	None as no extra feed grown	An increase in feed grown that is eaten would result in more nutrient removal.

Income/Benefits

The site was rotationally grazed and both treatments were within the same paddock and so production benefits have been estimated from pasture cuts.

Table 6; Estimated benefits of high input versus standard input.

Benefits	High input vs Standard input	Comments
Higher seeding rates	Reduction on 219 kg DM/ha from higher seeding rates in winter where N wasn't applied (see Fig X Sowing rate comparison). An increase of 542 kg DM/ha grown in winter to early spring from the higher seeding rate when Nitrogen was applied.	No additional feed grown from the higher seeding rate in late winter/early spring which was unexpected. Overall a reduction of 1.27 t/ha of feed from the high seeding rate. When Nitrogen was applied there was greater growth from the higher seeding rate, indicating nitrogen was limiting in the standard input system.
Shift in timing of feed grown with the use of urea as shown by pasture cages	An extra 1.15 t DM/ha grown in August/Mid Sep from nitrogen but only an extra 173 kg DM/ha grown from Sep to Nov compared to no nitrogen.	The Aug Nitrogen application grew more feed in late winter/early spring which could be used to lift pasture production quickly to benefit lambing ewes. The N response was mainly confined to late winter/early spring which probably coincides with moisture availability.
Fertiliser rate	No obvious benefit in late winter/early spring but an extra 773 kg DM/ha grown in mid September to late October.	The extra growth in mid spring from the higher fertiliser rate may have depleted moisture in the dry spring, so that there was no growth response in late spring.
Residual value	Same expected	In year 2, 20-30% plants might be expected to survive if the plant was able to form viable seed and the seed re-establishes. However due to the dry spring and demand on feed production, this was unlikely to have occurred.

The higher seed rate cost an extra $45/ha but grew no extra feed in August/early September when no nitrogen was applied. However, pasture responded to the nitrogen treatments at this time and indicates that moisture availability is not the factor restricting growth. The higher seeding rate did respond to the extra nitrogen, showing it was restricting responses. The double rate of fertiliser showed the biggest response in mid spring and perhaps indicates fertility was constraining the extra response that may have otherwise occurred from double sowing.

Conclusion

It should be noted the results are unreplicated and are inconsistent with results from other demonstrations. The results from 2018 at Martang South should therefore be treated with caution.
The site was affected a late autumn break and below average early spring rains which constrained pasture production; the extra inputs may not have been able to compensate for this.

The Martang South site was the most severely affected by the seasonal conditions and suggest that producers need to be flexible in their approach to species selection. Changing from ryegrass to a grazing cereal in response to the late autumn may have resulted in a higher rate of dry matter production.

The results indicate that the higher seeding rate appears to have required nitrogen application to provide extra dry matter production. Producers should consider annual ryegrass for high fertility sites. The results also indicate the benefits of the higher sowing rate will be short lived but will give greater dry matter gains in late winter- early spring provided nitrogen is used to boost growth.

Demo Site 2. (1) Moby Barley (2) Winteroo Oats

Location: "Overdale," Concongella Owners; Holden family

Background
Moby Barley has been successful as a grazing cereal in drier areas of the Wimmera andthe project advisory group decided to include it in the project. A Winteroo Oat crop was used as a control; Winteroo has proven to be a reliable performer in the Southern Wimmera.

It should be noted that the Moby site was a sandy loam whilst the Winteroo paddock was grown on a gravel loam soil.

Trial Inputs and Design
The cereals were sown in autumn; the details are shown in table 7. Nitrogen in the form of urea was applied in early August to a section of each demonstration.

Table 7; Establishment details

	Sowing Date	Sowing Rate	Fertliser prior to sowing	Fertliser at sowing
Moby barley	April 25th	67 kg/Ha	100 kg/Ha single super	80 kg/Ha MAP + Moly
Winteroo oats	April 23rd	80 kg/Ha	-	80 kg/Ha MAP + Moly

Production - grazing

Table 8; Moby barley grazing details

Size (Ha)	Date in	Date out	Days in paddock	Stock type	Number of stock	DSE rating of live-stock	Grazing days per ha this grazing period	DSE grazing days per ha this grazing period
A			B		C	D	GD= (c*b)/a	(GD*d)
28	20-8-18	23-8-18	3	Ewes	401	1	43.0	43.0
28	24-8-18	16-9-18	23	Ewes with twins	485	3.2	98.4	1274.9
Total DSE grazing days/ha for 2018								1317.8

Table 8 cont; Moby barley grazing details								
Average DSE/ha for 2018								3.61
28	17-1-19	06-2-19	20	Ewes	510	0.5	364.3	182.1
DSE/ha for summer period 2019								**0.5**

The Moby paddock had a proportion of dropped grain, some of which geminated after December rains. This allowed a valuable grazing period of 20 days for stock in January/February in 2019.

Table 9; Oats grazing details

Size (Ha)	**Date in**	**Date out**	**Days in paddock**	**Stock type**	**Number of stock**	**DSE rating of livestock**	**Grazing days per ha this grazing period**	**DSE grazing days per ha this grazing period**
24.7	10-8-18	03-9-18	24	Ewes +lambs	360	2.7	349.8	944.5
24.7	24-9-18	10-10-18	16	Ewes +lambs	284	3.0	184.0	551.9
24.7	10-12-18	17-12-18	7	Merino ewes	140	0.5 (DSE rating accounts for supplementary feeding at half drought ration).	39.7	19.8
Total DSE grazing days/ha for 2018								**1,516.2**
Average DSE/ha for 2018								**4.15**

Production – grain and straw

Only the Moby barley was harvested for grain and during this process, straw was direct baled and later utilised on farm in containment areas.

Table 10; Harvest results

	Grain tonnes/Ha	**Grain value/Ha @ $200/tonne**	**Straw tonnes/Ha**	**Straw value/Ha @$100/tonne**
Moby barley	2	$600	0.6	$120

The Moby barley straw feed test had an energy content of 7.3 ME and 3.6% protein in November.

Fig 9; Winteroo Oats 18th July

Fig. 10; Moby Barley 15th August

Fig. 11 & 12; Moby barley paddock, January 2019

Results

Dry Matter Results

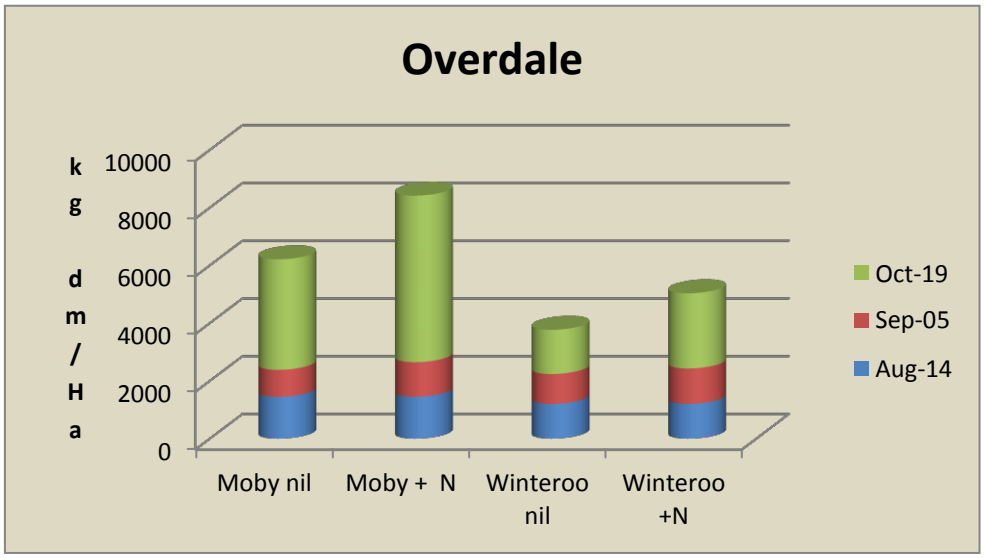

Fig. 13; Dry Matter results at Overdale

The results show that Moby barley outperformed Winteroo oats in this demonstration. The results also show increased dry matter production from the nitrogen application.

Feed quality and composition
Feed tests were conducted at Overdale on August 17th; the results are shown in tables 11 & 12.

Table 11; Feed Test results for August 17th at Demonstration 2; Overdale

OVERDALE	Moby Barley	Winteroo Oats
Crude Protein	35.8	24.5
Neutral Detergent Fibre (NDF)	35.0	35.6
Digestibility (DMD) (% of DM)	88.2	84.9
Est. Energy (MJ/kg DM)	13.6	13.0

The Moby barley showed a higher protein content, which becomes important when protein is limiting and a slightly higher energy content.

Table 12; Feed Test results for Moby straw (January 2018) at Demonstration 2; Overdale

OVERDALE	Moby Barley Straw
Crude Protein	3.6
Neutral Detergent Fibre (NDF)	78.0
Digestibility (DMD) (% of DM)	41.9
Est. Energy (MJ/kg DM)	7.3

Financial analysis

Costs of establishment

Table 13; Establishment costs used at Overdale

	Item	Rate	Input Unit	Price	Price Unit	Cost/ha
Seed	Moby Barley	67	kg/ha	$350	$/t	$23.45
	Winteroo Oats	80	kg/ha	$300	$/kg	$24.00
Fertiliser delivered & spread	MAP+Moly	80	kg/ha	$695	$/t	$55.60
	Singer Super	100	kg/ha	$345	$/t	$34.50
Knockdown herbicide	Glyphosate 540	1.5	L/ha	$5.00	$/L	$7.50
Operations	Sowing	1	application	$50	$/ha	$50.00
	Spraying	1	application	$12	$/ha	$12.00
	Spreading of fertiliser	1	application	$12	$/ha	$12.00

Table 14; Estimated additional costs of Moby Barley versus oats at Overdale

Costs	Oats vs Barley	Comment
Establishment costs	$161/ha vs $195/ha	Difference $34/ha. Note: The higher establishment costs of barley relate to additional application of single super.
Management costs		The 28 ha Moby barley paddock in two (12 ha and 16 ha) with a hot wire tape, low to the ground to improve grazing utilisation & less trampling.

The grazing risks with low Na (sodium) and high K (potassium) concentrations of both these crops may also pose a direct risk to livestock production especially reproducing ewes.

Income/Benefits

The gross margins showed a return for the barley of approximately $583/ha but the oats paddock was likely to incur a loss where the income per DSE was valued at $40. Table 15 shows the difference with GM where the livestock income is $40, $60 and $80 per DSE. The grazing income was similar in both paddocks but the additional growth of barley allowed the production of grain and hay. Barley also allowed additional grazing in summer 2019 which was valued at $60/ha due to high costs of grain at that time.

There was no supplementary feeding in either paddock during 2018. Supplementary feeding was needed to help graze down the barley stubble in 2019. The benefit for both crops was the spelling of phalaris in spring to support its persistence and for farm management. Not all paddocks can be sown to phalaris because it exposes risks to phalaris staggers or reduces the ability to take advantage of opportunities such as sowing a summer crop when moisture is available.

Table 15; Estimated gross margin of oats demonstration paddock at Overdale for 2018

Income	Rate	Input Unit	Price	Price Unit	Income ($/ha)
Grazing	4.15	DSE/ha	$40.00	DSE	$166.00
Gross Income					**$166.00**

Variable Costs	Rate	Input Unit	Price	Price Unit	Cost/ha
Winteroo Oats est.					$161.10
Drenches, vaccinate	4.15	DSE/ha	$2.29	DSE	$9.50
Shearing	4.15	DSE/ha	$6.71	DSE	$27.85
Selling costs	4.15	DSE/ha	$1.74	DSE	$7.22
Total variable costs					**$205.67**
Gross margin ($/ha)					**($39.67)**

Table 16; Estimated gross margin of barley demonstration paddock at Overdale for 2018

Income	Rate	Input Unit	Price	Price Unit	Income ($/ha)
Grain	2	t/ha	$330	t	$660.00
Straw	0.6	t/ha	$120	t	$72.00
Grazing	3.6	DSE/ha	$40.00	DSE	$166.40
Gross Income					**$876.00**

Variable Costs	Rate	Input Unit	Price	Price Unit	Cost/ha
Moby barley est.					$195.05
Bailing	0.9	bales/ha	$18.50	bale	$17.18
Harvesting			$55.00	ha	$55.00
Fuel & oil			$10.34	ha	$10.34
Drenches, vaccinate	3.6	DSE/ha	$2.29	DSE	$8.24
Shearing	3.6	DSE/ha	$6.71	DSE	$24.16
Selling Costs	3.6	DSE/ha	$1.74	DSE	$6.26
Total variable costs					**$309.97**
Gross margin ($/ha)					**$566.03**

Table 17; Estimated gross margin of oats and barley with variable grazing incomes at Overdale

	Oats			Barley		
	Average Income per DSE	**Medium Income per DSE**	**High Income per DSE**	**Average Income per DSE**	**Medium Income per DSE**	**High Income per DSE**
Income/DSE	$40	$60	$80	$40	$60	$80
Grazing Income $/ha	$166	$249	$332	$144	$216	$288
Grain				$660	$660	$660
Straw				$72	$72	$72
Gross income $/ha	$166	$249	$332	$876	$948	$1,020
Total Variable costs	$206	$206	$206	$310	$310	$310
Gross margin $/ha	**-$40**	**$43**	**$126**	**$566**	**$638**	**$710**

Table 18; other estimated benefits barley versus oats at "Overdale"

Benefits	Barley versus Oats	Comments	Assumptions
Extra Dry Matter, grown from establishment to October 19th measured via pasture cages & cuts	Barley grew an extra 2.4 DM t/ha without Nitrogen and 3.4 DM t/ha with Nitrogen compared to oats.	The extra feed was mainly grown in late mid Spring (Sep 5 to Oct 19). It cost an extra $34/ha to produce but this was for extra fertiliser. Nitrogen applied in August had the biggest impact on growth during mid spring.	
Grazing in summer 2019 from barley re-shooting.	182 DSE grazing days/ha from Jan 17 to Feb 6.	Gazing worth additional $100 /ha	Lupins with similar protein levels (30%) worth $550/t DM in January 2019 (PIRSA, 2019)
Higher energy quality of barely during winter.	Barley 0.6 MJME/kgDM higher than oats	Worth approximately an extra 10 g/day in sheep weight gain	6 MJME = 100g/day weight gain
Grazing utilisation of barley stubble		Farmer comments: The old Suffolk ewes in lamb loved the barley stubble, ate it down to the boards, could sow directly into it and had no trash issues. Did lose a bit of grain due to wind. Did also supplementary feed on the paddock to utilise the stubble. In comparison, the oat stubble was still standing, stock didn't like it as much.	

Farmer insights into management of barley

- Host farmer Mal Nicholson made the point that the below average rainfall in 2018 allowed the grazing cereals to be grazed at the right time in the growth cycle. A wetter winter may cause issues that comprise grazing times in trying to avoid any soil compaction and pugging issues.

- Spliting the barley paddock (28 ha) in two (12 ha and 16 ha) with a hot wire tape low to the ground meant better utilisation, so they didn't walk all over it and trash it.

- To get the value of cut straw meant the paddock had very few rocks in it. The barley straw was used to start off containment areas that were being set up as the season was tight.

- The success of the barley was being able to graze early and allow it to tiller out. Don't treat it as a crop, as it won't tiller. The dry winter meant it didn't bog up from grazing and allowed it to do very well. It was sown late but still managed to graze early.

- You have options with barley straw, either to eat it off or bale it.

Conclusion

The results show that Moby Barley appears to be a variety well suited to the conditions in the Southern Wimmera; it will again be included in the project for 2019.

The demonstration also highlighted that there are many non-tangible benefits of having a high producing annual forage in the system and that winter production is not the only benefit. For example Moby barley and other cereals have more chemical annual grass control options than grazing oats; this may be important if the annual forage crop is used as part of the preparation for future pasture establishment.

Demo Site 3. Oats

Location: South Glengowan at Joel Joel Owners; Hall Family

Background:
How much dry matter do oats produce and does it pay. The producers were focused on grazing with opportunistic grain or hay production.

Trial Inputs and Design
Winteroo oats were sown in May at a sowing rate of 140 kg/Ha which was cross sown@70 kg/Ha in each direction. 80 kg/Ha of DAP fertiliser was added at establishment. The paddock is the same one used at South Glengowan in the 2018 demonstration.

A rundown annual grass pasture in the adjacent paddock was used as a control for this demonstration site. The annual pasture was rotationally grazed in line with the usual farm management; its pasture composition is shown in figure 14. Annual pasture was stocked at equivalent of about 7.0 DSE/ha.

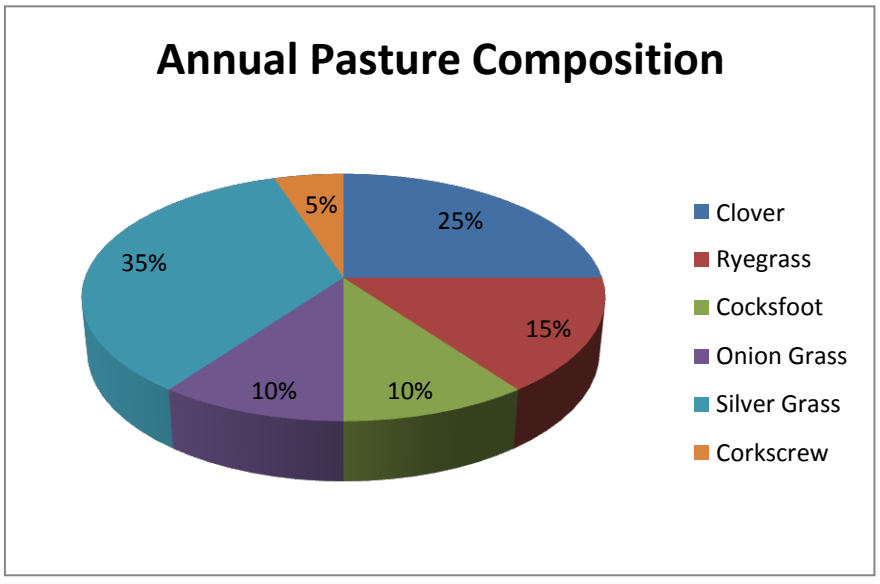

Fig 14; Control paddock pasture composition

Table 19; Oats stocking details for demonstration 3 at South Glengowan for 2018

Size (Ha)	Date in	Date out	Days in paddock	Stock type	Number of stock	DSE rating of livestock	Grazing days per ha this grazing period	DSE grazing days per ha this grazing period
A			B		C	D	GD= (CxB)/A	(GD*D)
42	1-7-18	15-9-18	90	Ewes + Lambs	200	3	428.6	1285.7
42	1-12-18	31-12-18	31	Ewes	140	1.2	103.3	124.0
Total DSE grazing days/ha for 2018								**1409.7**
Average DSE/ha for 2018								**3.86**

Pasture cages were placed in the paddocks to allow the collection of pasture cuts for DM measurement.

Fig. 15; Oats at South Glengowan; July 2018 showing caged and grazed areas

The oats were cut for hay in November and produced 220 tonnes of hay. They were made into square bales (8x4x3) each weighing 650kg, so 338 bales produced on 42 hectares.

Results

Dry Matter Results

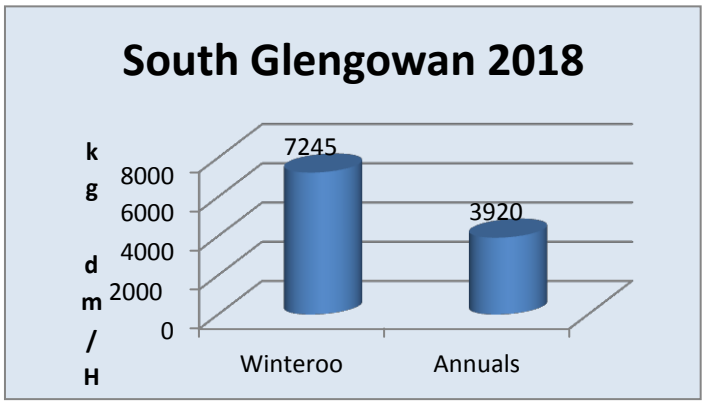

Fig. 16; Dry matter (kg DM/ha) production for South Glengowan 2018

The total DM results for the year show that the South Glengowan site produced 3.3 t DM/ha more than the control at South Glengowan.

Feed quality and composition

Feed Tests were conducted at South Glengowan on September 27th and October 18th; the results are shown in tables 19 and 20. The test dates were fairly close due to the effects on both the cereal and pasture from the dry conditions experienced in early spring.

Table 20; Feed Test results for September at Demonstration 3; South Glengowan

SOUTH GLENGOWAN	Cereal	Annual pasture
Crude Protein	24.6	14.4
Neutral Detergent Fibre (NDF)	34.1	51.0
Digestibility (DMD) (% of DM)	87.1	73.3
Est. Energy (MJ/kg DM)	13.4	11.0

Table 21; Feed Test results for October at Demonstration 3; South Glengowan

SOUTH GLENGOWAN	Cereal	Annual pasture
Crude Protein	11.0	10.6
Neutral Detergent Fibre (NDF)	48.8	59.5
Digestibility (DMD) (% of DM)	71.3	66.4
Est. Energy (MJ/kg DM)	10.6	9.8

Feed quality was higher in the cereal at both sampling times, 2.4MJ/kg of DM in September and 0.8 MJ/kg DM in October which would allow for additional animal production on oats.

Financial analysis

Costs of establishment

Table 22; Establishment costs at South Glengowan for Winteroo oats in 2018

Activity	Item	Rate	Input Unit	Price	Price Unit	Cost/ha
Seed	Winteroo Oats	140	kg/ha	$300.00	$/t	$42.00
Fertiliser	DAP	80	kg/ha	$700.00	$/t	$56.00
Knockdown herbicide	Glyphosate 450	2	L/ha	$13.40	$/L	$26.80
	MCPA	1	L/ha	$8.95	$/L	$8.95
	Fastac	100	mL/ha	$11.65	$/L	$1.17
Operations	Cross sown			$50.00	$/ha	$50.00
	Spraying	2		$12.00	$/ha	$24.00
Total costs						**$208.92**

Income/Benefits

The gross margins only include the supplementary costs that occurred in the paddock. Even though the stocking rate was higher in the annual pasture, stock required supplementary feeding. There was minimal supplementary feeding on the oats paddock. Stock only spent about 6 months of the year on the annual pasture and this supplementary feeding was valued at $10/DSE.

The Gross Margin for Winteroo oats was much higher than that of the annual pasture mainly coming from the income generation of hay in 2018 which had high value due to demand in the dry season and the additional forage growth. October rain allowed enough recovery for the oats to be cut for hay following grazing.

Tables 23 and 24 show the difference in gross margin where different incomes are used per DSE.

Table 23; Estimated gross margin of oats demonstration paddock with grazing and hay in yield at South Glengowan

Income	**Rate**	**Input Unit**	**Price**	**Price Unit**	**Income ($/ha)**
Hay	5.24	t/ha	$300.00	t	$1,571.43
Grazing Income option 1	3.9	DSE/ha	$40.00	DSE	$156.00
Gross Income					**$1,727.43**
Variable Costs	**Rate**	**Input Unit**	**Price**	**Price Unit**	**Cost/ha**
Winteroo oats est.					$208.92
Bailing	8.1	bales/ha	$20.00	bale	$161.17
Mowing/Windrowing	1	pass	$65.00	ha	$65.00
Fuel & Oil	1		$10.34	ha	$10.34
Drenches, vaccinate	3.9	DSE/ha	$2.29	DSE	$8.93
Shearing	3.9	DSE/ha	$6.71	DSE	$26.17
Oaten hay supplement	2	bales	$215.00	bale	$10.49
Selling costs	3.9	DSE/ha	$1.74	DSE	$6.79
Total variable costs					**$497.81**
Gross margin ($/ha)					**$1,229.62**

Table 24; Estimated gross margin of annual pasture demonstration paddock at South Glengowan

Income	**Rate**	**Input Unit**	**Price**	**Price Unit**	**Income ($/ha)**
Grazing	7	DSE/ha	$40.00	DSE	$280.00
Gross Income					**$280.00**

Variable Costs	**Rate**	**Input Unit**	**Price**	**Price Unit**	**Cost/ha**
Drenches, vaccinate	7	DSE/ha	$2.29	DSE	$16.03
Shearing	7	DSE/ha	$6.71	DSE	$46.97
Supplementary feed (Oats & Hay)	7	DSE/ha	$10.00	DSE	$70.00
Selling costs	7	DSE/ha	$1.74	DSE	$12.18
Total variable costs					**$145.18**
Gross margin ($/ha)					**$134.82**

Table 25; Estimated gross margin of oats and annual pasture with variable grazing incomes at South Glengowan

	Oats			**Annual Pasture**		
	Average Income per DSE	**Medium Income per DSE**	**High Income per DSE**	**Average Income per DSE**	**Medium Income per DSE**	**High Income per DSE**
Income/DSE	$40	$60	$80	$40	$60	$80
Grazing Income $/ha	$156	$234	$312	$280	$420	$560
Hay Income $/ha	$1,571	$1,571	$1,571			
Gross income $/ha	$1,727	$1,805	$1,883	$280	$420	$560
Total Variable costs	$498	$498	$498	$145	$145	$145
Gross margin $/ha	**$1,229**	**$1,307**	**$1,385**	**$135**	**$275**	**$415**

Conclusion
This demonstration highlighted that oats can be a valuable feed source in a poor year by allowing grazing and opportunistic hay production.

Demo Site 4. (1) Moby Barley (2) Tetilla Ryegrass (3) Phalaris based pasture

Location: Cobbitty/Paradoo Prime; Pigeon Ponds
Owners; Tim & Georgie Leeming

Background:
Demonstration site 4 compared two annual varieties with a control which was a Holdfast GT phalaris/sub clover pasture.

Pigeon Ponds had a more favourable season than the other four sites with an earlier autumn break and regular late autumn/early winter rains. Conditions got reasonably wet in winter before below average spring rainfall reduced potential dry matter yield. Rainfall for Balmoral; approximately 17 km from the site is shown in figure 17.

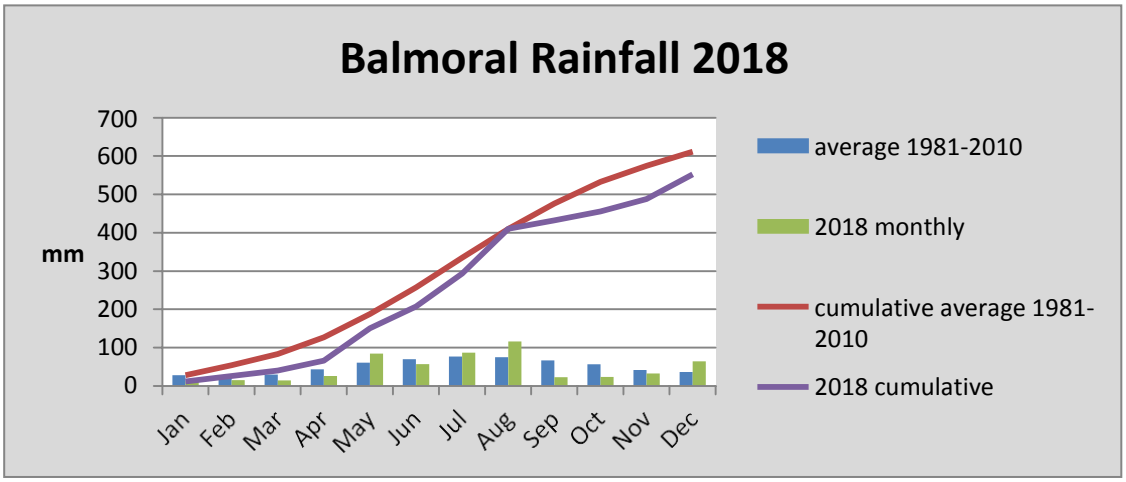

Fig 17; Balmoral rainfall 2018

Trial Inputs and Design
Two paddocks were selected for high production annual forage pastures, one paddock had Tetila ryegrass established and the other was sown with Moby Barley. A long term Australian/sub clover pasture was selected as a control paddock.

Table 26; Paradoo Site Details

Activity	Moby Barley	Tetila Ryegrass	Phalaris
Date Sown	18th April 2018	7th April 2018	Autumn 2010
Sowing rate Kg/Ha	80	27	4
MAP Fertiliser at sowing	80	80	N/A
Urea- kg/Ha May 29	-	80	-
Urea – kg/Ha Aug 27	120	100	-

Pasture cages were placed in the paddock to allow the collection of pasture cuts for DM measurement.

Fig. 18; Tetila 15th August

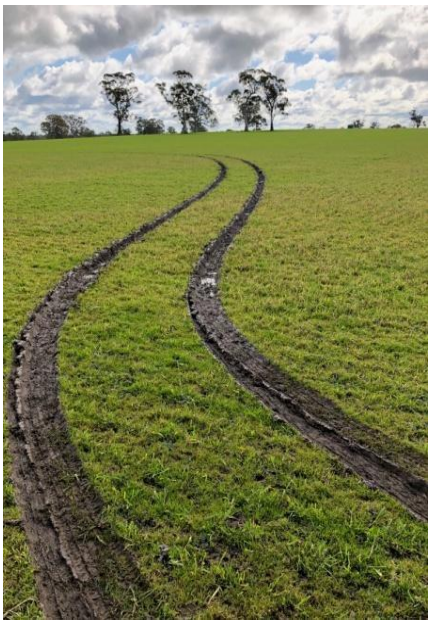

Fig. 19; Moby 15th August

Pasture Composition
The Tetila stand maintained a high level of ryegrass throughout the growing season and it made up 80% of the pasture composition at the start of October.

The Moby didn't handle the wet, cold conditions in winter and there large areas of plant loss; at the start of October, Moby made up 60% of the pasture composition. The range of the counts was 20% to 80% depending on the location of the assessment in the paddock. Not surprisingly, the lower, wetter areas had the lower counts.

The phalaris pasture had around 35% sub clover, 35% phalaris and 30% annual grasses and broadleaf weeds.

Results
Dry Matter Results

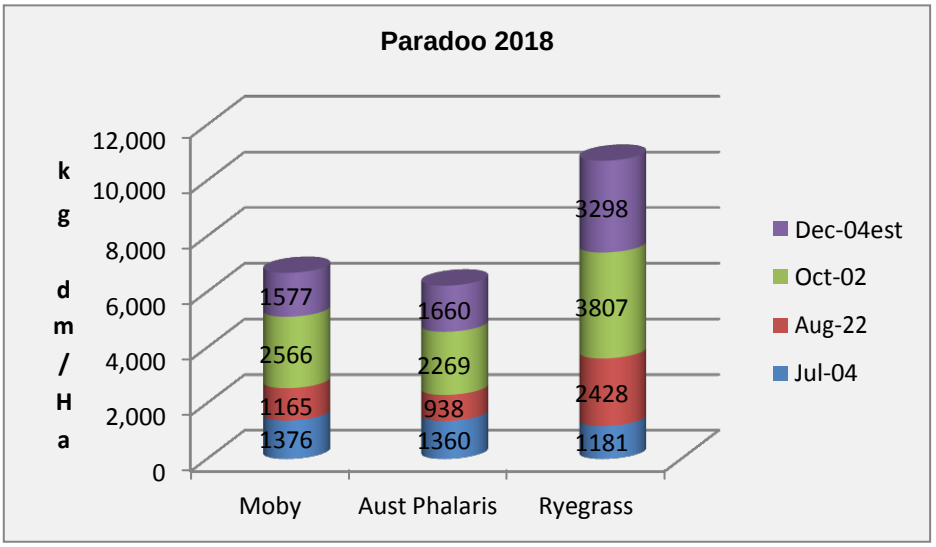

Fig. 20; Dry matter (kg DM/ha) production for Paradoo

The ryegrass produced 10.7 t DM/Ha and was an important component of the intensive grazing rotation during lambing on Paradoo.

The production of the Moby (5.3 t DM/ha) was most likely affected by the wet, cold winter while the phalaris production (6.2 t DM/ha) was probably typical of Australian.

Feed quality and composition
Feed Tests were conducted at Paradoo on August 22nd; the results are in table 27.

27Table 27; Feed Test results for August at Demonstration 4; Paradoo

PARADOO	Moby Barley	Tetila Ryegrass	Phalaris
Crude Protein	20.1	25.6	25.5
Neutral Detergent Fibre (NDF)	44.3	40.1	40.7
Digestibility (DMD) (% of DM)	62.7	75.3	69.5
Est. Energy (MJ/kg DM)	9.2	11.3	10.3

The energy for the Moby barley at Paradoo was much lower than the result at Overdale which was 13.6 MJ/kg DM, probably reflective of it being only 60% of the pasture composition.

Grazing
Large mobs were rotated around the paddocks, no individual paddock details available. The barley was eaten down but without eating the growing point (Tim checked with a razor blade) and so it was spelled and allowed to run to head and for the production of hay. The Moby Barley was cut for hay yielding 1 tonne/Ha @ 8 Mj/kg DM.

Financial analysis

Costs of establishment

Table 28; Establishment costs at Paradoo

Activity	Item	Rate	Input Unit	Price	Price Unit	Cost/ha
Seed	Tetila short term ryegrass	27	kg/ha	$1.90	**$/kg**	**$51.30**
	Moby barley	80	kg/ha	$350.00	**$/t**	**$28.00**
Fertiliser	MAP	80	kg/ha	$650.00	**$/t**	**$52.00**
Knockdown herbicide	dry sown					
Operations	Sowing	1	application	$44.00	**$/ha**	**$44.00**

Table 29; Additional costs of Barley &Tetila versus Australian phalaris

Activity management costs	Additional costs	Comment
Establishment costs	Barley $124/ha & Tetila $147/ha vs 0 costs for phalaris	Tetila was $23.30/ha more expensive due to the seed cost.
Costs of urea applied to plots	Barley cost $71/ha & Tetila $112/ha vs 0 costs for phalaris	Urea delivered $490/ha, Spreading $12/ha, Tetila had 2 applications of urea and 60 kg/ha more urea.
Extra time for establishment	Barley & Tetila both estimated to take about 10 weeks before grazing	
Extra risk of failure to establish	Estimated to be similar	
Extra nutrient removal	Tetila would require higher fertiliser rates in 2019. Estimated to be an additional 15 kg P/ha.	An increase in Tetila feed grown would have resulted in more nutrient removal. Removal approx. 3kgP/kg t of DM.

Income/Benefits

No grazing figures were available, so a gross margin has not been completed.

Table 30; Estimated benefits Tetila and barley versus phalaris at “Pardoo”

Benefits	Tetila vs Barley vs phalaris	Comments	Assumptions
Extra Dry Matter, grown from establishment to Dec 4th measured via pasture cages & cuts	Tetila grew an extra 5.4 t DM/ha than Moby and 4.5 DM t/ha than phalaris	The extra feed was grown in from July until Dec. The extra 5.4 t DM/ha is worth an extra $1292/ha It cost an extra $65/ha to produce additional feed above that of barley and an extra $260/ha more than the already established phalaris. The extra Nitrogen applied May 29th doesn't seem to have generated a pasture response up until July but may have been utilised to provide a response from July to Aug. An additional N application ion Aug 27th has helped contribute to extra feed over spring.	Assumed 80% utilisation, leaving behind 1000 kg DM/ha and additional feed valued using market replacement of Barley grain worth $330/t or 0.37 $/kg DM,
Barley hay	Produced 66, 500 kg round bales on 25 Hectares	Valued at $462/ha	Barley hay valued at $350/t
Higher energy quality during winter.	Tetila 2.1 MJME/kgDM higher than barley	Worth approximately an extra 35 g/day in sheep weight gain	6 MJME is approximately 100g/day weight gain in sheep
Regeneration of Tetila in 2019		Tetila although an annual regenerated in 2019 by allowing it to set seed. This reduces the need for re-sowing.	

How annuals fit in the farm system
The ryegrass performed exceptionally and played a major role in a successful rotation during the intensive lambing regime carried out by the Leemings.

Paddocks in gullies are used for three periods of lambing with breaks in between to allow for pasture recovery. This means that a large feed wedge is required for maximum production when the ewes and lambs come out of the lambing paddocks. The Tetila pasture made a large contribution to the lambing system management.

Tim grazed it up until November with ewes and lambs and had thought it had finished, but late rain rebooted it and Tim allowed it to set seed. From mid to end of January, once seed had dropped on the ground, he ate off the drymatter and this allowed the sub clover to come through in 2019.

Tim has always favoured perennial ryegrass but with sowing annual ryegrass at a high rate and with it capable of producing 12 t DM/ha, and managing it so that sowing only need occur every 2 or 3 years, the numbers are stacking up and it becomes an economic option.
As a result of this, Tim has sown more annual ryegrass in 2019. This time he has sown a ryegrass (Prime annual ryegrass) which he hopes has better seedling recruitment capability.

The Moby pasture was not as successful and Tim Leeming expressed his disappointment with it in his conditions; this was the first time he had grown it. As he explained at a farmer group visit “I saw it going really well at Goroke; I forgot that this isn’t Goroke; we get too wet and cold for it to be suited here”. Barley is also sensitive to low pH conditions; this may have been a factor in this result.

Tim thought if the upcoming season looked dire, then he might go for Moby barley as the drier conditions would suit. With a crop like barley you can use herbicide manipulation, take out all the weeds and take it to grain.

Tim has most of the farm in Holdfast GT but he doesn’t want all the farm in it. He wants some flexibility to make use of rainfall. For example if he gets 3 inches of summer rainfall, he might sow sorghum or brassicas in a couple of paddocks for summer feed.

Conclusion
The result at Paradoo reinforced the message of getting the right plant in the right place from the EverGraze project, with regards to the suitability of Moby barley in paddocks prone to waterlogging.

The Paradoo site also showed the importance of good planning and being ready to sow as soon as the autumn rains come or dry sow in the case of grazing cereals.

Demo Site 5. Barberia Ryegrass

Location: Quamby; Dobie Owners; de Fegely family

Background:
Barberia Ryegrass has the growth of annual but with medium term persistence. It has been used as a high production annual forage at Quamby and the de Fegeley’s were interested to measure its effectiveness as a longer term pasture.

Trial Inputs and Design
A second year Barberia Ryegrass pasture was measured for dry matter production and feed quality during 2018; an adjacent Holdfast GT phalaris/sub clover pasture was measured as a control paddock.

Table 31; Paddock details; Quamby

Quamby	Sowing Date	Sowing Rate	Fertliser 2018
Barberia Ryegrass	May 2017	20 kg/Ha	55 kg/Ha MAP
Holdfast GT Phalaris	May 2010	4 kg/Ha + 12 kg/Ha sub clover	55 kg/Ha MAP

Pasture cages were placed in the paddock to allow the collection of pasture cuts for DM measurement.

Fig. 21; Barberia Ryegrass at Quamby, December 2018

Results

Dry Matter Results

Four caged areas were measured in each paddock; the individual cage results and the average for each pasture are shown below.

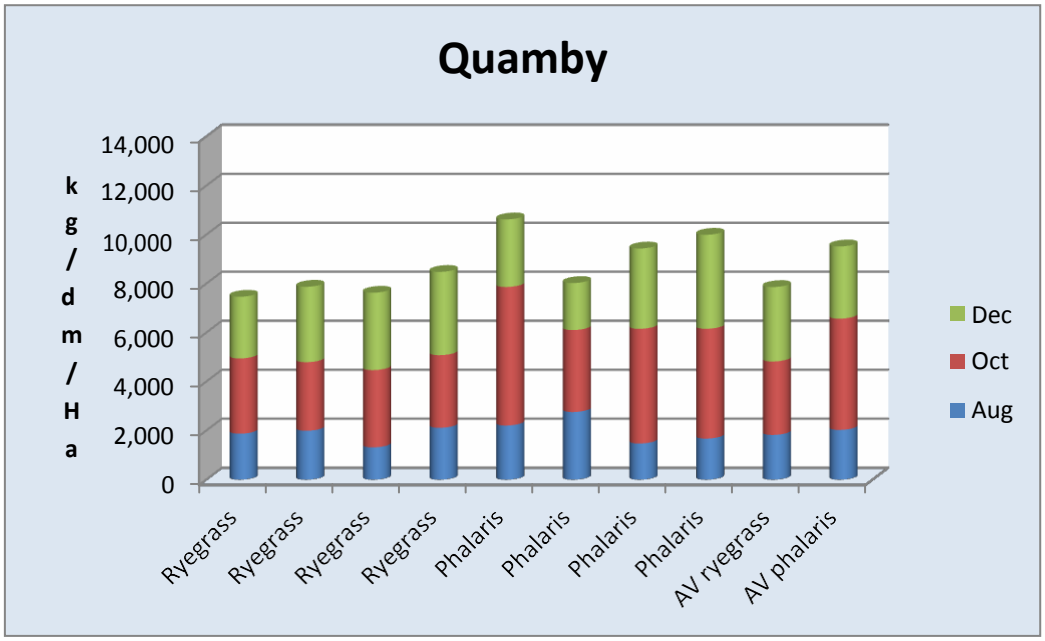

Fig. 22; Dry matter (kg DM/ha) Quamby 2018

Table 32; Total DM: Quamby 2018

	August 28th	October 18th	December 6th	TOTAL
Ryegrass	1830	2999	3040	7869
Phalaris	2034	4543	2950	9527

The phalaris produced higher dry matter results in both the late winter and mid spring cuts resulting in growing 1658 kg/DM/ha more than the ryegrass overall. Part of the difference is likely to be due to the contribution of Trikkala sub clover in the phalaris pasture and possibly providing additional nitrogen for growth. The clover component in the phalaris pasture was around 40% while it was only approximately 10% in the ryegrass.

Feed quality and composition

Feed tests were conducted at Quamby on August 28th; the results are shown in tables xx

Table 33; Feed Test results for August at Demonstration 5; Quamby

QUAMBY	Barberia Ryegrass pasture	Holdfast GT Phalaris pasture
Crude Protein	30.5	27.1
Neutral Detergent Fibre (NDF)	31.6	34.7
Digestibility (DMD) (% of DM)	85.8	84.6
Est. Energy (MJ/kg DM)	13.1	12.9

There was little difference in the energy value between the pastures. The higher subclover content might have driven up the quality results of phalaris.

How annuals fit in the farm system

Whilst in 2018 there was a difference in dry matter grown between ryegrass and phalaris the ryegrass pasture provides additional benefits to the farming system. High performing phalaris/sub clover pastures are the basis for the lamb production system on Quamby, but their system would be unworkable without annuals in the mix.

Charlie & Rich de Fegely aim to have 20% of the farm devoted to quick growing annual or short term pastures for their system to turn off 8,000 lambs annually. Pure legume stands and grazing barley are also part of the mix, although annual grasses have mostly taken the place of grazing cereals in their system.
Having 100% of the farm in phalaris would expose them to risk, with nowhere to put stock in the case of a phalaris staggers issue. Some paddocks with phalaris would be grazed at sensitive times instead of being spelled, which would threaten their persistence. It would also reduce their opportunity to take advantage of out of season rainfall events.

The short term pastures consist of grazing barley and annual or bi-annual ryegrass, these are combined with Arrowleaf and Antas clover pastures to allow a weaned lamb rotation at high stocking rates which aims to have weight gains of 100 grams/day. The 14 day rotation has mob sizes of up to 75 DSE/ha on the individual paddocks and 11.5 DSE/ha on the whole area in the rotation. The pastures need to be quick growing throughout spring to have enough quality feed ahead of the rotating mob of lambs to ensure maximum production.

While the short term grasses and pure clover stands are maximising weaned lamb production, the phalaris based phalaris pastures are in recovery phase after lambing and lactation with managed grazing ensuring their long term persistence, which are a feature of the Quamby system. They are also producing sufficient dry matter to carry ewes over summer and autumn before lucerne pastures are used to flush the ewes before joining.
The use of annual forage residue in the Quamby system over summer helps the management of the phalaris pastures resulting in more robust perennial pastures which make up the majority of the pasture mix.

Conclusion
The Barberia long rotation ryegrass fitted into this farming system and made a positive contribution to the entire farm output.

Take home messages from demonstrations in years 1 & 2

- Having annual forages in the grazing system provides extra dry matter in mid to late winter above that of annual or rundown pastures.
- Annual forages also provide valuable backup spring feed in the event of a failed spring and allows you to rest perennial pastures to increase growth and improve persistence.
- Annuals with lower costs of production per tonne of dry matter produced are more likely to be profitable provided the essential ingredients of weed control and fertility are provided.
- Cereals allow grazing and opportunistic grain or hay production in good years which can produce high gross margin (GM) results. Lower or even negative GM can result from grazing only but the GM does not take into account other benefits on farm such as saving perennial pastures for lambing ewes.
- Specialist grazing Barley appears to be a variety well suited to the conditions in the Southern Wimmera.
- Specialist grazing barley and other cereals have more chemical annual grass control options than grazing oats; this may be important if the annual forage crop is used as part of the preparation for future pasture establishment.
- Specialist grazing barley is sensitive to low pH conditions, a pH of >5.0 (CaCl) is recommended for barley.
- The result at Paradoo reinforced the message of getting the right plant in the right place from the EverGraze project.
- Year two results reinforce the importance of good planning and being ready to sow as soon as the autumn rains come or dry sow in the case of grazing cereals and annual ryegrass.
- The sowing date comparisons would suggest that to get a benefit from higher seed rates in the drier region of the Southern Wimmera pasture establishment needs to be early in the autumn.
- Producers need to be flexible in their approach to species selection. Changing from ryegrass to a grazing cereal in response to a late autumn break may result in earlier useable winter feed and a higher rate of dry matter production.
- More research is required by the grazing industry on animal production gains on different varieties of high production annual forage pastures.

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- MLA PDS Co-ordinator – Russell Pattinson