High Production Annual Forage in Perennial Systems

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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 for the 2017 demonstration (Fig. 2).

With the exception of a very dry June, good rainfall was recorded during the growing season (Fig 1). Rainfall records at South Glengowan showed a lower total for 2017 than at the official Stawell site; 25 km to the west.

Generally high production sites were compared to a control as defined in table 1.

Table 1. Demonstration summary

High production annual forage	**Control**
Grazing cereal	Degraded pasture
High Production Annual Grass Pasture	Current practice annual grass pasture. (lower seed rates, standard fertiliser).

Each of the inputs and outputs of each demonstration is described below.

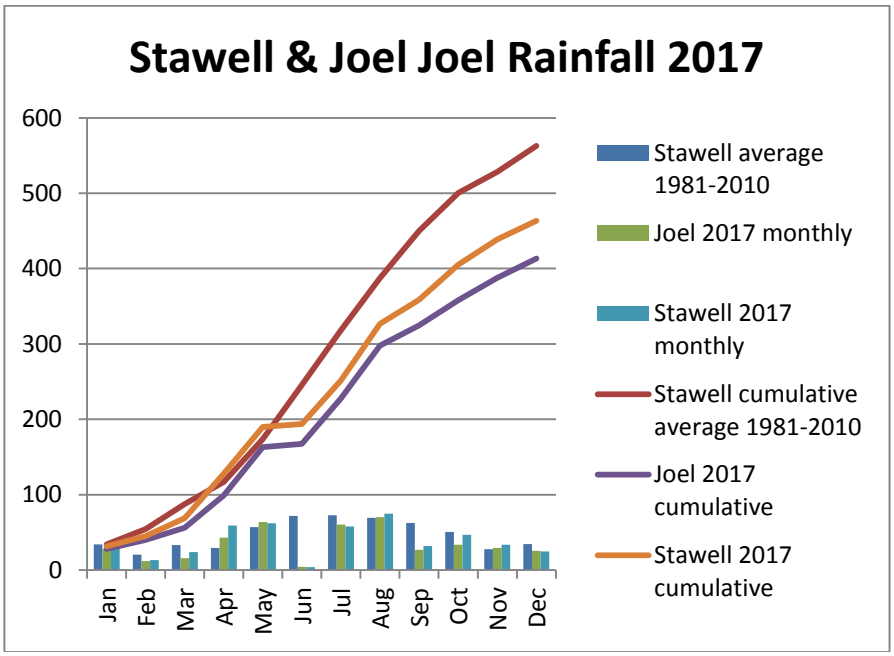

Fig.1. Stawell and Joel Joel rainfall 2017

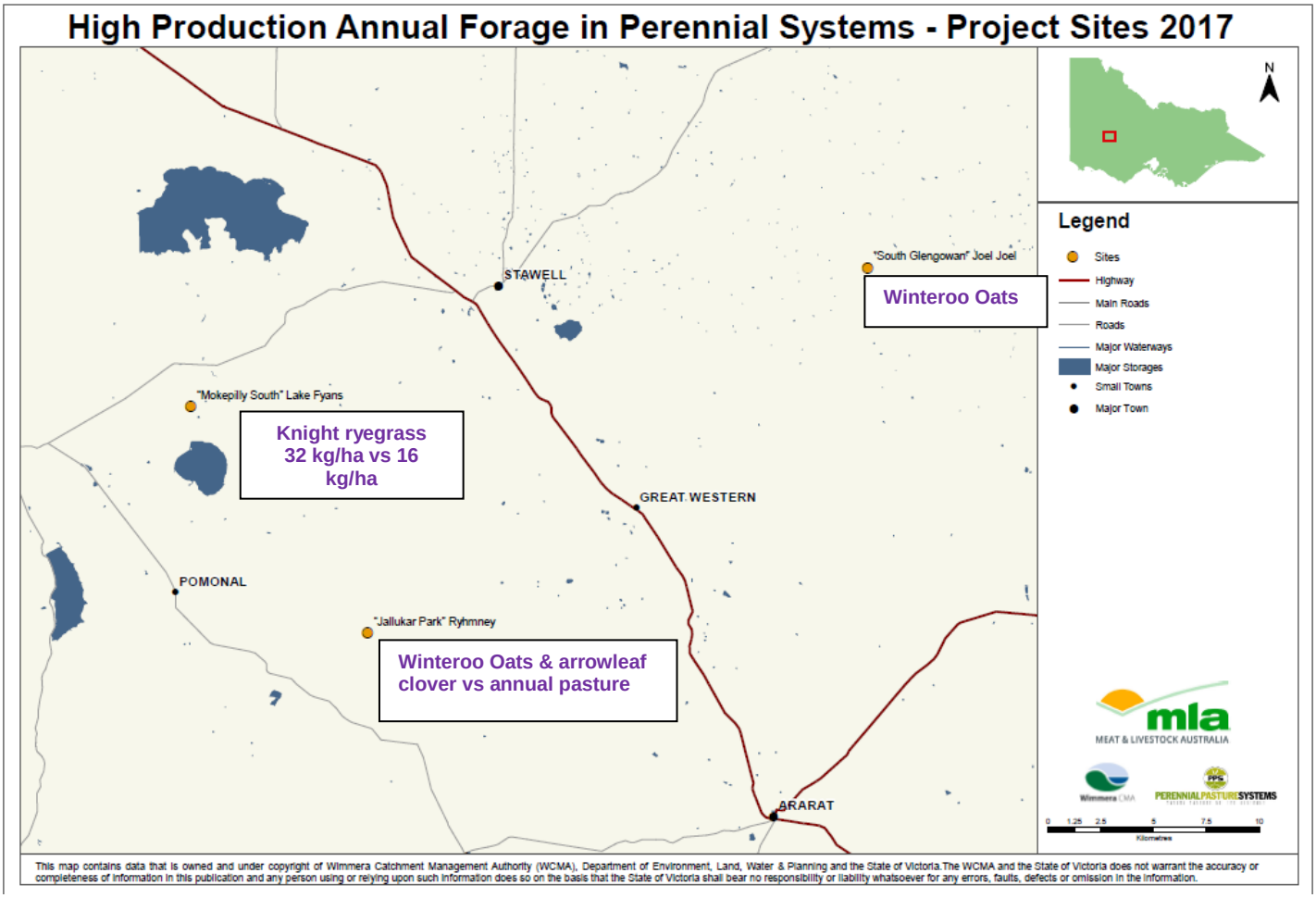

Fig. 2. Location of project sites 2017

Demo Site 1. Italian Ryegrass

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

Background
In high rainfall areas, the higher the sowing rate, the more early feed grown but does it work in drier regions?

Trial Inputs and Design
Knight short term ryegrass (Italian diploid ryegrass) sown at "conventional" rate of 16 kg/Ha with 80 kg/Ha of MAP fertiliser versus "double" rate of 32 kg/Ha and 160 kg/Ha of MAP. In retrospect, the double rate of fertiliser was considered excessive and the double rate should only have been the extra seed.

Only a section of the paddock was sown with the double rate. Paddock size was 17.5 ha.

The pasture was sown on April 22nd 2017. The whole paddock had received a capital application of 150 kg/Ha of single superphosphate + Molybdenum in the summer prior to the ryegrass establishment. This application was to address low phosphorus which was assumed to be below Olsen P 10 mg/kg.

Grazed with approximately 120 XBD ewes (65 kg) with 120% lambs rotationally grazed July – Dec (123 days total), leaving residue of 1000 kg/ha on 31st December 2017. Stocking rate was 6.9 ewes/ha. Lambing occurred in late autumn.

Table 2. Average monthly stocking rate at Mokepilly South and grazing times

Month	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Total
DSE/ha	0	0	0	12.7	0	13.6	7.3	0	27.7	Avg 6.9 dse/ha
Days				31		30	31		31	123

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 two thirds of the cages in both treatments in early September.

Fig. 3. Italian ryegrass site at Mokepilly South

Results

Dry Matter production

The results show a large DM increase (154%) in the winter measurement in the ryegrass sown at the higher rate (545 kg DM/ha versus 1385 kg DM/ha) but only minor differences were recorded in the two spring cuts indicating the advantage of the higher sowing rate had diminished.

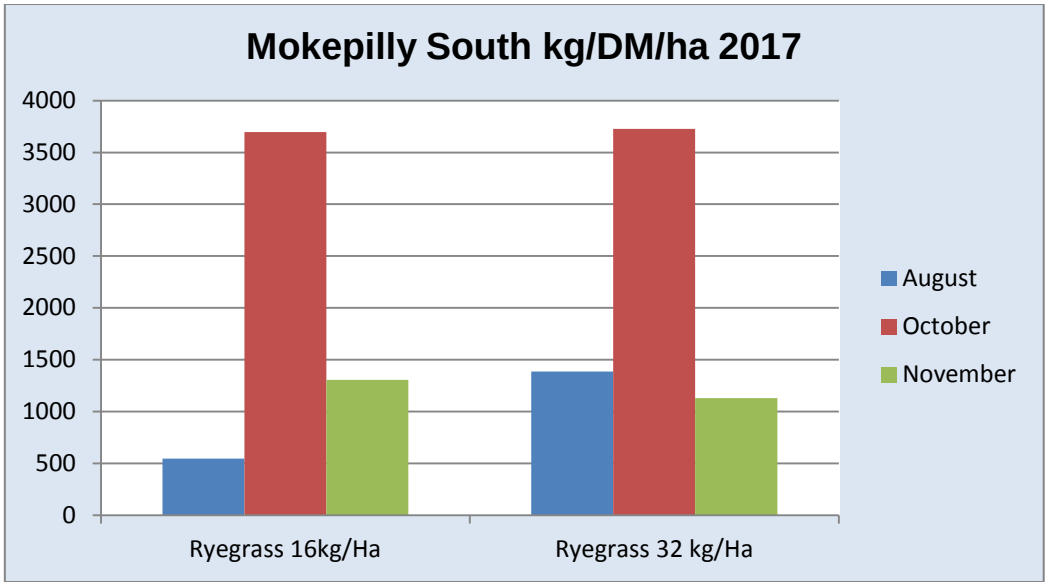

Fig. 4. Total DM results (+N and nil N results added together)

Fig. 5 and 6. Mokepilly South

The applied nitrogen in early September showed large but short lived responses (approximately 60% increase) to the nitrogen application in both the high and low sowing rate but this effect did not carry over into October. The nitrogen might have been better applied during winter (provided soil was not waterlogged) to lift dry matter production even further or targeted 4 weeks out to when feed was needed.

The production of feed appeared to slow in October/mid November and perhaps not providing the late spring feed that was expected perhaps becoming low in nitrogen or lower rainfall reduced growth.

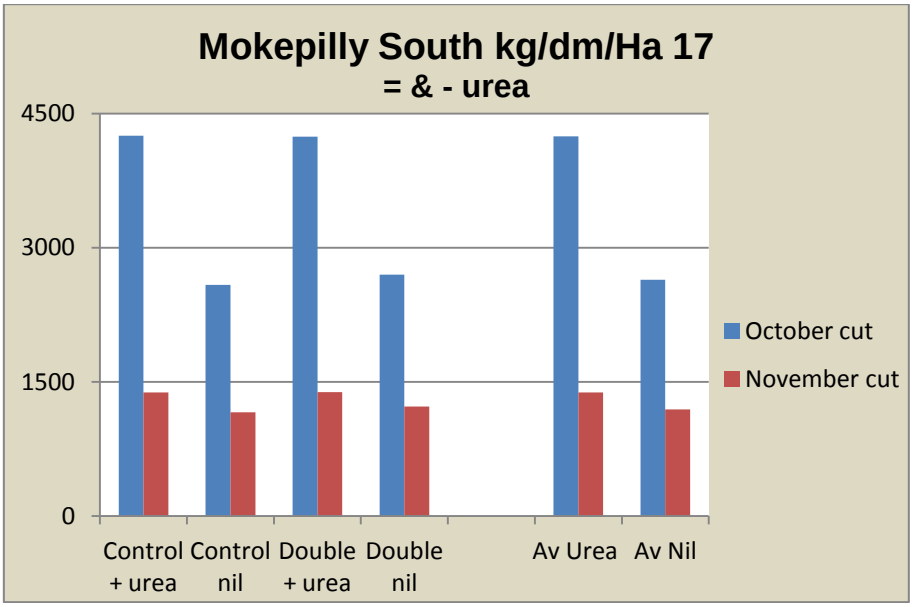

Fig. 7. Dry matter production with and without urea

Fig. 8. Response to urea application

Table 3. Summary of dry matter production (kg DM/ha) produced in each treatment at demo site 1 at different times in late winter and spring

Time	Control 16 kg/ha		Double Rate 32 kg/ha	
	- Nitrogen	+ Nitrogen late Aug	- Nitrogen	+ Nitrogen late Aug
Aug	545		1385	
Sep	2585	4252	2699	4251
Oct/mid Nov	1158	1380	1223	1383
Total	4289	6177	5306	6484

Feed quality
Feedtest results were conducted on September 5th and the results are shown in the table 3. There was little difference in the estimated energy (MJ/kg DM).

A XB ewe (65 kg) with a single lamb may require approximately 8.8 MJ ME/hd/day for maintenance and the Italian ryegrass measured an ME of 13.5 MJ/kg DM indicating it would meet demands provided enough feed was on offer.

Table 4. September 2017 feed test results at demo site 1

Italian ryegrass	16 kg/Ha	32 kg/Ha
Crude Protein	21.5	19.2
Neutral Detergent Fibre (NDF)	37.4	34.9
Digestibility (DMD) (% of DM)	84.9	88.4
Est. Energy (MJ/kg DM)	13.5	13.6

All treatments had Feed Tests conducted in early November; the results are shown in table 4. There was some variance in feed quality measurements in the results, particularly crude protein in the high sowing rate with urea which cannot be explained other than sampling error. However, generally there was no consistent pattern between the sowing rate or urea results.

However, the results do indicate that Italian ryegrass is proving very good feed quality in late spring that would exceed an annual pasture or oats at this time.

Table 5. November 2017 feed test results at demo site 1

Italian ryegrass	16 kg/Ha + Urea	16 kg/Ha nil Urea	32 kg/Ha + Urea	32 kg/Ha nil Urea
Crude Protein	17.5	18.4	13.1	19.2
Neutral Detergent Fibre (NDF)	40.4	41.2	43.1	46.6
Digestibility (DMD) (% of DM)	82.9	83.0	80.4	80.1
Est. Energy (MJ/kg DM)	12.6	12.7	12.2	12.2

Note; the crude protein for the 32 kg/Ha + Urea is vastly different to the other three tests. The samples were checked but no cause was found for the anomaly.

Financials

Costs of establishment

The costs of the additional rate of MAP fertiliser (80 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 MAP 160 kg/ha treatment was 8 kg/ha applied at sowing. It's not known if it contributed to faster establishment or was not utilised but the rate exceeds the recommended rate of starter nitrogen. For simplicity the cost of the extra N added at sowing has not been included in the calculation of establishment costs.

Table 6. Establishment costs at Mokepilly South.

	Item	Rate	Input Unit	Price	Price Unit	Cost/ha
Seed	Knight short term ryegrass	16 or 32	kg/ha	$ 7.75	$/kg	$124 or $248.00
Fertiliser	MAP	80	kg/ha	$ 704.00	$/t	$ $56.32
	Urea	100	kg/ha	$ 294.00	$/t	$ 29.40
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	1	application	$ 12.00	$/ha	$ 12.00
	Spreading of fertiliser	1	application	$ 12.00	$/ha	$12.00

Notes: Single super + Moly was applied prior to establishment at a capital cost $45.60/ha to bring the fertility up so that the performance of Italian ryegrass would not be impaired.
The price of Knight short term ryegrass was quoted from a merchandise store in early 2018.

Table 7. Summary of establishment costs at demo site 1.

	Control 16 kg/ha		Double Rate 32 kg/ha	
	- Nitrogen	+ Nitrogen late Aug	- Nitrogen	+ Nitrogen late Aug
Costs	$264/ha	$306/ha	$376/ha	$418/ha

Table 8. Estimated additional costs

Costs	Control Vs Double rate	Comment
Establishment costs without Nitrogen	$264/ha Vs. $376/ha	Difference of $112/ha
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	An increase in feed grown could mean additional nutrients could be removed if that feed is utilised.	

Income/Benefits

As the site was rotationally grazed, and both treatments were within the same paddock, potential benefits have been estimated rather than a gross margin produced.

Table 9. Estimated benefits of high input versus standard input.

Benefits	High input vs Standard input	Comments	Calculation
Extra Dry Matter, grown in Aug as measured by cuts	0.84 DM t/ha	Worth the equivalent of $136/ha if you needed to supplementary feed and cost an extra $112/ha to produce. Worth nothing if you didn't need to supplementary feed over late winter.	This is based on 60% utilisation where 504 kg DM/ha available at 13.5 MJ ME/kg DM which is equivalent to 6804 MJ ME/ha. The cost to supply this with feed barley at $218/t fed (90% DM) and an ME of 12 is 2 cents/MJ of ME. Assumes no wastage of grain. (6804 MJ ME/ha x 0.02 $) = $136/ha This figure does not include labour to feed out
Estimated extra DSE grazing days in August from 504 kg DM/ha (60% utilisation of 0.84 DM t/ha)	504 DSE grazing days/ha	504 DSE grazing days/ha at a stocking rate of 14 DSE/ha would allow stock to graze for 36 days before feed would run out or a phalaris paddock to be rested at this time.	Allowed 1.0 kg DM/hd/day, with stock utilising 60% of feed (504 kg DM/ha ÷1.0)
Extra DM/ha from Nitrogen grown in September	Extra 1 to 1.6 t DM/ha	Nitrogen cost about $40/ha	
Residual value	Same expected	In year 2, 20-30% plants might survive	

The higher seed rate cost an extra $112/ha to grow an extra 840 kg DM/ha in August and in a year when feed demand was high this cost would have been recouped based on supplementary feeding alone. There may have also been other additional benefits that may have allowed costs to be recouped, for example additional animal production at this time (eg weight gains) that have not been able to be accounted for.

Actual grazing occurred in July at 12.7 DSE/ha (DSE rating of 1.8, given 6.9 ewes/ha were grazed) and feed at this time is generally always highly sought after for filling feed gaps and to allow phalaris to be rested.

Conclusion

The double rate of Italian ryegrass did lift winter production as expected and covered the additional seed costs. The demonstration showed a good response to nitrogen and applying nitrogen in early to mid-winter would have assisted in also lifting winter production and growing feed when it is often most needed. This site which was in the process of building nutrients and may not have reached critical nutrient levels to allow the full yield production of Italian ryegrass.

Demo Site 2. Winteroo Oats + Arrowleaf clover

Location: Jallukar Park at Rhymney
Owners, Simon & Yvette Brady

Background
How much do oats produce and does it pay?

The owner routinely sows oats with the objective of not only growing more winter feed, but having backup feed in case the spring fails. If the spring fails, the crop wouldn't likely produce as much as it would in a normal year but this feed would be highly valuable and allow paddocks of phalaris to be rested so they could become reproductive and lay down dormant buds to survive the summer.

Trial Inputs and Design
Winteroo oats + Arrowleaf clover (14.5) versus annual pasture (14.0 ha).

The cereal mix was sown on May 8th 2017. The cereal mix paddock had received a capital application of lime 2.5 t/ha.

The soil type is a light granite. Grazing occurred with 2 mobs rotated between paddocks following lambing on May 15th.

Table 10. Stocking details for demonstration 2 at Jallukar Park

Grazing periods	Stocking details	Cereal DSE/ha	Control DSE/ha
1st April to 28th Oct	189 Merino ewes with 270 lambs, May 15 lambing rated at 2.7 DSE	35	36
5th Nov to 25th Dec	750 1.5 yr Merino ewes Rated 1.3 DSE in cereal to reflect weight gain & 1 DSE on annuals which had no weight gain	67	54

Table 11. Number of days grazing occurred in the Control and Cereal at Jallukar Park

Month	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Mid Dec	Total
Control	30	0	15	0	24	6	13	10	5	73
Cereal	0	0	0	31	7	24	18	15	20	115

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

Fig. 9 and 10. Annual pasture site Jallukar Park

Fig. 11 and 12. Cereal site at Jallukar Park

Rhymney's rainfall will be approximately related to Stawell's rainfall which is shown in figure 1 which indicates a good rainfall year.

Results

Dry Matter Results

The winter DM results are shown in figure 13, they show large increases in feed availability at the cereal sites when compared to the control pasture.

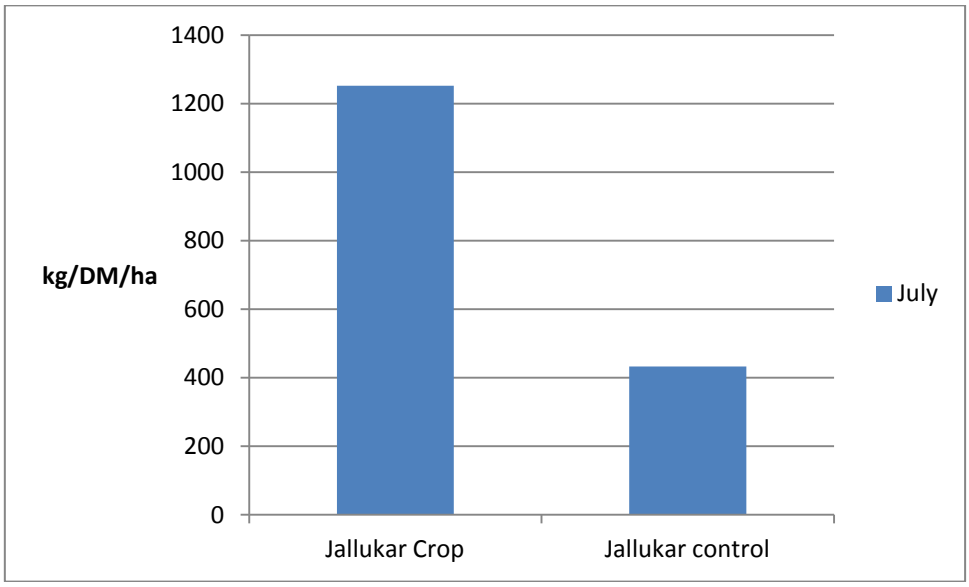

Fig. 13. Winter DM results

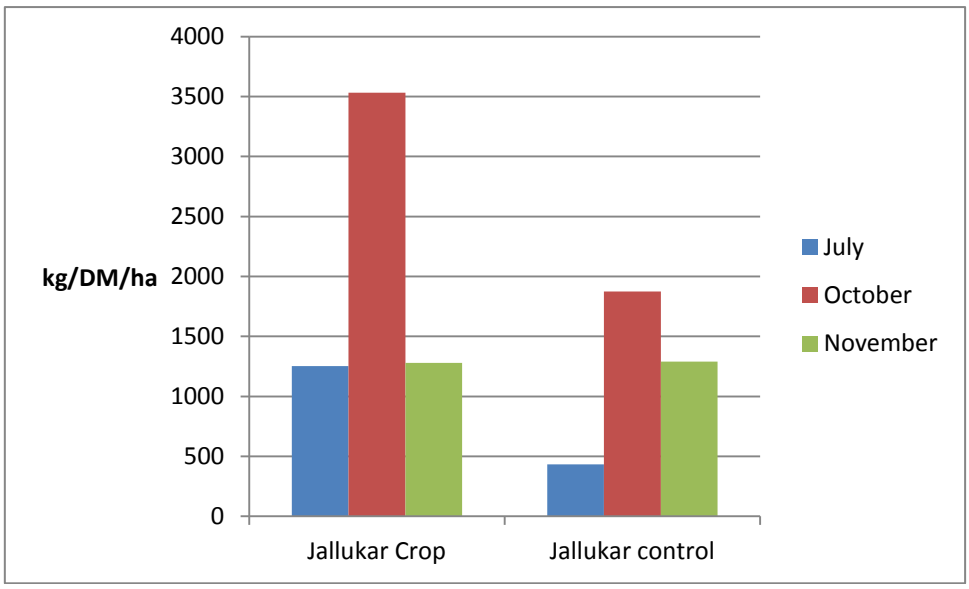

Fig. 14. Dry matter (kg DM/ha) production for Jallukar Park demonstration from July to November.

The total DM results for the year show that the Jallukar cereal site grew 2,465 kg/DM/ha more than the control.

Feed quality and composition

Feed Tests were conducted at Jallukar Park in late August and early November, the results are shown in tables 12 and 13.

Table 12. Feed Test results for August at Demonstration 2 Jallukar Park

JALLUKAR PARK	Cereal	Annual pasture
Crude Protein	16.7	13.8
Neutral Detergent Fibre (NDF)	34.6	52.1
Digestibility (DMD) (% of DM)	86.6	74.1
Est. Energy (MJ/kg DM)	13.3	11.1

Table 13. Feed Test results for November at Demonstration 2 Jallukar Park

JALLUKAR PARK	Cereal	Annual pasture
Crude Protein	6.7	8.2
Neutral Detergent Fibre (NDF)	47.3	57.5
Digestibility (DMD) (% of DM)	68.2	66.9
Est. Energy (MJ/kg DM)	10.1	9.9

Feed quality was higher in the cereal mix in August but the difference was much less in late spring.

The control annual pasture was typical of annual pastures in the region. The spring composition of the pasture is shown in figure 15 showing 55% annual grasses and 25% clover and 20% erodium.

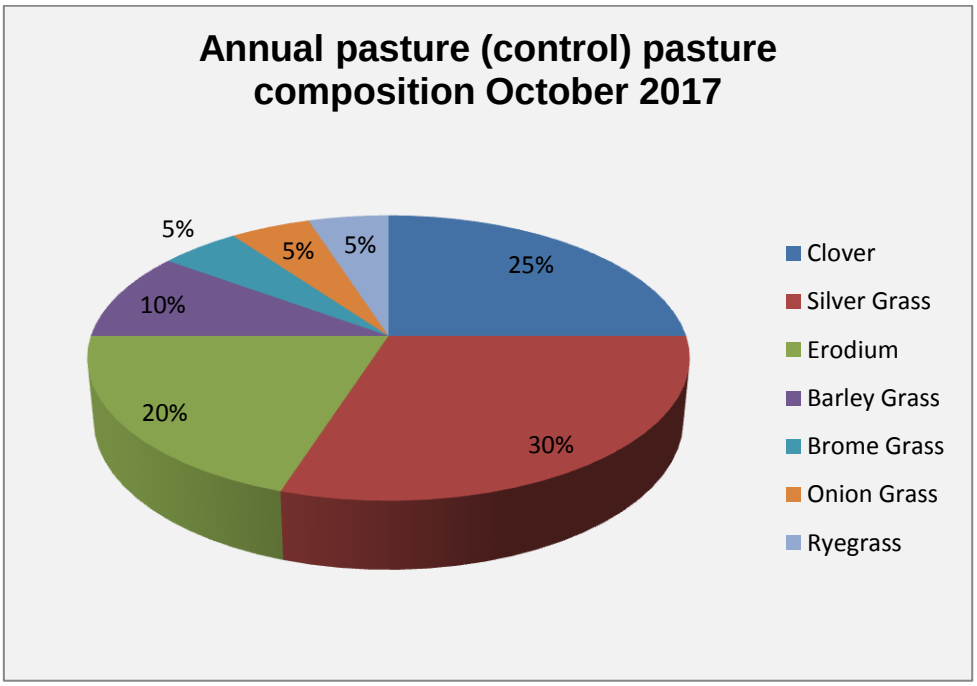

Fig.15. Annual paddock pasture composition

The crop forage contained 60% oats and 10% clover, with 30% volunteer annual grasses.

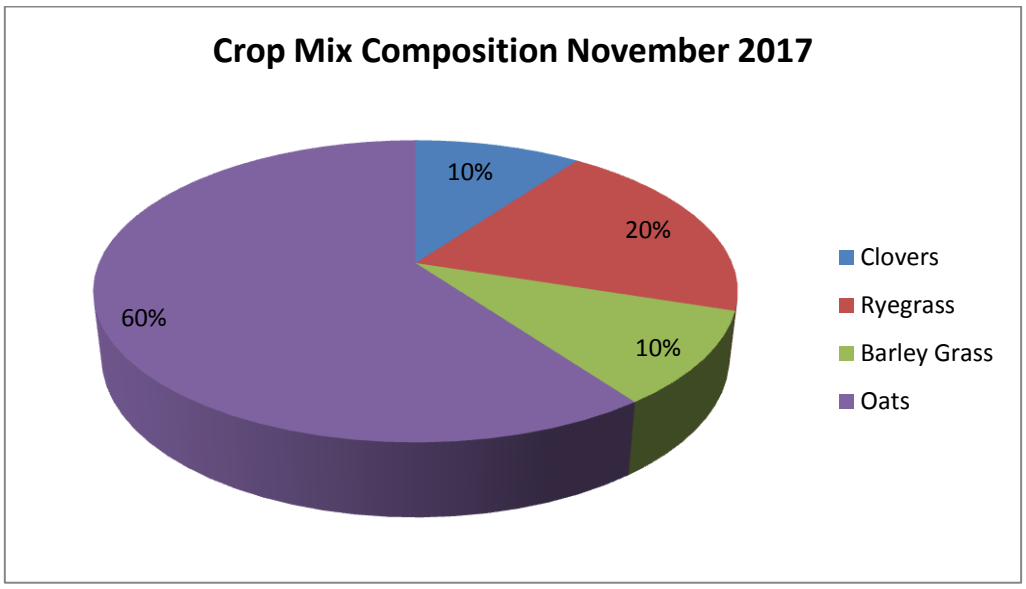

Fig. 16. Crop mix pasture composition

Financial analysis

Costs of establishment

Table 14. Establishment costs at Jallukar Park.

	Item	Rate	Input Unit	Price	Price Unit	Cost/ha
Seed	Winteroo Oats	100	kg/ha	$ 200.00	$/t	$ 20.00
	Arrowleaf Clover	8	kg/ha	$ 2.50	$/kg	$ 20.00
Fertiliser	MAP+Zn+Cu	80	kg/ha	$ 720.00	$/t	$ 57.60
	Potash	60	kg/ha	$ 550.00	$/t	$ 33.00
	Urea	50	kg/ha	$ 294.00	$/t	$ 14.70
Knockdown herbicide	Glyphosate 540	1.2	L/ha	$ 5.00	$/L	$ 6.00
	Striker	80	mL/ha		$/L	$ 1.20
	Fastac	100	mL/ha	$ 11.65	$/L	$ 1.17
Operations	Sowing	1	application	$ 50.00	$/ha	$ 50.00
	Spraying	1	application	$ 12.00	$/ha	$ 24.00
	Spreading of fertiliser	2	applications	$ 12.00	$/ha	$ 24.00
	Cartage of fertiliser			$ 15.00	$/tonne	$ 7.80
Total costs						**$ 264**

Lime is a capital cost and so has been excluded in the costs of establishment. Lime was spread at 2.5t/ha at a cost of $50/ha spread and a cost per hectare of $125/ha. The lime is thought to last approximately 10 years and so could have been included in the establishment costs at an annual cost of $12.50/ha.

The annual pasture received superphosphate + molybdenum ($304/t) at a cost of $42/ha spread.

Table 15. Estimated additional costs of oats versus control at Jallukar Park

Costs	Oats vs Control	Comment
Establishment costs	$264/ha vs $42/ha	Difference $222/ha
Extra time for establishment		Took 8 weeks for oats to establish before grazing commenced.
Extra risk of failure to establish		
Extra nutrient removal	Increase in dry matter produced would mean extra 40% nutrients removed	Nutrient amount per kg DM removed would be similar.

Note: No magnesium or sodium supplements were needed with grazing oats because it has a much higher forage sodium content than barley or wheat which also affects magnesium uptake (GRDC 2014).

Income/Benefits

It was difficult to determine income from the treatments as only the one mob of stock were used and rotationally grazed between both paddocks. Potential benefits have been estimated rather than a gross margin produced.

Table 16. Estimated benefits oats versus control at Jallukar Park

Benefits	Oats vs Control	Comments	Calculation
Extra Dry Matter, grown in in July to October as measured by cuts	2.5 DM t/ha	Worth the equivalent of $360/ha based on replacement value with barley. This value would only be realised in a poor year when you needed to supplementary feed. Worth nothing in a good year if you didn't need to supplementary feed. It cost an extra $220/ha to produce. Breakeven DM production was calculated to be 1.2 t DM/ha	This is based on 60% utilisation where 1500 kg DM/ha available at approx. 12 MJ ME/kg DM which is equivalent to 18,000 MJ ME/ha. The cost to supply this with feed barley at $218/t fed (90% DM) and an ME of 12 is 2 cents/MJ of ME. Assumes no wastage or feeding out costs. (18000 MJ ME/ha x 0.02 $) = $360/ha.
Extra Dry Matter, grown in in July to October as measured by cuts	2.5 DM t/ha	An extra 1500 kg of available DM/ha would have allowed an extra 4 ewes/ha to be run over the grazing period. However the increase in available DM was utilised by ewes with twins during July, Aug reducing the need to purchase stock and continue to carry them.	
Total extra grazing days from June to Dec by stock	42 days	Extra grazing days comes from extra DM production.	
Extra grazed days by ewes with lambs over winter	37 days	Extra days enables producer to rest phalaris to increase its leaf area and growth by 10-20%.	80 days on oats versus 37 on annual.
Extra Grazed days by Ewe weaners in Nov to Dec	20 days	If spring fails, you still have oats you can utilise without the issue of having to rest phalaris or risk grazing phalaris which impacts on its ability to produce dormant buds.	35 days on oats versus 15 days on annual
Extra animal production of young ewes Nov to Dec	50g/hd	No weight gain on annual pasture. More available feed allowed a higher intake and weight gains to occur.	Estimated by host farmer.
Peace of mind		Owner sleeps at night, knowing he still has some feed if spring fails	
Flexibility		Provides diversity to farm which already has most paddocks sown to phalaris.	

The good rainfall year of 2017 enabled good dry matter production of the oats. In a good year, the extra feed may not be needed by grazing livestock but it provides opportunity to rest phalaris paddocks or sow down other paddocks. In a year with a late break, the oats will provide a valuable source of feed reducing supplementary feeding costs.

Importantly it will also provide a source of feed (albeit reduced) in a failed spring that can be utilised without the concerns of impacting on its persistence which exist in a permanent pasture.

For producers who have already improved much of their farm and are running out of paddocks where they can put stock to rest phalaris or other permanent pastures, the oats provides a good alternative to containing stock and supplementary feeding them.

Conclusion

This demonstration highlighted 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.

The financial analysis used showed that for the 2017 year, oats plus arrowleaf clover produced an extra 1.3 t DM/ha above the breakeven amount which indicated its potential to pay for the establishment costs. This analysis excluded the costs of not being able to graze the paddock whilst it was establishing or the costs involved to sow it down in the following year which would lessen its benefit. 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.

Fig. 17. Demo site 3; South Glengowan

Demo Site 3. Oats

Location: South Glengowan at Joel Joel
Owners, Ken and Justin Hall

Background:
How much dry matter does oats produce and does it pay?

The producers were focused on grazing with opportunistic grain production.

Trial Inputs and Design
Winteroo oats sown on April 15th 2017.

There was no control and so the Jallukar park annual pasture was used as a comparison. Paddock size was 42 ha.

The cereal was grazed from June until September and spring rains produced enough growth for 16 ha to be cut for hay and the remaining 32 ha to be harvested for grain.

Table 17. Stocking details for demonstration 3 at South Glengowan

Grazing periods	Stocking details	Cereal DSE/ha
June 7th to September 15th (100 days)	193 ewes (65 kg) with 300 white suffolk cross lambs. Lambing in mid April. DSE rated 3.0	13.8

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

Fig. 18. Oats at South Glengowan

The control annual pasture was located at Jallukar Park and would be typical of run down pastures in the region. The spring composition of the annual pasture is shown in figure 11.

Results

Dry Matter Results

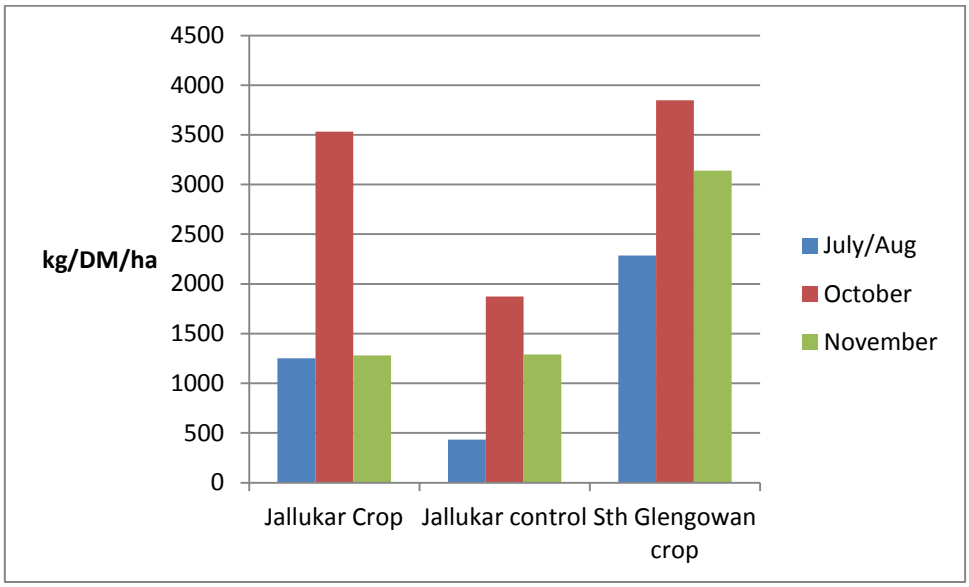

Fig. 18. Dry matter (kg DM/ha) production for cereals demonstration from July to November.

The total DM results for the year show that the South Glengowan site produced 5.7 t DM/ha higher than the control at Jallukar Park. The Jallular park crop which was also oats produced less and this might be attributed to be sown with arrowleaf clover which competed with that crop rather than rainfall as both sites received adequate rainfall for the growing season.

The South Glengowan site also received two good rainfall events in October that allowed greater than anticipated growth.

Feed quality and composition
Feed tests were not conducted at South Glengowan. Feed tests collected of oats and annual pasture at Jallukar Park in late August and early November are shown in Demonstration 2 Jallukar Park notes, although the oats at South Glengowan was not sown with arrowleaf clover and so may be of lower feed quality.

Financial analysis

Costs of establishment

Table 18. Establishment costs at South Glengowan.

	Item	Rate	Input Unit	Price	Price Unit	Cost/ha
Seed	Winteroo Oats	140	kg/ha	$ 200.00	$/t	$ 28.00
Fertiliser	Granulock, Zn & Cu	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	Cultivation	1		$ 40.00	$/ha	$ 40.00
	Sowing (contract)	1	application	$ 50.00	$/ha	$ 50.00
	Spraying	2	applications	$ 12.00	$/ha	$ 24.00
	Cartage of fertiliser	1	$/tonne	$15.00	$/ha	$ 1.20
Total costs						**$ 234.92**

A knockdown spray in September 2016 was used to control barley grass and the owner felt this contributed to the successful result of the oats dry matter production and so has been included in the establishment costs.

Income/Benefits
Lambs gained 315 grams/day. They entered paddock weighing 19 kg on June 7th and weighing 50.5 kg on September 15th. 70 lambs were sold and the remainder were kept for breeding purposes.

The oats paddock was used for grazing for 100 days which allowed the adjacent paddock which had been sown to phalaris to be rested while it established.

During the 100 days grazing, there would have been wool growth, estimated to be 1 kg/hd on 193 ewes.

After stock were removed, spring rains enabled extra growth and so there was opportunistic hay production on 16 ha with 100 tonnes of oaten hay produced into 153 square bales each weighing 650 kg and grain harvesting (90 t) on 26 ha.

There was likely also spilt oats and stubble that could have enabled additional grazing opportunities in December.

Gross Margin
Two gross margins have been calculated for the paddock based on some of the realised income produced from both enterprises undertaken (grazing/grain harvesting and grazing/hay production). The gross margins are conservative as it does not take into account the value of grazing of the ewes and 210 unsold lambs. It also does not take account of the time (7.5 weeks) that the paddock cannot be grazed whilst oats established.

The gross margin for hay and grain production varied with hay production potentially more profitable due to the value placed on the retained hay.

Table 19. Estimated gross margin of oats demonstration paddock with lambs and grain yield (26 ha) at South Glengowan.

Income						
		Yield	**Input Unit**	**Price**	**Price Unit**	**Income ($/ha)**
Lambs	Lambs 70 sold	14.8	kg	$6.15	$/kg dressed wt	$151.75
Grain	Yield	3.46	t/ha	$170.00	$/t	$588.20
Gross Income						**$739.95**
Variable costs						
		Rate	**Input Unit**	**Price**	**Price Unit**	**Cost/ha**
Oats	Establishment					$234.92
	Harvesting			$55.00	$/ha	$55.00
Animal health	Drenches, vaccinations	493	hd	$1.00	hd	$11.74
Lamb sale costs	Selling cost	70	hd	$2.50	hd	$4.17
	Freight	70	hd	$ 4.00	hd	$6.67
Total variable costs						**$312.49**
Gross margin ($/ha)						**$427.46**

- Lambs: Income is based on the weight gain of 70 lambs sold which occurred over 100 days grazing within in the demonstration paddock of 42 ha. Dressed weight gain at 47% was 23.7 kg. Price/hd $145.95. ($145.95 ÷23.7 kg =$6.15/kg dressed weight).
- Grain price: Value of feed oats costed in 2017 if farmer had to purchase (source: PIRSA, 2017). Producer kept oats and so no transport costs or selling costs.
- Other income and costs not included are potential wool growth during the grazing period and the time the paddock took to establish.

Table 20. Estimated gross margin of oats demonstration paddock with lambs and hay production (16 ha) at South Glengowan.

Income						
		Yield	**Input Unit**	**Price**	**Price Unit**	**Income ($/ha)**
Lambs	Lambs 70 sold	14.8	kg	$6.15	$/kg dressed wt	$151.75
Hay	Hay bales	6.25	t/ha	$163.00	$/t	$1,018.75
Gross Income						**$1,170.50**
Variable costs						
		Rate	**Input Unit**	**Price**	**Price Unit**	**Cost/ha**
Oats	Establishment					$234.92
Hay	Bailing	9.6	bales/ha	$20.00	bale	$191.25
	Mowing	16	ha	$ 48.00	ha	$48.00
Animal health	Drenches, vaccinations	493	hd	$1 00	hd	$11.74
Lamb sale costs	Selling cost	70	hd	$2.50	hd	$4.17
	Freight	70	hd	$ 4.00	hd	$6.67
Total variable costs						**$496.74**
Gross margin ($/ha)						**$673.76**

- Bales: Oaten hay valued on a 5 year average selling price, if they had to purchase (Source: PIRSA, 2017). Hay retained by producer, so no selling or transport costs.

Conclusion

This demonstration highlighted that oats can be a valuable feed source in a poor year by reducing supplementary feeding costs and in a good year, although extra feed may not be needed, it does recoup establishment costs by providing opportunistic hay and grain production.

Early take home messages from demonstrations in year 1

- 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.

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