# MLA PDS: Alternate forage crops for Southern WA

## Introduction

Summer rainfall in the southwest of WA is happening more frequently. In 2021 over 90ml of rainfall was received for (Manypeaks) from 1 January to 10 March. There is an opportunity for producers in the south west high rainfall zone (HRZ) to take advantage of summer rainfall events with summer forage crops, but this begs the questions as to what a summer forage can contribute to the farming systems and what species are best suited. Stirlings to Coast Farmers (SCF) set out to explore these questions with a project specifically looking at Pallaton Raphno, millet, Hyola 970 canola, cowpea and sorghum. In the 2020 season producer demonstration paddocks were sown to Raphno and millet and the findings are presented below.

Benefits from summer crops allow deferred grazing on annual pastures, giving them more time to establish and reach critical biomass before stock graze them, which means more productive annual pastures with more biomass. More feed availability during the autumn feed gap will improve profitability in one of two ways. Firstly, by carrying more livestock and secondly, by having animals ready for the market outside of peak supply times.

For the first year of the project the three trial sites were:

- Pyle- North Manypeaks, lambs grazing Pallaton Raphno versus ryegrass re-growth
- Smith- Green Range, lambs grazing millet versus barley stubble
- Rochester- Manypeaks, yearling cattle grazing Pallaton Raphno and Optiweigh system

This project will continue for another two years.

## Aim

To demonstrate the feed value of alternate high biomass summer forage crops in increasing stocking rates and live weight gain of prime lamb or beef cattle relative to current systems in the HRZ of Western Australia.

*This Producer Demonstration Site is funded by Meat & Livestock Australia*

MEAT & LIVESTOCK AUSTRALIA

# PYLE SITE: PALLATON RAPHNO VS RYEGRASS REGROWTH

## Key Messages

- **Pallaton Raphno had a higher nutritional value (NV) than the ryegrass control, with a higher crude protein, digestibility and metabolisable energy.**
- **Raphno and ryegrass had similar biomass of 3t/ha and 3.8t/ha respectively.**
- **Excellent weight gain was achieved on the Raphno with 62.5g/head/day more than the ryegrass regrowth.**
- **The ability of Raphno to grow under grazing pressure and produce leaf material allowed a much higher stocking density with 1400 lambs on 45ha (31 lambs/ha), compared to 360 lambs on 30 hectares (12 lambs /ha).**
- **Lamb live weight gain measured in kg/ha/day was a staggering 5.35kg/ha/day for the Raphno compared to 1.31kg/ha/day achieved on the ryegrass.**

## Background

On September 2 2020, brothers Tim and David Pyle planted a 45ha paddock of new forage brassica, Pallaton Raphno, after seeing it trialled in the region. The control comparison was 30ha of ryegrass regrowth from a 2020 silage crop cut on October 15 2020. After sowing, the Raphno was sprayed for diamond back moth (DBM) on November 2 with Affirm and 100L/ha of Flexi-N was applied a day later. Despite the insecticide application, there were still signs of damage from DBM on December 3. Biomass cuts were taken on December 3 with soil and plant tissue samples collected on December 7. Lambs were introduced on December 3 and removed to be weighed on January 4 when the ryegrass regrowth ran out. In comparison there was plenty of feed remaining in the Raphno paddock. A considerable benefit of this crop is its ability to grow under grazing pressure. It can be grazed multiple times over summer and throughout the year depending on rainfall, grazing pressure, and pest management.

## Method

The Pyle's site investigated lamb growth rates on Pallaton Raphno compared to ryegrass regrowth. The control of ryegrass regrowth was selected because it is a common feed source available at this time of year in the Pyle's operation.

Prior to grazing, soil samples were collected for each paddock from 0 - 10cm depth. Four quadrant cuts were collected from each paddock to determine biomass prior to grazing. The samples were dried at 65°C for 48 hours before being weighed. Plant samples were also collected for nutritive value (NV) analysis. NV samples were analysed by Feedtest, 260 Princes Highway, Werribee, VIC.

A proportion of the lambs were weighed from each group selected to go onto the Raphno and Ryegrass. The same proportion was then weighed coming off the respective forages one month later.

## Site results

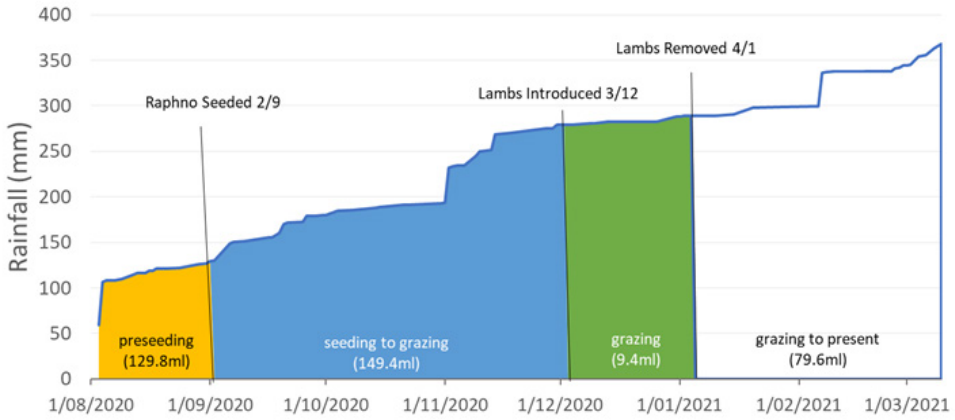


*Figure 2. Summary of cumulative rainfall on the Pyle's property from August 1 2020 to March 10 2021 at a nearby GoannaAg digital rain gauge located at the Drawbin and Pfeiffer road intersection.*

*Table 1. Pyle soil sample results taken December 7 2020.*

| Site Name | Depth | pH (CaCl2) | Al CaCl2 (mg/kg) | PBI + P Col | P Col (mg/kg) | Texture | Sand (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|
| Raphno | 0-10 | **5.6** | 0.1 | 22 | **32** | Sand | 98.0 | 1.0 |
| Rye | 0-10 | **4.5** | 1.2 | 20 | 19 | Sand | 97.0 | 1.0 |

*Table 2. Pyle dry matter (DM) cuts prior to grazing*

| Forage | g of 0.1m$^2$ quad | t/Ha |
|---|---|---|
| Rye grass | 30.10 | 3.01 |
| Pallaton raphno | 38.30 | 3.83 |

*Table 3. Pyle nutritional value (NV) analysis of forages*

| NV Analysis | Ryegrass regrowth | Pallaton Raphno |
|---|---|---|
| Dry matter (DM) | 30.3% | 13.9% |
| Moisture | 69.7% | 86.1% |
| Crude protein | 7.9% of DM | 16.4% of DM |
| Acid detergent fiber | 38.6% of DM | 13% of DM |
| Neutral detergent fiber | 71.5% of DM | 19.3% of DM |
| Digestibility (DMD) | 51.2% of DM | 88.3% of DM |
| Digestibility (DOMD) | 50.2% of DM | 81.6% of DM |
| Estimated metabolisable energy | 7.2MJ/kg DM | 13.6MJ/kg DM |
| Fat | 2.4% of DM | 3.8% of DM |
| Ash | 6.9% of DM | 10.9% of DM |

## Animal results and discussion

*Table 4. Stocking rate and weight gain for lambs grazing Pallaton Raphno and ryegrass regrowth at the Pyles'.*

| **Forage** | **Head** | **Area (ha)** | **Stocking rate (lambs/ha)** |
|---|---|---|---|
| Ryegrass | 360 | 30 | 12 |
| Raphno | 1400 | 45 | 31.11 |
| **Forage** | **Weigh In (average kg)** | **Weigh Out (average kg)** | **Weight gain (average kg)** |
| Ryegrass | 49 | 52.5 | 3.5 |
| Raphno | 42.5 | 48 | 5.5 |

*Table 5. Average weight gain for lambs grazing forages for one month*

| **Forage** | **Avg weight gain (g/hd/day)** | **Avg weight gain (kg/ha/day)** |
|---|---|---|
| Ryegrass | 109.38 | 1.31 |
| Raphno | 171.88 | 5.35 |

Figure 3. Left, photo of the Pyles' 30ha Ryegrass control on December 7 2020. Right, the same crop on January 15 2021 after the lambs had been removed.

Figure 4. Left, photo of the Pyles' 45ha Pallaton Raphno crop on December 7 2020. Right, the same crop on January 15 2021 after the lambs had been removed.

The Pallaton Raphno had a higher nutritional value than the ryegrass control, with a higher crude protein, digestibility and metabolisable energy. Interestingly the Raphno and ryegrass had similar biomass of 3t/ha and 3.8t/ha, respectively. Excellent weight gain was achieved on the Raphno with 62.5g/head/day more than the ryegrass regrowth. This was a great result and when it is calculated at kg/ha/day, the Raphno significantly outperformed the ryegrass.

The ability of Raphno to grow under grazing pressure and produce leaf material allowed a much higher stocking density with 1400 lambs on 45ha (31 lambs/ha), compared to 360 lambs on 30 hectares (12 lambs/ha). The lamb live weight gain measured in kg/ha/day was a staggering 5.35kg/ha/day for the Raphno compared to 1.31kg/ha/day achieved on the ryegrass. Once the sheep were removed due to the ryegrass being depleted, the Raphno paddock still had excess biomass, which indicated it could have supported a higher stocking rate than 31 lambs per hectare.

# SMITH SITE: MILLET VS BARLEY STUBBLE

## Key Messages

- **The summer crop (millet) had a higher NV than the barley stubble, with a higher crude protein, digestibility and metabolisable energy.**
- **There was a much greater biomass in the control barley stubble 3.5t/ha than the 1.2t/ha of millet.**
- **Millet growth was highly variable and showed signs of heat and moisture stress before grazing.**
- **Despite the environmental stress the millet had an average daily gain (ADG) of 253g/head, which was over double the 120g/hd/day achieved by the barley stubble.**

## Background

In 2020, the Smith's decided to do some soil amelioration by claying a paddock in September. To ensure erosion was kept to a minimum, 90ha of millet was sown on October 18 and proceeded to germinate with the first rains in November. Other than being sprayed with Estercide and Garlon to kill the melons, no additional crop protection or fertiliser was applied. The Smith's site grazing control was a barley stubble harvested on December 16 2020. This paddock was also clayed seven years ago. The barley crop received a small amount of hail damage with Ryan Smith estimating there was approximately 100kg/ha of barley grain on the ground.

Ploughing to incorporate the clay dried the soil profile out artificially. The millet paddock received 36mm before sowing and another 107mm before December 16 when the lambs were first introduced. Despite rainfall being above average for November to December, the millet was heat and moisture stressed on December 16. Biomass cuts were taken on December 16 with soil and plant tissue samples collected on December 15.

## Method

Smith's site investigated lamb growth rates on millet compared to barley stubbles. The control of barley stubbles was selected because it is a traditional feed source available at this time of year.

Prior to grazing, soil samples were collected for each paddock from 0-10cm depth. Four quadrant cuts were collected from the barley paddock while six were collected from the millet to determine biomass prior to grazing. More quadrants were cut from the millet paddock to account for the higher variability in plant density compared to the barley paddock which was more even. The samples were dried at 65°C for 48 hours before being weighed. Plant samples were also collected for nutritive value (NV) analysis. NV samples were analysed by Feedtest, 260 Princes Highway, Werribee, VIC.

100 lambs were weighed and marked from each group selected to go onto the millet and barley. The same marked lambs were then weighed coming off the respective forages one month later.

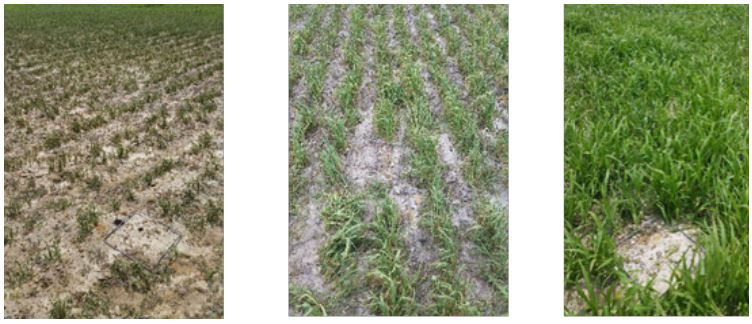

*Figure 3. Images of the millet taken on the December 16 2020 showing the variation in plant density and health across the paddock.*

## Site results

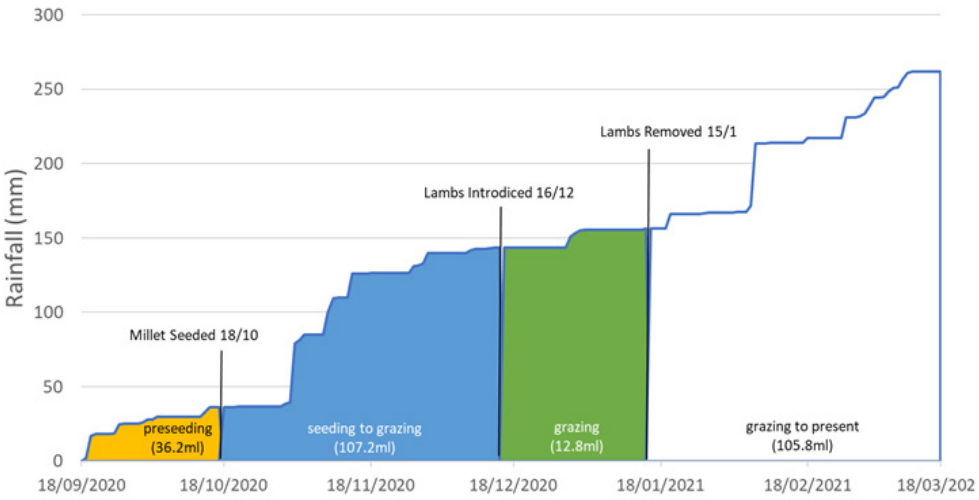


*Figure 1. Summary of cumulative rainfall from September 18 2020 to March 18 2021 at the Smiths' Metos weather station, located on Kojaneerup West road close to the demonstration site.*

*Table 1. Smith soil sample results taken December 15 2020.*

| Site Name | Depth | pH (CaCl2) | Al CaCl2 (mg/kg) | PBI + P Col | P Col (mg/kg) | Texture | Sand (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|
| Millet | 0-10 | 5.8 | 0.1 | 42 | 22 | Sand | 94.0 | 2.8 |
| Barley Stubble | 0-10 | 5.9 | 0.1 | 19 | 14 | Sand | 95.0 | 2.5 |


*Figure 2. Millet, Satellite NDVI image captured on December 19 2020, showing the variation in plant density and health across the paddock.*

*Table 2. Smith Dry matter (DM) cuts taken prior to grazing*

| Forage | g of 0.1m$^2$ quad | t/ha |
|---|---|---|
| Smith barley stubble | 35.53 | 3.55 |
| Smith millet | 12.02 | 1.20 |

*Table 3. Smith nutritive value (NV) analysis of forages.*

| NV Analysis | Barley stubble | Millet |
|---|---|---|
| Dry matter (DM) | 87.0 % | 18.7 % |
| Moisture | 13.0 % | 81.3 % |
| Crude protein | 2.7 % of DM | 21.0 % of DM |
| Acid detergent fiber | 47 % of DM | 23.7 % of DM |
| Neutral detergent fiber | 81.7 % of DM | 40.2 % of DM |
| Digestibility (DMD) | 43.4 % of DM | 81.3 % of DM |
| Digestibility (DOMD) | 43.6 % of DM | 75.7 % of DM |
| Estimated metabolisable energy | 5.9 MJ/kg DM | 12.4 MJ/kg DM |
| Fat | 2.0 % of DM | 4.1 % of DM |
| Ash | 5.1 % of DM | 8.6 % of DM |

## Animal results and discussion

*Figure 5. Left, photo of the Smiths' 90ha millet crop on December 16 2020. Right, the same crop on January 15 2021 after the lambs had been removed.*

*Figure 6. Left, photo of the Smiths' 160ha barley stubble on December 16 2020. Right, the same stubble on January 15 2021 after the lambs had been removed.*

*Table 4. Smith stocking rates and average weight gain of lambs grazing millet and barley stubble.*

| Forage | Head | Area (Ha) | Stocking Rate (lambs/ha) |
|---|---|---|---|
| Barley | 588 | 160 | 3.68 |
| Millet | 500 | 90 | 5.55 |
| **Forage** | **Weigh In (Avg kg)** | **Weigh Out (Avg kg)** | **Weight gain (Avg kg)** |
| Barley | 42.4 | 46.0 | 3.6 |
| Millet | 41.7 | 49.3 | 7.6 |

*Table 5. Average weight gain of lambs on forages for one month*

| Forage | Avg weight gain (g/hd/day) | Weight gain (kg/ha/day) |
|---|---|---|
| Barley stubble | 120.00 | 0.44 |
| Millet | 253.33 | 1.41 |

The 2020 season was not kind to the Smith's millet as paddock soil amelioration (ploughing) caused the soil profile to dry out, leading to heat and moisture stress before grazing. This also resulted in variable plant health and biomass, as seen in Figure 3. Pasture cuts revealed a much larger biomass available prior to grazing in the control barley stubble with 3.5t/ha compared to 1.2t/ha of millet. Despite the environmental stress the millet had an average daily gain (ADG) of 253g/head, which was over double the 120g/hd/day achieved by the barley stubble. The summer crop (millet) had a higher NV than the barley stubble, with higher crude protein, digestibility and metabolisable energy. At the conclusion of grazing there was still some grain amongst the barley stubble available suggesting that it was not stocked to capacity over the grazing period. Therefore, the barley stubble weight gain kg/ha/day will be underestimated.

# ROCHESTER SITE: RAPHNO AND OPTIWEIGH SYSTEM

## Key Messages

- **Successful cattle induction to Raphno was challenging to achieve. Best results were attained when weaner cattle were moved off Raphno onto pasture each day over the first week, slowly introducing them to longer grazing periods on the Raphno.**
- **Poor induction for the first grazing event saw steers reduce their Average Daily Gain (ADG) from 2kg/day on rye clover pasture down to 0.08kg/day on Raphno.**
- **Second grazing event by growing weaner cattle received a better induction and Heifers slowly built up to and maxed out at 1kg ADG.**
- **The Optiweigh system is a game changer to better understand different forages and how different grazing systems influence weight gain and pasture utilisation.**

## Background

After observing a local trial of Pallaton Raphno in 2018, Kent Rochester decided to try some on his own farm. The Raphno was sown in September 2019 into eight 5ha grazing cells. The cells were to be grazed in rotation. Following seeding, 300kg of super copper zinc moly was applied over the eight 5ha cells. No other fertiliser or crop protection was applied. Plant samples were collected in the second week of November and sent off for nutritive value (NV) analysis. Optiweigh is an automatic in paddock weigh system that Kent purchased in 2019.

**"We gave Optiweigh a go to better understand what happens to weight gain in paddock on different feeds and with different supplements. Mainly to maximise weight gain per hectare"**

A huge benefit to the Optiweigh system is the ease at which it can be moved. Even if moving cattle on a daily basis there is no trouble following the grazing group. Another large benefit is being able to track heifer ADG leading into AI programs. It also helps to ensure the pasture available is allocated to the most profitable stock class i.e. cows and calves to lower weight gain pasture and trade cattle to highest weight gain paddocks.

## Method

The Rochester site investigated steer and heifer growth rates on Pallaton Raphno compared to a clover rye mix at the end of spring. The comparison to clover and ryegrass mix was selected because it was the pasture grazed immediately prior to steers grazing the Raphno with weight data collected.

Plant samples were also collected for nutritive value (NV) analysis. NV samples were analysed by Feedtest, 260 Princes Highway, Werribee, VIC. Two hundred and fifty steers and 120 heifers had their weight gain tracked using the Optiweigh system. Tracking of the steer weights were abandoned after ten days due to poor weight gain, while heifers were recorded for six weeks.

## Results and discussion

*Table 1. Rochester NV analysis of Pallaton Raphno*

| NV Analysis | Pallaton Raphno |
|---|---|
| Dry matter (DM) | 18.9 % |
| Moisture | 81.1 % |
| Crude protein | 18.6 % of DM |
| Acid detergent fiber | 14.2 % of DM |
| Neutral detergent fiber | 23.4 % of DM |
| Digestibility (DMD) | 93.1 % of DM |
| Digestibility (DOMD) | 85.7 % of DM |
| Estimated metabolisable energy | 14.4 MJ/kg DM |
| Fat | 4.2 % of DM |
| Ash | 3.5 % of DM |

*Table 2. Average daily weight gain of weaner cattle on Pallaton Raphno and clover/ryegrass pasture for the Rochester site.*

| Date | Forage | Class of stock | Head | Area (ha) | Weigh In (Avg kg) | Weight gain |
|---|---|---|---|---|---|---|
| Late October 2019 | Raphno | Green tag steers | 250 | 5 | 325 | 0.08 |
| September 2019 | Clover rye mix | Green tag steers | 250 | 5 | 305 | 2.00 |
| November/ December 2019 | Raphno | Green tag heifers | 120 | 40 | 300 | 1.00 |

In late October 250 steers commenced grazing the Raphno with a 325kg average weight and ad-lib hay available. Steers visually looked poorer after ten days grazing. After a cross section of the group were yard weighed it revealed an average daily gain (ADG) of only 0.08 kg was being achieved on the Raphno compared to approximately 2kg per day on a previous ryegrass and clover pasture. Based on this data Kent abandoned tracking that group and returned the steers to conventional spring grass.

After consultation with an agronomist, an agriculture supplies specialist and a local vet, it appears the cattle were ill adjusted to graze the Raphno crop. Kent received many suggestions on induction strategies to Raphno brassicas for cattle. The remainder of the cells were grazed by dry cows, but no data was collected.

The second attempt to graze growing weaner cattle was with 120 approximately 300kg heifers. After a better induction process and added supplements, an average daily weight gain of roughly 1kg was achieved. Moving the heifers on and off the Raphno each day for the first week was the main practice change to the induction period. There was also ad-lib straw and silage rather than hay with Beachport minerals added to the water troughs. By the time 1kg ADG had been achieved, heat, diamond back moth and moisture stress were affecting the forage. Kent believed this was probably affecting palatability and feed quality.

In April 2020, Kent grazed the remaining plants quite hard because there were too few plant numbers to continue the monoculture. Cereals were then sown into the Raphno paddocks to experiment with having two fodder species.

The last graze occurred on June 20 2020 and was with cow-calf units at a density of 56 pairs per hectare. The cows overgrazed the grasses and other paddock plants and had to be pushed to eat Raphno plants. Kent commented that again, this was not an ideal induction to the crop for the stock. Kent concluded that to get the induction process correct each time he grazed the Raphno would not fit in with his management system.

Kent's concluding remark on the trial was that Raphno was an amazing plant, with a great ability to survive and grow in harsh conditions and with good feed test data. He just needs to find a way to fit it into the grazing system and create good induction protocols to achieve a good result.

The Optiweigh system is instrumental in knowing when ADG has dropped or picked up after adding supplements or changing grazing duration. This knowledge of understanding what happens in the paddock better is key to making quick and timely decisions before they become visually apparent. It has not all been smooth sailing though, with the main issue of ensuring cattle participation rates are high enough to get an accurate representation of the mob. Over the summer a block of minerals was found to be sufficient to encourage cattle through the Optiweigh system, however in spring when cattle are quite content more encouragement is required such as a molasses roller or molasses base block.

*Figure 1. Optiweigh system on site at Kent Rochester's.*

## Conclusion

Successful cattle induction to Raphno was challenging to achieve. Due to poor induction the first grazing event saw steers reduce their ADG from 2kg/day on rye clover pasture down to just 0.08kg/day on Raphno. The second grazing event by growing weaner cattle received a better induction that involved moving the heifers off Raphno onto pasture each day over the first week, slowly introducing them to longer grazing periods. Heifers slowly built up to and maxed out at 1kg ADG. Until proven induction protocols are available Raphno as a monoculture will not be pursued by Kent in his system.

*This Producer Demonstration Site is funded by Meat & Livestock Australia*

mla MEAT & LIVESTOCK AUSTRALIA