Adaptive Forage Planning Project

Adaptive Forage Planning Discussion Day

Where: ***Brad & Jim Missen's*** **run-off block**
Rosedale-Flynns Creek Road
Date: **Wednesday 9th. September**
When: **10.15 am – 12.15 pm**

Where: ***Andrew Neumann's*** **farm**
North of CFA shed at intersection of
Stratford-Bengworden & Ramahyuck Rds
When: **1.30 pm – 3.30 pm**

Where: ***Wayne Bowden's*** **Farm**
South Gippsland Hwy
Park in paddock West of Greenmount Rd.
Date: **Thursday 10th. September**
When: **10.15 am – ~1.00 pm**

Further Information:
Frank Mickan: 5624 2259, 0427 317 471
Frank.mickan@dpi.vic.gov.au
Greg O'Brien: 5624 2288, 0427 522 909

Please NOTE:

DISCLAIMER

The yield data supplied in these Discussion Day notes are a very rough guide only and are not to be used in any way as promoting one species or varieties over each other by anyone.

The yield data is derived from the average of 3 cuts per demonstration plot, of which there is only one plot for each species or variety. To be scientifically robust, several plots of each species/variety would need to be sown and harvested separately.

The yield data is supplied only to provide a rough idea of what the crop looks like at these yields and perhaps may show a trend of sorts. The real value from these demonstration plots is the discussion in the paddock with other farmers and service providers.

PLEASE….

- DO NOT walk on the plots
- Please walk across the ends and between the plots
- Ask questions
- Contact me if you wish to be kept informed directly of results and discussion days
  (Contact details on front cover)
- **Thanks to the host farmers involved**
  - Brad & Jim Missen
  - Andrew Neumann
  - Wayne Bowden
- **Thanks to the seed companies who generously donated seed**
  - Heritage Seeds
  - Hyleaze seeds
  - Murray Goulburn
  - PGG Wrightson Seeds
  - Stephen Pasture Seeds Pty. Ltd.

ADAPTIVE FORAGE PLANNING PROJECT

INTRODUCTION

The **Adaptive Forage Planning** project is a state-wide DPI project being carried out by the Dairy Extension Centre (DEC). The DEC plans to help dairy farmers adapt to seasonal variability using forage planning to achieve the appropriate mix of home grown and purchased forage (crops and pastures). This will improve the security of fodder supply in an increasingly variable climate. Our future work will examine the variability of home grown forage supply and the use of a forage planning approach to reduce the impact of this variability.

Purchasing of feed requires a reliable supply and having it grown locally will reduce transport costs and provide more opportunities for cropping farmers. Forages that meet both the requirement of cropping farmers and dairy farmers are needed. Currently this project is conducting forage demonstrations at Yarram, Rosedale and Perry Bridge to investigate some crop options for dairy, cropping and mixed farmers and service providers who are showing increased interest due to the recent poorer 7 variable seasons. Yield, quality and reliability of the forages will help in planning the way forward for a Gippsland forage industry

WHY?

- Variability and unpredictability of the seasons has been a common occurrence for some years now, and probably will into the future.
- Despite higher grain & forage prices, due to shortages and high demand, poor seasons have resulted in low yields and high costs for Gippsland croppers.
- Dairy farmers have also suffered from below average pasture production due to the poor seasons and now, a recent severe drop in milk price.
- Dairy farms would like a more consistent supply of bought in high quality feed with less volatility in prices to fill feed gaps throughout the year.
- Uncertainties in supply and price are managed better by good working relationships between croppers and dairy farmers for the supply grain and fodder.
- Where appropriate, dairy run-off blocks may have the potential to grow more and higher quality forage for the miking platform.
- A recent survey (Gippsland Southern Farming Systems) reported that Central and East Gippsland have the climate and soil types to substantially grow much more grain and cereal forage than currently grown.

HOW?

These plots are the focal point of a series of short sharp sessions in paddock to learn first hand about the growth and management of various crops by monitoring and discussing them via on-farm discussion days. These days are designed to cover PLANNING, SOWING, possibly EARLY GROWTH, GRAZING (if appropriate), HARVESTING and a FINAL summing up/report back meeting, given that many people cannot always get to the HARVEST day.

These days are not just a “kick the sod or plant” days. We hope that we can encourage everyone to:-

- **consider forage planning**. That is, thinking about your whole farming system, **WHEN, HOW** and **WHY** might you use a crop?

- **understand and learn from each other's enterprise systems** and why they each have their own requirements, such as why dairy farmers need high quality, why croppers need the true costs and full impact of growing crops on cropping farms, etc.
- **form and/or build stronger relationships** with farmers in each other's enterprise with a potential view to sourcing on-going fodder/grain in the future notwithstanding the problems such as high variability in supply, prices, costs of production, impact of world markets, etc.

Adaptive Forage Planning Discussion Days

Aims:

- To investigate the growing of forage crops (such as cereals and legumes) as one strategy for adapting to climate variability
- To increase incomes/spread risks of cropping farmers and to cost-effectively supply high quality fodder to the surrounding dairy farmers
- To investigate the potential of legume cereal mixtures to supply of medium to high quality
  (Potentially grown on dairy run-off block or local cropper farms)
- To better understand the integration of forage production into both farming systems
- To increase the capacity of everyone involved in the forage industry (cropping and dairy farmers and their service providers i.e. contractors, agronomists, advisors, seed and herbicide company representatives, etc) to potentially grow new forages or cereal/legume mixes successfully in the surrounding area
- To disseminate the learned information (Field days, media articles, etc.) to farmers, service providers and agribusiness as appropriate
- To engender the development of a sustained working relationship between dairy and cropping farmers

TODAY

Today is a combination of the EARLY GROWTH & GRAZING Discussion Day although these plots have not been grazed due to lack of rain and difficulty to do so amongst the other ungrazeable plots. However, using our recent experiences of grazing cereals and that of the local service providers, we will refer to specific plots/plants here so that farmers will gain some practical information and skills.

WHY AND WHERE MIGHT YOU USE THESE CROPS?

Greg O'Brien
Dairy Extension Officer
DPI. Ellinbank

Seasonal growing conditions in central Gippsland have always been highly variable.

In recent years, it appears to have been a more difficult environment for growing pastures and crops. In addition, stocking rates tend to be higher in response to the usual cost-price squeeze felt by businesses, requiring higher drymatter utilisation.

The gap between herd requirements and average pasture production potential has narrowed, with potentially more years not meeting herd requirements. This means that the variability of pasture growth is having a greater impact and it is timely to consider how we might respond to this variability.

In a forage planning sense, there are two broad approaches dairy farmers might take. One is to look at what might be done in relation to home grown forage (pastures and crops). The other is to explore feed purchasing strategies.

There are many elements to consider (cost of production, reliability, fit with system, etc). The DPI Adaptive Forage Planning project aims to help farmers work through options and identify potential strategies.

Perennial Ryegrass Variability

Looking at seasonal production of perennial ryegrass, the recent pattern seems to be for later autumn breaks, longer hotter summers, earlier/shorter springs and milder winters. As a result, cool season production is more important than it has been and the warm- season feed gaps are larger.

In many rainfed districts, perennial ryegrass does not persist as well as desired, thinning within three years. In this instance, options to improve growth potential could include renovating ryegrass pasture more regularly, moving to more persistent perennial species, introducing annuals into the system or a mix of these.

The renovation technique of existing perennial ryegrass pastures could include drilling ryegrass into the existing sward, cultivating and resowing (ie ryegrass to ryegrass) or having a cropping program as part of the renovation program.

Managing variability

What might be some strategies for managing this variability?

Perhaps it is wise to begin with an estimation of the annual pasture consumption your feed plan relies on. Comparing this with growth potential under past seasonal conditions will give you a feel for how many years you might be exposed to a deficit if relying on ryegrass pasture.

Working with the existing perennial ryegrass base, there may be a need to make more of cool-season production, conserving more spring pasture to feed back. Getting more from the existing ryegrass pasture might involve strategic use of nitrogen to boost grazing yields or to increase the amount of conserved fodder to fill gaps at other times of year. Have you ever worked out how big the gaps are and how they differ between good, average and poor years?

Perhaps using out paddocks to better effect to provide feed for the milking platform might warrant consideration??

Is it a good or bad idea to use alternative forages on the home farm or turnout block to help manage variability? Or do they create more variability with increased risk?

Have you ever thought about the potential to make different supplement purchasing strategies?

For cropping farmers in the audience, have you ever thought about being a supplier of feed to dairy farmers?
Being a producer of forage for dairy farmers has implications including the fit of the forage within your business and its saleability. Dairy farmers require both moderate quality feeds and high quality feeds. They pay more for high quality feeds. The demand generally reflects seasonal conditions. Some crops may fit in well with livestock requirements on a mixed farm or complement the cropping rotation, providing some flexibility and/or additional income. It may be desirable to manage variability in price and demand by entering into contracts with dairy farmers that share the risk.

These are all major decisions for farmers, and the way forward is by no means clear. Adaptive Forage Planning aims to provide a platform for exploring the way forward.

Today is not about solutions. It is about beginning to explore options.

What do alternative species offer?

We have three field sites (Yarram, Rosedale and Perry Bridge) that are looking at annuals and one short rotation legume. All are suited to the rainfall expected in these districts. The focus is on taking advantage of the more reliable cool-season growing conditions.

It is hoped that both dairy farmers and cropping/mixed farmers take an interest in this work. Cropping/mixed farmers may become an important source of locally grown hay or silage for dairy farmers, provided win;win outcomes can be identified.

The species have a range of attributes making some more suited to milking stock than others. It is important to consider what feeds are required by the dairy business and in what quantities.

Winter cereals

Winter cereals are high yielding, are tolerant of lowish soil moisture conditions and are of moderate quality (determined by stage of maturity at harvest). They can be grazed with

minimal impact on total yield, provided they are grazed at the correct time (source notes on cereal management www.dairyextension.com.au and go to Project 3030 resources)

Cereals do not require grazing, making them attractive where grazing is not available or required.

They should only make up a small portion of a milker diet (up to 20% if combined with higher quality feeds) due to their high fibre content together with lower than desired protein and energy content. They are a good companion to lush pasture plus grain diets (eg winter and early spring). They are a good dry cow diet or can be combined with high energy feeds to grow dairy heifers.

Winter cereals are flexible as they are not all the same. They differ in their ideal sowing dates, maturity dates and grain to stem ratio at harvest (affecting quality). Those with longer growing season are good for early sowing, providing autumn/winter grazing and fodder conservation. Others are suited to late sowings whilst still yielding well at harvest.

Examples of roles for cereals - *croppers* (maybe a dual purpose variety if both grazing and grain growing is an option), *mixed farmers* (handy winter grazing then a silage/hay crop for sale) or *dairy farmers* with a turnout block that doesn't have grazing stock.

Winter cereals and legumes

In recognition of the lower than desired feed quality of cereal silage, Project 3030 is looking at cereal/legume mixes. If grazed, peas will not regrow, so are a conservation option. The paddock needs to be relatively free of broad-leafed weeds. There is information on yield and quality of cereal/pea mixes and trials using other cereal/legumes are underway at DemoDairy.

Basically, having peas in the mix improves quality (particularly protein). The stature and the proportion of peas in the seed mix seems to be important. Short-statured cereals seem best, with tall-statured cereals tending to dominate the pea component. Having 75% peas in the mix results in a high proportion of pea in the harvested crop without affecting yield greatly. A pure stand of peas can yield well but may lodge, causing difficulty with harvest (hence cereals are used to support the pea). Some peas are reported to be self-supporting.

Possible role of cereal/legume mixes – silage for sale or use within the business where quality and yield are important and there isn't a requirement for grazing. Maybe hay but drying peas without leaf shatter could be challenging.

Annual ryegrass

Annual ryegrass is a species that is familiar to most Gippsland farmers and so its growth requirements are well understood, giving reliable results. Quality of ryegrass is high (unless harvested as a mature crop). It requires multiple harvests or grazing to ensure high yields (unlike cereals and peas that can be more efficiently harvested in a single harvest).

Possible role of annual ryegrass - they may be a good option for turnout blocks used for heifer replacements or dry stock or perhaps mixed farming operations that wish to sell some of their spring surplus as silage or hay.

Sulla

Sulla is a short-lived (2-3 years) legume that is suited to short growing seasons. It is relatively new in Gippsland but has potential for high silage/hay yields in spring.

It has the advantage of lasting more than a year (reduced sowing costs) and may be able to produce beyond 2-3 years if re-seeding can be managed successfully.

Possible role of sulla – high yielding good to high quality silage or hay for sale or use within the business. Minimal or no grazing expectations (although it has been grazed successfully, there isn't local experience).

Figure 0. Sulla plant

Annual legumes

Annual legumes are attractive as a high quality feed for fodder conservation. They tend to be a slow growing seedling, providing little grazing before spring (although there has been exceptions to this that need to be better understood). They are a moderate yielding, high quality species. Being a legume, they can put nitrogen into the soil for the next crop.

Possible role of annual legumes – as a high quality conserved feed for sale or use within the business. Attractive as a milker feed, growing dairy heifers or for finishing stock in mixed farming operation. They can build soil nitrogen for following crops and pasture plus may provide a disease break in a cropping rotation.

DEMONSTRATION PLOT DETAILS & RESULTS TO DATE

Frank Mickan
Dairy Extension Officer
DPI. Ellinbank

Brad and Jim Missen: Dairy farm run-off block

Background to plots (Appendix 1a)

- Paddock planted to Crackerjack triticale in 2008 winter and to sorghum over summer (not successful due to lack of rain).
- Project site paddock had a hardpan about 10 - 15 cm below the surface, and was deep ripped down to ~30 – 35 cm (13″-14″) depth at about 45 cm (18″) spacing.
- Soil tested just before sowing (See Table 1).
- Plot area resprayed before sowing with Roundup to knock self-sown triticale and a few other weeds.

Table 1. Soil test results Rosedale/Flynn Road (Sampled 5 05 09)

Measurement	Results	Test Results say
Soil type	Sandy loam	
$pH_{(water)}$	5.3	LOW
$pH_{(CaCl)}$	4.6	LOW
Olsen P	42 mg/kg	Very high
PBI	45	
Potassium K	94 mg/kg	Low
Sulphate S (KCl40)	21.0 mg/kg	V high (Test said Sufficient)
Organic Carbon	2.54 %	Sufficient
Aluminium saturation	2.5 %	Sufficient
Calcium:Magnesium ratio	3.3	Good
Magnesium:Potassium	5.3	OK
Exchangeable Mg, K & Cu		Marginal

Sowing Details

- Sown 20 05 09
- Drill used: Connor-Shea (Figure 1)
- Fertiliser at sowing: 50 - 65 kg DAP /ha
- Seed bed at sowing (Figure 2).
- Sowing depth: Cereals ~ 3 – 4 cm, grasses ~1 – 2 cm. clovers dropped on top
- Soil temperature at sowing: 12.0° C approx. 10.00 pm.
  Standard time of measurement for experiments is usually 9.00 am at 10 cm depth.

Figure 1. Connor Shea seed drill

Figure 2. Seed bed at sowing 20 05 09

RESULTS

Appendix 1b

Andrew Neumann: Cropper

Background to plots (Appendix 2a)

- Many weeds (barley grass, pigeon, couch and bent grass, sorrel, marshmallow, something that could be crumb/mint or stinkweed(?), plus several other weeds.
- Pre-sow sprayed with Round-up PowerMax @ 1.5 L/ha + 45.5 ml/ha Hammer using 50 L/ha water. Sprayed 19/04/09. Not resprayed before sowing.
- Legumes sprayed with 500 ml/ha Status (Group A) on 4th. June, 2009. No Le Mat.
- Plots sprayed with 2 L/ha Buttress, 35 gms/ha Broadstrike and 100 ml/ha Le Mat to target broadleaved weeds, marshmallow and red legged earth mite ad lucerne flea.
- Already had one spray over the legumes with a Group A spray. Andrew is reluctant to do so again with another Gp A (concerned about herbicide resistance build up)
- Too late to hit grass weeds in the cereals although Raptor was an option, but too expensive.
- Soil tested just before sowing. (See Table 2).

Table 2. Soil test results Perry Bridge (Sampled 11 05 09)

Measurement	Results	FM says
Soil type	Brown Sandy loam	
pH $_{(water)}$	5.70	OK
pH$_{(CaCl)}$	4.80	OK
Olsen P	26 mg/kg	OK
PBI	55	
Potassium K	110 mg/kg	Low
Sulphate S (KCl40)	15.0 mg/kg	OK
Organic Carbon	2.40 %	OK
Aluminium saturation	2.2 %	OK
Ca:Mg ratio	4.1	Good
Potassium:Magnesium ratio	0.4	

Sowing details

- Sown 19 05 09
- Drill used: Duncan No-Till Renovator with Baker boots (See Figure 3).
- Fertiliser at sowing: 100 kg DAP/ha
- Seed bed at sowing. (See Figure 4).

Figure 3. Connor Shea seed drill **Figure 4. Seed bed at sowing 19 05 09**

- Soil temperature at sowing: 12.5° C approx. 12.00 pm.
- Sowing depths: Cereals 2 – 3 cm, ryegrass 1 cm, clovers dropped on surface.
- Fertiliser placed just below seed
- Chain harrow covered seed.
- Rainfall to date (Table 3).

Table 3. Rainfall (mm) Perry Bridge

Month	Jan	Feb	Mar	April	May	June	July	Aug to 18/8/09
Monthly RF	1.5	42.25	21.25	45.75	21.0	15.0	28.75	28.5….
Progress. Total	1.5	43.75	65.0	110.75	131.75	146.75	175.5	204…

RESULTS

Appendix 2b

Wayne Bowden: Cropper and run-off block

Background to plots (Appendix 3a)

- Paddock sown to maize over 2008/09 summer
- Soil fertility still high due to previous crops
- Sprayed with knockdown and disced then power harrowed.
- Soil tested just before sowing. (See Table 4).
- Clover & Sulla plots sprayed with Broadstrike at 35 grams plus Chemwet at 200 ml/ha on 2/9/09
- Fusilade 850 ml/ha planned to be sprayed a week later but waiting on very still conditions (plots to be sprayed are next door to grass plot) and so still to be done.

Table 4. Soil test results Yarram (Sampled 20 05 09)

Measurement	Results	FM says
Soil type	Grey Clay loam	
pH $_{(water)}$	5.0	Low (need >5.5 ideally)
pH$_{(CaCl)}$	4.6	Low (need >5.0 ideally)
Olsen P	56 mg/kg	Very High (Well above needs)
PBI	120	
Potassium K	270 mg/kg	Good level
Sulphate S (KCl40)	37.0 mg/kg	High (Well above needs)
Organic Carbon	3.70 %	OK
Aluminium saturation	3.0 %	OK
Ca:Mg ratio	4.4	Good
Potassium:Magnesium ratio	0.4	

Sowing details

- Sown 22 05 09
- Drill used: Sow-Easy Air Seeder (See Figure 5).
- Fertiliser at sowing: 100 kg DAP/ha
- Seed bed at sowing (See Figure 6).

Figure 5. Sow Easy Air Seeder

Figure 6. Seed bed at sowing 22 05 09

- Soil temperature at sowing: 12.5° C approx. 10.15 am.
- Very dry up to sowing so seedbed was very powdery (See Figure 6)
- Sowing depths: Cereals 2 – 3 cm, ryegrass 1 cm, clovers dropped on surface
- Cereals only covered with crumbler roller. Too powdery for harrows or a roller.
- Rainfall to date Table 5.

Table 5. Rainfall (mm) Yarram

Month	Jan	Feb	Mar	April	May	June	July	Aug	Sept
Monthly RF	5.5	26.5	34.5	60.5	19.5	44.25	67.25	76.75	5.5…
Progressive Total	5.5	32	66.5	127	147	191	258	335	340

RESULTS

Appendix 3b & 3c

Frank Mickan

Appendix 1a

Brad Missen

Flynn – Rosedale Road

N

8. Winterstar 2 Ryegrass – 29 kg/ha
(Winterstar 2 Ryegrass – 25 kg/ha)

7. WilpenaA Sulla – 9.4 kg/ha (Lime Coated + Inoculated
(Sulla – 6 kg/ha (Uncoated))

6. Balansa Cl – 4.4 kg/ha (Coated)
(Balansa Cl – 4 kg/ha)

Balansa Cl – No Fert.

5. Rudd W (80) + Shaftal Cl (5) – 97 kg/ha (92:8%)
(Rudd W (80) + Shaftal Cl (5) – 97 kg/ha (94:6%))

4. Rudd W. (53) + Kaspa Pea (70) – 123 kg/ha (43:57%)
(Rudd W. (60) + Kaspa Pea (80) – 140 kg/ha (43:57%))

3. Dictator 2 Barley – 106 kg/ha
(Dictator 2 Barley – 80, but 110 kg/ha to cp with Rudd)

2. Rudd Winter Wheat – 123 kg/ha
(Rudd Winter Wheat – 110 kg/ha)

1. Dictator 2 Barley – 125 kg/ha (No Fertiliser)
(Dictator 2 Barley – 80, but 110 kg/ha to compare w Rudd)

Rudd Winter Wheat – 101 kg/ha

Bold type: Actual sowing rate to nearest 5 kg for cereals
Normal type: Proposed sowing rate

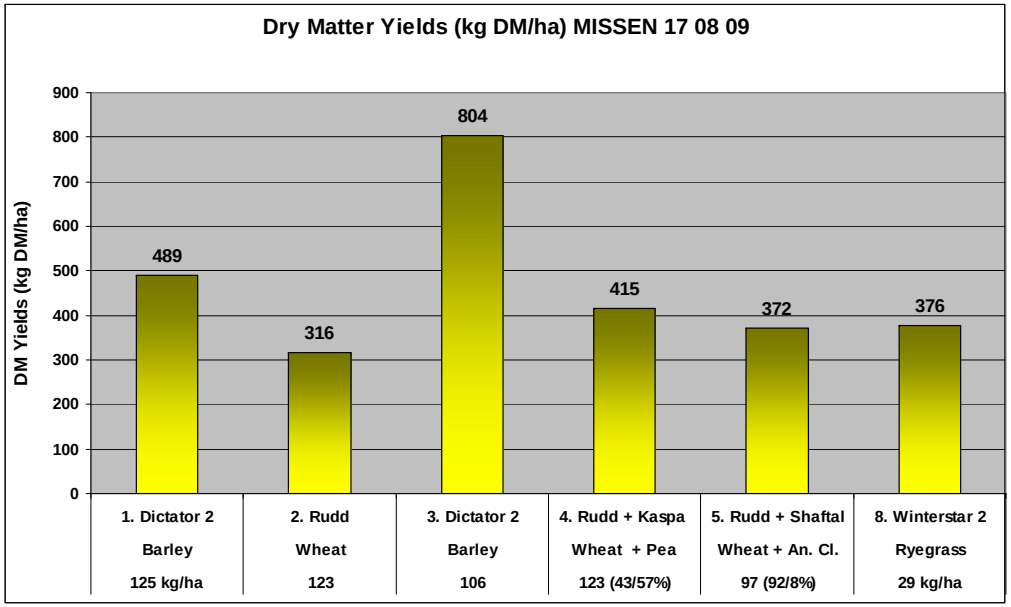
Connor-Shea drill

Fertiliser ~ 50 – 65 kg/ha DAP

Sown: Wednesday 20/05/09

Appendix 1b

Brad Missen



Nutritive values

Species + Proportion of each variety in kg	Barley	Winter Wheat	Barley	Winter Wheat + Pea	Win. Wheat + An. Cl.	Ryegrass
Cultivar	1. Dictator 2	2. Rudd	3. Dictator 2	4. Rudd + Kaspa	5. Rudd + Shaftal	8. WinterStar 2
Ratio of each species (Cereal/Pea %)				43/57	92/8	
Sowing rate (kg/ha)	125	123	106	123	97	29
Growth Stage	*Tillering GS23 - 24*	*Tillering GS24*	*Tillering GS23 - 24*	*Tillering GS24*	*Tillering GS24*	
MEASUREMENTS[1]						
Dry Matter content*(%)	20.9	18.6	19.0	16.2	18.5	11.1
Crude Protein (%)	**18.4**	**24.3**	**20.1**	**26.3**	**23.8**	**28.7**
Metabolisable Energy**(MJ ME/kg DM or ME)	**12.3**	**12**	**12.5**	**12**	**12.4**	**11.9**
Neutral Detergent Fibre (NDF % of DM)	36.8	36.5	36.6	35.1	35.1	40.3
Dry Matter Digestibility (DMD %)	81.0	79.1	82.0	81.5	81.5	78.5
Digestible Organic Matter in the DM (DOMD %)	75.4	73.8	76.3	75.6	75.8	73.3
Nitrate-Nitrogen (mg/kg DM)[2]	**<30**	**<30**	**<30**	**80**	**<30**	**290**

*DM content measured at FEEDTEST

**ME = (0.203 x DOMD %) – 3.001

[1]Average of 2 samples

[2] Mg/kg DM = ppm

Table of NO_3^- - N levels (ppm*) used by FEEDTEST	
Generally considered safe for stock	0 – 1,500 ppm
Caution: Problems can occur, mix, dilute, limit forage intake	1,500 – 4,500 ppm
Danger: Do not feed. Potentially toxic	> 4500 ppm

Bold type: Actual sowing rate to nearest 5 kg for cereals
Normal type: Proposed sowing rate

N

Intersection of Stratford – Bengworden Rd & Ramahyuck Rd, Perry Bridge

1. Abundant Ryegrass – 29 kg/ha
Abundant Ryegrass – 25 kg/ha

2. Dictator 2 Barley – 110 kg/ha
Dictator 2 Barley – 100 kg/ha

3. Zulu Arrowleaf Clover – 10 kg/ha (AgristrikeCoated)
Zulu Arrowleaf Clover – 6 Uncoated (10.0 kg/ha Coated)

4. Arrotas Arrowleaf Clover – 11.5 kg/ha (Gaucho Coated)
Arrotas Arrowleaf Clover – 6 Uncoated (10.0 kg/ha Coated) (5 runs)

5. Viper Balansa Clover – 3.1 kg/ha (AgristrikeCoated)
(Viper Balansa Clover – 4 kg/ha)

6. Bolta Balansa Clover – 3.5 kg/ha (Agristrike Coated)
(Bolta Balansa Clover – 4 kg/ha)

7. WilpenaA Sulla – 5.8 kg/ha (Lime Coated + Inoculated
Sulla – 6 kg/ha (Uncoated)

8. Flash Persian Clover – 8.6 kg/ha (Coated?)

Duncan Renovator No-Till Seeder

Fertiliser 100 kg/ha DAP

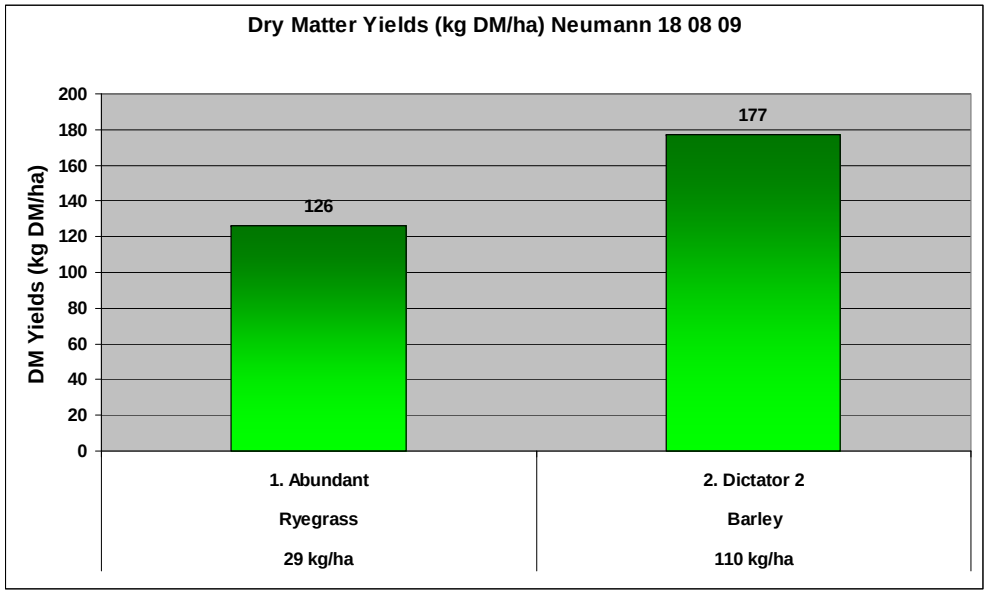
Sown: Tuesday 19/05/09

Appendix 2a

Andrew Neumann

Appendix 2b

Andrew Neumann



Nutritive values

Species	**Ryegrass**	**Barley**
Cultivar	**Abundant**	**Dictator 2**
Ratio of each species (Cereal/Pea %)		
Sowing rate (kg/ha)	**29**	**110**
Growth Stage	***Tillering***	***Tillering GS20 - 22***
MEASUREMENTS[1]		
Dry Matter content*(%)	**21.8**	**23.1**
Crude Protein (%)	**16.5**	**16.6**
Metabolisable Energy**(MJ ME/kg DM or ME)	**12.7**	**11.8**
Neutral Detergent Fibre (NDF % of DM)	36.1	42.9
Dry Matter Digestibility (DMD %)	83.2	77.7
Digestible Organic Matter in the DM (DOMD %)	77.3	72.7
Nitrate-Nitrogen (mg/kg DM)[2]	**<30**	**<30**

*DM content measured at FEEDTEST

**ME = (0.203 x DOMD %) – 3.001

[1]Average of 3 samples

[2] Mg/kg DM = ppm

Appendix 3a

N

South Gippsland Highway

Wayne Bowden

Bold type: Actual sowing rate to nearest 5 kg for cereals
Normal type: Proposed sowing rate

18. Fruit Salad (~100 kg/ha)

17. Galileo oats - 80 kg/ha

16. Urambie Barley – 80 kg/ha
Urambie Barley – 80 kg/ha(3 runs)

15. Urambie Barley (30) + Morgan Peas (80) – 110 kg/ha (27:73%)
Urambie Barley (30) + Morgan Peas (80) – 140 kg/ha (27:73%) (2 runs) *(In bin for Wayne)*

14. Urambie Barley (60) + Morgan Peas (80) – 140 kg/ha (43:57%)
Urambie Barley (60) + Morgan Peas (80) – 140 kg/ha (43:57%) (2 runs) *(In bin for Wayne)*

13. HDL (High Density Legumes) – 4.0 kg/ha (Kickstart Coated)
HDL (High Density Legumes) – 8.9 kg/ha (Kickstart Coated) (4 runs)

12. Winterstar 2 Ryegrass – 25 kg/ha
Winterstar 2 Ryegrass – 25 kg/ha (3 runs)

11. WilpenaA Sulla – 11 kg/ha (Lime Coated + Inoculated)
Sulla – 5 kg/ha (Uncoated) (4 runs)

10. Arrotas Arrowleaf Clover – 10.7 kg/ha (Coated)
Arrotas Arrowleaf Clover – 6 Uncoated (10.0 kg/ha Coated) (5 runs)

9. Crackerjack Trit.(60) + Kaspa Peas (80) – 145 kg/ha (43:57%)
Crackerjack Triticale (60) + Kaspa peas (80) – 140 kg/ha (43:57%) (2 runs)

8. Dictator 2 Barley (60) + Morgan Peas (80) – 147 kg/ha (43:57%)
Dictator 2 Barley (60) + Morgan Peas (80) – 140 kg/ha (43:57%) (2 runs)

Dictator 2 Barley (60) + Morgan Peas (80) – 25 kg/ha (43:57%) (1 runs)

Tetilla rye grass (40 kg/ha) Fill in along drain

7. Winterstar 2 Ryegrass – 25 kg/ha
Winterstar 2 Ryegrass – 25 kg/ha (2 runs)

6. Galileo oats (60) + Morgan Peas (80) – 140 kg/ha (43:57%)
Galileo oats (60) + Morgan Peas (80) – 140 kg/ha (43:57%) (2 runs)

5. Crackerjack Trit. (60) + Morgan Peas (80) – 145 kg/ha (43:57%)
Crackerjack Triticale (60) + Morgan (80) – 140 kg/ha (43:57%) (2 runs)

4. Targa Oats (60) + Kaspa Pea (80) – 148 kg/ha (43:57%)
Targa Oats (60) + Kaspa Pea (80) – 140 kg/ha (43:57%) (2 runs)

3. Targa Oats – 110 kg/ha
Targa Oats – 110 kg/ha (2 runs)

2. Urambie Barley – 100 kg/ha
Urambie Barley – 80 kg/ha(3 runs)

1. Dictator 2 Barley – 110 kg/ha (No Fertiliser)
Dictator 2 Barley – 100 kg/ha(3 runs)

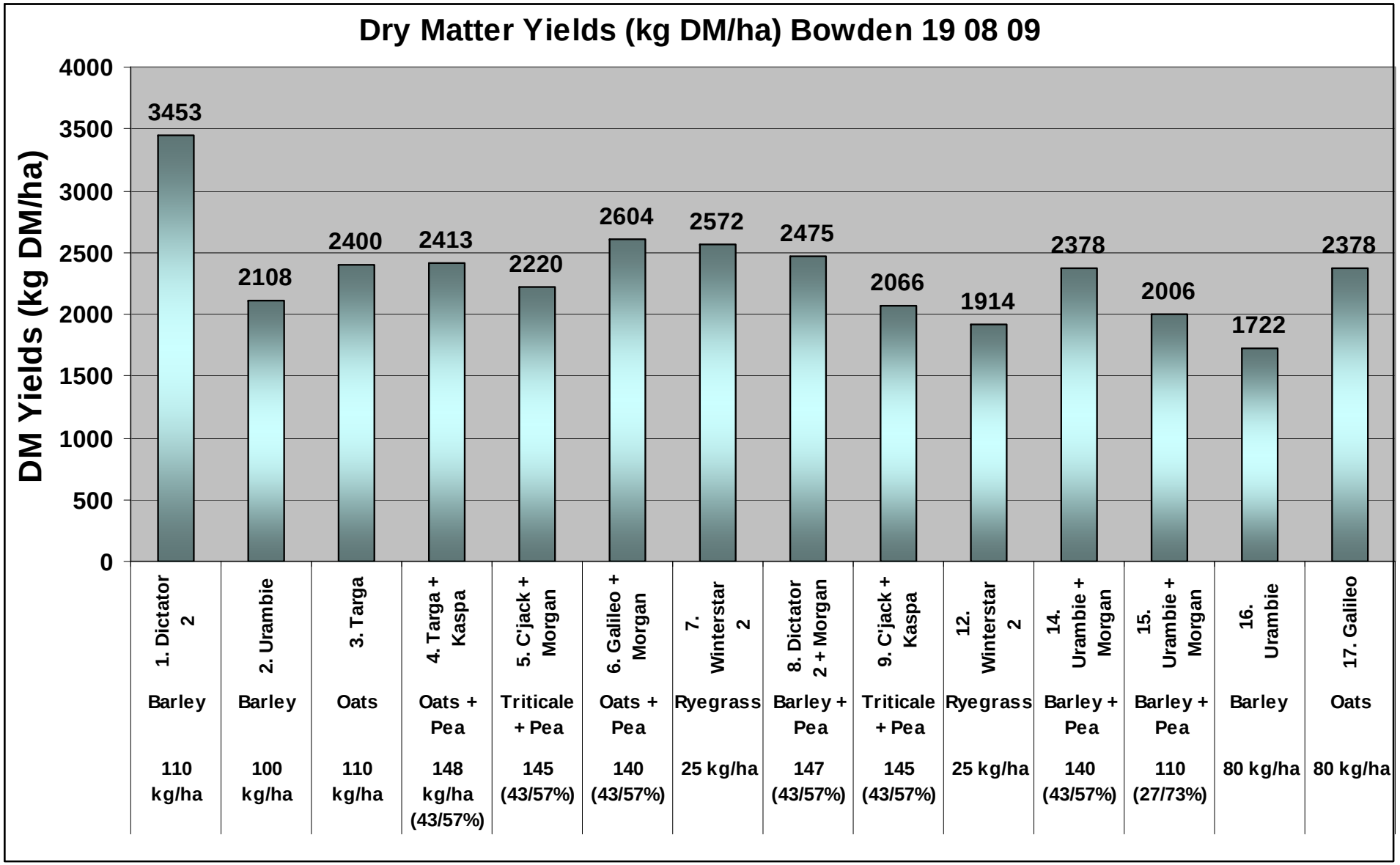
Sow-Easy air seeder

Fertiliser 60 kg/ha DAP

Sown: Friday 22/05/09

Wayne Bowden

Appendix 3b



Wayne Bowden

Nutritive values

Appendix 3c

Species + Proportion of each variety in kg	Barley (No Fert.)	Barley	Oats	Oats 60 + Peas 80	Triticale 60 + Peas 80	Oats 60 + Peas 80	Ryegrass
Cultivar	1. Dictator 2	2. Urambie	3. Targa	4. Targa + Kaspa	5. C'jack + Morgan	6. Galileo + Morgan	7. Winterstar 2
Ratio of each species (Cereal/Pea %)				43/57	43/57	43/57	
Sowing rate (kg/ha)	110	100	110	148	145	140	25
Growth Stage	*SE [3] GS32+*	*SE [3] GS31 - 32*	*SE [3] GS30- 31*	*SE [3] GS30 - 31*	*SE [3] GS32 +*	*SE [3] GS30 - 31*	
MEASUREMENTS[1]							
Dry Matter content*(%)	8.2	9.5	9.8	9.9	10.1	8.7	
Crude Protein (%)	**25.4**	**29.6**	**26.9**	**26.7**	**25.4**	**26.3**	
Metabolisable Energy**(MJ ME/kg DM or ME)	**11.3**	**12**	**11.7**	**11.4**	**10.9**	**11.4**	
Neutral Detergent Fibre (NDF % of DM)	46.0	42.9	44.0	40.3	42.4	42.3	
Dry Matter Digestibility (DMD %)	75.3	78.9	77.5	75.8	72.8	75.5	
Digestible Organic Matter in the DM (DOMD %)	70.6	73.7	72.5	71.0	68.5	70.7	
Nitrate-Nitrogen (mg/kg DM)[2]	**3850**	**2140**	**2350**	**920**	**760**	**4770**	

Species + Proportion of each variety in kg	Barley 60 + Peas 80	Triticale 60 + Peas 80	Ryegrass	Barley 60 + Peas 80	Barley 30 + Peas 80	Barley	Oats
Cultivar	8. Dictator 2 + Morgan	9. C'jack + Kaspa	12. Winterstar 2	14. Urambie + Morgan	15. Urambie + Morgan	16. Urambie	17. Galileo
Ratio of each species (Cereal/Pea %)	43/57	43/57		43/57	27/73		
Sowing rate (kg/ha)	147	145	25	140	110	80	80
Growth Stage	*SE [3] GS32 +*	*SE [3] GS32 +*		*SE [3] GS31 - 32*	*SE [3] GS31 - 32*	*SE [3] GS31 - 32*	*SE [3] GS30 - 31*
MEASUREMENTS[1]							
Dry Matter content*(%)	9.3	9.4	8.3	8.4	8.8	9.3	8.6
Crude Protein (%)	**22.8**	**26.5**	**25.4**	**27.6**	**26.0**	**31.7**	**25.6**
Metabolisable Energy**(MJ ME/kg DM or ME)	**11.1**	**10.9**	**11.8**	**11.2**	**10.9**	**12.4**	**11.5**
Neutral Detergent Fibre (NDF % of DM)	46.4	42.5	44.3	40.4	38.3	39.0	46.8
Dry Matter Digestibility (DMD %)	73.8	73.0	78.1	74.5	72.8	81.6	76.3
Digestible Organic Matter in the DM (DOMD %)	69.3	68.6	73.0	69.9	68.5	75.9	71.4
Nitrate-Nitrogen (mg/kg DM)[2]	**820**	**650**	**1290**	**1960**	**1820**	**1900**	**3960**

*DM content measured at FEEDTEST

**ME = (0.203 x DOMD %) – 3.001

[1] Average of 2 samples

[2] Mg/kg DM = ppm

[3] SE = Stem Elongation