

## Pastures from Space & Precision Sheep Production

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### Do you really NEED FOO map?

David Masters, Senior Research Scientist and leader of the Animal Production from Saline Land (APSL) program with CSIRO recently visited a wool producing property near Albany where kikuyu is being strip grazed to produce superfine wool.

As part of the walk through the paddocks to review the activities of this particular producer well known for his extensive plantings of kikuyu David noticed a golf cart with clubs and a few balls.

Although this looked somewhat out of place in such an agricultural setting, the strip-grazed expanses of kikuyu did resemble a well-manicured fairway, so David decided to question the producer as to their use. The answer surprised David for its ingenuity, effectiveness and simplicity in solving the problem of finding enough time to regularly estimate biomass in a targeted production system.

His particular producer had found the perfect excuse to play golf during working hours. Rather than doing pasture cuts to estimate FOO, the golf balls are used as the FOO indicators with a very simple technique.

1- Decide which club you need practice with, although length of the paddock may have to be considered also

- 2- Hit several balls to different areas of the paddock (just like trying to aim down the fairway!)
- 3- If on average the balls are covered by grass it is time to put on more animals and increase the grazing pressure
- 4- If you loose any balls add a few more animals again

Note: - rabbit warrens do not count as holes in one...

Fortunately this technique is not one that can be applied across all farms, even if it is not subject to the usual problems of clouded skies and stubble interfering with the image (although the stubble could affect the swing).

Therefore we are confident that the Pastures from Space team still has a role to play in developing the technology...

### Grazing effects on pasture growth

*Mike Hyder, Agriculture Dept., Albany*

While it is the *distribution* of pasture production throughout the growing season that is of most concern to wool producers in Mediterranean environments, the *potential* productivity of annual pastures is seldom realised.

Under experimental conditions where the leaf area index (LAI\*) of clover and grass was maintained above 5, researchers have measured annual DM production 16-17 t DM/ha per year. However, under grazed conditions, the actual productivity is usually between 6-12 t DM/ha per year.

This disparity between potential and actual is due to factors such as length of growing season, waterlogging, temperature, light energy, low plant density, nutrient deficiency etc. In addition, the grazing animal can also have a profound effect on the rate of pasture supply.

For annual-based clover/ryegrass pastures, optimum PGR occurs at a LAI of about 4. This equates to about 1400 kg DM/ha feed on offer (FOO). As increased grazing pressure results in FOO < 1400 kg DM/ha, leaf area becomes inadequate to support optimum PGR, and significant changes in pasture composition can occur, affecting growth, growth habit and the competitive performance of different species. Infrequent defoliation under lax grazing conditions results in dominance of erect species such as grasses. Frequent, intensive grazing can lead to increased branching and a larger number of smaller leaves in prostrate species such as clover.

Severe defoliation of leaf material results in leaf sheaths being the main interceptors of radiation. Because leaf sheaths have less efficient photosynthetic efficiency, PGR is reduced. Prolonged intensive defoliation results in a decrease in root growth because leaves compete better than roots for the products of photosynthesis.

The effects of trampling and excreta on PGR are not well understood, but under intensive grazing with cattle, reductions in growth can be as high as 50%. For intensive sheep grazing systems, losses probably range from 15-30%. These effects are presently being explored in the AWIL-funded Lifetime Wool Project, which has measured feed intake of ewes grazing pastures maintained at different amounts through winter and spring. The feed intake results will show how much pasture has been removed by sheep, and will be reconciled against changes in feed on offer to give a better estimate of PGR under grazing.

This knowledge will be useful in making adjustments to PGR in calculations used to regulate stocking rates and manage pastures to target amounts.

- a LAI of 4 means that in 1 square metre, the total area of leaf material is 4.

**From Gonz:**

Interestingly Andrew Thompson noted in two stocking rate (0-48/ha) experiments at Mt Barker in 1989 and 1990 that stocking rate and starting FOO had no significant effect on PGR through most of spring when FOO exceeded 1100kg DM/ha.

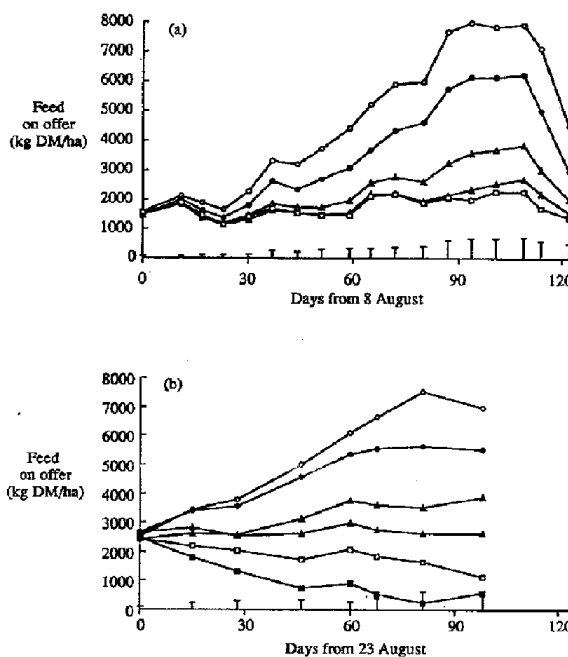


Fig. 1. Feed on offer under grazing at stocking rates of 8 (○), 16 (●), 24 (△), 32 (▲), 40 (□) and 48 (■) sheep/ha between days 0 and 122 (Expt 1) (a), and between days 0 and 98 (Expt 2) (b). Vertical lines denote the mean of three plots.

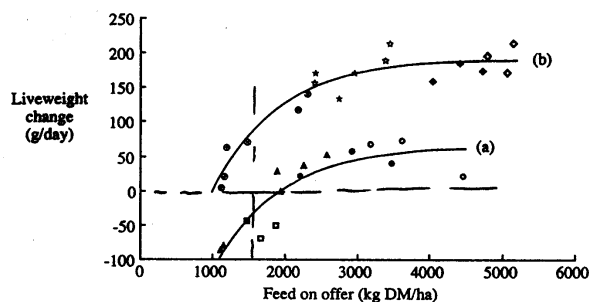


Fig. 3. Liveweight change in relation to green feed on offer. Points represent plot means for sheep stocked at 8 (○), 16 (●), 24 (△), 32 (▲) or 40 (□) sheep/ha in Expt 1 (a), and 8 (◇), 16 (◆), 24 (☆), 32 (★), 40 (⊙) or 48 (⊕) sheep/ha in Expt 2 (b).

The slope ( $\pm$  s.e.m.) and significance of linear relationships between the weight or characteristics of the wool grown and stocking rate are given. n.s.,  $P > 0.05$ ; \*  $P < 0.05$

	Stocking rate (sheep/ha)					s.e.d.	Linear relationship		Sig. <sup>^</sup>
	8	16	24	32	40		Slope	s.e.m.	
Greasy wool weight (kg)	5.97	5.95	5.44	5.79	5.26	0.224	-0.020	0.0038	*
Clean wool weight (kg)	5.05	4.91	4.57	4.90	4.39	0.199	-0.017	0.0080	*
Fibre diameter (microns)	24.0	24.6	23.5	23.8	22.3	0.64	-0.05	0.024	*
Staple length (mm)	93	89	90	92	86	2.3	-0.1	0.09	0.06
Staple strength (N/ktex)	39.6	40.2	40.6	40.5	38.2	2.00			n.s.
Position of break (% from tip)	62.2	60.0	64.9	61.9	66.0	4.72			n.s.

<sup>^</sup> Significance applies to correlation coefficient.

Previously Phil Cocks (1974) showed on clover dominant pastures that when FOO was between 500 and 1300 kg DM/ha, PGR was between 20 and 70 % of that when FOO exceeded 1400 kg DM/ha due to a combination of the reasons listed by Mike above

Andrew Thompson also showed that for LW maintenance of mature wethers a FOO of between 1000 and 2000 was necessary depending on the year. But for maximum gain a FOO of 3000-4000 kg/ha was necessary.

The figures and table were selected from Andrew's publication showing the effects of stocking rate on FOO and the effects of FOO on liveweight change.

#### **From Andrew's paper:**

"If increases in sheep numbers are to be used to increase pasture utilization in spring, decision on management will have to be made in relation to FOO and PGR, rather than on stock numbers per unit of land."

"Doyle et al (1993) have proposed that grazing management decisions should be made on the basis of grazing pressure, yet such decisions are still most commonly based on stocking rate."

### **Using the technology on farm**

At the last meetings in August collaborators present were asked to outline how they were using the technology to date.

#### **In Darkan**

Brad-

- Identifying poor performing paddocks-, which can then be treated accordingly- soil testing/ fertilizer application, renovation etc. As a continuation of the theme Brad has also set up a nursery paddock for production of new pasture varieties.

- Stocking rate manipulation assisting in paddock management /manipulation e.g. Forecast PGR and historical PGR information allowed Brad to increase SR, take 100 acres out of the grazing system, and plan for a summer fodder crop (millet)
- FOO data has been useful as a diagnostic tool. 2 FOO images a year would be sufficient. A pixelated PGR map would be good. Some type of nutrient audit by satellite would also be good to have.

Comment- Rodger- needs to incorporate yield data (crop yield maps). As part of systems approach, and acknowledge the importance and influence of the cropping phase in the pasture system. Composition data as a reflection of quality is also important.

Comment Graham- 'the technology is there, and available' 'The simple is doable'

Bill

- Need FOO maps early in the season
- PGR data and FOO maps allow for:
  - ◇ Feed budgeting, vital when rotational grazing.
  - ◇ Strategic feed planning, for particular mobs of animals e.g. better performing paddocks are grazed by 'high value/higher nutritional need' mobs i.e. Ewes and lambs. Poorer performing paddocks left for the 'sacrificial' mobs e.g. Hoggets that are able to graze at a maintenance level.
- Bill is keen to access historical data, so he is better able to predict and plan 'best bet' stock management strategies.

Roclea

- Pasture budgeting with hoggets. FOO and PGR information dictates management strategy.
- Has allowed for an increase in stocking rate
- Need to sell technology. Must be cost effective. Can't afford to buy expensive images (Comment made after Steve mentioned the major increase in cost, if we moved to different satellite and/or technology)

*Comment Graham Donald- we are looking at new cost effective satellites to suit our requirements. It has been difficult to find satellites to produce 'real time' data (timely) data.*

### **Farm Tour**

The group then went to look at the paddock that Brad has planned for millet, as well as inspect/ discuss the performance of a paddock currently running 50 DSE to the Ha.

### **In Kojonup**

Roger

- Identifying poor performing paddocks-, which can then be, treated accordingly- soil testing/ fertilizer application, renovation etc
- Stocking rate manipulation- using PGR data to match SR to PGR, to meet stock nutritional requirements
- Having the confidence to make the decisions (like above) and know it is ok!
- In the future building deciles for the PGR's so we can start to look further out with our planning. Similar to using deciles with rain.

Erin

- Using PGR and FOO data to identify paddocks for different uses e.g. renovation, summer crops etc

Ben W

- Using data to identify poor paddocks- Assisting in decisions on Fertilizer inputs etc.
- Assisting in decisions in regards to sale stock, early in the season

Bill W

- Use PGR information to make grazing decisions (i.e. in which paddocks to graze different mobs
- Overlay data over soil information (derived using radiometrics) to identify production from different soil types so as to develop tactics for maximizing pasture production

All participants acknowledged a change in philosophy, and utilization of new tactics. Also an increase in confidence in decision making, having the data available to support management decisions.

### **And for the future...**

- Benchmarking Paddocks to measure improvements in paddock productivity, and hence 'cost effectiveness' of any inputs
- Being able to use PGR as a base for decile rating a year, thus being able to identify potential for the year, i.e. 'Is it going to be a decile 1 year or a decile 5 year'

### **General Comments**

- Pixelated PGR would be very good in assisting in mapping PGR performance across the paddock
- Historical PGR/FOO data would be very useful for pre-emptive decision-making. (Could be part of the combination that comes up with the decile rating- per. Roger)

### **Pastures from Space in the public eye.**

#### ***Going back to school***

Gael Bell (AWI funded Woolpro in Schools project) Education officer, is setting up a Pastures from Space display as part of the WinS overall display, at the up and coming Demark College of Agriculture open day. Going on line, and will have Richard Coole's FOO (with his permission) up for all to peruse.

#### ***Getting back into sheep***

Rodger Bryant was at a "prime time to get back into sheep" (MLA sponsored) workshop held on the 8<sup>th</sup> September at Mt barker (140 + people attended).

James Hall from the DFMAg was talking at one session. Referred to Pastures from Space and Pasture Watch a few times in his session on "getting back into sheep", as far as discussing on farms tool to assist in on farm sheep management decisions.

## **New Pastures from Space website** *and we need some guinea pigs to test-drive it*

To mark the delivery of PGR from MODIS data and the recognition that Pastures from Space will be the official name used when this technology is ready to be commercialised a new website has been created that brings together all the information relevant to the Pastures from Space project. It aims to give users a complete understanding of the technology and the process behind the generation of the estimates.

The website also brings together in one website the areas of Pasture Biomass or Feed-on-offer (FOO) and the PGR data to give users a one stop tool to manage and budget feed resources in agricultural enterprises.

A key feature of the web site is a web-enabled GIS (Geographical Information System) system that allows users to interactively zoom into their area of interest to gain more specific PGR information. The GIS system includes landscape information such as roads, rivers and other major features for users to navigate during zooming using major roads or other landscape features such

as rivers or streams. This system replaces the previous site where PGR's were delivered at a shire level.

While at this stage the maps do not have the farm boundaries as FOO maps, if you navigate to your location, you will be able to see a pixelated PGR map from MODIS and it should be retrospective to when we started delivering MODIS data on the 27 August.

The website should be operational within the next week or so at the following URL address: [www.pasturesfromspace.csiro.au](http://www.pasturesfromspace.csiro.au) and after a period of time for our collaborators to have a sneak preview, it will go public to the rest of the world.

You will all be informed via email when the website is ready to view and we would appreciate some feedback... as all good works of art in progress it is bound to benefit from your input.

I know it is jumping the gun, letting the cat out of the bag, etc., etc. before it is ready but I did not want to miss the chance of including a note here to wet your appetite...

**Gonz 19.09.03**

## Group Meetings

Next meeting dates:

**Brookton** PSP meeting scheduled for the **22nd September**, 1pm.  
Property of Max & Virginia Watts, 'North Westwood' block

Scheduled for **October**

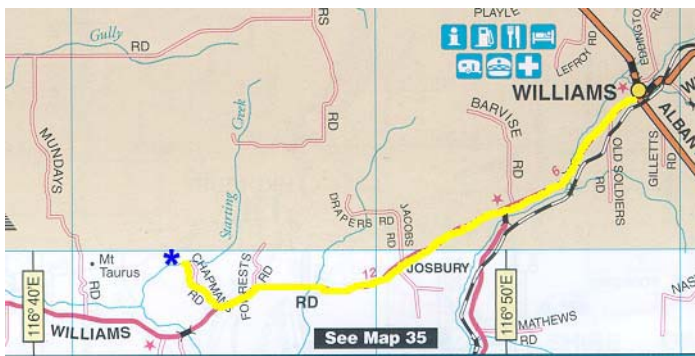
\*\*\* Note Change of site for meeting - See map for how to get there\*\*\*

**Darkan/Arthur River- 23<sup>rd</sup> October** 9am-11.30am- at Bill Creswell's shearing shed.

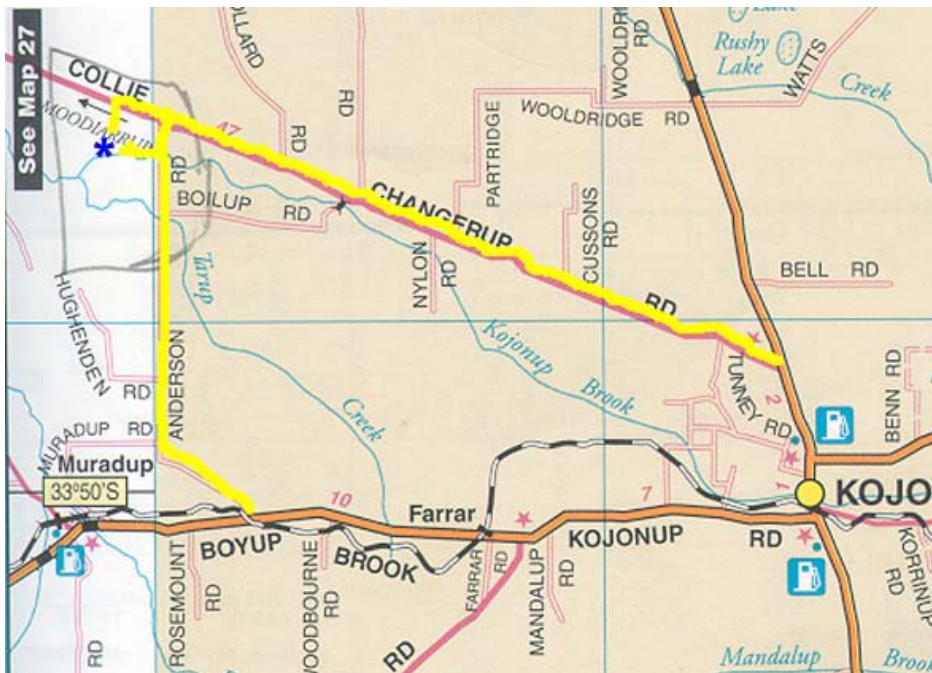
**Kojonup 1&2- 23<sup>rd</sup> October** 2pm-5pm- at Alan and Wendy Andersons shearing shed.

For Moora and Dandaragan, please check with your local coordinator.

We look forward to seeing you all at the respective meetings. Jus follow the yellow brick road...



Cresswell



Anderson