Pastures from Space & Precision Sheep Production

Contents:

How good is your FOOing?

Acting on a request from Bill Webb (Kojonup) for the July meeting we organised a FOOing session to enable participants to test their skills in estimating pasture biomass.

The incentive to participate was the possibility of winning a copy of the Green Feed Budget Calculator program (see newsletter No 3). As the analysis of results progressed it became apparent that two possible results could be obtained depending on whether we used the r^2 or smallest difference methods to calculate the winner. At this point Chris Oldham volunteered his copy of the program and two presentations were made.

Rodger Bryant, Chris Oldham and myself set up 4 quadrats in the paddock adjacent to Roger House's shearing shed and Rodger visually estimated them under supervision from Chris and John Young.
After all the results were recorded, volunteers were called to cut the pastures and I took them back to Perth for washing and oven drying before weighing.

Richard, Mal and Lucy doing a pasture cut for calibration
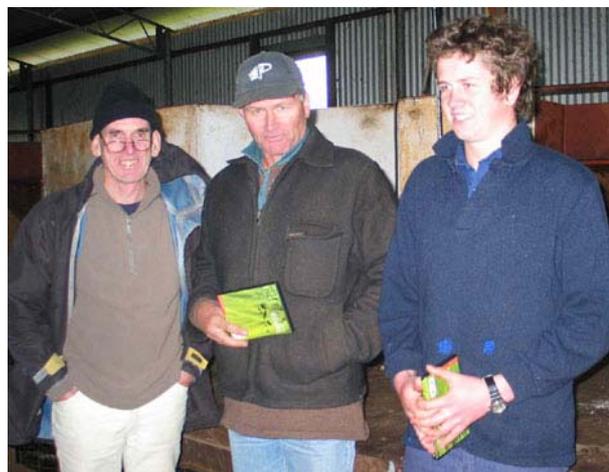
Chris Oldham with Tim Eyres and Neil, the winners of the two Green Feed Budget Calculator programs

| Quadrat No.	RB's Visual Estimates (Kg DM/ha)	Oven dried Estimates (kg DM/ha)
1	500	888
2	950	1409
3	1750	1568
4	2100	1630

Towards the end of the meeting all the results from visual estimates were entered into the computer, projected on the screen and discussed with the group.

The r^2 values for all were very good, the lowest being 0.92 (on a scale of 0.00 to 1.00 where 1.00 is a perfect match) and the highest 0.998. However, when comparing the smallest difference to Rodger's estimates it was clear that r^2 could be somewhat misleading when only 4 estimates were plotted.

Using the oven dried FOO for recalculating the r^2 values with the estimates gave a very different outcome, with values ranging from 0.64 to 0.95, as did the smallest difference method although I am pleased to say that Tim Eyres still came in closest to the mark here.

We all agreed that it was much easier to estimate very low FOO's and that the errors quickly increased when biomass was greater than 1000 kg DM/ha, so calibrating the eye is essential when going into spring. An alternative interpretation is

that the errors from the satellite predicted FOO are smaller than from an untrained/un-calibrated eye.
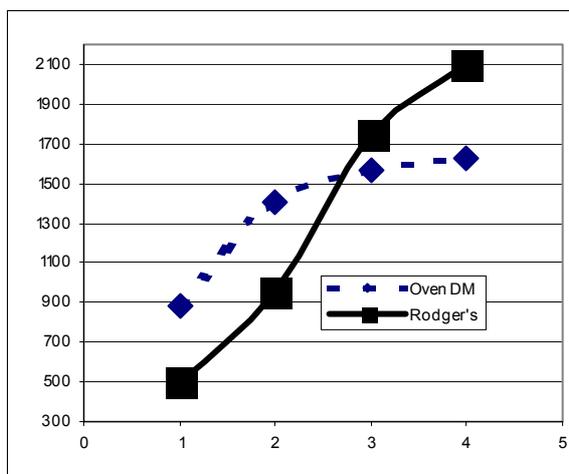
Visual estimated from Rodger vs. cuts

Main messages from this activity:

- 4 cuts are not enough, need at least 10, so pick a warm day and invite a couple of your neighbours.
- Need to do monthly cuts as the "visual to DM" relationship changes with maturity going into spring i.e. greater stem to leaf ratio and heavier stems.
- All samples were washed before drying, but for some of them there was a huge amount of soil bagged with the sample i.e. potential for large errors if not washed properly. (Sorry Roger we owe you half a paddock!).
- Although we did not do any botanical compositions, it is important to keep that in mind if trying to allocate a nutritive value to different pastures.
- Rodger is going back to FOOing school but he won't be alone! (Rodger, this is why I was the one taking notes!)

Landsat 5 – delivering

Acquisition of images from Landsat 5 is going ahead pretty much as planned and so far no technical problems have arisen from this satellite… all we need is a few more cloudless skies.

The problem with Landsat 7

…Still testing the extent of the problem and the likelihood of acquiring usable data.
In an effort to better understand the impacts to the mission if the Scan Line Corrector (SLC) operations prove to be non-recoverable, the USGS

and NASA polled a cross section of the user community on the impacts of the SLC-off version of Landsat 7 data.

A diverse group of scientists with ongoing experience using Landsat 7 data evaluated the scientific usability and validity of Landsat 7 products containing the SLC anomaly. The disciplines represented by these scientists include Geography, Agriculture, Forestry, Rangeland Ecosystems, Glaciology and Ice Cap Monitoring, Ecological Remote Sensing (RS), Phenological Characterization, Coastal /Oceanographic RS and Coral Reef Monitoring, Tropical Forest Monitoring, Water Quality Monitoring, RS Methodology and Techniques Development, and Global Change Monitoring. EROS Data Centre (EDC) scientists and engineers also performed evaluations of the radiometric and geometric validity of these products. *(This gives you an idea of how widely these satellites are being used).*

Additionally, the potential to develop new tools or methods of compensation for this anomaly (for example, developing a mosaic of overlapping scenes or data from subsequent imagery to "fill in" missing pixels) may enable more scientific uses of these data.

…there are three possible options for how to proceed: do nothing – continue taking data with SLC off, re-try the SLC using the primary electronics, or try the SLC using the secondary electronics. The team is evaluating the risks associated with each of the options.

Engineers are also working on modifications to the Landsat 7 algorithms to allow for processing of the SLC-off data. When finished, the team will determine when SLC-off data will be available to the public.

The reality… still remains
They still don't know the extent of the problem, how long it will take to find a solution, if at all possible… and neither do we!

Below the horizon
– It's coming and we can almost see it

In the last month we have attempted to explore further the availability of other satellites from which to fill in some of the gaps and expand the catalogue of possible images.

The first go at using the images from **Quickbird** (resolution of 1-4 m) is underway, focusing on the Vasse area where our cousins in the dairy industry work on what we would normally call ridiculously small paddocks. The first image will be acquired within the next fortnight.

This trial is primarily for technical evaluation to show we can do it and to understand what changes need to be implemented in the processing and interpretation of the data.

This is exciting groundbreaking stuff as it is the first time this satellite has been used for this purpose anywhere.

A second satellite is also being tested. The **SAC-C satellite** run by the Argentine Space Agency follows a flight pattern similar to the troubled Landsat 7 satellite. This satellite has a resolution of 175 m per pixel (so not as good as Landsat but better than Modis). With this pixel size, **sac-c** is not likely to be of great use for direct FOO estimation but it may be used as a further source of "Virtual FOO" to fill some gaps and it is one of interest to our other cousins with the ridiculously large paddocks full of crops. Interestingly this satellite acquires an image that is 300 km wide in a continuos strip of 1000 km so one image can capture most of the farms in the project for only US$500.

The first image was acquired in late July and the next image is due on Monday 1st September. Looks very promising.

Feedback from the Badgingarra and Walebing Groups:

Frustration all round in not having had a FOO image so far this year due to cloud cover. Mike Humphry was using PGR to help calculate FOO for his paddocks. While some producers are using PGR information others were concerned about the fact that the values for paddocks were similar and therefore only providing an average value for the farm. There was positive feedback on Pasture Watch and the fact that they could get the information on time and that it was reliable. Request from Pauline Roberts and Kristin Lefroy (both have 90 or more paddocks each) to get PGR as a map.

Response from Steve Gherardi

Re FOO - We would normally have tried to capture an image from the SPOT satellite that passes over every 3-5 days. However, because of the prohibitive prices for SPOT images we are unable to stretch the budget that far. Last year we purchased our SPOT images from the Australian Center for Remote Sensing (ACRES) who also provide us with our Landsat images. This year we have had to go to Raytheon (commercial company) who are the sole Australian provider of SPOT images. Through the Dept of Land Information (DLI, ex-DOLA) we are having discussions with Raytheon about purchasing of images at realistic prices. Re PGR - The move to MODIS (250 m^2 pixel) should help to provide more accurate estimates of PGR at the paddock level. I will investigate the possibility of a PGR map for 2004.

Remember that if you have any concerns with your FOO maps, then report them to your group coordinator ASAP, so they can be investigated as close to satellite pass date as possible (a paddock can change a lot in 3 weeks!) and we may have an answer for discussion at the next group meeting.

MODIS on line and delivering...

Yes! from next week onwards data from the MODIS satellite will be used for estimating and delivering PGR data to you. As Steve suggested above, this will deliver a significant increase in accuracy as we are getting 16 times more data per square kilometre or putting it a different way, delivering sub paddock PGR to every paddock greater than 6.25 ha in size.

This will potentially resolve the criticism of PGR values for paddock looking the same. And it is up to the individuals to provide us with feedback if you think this is not the case.

The data will be delivered to you through Pasture Watch just as before i.e. an average PGR value per paddock, so you don't have to change any settings in your systems.

Congratulations to Graham Donald (CSIRO) and Arjen Tjalma (DLI) for implementing the changes to the system and to the team of field operators at the DAWA for providing great quality data with which to validate the new estimates from MODIS.

Feed Budget Calculator

We conducted an impromptu demonstration of the Green Feed Budget Paddock Calculator during the July meeting in Kojonup to familiarize those present with some of the potential scenarios the program tackles. From deferred grazing in autumn to strip grazing in spring, with several options for managing both plants and animals. Some of the default values were questioned and Chris undertook to follow this up with Steve Gherardi.

At the time Chris Oldham suggested that the winners of the two copies of the program may want to come back to the next meeting and work through some scenarios with real data from their properties. But not to be outdone, Chris also undertook to develop some case studies with data from the Lifetime Wool Production Project to present at a future meeting.

At this stage the Feed Budget Calculator program is not available for release. It is currently undergoing further testing by producers and scientists prior to general release.

Quantifying Pastures from Space

Lucy Anderton; Regional Economist attached to the Katanning District office of the Dept. of Agriculture was successful in attracting the attention of some of the collaborators and with little arm twisting had a number of volunteers willing to open their books for case studies on how the technology is being used and the value of the technology to producers

No doubt at the appropriate time we will get an update on how this part of the project is going but if you have any burning questions, Lucy can be contacted at the Katanning office on 98213333.

FOO vs. Available FOO

An interesting discussion is raging among some of the members of the Darkan group because of perceived discrepancies between satellite and visual estimates leading to the question "is all FOO the same?"

In short "NO", but in the same way that the technology can't differentiate between grass or clover dominant pastures (at present), it also can't differentiate between your average sward and a very matted green base of stalks driven into a prostrate position because of heavy grazing.

In one example a paddock based on capeweed, clover and geranium, which the previous month had been questioned for reporting high FOO values was visually estimated around 600 kg DM/ha, but when cut for calibration came back as 1460 kg DM/ha. The other side of the coin, a grass dominates pastures, erect and leafy, which looked heavy but when cut for calibration produce less DM than expected.

The first paddock had been grazed very tight, "like a bowling green, with good ground cover of about 80%, pasture height was no more than an inch and with very low leaf content. According to Rodger Bryant, all the ingredients suggested about 600 kg dm/ha.

As we move into spring and pastures shift into flowering and seed production, the dry matter % and woodiness of the stem will increase and an even greater discrepancy will be likely between un-calibrated visual estimates and satellite estimates in heavily grazed pastures.

Changes in DM and Cellulose to Lignin ratios (woodiness) in clover through spring
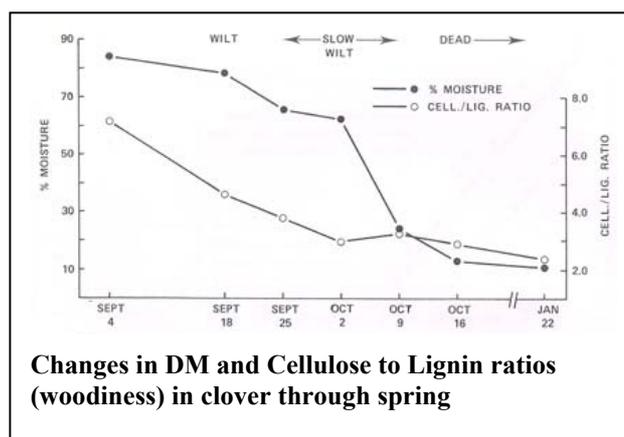
As we use this technology to achieve higher levels of pasture utilization it is important to differentiate between total FOO and available FOO (aFOO) in any feed budgeting situation. This will have implications not only in the level of animal

production reached but also the persistence and productivity of the pasture.

Implications:
Livestock production: Expecting animals to thrive on a poorly accessible DM source will lower intake (quantity and quality) and restrict productivity, especially important with lactating animals.

Maximizing PGR: Plants grow as their fastest when the Leaf Area Index (LAI) is as close to 1 as possible. As pastures are defoliated the efficiency of growth is reduced.

In cases of total defoliation, spelling is necessary until the new growth reaches its third new leaf, by which time the first two leaves are repleting root stores of energy.

If tight grazing is prolonged, energy stores are depleted and the plant will loose vigour at the time when it should be setting up to fill seeds prior to senescence with effects on next years seed bank.

Pasture persistence: Maintaining an effective seed bank is essential for the persistence of the pasture and to protect against false breaks.

The removal of any of the drivers of Seed set will negatively influence the final seed bank, so we need to find a balance between production now and production next year.
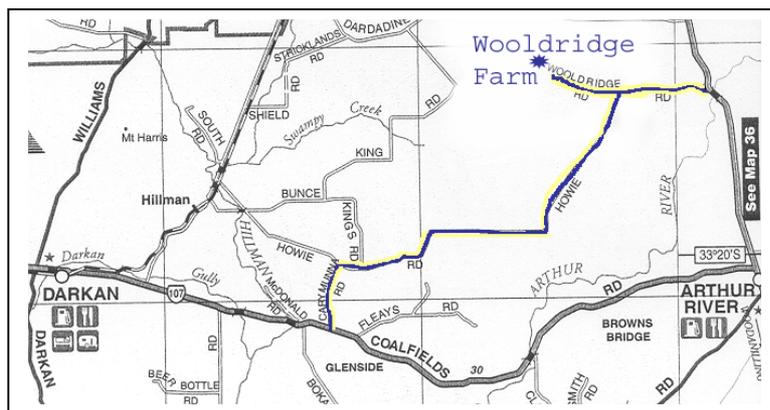
Seed set = (No of seed heads + amount of photosynthetic tissue + nutrient re-translocation)

Group Meetings

Next meeting dates: **Thursday 28 August**

Darkan- 9am-11.30am- at Brad Wooldridge's shearing shed.
Note Change of site for meeting - See map for how to get there.

Kojonup 1&2- 2pm-5pm- at Roger and Annabel House shearing shed.

Due to limited time available, we have decided to run a combined meeting of the two groups in Kojonup.

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

Topics for the day:
- Pastures from space technology- Where are we at, we do we want to be, how do we get there- Group discussion.
- How I have used the technology on farm - Brad Wooldridge, Roger House- to lead discussion. Others to contribute.
- Newsletter- Gonz Mata
- FOOing exercise- Rodger Bryant to lead
- Farm tour- Brad/ Roger- action on farm!
- Discussion of FOO images

We look forward to seeing you all at the respective meetings.