Pastures from Space & Precision Sheep Production

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As you can see from the name above, we have amalgamated the Precision Sheep Production group (DAWA) and the Kojonup Pasture Utilization group (PIRD) Kojonup for 2003, which hopefully will bring benefits to both groups and better rationalize our limited resources this year.

With the break of season upon us we are cranking up the FOO and PGR programs for this year after many, many hours of discussions and meetings over the summer between WADA, CSIRO and DOLA.

In these pages I'll outline some of the changes we have introduced in 2003 for the benefits of those who could not make it to the meetings in Perth in March or in Kojonup or Darkan on the 16th of April and reinforce the messages for those who participated in very good discussions those days.

Gonzalo Mata
22/4/03 CSIRO

Objectives for 2003

➢ Deliver by email and website, regular and accurate paddock level FOO and PGR.
➢ Survey to understand attitudes towards remote sensing pasture management, their use and value (start and end of season).
➢ Design groundtruthing method to allow assessment of technical accuracy.

One of the biggest changes for the Pastures from Space program is going to a system of focus farms on which to base much of the **technology transfer activities**. Five focus farms have been established, located in zones 1, 2, 3, 4 and 10 as shown in **figure 1** below. For the Kojonup area Zones 5, 6, 9 and 10 are brought together and the focus farms is established at Roger and Annabelle House

PGR:

As we have already flagged in a previous email, this year we will be testing a new satellite (MODIS), which will give us higher resolution (250m/pixel) compared with NOAA last year at 1.0 km/pixel. Hopefully the transition to MODIS will be seamless and it will give us an even greater level of confidence in the numbers we are giving you.

As last year, PGR data will be provided weekly, where you will receive what happened in the last 7 days and also our prediction of what will happen in the next 7 days.

Having finally received the OK from AWI, and expecting to sign the contracts soon, we will also be aiming to develop other forecast tools (linked to the Met Bureau) to help us look further into the future.

It was clear last year that PGR information was somewhat under-utilised for a variety of reasons, so this year we are introducing an interpretation tool to make PGR more user-friendly. See the section on "**Pasture Watch**" for more details.

FOO:

We have totally revamped our FOO system to improve on what we delivered last year, which we all agree had some shortcomings.

1) *Delivering images every month*.
For many of you we could not achieve this because as hard as we try, satellites can't see through clouds. That has not changed, but we are increasing our options by adding two more satellites to increase our chances.

Landsat 7 and SPOT 4 were the two satellites we used last year. Landsat 5 (the older brother to Landsat 7) is coming back into service from July onwards and will give us the opportunity to

acquire images 7 days either side of Landsat 7 and with the same resolution (30 m/pixel).

We will also use MODIS (already mentioned in PGR) and some clever mathematics to recalculate from the 250m/pixel down towards the 30m/pixel range in what we call "VIRTUAL Landsat". Although there will be a reduction in resolution it will help us fill the gaps when the other satellites have failed us. MODIS flies over twice per day, and we will be getting weekly composites of these images. That is out of the 14 images we will get per week, we should be able to find some images where farms are not covered by clouds.

Of course as I am sure you all understand, this is very much experimental (we have been working on this since last October) and will be further developed and tested as we go.

We are quietly confident that we will be able to achieve the goal of delivering images, even for the most cloud-affected areas at least monthly and as we progress towards spring, may venture into providing fortnightly VIRTUAL Landsat.

2) *Grey Areas.*
There are two main reasons for grey areas in the maps you received last year:

a) Stubble reflection
The stubble problem is an ongoing part of our research and we will be devoting some effort this year to progress this, but to start it is still a problem. Stubble reflects light in a range outside what we see as normal pasture, even if there is some pasture growth underneath it. This is specially so in heavy paddocks. Therefore first year pastures tended to be seen as grey last year.

We have specifically identified some 1st year pasture paddocks this year within the focus farms to help us collect data for this work. It is also important that those of you who have not provided us with an inventory of paddock use for this year do so as soon as possible, so that we can refer to that information when interpreting the satellite data.

You should all have been sent either by email or fax a list of all the paddocks we have recorded for your property. Could you please assign one of the codes below to each paddock and return

this information to Rodger Bryant or Gonz Mata.

Crop	code	Pasture	code
unspecified	y	annual permanent	pp
barley	b	annual new	pn
canola	c	annual 1st yr after crop	p1
lupin	l	annual 2nd yr after crop	p2
oats	o	perennial lucern	pl
wheat	w	perennial kykuyu	pk
peas	p	perennial other	po

b) Inadequate calibration of the model.
Last year Pastures form Space had 9 zones from Dongara to Frankland and within those zones anything up to about 10 farms each. We used 3 farms per zone to gather our ground data from which to calculate a zonal average calibration to convert the greenness indicator NDVI into a FOO map. For many it worked well but for others not so. The zones were based on an assumption of similar climatic patterns, but the drought made sure that would not always be the case last year.

This year we started with the idea of visiting every single farm once per month, about 1 week before the satellite was due, but we have realised we don't have the manpower to do that, as there are about 70 properties and only three skilled field operators. It would also have meant 6-7 times more work calculating FOO maps for each farm. The Kojonup area with 24 producers and some with more than one farm is a particular problem.
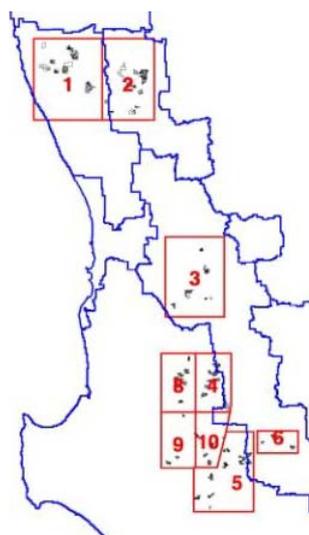

Figure 1 FOO zones for

In the Kojonup area we have been forced to go back to zones so that we only visit 8 properties or sub zones each month. However compared to last year, the sub zones are much smaller, never more that 20 x 20 km, which will improve the confidence in our calibrations. Last year zones were up to 40 x 80 km. We had to make similar compromises in the other zones.

The names allocated to each sub zone in **figure 2** indicates the property on which ground data will be collected and the other farms FOO within the sub zone will be calculated according to that ground data. These sub zones are not yet finalised, as it was clear at the April 16th meeting that better groupings could be made. If you recognise where you are and believe your growing conditions better fit an adjacent zone, please talk to us soon.
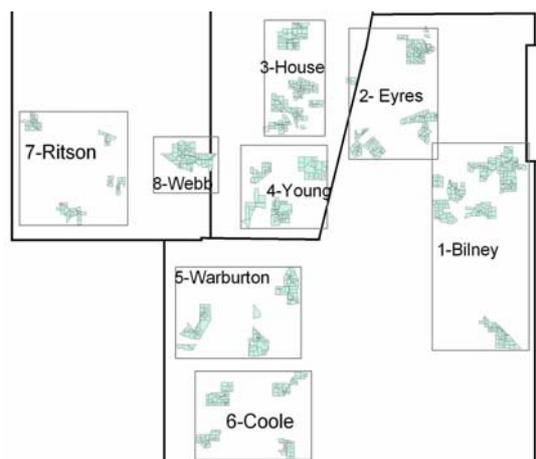
Figure 2 Kojonup FOO sub zones for 2003

On top of that, we are testing 4 different ways of calculating the FOO maps, again developed since October last year. It is likely that some methods work better at some times of the year than others so we have a program for testing all.

With all these innovations we have established a **Quality Control** program to ensure that the best method is chosen for each property. The FOO maps will be reviewed by a team including DAWA field operators and DOLA to choose the ones that best fit what we believe is out there and hope to get lots of feedback from all of you if we are not quite right.

Pasture Watch

Delivering great data is useful only if that data is put to some use to make your enterprises more efficient or more profitable. In many cases last year's data was under-utilised for to many reasons.

In 2003 you will have a new tool to help you interpret the PGR and FOO data and compare it to previous years results.

Pasture Watch is a computer program developed by Roger Wiese, from Fairport Technologies, the makers of PAM, in response to an approach by DAWA and CSIRO.

This program will sit in your PC and will allow you to plot PGR weekly for each pasture paddock, comparing it to the farm average and the forecast PGR for the following week.
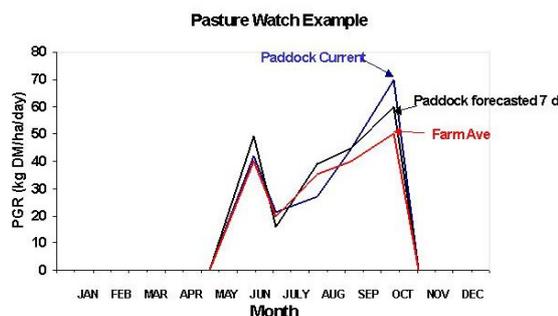
Similarly, monthly FOO for each paddock in your farm will be plotted together with an estimate of total pasture production for that paddock, giving you an estimate of pasture utilisation as the year progresses.

This will be an important tool in making decisions as to whether to decrease or increase stocking rate, close a paddock for hay or silage, do some drought planning, etc.
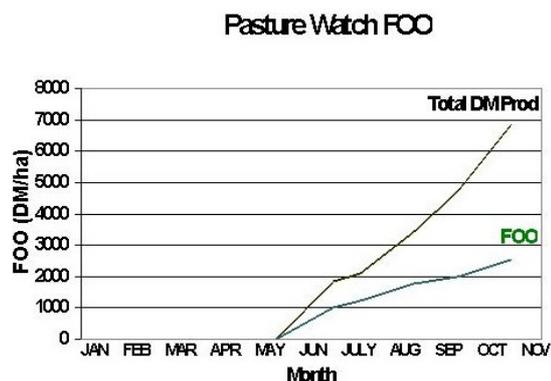
Figure 4 Monthly FOO and Total DM

For each paddock you will be able to set up critical warnings to help decision-making. For example, you will be able to set lower FOO limits in autumn so that when a paddock reached 800 kg DM/ha a pop-up message will suggest that supplementary feeding in that paddock is no longer necessary. Setting limits to ensure that FOO for pregnant ewes does not drop below 1500

kg DM/ha. If managing wool profiles in spring, upper limits can be set to remind you when to increase stocking rate or reduce paddock area to ensure a constant FOO level above which micron blow-out is likely does not happen.

The best thing is that the program will get the data automatically. Every time you connect to the internet and start the program it will quietly go away to a central data storage point and download the latest PGR data available for your property. If you come back from a three-week fishing trip, it will download all the missing data, not just the last week. Once per month it will download the FOO data in a similar way.

At this point, Pasture Watch will not download the colour maps you received last year, they will still be sent to you by email and can also be accessed through the internet.

The big brother to Pasture Watch is the PAM program. The same functions are available in the latest version of PAM, but in addition it allows you to link your pasture information to your animal and financial records and will allow users to import the colour maps into the system. Of course we understand that not everybody wished to use PAM. All five focus farms have been set up with PAM, and will demonstrate PAM's functionalities at the monthly meetings.

You will soon receive information on when Pasture Watch will be available for distribution.

2003 meetings:

With all these innovations and to make sure that you get the best value out of the project, this year we will also be combining some of the meetings between the DAWA coordinated group and the PIRD group.

The purposes of the meetings are:
- ➢ Share feedback on the delivery of FOO and PGR data. Discuss technical problems.
- ➢ Utilization of FOO and PGR information, including PAM, Pasture Watch and feed budget calculator.
- ➢ Visit a selection of paddocks where ground truthing is being carried out
- ➢ Present ongoing results from the lifetime Wool production project.
- ➢ Discuss any other activities participants may suggest in relation to Pastures from Space

The meetings will be held every month at the focus farm, in the shearing shed at Roger and Annabelle House.

The dates for the meetings have not yet been set, as it will depend on when we start acquiring satellite images. They will be held 7-10 days after the satellite pass to allow us to provide you with data and for you to provide any feedback you have, which will be acted on and problems solved before the meetings are held. This will allow us to spend time discussing other things apart from the technical problems we saw last year.

PSP Survey

Many of you completed a survey at the end of last year, coordinated by Joanne Sneddon. Some of the results of that survey were presented in March and demonstrated we had a way to go.

Joanne has devised a second survey as part of her PhD work that specifically addresses your views for 2003 in line with our objectives. It addresses how you will use the data to improve your enterprise in 2003. One of our aims at the first meeting will be to look at what changes may be brought about by the technology.

Other groups have identified activities such as introducing prime lamb production using pasture watch to control rate of growth, drought planning, setting up paddocks for next summer, cattle movements in and out depending on surplus feed, silage production, controlling reproductive ewe nutrition and fibre profile manipulation.

We will follow this up at the end of the growing season to collect sufficient data to demonstrate to AWI that producers see value and can derive benefits form this technology. If we can't demonstrate this, our chances for further funding will be in question

New Faces:

Rodger Bryant is a Technical officer based at the Narrogin office of DAWA and will be involved in coordinating the meetings with the Precision Sheep Production group and the Kojonup Pasture Utilization group.

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Lifetime wool production

What are the consequences of underfeeding the pregnant ewe?
➢ Lower ewe reproductive performance
➢ Lower wool production and fibre diameter
➢ Lower lamb birth weight and survival
➢ Lower secondary follicle density

➢ <u>When</u> should ewe nutrition be improved? Early and mid-pregnancy and/or late pregnancy?
➢ <u>How much</u> should ewe nutrition be improved? What supplements and/or amounts of pasture are needed for optimum ewe and progeny performance?
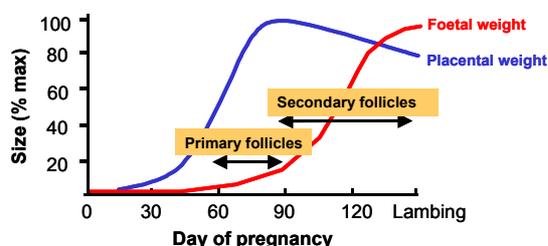

Figure 5 Foetal development through pregnancy

The outcomes of this project funded by AWI are to develop grazing systems that enable wool producers to manage breeding ewes to <u>optimize</u> the value of the wool clip from the ewe, and the lifetime productivity of the progeny. These systems will be developed and demonstrated on commercial properties.

A second site for this project has been set up in Hamilton Victoria and is linked through the use of genetic material.

Ewes in condition score 3 will be mated using frozen semen separated into two groups and fed or allowed to graze different pasture levels so that by day 90 a full condition score is obtained between the two groups. At day 90 of pregnancy the ewes are split into 5 groups and allowed to graze pastures of 800, 1100, 1400, 2000 and 3000 kg DM/ha until weaning.

Carryover effects affecting FW and FD have been observed in the 2001 progeny at the 2003 shearing for both the ewe and the offspring.

Pasture from Space technology will be used for monitoring these animals as well as other on-farm trials run concurrently.
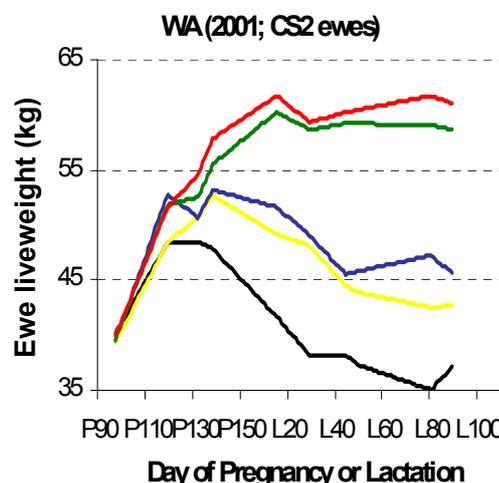

Figure 6 Ewe liveweight from day 90 of

Initial results indicate that a pasture level around 1500 provide sufficient nutrition to the developing foetus while allowing optimum productivity per hectare.

Progress of these results will be discussed at the monthly meetings