Pastures from space

Background

Pastures from Space, whilst sounding rather like some 'sci-fi' movie is actually a program which provides estimates of pasture growth rate (PGR) during the growing season by means of remote sensing. Satellite and climate data are used to predict the rate at which pasture is growing. This information can be used by farmers to manage their enterprises more effectively and potentially increase their productivity. During the 2006 WA farm tour, KI farmers met with producers who were using the technology and realised its applicability for the Island.

Whilst the technology has been widely trialled by Western Australian farmers, work was needed to 'ground truth' the satellite data for KI.

What was done

Six transect sites were set up on grazing properties across the island. Five were on annual pastures, T Weatherspoon, R and J Bell, J and A Bates and two sites on J and J Symons. One transect was on perennial pasture on T and A Heinrich's property.

At each site up to 7 pasture cages were placed across the paddock. Each month the pasture growth was estimated using visual observations and actual pasture cuts. This data was then compared to what the satellite was 'telling' us the pasture growth rates were.

Similar work is also being undertaken in the SE of SA and western Victoria with support from AWI. This will result in more robust PGR data from the 'Pastures from Space' technology for eastern Australia.

Results

Figure 1: PGR predictions for individual farms from Satellite images

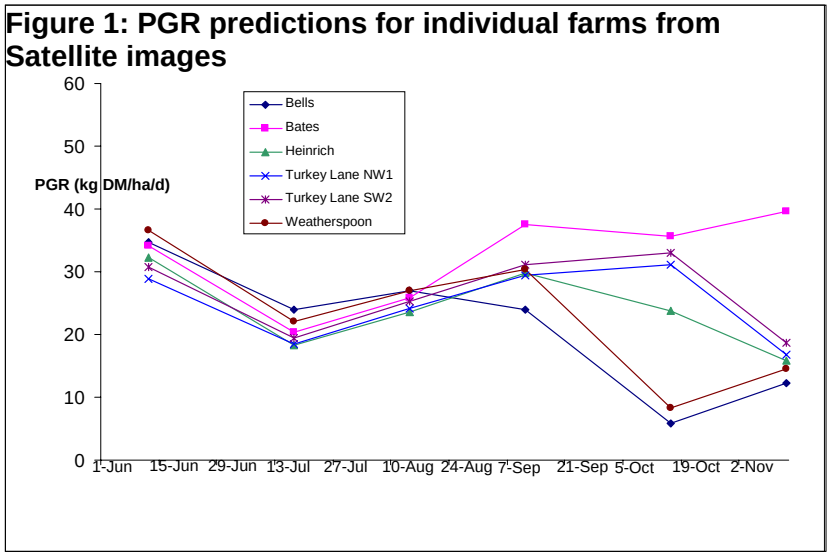

Figure 1 presents the means of the PGR estimates from the satellite. Very little variation is seen across all properties for June, July and August. Between August and mid September, Bates increased in PGR while Bells decreases. Over the next 5 weeks Heinrich and Weatherspoon also showed a PGR decline as soil moisture became more limiting. The range in satellite-predicted PGR and the pattern of change of the individual properties from September to November are a clear representation of the interaction of precipitation, temperature and water holding capacity of the soils.

The soil type at the Bell site is predominately cracking clays, whilst Bates, Weatherspoon, Heinrich and Symons consists of ironstone and shallow to moderately deep acidic soils

on rock. Across all farms the average water holding capacity is classified as being moderately low (40 – 70 mm) to moderate (70-100 mm) (Soil and Land Program, SA Gov). With these soil characteristics, it is possible that monitored pastures would be susceptible to limited moisture when precipitation decreased in August and September at the same time that temperature was on the increase.

Figure 2: Comparison of PGR estimates from Cages and Satellite (Mean + s.d.) across all properties

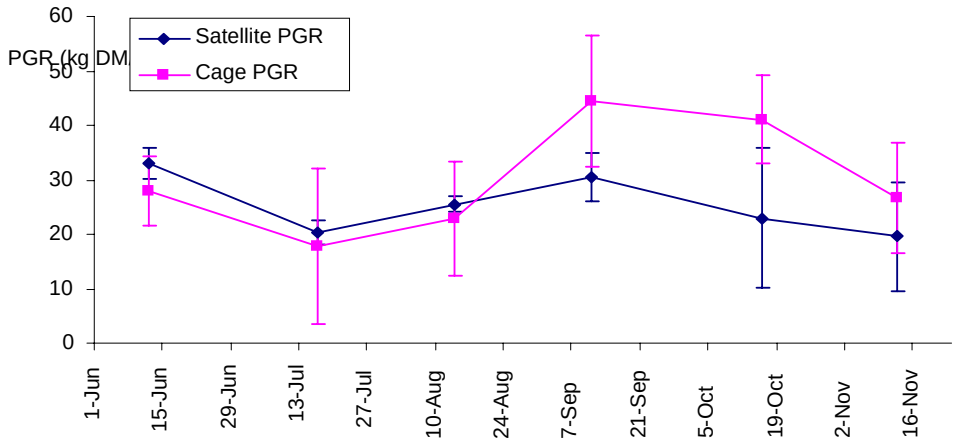

Figure 2 presents the means and standard deviations of the averages across all properties for cage and satellite predicted PGR. As well as variability between farms (indicated by the large standard deviation bars), the pasture cage data showed large variability in PGR within paddocks with differences of more than 30 kg DM/ha/d observed indicating the impact of differences in soil type or topography on cage predictions.

Figure 3:

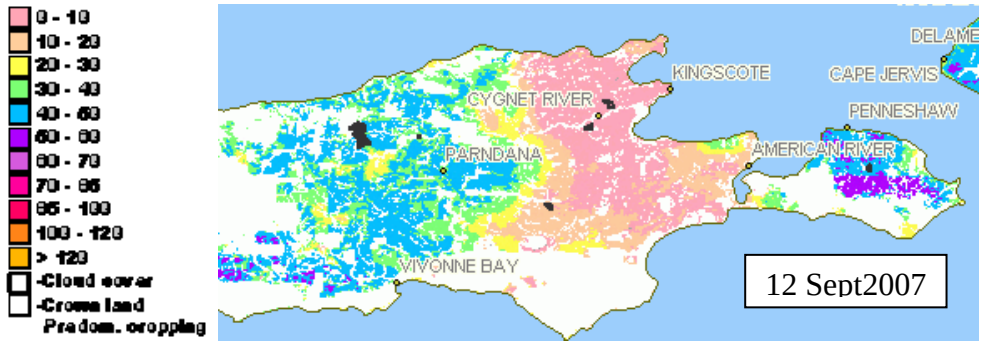

Figure 3 shows a PGR map for KI from the Pastures from Space website (www.pasturesfromspace.csiro.au) for the 12 September 2007 showing the pattern of reduced pasture growth. The outline and distribution of paddocks in the trial are shown in black.

The PGR data collected during the season was then used to calculate the potential Total Dry Matter (TDM) production, ie the accumulated biomass if pasture had not been

removed through grazing. This can then form the basis for the analysis of pasture production and utilization efficiency at the farm or paddock level.

Potential stocking rate was calculated by two methods: Grimm (1998) based on DM utilization (TDM-1500/500) and French (1987) based on conversion of annual rainfall into sheep/ha and thus must assume a DM allowance per head. There was good agreement between the two methods for Bates, Weatherspoon and Bells. For Symons and Heinrich the SR calculated by the French method was almost double that of the Grimm estimate and double the estimates of the other properties using the French method. Using the Grimm equation the mean stocking rate was 7 DSE/ha with a range of 4.8 to 10.4 DSE/ha across all properties. Based on these stocking rates, the percentage of Pasture Utilization was estimated at 51% with a range from 45 to 57% and suggests that there is room for increases in productivity through efficiency of use.

Water Use Efficiency (kg DM/mm rainfall) was calculated and for the Symons and Heinrich properties was lower (10.2 vs 12.8) than for the other properties, even though they produced some of the higher total dry matters (TDM). Comparisons of the Bureau of Meteorology estimates of precipitation with farmer rainfall records may shed some light on these discrepancies and may also explain differences in SR discussed above.

This PGR analysis was conducted entirely with data derived from Pasture Watch where the model as it is currently used does not include factors such as soil characteristics to fine tune predictions. A sensitivity analysis of the factors contributing to the PGR model with parameters specific for KI would be a logical next step. However, as the most variable dataset appears to be the cage estimates of PGR, the effort to fine tune the model would need to be accompanied by improvements in field data to justify the effort.

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- National Landcare program through Agriculture Kangaroo Island
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- A & T Heinrich
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- Agvet Services Pty Ltd

Take home message

- There was good correlation between the visual cuts and satellite data early in the season, but during the spring results diverged
- Further work is required to fine-tune the satellite data for KI, including soil characteristics and more accurate rainfall data
- Pastures from Space is a useful tool for landholders to further fine-tune their grazing operations