My experience with satellite predicted estimates of feed on offer and pasture growth rates

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Introduction

Wool producers and scientists have long recognised the need for reliable and accurate pasture measurements; and a number of producer training and educational groups have been formed, such as PROGRAZE and Woolpro. These groups aim to train producers to become better at evaluating their pastures so they can make informed grazing decisions to better utilise the available pasture. Visually evaluating pastures and cutting the necessary calibration samples is a time-consuming job, and results from my experience in our local Woolpro group clearly showed that producers' ability to accurately predict feed on offer is variable: even very experienced technicians can occasionally get it very wrong.

Developing a sustainable and efficient grazing system requires a clear understanding of pasture availability, how animals respond to changes in pasture availability, and therefore what pasture conditions are required to achieve target levels of feed intake and animal performance. Effective feed budgeting requires accurate and timely estimates of feed on offer and pasture growth rates. As discussed previously, I have convinced myself that current visual methods for feed budgeting are not sufficiently accurate in my hands to be cost-effective

In February 2001, I was approached to join a group who were investigating the feasibility of using satellite images to predict green pasture biomass, or feed on offer, and pasture growth rates. The predicted estimates of feed on offer and pasture growth rates were reported retrospectively, 3 weeks after the satellite overpass. In 2002, the estimates of feed on offer and pasture growth rates were reported within 5 days of the satellite overpass, and detailed 8-day weather forecasts were used to provide forecasted estimates of pasture growth rates 7 days ahead. This information was posted on a secure website or e-mailed. This paper will report on some of the ways I attempted to use this information to improve the productivity on my farm.

Flock structure and grazing management

I have been farming for most of my life at Kojonup, which is situated in the southwest of Western Australia. The farm consists of about 850 arable hectares, and the average annual rainfall is around 550 mm. My flock structure in the past has been 50% dry sheep and 50% mated ewes; but in the last couple of years, I have increased the ewes up to 65% of the flock. Until the early 1990s, cropping was a very small part of the farm's income; but as wool became less profitable, cropping area was increased from 10% to 35%.

Also during this time, I changed my grazing management. I first started strip grazing my wethers at the modest stocking rate of 20 DSE/ha during winter and have gone as high as 35 DSE/ha during winter in 2001. In 2001, I started strip grazing my weaners. This gave me the option to run my ewes at a lower stocking rate to benefit the lambs. Now, with the results from the Life Time Wool Program, which has been running for 2 years in both Victoria and Western Australia, I am reassessing the grazing management of my ewes and am involved in the on-farm application of the research.

Feed budgeting

The key to higher productivity in the future hinges on increasing pasture utilisation, which, in the past, has been less than 40% at average district stocking rates. To achieve this, producers need to be able to feed budget. Accurate feed budgeting requires knowledge of how much pasture is on offer (feed on offer) and how fast the pasture is growing (pasture growth rate) to know how long the flock can graze at that stocking rate. In the future, with these measurements provided via the satellite, it will be a time-efficient method of determining the grazing days available on your property.

This year, we will be using a computer program called Paddock Action Manager (PAM) to run a feed budget for the whole farm. It is planned that the computer program will automatically download the new information from the website when I turn it on in the morning and will then plot the estimated accumulation of feed on offer in each paddock. I will be able to set critical decision limits, such as the minimum level of feed on offer for cessation of handfeeding after the break or the minimum or maximum levels of feed on offer in particular paddocks. When I check PAM later in the day, it will provide clear reminders if any of my preset limits have been exceeded. In the future, PAM or similar farm management packages may also do feed budgeting calculations similar to current decision aids, such as PRO Plus, thus making the process very time effective.

Last year, the paddock that was being used to calibrate the satellite ran extra sheep. Previously, I would split some off the mob before lambing; but I had the confidence to leave them all in the paddock after doing a feed budget. The 30-ha paddock ran 15 DSE/ha in 2002 when usually it would only run 11 to 12 DSE/ha. Last year, the pasture growth rate in June was 20+ kg/ha/day when we would normally expect less than 10 kg/ha/day.

Historical information

Information from past years, which can also be provided from the satellites (see, for example, Figure 1), can be used to create trigger points for decisions that need to be made about stocking rate for a particular year rather than just stocking to the worst pasture years as has been the practice for a lot of producers. We now have the ability to find out how our pastures have performed given a range of dates for the break of season and variable amounts and distribution of rainfall over the growing season. During 2000, which was a very poor year, I was able to maintain my stocking rate because all my dry sheep were being strip grazed and I had sufficient silage to get the ewes through. However, looking back at the other years that we have information for shows that our overall stocking policy needs revising. What are the opportunities in an average year if we can achieve this in a below-average year? Knowing the range of possible pasture growth rate curves (see Figure 1) gives us the flexibility to make stocking rate decisions with greater confidence rather than relying on plain old guesswork. By referring to historical data, we can formulate trigger points to help us make decisions regarding our stocking rate. To achieve a higher pasture utilisation, we need to use all the tools available.

Yield mapping

Theoretically, the information about the spatial distribution of feed on offer provided by the satellite images may also give me the opportunity to identify high- and low-performing areas of pasture paddocks (Figure 2).

The low-performing areas can be soil and tissue tested to identify reasons for poor performance. It may be as simple as low plant density or waterlogging, and options can be explored to remedy the problem. In the future, more and more wool producer will have the option of treating the pastures like crops and improving productivity markedly.

Precision wool growing

Staple strength in sheep often depends more on the amount of wool grown on green feed than on the low point on dry feed. The minimum diameter varies less than the maximum diameter reached in spring. Figure 3 shows a graph of the fibre-diameter profile for a mob of young sheep I split at random and managed differently. One mob was set stocked at 13 sheep/ha and basically had ad lib grass from the break of the season. The other mob I strip grazed at 33 sheep/ha to restrict intake. Strip grazing decreased the average fibre diameter from 18.8 to 17.4 microns and increased staple strength by 4.6 N/ktex. Although the clean fleece weight of the strip-grazed sheep was reduced by 200 g/head, the overall value of the fleece was increased, as was the wool cut per hectare. The satellite technology should make this far easier to achieve over the whole farm by grazing to set feed-on-offer targets and increasing the staple strength and lowering the micron of as many mobs as required.

Conclusion

The use of the satellite technology in the future is dependent on the ability of the providers to deliver information in a cost- and time-effective manner. Even at this stage, the accuracy is acceptable, as it takes into account the whole paddock. To do this visually would not be time effective for producers on a whole-farm basis. We have found that even a 1-km transect was not representative of the whole paddock in some cases. Last year, the delivery of information was poor due to cloud cover affecting images. This is being addressed now with the use of different satellites that are passing over more frequently.

This information is just the tip of the iceberg as there are developments going on at the moment to look at the dry biomass plus other properties of the pasture.

Acknowledgments

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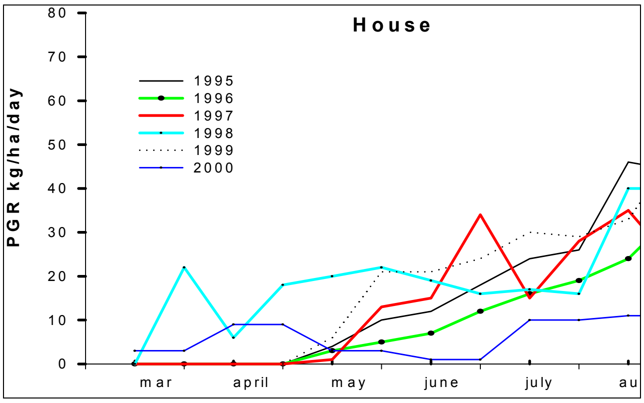
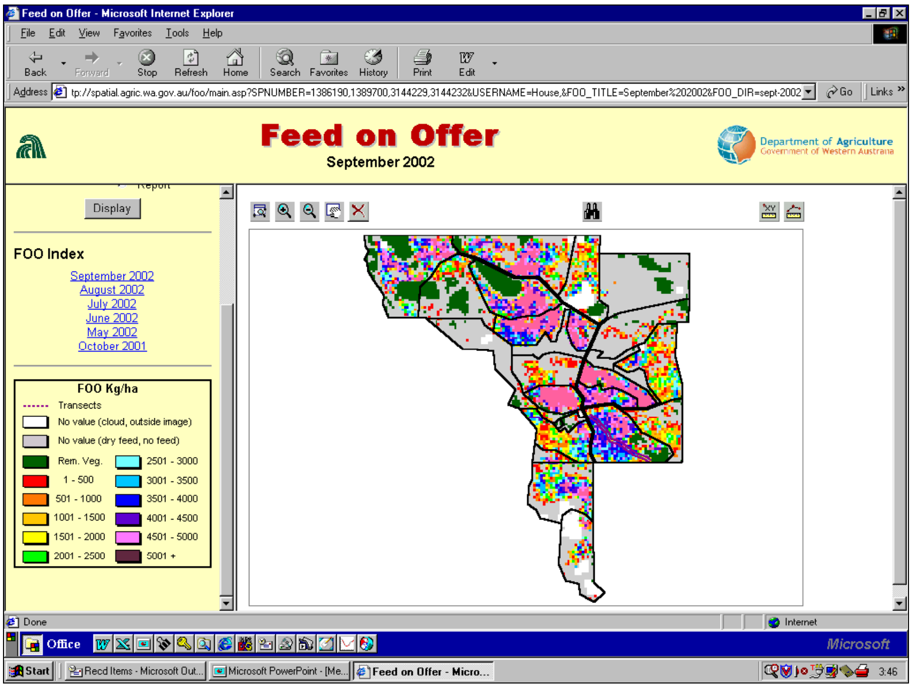


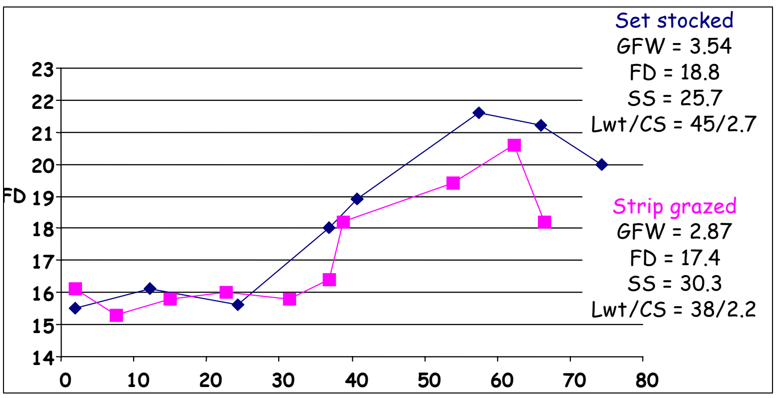
Source: G. Donald, CSIRO.

Figure 1. Historical pasture growth rates for my farm for the years 1995 to 2000.



Source: CSIRO.

Figure 2. The spatial distribution of feed on offer showing areas within paddocks at the peak of the growing season in September 2002.



GFW=greasy fleece weight; FD=fibre diameter in microns; SS=staple strength in newtons per kilotex; Lwt/CS= liveweight in kilograms/condition score on a scale of 1 (emaciated) to 5 (overfat).

Figure 3. Fibre-diameter profile showing average micron at monthly intervals for both strip-grazed and set-stocked ewe weaners, shorn as lambs in April and again in February the following year.