Using grassgro™; to support tactical decisions on grazing farms: a case study at "Yaloak", Ballan, Victoria

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Abstract

Unseasonably dry conditions at Ballan in spring 1996 meant strategies were needed regarding supplementary feeding of livestock over the summer-autumn period. Tactical use of the GrassGro™ decision support tool was used to assist by providing predictions of likely feed requirements.

Key words: GrassGro, decision support, drought planning, supplementary feeding.

Good farm management decisions require anticipation of future risks to ensure the most effective and productive use of farm resources. This paper presents a case study which shows how the GrassGro decision support (DS) tool (2) can be used in risk assess-ment for grazing enterprises. The study was carried out for a wether grazing enterprise on "Yaloak", a property near Ballan in Victoria and resulted from a request in late 1996 from the manager to the McKinnon Foundation at Melbourne University. GrazFeed (1) has been used at "Yaloak" since its commercial release in 1990 to assist in making tactical grazing and supplementary feeding decisions. Its use has helped to improve the allocation of pasture and stored fodder reserves, and contributes significantly to improved stocking rates at "Yaloak". Since GrazFeed only deals with events at a point in time, the next step to enhancing management at "Yaloak" is a model which can accurately estimate future production of both pastures and animals based on probable climatic data. This would provide enormous assistance in manag-ing seasonal variation through formulating strategic responses to likely seasonal pasture and livestock con-ditions.

Description of Yaloak

"Yaloak Estate" is a property of approximately 5000 ha and is located 10 km south of Ballan in Victoria.? Average rainfall varies across the property from 660 mm in the west to 560 mm in the east. Topography ranges from undulating basalt plains in the west moving down through steep gorges to alluvial valleys in the east.? All the basaltic areas have been improved over the last 20 years. Prior to 1993 the improved areas were managed to maintain an Olsen P of around 10.? Subsequent years have seen large applications of phosphorus starting in 1993 when an area of 250 ha received an application of 23 kg P/ha. Between 20 and 30 kg P/ha/yr has been applied to an increasing proportion of the property every year since, with 3000 ha receiving approximately 20 kg of P in 1996-97. High phosphorus use has brought its own problems with financial and management implicat-ions. In particular, the higher stocking rates achieved mean a need for a more pro-active approach to planning for drought.

The core enterprise on "Yaloak" is a self-replacing medium Merino flock which accounts for half of the total dry sheep equivalents (DSE's) carried and is maintained through all droughts. Another quarter of the DSE's is a first-cross lamb enterprise, with the remain-ing stock Angus cross cows joined to terminal sires.

Seasonal Conditions

The spring of 1996 began with very good rains in early September, but rainfalls in October, November and December were significantly below average (Fig. 1).? This dry end to the 1996 growing season meant that pasture availability was relatively low, and pastures were wilting by 15 November. This created an expectation of increased requirements for fodder before the autumn break.

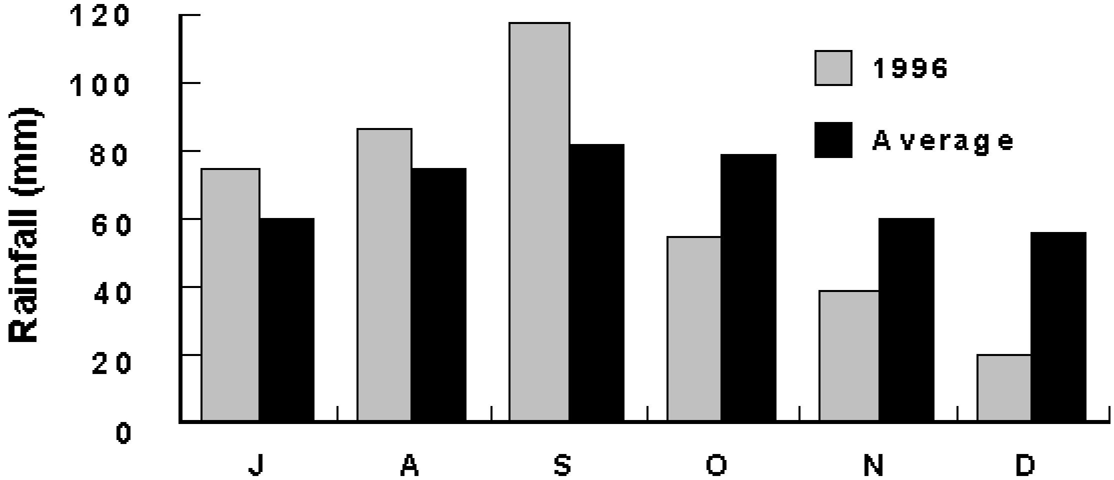
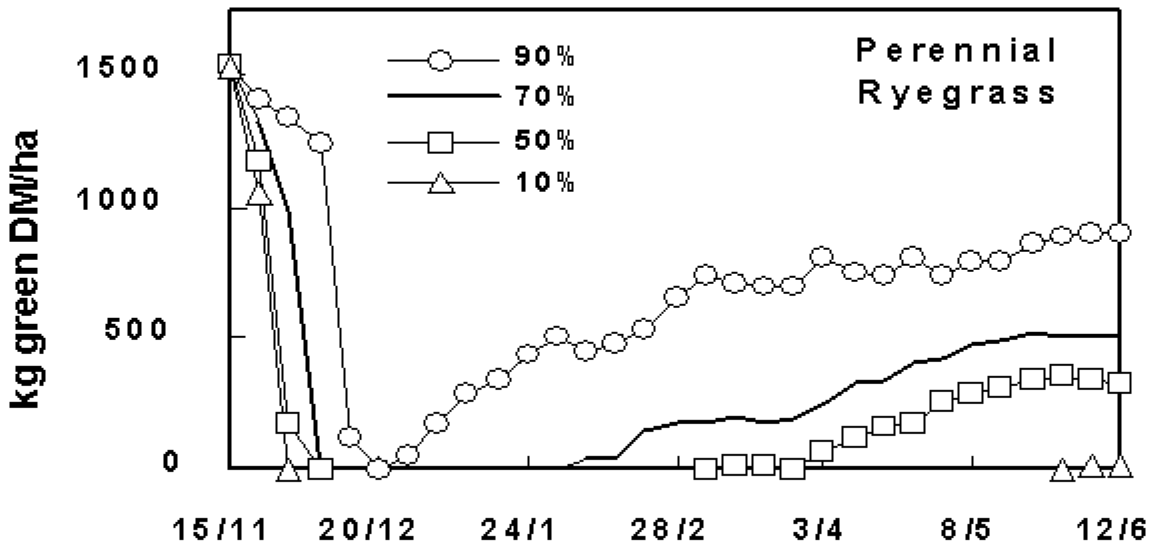


Figure 1



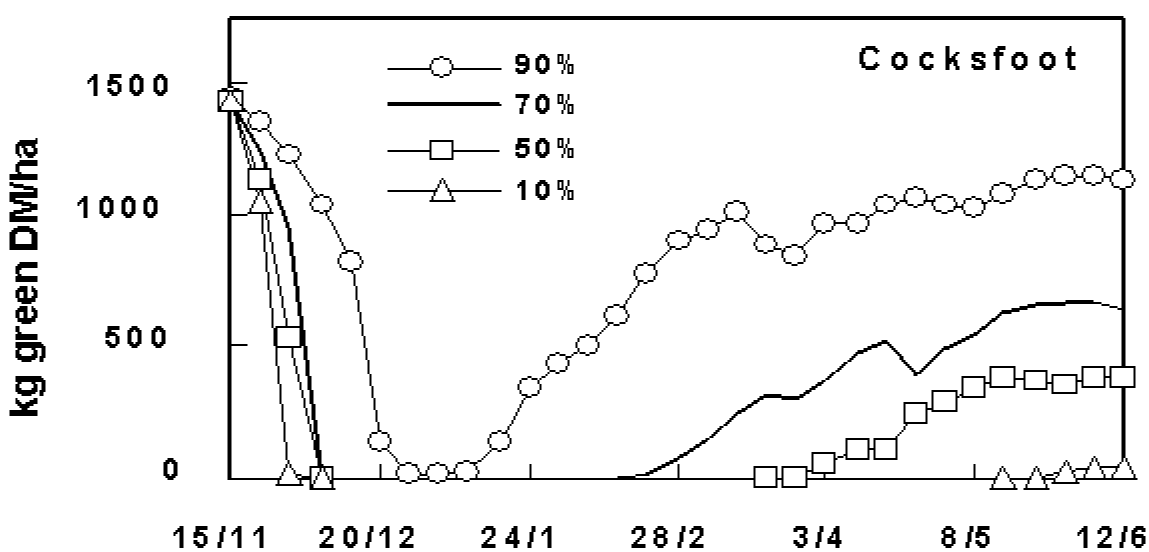


Figure 2

Information Needed to Enhance Management Decisions

Several questions were posed concerning the need for supplementary feed over the summer and autumn of 1996-97:

• First, it was important to assess the likelihood that supplements would be required at all, in order to decide whether special planning for a period of feeding was warranted.

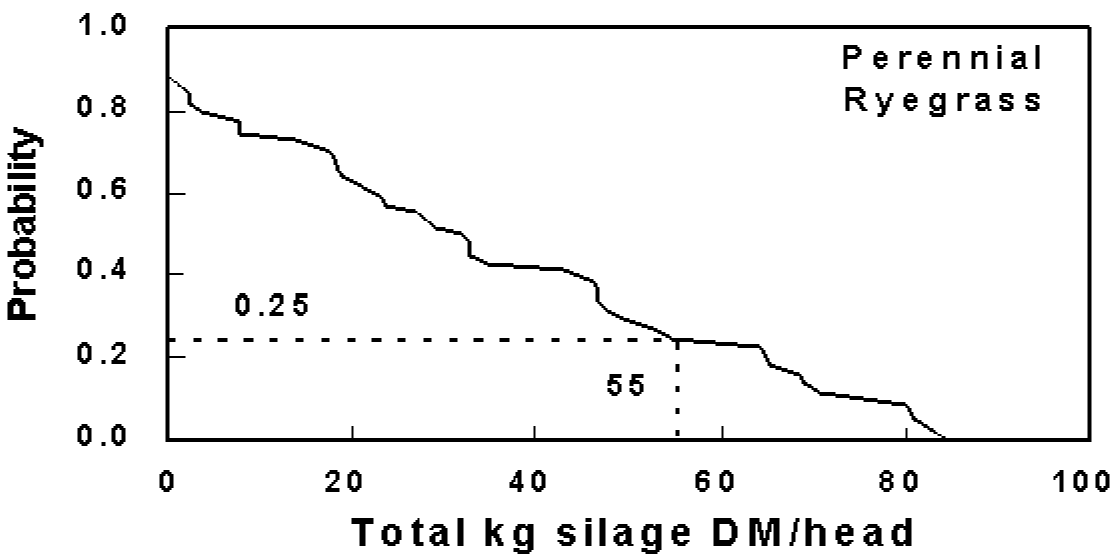
• If supplements were required, when would feeding be likely to start? This would define the urgency of the situation and would help planning for any extra fodder or labour required.

• If and when feed supplements were required, what quantities were likely to be needed? This would aid planning for feed purchases and allow for purchase of extra fodder at the most advantageous time rather than waiting for feed reserves to run low before purchasing due to necessity.

Method

The Analysis

The GrassGro DS tool was chosen to analyse the need for supplementary feeding and to provide a probability distribution for the amount and timing of supplementary feed requirements. The GrassGro software combines a model of pasture growth (2) and the model for grazing animal nutrition used in GrazFeed (1). The pasture model predicts growth at any location using daily weather data as inputs to the system. Effects of weather and available soil moisture drive daily increments in pasture growth, which in turn determine the amount and quality of herbage on offer. These are input to the graz- ing and animal nutrition sections of the model to predict the performance of the stock defined in the grazing system.



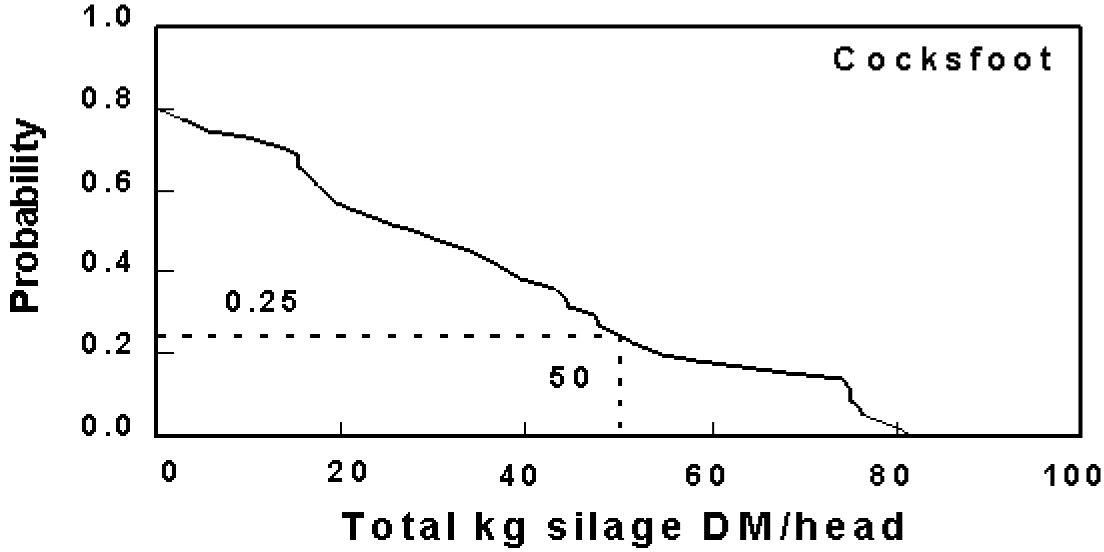


Figure 3

The type of simulation used was a "tactical run", which uses a common starting point from which several months of production are simulated using weather inputs from each of a range of years. The range of possible production outcomes is indicated by the predicted variation between years resulting from the effect of each year's climatic conditions. In this case study, a tactical simulation allowed the estimation of a probability distribution of supplementary feeding requirements given the known state of the pastures and animals on 15 November 1996.

There was a mixture of livestock classes present on Yaloak at the time, but it was decided to simplify the analysis by assessing feed requirements based on wethers and to extrapolate total requirements based on DSE's. While this approach is an approximation, it was considered reasonable for the period in question.

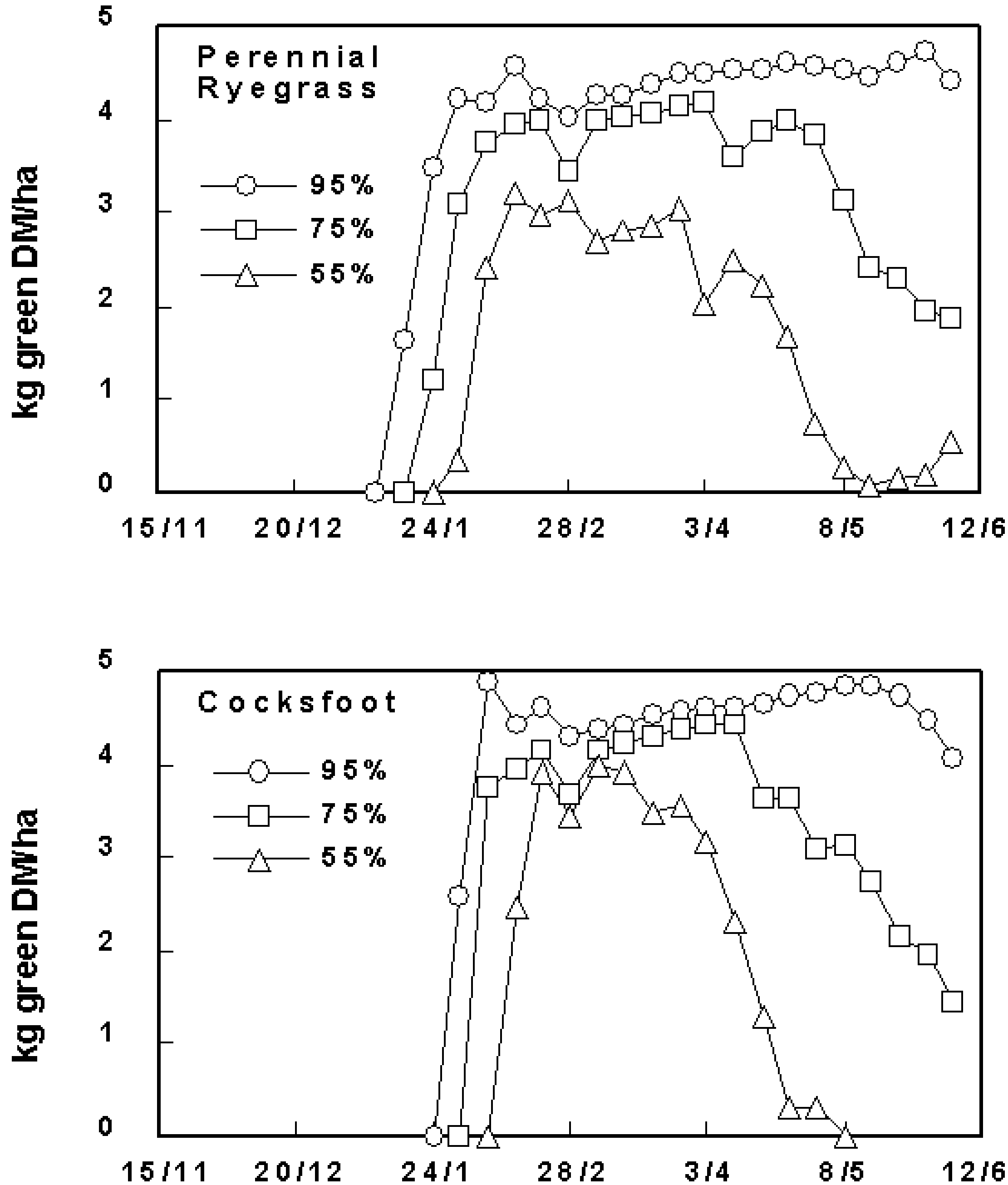


Figure 4

The Process

The best available information was used to initialise the GrassGro DS tool and a separate simulation was done for each of the two main soil types. The state of the grazing system on 15 November is shown in Table 1.? Complete weather data was needed from as near to "Yaloak" as possible, so a composite weather set was constructed from several nearby sites. Primary data were taken from Ballan (Fiskville) (Bureau of Meteorology locality 087005).

It was assumed for the analysis that animals would be fed silage when they reached minimum survival weight or total pasture DM dropped below 800 kg/ha. This threshold was chosen to help maintain ground cover through to autumn. Each soil/pasture type was then run as a tactical simulation from 15 November to 31 May, using weather data for 45 seasons from 1950 to 1994.

Results

Predicted outcomes

Data from the two simulations are displayed using the plotting facilities available within GrassGro. Of greatest interest were estimates of pasture availability and supplementary feed requirements. Fig. 2 illustrates the potential distributions of available green pasture over the period and includes the 10th, 50th, 70th and 90th percentile lines. The bold line in each graph represents the 70th percentile and shows that for both pasture types there was a seventy percent chance there would be no green pasture available for stock between the end of November and late January. Also, for both pasture types there was a 10% chance there would be no useful pasture growth before 15 June. This distribution of potential pasture availability is used to derive livestock perform-ance and, in turn, the requirement for supplementary feed.

Although Fig. 2 does not show the availability of standing dead pasture, GrassGro has accounted for animal intake of this component. The issues of greatest interest in terms of drought preparedness are whether feed supplements will be required, and if so how much feed will be needed.

Fig. 3 shows cumulative distribution functions for the probability of total summer and autumn supplementary feed requirements exceeding the value shown on the X axis. On both pasture types there was about an 80% chance that some supplement would be required, but the total requirement would not exceed 80 kg DM/head. In order to cover 75% of possible outcomes (*ie.* a 0.25 probability level), the silage dry matter on hand per wether would need to exceed 49 kg.

The necessary stored supplement is related to the individual grazier's attitude to risk. Choosing the 75% level may mean, in a worst case situation, that the equivalent of another 31 kg of silage per head would need to be acquired at drought prices. Alternatively, a grazier could opt to conserve or purchase this extra fodder early, possibly at lower prices, even though it is unlikely to be needed. Striking the best balance point is a decision for the individual grazier to make. Carrying less conserved fodder into the summer would mean that cash reserves should be accessible to allow for extra purchases should the need arise. The maximum cash reserve required would be the value of the difference between fodder already stored and the potential maximum requirement.

Fig. 4 shows when supplementary feeding may be required. Feeding was unlikely to commence before the middle of January but was almost certain to start by early to mid-February. In addition, there was a 25% chance that high levels of feeding would be needed through till at least the middle of May (see the 75th percentile line).

Actual Outcome

Feed budgets for "Yaloak" carried out in November 1996 indicated that in the absence of useful rainfall, pasture availability would reach critical levels and feed-ing would start by late January. This proved to be the case. Useful rain did not fall until mid-May with a fall of 26 mm and feeding was not completely curtailed until mid-June. Silage reserves in November consisted of around 1500? t of dry matter and from February onwards approximately 34,000 DSE's were carried. Fig. 4 and 5 show that this level of conserved fodder should have been enough for 70% of possible seasonal outcomes. The seasonal conditions at "Yaloak" also prompted the conservation of a further 1000 t of silage from the cutting of a failing winter-wheat crop bringing the total to 2500 t. By mid-June all but 100 tonnes had been used, equating to approximately 70 kg of silage DM fed per DSE.

Conclusion

The actual outcome of the season on "Yaloak" was within the probability boundaries suggested by GrassGro. The GrassGro DS tool proved capable of indicating the likely date of commencement of feeding, showing there was a 45% chance that feeding would commence by the first week in February. GrassGro predicted there was a significant chance that feeding would continue through to the end of the autumn and also that, averaged over the two pasture types, there was a greater than 10% probability that feeding requirements would exceed 70 kg of silage dry matter per DSE. The GrassGro simulations also indicate the actual outcome was close to the worst possible with regard to supplementary feed requirements over the summer and autumn period given the state of the pastures on 15 November 1996.

References

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