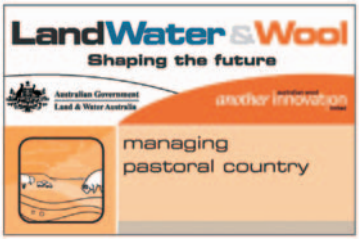
INFORMING DECISIONS OF PASTORAL WOOLGROWERS FOR COUNTRY AND PROFIT

An aid for critical decisions on stocking rates



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The decision aid was developed by Alexander Holm & Associates with contributions towards concept design by Ian Watson from Western Australian Department of Agriculture and Kathryn Egerton-Warburton. Robert and Kathryn Mitchell from Barnong Station and members of the Yalgoo Besprac group contributed test data and valuable comment during product development. Background information on impacts of drought was derived from Alexander Holm's published research. Climatic data was from *Rainman* v 4.3 produced by Department of Primary Industries Queensland

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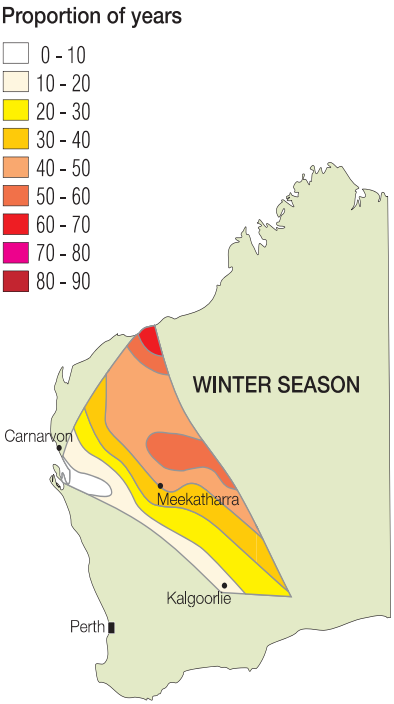
INTRODUCTION

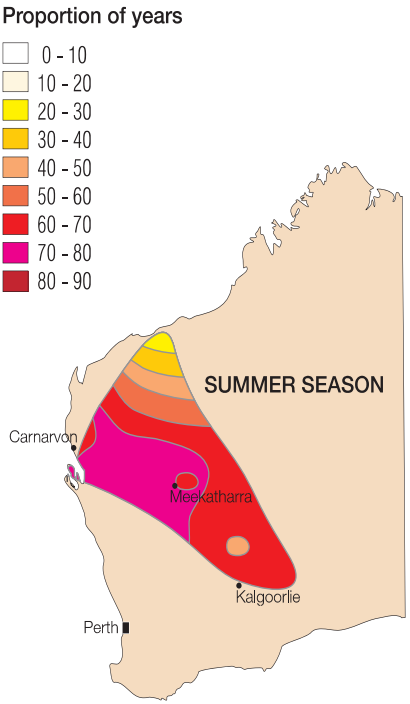
The economic performance of the pastoral sheep industry is in doubt and its environmental record is being challenged. Improved use of natural resources is essential to preserve future land use options and to ensure optimum sheep productivity and profitability.

The aim of this decision support manual and associated computer software (CDSR) is to assist livestock selling decisions that pastoral sheep owners make before drought bites hard. Delayed decisions often mean stock loose condition and become un-saleable. Delayed decisions force stock to overgraze and kill perennial plants. Eventually rain mostly runs off rather than supporting feed growth.

Timely decisions that adjust stock numbers to available feed are most important in demonstrating environmental viability.



Probablities of failed winter season



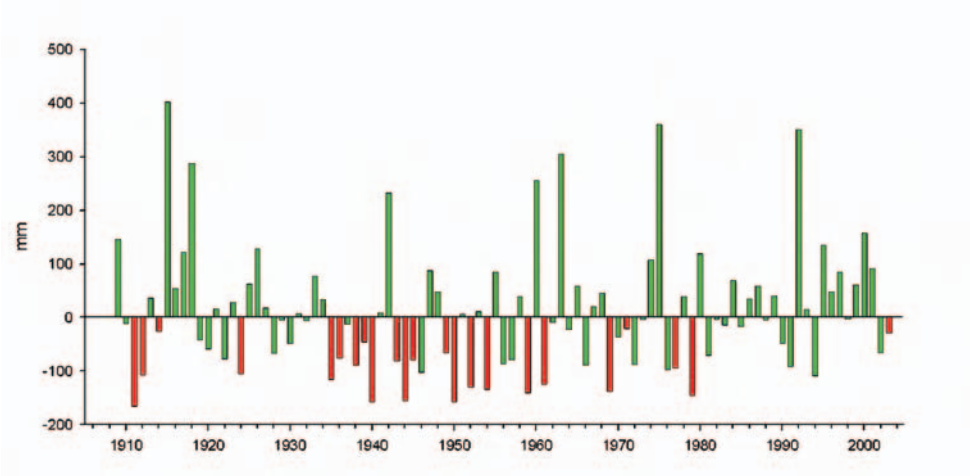
Probablities of failed summer season

Droughts - common and cruel

Droughts or dry times are part of the climatic environment in semi-arid grazing lands.

On a typical Gascoyne-Murchison pastoral property, about one year in four is a drought year where there is no growing season in summer or winter. Seasons are fair to good in about 15 of 20 winters and only 4 or 5 of 20 summers – poor odds for holding stock after a failed winter season!

Droughts are harsh and unsparing – particularly when stock are held too long before sale or die on the property.



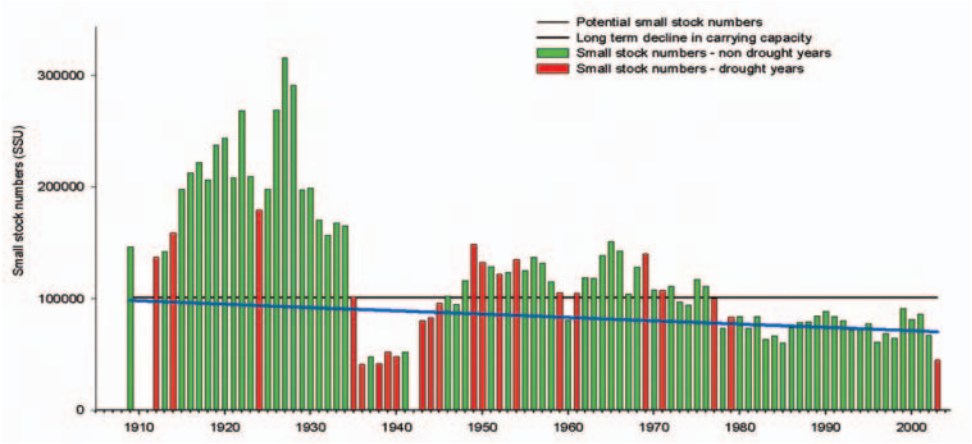
Annual rainfall deviations from average for Mount Magnet area showing defined drought years

Drought 1937-1942

"The new owners (of Bidgemia) were to experience a seven-year run of good seasons. In the June 1934 shearing 92,000 sheep went over the boards, yielding a wool clip of 2,000 bales of wool as well 20,000 lambs were marked. The following year only 262 points of rain fell and sheep began to die. By 1937 only 8,000 sheep were left." (McDonald, 1991 p 13).

Drought 1976-1980

"..Geoff Buckland reported the cattle dying, 'twenty so far', and by the beginning of March he noted .. that 'sheep from Mortimer's very weak'. There was no market for their sale and the price would not have covered freight." "Shearing began on 16th January (1978)... only 7985 sheep were shorn, a drop of 5000 from the previous year, all of which had perished in the drought." (Mitchell, 2000 p 173)



Historical stock numbers for all pastoral leases in the Shire of Mount Magnet

The long term decline in carrying capacity of pastoral country within the Shire of Mt Magnet is proof that the land has never recovered from drought of the 1930s. The area fails to respond to rainfall – less water infiltrates into the soil, more runs off and consequently less is converted into plant biomass.

Overstocking in droughts also results in loss of perennial plants that are palatable to livestock and a subsequent change to less palatable or unpalatable perennial plants.

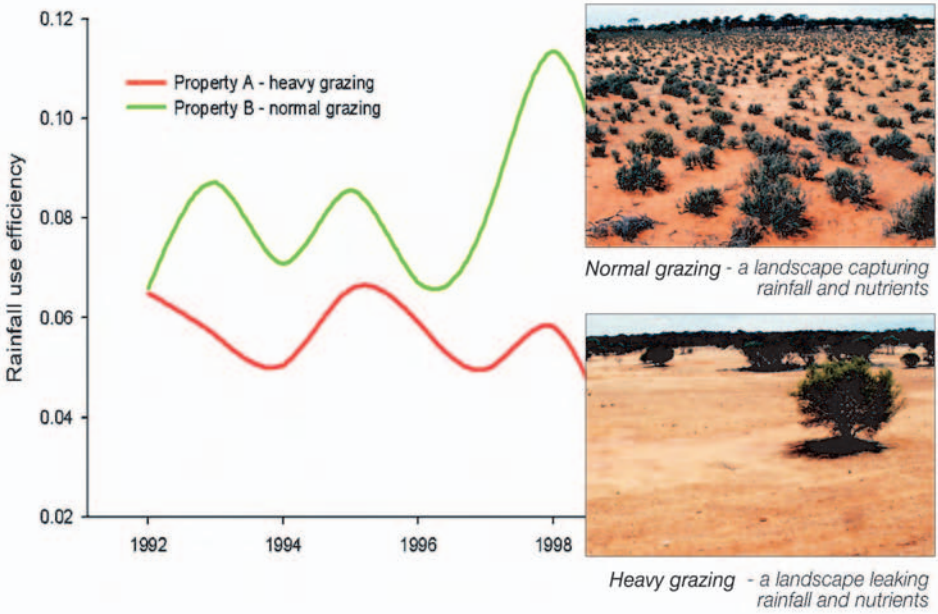
Drought 1936-1942

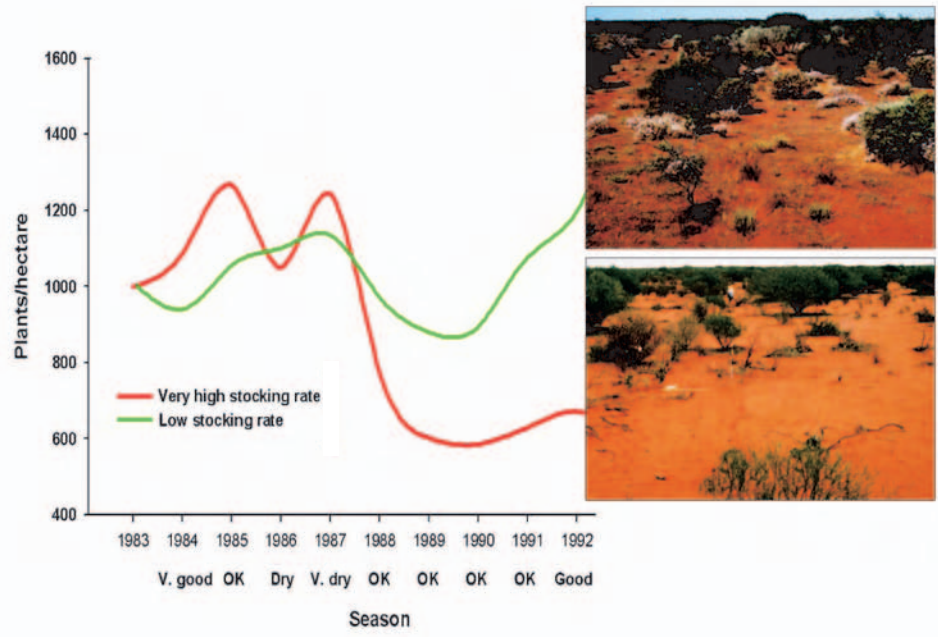
"By now (1926) Landor was carrying 50,000 sheep and 5,000 cattle. "It was Mr Bush's ambition that Landor should carry 80,000 sheep. During 1936 only 260 points of rain were recorded at Landor and sheep began to die. Each year the rain was more spasmodic and each year stock losses grew. ....in 1938, only 13,225 sheep were left

The drought dragged on and in 1942 all that remained of the Landor flock was 6,220 sheep. Landor was never again to see such buoyant times, and never again did it carry such numbers." (McDonald, 1991, p 23-24).

Prompt decisions when faced with impending drought are more often than not rewarded by:

- Better prices for sale animals.
- Fewer deaths.
- Less pressure on stock waters.
- Freeing up operating funds.
- Opportunity to improve the structure of the flock by removing poor performers and older animals





Survival of cotton bush after a drought in 1987

CRITICAL DECISIONS ON STOCKING RATES (CDSR)

CDSR is designed for wool growers in southern Australian pastoral lands. It helps assess the 'susceptibility of the property to drought' which dictates the required urgency and extent of necessary decisions when drought looms. An index (graph) of available green feed, (via satellite and internet) is updated every two weeks. Current and earlier stocking rates on the property are factored into the green feed (greenness) index.

A comparison of the greenness index with the average greenness index reveals current seasonal conditions over the entire property. In the event of a 'seasonal alert', alternative stock reduction or management strategies are proposed aligned with the property's susceptibility to drought.

THE CDSR MODULES

A data entry module for details such as property size, stock numbers and rainfall. (Note CDSR requires MS Office 2000 or later to be installed prior to use).

A risk profile module for self-assessment of Susceptibility of the Property to Drought (SPD) based on:

a) Inherent factors which include ratings for availability of perennial feed, salinity of feed and water.
b) Variable factors which include age of stock, stock distribution and abundance of feral animals.

These risk factors are summarized and enable pastoralists to identify themselves on a risk grid where high risk indicates need for prompt, significant de-stocking in face of a poor or failed season and low risk indicates less urgent and/or less significant de-stocking.

A seasonal analysis module which tracks stock numbers on the property over preceding two years in relation to the evolving season in two-weekly or monthly time steps. Two outputs are provided:

a) A worm graph measuring amount of green feed on offer (from satellite data).
b) A worm graph measuring amount of green feed on offer related to currentstocking pressure.

Young wethers at November shearing after a failed winter season, above left from a heavily stocked paddock and above right from a conservatively stocked paddock.

The seasonal analysis module also includes options to review trends over several years in a) the two green feed measures and b) monthly rainfall with a comparison of current stocking rate with long term average stocking rate.

Data from seasonal analyses provides a seasonal alert rating and is combined with the risk profile SPD rating in an **assessment module**. Indicative management responses are provided for each combination of SPD rating and seasonal alert status.

DATA ENTRY MODULE

Enter the following data to initialise CDSR at first start-up:

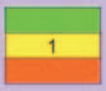
- Property name and district (e.g. Murchison).
- Property area (hectares) and sustainable long-term stocking rate as dry sheep equivalents (DSE - one DSE is one wether). Data is automatically back filled from year-of-entry allowing for a change in area and/or long term stocking rate.
- Historical numbers of each class of stock (sheep, goat, cattle) for each year for as many years as required. Data is automatically back-filled from month-of-entry in each year allowing for monthly or less frequent updates to stock numbers in each year.
- Historical monthly or daily rainfall for as many years as required.

Regularly update stock and rainfall data.

Fixed factors pre-disposing property to effects of drought

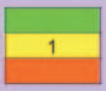
Presence of perennial stock feed (e.g. bluebush, saltbush, cotton bush, perennial grasses)

Perennial feed widespread and abundant.
Perennial feed widespread but not abundant or abundant in localized areas.
Limited perennial feed



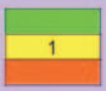
Salinity of perennial feed

Perennial feed mostly non-saline (grasses, acacias, cotton bush etc)
Perennial feed partly saline, partly non-saline
Perennial feed mostly saline (bluebush, saltbush, frankenia etc)



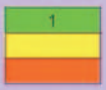
Stock water distribution

Majority of lease (>75%) within 4 km of operational stock water
50 -75 % of lease within 4 km of operational stock water
Less than 50% of lease within 4 km of operational stock water



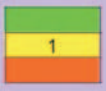
Stock water salinity

More than 75% of stock waters have low salinity (< 2500 ppm)
50 -75% of stock waters have low salinity
Less than 50% of stock waters have low salinity



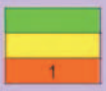
Stock water reliability

All stock waters will persist through drought
At least 75% of stock waters will persist through drought
Less than 75% of stock waters will persist through drought



Landscape drainage

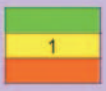
Rainfall mostly retained on the lease (flood out country, sandy surface soils, no active erosion)
Rainfall partly retained on and partly runs off the lease
Rainfall mostly runs off the lease (hilly country, run-off landscapes, widespread active erosion)



Variable factors pre-disposing property to effects of drought

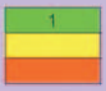
Age of stock

Stock mostly young
Uniform age distribution
Stock disproportionately aged



Stock distribution on lease

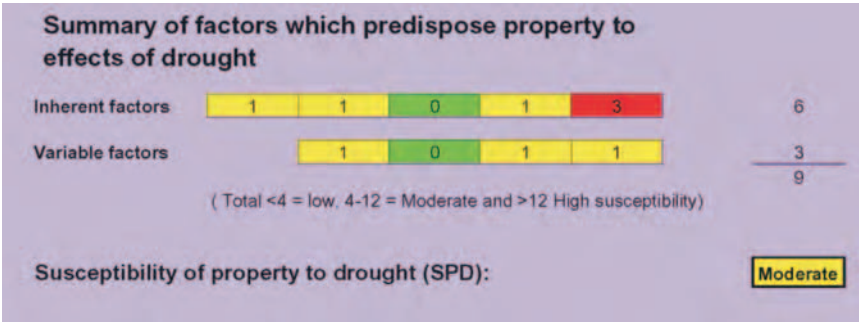
Stock uniformly distributed around lease
Stock concentrated in 50 to 75% of lease area
Stock concentrated in less than half the lease area



Abundance of competitive grazing and browsing animals (feral animals and kangaroo)

Few competitors (<20% of total stock equivalent numbers)
Competitors between 20 and 50 % of total stock equivalent numbers
Abundant competitors (over 50% of total stock equivalent numbers)

Rate each category and update variable factors as necessary. This data is automatically summarised and assesses the Susceptibility of Property to Drought (SPD). For example, properties on which stock waters are poorly distributed, salty or do not persist through drought are rated as moderate or high SPD.



SEASONAL ANALYSIS MODULE

Seasonal conditions across the property are assessed via the internet every two weeks and combined with other property data (data entry module) by CDSR to produce graphs on stocking rates in relation to seasonal conditions at the key decision date.

The key decision date – the Critical Date – in southern pastoral regions of Western Australia is the date after which there is little chance of sufficient rain to produce green feed, given that there has been no start to the winter season to this date.

District	Most common start to winter season	Average start of winter season	Critical decision date
Carnarvon	June 3	June 15	August 15
Shark Bay	June 7	June 16	August 15
Yalgoo	June 8	June 21	August 15
Wiluna	June 9	June 23	August 15
Meekatharra	June 10	June 28	August 15
Upper Gascoyne	June 15	June 30	August 15
Sandstone	June 30	July 2	August 15
Murchison	July 4	July 6	August 15
Mt Magnet	July 8	July 6	August 15
North East Goldfields	August 4	July 22	September 1
Kalgoorlie	August 4	July 21	September 1
Nullarbor Eyre Highway	August 9	August 1	September 1

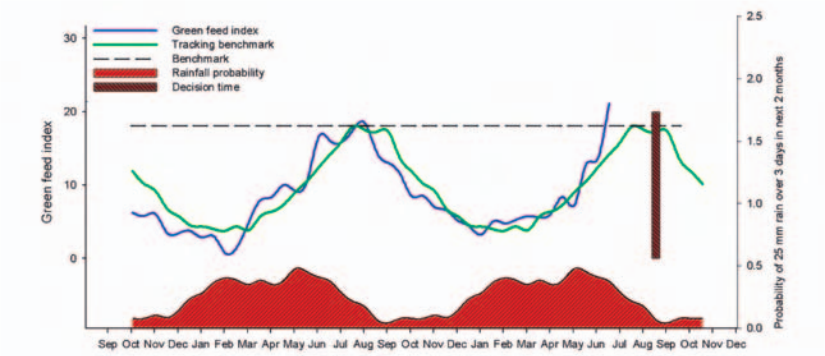
Seasonal alert graphs

Two 'worm graphs' are provided on a rolling two-year basis to assist assessment of seasonal conditions across the property at the critical decision date. The probability of receiving sufficient rainfall to initiate pasture growth (taken as 25 mm of rain over a three day period) is also shown in both graphs.

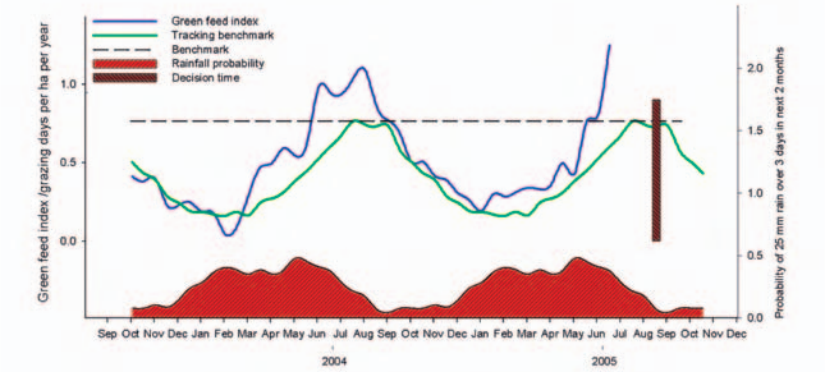
The first worm graph provides an index of green feed which is average greenness (satellite data) in near real time (fortnightly) compared to highest and lowest ever greenness previously recorded for the target area. The green feed index is compared with a tracking benchmark which is the average greenness since 1991 (when data was first obtained) and a static benchmark which is the maximum of the tracking benchmark.

The second worm graph uses the same greenness data and relates this to the current stocking rate (expressed as grazing days per hectare per year). The tracking benchmark and static benchmark are provided by dividing the greenness benchmark by the long term sustainable stocking rate (also expressed as grazing days per hectare per year).

Average seasonal conditions are expected if the current greenness index has exceeded the benchmark by the critical decision date. A seasonal alert is indicated if the current seasonal index in either graph fails to reach the benchmark by the critical decision date.



Current trends in available feed and probability of rain



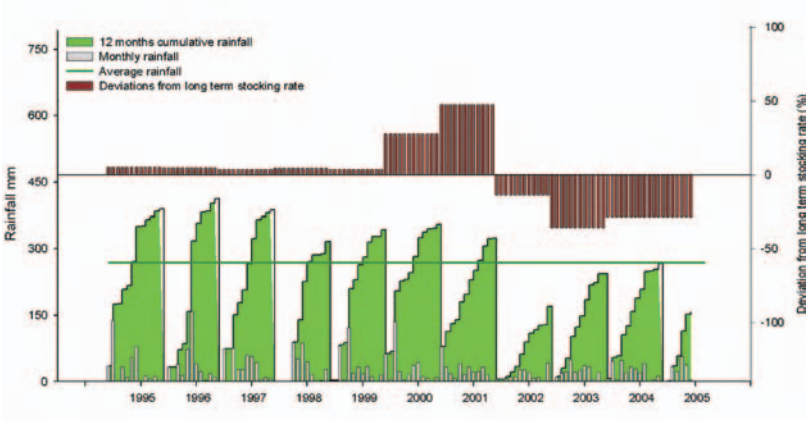
Current trends in available feed in relation to stock numbers and probability of rain

Seasonal review graphs

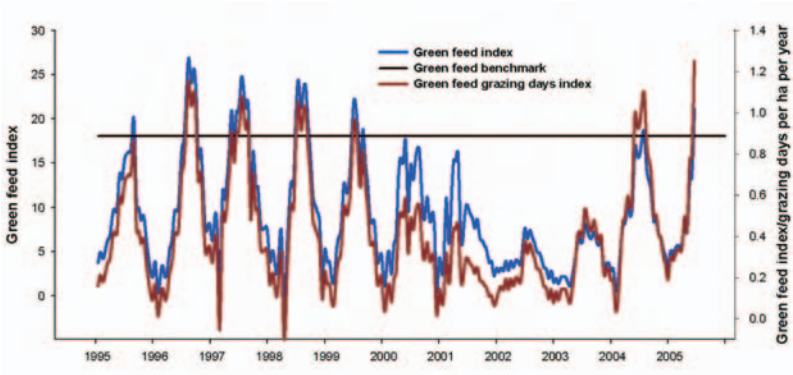
Interpretation of seasonal alert graphs is aided by using supplementary review graphs (seasonal conditions and stocking rates over a number of years) for comparison.

The first review graph shows trends in total stock numbers (DSEs) as deviations from the long term sustainable stocking rate in comparison to monthly rainfall and cumulative monthly rainfall for each year (cumulated from month specified by user – e.g. 12 months commencing each April).

The second review graph shows long-term trends in both greenness indexes.



Trends in rainfall and stocking rates over ten years



Trends in green feed index and green feed and stocking rates over ten years

ASSESSMENT MODULE

The seasonal risk analysis prompts a visual appraisal of the two seasonal alert graphs at the critical decision date. A seasonal alert is indicated if either worm graph just fails to reach the benchmark by the critical decision date. A seasonal high alert is indicated if either work graph has been well below the benchmark for at least six months prior to the critical decision date. In both cases alerts may be either up or down graded depending on seasonal history (e.g. downgraded from high alert to alert if there has been a run of above average seasons).

Information from the seasonal risk analysis is combined with the SPD rating (Susceptibility of Property to Drought) by CDSR to provide Indicative Management Responses. In terms of stock management and reduction in stock numbers these responses include risk assessment, whereby increasingly urgent and/or extensive responses are suggested as SPD ratings move from low to high.