'Drying Order': A management tool for climate change

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Abstract: *Climate change is predicted to produce an increasing frequency of dry periods in south-eastern Australia. The impact will vary in the landscape depending on soil properties and influences such as aspect, slope and exposure. These influences were qualitatively combined to map a general 'drying order' on property plans. 'Drying order' was then used as a tool to identify specific management strategies to optimise soil moisture availability and to build resilience to dry periods. Training was offered in this approach and as a result, 97 per cent of participants had begun or intended changes in land management and 91 per cent felt better prepared for the impact of climate change.*

Introduction

The total amount of moisture available to plants from a rainfall event is dependent on four main factors: the amount of infiltration into the soil, the capacity of the soil to store water available to plant roots, the depth of plant roots, and the degree to which soil moisture is reduced by evaporation. Each of the four factors is affected by a number of variables linked by the landscape or land-forming processes. Consideration of these processes identifies a general sequence of drying in the landscape or 'drying order' which can be readily mapped on a property plan, and adjustments made for local circumstances.

Paddock utilisation

Areas of different 'drying order' in the same paddock are commonly reflected by differences in pasture species and quality. Stock respond by heavily grazing better pastures (often mapped as late in the drying order), and under-utilising less palatable areas (often mapped as early in the drying order). Fencing, relocation of water points or placing of feed supplements can be used to better control pasture utilisation.

Rotation strategies

As a dry period develops the areas low in the 'drying order' are the first to halt growth and decline in feed value. Managers can use 'drying order' to plan paddock rotations which anticipate dry seasons. Feed value can be harvested before it declines and reserves are maintained in the areas late in the drying order.

Targeted management

Using simple equipment, landowners were able to collect data on soil compaction, infiltration rate, structure, texture, slaking and acidity. This data was combined with laboratory analysis to grade the soils into three classes; 'A' class being most fertile and 'C' class least fertile. Adding soil classes to the property plan allowed targeted management responses.

Areas with reasonable fertility and moisture retention are strong candidates for the investment of fertiliser inputs. Areas with poor fertility and limited moisture retention are vulnerable to degradation and require low cost strategies centred on hardy species and carefully controlled grazing pressure. Areas with reasonable fertility but limited moisture retention are priority areas for strategies aimed to improve moisture availability.

Moisture retention

A range of avenues were canvassed with the aim of improving soil infiltration, building readily available soil water, increasing root depth and reducing evaporation losses. The methods canvassed included windbreaks, soil aeration, species selection, contour slashing, building organic carbon and strategic grazing. The measures most likely to be of benefit were matched to each paddock according to its soil properties and location in the landscape.

Methods

Training in the above conceptual framework was delivered to small groups of landowners over a period of three days. Twelve groups received the training in different locations over a 500 km range of the North Coast and Northern Tablelands of New South Wales (NSW).

Results

At the completion of training, the landowners had an integrated whole-farm plan for dry spells as well as individual paddock plans prioritised to improve soil moisture availability and production. Participants were able to rapidly grasp and map a numeric drying order on their property. Adding a basic, three tiered system of soil classes produced a simple mapping code which identified the fertility and moisture limitations of each area. In stages, the land-owners were able to match the code to specific recommendations for management of each paddock. Exit surveys indicated that 96 per cent of participants intended to make one or more management changes as a result of the training. For example, 84 per cent intended to use hardier pasture species, 77 per cent planned windbreaks, 63 per cent intended changes in paddock rotations, 81 per cent planned grazing practices to maximise root depth and 60 per cent intended changes in paddock fencing.

Conclusions

The value of the extension program outlined in this paper is in its ability to identify where soil moisture is more likely to be limiting than other soil factors and to provide targeted strategies to address the main source of limitation in each case. At an enterprise level the likely benefits will be reduced degradation costs, less feed supplementation, delayed de-stocking beyond market lows and better long-term stocking capacity. The program is likely to have most benefit in grazing areas where there is variation in the landscape and with current annual rainfall between 600 mm to 1500 mm.

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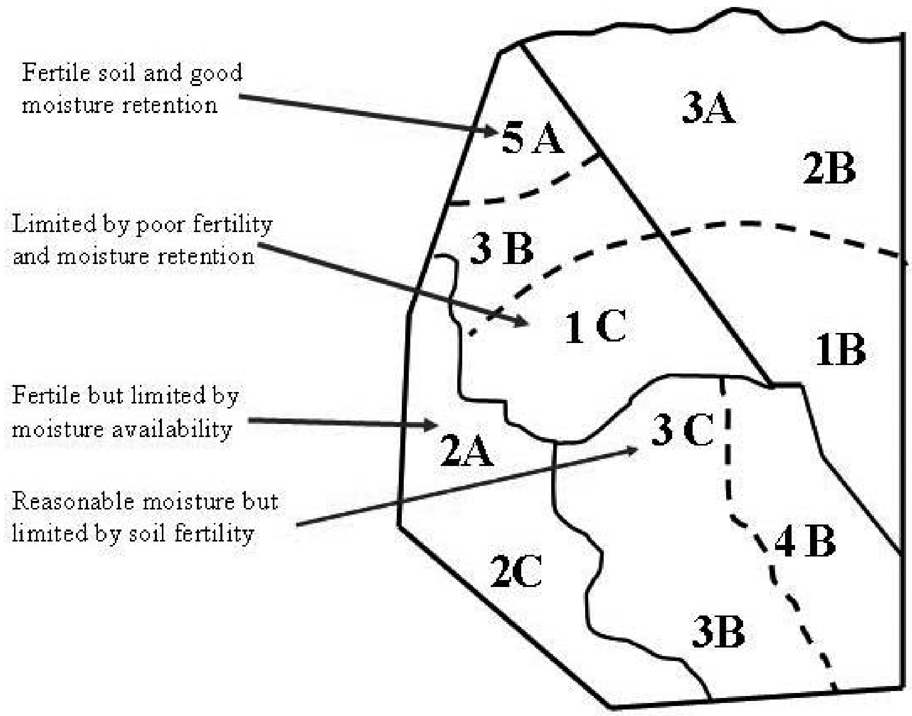

Figure 1: Example property plan showing current paddock boundaries (solid lines). Within each paddock drying order is numbered and associated with soil classes 'A', 'B' or 'C'. Dashed lines indicate proposed fencing to separate major differences in drying order.