MAKING USE OF NATURAL REGENERATION OF NATIVE AND IMPROVED PASTURES

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INTRODUCTION

Pastures are a major resource on most properties and require good management to maintain productivity. When pastures become degraded and productivity is low, either as a result of poor seasonal conditions or inappropriate management, then resowing is often carried out. However, rapid increases in the costs associated with the resowing of pastures (fertiliser, fuel, herbicide etc) and the often high risk of failure have rekindled an interest by graziers in using management to manipulate species composition and so improve the productivity of pastures that are in poor condition. Such management practices require a knowledge of the life cycle of individual species (seasonal growth patterns, time of flowering and time of germination) and the matching of the time of management to encourage the desirable pasture species and discourage the undesirable ones. Unfortunately, little information is available on the life cycle of most of the major pasture species and it is ironic that, today, more is probably known about the population dynamics of the native and naturalised species than of the exotic legumes and grasses.

RESOW OR REGENERATE?

The discovery early this century that topdressing with superphosphate enabled the establishment of exotic clovers and highly productive grasses led to a revolution in pasture management. Natural grasslands, up until that time the mainstay of pastoral production, were viewed as lower quality inferior pastures and the term "pasture improvement" came to be synonymous with the sowing of exotic grasses and legumes and topdressing (usually with superphosphate) to obtain maximum plant production. This replacement philosophy has dominated the thinking of graziers and pasture agronomists for nearly fifty years, resulting in limited knowledge of pasture ecosystems and little research or understanding of pasture population dynamics and the factors regulating the density, persistence and productivity of individual species. A corollary to this all-pervading philosophy is that many graziers, researchers and advisors now often only think in terms of pasture seeding as a means of manipulating pasture composition. However, individual plant species vary widely in their reaction to environmental and management factors and this, combined with a knowledge of the plant life cycles, can be used to markedly affect pasture composition.

PHILOSOPHY OF PASTURE MANAGEMENT

Ideally, pasture management should be concerned with producing and maintaining a particular species assemblage in a pasture. This principle applies to all pastures from native to highly improved. In practice more often than not, the proportion of sown or desirable species in a pasture decreases with time, and less palatable or weedy species invade. In such degraded pastures the equilibrium of the pasture ecosytem, which initially favoured the growth of sown species or desirable native plants, is disturbed and a new equilibrium is created which favours the undesirable species. Hence it is highly

unlikely that the better species will regenerate naturally. What is required is management to re-establish the conditions that favour the growth and persistence of the desirable species and so maintain pasture stability and productivity.

This paper outlines a range of management options such as grazing pressure, time of grazing, fertiliser application, and herbicide treatment which applied, either alone or in combination with one another can be used to regenerate species in certain pasture situations.

MANIPULATION OF SPECIES COMPOSITION BY GRAZING

The manipulation of both stocking rate and time of grazing has a major effect on pasture composition. To encourage species, grazing should be avoided when seedlings are establishing and when mature plants are flowering and producing seed. Alternatively, undesirable species can be discouraged by grazing to prevent seedling establishment and seed production, and to reduce the vigour of mature plants.

These principles have been applied to native pastures on the Northern Slopes of NSW (Lodge and Whalley 1985; Lodge *et al* 1987) to decrease the abundance of undesirable species such as wiregrass (*Aristida ramosa*) and increase more valuable species such as wallaby grass or white-top (*Danthonia* spp). In contrast to the usual practice of continuous grazing, this management system matches the season and intensity of grazing to the life cycle of these grasses. Heavy summer grazing prevents wiregrass plants from seeding and seedlings from establishing, and reduces the vigour of mature plants. Resting the pasture in winter and spring allows wallaby grass seedlings to establish and plants to grow and produce seed. A practical example of this type of grazing system being used in commercial practice, in conjunction with the application of superphosphate, was outlined by Fleming (1985).

For successful regeneration, annual legumes such as subterranean clover and medics depend on producing large amounts of seed to ensure adequate soil seed banks. A number of researchers (Rossiter 1961; Collins 1978) have shown that the frequent defoliation of subclover swards during the period from one month after sowing until the onset of flowering can increase seed production by 30-50%. This increase occurs firstly because defoliation reduces shading, encouraging more flowers, and secondly it promotes a higher proportion of burrs to be buried, which also increases seed yield. Swards which have been heavily grazed prior to flowering also have higher levels of hard-seedness which aids their persistence. For maximum seed production in both subterranean clover and annual medics pastures, stock should be removed after flowering commences.

FERTILISER APPLICATION AND GRAZING

Both stocking rate and rate of superphosphate application markedly affect the white clover content of sown and natural pastures (Robinson 1977). In natural pasture with no superphosphate applied, white clover content was always less than 5% (Robinson and Lazenby 1976); superphosphate application increased its frequency to over 80%. However, at a stocking rate of 8 wethers per hectare, severe competition from white clover eliminated many native grasses, causing a decline in pasture stability, whereas at 16 wethers per hectare pasture stability was maintained. Superphosphate applications dramatically increase the proportion of white clover in a pasture. To ensure economic returns and pasture stability, stocking rates must also be increased. Superphosphate applications are an expensive means of developing

or regenerating pasture. For example, an application rate of 125 kg per hectare per year at an annual stocking rate of three wethers per hectare will only pay for the cost of the fertiliser. The break-even stocking rate for wethers is around 6 per hectare, and so fertiliser is best applied to either maintain already productive pastures, or where pastures are used for fattening or breeding.

HERBICIDE APPLICATION AND GRAZING

One of the best examples of the successful use of herbicide application and grazing to reduce the abundance of undesirable, weedy species, is the technique of spray/ grazing. A sub-lethal application of either MCPA or 2,4-D amine applied to established pastures when broadleaf weeds are at the early vegetative stage results in wilting of the plant and an increase in sugars. Sheep grazing at extremely high stocking rates selectively graze the weeds, leaving the more desirable pasture species. Further details of this procedure are provided by the paper of Miller (1987) in these proceedings.

LIMITATIONS AND CONCLUSIONS

The ability of sown and desirable plants to successfully regenerate in a pasture will depend not only on the vigour of the surviving plants but also on the seed reserves in the soil. Through management, favourable conditions can be created to increase plant vigour and promote germination and establishment. However, where seed production capacity and soil reserves are low, successful regeneration of a species will be slow and probably economically unacceptable. For example, red clover (*Trifolium pratense*) invariably has low soil seed levels and fails to persist for long periods. Lucerne does not successfully regenerate in grazed stands because of its low seed production, seed dormancy and poor germination.

Until recently little attention has been given to enhancing the more productive pasture species by grazing or managment manipulations. The challenge for the next decade is for the grazing industries to remain viable in the face of a worsening cost/price ratio. Researchers, advisors and graziers should be increasingly concerned with the development and adoption of technology to either maintain or even improve pastoral production, while decreasing the cost of inputs or finding lower cost alternative inputs.

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