NATIVE PASTURE MANAGEMENT IN THE 400-600 MM RAINFALL ZONE OF NORTHERN NSW

A.M. Bowman¹, G. Brooke² and R. Van de Ven³

¹NSW Agriculture, Trangie, 2823, ²NSW Agriculture, Nyngan, 2825 and ³NSW Agriculture, Orange, NSW 2800

Abstract

This study documented the condition of native pastures in the 400-600 mm rainfall zone of north western NSW based on the content of desirable and undesirable perennial grasses and related pasture composition to grazing management strategies used by producers for those particular paddocks (*Paddock survey*). The pastures were found to contain a useful mix of desirable perennial grasses and mostly to be classed as in reasonable to good condition. A mail-out questionnaire to the same region (*Producer survey*) provided information on producer management of these pastures. More than 70% of respondents were rotating stock to rest paddocks although 20% felt that there stocking rates were at their top limit. There was no over-whelming evidence that producers themselves were concerned there had been a decline in the quality and persistence of native pastures on their own properties or in their district.

Key Words: Native pasture, survey, perennial native grasses, northern NSW, low rainfall, grazing management

Over recent years there has been much publicity suggesting that native pastures in the grazing lands of northern NSW have become degraded. However, there is little objective information from the region to support or refute this. This study was designed to document the condition of native pastures in the 400-600 mm rainfall zone of north western NSW, bounded by Narromine to the south, Cobar to the west, Walgett to the north and Gilgandra to the east, based on the content of perennial grasses classified as desirable or undesirable from a pastoral perspective. This provided objective data that described paddocks as they are now and the activities producers have carried out on those paddocks that may have contributed to their present condition (*Paddock survey*). The survey region lies on the boundary of the summer/winter dominant rainfall zone of northern NSW and the transitional zone between self-mulching grey clay and hardsetting red clay soils.

A mail-out questionnaire to the same region (*Producer survey*) was used to elicit producer opinions regarding decline in the quality and persistence of pastures on their own properties or in their district, to investigate the strategies they use now for pasture management and identify the factors they considered important in achieving a successful grazing enterprise.

Methodology

The *Paddock survey* was carried out in the summer of 1995/96 and covered 157 paddocks on 80 properties selected at random within the region. On each property the producer was asked to nominate a paddock they would describe as in good condition and one on the same soil type in poor condition. The producer then completed a small questionnaire on the management of each paddock over the last 3 years and was asked to rate the paddock condition on a 1 (poor) to 5 (good) scale. Producers were asked about their grazing system: whether they set stocked (stock are spread over most of the property), rotationally grazed (moved stock regularly from paddock to paddock so some paddocks had no stock at certain times) or strategically or opportunity grazed (had no fixed plan but moved stock around depending on paddock conditions and stock requirements) the paddock. They were also asked what type of stock they ran and at what stocking rate (light, medium or heavy) over the last 3 years. They were asked if they had crash grazed or spelled the paddock (for at least 3 months) in the last 3 years. Data were analysed to investigate the effect of any of these management variables on the frequency of occurrence of species found within the paddocks. Note that care was still required when interpreting these results as we have only investigated management/production factors over the last 3 years while pasture composition could reflect management and/or seasonal conditions over a much longer period.

Fifty 1 m^2 quadrats were located on a transect across each paddock. These quadrats were at 50 to 100m intervals depending on the size of the paddock. In each quadrat the species, number and butt size (4 butt diameter size groups - cm, 5-10 cm, 10-15 cm, 15 cm) of desirable and undesirable perennial grasses was recorded. The presence of other species in the quadrats was also recorded. The paddocks were then rated by the surveyors on the 1 to 5 scale.

The *Producer Survey* was based on that designed by Lees and Reeve (1) and used by the Meat Research Corporation (MRC) to document pasture management practices in the high rainfall zone of northern NSW. This was modified to suit our study area where the pasture base is primarily native or naturalised species and low input pastures dominate. A pilot study with the modified survey was carried out in the Coonamble and Trangie districts with students from the University of Western Sydney. The survey was then mailed across the study region in January, 1996. A follow-up mail out was conducted in March, 1996. In total 979 survey forms were sent out with a 42% return.

All the data collected was collated under 6 districts within the region (Trangie/Narromine, Collie/Armatree, Coonamble/Walgett, Bourke, Nyngan and Warren/ Carinda). This division of districts was based on the summer/winter dominant rainfall line as well as separat-ing districts for the different rainfall zones (*ie.* Bourke in the 400 mm zone, Coonamble/Walgett, Trangie/Narromine, Nyngan and Warren/Carinda in the 500 mm zone and Collie/Armatree in the 600 mm zone). Districts also were therefore separated on major soil types, with Coonamble/Walgett, Bourke, Collie/Armatree and Warren/Carinda being mainly heavy grey clays and Trangie/Narromine and Nyngan mainly hardsetting red soils.

Results

Pasture composition

The *Paddock Survey* data showed that the majority of? paddocks in the region were in reasonably good condition, containing a useful mixture of perennial grasses. The most commonly occurring desirable perennial grass in the region, despite the transition in soil type and rainfall, was curly windmill grass (*Enteropogon acicularis*) which was found in 62% of the paddocks. In paddocks where it was recorded it was found, on average, in more than half the quadrats. This species was more dominant in the south of the region, on red soil, where it was associated with *Paspalidium* (32% of paddocks) and *Digitaria* species (45%). It was, however, also found on grey soils in the north with Mitchell grass (*Astrebla, 22*% of paddocks), Queens-land bluegrass (*Dichanthium* sericeum, 13%) and *Panicum* species (38%). Annual grasses were also common, with the useful annual windmill grass (*Chloris truncata*) being widespread (50% of paddocks). Usually where the perennial curly windmill grass was found in a paddock, it was associated with annual windmill grass.

The desirable and palatable *Medicago* species were found in all paddocks. Other useful perennial species recorded included saltbushes (*Atriplex* and *Rhagodia* spp.), bluebushes (*Maireana* spp) and copper burrs (*Sclerolaena* spp). All of these were more common in the western districts of the region.

The most common undesirable perennial grass were the widespread *Stipa* species (50% of paddocks and 32% of the quadrats in those paddocks). Perennial love-grasses (*Eragrostis* species) were found in 39% of the paddocks and wiregrasses (*Aristida* species) in 15%.

The major weed problems identified were roly-poly (both hard, *Bassia quinquecuspis* and soft, *Salsola kali*) in 65% of paddocks and galvanised burr (*Sclerolaena birchii*) in 24%. Other broadleaf weeds included Solan-aceae species (mainly Quena, 60% of paddocks), tarvine (*Boerhavia diffusa*, 39%), cathead (*Caltrop* and *Emex* species, 33%), pigweed (*Portulaca oleracea*, 37%) and saffron thistle (*Carthamus lanatus*, 36%).

Producer assessment of the paddocks (condition scoring) correlated closely to the results of the survey condition scoring, although producers scored their better paddocks slightly more favourably than the survey. The majority of paddocks were scored 3 to 4, by producers and in the survey, on the 1 to 5 scale.

Grazing management in relation to pasture com- position

The analysis demonstrated that the frequency of occurrence of some perennial grass species was significantly correlated to the grazing method that had been used for the paddock. For example *Digitaria* species occurred more frequently (P<0.01) in paddocks that had been opportunistically or strategically grazed, while *Panicum* and *Paspalidium* species were found more frequently (P<0.01) in paddocks that were rotationally grazed. Of the other species, saffron thistle occurred more frequently in paddocks that had been set stocked (P<0.01).

The type of stock run in the paddocks also affected the frequency of occurrence of some species. *Danthonia* species occurred more frequently in paddocks that had only been grazed by cattle. *Aristida* species were also favoured by grazing with cattle and were significantly less common in paddocks where sheep and cattle were grazed together or in rotation. Barley grass (*Hordeum* species) and roly-poly both occurred less frequently (P.01) where sheep alone were used.

Light stocking rates favoured the undesirable pere-nnial grasses such as *Aristida* and red grass (*Bothrichloa macra*). However, this result may indicate that paddocks carry light stocking rates now because of dominance by these less palatable species rather than the light stocking rates themselves causing that particular composition. Paddocks with medium stocking rates had a high occurr-ence of both the perennial and annual windmill grasses. Paddocks with heavy stocking rates contained significantly more Mitchell grass, as well as barley grass and saffron thistle. Again, barley grass and saffron thistle may occur frequently in these paddocks now because they have been heavily stocked in the past and more palatable species removed. These results could also indicate that Mitchell grass is resilient to heavy stocking for short periods of time or that it recruits more easily under heavy stocking when competition is removed. Queensland blue grass, *Danthonia*, annual windmill grass and the palatable annual Flinders grass (*Iseilema membranaceum*) all occurred more frequently (P<0.01) in paddocks that had been crash grazed in the last 3 years. Crash grazing severely disadvantaged the undesirable *Stipa* species (P<0.05).

No species were found to occur more frequently in paddocks that had been spelled, however, *Eragrostis* species (both desirable and undesirable) occurred more frequently in paddocks that had not been spelled.

Grazing management in relation to butt size of perennial grasses

Again, after removing the significant district effect (P<0.01), grazing management (P<0.05) and spelling (P<0.05) were both found to affect the butt size of desirable perennial grasses. If set stocking was used as a base for comparison, paddocks grazed with the other 3 strategies (rotational, opportunity or strategic) all contained a greater frequency of small plants (<5 cm). Rotational and strategic grazing also produced more plants with large diameters than set stocking. It could be that these alternative grazing techniques allowed greater recruitment of new (smaller) plants than did set stocking, while both rotational and strategic grazing also allowed the persistence of older (large) plants.

Grazing management strategy (P<0.05) and stocking rates (P<0.05) also had a significant effect on the butt size of undesirable perennial grasses. In this case there were more small plants under set stocking than the other strategies. Heavy stocking rates depressed the number of large undesirable perennial grass plants, but produced significantly more small ones than light or medium stocking rates.

These results show that strategic grazing could be used to suppress plant species, possibly by preventing recruitment and/or removing older large plants. Heavy stocking rates could also be used to suppress the number of undesirable perennial grasses. The frequency of smaller, desirable, perennial grass plants in paddocks that had been spelled was lower and this may need to be considered in light of recruitment, although this spelling phase could obviously have allowed seed set even though recruitment had not yet occurred.

Producer Attitudes

The *Producer Survey* information showed that the larger western properties comprised mainly native/natural pastures, while up to half the possible area of the smaller eastern properties was sown to improved pasture, primarily lucerne. Sheep numbers in the region were significantly correlated to property size, while cattle numbers were not. The majority of producers in the region believed their stocking rates were tending toward their upper limit. Some 20% of producers con-sidered they were presently stocked at their top limit.

There was no clear evidence that producers consider-ed that pasture persistence or quality was declining in the region or on their own properties. However, stocking rate, weeds and grazing management were listed as the most important factors affecting pasture quality and persistence, if seasonal conditions were not considered.

The most common change to pasture management in the last 3 years had been to spell paddocks or reduce stocking rates. Respondents indicated that this was a response to the 1994 drought rather than a practised long-term management strategy. However, the most common change planned by producers for the next 3 years was to sow more improved pasture, even in the western districts of the region.

Most producers surveyed (87%) felt that using grazing management to maintain pasture quality and persistence was worthwhile and a large proportion (76%) were already rotating stock to rest paddocks. Little information could be gained on the length of the graze or spell periods, and in fact most producers said they strategically grazed. Only 12% were set stocking and these were primarily in the west of the region.

The main pasture management tool for the majority of respondents was to lock up their paddocks in spring or summer. This reflected the slightly summer dominant rainfall pattern in the north of the survey region as well as the desire to let desirable perennial grasses, which are mainly spring/summer growers, to set seed. Crash grazing was not widely used (only 39% of producers), primarily because the paddocks were too large to manage it effectively. However, it was more widely used in the eastern districts (Trangie/Narromine and Collie/ Armatree) where paddocks were smaller.

Stock water supplies was listed by most respondents as a very important factor in achieving a successful grazing enterprise, while caring for the land was listed second. Persistence of pastures in dry times and financial management were also ranked highly.

Conclusions

The results of the *Paddock Survey* showed that most paddocks in the region are in reasonable to good condition and contained a useful mix of desirable perennial grasses. Condition scoring of the paddocks by producers corresponded closely to the survey condition scoring, although producers scored their better paddocks slightly more favourably than the survey.

Some grazing management techniques that producers were using could be significantly correlated to the composition of their pastures. However understanding how particular species might respond to grazing strategies was limited and producers were keen to gain this knowledge. Apart from seasonal conditions, stock-ing rates, weeds and grazing management were listed by producers as the most important factors affecting native pasture quality and persistence.

Acknowledgements

The technical assistance of Warren Smith, Ian Toole, Dianne Foran and Jane Jenkins is gratefully acknowledged as is the co-operation of the landholders who returned questionnaires and allowed us to survey their paddocks. Funding assistance was provided by the Meat Research Corporation.

References

1. Lees, J. and Reeve, I. 1994 *TPSKP Producer Survey (M.414)*. Report to the MRC.