Managing native grass-based pastures for sustainability

John Fleming[A] and Guy Robinson[B]

[A] *"Marinka", Ben Lomond, NSW, 2365*
[B] *58 Lawrence Street, Glen Innes, NSW, 2370*

Abstract. The Fleming family has been involved in grazing production on several soil types on the Northern Tablelands since 1964. All these enterprises have been based on fertilised naturalised pastures with minimum capital input. The processes and methodology involved are presented with some indication of the results achieved. Although this may be a controversial view, we believe the future of successful sustainable grazing lies in minimal environmental disturbance with minimal inputs. One way is by working with existing vegetation to develop dynamic swards that are capable of coping successfully with management and climatic variations.

It is now 13 years since we each presented a paper to the 1st Grasslands Conference at Hawkesbury Ag College in July 1986 (Fleming 1986; Robinson 1986). There does not seem to be any evidence to suggest that the theories put forward then have not stood up over the years, and it is with pleasure that we now combine to beat the same drum again.

Lessons from our experience

We, the Fleming family, went to Walcha Road in 1964 to grow clean wool on superb improved pastures. I spent some time with the Nivisons of "Mirani", who pioneered aerial supering and who were only too eager to tell me all they knew. Armed with this information, we flew out seed and super not long before the 1965-66 drought. In our case, the grasses did not establish and, after the drought, a lot of previously established pastures in the district needed replanting. Although the grasses didn't establish, in time the clover did and production began to increase.

About this time a group of 40 local property owners hired a New Zealand farm adviser to help them-they became known as the 'Top 40'. Following their lead, 13 of us formed a group calling ourselves the 'Rock bottoms' and we met on a property of one of the group once a month to be shown what was happening on the place. I then had access to 12 other sets of production figures and different styles of pasture management. I found out that our production was well up with the exotics. Visually it was hard to accept that this could be possible, but it was happening.

At this time I saw a paddock being sown conventionally to introduced pasture using machin-ery worth approximately twice what we had paid for our 2000 acres. This would have bought a lot of fertiliser in those days. After the initial disappointment of establishment failure, I noticed the evid-ence of another approach unfolding before my eyes. Barley grass had begun to come in on the camps. Managing the height at which it went to seed (in order to keep wool clean) using big mobs of sheep, gave the clue to developing a productive natural pasture. The effect of manipulation with fertiliser, clover and stock became apparent.

Management of natural pastures

Initially, the Walcha Road country was 50% bare ground after years of annual burning. There was a lot of lichen, and muddy water would run off after as little as 15 mm of rain. The sward was dominated by summer-growing redgrass (*Bothriochloa macra*) and rat's tail grass (*Sporobolus elongatus*) which choked out the winter green wallaby grasses (*Danthonia* spp.) and weeping rice grass (*Micro-laena stipoides*), leading to annual winter droughts of frosted-off summer growth of low palatability and nutrition, marginally improved by rats tail fescue (*Vulpia* spp.). At Walcha Road, with fertiliser and legumes, we doubled production in five years. As soon as the spring began to peep through, 50% more sheep were added from other paddocks to control the summer growth in the target paddock. The whole paddock was more evenly grazed and kept shorter, so encouraging the winter green species. It is important that the area the extra sheep have come from is not allowed to close up again. This can be achieved by using cattle, and becomes easier once the pasture has attained a better summer-winter balance. Also, the cattle will do better on their own away from the sheep.

The problem with natural pastures on the table-

lands is that under conservative stocking rates and without management, the summer growing species can grow out of control and dominate the sward, remaining in winter as frosted, low quality roughage. This type of management shades out the *Danthonia* spp. that need the light. *Danthonia* spp. and *Microlaena* are capable of responding to higher fertility and able to grow through winter, providing the basis for a balanced pasture.

In a study at Glen Innes, Robinson and Archer (1988) compared fertilised stands of individual native grasses with Sirosa phalaris and Demeter fescue. Comparisons of dry matter production showed that many of the native grasses were at least as productive as the introduced species. *Poa sieberiana* produced more green leaf than phalaris and fescue in spring and summer, more than fescue in winter and a similar amount to both in autumn. *Themeda triandra* produced less green leaf than the introduced species in spring, but similar amounts in autumn and twice as much as fescue and three times as much as phalaris in summer. *Danthonia linkii* and *Microlaena stipoides* were less productive than the introduced grasses, but their digestibilities were similar (Archer and Robinson 1988). Nitrogen content of green leaf of *Danthonia* was similar to phalaris and fescue, but *Microlaena* had the highest N content of all the grasses, including phalaris and fescue. This all goes to show that, given fertility, native grasses can perform.

Robinson and Archer (1988) found that individual native grass plants proved very variable both in production (20-30%) and digestibility (up to 10 units), showing considerable potential to develop improved plants. Together with production figures from managed natural swards and associated tissue tests, these data suggest that there is considerable potential for native grasses as pasture plants. Each drought shows the limitations of many introduced species. Records of the rainfall at Armidale over the last 100 years suggest that pasture improvement took off during favourable climatic periods (M. Duncan *pers. comm.*). Perhaps our expectations of introduced species may be too high, as the drier years are more the norm. Also, margins are getting tighter. Don't forget that when pasture improvement really got going, margins were good. Today they are tight enough to put into question the practice of planting out exotic pasture in many cases.

Anyone on the tablelands with undisturbed native pasture already has useful grasses within the sward. Many of these grasses are often invaders of sown pastures. Thus, often all that is needed is the knowledge and management ability to turn what is already there into something rather special.

The overriding key to the jigsaw is to keep clover under control, because of its ability to smother out the grass and set up an instant drought. Three or four days of hot westerly winds on a clover dominant pasture can see the clover collapse, resulting in large bare areas in the pasture. This happened to us at Walcha Road once, and it took several years without fertiliser to get good grass cover again. So, watch the clover content, and only apply fertiliser if clover performance is not good enough given the seasonal conditions.

Set stocking, especially at high rates, is not necessarily the best management system. In a set stocked paddock, there can be at the same time areas understocked, leading to an accumulation of unpalatable senescent growth, with other areas being flogged out by constant grazing. Nature is not rigid and, after senescent growth has been reduced by heavy grazing, a more flexible approach is needed.

There are many ways to improve feed utilisation - increasing stocking rate, rotating, subdividing, increasing mob size, *etc*. Ultimately, what is decided will depend on the knowledge of the operator and his attitude to higher capital inputs, increasing operating costs, species management, risk, climatic variation and the amount of income it is necessary to generate.

It is important to remember that forage quality is almost as important as quantity, and grazing methods differ for each climate. A standing "hay-stack" in a dry climate is great, but a similar mass of dry matter is of much lower value on the table-lands in August after rain and a series of frosts.

One of the most important pieces of equipment for the development of management systems is a knowledge of botany. For a system of management to extract the optimum return and remain sustainable, we need to be able to identify and understand the behaviour of plants within the sward. We need to remember that some species can be crowded out and some can't tolerate heavy grazing. Also, there are marked differences in the tolerance of species to acidity, heat, moisture stress, *etc*. The reaction of individual species to changes in fertility is very important - fertiliser is one of the key farm inputs.

In the end, best results will come by managing particular species within the sward. We use sheep, cattle and goats to manage pasture. Cattle are less selective than sheep and will go for the roughage, especially if given urea. Goats browse and like roughage but don't like clover. They like seed heads and can be used to help control thistles, blackberry, etc. and, of course, sheep will eat out the bottom. This last fact is useful in controlling bloat.

By watching what is happening in the pasture, the appropriate type of animal can be introduced at the appropriate time to keep the pasture opened up, so that a better winter-summer balance is achieved. This should be done in conjunction with manipulating the numbers according to the seasons - lamb and calve in spring for extra numbers, and cast for age and sell off extras in autumn to align stock numbers with winter growth rates.

Although it is possible to change enterprises and management in an attempt to capture off-season markets, I prefer to go along with nature and accept that there is a time of plenty during the year and a time of comparative dormancy. It is not difficult to arrange a livestock enterprise to take this into account, especially if the pasture has been manipulated with fertiliser, clover and stock to encourage the winter-green species.

Features of native grass-based pastures

These pastures have evolved over a period of time as a result of the application of fertiliser and clover to a native sward. Such a pasture consists of native grasses, clover and other species introduced by stock, with each species growing in the areas most suited to its requirements. *Bothriochloa* seems to like the warmer northern faces. *Microlaena* can grow in semi-shade, but moves into the open as fertility rises. Eventually, *Microlaena* and *Dan-thonia* spp. will grow in most places All these species respond to higher fertility.

When you think about native grasses overall, the economics are compelling. In my experience they use less fertiliser inputs, need less rain, neither need replanting or spraying for insects or disease, probably because of their diversity. Production from a natural pasture can be up to 80% of that from an exotic pasture (Munnich *et al.* 1991), and experiments have suggested they can be more profitable. In an experiment at Dundee, no production differences were detected in pastures with varying proportions of introduced grasses (0-70%) in most years. However, in a drought year, supplementary feeding was necessary to keep the sheep alive on the pastures with the highest proportion of introduced grasses (Robinson and Dowling 1985).

Natural pastures form a very thick sward, leading to better water quality in runoff. They use less of our finite resources because they need fewer chemicals and fertiliser and don't need farming. They don't leave large areas ploughed just waiting for the summer storm. In our opinion, no one act can cause more problems than ploughing on low-fertility, shallow soils on the tablelands. Because native grasses are totally adapted, they don't upset the balance of nature (above and below ground) that we know so little about. Some natives are very acid-tolerant which would have some relevance in the south.

There are 160 species of native grasses that have evolved in the New England tablelands under these conditions, and there are a few groups that it is important to know the behaviour of so that we can develop a balanced natural pasture. Recognition of the different response patterns of individual species and groups highlights the importance of diversity within a pasture community.

Because of the range of species in a natural pasture, the deleterious effect of a management mistake for one species is often compensated by an improved response from another component. In contrast, where improved grasses are sown alone, a management mistake can be disastrous, as happened for many sowings of Sirosa phalaris on the Northern Tablelands.

In pastures, there seems to be a philosophy that, "Everything we haven't planted here is a weed, and the fewer species the better". This may be partly due to the fact that we can't identify the native species and don't appreciate just how many are present. If the longevity of a pasture is partly dependent on exclusion of as much competition as possible, alarm bells should be ringing.

We have been in the New England for 34 years, and there has been a declared drought in 16 of them. We have used natural pastures all that time, have produced up to 50 kg/ha wool, and have never replanted a pasture - come to think of it we really haven't planted one either! Environmentally, the approach seems to me to be sound, and I'm now comfortable with it, particularly as it means minimal disturbance to other components of the community such as trees, shrubs, birds and insects. These are all important (maybe essential) components of a stable ecosystem. We should all learn as much as possible about all facets of the highly complex environment we operate in, so that decisions we take are based on a sound understanding of what we are dealing with.

Today we are being bombarded by people telling us we are destroying things and that the ways of the past are all bad. We are told that certain actions will solve all our problems, but beware of half truths. Just to illustrate how things can be turned around in the telling, an early experiment compared unfertilised native pasture with fertilised exotic pasture and concluded that exotic pastures were much more productive. How unexpected?

The inference that exotics are better became an accepted fact that formed the basis for extension advice. This attitude is still being advocated by some people who do not seem to be aware of results from work done on the natives in recent years, both experimentally by researchers and by producers on their properties. These results can't all be wrong! Just how many droughts do people need to endure before it becomes evident that many so-called permanent pastures are so short lived?

Conclusions

If society wishes to secure future food and fibre requirements without destroying the environment (and this will apply world wide), a far more equitable system will need to be devised, so that the custodians of the land receive enough reward to maintain the resource. Driving around the bush reveals a very sorry state of affairs, with fences falling

down, buildings needing paint and pastures needing fertiliser. In many cases, the landowner is working off-farm where he can't look after it.

In the meantime, an effort has to be made to produce more with low inputs, without allowing the land resource to degrade. I believe that our native grasses can play a big role in this, and that we should try to find out more about them. It would appear that with management, they can last for a long time, whereas the Australian environment cannot always stand the high-input intensive approach for very long. Environmental solutions **have** to be found, because so many of the things that are going wrong concern finite resources or endangered species.

References

Archer, K.A. and Robinson, G.G. (1988). Agronomic potential of native grass species on the Northern Tablelands of New South Wales. II. Nutritive value. *Australian Journal of Agricultural Research* **39**, 425-36.

Fleming, J. (1986). Profitable production from native pastures on the Northern Tablelands. Proceedings, 1st Annual Conference, Grassland Society of NSW. pp. 5-11.

Munnich, D.J., Simpson, P.C. and Nicol, H.I. (1991). A survey of native grasses in the Goulburn district and factors influencing their abundance. *Rangeland Journal* **3**, 118-29.

Robinson, G.G. (1986). Making the most of your existing pastures. Proceedings, 1st Annual Conference, Grassland Society of NSW. pp. 1-4.

Robinson, G.G. and Archer, K.A. (1988). Agronomic potential of native grass species on the Northern Tablelands of New South Wales. I. Growth and Herbage Production. *Australian Journal of Agricultural Research* **39**, 415-23.

Robinson, G.G. and Dowling, P.M. (1985). The effect of proportion of sown grasses on pastures and animal production from fertilised pastures on the Northern Tablelands of New South Wales. *Australian Rangeland Journal* **7**, 88-92.