THE POTENTIAL FOR USING NATIVE GRASSES

Greg Lodge
NSW Agriculture & Fisheries
Agricultural Research Centre
Tamworth 2340

".... pastures sown down to superior strains of Danthonia ..... are capable of yielding large amounts of palatable nutritious fodder, ideal for wool production and for maintenance of sheep" Cashmore (1932).

THE ROLE OF NATIVE GRASSES

Rapid increases in the costs associated with the establishment and maintenance of sown pastures (fuel, fertiliser, herbicide, etc.) and the lack of persistence of some species in the droughts of the 1980's has rekindled a growing interest by graziers in the management and increased productivity of a major resource on most properties - their natural pastures. Native grasses are adapted to the environment. They have evolved under harsh conditions of periodic drought and inherent low soil fertility. As such, they could have lower re-establishment and maintenance costs than pastures based on more traditional grass species (Fleming 1986). In recent droughts, the adaptability of the native perennial grasses to harsh conditions has proved valuable to graziers.

Most of the pasture research in the temperate areas of Australia has concentrated on the replacement of native and naturalised species (Whalley 1970) rather than enhancement or development of the more valuable native species. However, native grasses are resilient and despite these efforts, they are still the dominant pasture type in New South Wales, covering an area of over 60 million ha (Whalley and Lodge, 1985). Even in the higher rainfall Slopes and Tablelands environments, natural pastures predominate. For example, approximately 71% of the 5.4 million ha of rural holdings on the northern Slopes and Tablelands are comprised of native and natural pastures (Lodge et al 1984), which, when undeveloped, carry less than 2.0 dry sheep equivalents (DSE) per ha (3/4 DSE per acre). In these environments, conditions for pasture growth are favourable, fertilizer is used over some 40% of the total pasture area, and large areas of sown pasture occur on the Tablelands. Despite these developments, carrying capacities are alarmingly low, averaging only 3.0 DSE per hectare (just over 1 DSE per acre). This low carrying capacity of the natural pastures results from their dominance by summer-growing, frost susceptible native perennial grasses. These grasses provide little green forage in winter and early spring, leading to an energy drought, with pastures low in protein and digestibility (Lodge and Roberts 1979). Consequently, stocking rates and returns from these pastures are low. A lack of winter green forage can also reduce wool fibre diameter (Roe et al. 1959), increasing the risk of wool tenderness.

THE DOMESTICATION PROCESS

All species that are commercially available for sowing (eg lucerne and phalaris) have at some stage been domesticated from native wild types. Seeds of valuable native grasses are not commercially available. To enable these grasses to be sown they first require a process of selection, evaluation and breeding (the domestication process). The

need for productive grasses adapted to the wide climatic fluctuations that characterise so many Australian environments was highlighted by Whalley and Lodge (1985). Persistent native grass species that establish readily would have an essential role in increasing pasture productivity in:

(i) areas where traditional exotic grass species are sown but perform poorly.
(ii) environments where no satisfactory grass species are available. Both of these situations include not only areas of existing natural pastures, but also lands that have been continuously cropped.

Domestication of valuable native grasses is a relatively new concept for Australian agronomists and graziers. If the seeds of valuable native perennial grasses were available for commercial sowings it would enable the widespread development of higher quality, adapted pastures for increased livestock production. In terms of both forage value and drought resistance the most productive native perennial grasses in the eastern districts of northern New South Wales have been shown to be the yearlong green perennials wallaby grass or white-top (Danthonia spp), weeping grass (Microlaena stipoides) and the cool season perennial wheat grass (Agropyron scabrum).

In the western areas on the heavier textured soils Mitchell grass (Astrebla lappacea) has proved to be a valuable species. Initially, domestication involves the collection and growing out of a range of plants within a species to assess the amount of genetic variability. It then requires the selection of agronomically superior plants (eg. individuals with high green leaf content in winter) and individuals with flowering and seed production characteristics amenable to commercial seed production (eg. seed retention, high seed yield). Further detailed work may then be required to investigate the breeding systems of the different grasses, and assess their suitability for domestication and, if necessary, plant breeding.

DESCRIPTION OF EXPERIMENTS

Experimental sites established at Tamworth include over 3500 plants collected from 400 sites, covering most districts of New South Wales. These have been planted out in nursery rows for evaluation and approximately 50% of the collection is D.linkii, with the remainder being D.richardsonii. Plants have been assessed for seasonal growth as well as seed head type and shape, time of flowering and seed yield. Selection for high seed retention over three generations has substantially improved yield. For example in D.richardsonii seed yield was increased over 600% after one cycle of selection for seed weight; in D.linkii increases of 250% have been obtained. Elite lines from these collections are being further selected and it is planned to release at least one cultivar by 1992.

CONCLUSIONS

The availability of domesticated species of native grasses will provide adapted, persistent pasture species. Because of this adaptability pastures based on productive, persistent domesticated perennial grasses should have advantages of:

power costs per unit of output: less fertilizer input and less resowing after drought than for exotic species.

* a greater proportion of winter green native grasses than many existing native pastures.

* reduced penalties associated with seed contamination and wool fault.

* increasing the gross margins from wool production.

* enabling individual producers to increase the size of their breeding flocks.

Additionally there are large areas in New South Wales where introduced exotic grasses are difficult to establish and unsuited to the environment. The availability of seed of native grasses will provide productive and persistent pasture species for many of these areas.

In 1920 the noted agrostologist John Breakwell wrote that "the Danthonia species were probably the most important economic grasses of New South Wales" with "great commercial possibilities". Nearly 70 years later the challenge of domesticating Danthonia and other valuable native grasses has not been met.

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