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AUGUST 2010 | PRIMEFACT 1051

Tropical perennial grasses for northern inland NSW

BR McGufficke

District Agronomist, Industry & Investment NSW, Inverell

LH McCormick

Technical Specialist Pastures (North), Industry & Investment NSW, Tamworth

Introduced perennial tropical grasses are used extensively in the warmer regions of northern New South Wales (NSW) where they make a major contribution to livestock production. Their use is also increasing in many environments throughout the central west of NSW.

Tropical grasses have many advantages for grazing and cropping systems in northern NSW. They:

- are highly responsive to summer rainfall with growth rates up to 150 kg dry matter (DM)/ha/day. Surplus forage can be baled as hay or silage, or carried into the winter period as dry feed
- are persistent and productive in a variable rainfall climate. Our summers tend to be hot with rain falling in storms while our winters are cold with frequent frosts
- are more persistent and productive than temperate perennial grass pastures in many areas
- provide high ground cover reducing erosion
- have a large fibrous root system which is effective in improving soil structure
- increase soil carbon
- are useful for regenerating degraded cropping soils in harsh environments
- can contribute significantly to the management of ground water recharge areas to mitigate rising water tables and dryland salinity

Figure 1. Steers grazing Premier digit grass on the North-West Slopes of NSW.

- are adapted to a wide range of environments and soil types
- have higher water and nitrogen (N) use efficiencies than temperate grasses and a greater tolerance of high temperatures
- are far more productive than temperate species in most summer rainfall dominant environments.

Tropical grasses are susceptible to frost and the main growth period is from mid-spring until mid-autumn. Companion winter species, commonly annual legumes, balance these pastures by providing late autumn, winter, and early spring feed when rainfall allows for such growth.

The average digestibility of tropical grass species is reported to be about 12.8% lower than temperate grasses at the same growth stage. About 60% of this reduced dry matter digestibility (DMD) can be attributed to the higher temperatures experienced by tropical grasses during their growing season. Studies have shown both tropical and temperate grasses decline in DMD at a mean rate of 0.6% unit for each 1°C increase in temperature. The remaining difference is probably due to basic

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differences in anatomical structure between leaves of tropical and temperate grasses because of their different photosynthetic pathways.

Digestibility can vary significantly within a species and between species. Growth stage, soil fertility and other environmental factors are also critical. The digestibility of all grasses is highest at the young, leafy growth stage.

Although tropical grasses will persist under harsh conditions they respond well to good nutrition and grazing management. All grasses need adequate nitrogen to maximise protein levels for optimum livestock performance. The best way to maximise protein in grasses is to maintain adequate soil nitrogen levels using nitrogen fertiliser or legumes, and graze pastures when grasses are at the leafy growth stage.

Many of the tropical grasses have a proven record in the control of weed species such as spiny burr grass (*Cenchrus incertus*), blue heliotrope (*Heliotropium amplexicaule*), lippia (*Phyla canescens*) and galvanised burr (*Sclerolaena birchii*).

Variety selection

Tropical grasses have been evaluated in experiments across the north and central west by NSW Department of Primary Industries (now Industry & Investment NSW) for well over a decade. These studies have shown the suitability of species to various climatic zones and soil types.

Recommendations derived from these studies can be divided into light, medium and heavy soils with comments on climatic zones where appropriate.

Figure 2. Katambora Rhodes grass was the best performing Rhodes grass across the range of light to medium soils.

Light soils: Soil groups - sands, sandy loams; pH_{Ca} <5.0–6.0

Katambora and Pioneer Rhodes grass (*Chloris gayana*, Fig. 2) and Swann forest bluegrass (*Bothriochloa bladii*) perform well across the slopes on these soils. Consol lovegrass (*Eragrostis curvula* var. *conferta*) grows well on sandy soils and is excellent for controlling spiny burr grass. American and Gayndah buffel grass (*Cenchrus ciliaris*) demonstrated good persistence in western NSW.

Premier digit grass (*Digitaria eriantha*, Fig. 3) also performs well across the slopes and plains on these light soils and as far west as Cumborah, the most western site that species have been evaluated. Premier digit has good dry matter digestibility, is widely adapted and will grow well over a wide range of soil types and climatic zones.

Figure 3. Premier digit grass is an ideal cultivar for light and medium soils.

Medium soils: Soil groups - clay loams, silty clay loams; pH_{Ca} 5.0–7.0

Katambora is the best performing Rhodes grass on these soil types. The two newer varieties Finecut and Topcut establish faster than other species on hard setting sites, but are not as persistent as Katambora. Premier digit grass and Swann forest bluegrass perform very well on the medium soils. Bissett creeping bluegrass (*B. insculpta*) and Bowen Indian bluegrass (*B. pertusa*) also perform well on these medium soils.

Inverell purple pigeon grass (*Setaria incrassata*) and Bambatsi panic (*Panicum coloratum* var. *makarikariense*, Fig. 4) are persistent on medium soils if nitrogen levels are adequate. In low rainfall areas, such as the western plains, American and

Gayndah buffel grass are the most persistent cultivars.

Figure 4. Bambatsi panic is an ideal cultivar for heavy soils and flood-prone areas.

Heavy soils: Soil groups - grey, black clays; pH_{Ca} 6.0–8.0.

The best performing species on these soils are Inverell purple pigeon grass, Bambatsi panic, and Floren bluegrass (*Dichanthium aristatum*). Plant survival, production and forage quality of purple pigeon grass are closely related to soil nitrogen status.

On the western plains where the annual rainfall is too low for grasses in this group, Biloela buffel grass has a role providing it is not established in a floodway.

Species mixtures

Tropical grass pastures are commonly sown as a mixture of several species. This has the advantage of allowing each species to find its niche across a paddock with variable soil types. High ground cover can be achieved quickly with the use of species with different growth habits.

The disadvantage is that some species are more competitive than others and can restrict the growth and establishment of other species in a mixture. Research has shown Katambora Rhodes grass is highly competitive in a mixture with both Premier digit and Bambatsi panic. This competition can be reduced by either eliminating Katambora Rhodes grass from a mix or ensuring that it is no more that 20% of the mix.

Preferential grazing and the decline of the more palatable species is another disadvantage of mixtures.

Establishment

Tropical grass species are sown during the spring-summer period when evaporation rates are high and therefore it is important to have good subsoil moisture at sowing. Perennial tropical grasses can be successfully sown from October until early February in north western and central western NSW provided there is a good reserve of subsoil moisture. Many of these species have low seedling vigour and rain soon after germination is important for seedling survival because of the hot, summer conditions.

Paddock preparation should commence at least two years before sowing to control weeds, in particular annual summer grasses. Weed competition is a major cause of pasture establishment failure; however in farming country good weed control during the cropping phase can be effective in reducing weed competition.

Ground cover from cereal stubble, can greatly improve establishment when compared to bare fallows (Fig. 5). Ground cover can lower summer soil temperatures and reduce evaporation providing a better environment for seed germination and plant establishment in marginal conditions.

Figure 5. The improved establishment of Premier digit grass sown into stubble (right) and without (left).

Sowing

Perennial tropical grasses are very sensitive to sowing depth. Research has shown the ideal depth is 10 to 25 mm, so aiming to sow at 10 mm will allow for variation in a paddock and combine sowing depth. Conventional sowing and direct drilling are reliable methods of sowing, and the use of press wheels or rollers greatly improves soil-seed contact resulting in better germination.

Aerial sowing is less reliable and will only give satisfactory results with good preparation, management and favourable seasonal conditions. If grasses are aerial sown they must be treated with an insecticide to prevent ant theft.

Adequate seed must be sown to establish a viable pasture as quickly as possible. A moderate saving in seed cost at sowing may incur a large loss of production due to a low plant population and the resultant stand may not have the capacity to thicken.

Seed quality can be highly variable and growers should always insist on a certificate of seed analysis showing purity and germination before purchasing seed. This certificate will also identify any weed seed contamination. There is a high risk of introducing noxious weeds in seed and this can result in a considerable ongoing expense.

Seeding rates should be calculated to ensure a minimum of 10 plants per square metre. Queensland research on red soils indicates 17 live seeds are required to establish one plant, as losses are high at sowing times for tropical grasses.

The soil surface dries quickly in spring and early summer so it is important to sow tropical grasses ahead of a rainfall event. Four and ten day forecasts are increasingly useful for making summer grass pasture sowing decisions.

Seed dormancy

Seed dormancy is common in tropical grasses. For example, purple pigeon grass seed that is one year old may have a germination percentage as low as 15% but two year old seed can have a germination percentage of 70%.

Although seed dormancy can present problems at sowing, it is an excellent survival mechanism as it enables seed to survive for extended periods in the soil and slowly increase the pasture density.

Katambora Rhodes grass, Bambatsi panic, Swann forest bluegrass and Premier digit grass do not display any seed dormancy.

Nutrition and companion legumes

Nutrition is important for establishment of tropical grass pastures and optimising forage quality and animal production in established pastures.

Adequate nutrition is particularly important for the establishment of tropical grasses as many of these species have low seedling vigour. The application of phosphorus, sulphur and a small quantity of nitrogen (10–15 kg/ha of N) will greatly enhance establishment in low to moderate fertility soils.

All grasses need adequate nitrogen to maximise protein levels for optimum livestock performance. Research has shown that if the crude protein content of tropical grasses falls below 6–8 percent, animal intake will be depressed because of a crude protein deficiency in the animal. When crude protein levels were increased from 4.1 to 9.9 percent, dry matter intake of beef cattle increased from 4.3 to 7.7 kg/day. When fed the unfertilised grass, cattle lost 0.22 kg/day, but when fed the fertilised grass they gained 0.69 kg/day.

The crude protein content in tropical grasses can be increased by applying nitrogen fertiliser; however the best way to maximise protein in grasses is to maintain adequate soil nitrogen levels with legumes, and graze pastures when grasses are at the young, leafy growth stage.

Tropical grasses should be established with a suitable legume which will provide soil nitrogen. The companion legume species used will depend on environmental conditions and soil type. As most legumes used are temperate annual species, such as subterranean clover, serradella or medic, it is generally best to sow them either in the autumn before the grass is sown or the autumn after establishment.

Grazing management

Perennial tropical grasses should generally not be grazed in the establishment year until they have flowered and produced seed. The two main exceptions to this rule are when weed competition is severe and where plants are well advanced early in the season; however always ensure the plants have a well developed root system before grazing. Grazing can stimulate tillering when plants are well advanced early in the season with good soil moisture.

Once flowering and seed set have finished grazing can commence as the seed drops readily at maturity. Allowing the grasses to seed can increase the density of the pasture, depending on soil type and seasonal conditions.

Figure 6. Sheep will graze tropical grasses, but there needs to be a greater focus on management.

When pastures have established grazing management is used to manage the botanical composition of the grasses and companion legumes. Grazing management also aims to

achieve feed quality and quantity targets for animal production.

The growth rates of tropical perennial grasses in inland NSW have been recorded as high as 150 kg DM/ha/day, the range is generally 55–112 kg DM/ha/day. To manage pastures with these growth rates flexible grazing strategies should be used to utilise the forage produced.

Acknowledgements

The many District Agronomists who established and managed grass evaluation trials and cooperating landholders who provided the sites.

We also thank DV Sayer for typing and editorial assistance.

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ISSN 1832-6668

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