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Tropical perennial grasses – pasture quality and livestock production

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Fertilised perennial tropical grasses have higher quality forage than other summer-growing forages such as forage sorghum and native pastures dominated by summer-growing grasses.

Pasture quality is optimised with good plant nutrition and grazing management. Application of nitrogen increases crude protein levels by up to 5% which are maintained throughout the growing season. Grazing management strategies that maintain the pasture in the vegetative growth stage and reduce the proportion of stem and dead material will also enhance feed quality.

Animal production will be highest when pasture quality is optimised. With good management and average seasonal conditions tropical perennial grass pastures are capable of playing an important role in both cattle and sheep production systems in north west NSW.

Feed intake is the driver for animal production so the focus needs to be on optimising the quantity of green feed available. Herbage mass for cattle should be 1600–2500 kg DM/ha and sheep 1000–1500 kg DM/ha (when digestibility is 65%).

For sheep production, tropical grass pastures can be used for autumn joining/spring lambing systems prior to joining, during early pregnancy and late lactation prior to weaning, and for spring born lambs following weaning. For spring joining/autumn lambing systems tropical grasses can be used pre-joining in spring and to maintain ewe fat score in early to mid-pregnancy (throughout summer).

Good plant nutrition is essential for tropical perennial grass pastures to achieve optimum growth and quality for animal production. Tropical grasses are responsive to increasing nutrition and can produce an additional 100 kg of herbage in the growing season for every kg of nitrogen applied. That is, the application of 50 kg/ha of nitrogen can increase herbage production from 5 to 10 t/ha over a growing season.

The most useful measure of pasture quality is its *digestibility*, which is defined as the proportion of feed that an animal consumes that is used to satisfy its nutritional requirements. It is directly related to the energy content of a pasture and has a positive relationship with protein. Energy intake is the driving influence on animal performance, followed by the intake of protein, vitamins and minerals. This means that a pasture with a digestibility of about 70% will have high proportion of green leaf and have energy and protein levels capable of supporting high levels of cattle or sheep performance. In contrast, a pasture of lower digestibility (55%) has a high proportion of stem and dead herbage with energy levels only capable of maintaining animals.

Pasture digestibility is directly related to the stage of growth of a pasture and declines as pastures mature and have increased amounts of stem and dead material. Protein content of a pasture is also influenced by species composition and plant nutrition. For example, legumes have higher protein content than grasses, and grasses, either fertilised or with a legume component, have higher protein than unfertilised, legume deficient pastures.

The importance of digestibility and protein is that they influence the speed at which forage is digested. Forage with high digestibility moves

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through the rumen quickly, allowing the animal to eat more. The more pasture eaten by an animal, the higher the level of production.

Tropical perennial grass quality is lower than that of most sown temperate perennial grasses. This is due to greater lignification of the plant leaves which is a mechanism they have developed to minimise water loss (transpiration) which increases their survival in hot summer conditions.

This perceived 'poor' quality of tropical perennial grasses has deterred some producers from considering them as valuable pasture species. However, it is important to remember two things, firstly, that temperate and tropical grasses grow at different times of the year and so in practice comparisons are often of little relevance. Secondly, information suggests that the relative performance of animals grazing temperate and tropical perennial grasses is different (Fig. 1). In the field, this difference is thought to be associated with the higher intake of green leaf material of tropical grasses, which is related both to their more upright structure and their indeterminate growth of green leaves during stem elongation and flowering. While animal performance will be higher for a temperate grass with digestibility greater than 66%, it may be greater for a tropical grass when digestibility is below 66%.

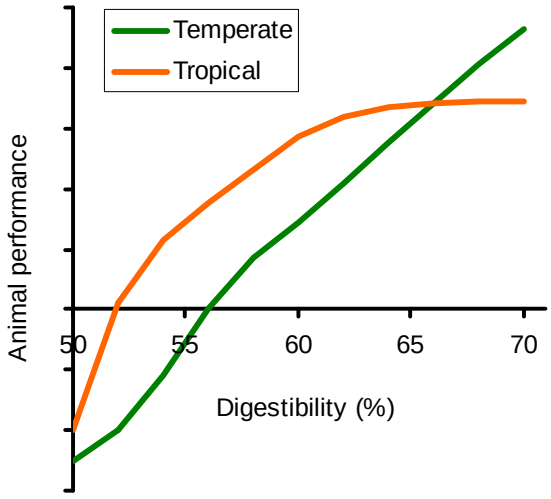

Figure 1. The relative performance of animals grazing temperate and tropical perennial grasses varies as pasture quality changes. Animal performance can be higher on tropical perennial grasses when digestibility declines below 66%.

An important potential role for tropical pastures in NSW is to help fill the feed gap that regularly occurs in late summer-autumn as native pastures decline in quality and lucerne growth slows, and before early sown grazing oats are available.

When considering the advantages and disadvantages of tropical grasses they should be compared with other summer-growing forages such as native pastures, forage sorghum and lucerne.

In northern NSW, native pastures dominated by summer-growing grasses are not suitable as the sole forage base for profitable breeding or fattening enterprises. To successfully run breeding or finishing enterprises their use needs to be integrated with other forage sources such as sown pastures, forage crops and/or supplements.

Forage sorghum generally has lower forage quality than tropical grass pastures (Fig. 2), requires re-sowing each spring and is not available for grazing until about December. Native pastures dominated by summer-active grasses such as redgrass and bluegrass can produce good quality herbage, but they tend to mature quickly and so only produce higher quality forage for short periods in spring-summer, particularly following rainfall.

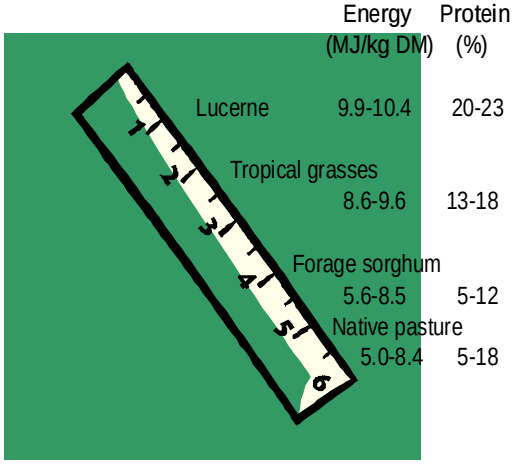

Figure 2. Well managed actively growing tropical grasses can have higher forage quality than forage sorghum and native pasture, but less than that of lucerne.

Lucerne is the benchmark summer-growing perennial legume in northern NSW and produces higher quality forage than tropical grasses. However, in pure stands it has the disadvantage of low ground cover, increased risk of bloat and it tends to lose its leaves when it becomes water stressed in summer.

Achieving high quality tropical perennial grass pastures

One of the biggest challenges with tropical grass pastures is maintaining high feed quality. This can be achieved with both good plant nutrition and appropriate grazing management strategies.

Plant nutrition can be improved by annual application of fertiliser, in particular nitrogen applied

either as fertiliser or provided by a legume in the pasture. Research at Tamworth in northern NSW found that the addition of 100 kg/ha of nitrogen increased crude protein levels up to 5% and maintained these levels throughout the growing season. In contrast, unfertilised tropical grass pastures may have reasonable quality at the start of the season, as they utilise mineralised nitrogen that has accumulated over winter, but once this has been used crude protein levels rapidly decline (Table 1).

Table 1. Crude protein (%) and metabolisable energy (MJ/kg DM) of green leaves of Premier digit grass unfertilised (Nil) or fertilised (Fert) with 100 kg/ha nitrogen during the growing season. Forage quality is higher in fertilised regrowth. Crude protein levels declined markedly from November to March in the unfertilised grass.

Month	2 weeks regrowth		6 weeks regrowth	
	Nil	Fert	Nil	Fert
	Crude protein (%)			
Nov.	15.9	18.7	14.2	17.0
Jan.	14.7	18.4	13.4	16.9
Mar.	13.1	18.0	11.8	17.4
	Metabolisable energy (MJ/kg DM)			
Nov.	9.5	9.6	9.1	8.6
Jan.	9.1	9.5	9.2	9.5
Mar.	7.1	7.7	7.2	7.3

Effective grazing management is required to maintain the pasture in a vegetative growth stage because as it matures stem elongation commences and pasture quality declines. Again, research at Tamworth has shown that crude protein and metabolisable energy levels of the green leaf proportion of Premier digit grass plants cut every 2 weeks were higher than those cut every 6 weeks (Table 1). As an example, in March, the crude protein of green leaves of Premier digit grass fertilised with 100 kg/ha nitrogen and cut every 2 weeks was 18.0% and their metabolisable energy was 7.7 MJ ME/kg dry matter (DM). When fertilised and cut every 6 weeks green leaves of this cultivar had 17.4% crude protein and 7.3 MJ ME/kg DM. In both fertilised and unfertilised digit pastures, the proportion of green leaf after 2 weeks regrowth was about 75%, but declined to about 30% after 6 weeks of regrowth.

During mid-summer, when there is good soil moisture tropical perennial grasses have high growth rates and will require regular grazing at high stock densities to maintain them in a high quality, leafy stage of growth. For example, to utilise the growth of a tropical grass pasture (with herbage mass non-limiting for animal intake and a digestibility of 68%) growing at 100 kg DM/ha/day, the stocking rates would need to be ~60 lambs/ha (25 kg liveweight with an intake of 1.6 kg DM/head/day) or 11 steers/ha (~300 kg liveweight, intake 9 kg DM/head/day). Therefore to utilise these grasses and maintain quality they will need to be either set stocked, maintaining the benchmarks listed in Table 2, or rotationally grazed with only short rest periods between grazing, depending on seasonal conditions and regrowth.

Table 2. Minimum green herbage mass (kg DM/ha) to maintain satisfactory production levels in cattle and sheep on tropical grass pastures with digestibility of 65% (9.2 MJ ME/kg DM), 60% (8.4 MJ ME/kg DM) and 55% (7.5 MJ ME/kg DM) (modified from Prograze manual). Note these predictions are based on a pasture which includes 400 kg DM/ha dead pasture with a digestibility of 45%. The value 'ns' indicates that the feed quality is not suitable for this livestock class.

Livestock class	Pasture digestibility		
	65%	60%	55%
Dry cows	870	1250	2400
Pregnant cows (7-8 months)	1650	2700	7500
Lactating cows + 2 mth old calf	2500	4000	ns
Growing cattle – % of potential growth			
30	770	1150	2400
50	1050	1700	4500
70	1600	2700	ns
90	2200	ns	ns
Dry sheep	560	800	1300
Pregnant ewes (100 days)	800	1700	2300
Lactating ewes + single lamb	1200	ns	ns
Growing lambs – % of potential growth			
30	500	600	1100
50	600	750	1900
70	800	1250	ns
90	1300	ns	ns

Animal production

Tropical perennial grass pastures are often considered to be better suited to cattle, but they can also be suitable for sheep – grazing management is the key.

Availability of herbage mass has major influence on the daily feed intake of livestock. To maximise animal intake and performance producers should

aim to maintain herbage mass (with a digestibility of 65%) between 1600–2500 kg DM/ha for cattle and 1000–1500 kg DM/ha for sheep (Table 2, Fig. 3). If herbage mass is less than these minimum amounts, then feed intake will be less, resulting in lower levels of animal performance. However, if herbage mass is above these maximum levels there is no increase in feed intake or animal performance. This occurs because firstly, the animals meet their 'gut fill' requirements in an optimum time frame and secondly, at high levels of herbage mass pasture digestibility is generally lower. Plant material with low digestibility slows the passage of feed through the animal's digestive system, reducing intake levels.

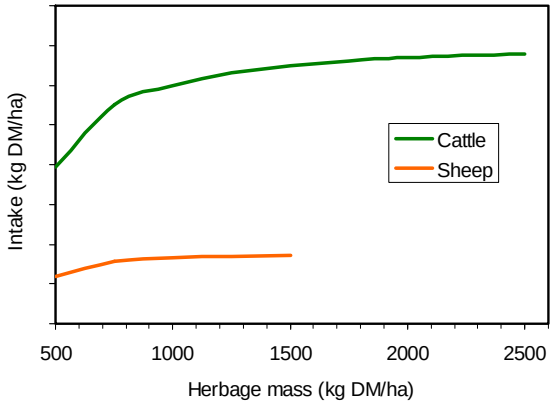

Figure 3. Change in intake with increasing herbage mass. Green herbage mass within the range of 1600–2500 kg DM/ha is optimum for intake while maintaining high quality. For sheep, herbage mass of 1000–1500 kg DM/ha is optimum for intake and quality (Prograze manual).

It is also important to realise that tropical grasses mature and digestibility declines more rapidly than in temperate grasses. This means that the 'window' for moderate to high animal production is small without appropriate grazing management and may not be sustained for lengthy periods.

Role of tropical perennial grasses in cattle production systems

Cattle production is driven primarily by feed intake. Therefore the focus should be on optimising the quantity of green feed available (1600–2500 kg DM/ha) and maximising the quality of feed-on-offer. The ability of tropical grass pastures to respond to rainfall, producing large quantities of herbage means that they can be effective at meeting these quantity targets. However, the greater challenge for producers is to meet the quality targets which can be achieved with stocking rate.

Producers should aim to maintain pastures in a range of 60–70% digestibility (Figs. 4 and 5) and above 65% for moderate to high levels of production. It is important to recognise that below 60% digestibility, production levels will be much lower and the pasture may not suit some classes of cattle, such as lactating cows or high growth rates in growing stock (Table 2).

Time of calving may determine the usefulness of tropical pastures in a breeding herd. Generally, lactating cows require twice the energy requirements of a dry cow and so to ensure milk production and successful joining, they must be grazed on high quality pastures (i.e. digestibility ~65%) with ~2500 kg DM /ha. For spring calving herds, perennial tropical grass pastures may not meet these quality requirements. Therefore, producers may need to consider grazing alternative pastures or crops, or provide an appropriate supplement to meet the needs of lactating cows. However, tropical pastures may provide adequate levels of nutrition to ensure the successful rejoining of cows in summer, or moderate to high growth rates (0.7–1.0 kg/head/day) in growing animals (Fig. 6).

Similarly, in winter when carry-over feed has frosted it will be mostly dead material with a low digestibility and so would be unable to support moderate growth or lactation unless supplementation is provided.

Role of tropical perennial grasses in sheep production systems

In northern NSW, sheep breeding production

Figure 4. Tropical perennial grasses should be maintained in a range of 60–70% digestibility.

systems are based on an autumn joining/spring lambing or a spring joining/autumn lambing program. Within each production system it is critical that ewes attain a fat score of 3–3.5 at joining and that it does not fall below 3 score throughout pregnancy, especially in the last 50 days.

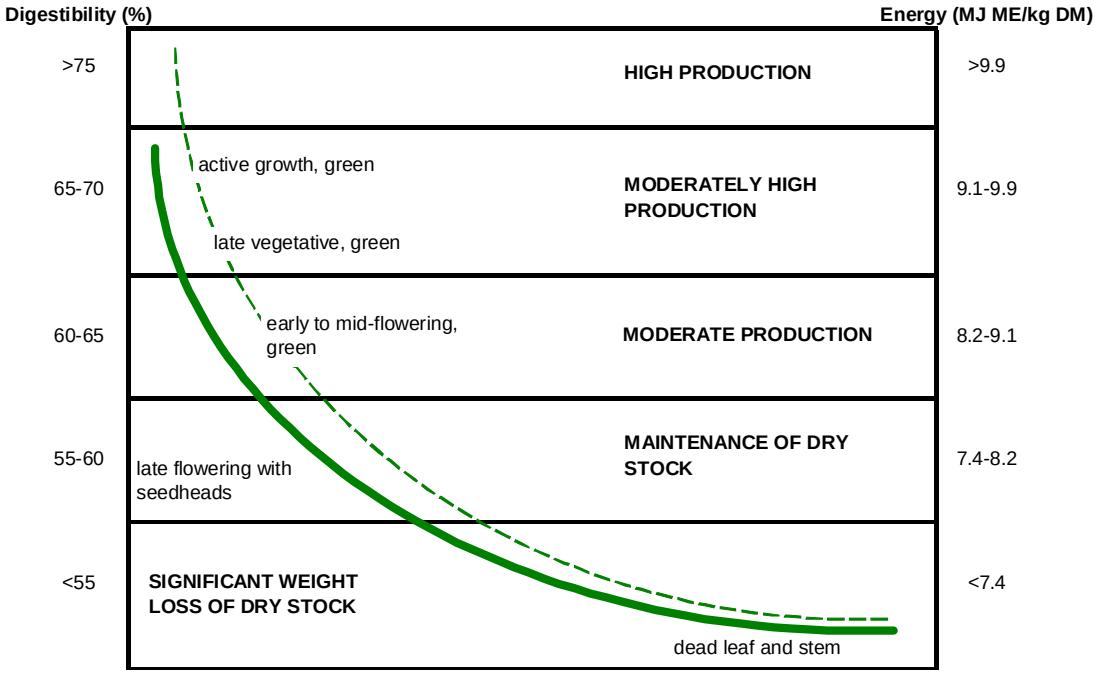

Figure 5. Guide to digestibility decline as tropical (—) and temperate grasses (- -) mature. For moderate to high levels of production, digestibility must be maintained above 65% (modified from Prograze manual).

In an autumn joining/spring lambing system, lambs born in spring (September) are weaned at 3–4 months of age (December–January). This allows about 3 months over summer for ewes to regain condition for joining in March–April. Commonly, ewes will need to regain 1–1.5 fat scores to attain a fat score of 3.5 by joining. This equates to 7–10 kg liveweight over a period of about 100 days (i.e. a growth rate of 70–100 grams/head/day). Tropical pastures with the appropriate grazing management system would enable ewes to achieve these growth rates (Figs. 5 and 7). Once ewes have attained these target fat scores for joining they will need to be maintained (or allowed to fall by no more than 0.5 of a score) during the first 100 days of pregnancy. In early pregnancy, tropical perennial grasses may meet these needs, but with frosts and declining feed quality they are unlikely to meet ewe nutritional requirements in mid to late pregnancy. Similarly, for lambing (in September) and early lactation tropical perennial grasses are unlikely to provide sufficient quality feed (Fig. 8, Table 2). After weaning, prime lambs are usually grazed on lucerne or summer forage legumes such as lablab or cowpeas to maximise growth rates. However, Merino weaners or lambs that are held-over to be later finished on forage oats could achieve moderate to high growth rates on tropical grasses.

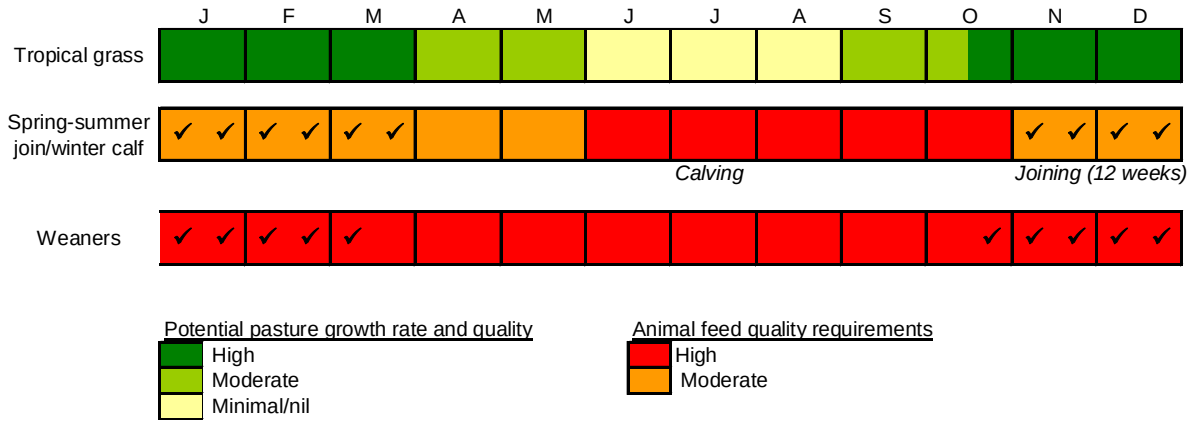

Figure 6. Perennial tropical grass pastures are suitable for successful rejoining of cows in summer, or moderate to high growth rates in growing animals from spring, when the tropical grass pasture commences growth, until autumn.

Figure 7. Sheep grazing mixed tropical perennial grasses.

In a spring joining/autumn lambing system, lambs are weaned in June–July which allows 3–4 months for ewes to regain condition before joining in October–November. In late winter–early spring, adequate weight gain for both dry ewes and weaned lambs would be dependent on forage sources such as lucerne, winter forage crops or native pastures oversown with an annual legume such as subterranean clover. Once tropical perennial grasses have commenced growth in spring they could be suitable for preparing ewes for joining or for moderate growth rates in lambs. In the critical last 50 days of pregnancy (February–March) and lactation (April–June), well managed tropical pastures could contribute towards meeting ewe requirements, particularly if grain supplementation was also available.

Animal health issues

Pasture improvement may be associated with an increase in the incidence of certain livestock health disorders (e.g. photosensitisation from panic grasses). Livestock and production losses from some disorders are possible. Management may need to be modified to minimise risk. Consult your veterinarian or adviser when planning pasture improvement.

Acknowledgement

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Further reading

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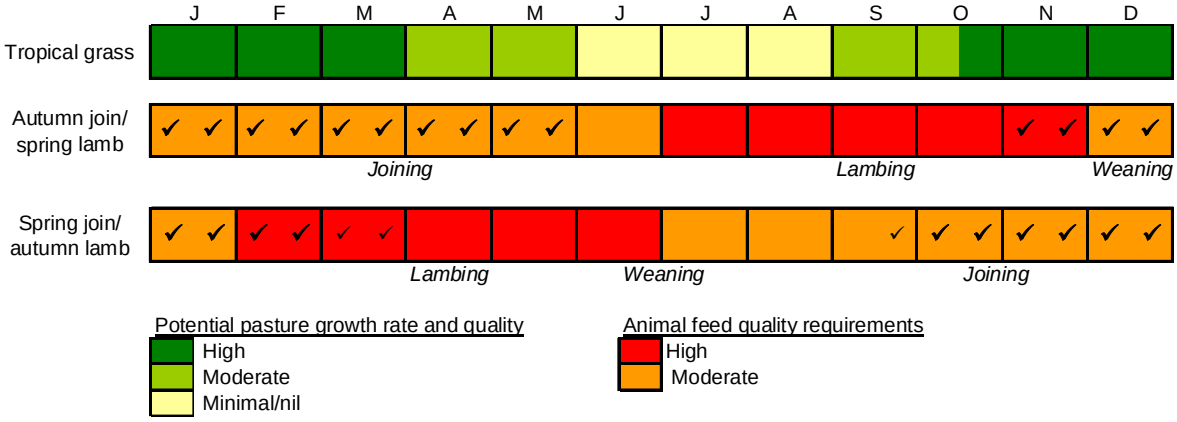

Figure 8. Perennial tropical grass pastures are suitable for autumn joining/spring lambing sheep enterprises from weaning in December until after joining in autumn. Tropical pastures can supply suitable feed for spring joining/autumn lambing systems from spring, when the tropical grass pasture commences growth, until about lambing in autumn.

The department's website www.industry.nsw.gov.au contains useful information on individual grass species.

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