Pasture Photo Standards for the Mackay Whitsunday Region

Graham R Fletcher

Disclaimer: This document is designed to be used as a tool to assist in estimation of pasture yields in the Mackay Whitsunday region. It is not a substitute for personnel with expert knowledge of grazing land production or pasture management, and the information contained within may not be applicable to other regions.

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by Graham R Fletcher

Table of contents

Introduction

No matter what part of Australia you hail from, optimising beef production without jeopardizing land condition can be a challenging exercise. It is important when making decisions on stocking rates that we a have an understanding of our grass resource and how we manage it effectively. The use of forage budgeting can help to provide information on stocking rates that maximise production in a sustainable way.

Photo standards are a useful tool in establishing rapid 'by-eye' assessment of pasture yield. Such assessment can be used on its own or in combination with ground truthing techniques such as physical yield determination.

Variations in seasons, elevation, vegetation, land type and soil type all combine to impact the pasture yield potential of grazing land, not only between paddocks but within paddocks. These yield photos have been developed to assist in yield determination for the purpose of forage budgeting specific to sown pastures within the Mackay Whitsunday region.

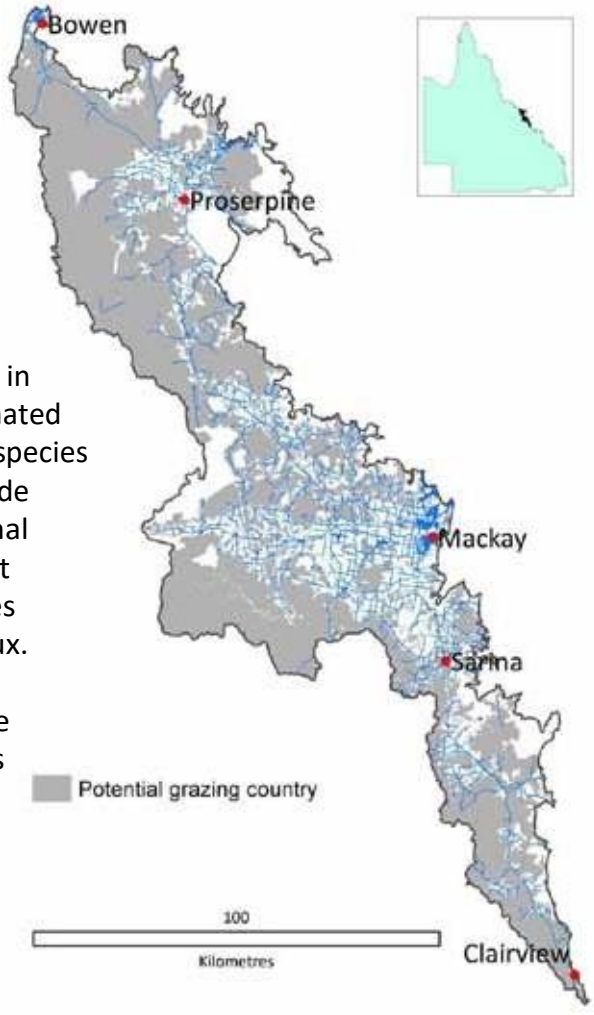
Overview of the Mackay Whitsunday region

Located on the central Queensland coast the region extends from St Lawrence in the south to Bowen in the north. It is bordered by the Clarke and Dalrymple ranges which extend approximately 80 km inland at the widest point. The majority of the region experiences annual rainfall in the 1500 to 2000 mm range with most falling between December and March.

The region includes the catchments of the Pioneer, O'Connell, and Proserpine River systems as well as other smaller streams draining into the Great Barrier Reef lagoon. The region encompasses a land area of around 940,000 ha, with around 70% of this land area occupied by grazing enterprises. Sugar cane is other dominant land use. These industries have co-existed for around 150 years.

Australian Bureau of Statistics Agricultural commodities by Local Government Area (LGA) for the year ending 20 June 2012 reports a beef population of around 1,220,000 cattle for the Mackay Whitsunday and Isaac shires. The contribution of cattle within the Mackay Whitsunday coastal zone is 11% of this figure or 143,000 cattle.

Of the total grazing land area in Mackay Whitsunday an estimated 90% has some form of sown species present. It is difficult to provide an accurate figure as seasonal conditions and management impacts can keep the species composition in perpetual flux. Composition is continually changing as sown and native grasses, legumes and weeds move in and out of the system.



Pasture budgeting and assessment

Pasture budgeting is a process that producers carry out every time they enter a paddock, i.e., assessing the quantity and quality of pasture. Consideration of pasture availability in conjunction with seasonal forecasts and market opportunities helps with making good decisions
on how stocking rates will be regulated over a short term (12 months) or long term (10 years) planning horizon.

Introducing the term of pasture yield (kg/ha) refines this assessment. Once total yield of pasture is known, the proportions of that yield that are retained, lost, not used, or available for consumption can be identified.

- **Residual**
  The amount of pasture that should not be grazed to ensure the continued health and productivity of that pasture.
- **Detachment**
  The component of pasture that will be trampled, broken from the plant, or consumed by insects. Typically, detachment is about 15%. The higher the pasture yield, the higher the detachment. Detachment also changes with cattle classes - younger cattle tend to waste more pasture than older cattle.
- **Unpalatable feed**
  Plant species or components of plants that will not be utilised by cattle, i.e., unpalatable species and weeds or dead material that is no longer palatable.
- **Available for grazing**
  The quantity of pasture actually available for grazing (kg DM/ha).

Understanding these principles and the factors that influences pasture yield also assists with assessing land condition. Due to the high rainfall of the Mackay region, 'percentage ground cover', a factor associated with assessing land condition in rangeland areas, is not as critical. Ground cover within coastal pastures rarely falls below 85%.

Species composition within a pasture is the major determinant of land condition in the Mackay region. The proportion of 3P grasses (perennial, palatable and productive) is the main indicator. Accurate assessments of pasture availability, health and species composition are the driving factors in the assessment of land condition.

These pasture photo standards have also been developed as a tool for use at Stocktake pasture monitoring workshops. Stocktake was developed to compliment the EDGE Network Grazing Land Management (GLM) package with a primary focus on assessing and monitoring grazing land. These yield photos will assist in the development of pasture budgets that incorporate yield, animal requirement and grazing time to calculate utilisation rates within paddocks. Utilisation rates provide a picture of the flexibility of pastures to cope with animal feed demand over a given period of time and are a useful tool to support decisions on stocking rates for continuous and rotational grazing régimes.

Utilizing the pasture photo standards

The pasture photos are divided into a collection of the five main sown pastures available in the Mackay Whitsunday region. These are:

- Pangola grass (*Digitaria eriantha*)
- Kazungula grass (*Kazungula sphacelata* cv. Kazungula)
- Rhodes grass (*Chloris gayana* cv. Callide)
- Tully grass (*Brachiaria humidicola* cv. Tully)
- Signal grass (*Brachiaria decumbens* cv. Signal)

Each set of photo standards incorporates a set of three photos for every yield comparison. The photos include 1 landscape photo and 2 elevated photos. The first elevated photo helps to give a bit more insight into height and density of plants and the second gives a comparison with the measuring staff.

There are a number of factors that need to be taken into account when doing a by-eye assessment of yield using photo sets. The first is to remember that in order to establish the yield associated with these photos a number of pasture yield cuts were taken from each site. These cuts were randomised and repeated to eliminate outlying samples yet even so the true yield may be within the range of 1000 kg/ha from what has been calculated. There is a fair amount of subjective thinking in comparing the yield photos to actual pasture sites and so it is important to remember there is a margin for error in yield calculations that are made by eye. This becomes even more difficult in paddocks where there is a mixture of species that exhibit different yields, or where elevation or utilization can impact on pasture density. In order to provide a more accurate picture to yield it would be advisable that yield photos were supplemented with actual pasture samples. Highlighted are some steps to taking a pasture sample which can also be combined with photo records to create your own pasture photo standards.

1. Take a photo of the sample area. If sampling one quadrat, the photo should be a close up of the quadrat area. If the photo is of a larger area, cut several quadrats and average the dry weights.
2. Use a set of hand shears and cut and collect all standing pasture in a 50 x 50 cm area to about 2 cm above ground level. Place the sample in a large, labelled paper bag.
3. Tare a set of scales using an identical, empty paper bag.
4. Weigh the freshly cut sample after the scales have been tared.
5. If the sample is big and bulky, take a sub-sample from the bag and put into another paper bag of the same size.
6. Weigh the fresh sub-sample with the tared scales.
7. To dry the sub-sample, place the bag in a microwave oven with a cup of water (empty the cup and replace with cool water each time you dry the sample as the microwave can malfunction if the water evaporates and the atmosphere gets too dry). Operate the microwave for two minutes on high. Keep doing this, weighing the sample after each drying cycle, until the sample is dry and brittle to touch, or is not losing any appreciable amount of weight each time it is dried. It may take six or eight repetitions.
8. Record the final dried sub-sample weight using tared scales.

To convert the weight of the pasture sample to a per hectare basis, use the following equation:

$$\% \text{ Dry Matter} = \text{Sample dried weight (g)} / \text{Sample wet weight (g)} \times 100$$

$$\text{Dry weight (kg DM/ha)} = \frac{\text{sample wet weight (g)} \times \% \text{ dry matter} \times 40}{100}$$

9. Record the per-hectare dry matter weight with the photo you took at the site either on a pasture monitoring database or by renaming the photo files with their respective yields.

Stocking rates for Mackay Whitsunday

It is very important when communicating stocking rates to use the same terminology. The statement 'that paddock will hold 80 head all year round', may be a summation made through a combination of historical data and experience. But there a number of ambiguities:

Animal requirement

- *What class of cattle make up that 80 head?*
- *Are they wet or dry cattle?*
- *What are their average weights and age?*

These factors impact how much they eat daily. A standard unit of measurement for beef cattle is an Adult Equivalent or AE, which is represented by one 450 kilogram steer or heifer (see table below).

Category	Adult Equivalent (AE) rating	Average live weight (kg)
Cattle - females		
Dry cows (>30 months)	1.00	450
Wet cows	1.35	450
Weaners (6-8 Months)	0.54	200
One-year-old Heifers (8-18 months)	0.68	265
Two-year-old heifers (18-30 months)	0.87	370
Cattle - males		
Weaners (6-8 months)	0.54	210
One-year-old steers (8-18 months)	0.68	275
Two-year-old steers (18-30 months)	0.93	405
2 1/2-year-old steers (18-30 months)	1.00	450
Three-year-old bullocks (30-42 months)	1.16	545
Four-year-old bullocks (42 - 52 months)	1.46	630
Bulls	1.50	650+
Sheep	0.11	45
Horses	1.20	
Kangaroos	0.10	

Utilisation of pastures can vary within paddocks based on topography, fertility of soils, distance to water and supplements.

The paddock area

- *What is the actual size of the paddock?*
- *Has an accurate area ever been measured?*
- *What is the variance in yield potential in that paddock and how do they utilize the paddock?*

This is important to know from a management perspective. If the paddock is split into two will both sides run 40 head? Sometimes it is better to measure capacity through proportion of the various land types as well as area.

The grazing days

- *Does all year round mean 365 days?*
- *Is this sustainable?*

A better way to communicate stocking rates is to use a ratio. So if the paddock was 240 hectares that would be 1 AE to 3 hectares (1:7.5 acres). Developing reliable long term stocking rates based on land types is an excellent starting point for management. Within Mackay Whitsunday, many historical stocking rates have a need to be re-assessed as they have taken into account the use of fertilizer inputs or mineralisation from the clearing of land. In many cases the fertility of grazing land has declined since those stocking rates were developed and sustainable levels of grazing may require a reduction of numbers.

What are the stocking rate ratios for your property by land type?

Judging wet weight

When calculating pasture yield it is important to have an understanding of the ratio of wet weight to dry matter in pasture. In Mackay Whitsunday pastures that have high leaf to stem ratios have the potential to exhibit high water contents during the wetter periods of the year, and this can make yield calculations based on visual assessment extremely hard. These turgid pastures possess relatively small proportions of dry matter (the critical ingredient to ruminant nutrition). Generally the dry matter percentage of pastures in an average year increases from 25-80% as the season progresses, yet wet coast pastures never really 'hay off' as they do in rangeland areas. During the wettest parts of the year, dry matter content in some stoloniferous pastures such as the Pangola or Signal varieties can contain as little as 15% dry matter.

The images below are of signal grass pasture that was calculated at 20,000 kg/ha bulk weight. The dry matter content was 15.4%, meaning the dry matter yield of that pasture was 3000 kg/ha. Subtracting residual levels, wastage and unpalatable feed provides a sobering reminder of actual feed available in wet coastal pastures.

Conversely there is good evidence that we underestimate the level of out of season growth in these pastures, particularly if they are utilised correctly to prevent becoming rank and unpalatable. It is important that when taking out of season growth into account we ensure that we are not pushing our system too far and that good plant nutrition and competitiveness is maintained.

Using pasture photos standards to judge dry matter yield in pasture is extremely inaccurate without good knowledge of the current water content of those pastures. When utilising the standards, assess pasture for bulk yield first. Water content must then be deducted from total yield to give a more accurate estimate of dry matter.

Water content is not always consistent over whole paddock, and factors other than species composition can influence your results. Elevation is one of these factors (as elevation increases, available soil moisture generally decreases). The type of soils present in a paddock can also vary in their water holding capabilities. Soil health can also affect soil water holding capacity and therefore the water content in the plant.

Grazing pressure can also have an effect, as pastures that have been recently grazed will have a higher dry matter content than spelled pastures, due to higher water content in the leaf matter (which is preferentially grazed). Areas of pasture that receive higher grazing pressure (such as areas close to camps and\or watering points) generally have increased compaction and a reduced ability to access and store nutrients and water (due to a reduced root matrix). As soil moisture falls below wilting point these pastures will lose their moisture content more rapidly than pastures that have been spelled or grazed less intensely.

Why is dry matter so important?

Water content of pastures also needs to be considered in the management of cattle during the wetter months. Earlier on we referred to dry matter as being the critical ingredient in ruminant nutrition. The first consideration we make in ruminant nutrition of pasture fed systems is ensuring that appetite is satisfied, which means consuming dry matter.

The average rate of daily consumption by a ruminant is around 2.2% of body weight in dry matter per day. Using the standard AE as an example with a weight of 450 kilograms, average daily consumption would be around 10 kilograms of dry matter.

So if the dry matter content of pastures is less than a quarter of the overall bulk weight, how much does the animal have to eat to maintain body weight? Here is a real life example...

During the wet season of 2010, pastures in Mackay Whitsunday had been subjected to long periods of rainfall and very few hours of sunlight. Pastures had responded to the season and had grown vigorously but cattle were still lagging in their body condition. A study was conducted on signal grass pastures north-east of Habana looking at dry matter content in feed. The study showed that in some areas dry matter content was as low as 13% of total pasture yield. The steers that were grazing these pastures averaged 500 kilograms, meaning their feed requirement at 2.2% of body weight was around 11 kilograms of dry matter. In order to meet this feed demand from a pasture that was 86% water they would have had to consume around 84 kilograms of grass per day.

A 500 kilogram composite steer with 84 kilograms of signal grass pasture.

The photo above shows that amount of grass harvested in a pile next to the steer. It is easy to see that the animal would have difficulty with that level of consumption.

Each species photos set in this guide incorporates 8-12 different yields ranging anywhere from 500-1000 kg/ha up to 20000 + kg/ha. Although you are unlikely to find a specific photo that exactly matches your pasture yield, the best place to start is to find the images that are slightly less and slightly more than yours and make an estimation of where your pasture sits between those two photos. Some people can estimate very accurately this way.

Maintain residual – leaving pasture for growth

Judging yield by-eye is not only useful for budgeting pasture at the beginning of the year but it can also be used for assessing whether pastures are reaching their residual yield levels at the end of the year. Managing pastures for a good response to rainfall at the end of the dry season is critically important not only for the sustainability and productivity of healthy 3P grasses but also in the control of weeds.

Below are a couple of examples of some potential residual levels for sown species in Mackay Whitsunday.

Signal grass

Bulk yield: 4000 kg/ha
Dry matter content: 50%
Dry matter yield: 2000 kg/ha

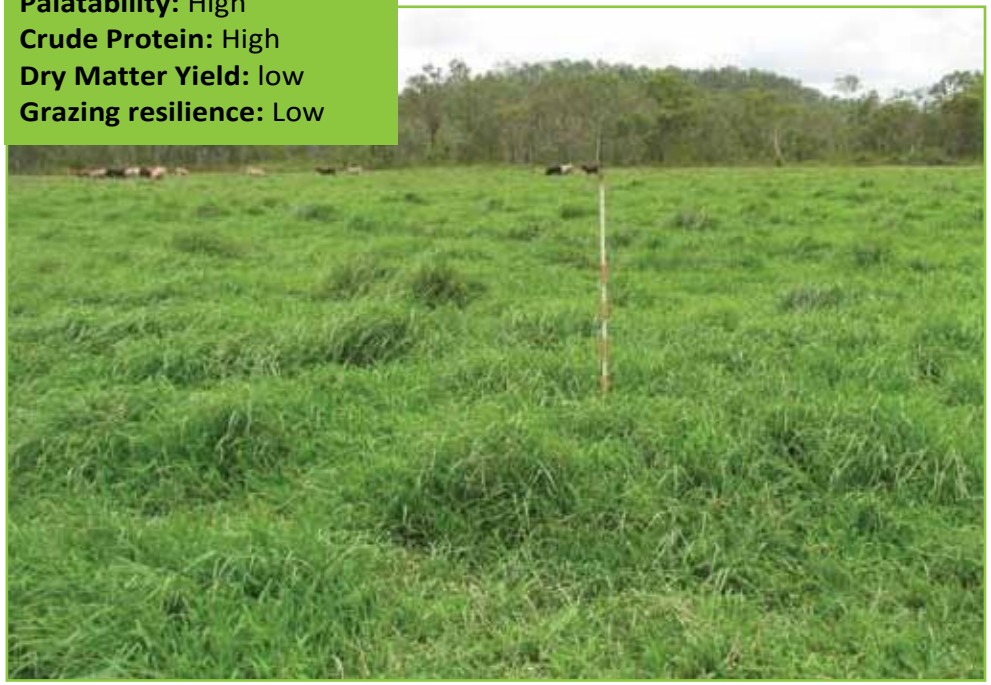
Pangola grass

Bulk yield: 3900 kg/ha
Dry matter content: 38%
Dry matter yield: 1500 kg/ha

Phases of growth in pasture

The physiology of growth in grass pastures can be broken up into 4 stages that occur throughout the year. As the plant moves through these stages the way in which it manages its nutrition and growth for survival changes. The impact of grazing animals on these plants also changes depending on the phase of growth.

PHASE 1
Digestibility / Energy: High
Palatability: High
Crude Protein: High
Dry Matter Yield: low
Grazing resilience: Low

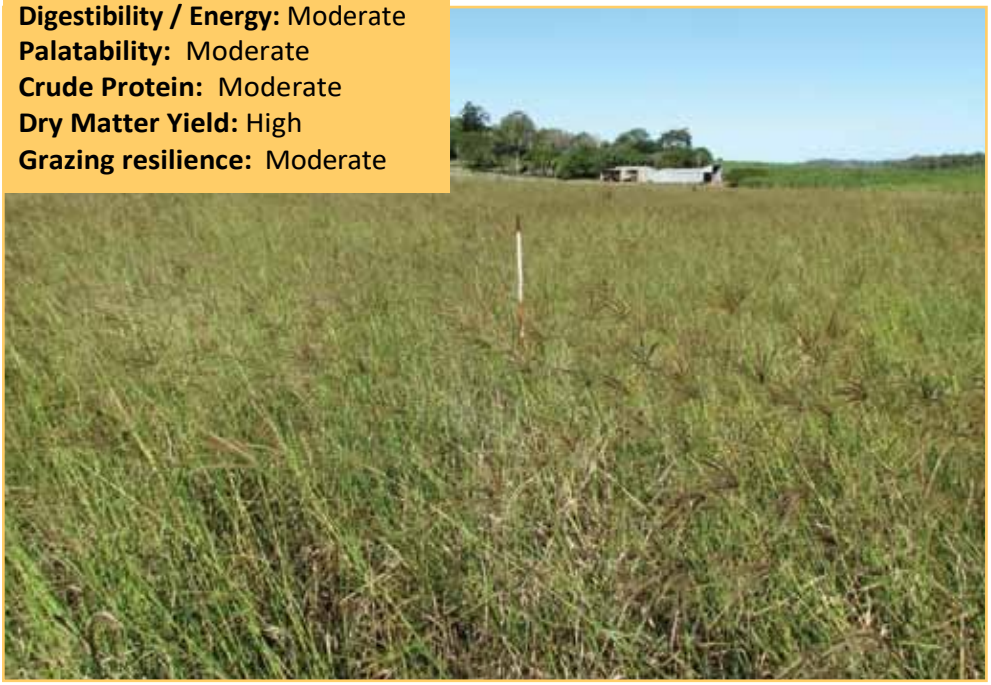


Phase 1 is the initial break of season response by grass to increasing temperatures and rainfall. Palatability and digestibility of pastures are normally at their highest at this time. Cattle will select this new growth over the older rank grass left over from the previous year. Energy stored in the root reserves elicits the initial leaf development, once these new leaves become established they aid in the sourcing energy for the development of additional leaf as well as root growth. Over-utilisation during these phases of growth can limit overall growth potential as well as make the plant less resilient to seasonal variation.

PHASE 2
Digestibility / Energy: High
Palatability: High
Crude Protein: High
Dry Matter Yield: Moderate to high
Grazing resilience: Moderate

Phase 2 is characterized by plants that have established leaves and are growing rapidly. Yield production during this time is generally at its highest and pasture quality is also good. This is the time at which the root zone is extending the most as it is supported by energy produced in the leaves. Plants are still sensitive to grazing at this stage so grazing for production should be managed so as not to over-utilise these highly palatable plants.

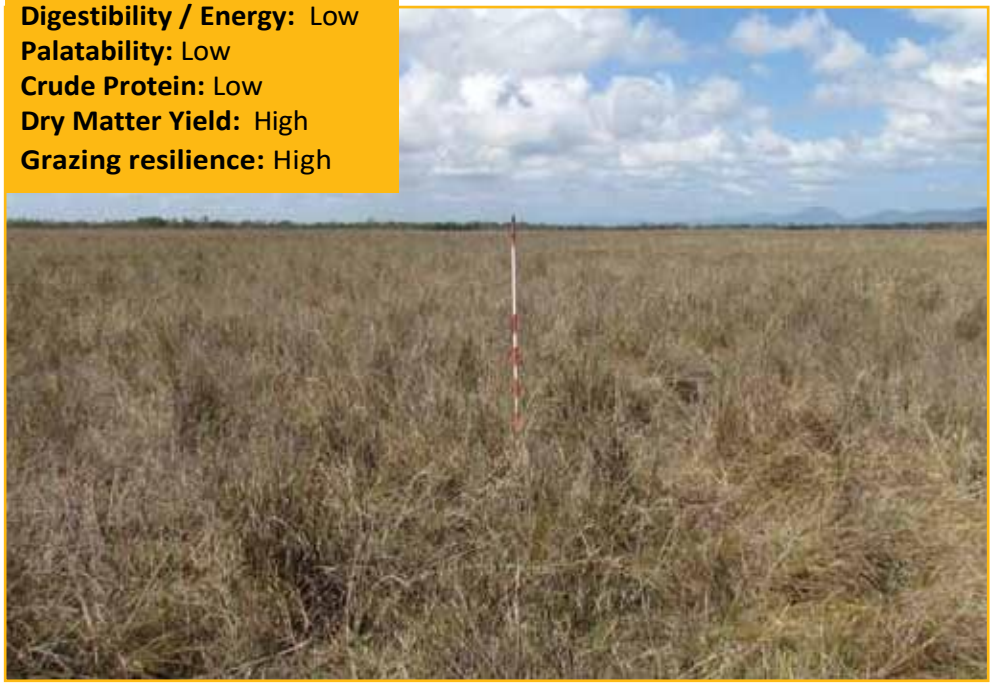
PHASE 3
Digestibility / Energy: Moderate
Palatability: Moderate
Crude Protein: Moderate
Dry Matter Yield: High
Grazing resilience: Moderate



Phase 3 is normally what is known as the reproductive phase as it is generally related to seed production. In pastures within the Mackay Whitsunday, seed production cannot always be linked to phase 3 as grasses can begin seeding quite early in the growing season. More significantly, phase 3 is the period in which nutrients begin to migrate out of the plant as it gets ready for dormancy. In some cases this is in the form of protein and energy into seed for new generations of grass. Storage also occurs in the root zone.

Most pastures in Mackay Whitsunday region will remain in phase 3 for a large period of the year. Cumulative rainfall and/or good soil moisture and warmer winter temperatures generally mean that we enjoy higher additional pasture growth throughout the year than many other regions. If pastures can be adequately managed, the number of days during phase 2 and 3 can be extended and its nutrition retained. The key is balancing between over-utilisation where plants can't respond and under-utilisation leading to rank growth.

PHASE 4
Digestibility / Energy: Low
Palatability: Low
Crude Protein: Low
Dry Matter Yield: High
Grazing resilience: High



Phase 4 is the dormancy phase. The plant's growth rate has declined to almost zero and its palatability and productivity is falling below the requirement of the animals grazing it. At this stage grazing has little impact on plant health due to its dormant state, although it is still important to maintain some framework for response when the season changes.

In rangeland concerns, seasonal conditions and rainfall mean that pastures quality declines at a gradual rate though the cooler, drier months of the year and phase 4 is associated with the typical dry season conditions. In Mackay there can be years where rainfall events throughout the year preclude pastures from ever reaching phase 4. Despite this it is important to realize the nutritional shortfalls that this phase brings to production.

The fenceline story

Sometimes the things we see in our own grazing environments help to reinforce that the choices we make throughout the year in our grazing management are critical to the health of our pastures. Cattle are interested in getting as much good quality forage into their rumen for digestion as quickly as they can, as this gives them more time to sit under a tree and ruminate. Their need for forage is by far and away the greatest influencing factor to land condition. Don't blame weeds for being weedy or grasses for not growing. The following is a story of a beef producer making that same realisation...

Things were not going well for John. It had been a dry year, with most of the rain falling heavily in February and then disappearing, the dry season was looking pretty bleak. John was starting to regret a few decisions he had made at the beginning of the year. He had forgone the decision to fertilise late last year as prices had escalated well over $1400 dollars a tonne for DAP, making it uneconomical to apply. This combined with a poor season and a few too many mouths meant that his normally healthy pastures had taken a hammering. He had received a bit over 2 inches the week before and his grass had freshened up for a while but today he was fixing the boundary fence he noticed it had begun to wilt again. Further compounding the issue was that next door looked pretty good and had only gone ahead since the rain.

So John decided to do a little digging. Literally.

And this is what he found...

The plant on the right is from John place, the one on the left is from next door. He found that the plants next door had not only greater framework for growth above ground, but the root matrix below the ground was much greater, allowing the plant to be more efficient at harvesting nutrients and moisture from the soil.

Photos of the boundary fence taken by John. To the right, the pasture still has good coverage but has been pushed a little too hard. The paddock on the left has had a more conservative stocking rate which has preserved the growing points of those plants. The species and soil type are the same but the reaction of those plants to the rainfall is different. Why???

Pastures that have a larger root matrix generally have an increased rate of adsorption of water in the upper soil profile, due to two factors:

1. as ground cover increases the velocity of run-off of water decreases. This slowing of run-off allows greater movement of water downwards into the soil.
2. adsorption tends to be greater at the base of plant as water tends to move along the root matrix as it permeates into the soil. Having those nutrients and water available to a larger more robust plant meant more grass production and a better feed quality to cattle.

This photo shows the fence line 18 months after the original photo was taken. Note that the grass has responded and the density of 3P grass is still excellent. This shows that pasture in good condition can withstand overgrazing to a point as long as they are suitably managed afterwards.

So what did John do to fix the situation?

He knew that the crux of the problem was that he had been over utilizing his pasture yield. He had historically maintained a very good residual at the end of the year but due to an extended dry season and over stocking he had drawn heavily from the reserves of the plant. Despite the pasture being over utilized they still remained in good condition with good productive species. So he decided to reduce his stocking rates and rested grass through a policy of rotational grazing, giving the pasture a minimum of 6–8 weeks cumulative spell over the wet season. This allowed those plants to maximise growth and become healthy resilient plants once more. Here is a photo of plants taken from the same site the next wet season.

Note that although the plant on the left has been grazed down, the comparison of root zones is quite similar and in comparison to plants taken twelve months earlier this pasture has regained its resilience.

A quick note from the author

In reflection of this book and in particular the above story I think it is important to never stop learning about what drives productivity and sustainability in grazing. I think at times we spend too much time being the students of our own university. It is important that we surround ourselves with people who have sound knowledge of the principles we require to be constantly improving our businesses.

Below is a summation of some of the grazing principles that John employs in the management of his property. As a long time student of agronomy across various landscapes John brings simplicity, efficiency, and common sense to his management. Please take time to read it.

In a relatively small scale male fattening operation there is fairly narrow margin between making money or recording a loss. It is very apparent that there is no 'silver bullet' management factor in relation to getting the best results from improved coastal pastures. The key to pasture management is developing a good understanding of the sustainable carrying capacity of the property underpinned through continual assessment of pasture recovery rates, nutrition, monitoring of pasture species change and seasonal weather forecasts.

The appearance of annual grasses and changes in weed populations are very good indicators of improved pasture competitiveness and the need to modify management strategies; having a management strategy that allows the flexibility to strategically rest fragile paddocks within the rotational grazing regime is important. I try to consistently achieve at least 5 weeks rest for each paddock through my rotational policy. If I find I have to move cattle on faster than this due to pasture availability I know that there is something wrong with the system and I need to reduce stocking rates.

I am very aware that the persistence of the improved grasses and introduced legumes is to some extent reliant on maintaining the nutritional status of the inherently infertile coastal soils. I monitor nutrient levels via a soil testing regime of geo-referenced sites across soil types on the property to make sure that things like adequate soil phosphorus reserves are maintained. Lastly, maintaining adequate phosphorus to sustain legumes and improved grasses is relatively expensive, therefore sourcing cattle with the right genetics to efficiently convert protein to muscle is critical.

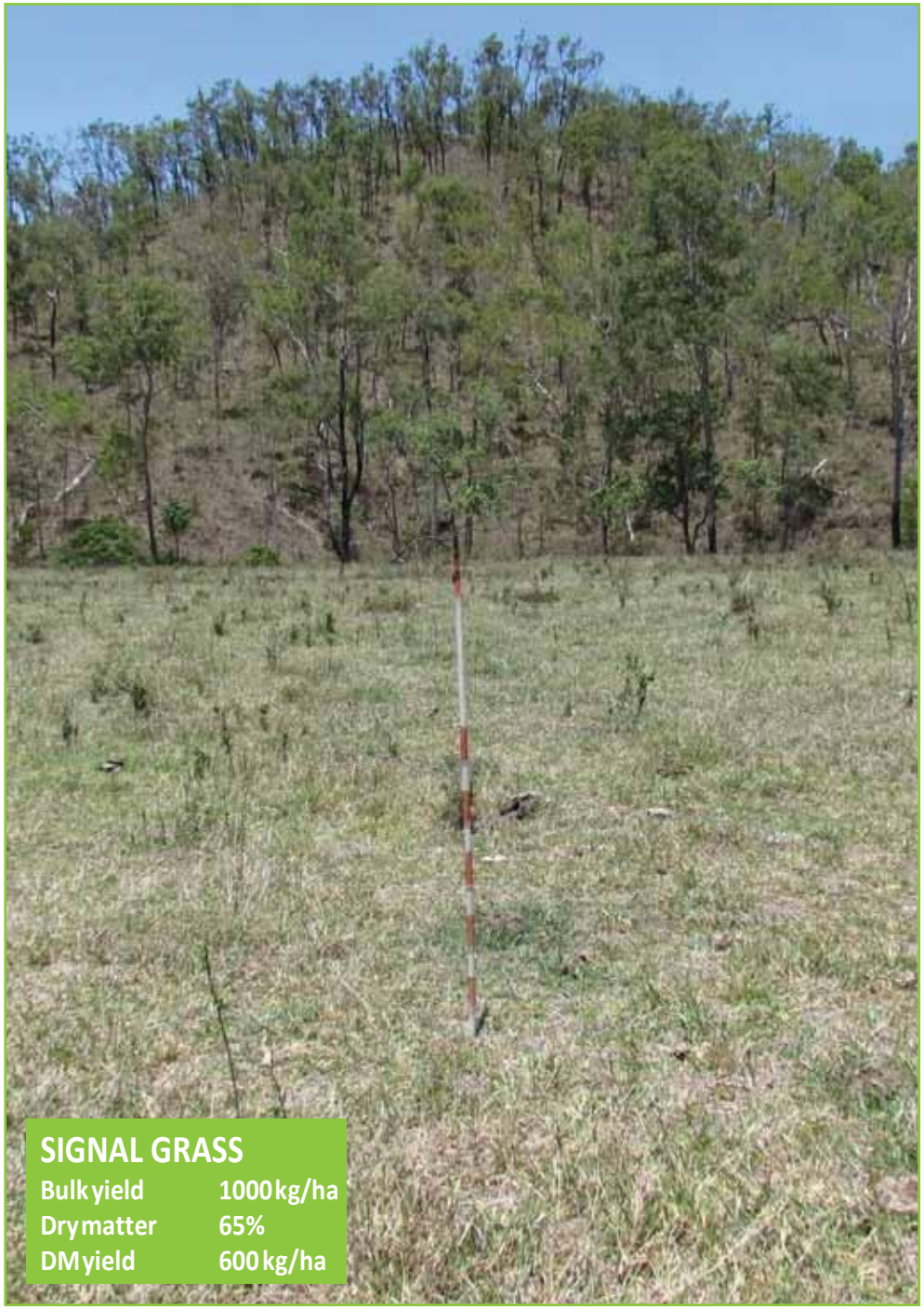
Signal grass (*Brachiaria decumbens* c.v. Signal)

Strengths

- Well suited to Mackay Whitsunday's high rainfall
- Tolerates high soil aluminium levels
- Very persistent, including under seasonally dry conditions
- Maintains green leaf well into seasonally dry periods
- Productive, capable of sustaining high stocking rates and grazing pressures
- Tolerant of low fertility
- Responds well to N and P fertiliser
- A vigorous stoloniferous grass that competes well against weeds
- Can establish on a variety of soils and elevations

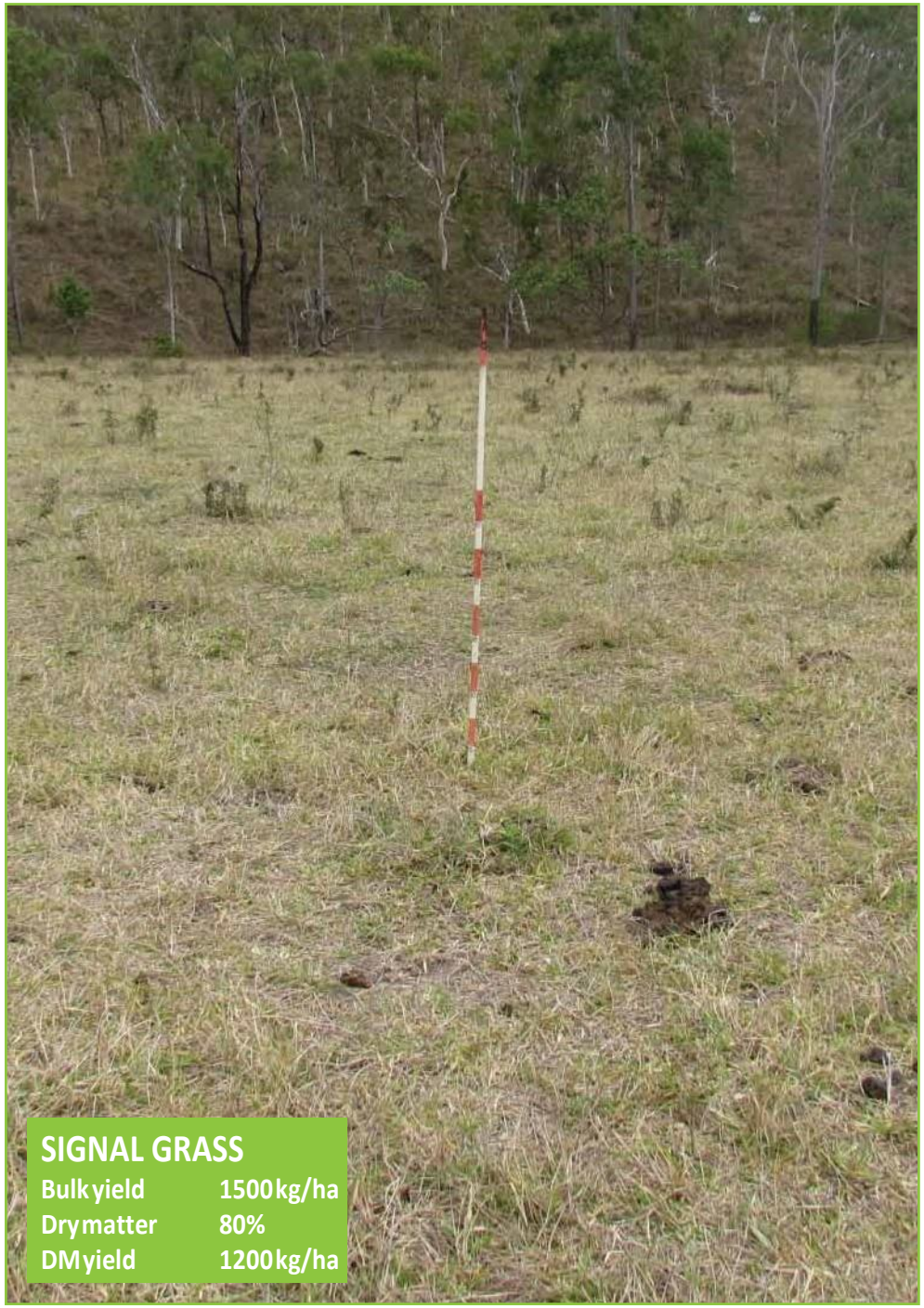
Limitations

- Slow to establish if dormant seed is sown
- Tends to dominate, making it hard to establish legumes
- Can be less palatable than other sown species leading to patch grazing
- Less tolerant to waterlogged conditions. Favours ridges.



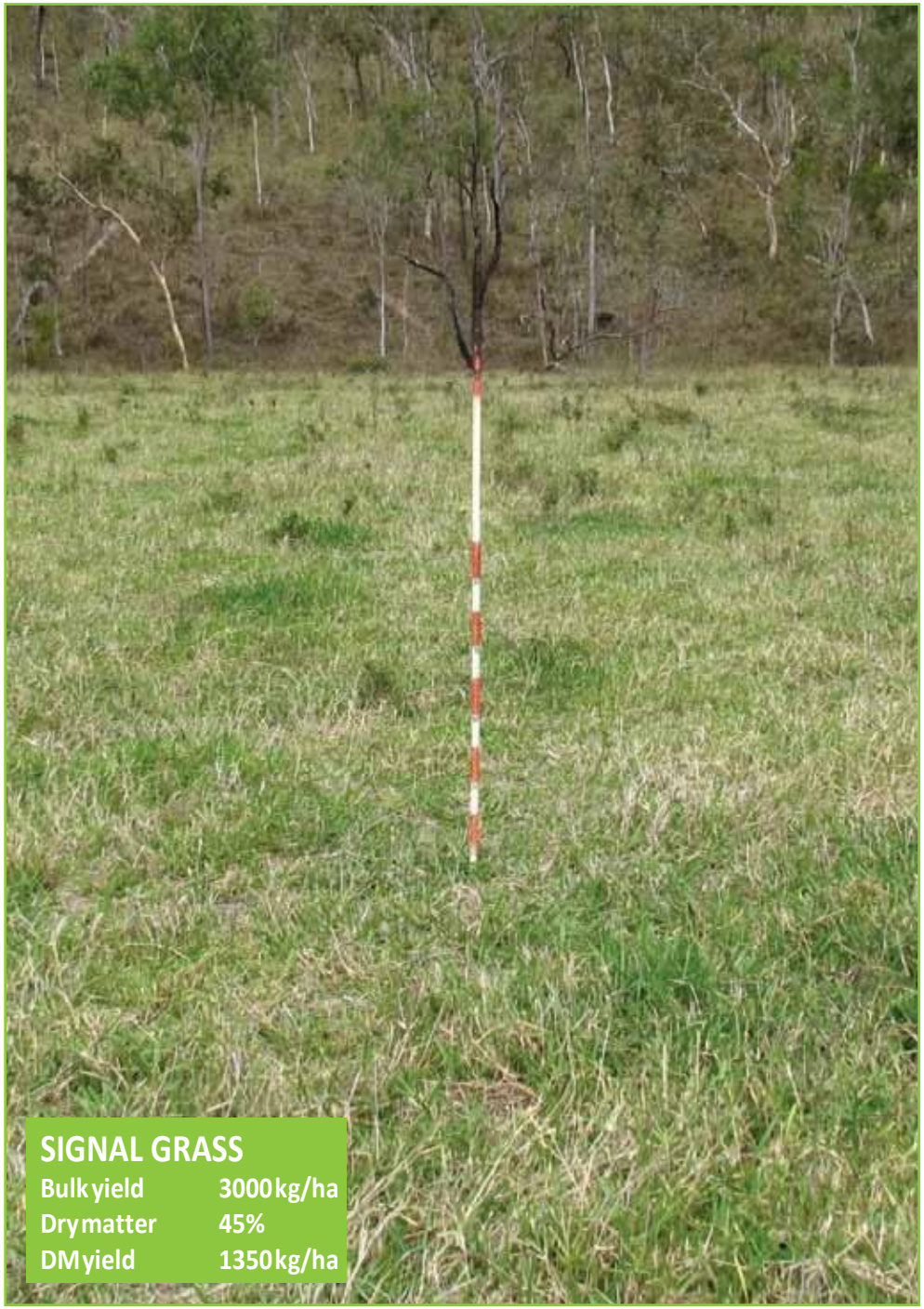
SIGNAL GRASS

Bulk yield	1000 kg/ha
Dry matter	65%
DM yield	600 kg/ha



SIGNAL GRASS

Bulk yield	1500 kg/ha
Dry matter	80%
DM yield	1200 kg/ha



SIGNAL GRASS

Bulk yield	3000 kg/ha
Dry matter	45%
DM yield	1350 kg/ha

SIGNAL GRASS

Bulk yield	4000 kg/ha
Dry matter	50%
DM yield	2000 kg/ha

SIGNAL GRASS

Bulk yield	4200 kg/ha
Dry matter	42%
DM yield	1800 kg/ha

SIGNAL GRASS

Bulk yield	8800 kg/ha
Dry matter	50%
DM yield	4400 kg/ha

SIGNAL GRASS

Bulk yield	10500 kg/ha
Dry matter	30%
DM yield	3200 kg/ha

SIGNAL GRASS

Bulk yield	16300 kg/ha
Dry matter	30%
DM yield	5000 kg/ha

SIGNAL GRASS

Bulk yield	17700 kg/ha
Dry matter	25%
DM yield	4500 kg/ha


SIGNAL GRASS
Bulkyield 22000kg/ha
Drymatter 20%
DMyield 4600kg/ha

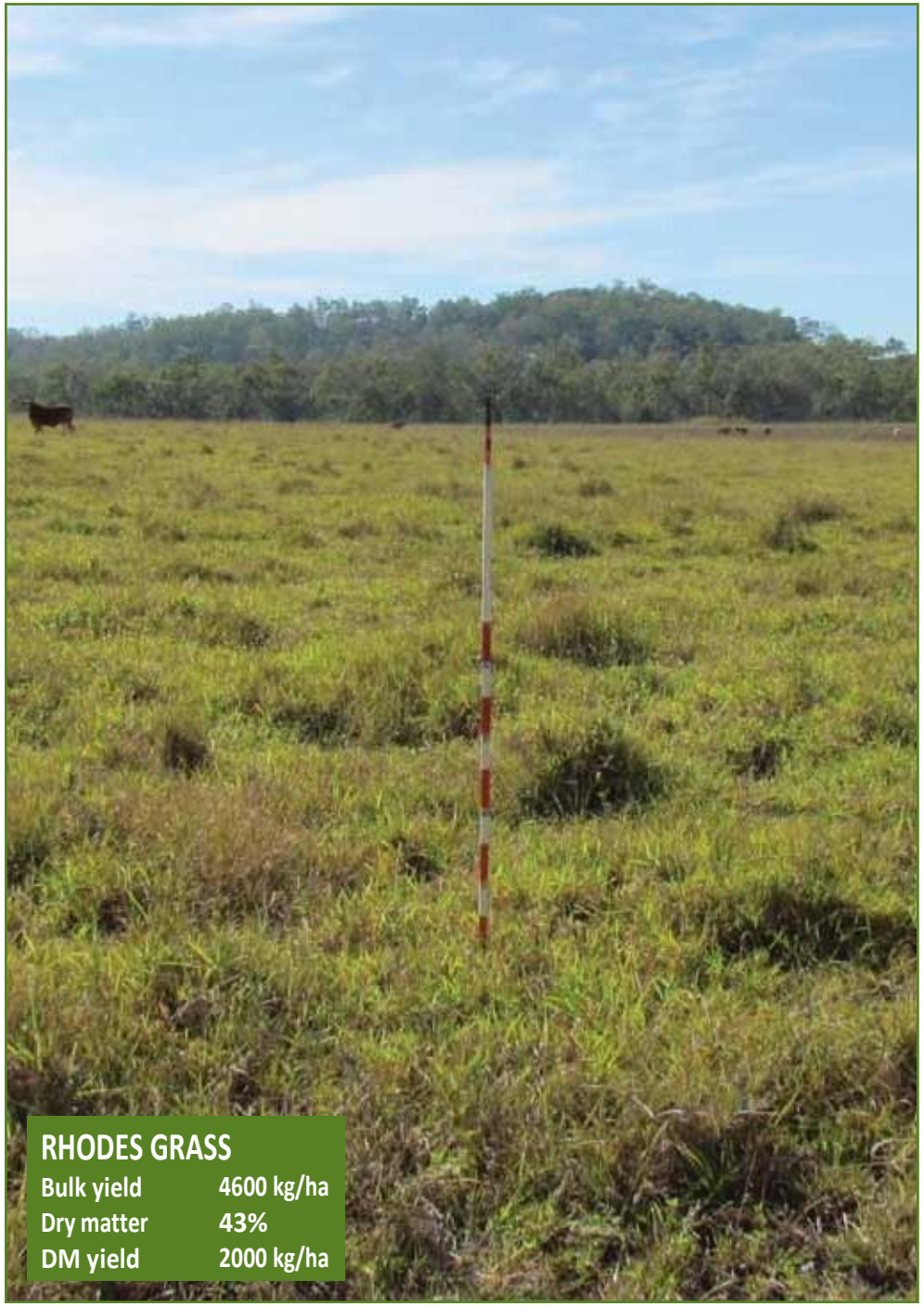
Rhodes grass (*Chloris gayana* c.v. Callide)

Strengths

- Very palatable and productive
- Very drought tolerant
- Good option for hay production
- Good salt tolerance
- Easily established, is an excellent companion grass with many of the stoloniferous varieties as it provides quick cover
- Can spread by runners although this is sporadic season to season

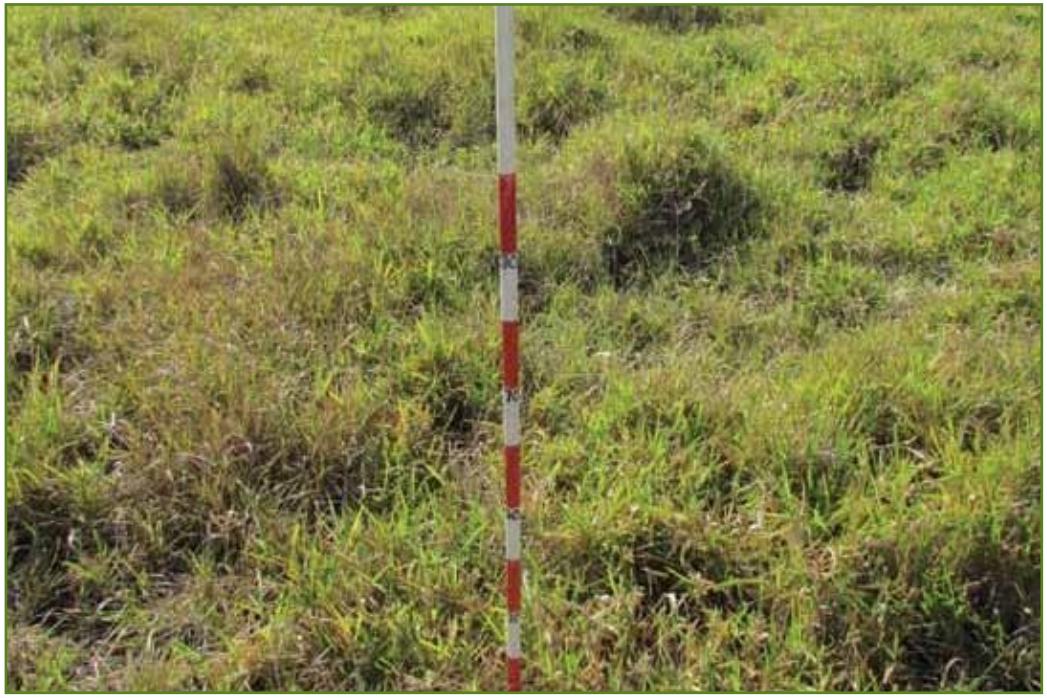
Limitations

- High palatability can mean it is over utilised in paddocks with mixed species.
- As a tussocky species tends to have less weed competitiveness than the other stoloniferous species
- In Mackay Whitsunday, Rhodes grass is a decreaser species (as grazing pressure increases it tends to decrease)
- Not adapted to acid, infertile soils
- Not tolerant of high exchangeable aluminium levels
- Requires high fertility to persist
- Quality drops rapidly with onset of seeding
- Low shade tolerance
- Poor tolerance of waterlogging



RHODES GRASS

Bulk yield	4600 kg/ha
Dry matter	43%
DM yield	2000 kg/ha



RHODES GRASS

Bulk yield	5100 kg/ha
Dry matter	49%
DM yield	2500 kg/ha

RHODES GRASS

Bulk yield	6600 kg/ha
Dry matter	48%
DM yield	3200 kg/ha

RHODES GRASS

Bulk yield	9200 kg/ha
Dry matter	28%
DM yield	3500 kg/ha

RHODES GRASS

Bulk yield	10000 kg/ha
Dry matter	60%
DM yield	6000 kg/ha

RHODES GRASS

Bulk yield	12100 kg/ha
Dry matter	66%
DM yield	8000 kg/ha

RHODES GRASS

Bulk yield	13300 kg/ha
Dry matter	33%
DM yield	4500 kg/ha

RHODES GRASS

Bulk yield	21000 kg/ha
Dry matter	43%
DM yield	9000 kg/ha

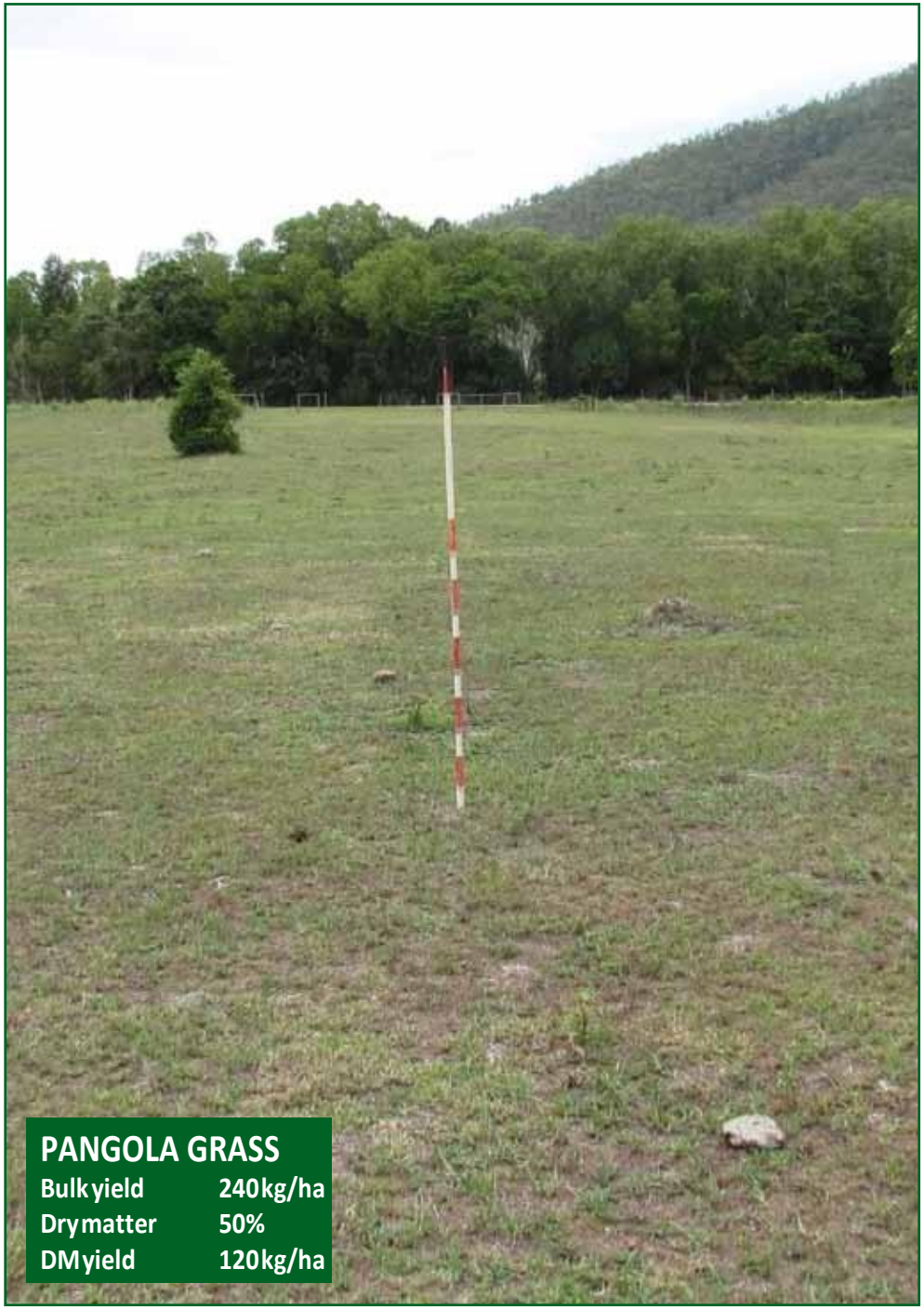
Pangola grass (*Digitaria eriantha*)

Strengths

- High palatability and good average yield
- Good stem to leaf balance
- Little rank growth if under utilised
- Good option for hay production
- Maintains good nutritive value even at maturity
- Tolerant of heavy grazing, water logging, drought, and fire
- Moderately tolerant of soil salinity and high aluminium
- Tolerant to varying pH levels (4.5 – 8.5)
- A stoloniferous grass (spreads by runners) that will compete well with weeds

Limitations

- Low germination rates in seed means vegetative planting through runners only
- Limited cool season growth
- Susceptible to Pangola stunt virus and rust, although yield effects are minimal in this region.
- High palatability can lead to over utilisation in paddocks where there is a mixture of species



PANGOLA GRASS

Bulk yield	240kg/ha
Dry matter	50%
DM yield	120kg/ha

PANGOLA GRASS

Bulk yield	3900 kg/ha
Dry matter	38%
DM yield	1500 kg/ha

PANGOLA GRASS

Bulk yield	4200 kg/ha
Dry matter	47%
DM yield	2000 kg/ha

PANGOLA GRASS

Bulk yield	4200 kg/ha
Dry matter	79%
DM yield	3320 kg/ha

PANGOLA GRASS

Bulk yield	5900 kg/ha
Dry matter	64%
DM yield	3800 kg/ha

PANGOLA GRASS

Bulk yield	7700 kg/ha
Dry matter	62%
DM yield	4800 kg/ha

PANGOLA GRASS

Bulk yield	9000 kg/ha
Dry matter	42%
DM yield	3800 kg/ha

PANGOLA GRASS

Bulk yield	18400 kg/ha
Dry matter	38%
DM yield	7000 kg/ha

PANGOLA GRASS

Bulk yield	19000 kg/ha
Dry matter	38%
DM yield	7400 kg/ha

Tully grass (*Brachiaria humidicola* cv. Tully)

Strengths

- Highly productive, high yielding
- Tolerant of heavy grazing
- Can be sown on a variety of soil types and tolerant of harder conditions
- Tolerant of waterlogging and some flooding.
- One of the most competitive grasses available to problem weeds. The best available sown species option against Giant Rat's Tail grass

Limitations

- Dormancy in fresh seed.
- Very difficult to establish legumes due to competitive nature.
- Nutritive value can be slightly lower than other sown species
- Can be slow to establish from seed
- Can be unpalatable to stock

TULLY GRASS

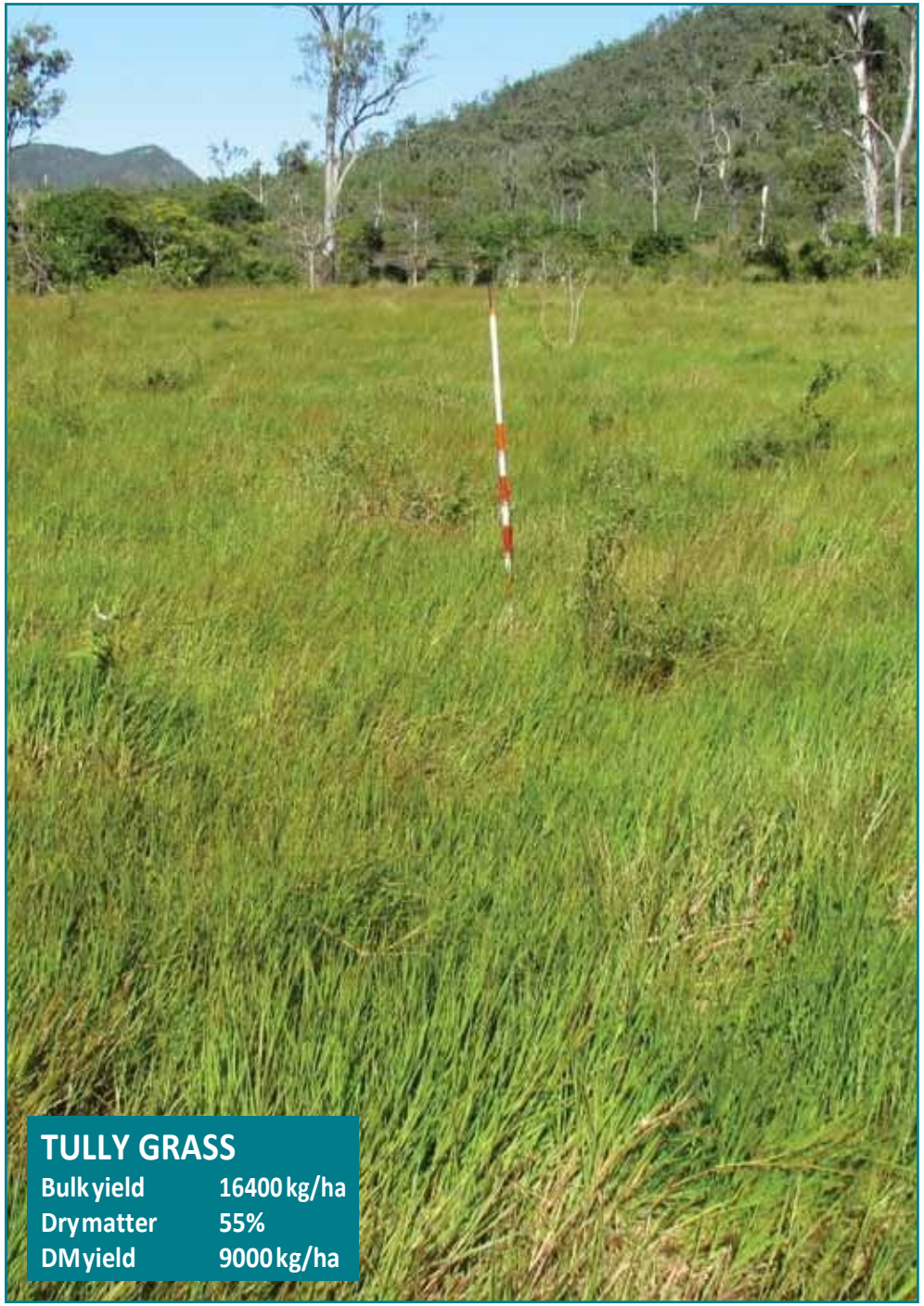
Bulk yield	3700 kg/ha
Dry matter	55%
DM yield	2000 kg/ha

TULLY GRASS

Bulk yield	4300 kg/ha
Dry matter	55%
DM yield	1200 kg/ha

TULLY GRASS

Bulk yield	13800 kg/ha
Dry matter	55%
DM yield	7600 kg/ha



TULLY GRASS

Bulk yield	16400 kg/ha
Dry matter	55%
DM yield	9000 kg/ha

TULLY GRASS

Bulk yield	17700 kg/ha
Dry matter	25%
DM yield	4400 kg/ha

Kazungula grass (*Kazungula sphacelata* cv. Kazungula)

Strengths

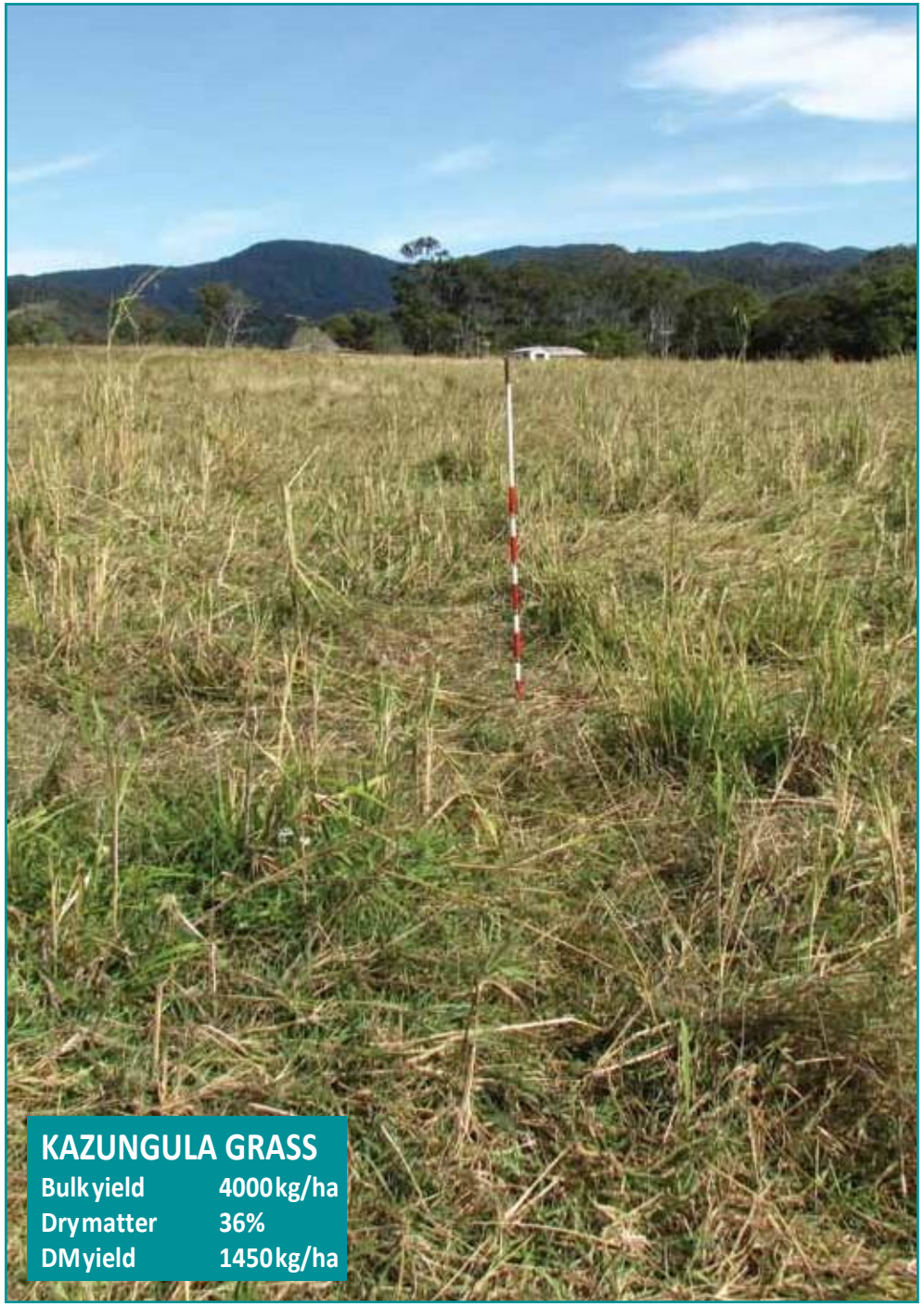
- Establishes easily from seed
- Persists under moderate grazing
- Adapted to a wide range of soils
- Responds well to fertiliser nitrogen
- Tolerant of flooding and water logging
- Some lines frost tolerant
- High forage production early spring, summer, and autumn
- Although little growth occurs in winter, green leaf carries well into winter

Limitations

- Quality drops rapidly with onset of seeding
- Lower comparative palatability to other species can be an issue in paddocks with mixed species, leading to under-utilisation
- Tussock growth and height can mean problems for weed identification and control in Mackay Whitsunday

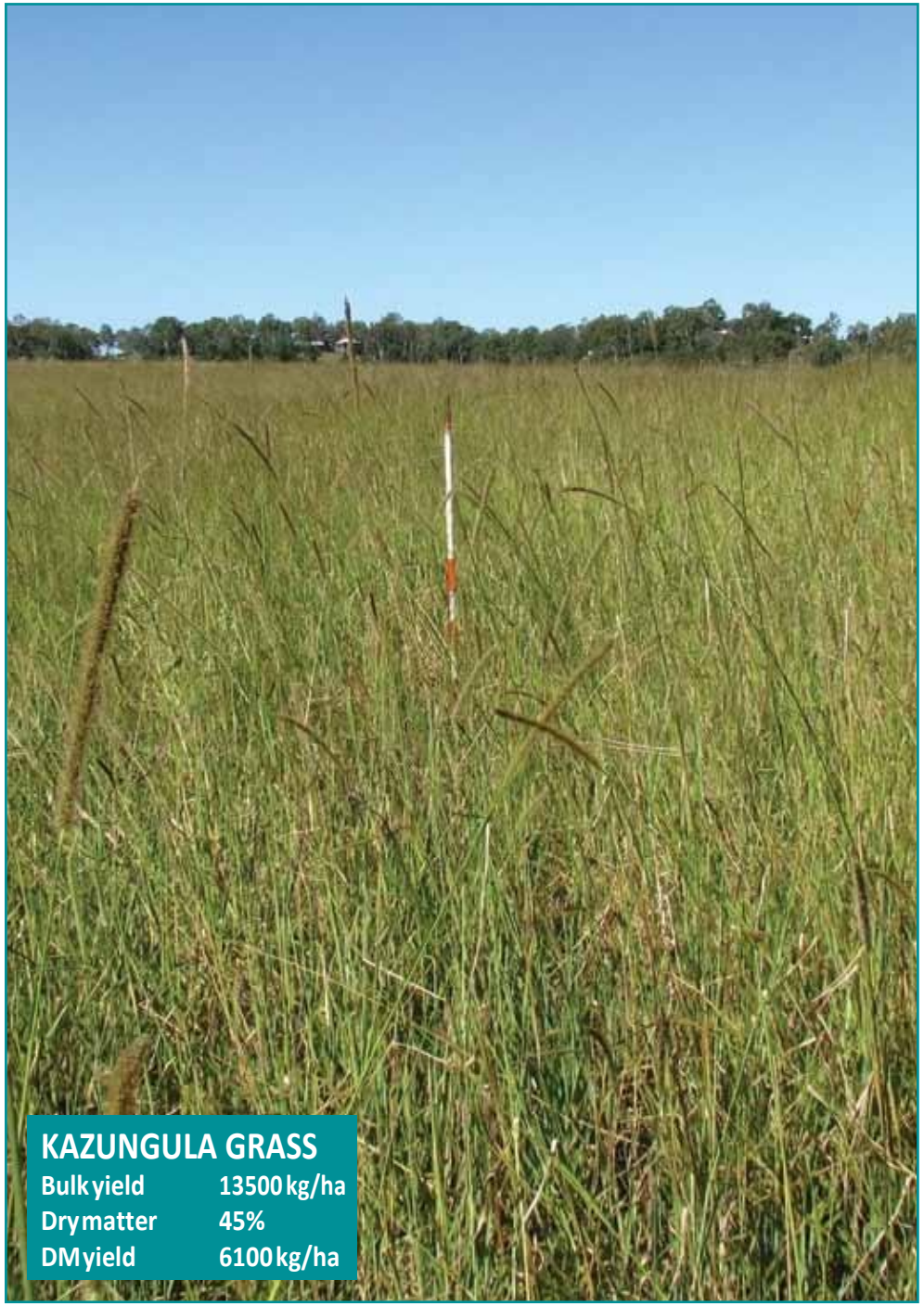
KAZUNGULA GRASS

Bulk yield	2500 kg/ha
Dry matter	47%
DM yield	1200 kg/ha


KAZUNGULA GRASS
Bulk yield 4000 kg/ha
Dry matter 36%
DM yield 1450 kg/ha

KAZUNGULA GRASS

Bulk yield	6800 kg/ha
Dry matter	45%
DM yield	3000 kg/ha



KAZUNGULA GRASS

Bulk yield	13500 kg/ha
Dry matter	45%
DM yield	6100 kg/ha

KAZUNGULA GRASS

Bulk yield	16900 kg/ha
Dry matter	45%
DM yield	7600 kg/ha

KAZUNGULA GRASS

Bulk yield	19760 kg/ha
Dry matter	32%
DM yield	6300 kg/ha

Further reading

FutureBeef website: https://futurebeef.com.au/

MLA website: https://www.mla.com.au/