# Can sustainable pasture utilisation rates be derived from commercial paddock data in the Northern Territory?

Walsh, D. and Cowley, R.

NT Department of Resources, GPO Box 3000, Darwin NT, 0801

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## Abstract

Sustainable pasture utilisation rates are the cornerstone of the grazing industry because they directly determine carrying capacity. To date, we have been able to determine utilisation rates only by using expensive, time-consuming grazing trials. This study successfully tested a quick, cost-effective approach based on a method used previously in Queensland that retrospectively calculates utilisation rates using station cattle records and pasture growth predictions. Our results indicate that an average utilisation rate of up to 30% appears to be sustainable in paddocks with uniform, grey cracking-clay soils on the Barkly Tableland. However, this level of utilisation negatively impacts on preferred pastures and less robust soil types.

## Introduction

In central and northern parts of the NT, increased intensification via paddock subdivision and water point development is currently occurring (Dyer *et al.* 2001, Oxley 2004). Consequently, there is a need to identify pasture utilisation rates that will achieve the desired level of cattle production without degrading pastures. "Sustainable utilisation rates" are defined as the proportion of annual forage production that can be consumed without adversely affecting land condition (Hunt 2009, McKeon *et al*. 2009). Utilisation rates directly determine carrying capacities and are therefore the foundation of a sustainable grazing industry.

Until recently, the only objective information on safe utilisation rates in the NT was from grazing trials and case studies on fertile cracking clays in the Victoria River District (Hunt *et al.* 2010). Grazing trials are expensive and time-consuming and it is unrealistic to expect that they can be conducted on all important land types in the NT. What is needed is a quick, cost-effective and repeatable method for determining utilisation rates. The objective of this study was to test such a method used successfully in Queensland.

## Methods

We used the method described by Johnston *et al.* (1996) which compares pasture intake and pasture growth to retrospectively calculate an average utilisation rate on "benchmark properties". The assumption underpinning the approach is that paddocks in good condition must have been managed using sustainable utilisation rates.

We calculated average utilisation rates for ten paddocks on three properties on the eastern side of the Barkly Tableland. The paddocks were chosen to meet the following criteria:

1. Good land condition (informed by a combination of producer opinion, visual assessment and records from monitoring sites).
2. Accurate records of cattle numbers and class.
3. A scientific understanding of pasture growth for the land type/s in the paddock.
4. Uniformity of land type.
5. At least ten years of grazing use.

Utilisation of annual forage <u>growth</u> (rather than standing yields) has been used in this study (Johnston *et al*. 1996, Hunt 2008): Utilisation Rate (%) = Pasture Intake (kg dry matter)/Pasture Growth (kg dry matter) X 100. Pasture intake was calculated by converting station stock records to animal equivalents (Chilcott *et al*. 2005) and multiplying by a standard daily intake figure (8kg/AE/day) to determine herd intake. Pasture growth was estimated using monthly median pasture growth outputs by vegetation type from the AussieGRASS model (Carter *et al.* 2000). These growth estimates were compared to data from field records, the literature and agency datasets to confirm their veracity and were subsequently used to estimate the amount of growth available for consumption within 5km of water for each paddock. Utilisation rates were subsequently calculated for each year, defined as starting at the beginning of the pasture growth season.

## Results

It was relatively hard to find study paddocks that met all the criteria. Sometimes paddocks had excellent stock records but were not in good land condition whilst others had insufficient sequences of accurate stock records. The ten chosen paddocks met the criteria for stock records and grazing duration, but were not always uniformly in good condition. However, this provided some insights into utilisation rate thresholds for different land types.

Paddocks with lower utilisation rates tended to have more country in A condition and paddocks with higher utilisation rates tended to have more country in B and C condition (Table 1). The exception was Paddock 1G, which had an average utilisation rate of 33% but did not contain any C condition country. This was the smallest paddock in the study and contained only one (highly productive) land type. It also experienced five early wet-season spells in ten years.

Interestingly, the highest stocking rates occurred in the four paddocks with mid-range utilisation rates (Table 1). All four exceeded the recommended stocking rates of 4.6-5.8 beasts/km² suggested by Holt & Bertram (1981) and two of the paddocks also exceeded the stocking rate of up to 7.1 head/km² recommended by Tothill & Gillies (1992). It would seem counter-intuitive that high stocking rates could be sustainable, but closer inspection of the data revealed that these paddocks had high average annual pasture growth over the study period (>1,200kg/ha).

Table 1. Details of the ten case study paddocks on the Barkly Tableland, in order of increasing average utilisation rate. Land systems descriptions can be found in Christian *et al.* (1954). Land condition is based on A = good, B = fair, C = poor and D = degraded land condition (Chilcott *et al*. 2005). The waters in the paddock include semi-permanent & permanent surface waters.

| Paddock Name | Study Time Period | Land Systems in Study Paddocks (percentage by area) | Land Condition | Paddock Size ($km^2$) and area within 5km of water (%) | Number of Waters in the Paddock | Average Utilisation Rate (5km Watered Area) | Average Stocking Rate (5km Watered Area) during Study($AE/km^2$) |
|---|---|---|---|---|---|---|---|
| 1A | January 2000-June 2009 | Barkly 3 (40%), Wonorah/Barkly 1 (36%), Wonorah (24%) | Mostly A & B with small areas of C near waters | 451 (76%) | 7 | 19% | 5.4 |
| 1B | January 2000-June 2009 | Barkly 3 (100%) | Mostly B with some areas of A | 181 (84%) | 5 | 20% | 4.7 |
| 1C | January 2000-June 2009 | Barkly 1(62%), Barkly 2 (19%), Wonorah (19%) | Mostly A & B with small areas of C near waters | 131 (83%) | 3 | 22% | 5.1 |
| 1D | January 2000-June 2009 | Barkly 1 (100%) | A and B | 146 (63%) | 3 | 23% | 6.8 |
| 1E | January 2000-June 2009 | Barkly 2 (38%), Wonorah/Barkly 1 (24%), Wonorah (21%), Barkly 1 (9%), Yelvertoft (4%), Barkly 3 (3%) | Mostly A & B with small areas of C near waters | 528 (67%) | 10 | 29% | 7.3 |
| 2A | January 2002-August 2009 | Barkly 2 (20%), Barkly 3 (80%) | Mostly B with areas of C near waters | 471 (97%) | 12 | 30% | 9.2 |
| 1F | January 2000-June 2009 | Barkly 1 (100%) | Mostly A & B with small areas of C near waters | 262 (84%) | 5 | 32% | 7.1 |
| 1G | October 1999-June 2009 | Barkly 1 (100%) | A and B | 69 (67%) | 2 | 33% | 5.2 |
| 3A | January 2002-June 2009 | Austral (90%), Kallala (9%), Sylvester (1%) | Mostly B with some areas of A. Areas of C near waters and creeklines | 220 (97%) | 6 | 45% | 4.9 |
| 3B | January 2000-June 2009 | Austral (76%), Wonardo (24%) | Mostly B with some areas of A. Areas of C near waters and creeklines | 247 (97%) | 4 | 142% (heavily skewed by the poor 2007/08 wet season). When this year is excluded, the average UR is 40% | 5.1 |

## Discussion

Stocking rates that result in an average utilisation rate of up to 30% appear to be sustainable for uniform, cracking grey clay soil types (e.g. Mitchell grass plains) in the Barkly region. However, this level of utilisation negatively impacts on less robust soil types and on preferred areas such as creek lines and bluebush swamps. In general, the best performing paddocks in terms of land condition had utilisation rates less than 25%. The only exception to this was Paddock 1G, which had five wet season spells in ten years.

Four paddocks had stocking rates in excess of levels recommended in the literature. Of these, the two that had at least one wet season spell (1D and 1F) had better land condition than the two that were continuously grazed (1E & 2A). This provides some support for the idea that higher stocking rates could be maintained on Mitchell grass pastures on the Barkly if wet season spelling is practiced (Materne 2005). We would qualify this by suggesting that slightly higher stocking rates with regular wet season spelling is likely to be more successful in paddocks with uniform Mitchell grass pastures than in paddocks with mixed soil types. More evidence is required before this recommendation can be confidently supported.

Ideally, longer spans of accurate stock records would give us greater confidence in the recommendations; however, we have found that these are very difficult to come by. This could be overcome by following some of our case study paddocks into the future to increase the evidence base. Such an approach would also allow for on-ground estimates of pasture growth each year which could be used to ground-truth the pasture growth model outputs. Despite the challenges of locating suitable case study paddocks, this study has demonstrated that this relatively quick, cost effective approach for calculating pasture utilisation rates can be successfully applied in the Northern Territory.

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