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Pasture legumes for high-quality dry-season cattle forage on red basalt soils in north Queensland

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Beef cattle production in the seasonally dry zone of north Queensland is based on uncleared native grasslands. Rainfall-related cycles in native grass growth and maturation results in low levels of dietary protein and metabolisable energy during the dry season (May-October in most years), which limits animal growth and business productivity (Rolfe *et al.* 2016). Sown legumes (notably *Stylosanthes* spp.) can improve the seasonal supply and quality of feed on infertile soils used for extensive grazing (Anon 1994) and is the best option to improve business resilience and profitability (Bowen *et al*. 2019). The Department of Agriculture and Fisheries is testing 'production paddocks' using pasture legumes grown in strips (as one option) and supplementing soil available phosphorous (P) and/or sulphur (S) to improve dry-season diets. Initially a range of pasture legumes were grown in replicated (3) small plots on 14 land-types to identify legume (and grass) lines for subsequent research. The results presented here represent red basalt soils near Mt. Surprise in north Queensland, characterised by high available soil P and low S. This land-type can produce 2900 kg DM/ha native grass in good condition (Ash *et al*. 2016), but is often degraded and invaded by low biomass grasses (e.g. *Bothriochloa pertusa*).

Twenty-nine legumes (14 taxa groups) were sown in rows into a cultivated site in 2014 (tines and glyphosate). Fertiliser S (24 kg/ha) was applied pre-plant only. After the establishment year, the plots were 're-set' each season by cutting (10 cm) after a ‘green date’ (50 mm rainfall over 4 weeks) and grown without grazing until the season was considered finished (no forecast rainfall). Herbage yield was measured (two 0.3 m^2 quadrats per plot; drying at 70°C until constant weight) and separated into leaf (leaves and fine material (< 2 mm stems) or stems). The plots were then grazed to a residual of ~1500 kg DM/ha. Sub-samples of leaf and stem grown for similar periods, but sampled in subsequent years, were analysed for feed value using wet chemistry procedures (Dairy One™).

Herbage yields are presented for years two and three after the establishment year (when effects due to cultivation are likely to have subsided) (Table 1). Other legume species (*Centrosema spp., Macroptilium gracile*) did not persist beyond the first year despite establishing well (data not presented). Some legumes produced high total herbage yields (notably *Stylosanthes seabrana* and *S. scabra*) but a large proportion of this was stem. Yields were highest in year 2, which had the longest growing period and highest rainfall component. Of the most persistent legumes, *C. ternatea, S. seabrana* and *S. scabra* produced the most leaf (<2.5 T DM/ha). High quality feed was produced in the dry season. The feed value of the legume leaf was high (~14-21% crude protein (CP); 8.2-9.5 MJ/kg metabolisable energy (ME)) for all legumes but lower for stem particularly for the erect shrubby types with thicker stems (*Desmanthus, S. scabra, S. seabrana*). Feed quality (crude protein and metabolisable energy) of plants sampled 15 weeks after the onset of the growing season was higher than for samples collected after 26 weeks.

Table 1. Mean herbage yields[A] and feed quality of legumes grown on a red basalt soil (kraznozem) in north Qld, sampled during the early and mid- dry season[B] and separated into leaf and stem components. The plots were sown on 4 March 2014

	Herbage yield (T DM/ha)								Crude protein (% wt DM)				Metabolisable Energy (MJ/kg)			
	28 months after sowing				38 months after sowing											
	27 weeks growth* (875 mm) 26 June 2016				16 weeks growth* (521 mm) 27 April 2017				15 weeks growth* (469 mm) 6 May 2020		26 weeks growth* (651 mm) 13 June 2018		15 weeks growth* (469 mm) 6 May 2020		26 weeks growth* (651 mm) 13 June 2018	
	Leaf		Stem		Leaf		Stem		Leaf	Stem	Leaf	Stem	Leaf	Stem	Leaf	Stem
Clitoria ternatea	1.93	*0.42*	2.71	*1.20*	2.65	*0.62*	1.46	*0.27*	20.8	10.4	17.8	6.6	8.9	5.4	8.4	5.0
Desmanthus spp.	1.09	*0.19*	2.45	*0.29*	0.66	*0.11*	1.36	*0.18*	15.0	5.7	13.8	6.1	9.5	5.6	8.2	6.3
Macroptilium atropurpureum	1.02	*0.26*	1.26	*0.21*	-		-		15.2	9.4			8.3	6.6		
M. bracteatum	0.48	*0.18*	1.19	*0.59*	-		-				14.2	5.5			9.5	5.9
Stylosanthes guianensis	1.63	*0.29*	2.22	*0.41*	0.64	*0.14*	0.81	*0.17*	15.0	8.8			8.7	5.8		
S. hamata	0.55	*0.17*	0.94	*0.37*	-		-		17.4	9.7			9.3	7.1		
S. scabra	2.88	*0.73*	5.70	*1.46*	1.45	*0.27*	2.01	*0.39*	17.6	7.2	14.3	6.7	8.2	4.9	9.3	5.3
S. seabrana	2.40	*0.35*	8.45	*1.58*	2.61	*0.30*	6.01	*0.71*	18.0	7.9	16.4	5.9	8.9	5.6	9.0	5.6

[A]Standard errors of herbage yield means are represented in italics.
[B]The growing period is denoted with * and represents since green date (50 mm rainfall within 4 weeks).

The use of legume strips sown into native grasslands has potential to significantly increase the volume and quality of feed during the early- to mid- dry season on red basalt soils in north Queensland and warrants testing on a semi-commercial scale. Research should target maximising the amount of legume leaf produced during the dry season through testing grazing management strategies and measuring animal performance and pasture productivity and stability.

References

Anon (1994) Forest Home weaner nutrition demonstration. Internal report. Department of Primary Industries, Brisbane.
Ash AJ *et al* (2011) *Rangeland Ecology and Management.* **64**, 223–239.
Bowen MK *et al* (2019) Northern Gulf production systems. DCAP project. Department of Agriculture and Fisheries, Brisbane.
Rolfe JW *et al* (2016) *The Rangeland Journal* **38**, 261–272.

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