THE VALUE OF NATIVE PASTURE HAY IN WESTERN QUEENSLAND

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SUMMARY

The value of native pasture hay for supplementation of weaner sheep was examined at three sites in western Queensland. Hay cut early at one site contained 42% more nitrogen than hay cut 6 weeks later. Early cut hay from another site contained sufficient nitrogen to allow liveweight gain in weaners. This hay comprised 38% forbs compared with 10 and 30% at the other sites. Spoilage from rain water was prevented or reduced by storing hay in a shed or above ground. Rate of harvesting was related to selection of site for maximum recoverable yield and minimum machine hours per tonne. Pasture hay production is a viable husbandry procedure if quantity and quality of the hay are adequate.

(Keywords: pasture hay, production, quality, storage, western Queensland)

INTRODUCTION

The advent of large round bales has improved the feasibility of pasture hay conservation in western Queensland. Excess pasture (l-3 t/ha) after normal wet seasons can be stored for dry season supplementation of weaner sheep to reduce losses of 10–15% which can occur when pastures are mature in dry spring months (Rose 1972). To determine the nutritive value of large round bales (500 kg) of pasture hay, native pastures in three districts were harvested and stored. Samples from bales were taken periodically to measure changes in quality over 10 months, the feed value of hay made from early and late cut pasture, and the effects of different methods of storage. The performance of weaners fed hay from each site was determined.

MATERIALS AND METHODS

Site 1, a predominantly Mitchell (Astrebla spp.) and Flinders (Iseilema spp.) grass sward with approximately 10% forbs was selected on relatively even ground at Toorak Research Station, Julia Creek (Lat 21°S, Long 141°E). Pasture was harvested over a 6 week period (February-March) which coincided with the maturation (flowering and seed setting) of the grass and light rainfall (19 mm) in weeks 4 and 5. Site 2 had a predominantly Mitchell grass sward with blue (Dichanthium spp.) and Panicum grasses and 38% forbs on rough ground at Croxdale Research Station, Charleville (Lat 26°S, Long 141°E). Pasture was harvested during March immediately before maturity. At site 3, the sward of mainly Panicum grass with 30% forbs was on relatively smooth ground on "Moonjaree", a property 200 km south of Croxdale. Pasture was harvested 4 weeks later than at Croxdale and after the grass had matured. Rainfall recorded for the 3 months before harvest was 379, 207 and 171 mm for sites 1, 2 and 3. Plucked samples of grasses and forbs were obtained immediately before harvest at each site. Four hours elapsed between cutting and baling.

At site 1, eight grab samples were bulked from each of 12 bales made in week 1 (early cut) and again from 12 made in week 6 (late cut). Immediately after sampling, all bales were stored in a shed. At site 2, 14 bales were sampled in the same manner. Six were raised off the ground onto round timber rails to reduce deterioration from soil moisture, six remained on the ground, and two were stored

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in a shed. At site 3, after sampling, four bales were stored in a shed and another eight in the open, on rails or on the ground. At all sites, each bale was sampled within 1 week of harvest and at 4 and 10 months. During this time 100 mm of rain were recorded at sites 2 and 3. Grab samples were obtained 20+ cm within the bale from material not weathered. Observations were made on the apparent loss of hay through- water spoilage.

Nitrogen (N) content was determined on all samples by the Kjeldahl method, and cell wall content (CWC) by the method described by Moir (1971). In two separate experiments, hay from the three sites was offered to groups of six weaner sheep aged between 16 and 20 weeks. In both experiments, ad lib intake and liveweight change and wool growth over a 35 day period were measured after a 28 day pre-measurement period.

Records were kept of pasture yield, tonnes per ha recovered as hay, time taken to harvest, plus fuel, repair and labour costs. Capital expenditure of baling equipment was estimated and cost per tonne of hay calculated. Both variable and fixed costs were determined.

RESULTS

Dry matter yield of pasture and yield of hay varied considerably between the sites. Method of storage had no apparent effect on N and CWC of hay made at each site (Table 1).

Table 1 Dry matter yield of pasture, yield of hay and effect of method of storage on nitrogen (N) and cell wall content (CWC)

Site		1. Early cut		1. Late cut		2. Early cut		3. Late cut	
		%N	%CWC	%N	%CWC	%N	%CWC	%N	%CWC
Pasture yield (kg/ha)		1300		1750		1000		1300	
yield of hay (%)		78		78		50		70	
Storage									
On ground	(a)	-	-	-	-	1.23	75.9	0.94	76.5
	(b)	-	-	-	-	1.26	74.0	0.85	77.6
	(c)	-	-	-	-	1.22	75.5	0.98	77.7
Above ground	(a)	-	-	-	-	1.07	76.0	1.26	75.0
	(b)	-	-	-	-	1.07	77.0	0.96	77.9
	(c)	-	-	-	-	1.12	75.4	0.94	77.6
Shedded	(a)	0.93	72.2	0.58	79.8	0.91	79.0	1.06	74.1
	(b)	0.88	76.2	0.58	77.0	1.07	78.3	0.90	76.1
	(c)	0.91	76.2	0.56	82.3	0.80	77.3	0.93	79.0

a, b, c = 1 week, 4 months, 10 months after baling.

The effects of stage of maturity and storage time on N and CWC are presented in Table 2. In week 1 at site 1 %N of plucked grasses and forbs was 0.95 and 0.98 respectively, and %CWC 76.3 and 73.4, while in week 6 the values were 0.55 and 0.96 and 81.4 and 69.4.

Nitrogen content, and dry matter intake of pasture hay from three sites together with liveweight change and wool growth of weaners fed the hay are presented in Table 3. Dry matter intake per kilogram of metabolic live weight is

also presented because of the differences in mean live weight of groups. costs of haymaking are presented in Table 4. There were marked differences in machine hours per hectare and per tonne, with consequent differences in variable costs. Fixed costs at $4 000/yr are assumed to arise from ownership of baler, rake and mower.

Table 2 Nitrogen (N) and cell wall content (CWC) of pasture and hay

Sampling	Site 1		Site 2		Site 3	
	%N	%CWC	%N	%CWC	%N	%CWC
Plucked pasture - early cut	0.96	75.3	1.41	n.d.	-	-
- late cut	0.69	77.4	-	-	0.77	77.4
1 week* - early cut	0.93	72.2	1.07	77.0	-	-
- late cut	0.58	79.8	-	-	1.16	74.6
4 months* - early cut	0.88	76.2	1.13	76.4	-	-
- late cut	0.58	77.0	-	-	0.90	77.2
10 months* - early cut	0.91	76.2	1.05	76.1	-	-
- late cut	0.56	82.3	-	-	0.96	78.1

* Approximate time of sampling after baling

Table 3 Nitrogen content and dry matter intake of pasture hay, and liveweight change and wool production of weaners fed the hay

Measurements	Site 1 late cut	Site 2 early cut	Site 3 late cut
Nitrogen (%)	0.70	1.05	0.85
Dry matter intake (DMI) (g/d)	562	759	714
DMI/kg 0.75 live weight	49.0	65.6	69.0
Liveweight change (g/d)	-50	17	-1
Clean wool production ($mg/cm^2/d$)	0.504	0.449	0.469

Table 4 Cost of haymaking using round balers

Recordings	Site 1	Site 2	Site 3
Area harvested (ha)	50	17	18
Tonnes of hay/ha	1.2	0.5	0.9
Machine hours/ha	1.4	2.0	2.1
Machine hours/t	1.2	4.0	2.6
Fuel cost at 40 c/L ($)	284.00	143.00	155.00
Labour cost at $8/h ($)	545.00	268.00	308.00
Repairs at $4.60/h ($)	313.00	156.00	170.00
Total variable cost ($)	1 142.00	567.00	633.00
Variable cost/t ($)	18.40	66.70	38.60
Fixed cost/t ($)	65.00	470.00	244.00

DISCUSSION

This study demonstrates that harvesting pasture hay of reasonable quality could provide an on-property fodder for maintaining weaners through periods of nutritional stress. Harvesting before plant maturity and,-where possible, selecting a pasture sward with a large component of forbs maximises hay quality. A marked decrease (42%) in N content occurred in late cut hay at site 1 where grass comprised 90% of the pasture sward. However, the forbs plucked from the pasture maintained high N and low CWC content over the harvesting period. Grazing experiments have highlighted the relationship between forbs in the diet and animal performance (Lorimer 1978). Deficiencies in mineral content of mature grass could also affect weaner performance (McMeniman, pers. corn.). Where grasses are mature and forbs are not available, hay requires fortification before feeding to ensure live weightismaintained (Stephenson et al. 1984).

Dry matter yields at the three sites indicate the different quantities of hay that can be obtained given the rainfall that was recorded before harvesting. The variation in the quality of hay between sites provides a guide to the expected animal performance. At site 2 initial variation also occurred between storage treatments. Weaners were fed "above ground" hay which, based on N and CWC values, provided a level of nutrition intermediate between the other two treatments. The average difference of four percentage points in CWC between the early and late cut hay both within and between sites represents 0.6 MJ ME/kg of dry matter. The N content and CWC of pasture at time of harvesting have more effect on the ultimate nutritive value of the hay than do changes in these values during storage. Observations suggest that hay to a depth of 10–15 cm on the top of the bale and 15-30 cm on the bottom was spoilt in bales stored on the ground. Total losses averaged 15% for bales on rails to 30% for bales on the ground. This loss is in agreement with findings by Wickes and Cochrane (1982) who reported dry matter losses of up to 38% over an 8 month period because of wind and rain. In western Queensland storage of hay above ground on rails is a realistic alternative if shed storage is not available.

The economic assessment of baling hay indicates that production cost per tonne is high. The primary determinant of variable cost per tonne (i.e., machine hours) needs to be reduced, and that of fixed cost per tonne (i.e., tonnes of hay per year) needs to be increased. If yields of 2 t/ha can be reached or if 1 t/h can be harvested, then the variable cost would be approximately $10/t. If 500 t/yr were produced, the total cost per tonne (variable + fixed) would be less than $20. Sheep owners in these districts report throughputs of 50 t/d with good sites and machinery. Hay with a metabolisable energy content of 7 MJ/kg and costing $20/t on-property compares favourably with purchased feedstuffs. Therefore, not only the quality but also the quantity of the on-property pasture hay must be adequate to ensure the success of this venture.

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