HERBAGE PRODUCTION FROM NATIVE GRASSES AND SOWN PASTURES IN SOUTH-WEST QUEENSLAND

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ABSTRACT

Based on a single harvest taken in autumn 1963 after abundant summer rains of from 7.5 in. in the far west to 22 in. in the east, semi arid native plant communities gave air dried pasture yields of 1200 lb/acre from land formerly under mulga scrub and 2000 lb from Mitchell grassland.

Contrasted with these yields, sown buffel grass pastures gave 2000 lb on land formerly under mulga scrub, 2800 lb on land earlier under poplar box forest and 5600 lb on such land which benefited from run-on water. The present range of introduced grasses is not adapted to the heavy soils of the Mitchell grassland, and comparisons with this native plant community cannot be drawn.

INTRODUCTION

The far south western Queensland shires of Murweh, Paroo, Bulloo and Quilpie and parts of Booringa and Balonne comprise nearly 100,000 sq. miles and support four million sheep and a quarter million cattle. At one cattle equivalent to six sheep the grazing intensity over the whole area amounts to a sheep to 12 acres. This varies from a sheep to three acres on Mitchell (*Astrebla spp.*) grassland and creek frontages to a sheep to 20-30 acres on mulga (*Acacia aneura*) scrubs and poplar box (*Eucalyptus populnea*) forests.

Rainfall over the area is highly variable both in amount, time of occurrence and is of a torrential nature, the latter characteristic being partly responsible for rapid run-off. Droughts are a common feature of the climate. Landholders mitigate the effects of low rainfall by lightly stocking pastures, delayed mating of ewes, purchased fodders, lopping branches or pushing over fodder trees and by pasture improvement through clearing timber and sowing introduced grasses.

Increasing interest in pasture improvement in the semi-arid western areas of Queensland calls for assessment of the productivity of introduced grasses against that of native plant communities. Enthusiasts either over-estimate the value of introduced grasses and dissenters condemn them outright.

Credit goes to Davies, Scott and Kennedy (1938) for being the first to have recorded presentation yield of Mitchell (*Astrebla* spp.) grassland in central western Queensland. Subsequently Roe and Allen (1945) published yield data from a Mitchell grassland in south western Queensland.

PASTURES AND METHODS OF SAMPLING

Summer herbage yields of five native plant communities and fourteen pastures of introduced grasses in 19 localities after good rains in December 1962 to April 1963 were measured in autumn 1963. Pasture yields in terms of air-dry material were obtained from random sample areas of 0.04 acre each. Composite soil samples consisting of six sub-samples were taken from the 0-3" horizon and were analysed for pH and phosphorus.

Common species in the five native plant communities were:
CHARLEVILLE, (Town Common): Open forest dominated by cypress pine (*Callitris columellaris*) and carbeen (*Eucalyptus tesselaris*) with sand wiregrass

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(*Aristida jerichoensis*), silver spike grass (*Digitaria brownei*), comet grass (*Perotis rara*) and red Natal grass (*Rhynchelytrum repens*).

CUNNAMULLA, (Gilnockie): A mulga (*Acacia aneura*)—box (*Eucalyptus populnea*) and gooramurra (*Eromophila bignoniflora*) community on the western apron of Cuttaburra Creek. The mulga in this area was selectively pushed for sheep fodder during the 1957-1962 drought. Associated grasses were blow-away grass (*Digitaria divaricatissima*), kerosene grass (*Aristida arenaria*), shot grass (*Paspalidium globoideum*) and love grasses (*Eragrostis* spp.).

EULO, (Wittenburra): The vegetation here bears a close resemblance to that on Cuttaburra Creek. This was the only area among the five native grazing lands not subjected to grazing during the previous six months.

MORVEN, (Ellwyn): Open bluegrass (*Dichanthium sericeum*)—golden beard (*Chrysopogon fallax*) grassland. These species are found in the open forest association of mulga (*Acacia aneura*)—Kurrajong (*Brachychiton populneum*)—wilga (*Geijera parviflora*)—silver-leaved ironbark (*Eucalyptus melanophloia*).

WYANDRA, (Claverton): Mitchell grassland with barley Mitchell (*Astrebla pectinata*) and curly Mitchell (*A. lappacea*), in places heavily infested with feathertop wiregrass (*Aristida latifolia*). Flinders grasses (*Iseilema membranaceum; I. vaginiflorum*), button grass (*Dactyloctenium radulans*) and bluegrass were of low incidence. Along creeks, Coolibah (*Eucalyptus microtheca*) is ubiquitous. Although as yet successful introduction of pasture grasses into the heavy soils formerly under Mitchell grasses has not occurred, this sample was taken to provide scale for the other communities sampled.

Sown pastures

Opportunity to measure forage yield from introduced species was afforded by a large number of evaluation sites commenced between 1950 and 1963. In these, the method of establishment was to lightly chisel plough the soil after timber removal, hand broadcast seed of the introduced grasses and lightly cover it with harrows or by dragging a branch over the area. No fertilizer was used anywhere. For the most part buffel grasses (*Cenchrus ciliaris*), Cloncurry buffel grass (*C. pennisetiformis*) and Birdwood grass (*C. setigerus*) were sampled. At one site green panic (*Panicum maximum* var. *trichoglume*) made a worthwhile contribution.

Pastures established in mulga communities are treated separately from those established in poplar box communities. This is done by virtue of more acid soils, lower available phosphorus and reduced water penetration of the soils of mulga communities.

Air-dried pasture yields were rounded off to the nearest 100 lb.

RESULTS

Rainfall

For the December-April period rainfall ranged from 7.5 inches at Eulo, 10 inches at Adavale, 14 inches at Thargomindah to 22 inches at Boatman, Morven and Charleville. Storm rains initiated growth during December. Heavy semi-monsoonal falls followed during the first half of January, sufficient to enable grasses to stool out. No further rains of any consequence were recorded for the remainder of January or February and fodder almost completely dried off. During late March, soaking rains occurred generally and heavy falls were recorded at all stations resulting in protracted growth of most plants into autumn. Effective rain from the January and March falls was seriously reduced at the acid soil sites where run-off was excessive.

Grass yields of Native Plant Communities are shown in Table I.

TABLE I

Grass Yields of Native Plant Communities in S.W. Queensland During May, 1963

Locality	Soil Texture	Soil pH	Available P (p.p.m.)	Grass Grazing Type		Yield (lb/ac Air Dry)
Charleville	Sand	5.8	18	Wire-grass	Light	1300
Cunnamulla	Sandy clay	5.8	6	Mulga grasses	Medium	900
Eulo	Sandy loam	5.3	9	Mulga grasses	None	1400
Ellwyn	Clay loam	5.6	8	Blue-grass	Light	1300
Claverton	Heavy	7.3	6	Mitchell grass	Light	2000
Overall Mean (Excluding Claverton)						1200

The available forage from four mulga communities at the end of summer amounted to 1200 lb when averaged over sand, sandy loam and clay loam soils. The slightly alkaline, heavy clay soil supporting Mitchell grass proved by far the most productive with 2000 lb, in contrast to the maximum yield from an acid sandy loam of 1400 lb. Yield varies independently of available phosphorus but is related to pH and soil texture.

Introduced grasses on mulga sites gave an average yield of 2000 lb/acre (Table II). Under comparable climatic and management conditions Biloela, American, and Molopo buffels were the heaviest yielders irrespective of site. Thirteen years after establishment the density and vigour of Gayndah buffel was still satisfactory at "Wilson" and similar to that at more recently established pastures at the other three sites.

TABLE II

Yields of Introduced Grasses from Four Mulga Communities in S.W. Queensland During May, 1963

Locality and Establishment Year	Soil Texture	Soil pH	Avail. P (p.p.m.)	Vegetation	Grazing	Cultivar	Yield (lb/ac Air Dry)
Avonvilla (1959)	Clay Loam	5.1	5	Mulga-Box-Sandalwood	None	Biloela	3100
						American	2400
						Cloncurry	2100
						Green Panic	1800
						W. Aust.	1500
						Gayndah	1000
						Birdwood	800
Cooladdi Park (1960)	Clay Loam	4.7	6	Mulga	Heavy	American	2100
						Molopo	1700
						Biloela	1700
						Gayndah	1200
North Tyrone (1960)	Clay	5.4	7	Mulga-Sandalwood	None	Molopo	3200
						American	3100
						Biloela	2700
						W. Aust.	2100
						Cloncurry	1900
						Gayndah	1700
Wilson (1958)	Sandy Loam	5.2	5	Mulga-Box-wiregrass	Heavy	Gayndah	2500
Overall Mean							2000

TABLE III

Yields of Introduced Grasses from Ten Box Communities in S.W. Queensland During May, 1963

Locality and Establishment Year	Soil Texture	Soil pH	Avail. P (p.p.m.)	Vegetation	Grazing	Cultivar	Yield (lb/ac air dry)
Blackburn (1959)	Clay Loam	6.0	12	Box-Turkey bush	None	Gayndah	3300
Dundee** (1963)	Clay Loam	5.7	21	Box-Galvanised burr	None	Molopo	1800
Maybe (1959)	Clay	6.7	12	Gidyea-Box	None	Mixture Buffels	2200
Northam (1958)	Loamy sand	6.8	92	Box-Galvanised burr	Light	Gayndah	4100
Tooloon (1950)	Loamy sand	5.8	25	Box-Cypress Pine	None	Gayndah	1600
Ricartoon* (1959)	Clay Loam	6.6	38	Box-Sandalwood	None	Biloela	5900
Yallara* (1961)	Clay Loam	6.8	16	Box-Gidyea-Sandalwood	None	Mixture Buffels	5200
Tinderry (1962)	Clay Loam	6.6	22	Coolabah-Gidyea-Box	Light	Gayndah	3400
Verona (1959)	Clay Loam	6.0	67	Pine-Box-Carbeen	None	Green Panic	3400
Wongalee (1957)	Fine sand	5.6	22	Pine-Iron-bark-Box	None	Gayndah	2800
Overall Mean							3400
Mean ("Ricartoon" and "Yallara")							5600
Mean (excluding "Ricartoon" and "Yallara")							2800

* These pastures benefited from run-on water
** Harvested only five months after sowing

Introduced grasses established on box country yielded 3400 pounds grass per acre (Table III), averaged over all sites compared with the yield of 1200 lb from native grasses and 2000 lb from introduced grasses on mulga. A useful yield was obtained from green panic, a rare introduction in this area. Run-on water greatly increased grass yields at "Ricartoon" and "Yallara".

DISCUSSION

Marked differences in yield were recorded from the different native plant communities. Yields on acidic soils were only about half of that obtained from the slightly alkaline soil. The lower productivity of the acid soils is associated with their rapid "sealing over" on being wetted and therefore more rain runs off. This results in a drier habitat with lower yield potential than the slightly alkaline heavy clay with better water relations and different native grasses. In spite of large distances between the acid soil sites, and allowing for some removal through grazing at three of the sites, yields were of the same order.

The same differential exists where introduced grasses were established in mulga and box habitats. Where introduced grasses were grown in mulga localities with self-sealing acid soils their overall mean yield was only 2000 lb compared with 3400 lb in box localities having less acid soils. The latter soils also have an overall higher available phosphorus status than mulga soils but available phosphorus does not appear to be related to yield. The beneficial influence of additional water is clearly illustrated

by a doubling of yields at "Ricartoon" and "Yallara" compared with sites without run-on water.

The acid nature of the soil however did not prove an impediment to high yields in the case of the buffel grasses Biloela, American and Molopo. The yields in some instances approached the overall mean yield of box localities. The cultivars Cloncurry, West Australian, Gayndah, Birdwood and green panic are clearly inferior on acid soils.

Persistence of buffel grasses coupled with their high productivity in these soils is illustrated by the thirteen year old pasture at "Tooloon", six-year old pasture at "Wongalee" and five-year old pastures at "Wilson" and "Northam". These pastures remained productive in the absence of an introduced source of nitrogen, either as fertilizer nitrogen or as legume nitrogen.

A mean yield of 1800 lb oven-dry (=2000 lb air-dried) grass per acre from Mitchell grassland from a single cut in autumn is slightly lower than the maximum of 2015 lb obtained by Davies, Scott and Kennedy (1938) in central western Queensland and higher than the 1546 lb obtained by Roe and Allen (1945) in south west Queensland. Decline in the presented yield due to senescence and grazing with time is reported by both groups of earlier workers but these were not measured here. Comparisons of yield among the three sites and seasons are not strictly valid.

A gradation from mulga grasses (= 1200 lb), Mitchell grass and buffel grass pasture on mulga (= 2000 lb), buffel grass pasture (box, without run-on water) (= 2800 lb), and buffel grass pasture (box, with run-on water) (= 5600 lb), illustrates the diversity of habitats and gives an indication of the yield potential of different pasture types.

It is interesting to speculate on the implications of the yields obtained. Three pounds oven-dried grass may be assumed as the daily maintenance requirement of a dry sheep (Everist, S. L., Harvey, J. M. and Bell, A. T., 1958). It is further assumed that 4 lb of air-dried material at 95° Fahrenheit and 20 percent relative humidity equals 3 lb of oven-dried material and that 25 percent of the presented material is eaten (the remainder is lost through decay and not eaten by sheep). With these assumptions, stocking rates would range from a sheep to 5 acres on open mulga communities to 3 acres on Mitchell grass and on buffel grass—mulga, to 2 acres on buffel grass—box with no run-on water and to 1 acre on buffel grass in box localities benefiting from run-on.

In addition to higher yield, other advantages of buffel grasses over mulga grasses are their greater persistence, higher proportion of acceptable herbage and faster and greater response to rain. These attributes might well lead to a doubling in carrying capacity compared to mulga plant communities, which is well below the fourfold increase claimed for improved pastures by Wilson (1961).

Frequent droughts of varying duration and intensity would have considerable influence on these claims obtained during a particularly favourable season. Should more than 25 percent of the presented forage from introduced grasses be eaten by sheep a fourfold increase in carrying capacity in mulga and box communities may be a realistic estimate.

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