PRODUCTIVITY AND DYNAMICS OF TWO SIRATRO BASED PASTURES IN THE BURNETT COASTAL FOOTHILLS OF SOUTH EAST QUEENSLAND

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ABSTRACT

Pastures of Macroptilium atropurpureum *cv. Siratro and scrobic* (Paspalum commersonii *cv. Paltridge*) *were established at two sites in south east Queensland and each was set stocked for 5 years with annual drafts of weaner steers at* 1.24, 0.82 *and* 0.62 *beasts/ha* (0.50, 0.33 *and* 0.25 *beasts/ac.*)

Scrobic failed to persist and there was a marked difference in the type of pasture that developed at each site. At Lowmead Siratro was strongly dominant over the native green couch (Cyndon dactylon) *and stocking rate had no effect on yields of the pasture constituents measured annually in May or liveweight gain per head. The mean gain per head was* 180 *kg* (396 *lb*) *in* 314 *days. At Brooweena the native spear grass* (Heteropogon contortus) *returned and stocking rate determined both Siratro yield and liveweight gain per head. The highest stocking rate gave negligible Siratro yield and poor animal performance, whilst the lowest stocking rate gave co-dominance of Siratro and native grass and a similar liveweight gain per head to that of the Lowmead pasture.*

INTRODUCTION

The Burnett coastal foothills of south-east Queensland as described by Fox (1964) are a strip of undulating to hilly country lying between the coastal ranges and the coastal lowlands. They extend from just south of Rodd's Bay (latitude 24°S) in the north to Tiaro (latitude 25.7°S) in the south, and vary in width from 25 to 55 km.

The climate is sub-tropical. A mean annual rainfall ranging from 950 mm to 1,200 mm, according to locality, is of predominantly summer incidence and highly variable. Frosts are common from May to September. The original vegetation was eucalypt open forest and woodland, much of which has been cleared to varying degrees to improve the growth of native grass for beef cattle grazing. Bullock fattening is the main enterprise but some graziers breed as well. In 1968-69 beef cattle numbers were approximately 134,000.

The native pastures are mainly dominated by *Heteropogon contortus* (bunch spear grass or spear grass) and have the limitations of a short growing season and poor quality of mature forage (Shaw and Norman 1970). As a consequence management involves light stocking to allow selective grazing, with burning of the large residue in spring. In spite of the low stocking rate (0.36 beasts/ha on the best country) animals lose weight regularly in winter. This leads to a slow net growth rate with $3\frac{1}{2}$-$4\frac{1}{2}$ years being necessary to turn off a finished carcass.

Prior to the advent of *Macroptilium atropurpureum* cv. Siratro sown pastures were non-persistent in the region. The persistence of Siratro in early trial work of Fox (pers. comm.) opened up new prospects. This paper presents results of two trials laid down to show the level of production that can be achieved from sown pastures based on Siratro and *Paspalum commersonii* cv. Paltridge (scrobic) and the dynamics of such pastures over five years of stocking.

MATERIALS AND METHODS

The two experimental areas were each of 18 hectares and each provided three unreplicated treatments of high (1.24), medium (0.82) and low (0.62 beasts/ha) stocking rates.

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Sites

The Lowmead site located on "Charnwood" station, 16 km south west of Lowmead, had an area of approximately two-thirds cleared narrow-leaf ironbark (*Eucalyptus crebra*) ridge and one-third cleared bluegum (*E. tereticornis*) flat in each treatment. The soil on the ridge was a podzolic derived from granite with an "A" horizon of 15-25 cm of brown sandy loam overlying yellowish-brown clay (Dy. 3 (Northcote 1971)). The soil on the flat was a grey brown alluvial sandy clay loam (Um). Available potassium is adequately supplied but available phosphorus is low on the ridge. (Table 1).

TABLE 1

Chemical analyses of representative soil samples from each site.

	Lowmead Ridge		Lowmead Flat		Brooweena Ridge	
Horizon	A	B	A	B	A	B
pH	6.0	6.0	6.0	*	6.0	6.0
Avail. P (ppm)	5	5	18	*	6	5
Replaceable K (me %)	0.34	0.13	0.26	*	0.67	0.25

* No B horizon.

Spear grass dominated the native pasture on the ridge and the better-drained portion of the flat. A broad waterway on the flat was grassed with *Bothriochloa bladhii*, *Sorghum nitidum* and paspalum (*Paspalum dilatatum*), but only in the lightest stocking rate treatment did it occupy an appreciable area (approximately 0.2 ha out of 8).

The Brooweena site situated on "Gigoomgan" station, 50 km south west of Maryborough consisted of a cleared spear grass ridge originally carrying silverleaf ironbark (*E. melanophloia*) and Moreton Bay ash (*E. tessellaris*). The predominant soil, derived from algal limestone, was a podzolic with about 10 cm of hard setting brown clay loam overlying yellowish-brown clay (Dy. 3). Available potassium is adequately supplied but available phosphorus is deficient (Table 1).

Pastures

Inoculated Siratro at 1.1 kg/ha and scrobic at 2.4 kg/ha at Brooweena and 2.8 kg/ha at Lowmead were sown in mid-October, 1964 after short land preparation at Brooweena and in mid-February 1965 after a nine month fallow at Lowmead. Molybdenised (0.03%) superphosphate was applied initially at both sites at 300 kg/ha and thereafter at 250 kg/ha every second year totalling 1,150 kg/ha to December 1969.

In the first spring the Siratro stand at Lowmead was inferior to that at Brooweena and a further 2.2 kg/ha Siratro with 250 kg/ha of superphosphate was oversown in February 1966.

Forage on offer was measured annually in May, before the first frost, by cutting at 2.5 cm above ground level 21, 18 and 15 random quadrats (1.0 m × 0.4 m) from the low, medium and high stocking rate treatments respectively. The cut material was sorted into Siratro, scrobic, and native grass and then oven-dried. Commencing in 1967 fallen leaves and dead stems of each fraction were separated from the live material and recorded as "litter". Sub-samples of each fraction were analysed for phosphorus and nitrogen content. From 1969, 12 similar quadrats were cut from native spear grass pasture in the adjacent station paddock. Siratro crowns were estimated in 1970.

The Brooweena pasture was burnt in the spring of 1967 to remove the large residue of dead spear grass, and again (inadvertently) in the spring of 1968. It was also

renovated lightly with a chisel plough in 1969, prior to the application of maintenance fertilizer.

Animals

After an establishment period of conservative stocking the pasture at each site was subdivided into 3 paddocks of 4, 6 and 8 hectares and each set stocked with 5 weaner steers. Each draft of steers was replaced annually in May over 5 years. Animals were weighed (without fasting) at the beginning and end of each grazing cycle and at irregular intermediate stages.

At Lowmead Hereford × Shorthorn × Brahman weaners of an average age of 8 months and a mean liveweight of 201 kg (range 116-222) were used. Entry of the first year's draft was delayed until 2nd September 1966. After disposal of each draft to Brisbane meatworks in April (corresponding to the marketing of station cattle) the pasture was unstocked for a short period each year ranging from 23 days in 1967 to 55 days in 1970.

At Brooweena the cattle were Herefords of an average age of 12 months and mean liveweight of 199 kg (range 177-222). An exception was in 1968-69 when 16 month old Brahman ($\frac{3}{4}$) × Hereford cross cattle with a mean weight of 286 kg were used. The first draft entered the pasture on 10th June 1966, and the pastures were subsequently stocked continuously until 24th April 1969. Because of drought the new draft due in May 1969 was not admitted until 28th September, an interval of 157 days. Subsequent stocking was continuous.

Seasonal Conditions

Mean annual rainfalls at "Charnwood" (5 km from the Lowmead site) and "Mt. Joseph" (5 km from the Brooweena site) for May to April for the years 1931–60 are 1,090 mm and 1,008 mm respectively. Annual recordings for May to April during the trial period varied considerably both above and below these figures. Rainfall at both recording stations was well below-average in the establishment year (1964–65). The driest year was 1968–69; at Brooweena the October–April rainfall was 307 mm with drought prevailing after January; at Lowmead with 441 mm for this period the position did not become acute. Good rainfall at both stations in May 1969 was followed by a mild winter. Autumn-winter rainfall in 1970 was well below-average. The best rainfall years were 1967–68 and 1970–71, with Lowmead rainfall for the latter year being twice the average.

RESULTS

Botanical Composition and Pasture Yields in May (Figure 1)

At the commencement of trial grazing native grass was dominant at both sites. At Brooweena it was mainly spear grass whilst at Lowmead it was about one-third spear grass and two-thirds green couch (*Cynodon dactylon*). Scrobic declined rapidly at both sites. At Lowmead Siratro became dominant and spear grass disappeared leaving couch as the sole grass; stocking rate had little effect on yield of legume or grass. At Brooweena native grass remained dominant in all treatments and Siratro yield was mainly governed by stocking rate with only a trace being present at the high rate. The low yield of herbage in all treatments in 1969 reflects the severity of the drought at that site.

Siratro Populations

In 1967 the Siratro at Lowmead already had a dense network of stolons compared to very few at Brooweena. The counts made in 1970 showed that there were 39,000, 33,000 and 12,000 crowns/ha in the low, medium and high stocking rate treatments respectively at Brooweena. At Lowmead the network of stolons and secondary crowns made counting difficult but there were approximately 100,000/ha in all treatments.

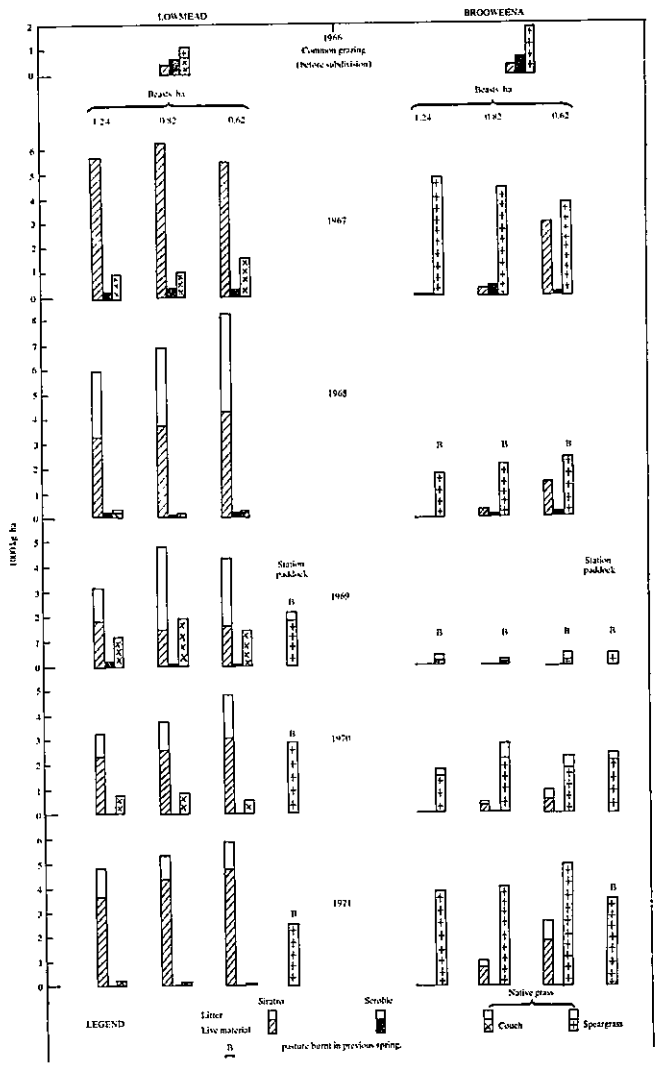

FIGURE 1

Yields of the different pasture fractions in May for five years at 1.24, 0.82 and 0.62 beasts/ha at Lowmead and Brooweena. Overall yields under common grazing before subdivision and yields of native pasture (spear grass) in adjacent station paddock for the last three years are also shown.

Cattle Performance (*Table* 2, *Fig.* 2)

At Lowmead the differences in total liveweight gains for the three stocking rates were small so that gain per acre was proportional to stocking rate. Performance was not reduced by the dry summer of 1968–69 and all groups gained weight over two of the four winters (1968 and 1969). Highest daily rate of gain/head (calculated from Fig. 2 as 0.84 kg) was made over the period November to February. The mean daily gain over the whole period (calculated from Table 3) was 0.57 kg/head.

TABLE 2

Liveweight gains (kg) per head and (per hectare) of steers at 3 stocking rates at Lowmead and Brooweena over five years.

Stocking Rates (beasts/ha)	1.24	0.82	0.62	Length of period (days)
(1) Lowmead				
1966–67	135 (167)	151 (124)	138 (85)	227
1967–68	153 (188)	171 (140)	179 (111)	349
1968–69	201 (248)	193 (159)	192 (119)	334
1969–70	179 (221)	188 (155)	195 (121)	304
1970–71	197 (243)	211 (174)	213 (131)	357
Mean of 5 years	173 (213)	183 (150)	183 (113)	314
(2) Brooweena				
1966–67	173 (213)	197 (162)	231 (142)	332
1967–68	129 (160)	160 (130)	209 (129)	388
1968–69	3 (3)	51 (43)	152 (94)	329
1969–70	103 (127)	133 (109)	159 (99)	205
1970–71	57 (71)	107 (88)	158 (97)	393
Mean of 5 years	93 (115)	130 (106)	182 (112)	329

When sold for slaughter the animals were lightly finished, dressing out at a mean of 50.2% (hot weight basis). There was only a slight margin in favour of the animals from the lighter stocking rate treatments.

At Brooweena there were generally large differences in animal performances between stocking rates, those from the first year being least and those from the drought year (1968–69) greatest. The mean gain per hectare was similar for all stocking rates. Highest daily rate of gain/head at the low stocking rate (calculated from Fig. 2 as 0.64 kg) was made roughly from December to March. At the low stocking rate the mean daily liveweight gain/head over the five years (calculated from Table 2) was 0.55 kg/head.

Slaughter information in 1967 tended to favour the low stocking rate whilst in subsequent years only the low stocking rate animals were fit for slaughter.

Chemical Composition

Phosphorus levels in all pasture constituents including the unfertilized spear grass were higher at Lowmead than at Brooweena and there was no consistent effect from topdressing.

Mean nitrogen values for green Siratro were similar at both sites (1.75%) while Siratro litter was consistently higher (2.11% at Lowmead.) Couch grass at Lowmead (1.31%) was similar to scrobic and had nearly twice as much nitrogen as spear grass at Brooweena.

Weeds

Spear thistle (*Cirsium arvense*) and fleabane (*Erigeron floribundus*) were two winter-spring weeds which noticeably invaded the Lowmead area after the Siratro had been frosted. Spear thistle was abundant in 1968, 1969 and 1971 whilst fleabane was abundant in January and December of 1969. Weed incidence was not related to stocking rate.

At Brooweena on the other hand weeds were relatively unimportant with fleabane occurring abundantly only in the low stocking rate treatment in the summer of 1969–70 following October cultivation. Spear thistle germinated appreciably during the wet winter of 1969 but the plants did not survive to maturity.

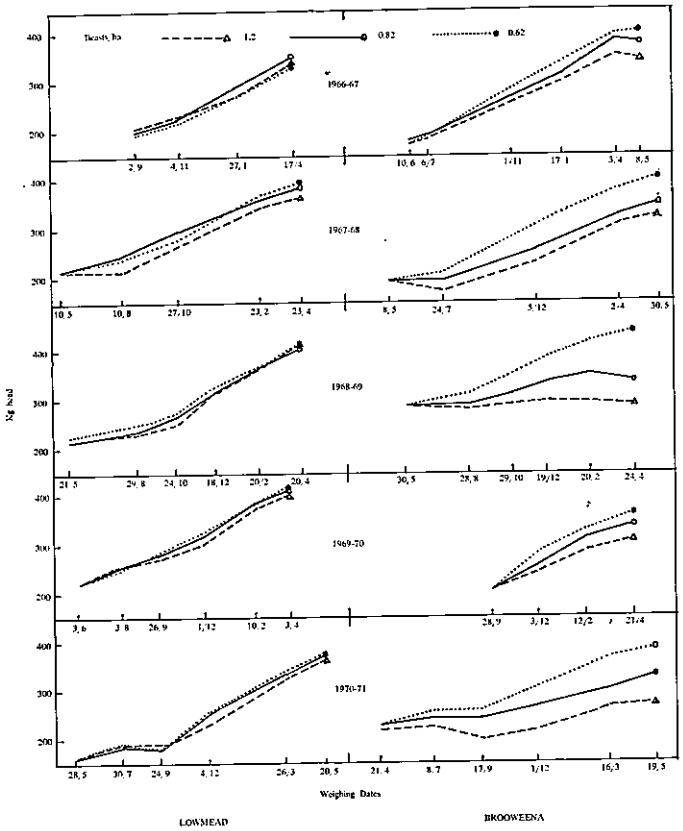

FIGURE 2

Mean cumulative liveweights of steers at 1.24, 0.82 and 0.62 beasts/ha for five years at Lowmead and Brooweena.

The Natural Grasses

The couch grass stand at Lowmead developed over the long fallow period. At Brooweena spear grass remained the main grass though other native grasses were apparent. *Bothriochloa decipiens* (pitted blue grass) was conspicuous in the high stocking rate treatment. In the years when burning occurred it was obvious in all treatments in the spring; however, as the season advanced it declined in the medium and low stocking rate treatments but remained in the station paddock. *Capillipedium parviflorum* (scented-top) was very obvious at the low stocking rate, less so at the medium stocking rate, absent at the high stocking rate and rare in the station paddock. *Themeda australis* (kangaroo grass) was present in the station paddock as a minor constituent but was absent from all treatment paddocks.

DISCUSSION

Siratro Growth at the Two Sites

The large difference in the amount of Siratro in the pastures at each site is probably a reflection of several factors. Firstly, the longer land preparation at Lowmead probably reduced competition from native species and the stand may also have

been favoured by the oversowing. However, the environment at Lowmead appears to be more suitable for Siratro for, even at the high stocking it proliferated much more vigorously than at the low stocking rate at Brooweena. The burning in 1967 and 1968 plus drought in 1969 would have reduced stolon development at Brooweena. However, the difference at the two sites was obvious in the first year of trial grazing, before these events occurred. If the drought year is excluded, effective rainfall at both sites was similar over the trial period and in the establishment year it was 254 mm more at Brooweena. The lighter texture and greater depth of topsoil at Lowmead would increase the effectiveness of small falls of rain. This and perhaps a slightly more humid environment may well have caused the greater stolon development.

Chemical Composition

The phosphorus and nitrogen figures give no guide to nutritive value of the herbage constituents throughout the year. However, they do show that scrobic and green couch maintain their nutritive value better than spear grass at the critical period of late autumn.

The much higher values of nitrogen in green couch at Lowmead than in spear grass at Brooweena would be influenced by the much greater growth of Siratro at Lowmead plus the greater responsiveness to nitrogen of couch grass.

Cattle Performance

At Lowmead each year the weaners went into a pasture containing sufficient Siratro and green couch (plus scrobic in the first three winters) to allow selection of a diet adequate for initial weight gain. After frosting there would be a drop in feed value similar to that reported by Jones (1967), then an improvement due to regrowth of couch grass which was the main feed in September. In a follow-up trial (Bisset and Marlowe unpublished) weaners on native spear grass pasture in summer (January to March) showed similar liveweight gains (0.79 kg/head/day) to those on the Siratro-couch grass pasture. This suggests that native pastures should continue to be used in summer and sown pastures saved for intensive use in autumn-winter-spring.

The large residual yield of herbage at all stocking rates shows that even the high stocking rate was below the carrying capacity of the pasture. However, the similarity of liveweight gain per head at all rates also shows that this level represents the capability of the pasture on a per head basis.

In the first winter at Brooweena animal performance was comparable to the average winter performance at Lowmead. This is attributed to a carryover of scrobic and Siratro in all treatments. However, in subsequent years scrobic had declined and there was a strong grazing effect not only on animal performance but also on the amount of Siratro in the pastures. Very little Siratro remained at the high stocking rate and this treatment virtually became native pasture fertilized and stocked at $3\frac{1}{2}$ times the normal rate. Also, the slow (observed) regrowth of spear grass in spring (compared to couch grass at Lowmead) meant that stocking rate was critical until about December. As the season advanced the decline in spear grass quality favoured the lower stocking rates because of greater scope for selectivity and the presence of Siratro.

The Legume-Grass Combination

Siratro is seen to be a vigorous, drought-tolerant and highly persistent legume in this environment and this is also echoed in commercial practice. In the absence of a strong companion grass it may become dominant, as at Lowmead, resulting in weeds invading the pasture once frosts have cut back the Siratro. At Brooweena spear grass provided an effective barrier against the weeds (except when its cover was reduced by drought plus cultivation). However, its poor feed quality for much of the year and (in relation to green couch) its relative slowness to respond to increased soil fertility are

drawbacks. There are several grasses which are now being used commercially with Siratro in the region namely Petrie panic (*Panicum maximum* var. *trichoglume*), Rhodes (*Chloris gayana* cv. Pioneer and Callide), setaria (*Setaria anceps* cv. Kazungula) and plicatulum (*Paspalum plicatulum* cv. Rodd's Bay).

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