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PERFORMANCE OF BEEF STEERS IN THE WET TROPICS OF QUEENSLAND

By W. MELLOR, Q.D.A., Q.D.A.H. AND P. J. ROUND, Q.D.A.

SUMMARY

Monthly weighings were made of 1 272 beef steers from 27 different drafts of stores grazed at Utchee Creek on the wet tropical coast of Queensland during 1968, 1969 and 1970. A mean annual liveweight gain of 217 kg was recorded. Rates of gain varied with the time of the year, breed and age or size of the cattle at time of purchase. Highest rates of gain were recorded during late spring and early summer, Brahman crossbred steers grew faster than Shorthorns, and large steers gained weight more rapidly than smaller ones.

I. INTRODUCTION

Few results have been published for animal performance in the wet tropics of Queensland. Guinea grass-legume pastures have given annual liveweight gains ranging from 460 kg/ha (Grof and Harding 1970) to 904 kg/ha (Mellor, Hibberd and Grof 1973 b). Beef cattle production from other grass species grown with legumes has ranged from a calculated 488 kg/ha for ruzi grass (Mellor, Hibberd and Grof 1973 a) to 794 kg/ha for pangola grass (Harding and Cameron 1972). Mean daily rates of gain for individual animals have ranged from 0·3 to 0·8 kg.

No clear-cut evidence of regular seasonal differences in rates of liveweight gain has been presented, though Grof and Harding (1970) recorded higher gains per animal from nitrogen fertilized guinea grass for December–March (0·65 kg/day) than for the rest of the year (0·28 kg/day). However, this pattern could be expected from pastures stocked at 4·94 beasts per hectare all year round and having such a marked seasonal growth pattern as guinea grass. Similarly, Mellor, Hibberd and Grof (1973 a and 1973 b) reported low rates of gain in winter and much higher rates of gain in the following spring and early summer. However, the change in seasonal stocking rate, coupled with the timing of draft replacements, undoubtedly affected seasonal growth rates of these cattle.

It has been suspected for some time that, in the wet tropics, British breed stores do not grow as well as Brahman crossbreds. Although this has not been demonstrated, the phenomenon is well documented for the drier tropics. For example, Arthur, Mayer and Rudder (1972) recently reported that $\frac{3}{8}$ to $\frac{3}{4}$ Brahman steers had a 16 to 21% advantage over pure Poll Herefords.

During 1968–1970, the Utchee Creek sub-station of South Johnstone Research Station had a stable area of pasture, all of which was utilized. Before 1968, the property was undergoing considerable development and after 1970 a

period of redevelopment was entered. Records are kept of monthly rates of liveweight change, date of purchase and sale, liveweight at purchase and sale, cold carcass weight, and values at purchase and sale for all store cattle. Accordingly, it was decided to examine the cattle records for those 3 years when stock numbers were high, areas were constant and key personnel were unchanged.

II. MATERIALS AND METHODS

Property description

Utchee Creek sub-station is 32 km south-west of Innisfail. Most of the 3 250 mm annual rainfall occurs during the summer. Mean maximum temperature in December is 31°C and mean minimum temperature in July is 13°C. Frosts are almost unknown, and humidity is generally high. Soils are of two types. A red, friable, well-drained basalt accounts for about two-thirds of the area. This soil was originally of high fertility, but recently deficiencies of phosphorus and molybdenum have been measured (Teitzel and Bruce 1972 a). The other one-third is a reddish-brown, less well drained and less fertile metamorphic soil (or a mixture of the basaltic and metamorphic), in which important deficiences of phosphorus, molybdenum and potassium have been recorded (Teitzel and Bruce 1972 b). Both soil types originally carried dense tropical rain-forest.

A wide range of tropical pastures was used during the 3-year period, but the major area was of common guinea grass *Panicum maximum*, common centro *Centrosema pubescens* from 2 to 5 years old. Maintenance fertilizing was not done as a standard practice, though small sections did receive some phosphorus, potassium and nitrogen. Of the 107 ha involved, none was adequately topdressed for optimum pasture persistence and productivity. Annual maintenance fertilizer applications have since been found necessary to stop the decline of the carrying capacity of the pasture and to maintain animal performance.

Topography of the land varied from gently sloping to moderately steep. The developed areas were subdivided into small paddocks ranging from 0·4 to 6·0 ha. Weighing and spray-dipping facilities were incorporated in centrally-situated yards.

Cattle management

Cattle management varied according to the requirements of each experiment, but generally the methods were similar. Stores were purchased direct from properties when needed. Initial liveweights were taken after an adjustment period of 4 to 7 days. Subsequent weighings were done at intervals of 1 month or less, usually coinciding with sprayings for tick and buffalo fly control. Stock were inoculated against tick fever, once if they fattened in 8 months or less, and twice if the fattening period was longer. A system of rotational grazing was usually employed, though some experiments were done with continuously stocked pastures.

Drafts were sold when the majority of animals were in finished condition. This inevitably resulted in some cattle being over-fat, while others were lacking in condition.

III. RESULTS AND DISCUSSIONS

Stocking and turn-off rates

Numbers of cattle on hand varied between 149 in November 1968 and 363 in August 1970. Rates of stocking and turn-off are shown in Table 1. The progressive increase in turn-off rates was primarily due to having more young cattle which fattened at a lighter weight.

TABLE 1

HERD STATISTICS

Details	1968	1969	1970	Average
Area of Pasture	101 ha	107 ha	107 ha	105 ha
Average Number of Cattle Carried ..	222	302	307	277
Average Stocking Rate	2·2/ha	2·8/ha	2·9/ha	2·7/ha
Annual Liveweight Gain/Head	207 kg	222 kg	221 kg	217 kg
Daily Liveweight Gain/Head	0·57 kg	0·61 kg	0·60 kg	0·59 kg
Number of Cattle Sold	250	310	362	307
Rate of Turnoff/Year	2·5/ha	2·9/ha	3·4/ha	2·9/ha
Average Time for Cattle to Fatten ..	325 days	355 days	309 days	330 days

Liveweight changes

Total weight gain per beast did not vary greatly from year to year (Table 1). However, there were large differences between monthly results (Figure 1).

Mean gains during May, June, July and August were consistently low (0·45 kg per day), while those for November, December and January were consistently high (0·78 kg per day). Low weight gains occurred when pasture growth was limited. This happened when low maximum temperatures were coupled with an apparent annual post-wet-season nitrogen deficiency. High gains were recorded when long, sunny hot days plus early summer storms resulted in rapid pasture growth.

There were variations in monthly weight changes from year to year. These resulted from seasonal differences and were most pronounced during the August-September-October quarter.

There was no marked depression in weight gains during the wet months of February, March and April when the average rainfall normally totals more than 1 520 mm. However, both surface and internal soil drainage at Utchee Creek are very good, and at less well-drained sites the wet season liveweight changes may be quite different.

Mortality

Deaths during the period totalled 11 head, giving a mortality rate of 0·9%. Known causes included tick fever, poisonous plants, injuries and urea poisoning. The cost of these losses, based on the landed price of animals and offset against the remainder, was 67c/head.

Carcass weight

Mean liveweight at sale was 420 kg, the cold carcass of 223 kg being readily accepted by the local trade. The mean dressing percentage was 53·2%, though drafts of steers varied between 49% and 57% of their unfasted liveweights.

Costs

Prices paid for store cattle and received for fat cattle were low compared with 1973 values, the average landed cost being $73.80/head. Only those costs directly concerned with the animal could be calculated from records kept. These averaged $1.90 per head, made up of 67c for losses, 56c for dip chemical, 35c for disease prevention and treatment, and 32c for slaughtering levy. Analyses of other costs associated with labour, maintenance of pasture, permanent improvements, machinery and depreciation and interest have not been attempted.

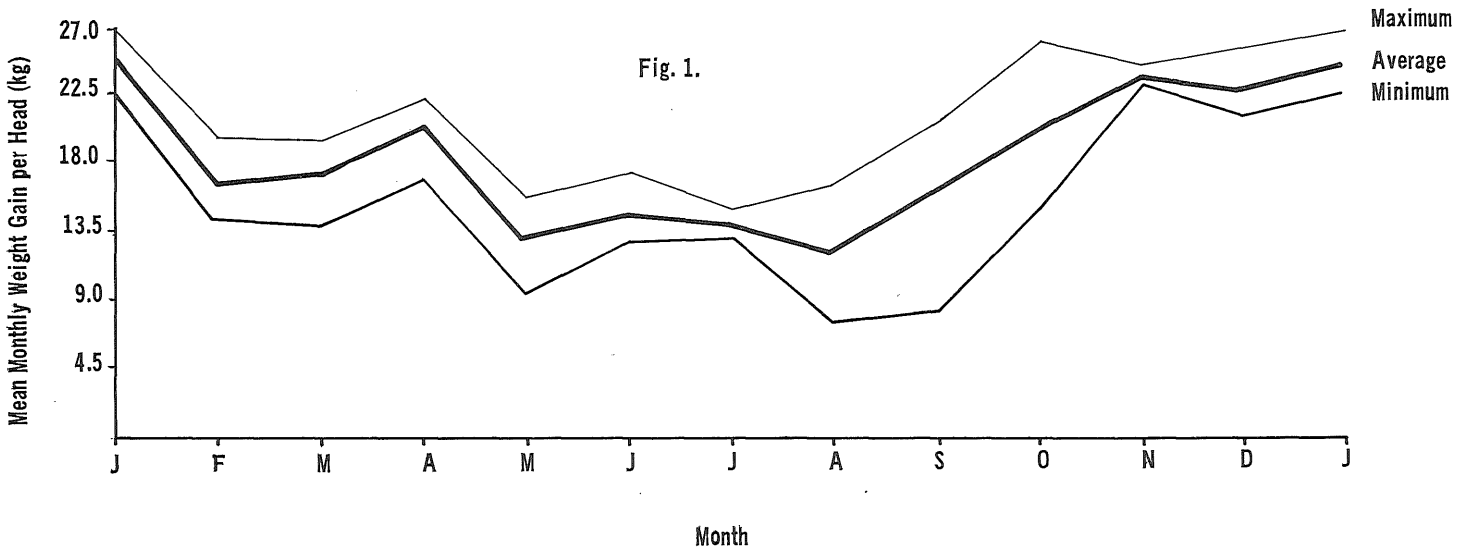


Figure 1: Maximum, minimum and average monthly liveweight gain (per head).

Returns

The mean sale price per animal, based on a mean of 51·74c/kg ($23.50/100 lb.) cold dressed weight, was $115.62. After deducting direct animal costs, this left a margin of $39.92/head, or a mean of $116.34/ha/year.

Variations in profitability

By considering both mean and specific performance records, it has been possible to make a number of comparisons between breeds and between sizes of stores.

1. BREED OF CATTLE. During the period, both Brahman cross cattle from the Mt. Garnet and Charters Towers areas and Shorthorn cattle from the Charters Towers area were used. Differences in performance between drafts of similar initial and sale weights were obvious—

(a) Brahman crossbreds had a mean daily liveweight gain of 0·62 kg compared with 0·54 kg for the Shorthorns.

(b) The mean dressing percentage for Brahman crossbreds was almost 2·5% more than for the Shorthorn animals.

The direct effect of these two factors on profitability is shown in Table 2.

TABLE 2

COMPARISON BETWEEN SHORTHORN AND BRAHMAN CROSSBRED STEERS

Details	Shorthorns	Brahman Crossbreds
Number Involved	142 head (6 drafts)	425 head (9 drafts)
Initial Liveweight	259 kg	259 kg
Sale Liveweight	425 kg	424 kg
Time to Finish	307 days	265 days
Gain/Head/Day	0·54 kg	0·62 kg
Cold Dressed Weight	218 kg	228 kg
Dressing Percentage	51·23	53·63
Direct Costs/Head	$82.63	$87.39
Sale Price/Head	$112.80	$117.97
Margin/Head	$30.17	$30.58
Drafts Fattened/Year	1·19	1·38
Margin/Beast Area/Year	$35.90	$42.20

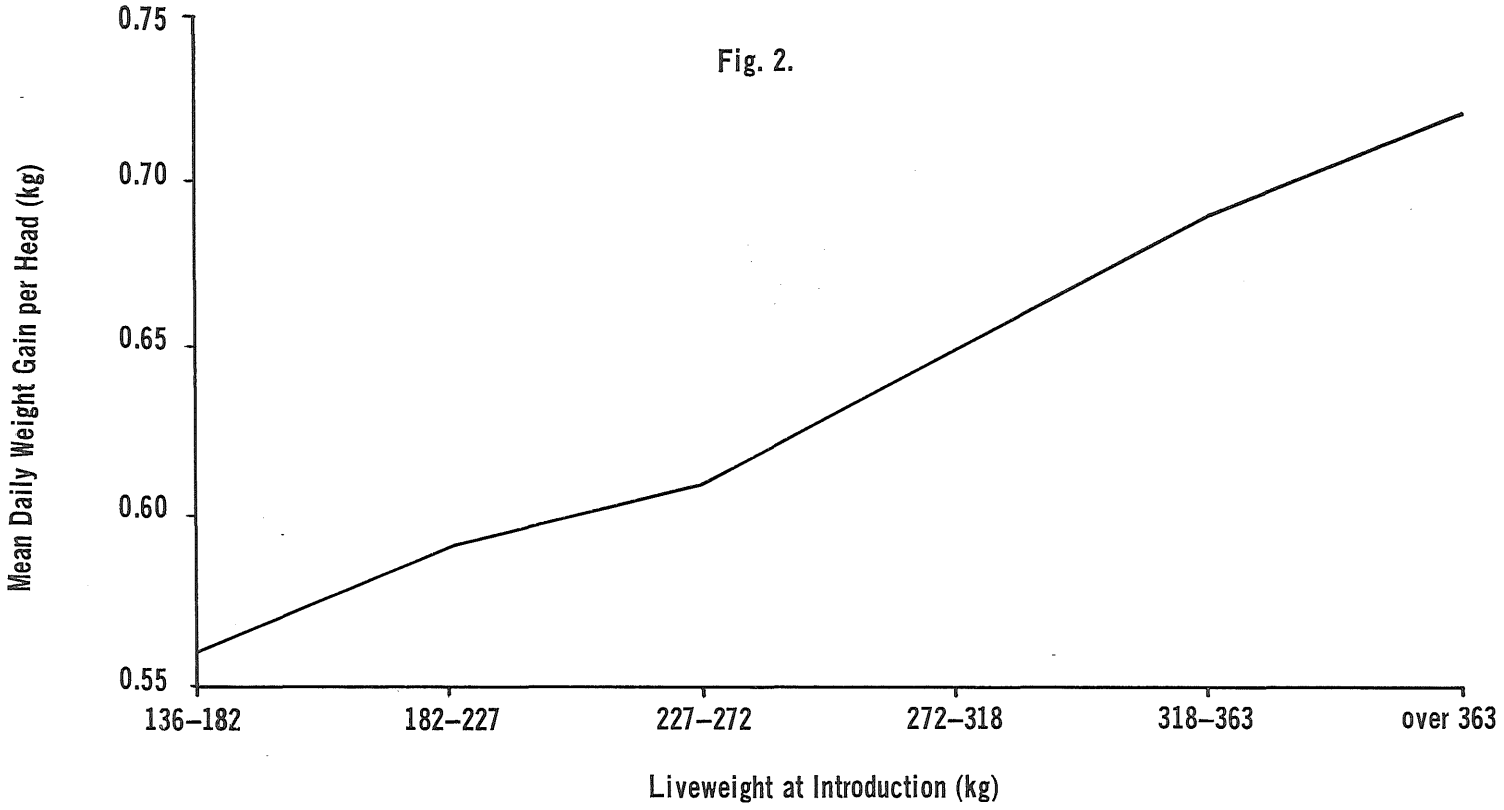
The differences per head between sale prices less direct animal costs were very similar, but because the Brahman crossbreds reached sale weight and condition 6 weeks earlier than the British breed cattle the turn-off rate was considerably higher. Thus there was an appreciable difference in the profitability of the two types of cattle. In fact, the Shorthorn stores at time of purchase would have needed to have been $11 per head cheaper than the crossbreds to have given a similar economic result.

Although a standard dipping programme was used, in practice it could be expected that the British breed stock would require more treatments for ticks. The extra costs for mustering and dipping would have to be taken into account.

2. AGE OR SIZE. Brahman crossbreds were grouped according to liveweight at introduction, in categories of 45 kg difference. Using only those weight groups represented by four or more animals in each draft, Figure 2 shows the increased rates of gain for the successively heavier groups.

These data are not conclusive, because the cattle were marketed at different weights. As might be expected, the smaller animals reached finished condition at a lighter weight than older ones. None was grown through to give a heavy

Fig. 2.



No. of Groups	4	7	8	7	5	3
No. of Head	43	58	144	132	68	14

Figure 2: Effect of initial liveweight on daily rate of gain.

export carcass, and it is probable that there would have been a reduction in the rate of gain of the heavier weight groups, particularly had they been taken on towards 545 kg liveweight.

It is usual to classify stores by age, so cattle were sorted into weaners (9 to 15 months old), yearlings (18 to 24 months) or bullocks (over 30 months old) at time of introduction. These age groups correspond approximately to liveweight ranges of 136 to 204 kg, 227 to 295 kg and 317 to 386 kg respectively. Table 3 shows detailed data of these three classes.

TABLE 3

COMPARISON BETWEEN DIFFERENT CLASSES OF STORES

Details	Weaners	Yearlings	Bullocks
Number Involved	167 head (17 groups)	375 head (32 groups)	200 head (23 groups)
Initial Liveweight	192 kg	272 kg	338 kg
Sale Liveweight	402 kg	421 kg	454 kg
Time to Finish	378 days	243 days	180 days
Gain/Head/Day	0·56 kg	0·61 kg	0·64 kg
Purchase Price/Unit Liveweight	35c/kg	31c/kg	32c/kg
Total Cost/Head	$69.57	$85.87	$109.66
Sale Price/Head	$111.53	$116.04	$125.04
Margin/Head	$41.96	$30.17	$15.38
Margin/Beast Area/Year ..	$40.52	$45.32	$31.19

Yearlings were more profitable than weaners with store bullocks being much inferior. This was largely the result of the relatively short time for which the heavier animals were on hand, as the difference between store price and fat price was too large to be compensated for quickly.

If the price obtained for fat bullocks were similar to the price paid for stores (per unit of weight), the higher rate of gain achieved by heavier animals might have become an important factor. Also, if the heavier stores were carried on to give a carcass suitable for the export trade rather than the local market, they would be more profitable even if their rate of gain were reduced as they matured. However, the other factor to be considered is stocking rate, and carrying capacity of pastures would probably vary according to the size of cattle. Such variation should make the younger classes even more attractive.

IV. CONCLUSIONS

Data presented in this paper show the average performance of steers under a wide range of conditions of stocking rate, pasture type, feed quantity and quality, and management. Although some cattle would have been favoured, others would have been subjected to conditions mitigating against a good rate of liveweight gain. The outcome probably approximates the results that might be expected under average commercial conditions where normally there are periods of overstocking and understocking, paddocks of good and bad pasture, and times when herd management is efficient and times when it is not.

It is therefore suggested that the average figures quoted may be taken as a base line above which production can be raised regularly and profitably by attention to such matters as selection of appropriate pasture species, adoption of a suitable maintenance fertilizer programme, flexibility in marketing policies and careful store buying practices. Experimentally, and provided weather conditions are not abnormal, cattle in 'standard' treatments should not perform below these levels.

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REFERENCES

ARTHUR, B. A., MAYER, B. G. and RUDDER, T. H. (1972).—Faster growth from crossbreds. *Qd agric. J.* 98:469-472.

GROF, B. and HARDING, W. A. T. (1970).—Dry matter yields and animal production of guinea grass (*Panicum maximum*) on the humid tropical coast of north Queensland. *Trop. Grasslds* 4:85-95.

HARDING, W. A. T. and CAMERON, D. G. (1972).—New pasture legumes for the wet tropics. *Qd agric. J.* 98:394-406.

MELLOR, W., HIBBERD, M. J., and GROF, B. (1973 *a*).—Performance of Kennedy ruzi grass on the wet tropical coast of Queensland. *Qd. J. agric. Anim. Sci.* 30:53-56.

MELLOR, W., HIBBERD, M. J., and GROF, B. (1973 *b*).—Beef cattle liveweight gains from mixed pastures of some guinea grasses and legumes on the wet tropical coast of Queensland. *Qd J. agric. Anim. Sci.* 30:259-266.

TEITZEL, J. K. and BRUCE, R. C. (1972 *a*).—Fertility studies of pasture soils in the wet tropical coast of Queensland. 3. Basaltic soils. *Aust. J. exp. Agric. Anim. Husb.* 12:49-54.

TEITZEL, J. K. and BRUCE, R. C. (1972 *b*).—Fertility studies of pasture soils in the wet tropical coast of Queensland. 4. Soils derived from metamorphic rocks. *Aust. J. exp. Agric. Anim. Husb.* 12:281-287.

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The authors are officers of the Queensland Department of Primary Industries, and are stationed at South Johnstone and Townsville respectively.