POST WEANING NUTRITIONAL REGIMES FOR Bos indicus CROSS STEERS GRAZING BRIGALOW LANDS IN CENTRAL QUEENSLAND

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SUMMARY

A postweaning winter-spring nutritional regime of protein supplements, rumen modifier and hormonal growth promotant (Compudose 200 or 400) given to *Bos indicus* cross weaner steers grazing buffel pastures on Brigalow lands, significantly increases short term liveweight gain through a synergistic response. This culminates in sufficient retention of the original response to increase carcase weight, predicted saleable meat yield and carcase value. A single Compudose 400 hormonal growth promotant (HGP), implanted at weaning will give similar results. The highest benefit : cost ratio resulting from these regimes is 6.44:1 (based on carcase value) for the Compudose 400 only treatment. Nutritional regimes in the absence of HGP result in a short term liveweight advantage which is not retained until slaughter due to compensatory gain. Partial compensation was recorded in regimes that incorporated HGP. Use of winter oats in combination with HGP will give a similar result to protein supplements in increasing liveweight gain over an 18 month postweaning period.

These are the major findings of a series of three experiments and demonstrations at two sites in Central Queensland where *Bos indicus* cross weaners graze a basal diet of predominantly buffel grass. They were exposed to different nutritional regimes in winter-spring including protein supplements following weaning, rumen modifiers or grazing oats. In all cases, regimes have included implantation with a single HGP at weaning, with the implant being absorbed by the animals at least 16 months pre-slaughter, a factor worth considering in respect to minimising HGP residues in meat products.

Average annual liveweight gains of control animals grazing buffel pastures averaged 165-182 kg. To meet postulated market specifications of minimum carcase weight 300 kg (580 kg liveweight at 52.5 dressing percentage) and a maximum age of four permanent teeth (approximately 2-2.5 years), annual gains of greater than 190 kg per annum are required. Our control animal gains are below this target resulting in only a small proportion of animals meeting specifications. With the imposition of a postweaning regime of protein supplements, rumen modifier and HGP or HGP alone, this annual gain is increased to 190-200 kg resulting in a maximum of half the animals in any similarly aged turnoff group meeting market specifications. Greater liveweight gains would be required to ensure all animals in such turnoff groups meet proposed market specifications.

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INTRODUCTION

Results from an AMLC and AMLRDC survey of the Japanese Beef Market (Anon 1990) indicated that future product will have to meet certain requirements in terms of carcase specifications. These are, weight, fat cover, age of animal at slaughter and minimum product parameter standards for fat colour, meat colour, aroma and particularly tenderness, in addition to supplying a fresh and clean product. Also highlighted is the need for more rigid grading to meet specifications and a more marked differentiation between grades, for example, prime grain, prime grass, standard grass and bulk grass.

The AMLRDC in consultation with industry has postulated new beef grades based on rigid specification. One of the major differences between specifications in the proposed grades and specifications previously described by AMLC (Loxton and Holroyd 1989) is the reduction in the maximum turnoff age of seven permanent teeth to four permanent teeth for steer carcases of 300 kg minimum carcase weight. In northern Australia, *Bos indicus* cross steers with four permanent teeth would be aged approximately two to two and a half years. To meet this age specification, annual liveweight gains of 190 kg or greater would be required to ensure all animals in a turnoff draft are marketable.

The Brigalow region of central and southern Queensland is one of the most productive cattle grazing areas in Queensland and produces 43% of the State's beef. Mean annual liveweight gains approximate 180 kg on recently sown brigalow pastures (Walker et *al* 1987) which is lower than the minimum growth rate required to meet age specifications of proposed markets. Average annual growth rates on aged pastures are expected to be lower than 180 kg/year (G.B. Robbins *pers comm*).

In addition to age and other carcase specifications and product parameters for export beef, there is considerable interest in improving meat yield. Meat yield is a measure of production efficiency for beef producers and exerts a significant impact on the efficiency and profitability of beef processors.

In this paper we report on three experiments carried out to improve the growth and carcase quality of Bos *indicus* cross steers grazing brigalow lands in Central Queensland by using different nutritional regimes, particularly in the postweaning period on grass pastures at conservative stocking rates. The nutritional regimes have been based on protein supplementation (Loxton and Holroyd 1989), growth enhancers, and pasture and forage crop technology.

MATERIALS AND METHOD

Three experiments have been carried out at two sites; at Brigalow Research Station (Site A), approximately 30 km NW of Theodore, and at 'Berrigurra' (Site B), a commercial property located approximately 20 km WNW of Blackwater. Both sites are representative of an original brigalow gidgee pasture type (Weston and Harbison 1980). Site A allowed replication of treatments while Site B is used without replication' as a concurrent producer demonstration of results and field evaluation of alternative nutritional strategies. Supplement regimes in all cases were offered in the winter-spring.

At Site A, experiments 1 and 2 were carried out on a land type with predominantly clay soils that had originally supported brigalow and gidgee scrub pastures with or without melonhole gilgai (Shields and Anderson 1989). These soils have a mean bicarbonate

TABLE 1 Description of postweaning treatments used at two different sites on Brigalow lands in Central Queensland

Site	Experiment No	Start of supplementation treatments and duration	Mean liveweight at start of experiment/treatment (kg)	Treatments	Treatment Descriptions
A (Brigalow Research Station)	1	May 1987	194	C	Control of predominantly buffel grass pasture
		142d		Pr_1	500 g/hd/d Protein Meal (3:1 Cottonseed Meal/Meat Meal)
				Pr_1 + A	500 g/hd/d Protein Meal + 2 g/hd/d Avotan
				Pr_1 + A + 200	500 g/hd/d Protein Meal, 2 g/hd/d Avotan + Compudose 200 (implanted May 1987)
	2	June 1988	222	C	Control of predominantly buffel grass pasture
		145 d		C + 400	Control of Compudose 400 (implanted June 1988)
				Pr_1 + A	500 g/hd/d Protein Meal + 2 g/hd/d Avotan
				Pr_1 + A + 400	500 g/hd/d Protein Mean, 2 g/hd/d Avotan + Compudose 400 (implanted June 1988)
B (Berrigurra)	3	June 1989	254	C	Control of predominantly buffel grass pasture
		140 d		C + 400	Control + Compudose 400 (implanted June 1989)
				Pr_2 + A	750 g/hd/d Protein Meal + 2 g/hd/d Avotan
				Pr_2 + A + 400	750 g/hd/d Protein Meal, 2 g/hd/d Avotan + Compudose 400 (implanted June 1989)
				Oats	Buffel grass plus access to grazing oats
				Oats + 400	Buffel grass plus access to grazing oats + Compudose 400 (implanted June 1989)

1 Avotan 100 (active ingredient Avoparcin, Cyanamid Australia).

2 Compudose 200 or Compudose 400 (Oestradiol 17β, Elanco Products Company).

extractable phosphorus value greater than 25 mg/kg. Experimental pastures comprised rhodes grass, buffel grass and green panic grass. There were 80 Africander cross weaner steers in experiment 1 and 80 Brahman cross weaner steers in experiment 2. The stocking rate was 1 weaner steer/2 ha.

In experiment 1, steers were allocated into four treatments shown in Table 1. There were two paddock replications of each treatment in a completely randomised layout of eight paddocks. In experiment 2, steers were allocated into four treatments shown in Table 1. There were four paddock replications of each of the two supplement treatments (main treatments). These were split for the Compudose 400 treatment in a completely randomised layout of eight paddocks on similar pastures to those used over the supplement treatment period.

In experiments 1 and 2, the steers in each experiment were given common grazing from the completion of supplementation until turnoff. Approximate stocking rate over this period was 1 steer/2.5 to 3 ha.

At Site B, experiment 3 was not a designed experiment but a producer demonstration of known technology carried out on duplex soils on a land type originally supporting brigalow and gidgee scrub pastures with or without melonhole gilgai (Shields and Anderson 1989). These soils have a bicarbonate extractable phosphorus value between 10 and 25 mg/kg. Pastures were predominantly buffel grass. There were 234 Belmont Red/Brahman cross weaner steers which grazed three experimental paddocks at a stocking rate of 1 weaner steer/3.2 ha. There was no replication of paddocks. Six treatment regimes are shown in Table 1.

Supplementation commenced in June 1989 and continued for 140 days. The oats were grazed out after 112 days of the 140 day supplementation period. At the completion of supplementation, all steers had common grazing on buffel pastures with access to ponded pastures (species - para, hymenachne and aleman grasses) at a stocking rate of 1 steer/3 ha.

In all experiments, unfasted liveweights were recorded. All animals in experiments 1 and 2 were slaughtered when the average of the group reached a minimum target carcase weight of 320 kg. At slaughter in experiments 1 and 2, carcase parameters were recorded using industry adopted criteria of the AUSMEAT system. Carcase length and depth were measured by the ABCAM system (Anon 1983). Predicted saleable meat yield (Y) in kg was calculated from the prediction equation of R.F. Thornton *pers comm* in experiments 1 and 2 where:

$$Y = -6.32 + 0.633HSCW - 0.353P8 + 0.348EMA \ (R^2 = 0.980, SEE = 6.49 \text{ kg})$$

where HSCW = hot standard carcase weight (kg)
P8 = rump fat thickness (mm)
EMA = eye muscle area at the tenth rib (cm^2).

Grading for the Japanese grassfed markets (Al, A2) in experiment 1 and 2 was based on carcases that met age, carcase weight, fat cover, fat colour and muscle score criteria at the time of slaughter.

In experiment 1, treatment effects were tested using analysis of variance in which the error term was estimated from paddock variation. Treatment means were compared using the protected LSD procedure at the five percent level of significance. Experiment 2 has not yet been subjected to statistical analysis, while experiment 3 has not been completed.

RESULTS AND DISCUSSION

The liveweight change of treatment groups in experiments 1 and 2 are shown in Table 2. Advantages over the supplement treatment period were 10, 15 and 32 kg for treatments Pr,, Pr_1 + A and Pr_1 + A + 200 respectively in experiment 1 and 12, 23 and 42 kg respectively for treatments C + 400, Pr_1 + A and Pr_1 + A + 400 in experiment 2.

In experiment 1, there was a significant improvement in liveweight gain ($P < 0.05$) recorded in the Pr_1 + A + 200 group at the end of the supplement treatment period by the end of year 1 and at turnoff. There was no improvement in year 2 or year 3 liveweight gains due to postweaning treatment. In experiment 2, the response in liveweight change at the end of the supplement treatment period to the Pr_1 + A + 400 treatment. The response over year 1 and at turnoff to both the C + 400 and Pr_1 + A + 400 treatments is large.

Partial compensation was recorded following the completion of postweaning supplementation treatments. The advantage to treatment (advantage in kg/control mean liveweight expressed as a percentage) was 12 % for the Pr_1 + A + 200 treatment at the end of postweaning supplementation in experiment 1. This advantage had been reduced to 4.9 % at slaughter. In experiment 2, advantage to treatment was 4.1% and 14.3% for the C + 400 and Pr_1 + A + 400 treatments respectively at the end of the postweaning supplementation period. By turnoff, the advantage of C + 400 had increased to 5.6%, while the advantage to Pr_1 + A + 400 had been reduced to 8.3% through compensation.

The data of experiment 1 suggests an additive response to the combination of protein supplement, rumen modifier and HGP in liveweight gain at the end of the supplement treatment period while experiment 2 data suggests a synergistic response. The advantage to postweaning treatment in liveweight change at turnoff was -5, -16 and 30 kg in experiment 1 and 34, 13 and 50 kg in experiment 2 compared to controls (Table 2). However, overall liveweight change data of experiment 2 suggests most of the advantage exhibited by the Pr_1 + A + 400 treatment was due to the influence of the HGP. The advantage in terms of increased liveweight gain at turnoff to postweaning treatments utilising a HGP was 6.9% in experiment 1, 9.2% and 13.5% in experiment 2. The differences are due to the different implants, Compudose 200 in experiment 1, Compudose 400 in experiment 2. The advantage of 9.2% and 13.5% recorded by the C + 400 and Pr_1 + A + 400 treatments are in the range of responses recorded by steers in extensive grazing situations that had been implanted with HGP (Sawyer and Barker, 1988). In contrast to the normal use of HGP, the steers in our experiments were implanted at weaning and supplemented over the postweaning period. The implantation of steers early in life with HGP resulted in a similar performance to those implanted later in life, as reported in other studies (Sawyer and Barker 1988).

The pattern of annual liveweight change in experiments 1 and 2 indicates the magnitude of liveweight gain that can be achieved in the year following weaning and which could not repeated in the second year following weaning, that is, over the age group period - yearling to 30 months old. This result which has also been recorded in some of our other experiments in the Brigalow area suggests grass pastures in the region are limiting for maximum liveweight gain in yearling aged animals which equates with at least 450 kg liveweight. Average annual liveweight gains of treatments in experiments 1 and 2

TABLE 2 Weaning to turnoff liveweight change (kg) of *Bos indicus* cross steers resulting from the use of postweaning production supplements and/or growth enhancers on Brigalow lands in Central Queensland (Site A)

Experiment No	Treatments[1]	Supplement Treatment period Change (kg)	Post treatment compensation period change (kg)	Annual liveweight changes			Overall liveweight change (kg)
				Year 1 (Weaning to yearling) (kg)	Year 2 (Yearling to 30 months) (kg)	Year 3 (30 months to turnoff)[1] (kg)	
1			(Oct '87 - Mar '88)				(May '87 - Dec '89)
	C[2]	68^{a}	96	216^{a}	148	70	434^{a}
	Pr_1	78^{a}	90	220^{a}	138	69	429^{a}
	Pr_1 + A	83^{ab}	87	225^{a}	129	64	418^{a}
	Pr_1 + A + 200	100^{b}	98	259^{b}	138	68	464^{b}
	LSD ($P=0.05$)	17.5	12.7	12.2	19.9	7.7	17.9
2			(Nov '88 - Mar '89)				(June '88 - Dec '90)
	C	71	79	196	134	40	370
	C + 400	83	99	235	147	22	404
	Pr_1 + A	94	71	212	138	33	383
	Pr_1 + A + 400	113	80	243	148	29	420

[1] For draft 1 - seven month period, draft 2 - six month period.

[2] Where superscripting is used, the F-test in the ANOVA was significant and means within columns followed by different letters are significantly different ($P<0.05$). Means only presented for experiment 2.

approximate (based on average of year 1 and 2 gains) 165 to 182 kg/year for controls, 191 kg/year for C + 400, 199 for Pr_1 + A + 200 and 196 kg/year for Pr_1 + A + 400. The mean annual liveweight gains reported in our studies conflict with those of Burns ***et al*** (1991) where gains of 139, 123 and 85 kg (15 month period) were recorded on similar pastures at the same site. Differences in seasons, genotype and stocking rate may account for the discrepancy.

Liveweight of the Pr_1 + A + 200 group at turnoff was significantly different ($P < 0.05$) compared to the other treatments in experiment 1 (Table 3). A similar improvement in final liveweight of the C + 400 and Pr_1 + A + 400 treatments appears to occur in experiment 2. In addition, from liveweight data of experiment 2 a minimum target Iiveweight of 580 kg (equivalent to 300 kg carcase weight at 52.5 dressing percentage) was reached by the Pr_1 + A + 400 group and C + 400 group at 30 months of age, some six months and five months earlier than the control group. The average annual liveweight gain of these treatment groups (196 to 199 kg/year) is sufficient to achieve a 50% turnoff of similarly aged steers (four tooth maximum at 30 months) with minimum 300 kg carcase weight. Animals below the mean annual liveweight gain in any draft would not be suitable to meet these age and weight criteria. This lower half needs to be targeted for additional treatment to meet market specification.

There was not an accompanying significant increase in hot carcase weight of the Pr_1 + A + 200 treatment group compared to controls in experiment 1 (Table 3). The significantly lower dressing percentage ($P < 0.05$) which is unexplained for this treatment group would account for the lack of carcase weight advantage. There is no difference between treatments in rump fat cover or eye muscle area. There was a non significant increase in eye muscle area of the Pr_1 and Pr_1 + A treatment groups. The Pr_1 + A + 200 treatment group had significantly longer and deeper carcases ($P < 0.05$) compared to controls. Predicted saleable meat yield and carcase value reflect carcase weight. There was no significant improvement in predicted carcase meat yield or carcase value of the Pr_1 + A + 200 treatment group compared to controls.

The grading of carcases suggests a higher proportion of carcases met current Japanese market specifications in the Pr_1 + A + 200 treatment group. Of economic consideration, the differences in carcase value between treatments reflect carcase weight/predicted saleable meat yield differences between treatments.

In experiment 2, the apparent trends show an increased carcase weight for the C + 400 and Pr_1 + A + 400 treatment groups, with no difference in dressing percentage, carcase depth, fat colour or meat colour score. Mean fat colour and meat colour values fall in the desired range of 4-5 for fat colour and 1-5 for meat colour to meet pasture fed specifications of the postulated grades. Rump fat cover and eye muscle area is marginally lower in the C + 400 treatment group and markedly lower in the Pr_1 + A treatment group. As in experiment 1, treatment differences in predicted saleable meat yield reflect carcase weight differences while carcase value differences reflect carcase weight/predicted saleable meat yield differences. The proportion of animals grading in Central Queensland for the current Japanese market is markedly improved in the Pr_1 + A + 400 treatment.

Improved carcase weight of HGP treated groups was probably due to the longer term Compudose 400 implant of experiment 2. There was no difference in dressing percentage between experiment 2 treatments, yet the dressing percentage of the Pr_1 + A + 200 group in treatment 1 was depressed. There appears to be no consistent trend in rump fat cover

TABLE 3 Carcase parameters of *Bos indicus* cross steers given postweaning production supplements and/or growth enhancers on Brigalow lands in Central Queensland (Site A)

Experiment No	Treatments	Final liveweight (kg)	Carcase weight (kg)	Dressing percentage (%)	Rump fat cover (mm)	Eye muscle area (cm^2)	Carcase length (mm)	Carcase depth (mm)	Ausmeat chiller assessment		Predicted saleable meat yield (kg)	Carcase value ($)	Carcases[3] graded Japanese grassfed (%)
									Fat[1] colour score	Meat[2] colour score			
1													
	C^4	629^{a}	336^{bc}	53.6^{a}	17.6	79.6	1161^{b}	658^{c}			228^{ab}	755^{bc}	60
	Pr_1	621^{a}	329^{ab}	53.2^{ab}	16.6	82.4	1153^{b}	649^{b}			226^{ab}	740^{ab}	70
	Pr_1 + A	612^{a}	325^{a}	53.1^{ab}	19.9	82.4	1133^{a}	642^{a}			221^{a}	728^{a}	45
	Pr_1 + A + 200	660^{b}	344^{c}	52.2^{b}	16.5	81.4	1206^{c}	665^{d}			234^{b}	772^{c}	74
	LSD ($P=0.05$)	17.4	10.3	1.2	4.0	4.2	20.3	6.9			8.4	24.4	
2													
	C	593	316	53.2	17.0	77.5	1137	627	6.4	2.20	215	679	60
	C + 400	626	334	53.4	15.9	76.7	1177	631	6.3	2.45	226	717	65
	Pr_1 + A	604	321	53.1	14.7	73.3	1148	633	6.2	2.26	217	692	63
	Pr_1 + A + 400	642	341	53.1	18.1	79.0	1174	636	5.7	2.00	231	748	84

1 Visual fat colour score 0-9, with 0-white, 9-yellow.
2 Visual meat colour score 1-9, with 1-bright, 9-dark.
3 Proportion of animals within treatments that met Japanese A1 or A2 market specifications.
4 Where superscripting is used, the F-test in the ANOVA was significant and means within columns followed by different letters are significantly different ($P<0.05$). For predicted saleable meat yield the difference indicated was only marginally significant ($P = 0.052$). Means only presented for experiment 2.

or eye muscle area. Most noticeable is the larger eye muscle area of the Pr_1 + A treatment group in experiment 1 (n.s), yet in contrast this same treatment in experiment 2 has greatly reduced eye muscle areas.

TABLE 4 Economic assessment of postweaning production supplements and/or growth enhancers realised as carcase value in ***Bos indicus*** cross steers grazing Brigalow lands in Central Queensland (Site A).

Experiment No	Treatments	Benefit : Cost ratio[1]
1	C	
	Pr_1	-0.66:1
	Pr_1 + A	-0.94:1
	Pr_1 + A + 200	0.52:1
2	C	
	C + 400	6.44:1
	Pr_1 + A	0.40:1
	Pr_1 + A + 400	1.78:1

Benefit cost ratio ≥1.00:1 acceptable; <1.00:1 unacceptable, that is, cost greater than benefits.

In experiment 2, HGP treated groups had more saleable meat, however there was no significant improvement in saleable meat yield in experiment 1. Predicted saleable meat yield is strongly influenced by carcase weight. Carcase length and carcase weight appear related in these experiments, as treatment groups implanted with HGP have longer carcases. In experiment 1, the Pr_1 + A + 200 group had less fat cover (n.s). In experiment 2, the C + 400 group also had less fat cover, while the Pr_1 + A + 400 group had. more rump fat cover. This suggested that carcase composition had been modified by the use of HGP whether in combination with protein supplements and rumen modifiers or not. This was probably due to a change in carcase fatness. However, the apparent change in composition was not sufficient to influence predicted saleable meat yield in experiment 1. Overseas studies reviewed by Sawyer and Barker (1988) have shown that levels of lean meat (protein) increase and the amount of fat decreases in selected portions of the carcase following the use of Compudose. We did not measure lean meat content in our experiments but have observed that the subcutaneous fat cover of the carcase can be affected.

The results of these experiments suggest the strong carryover effect of postweaning treatment on subsequent liveweight performance and carcase characteristics. Postweaning supplements were given approximately 2 to 2.5 years pre slaughter, while HGP were implanted 2.5 years pre-slaughter and in the case of Compudose 400 would have been absorbed by some 16 months pre-slaughter. In addition, the early stage of life at which the HGP were implanted and the long phase (16 months pre slaughter) without an active growth promotant, could have implications in minimising any HGP residues. This strategy may be attractive to consumers.

The benefit cost analysis based on carcase value carried out for postweaning treatments used in experiments 1 and 2 are shown in Table 4 The cost of all treatments in experiment 1 have outweighed any financial benefits, however the benefit of a single Compudose 400 implant (C + 400 treatment) at weaning in experiment 2 on subsequent carcase weight at approximately three years of age is most apparent. In contrast the benefit cost of the Pr_1 + A + 400 was only one third of the C + 400 treatment (experiment 2).

TABLE 5 Post weaning liveweight changes (kg) of ***Bos indicus*** cross steers exposed to different nutritional regimes on Brigalow lands in Central Queensland (Site B).

Experiment No	Treatments	Supplement Treatment period		Post treatment Compensation period	Overall	
		Change (kg)	Advantage to treatment (kg)	Change (kg)	Change (kg)	Advantage to treatment (kg)
3				(Nov '89 - Mar '90)	(June '89 - Dec '90)	
	C	55		84	247	
	C + 400	69	14	94	248	37
	Pr_2 + A	98	43	61	264	17
	Pr_2 + A + 400	116	61	69	291	44
	Oats	92	37	73	263	16
	Oats + 400	114	59	79	299	52

Experiment 3 was carried out at Site B, primarily to evaluate alternative nutritional strategies not available at Site A and be a technology demonstration site for beef producers. In experiment 3, the opportunity was taken to evaluate grazing oats for ***Bos indicus cross*** weaners. Grazing oats are often incorporated into cultural systems on brigalow lands following cultivation for the control of woody weeds in existing permanent pastures.

The response in liveweight change to some of the treatments in this experiment have been marked (Table 5). Notable responses over the supplementation treatment period were 43, 61, 37 and 59 kg for treatments - Pr_2 + A; Pr_2 + A + 400; Oats and Oats + 400 respectively. There was an apparent lack of response to the C + 400 treatment over the same period. High weight gains were achieved in the Pr_2 + A + 400 and Oats + 400 treatments over the 140 day treatment period. Over the 112 day effective grazing period of the oats, the daily gains of the Oats and Oats + 400 treatments were 0.98 and 1.13 kg/hd/d which is similar to that achieved by heavier cattle grazing oats in Central Queensland.

Performance over the compensation period shows the compensatory gain by the control group and the higher gains of the C + 400 group (94 kg) relative to the control (84 kg) and to the other groups with active HGP - Pr_2 + A + 400 (69 kg) and Oats + 400 (79 kg). This phenomenon of greater liveweight gains being recorded by C + 400 steers over the compensation period compared to the control and the other HGP groups was also recorded in experiment 2 at Site A. The physiological mechanism involved in this phenomenon is not understood. The lower gain over the compensation period of treatments as recorded by Pr_1 + A + 400 (experiment 2, Site A), Supp D + 400 or Oats + 400 treatments appears to reflect previous performance over the supplementation treatment period. This phenomenon requires further investigation.

TABLE 6 Economic assessment of increased liveweight gain due to different post weaning nutritional strategies for ***Bos indicus*** cross steers on Brigalow lands in Central Queensland (Site B).

Experiment	Treatments	Benefit : Cost Ratio[1] (Based on liveweight change June '89 - June '90)
3	C	
	C + 400	2.86:1
	Pr_2 + A	0.15:1
	Pr_2 + A + 400	0.76:1
	Oats	0.45:1
	Oats + 400	1.86:1

Benefit cost ratio ≥1.00:1 acceptable, <1.00:1 unacceptable, that is, cost greater than benefits.

The overall advantage to treatment in this experiment highlights the magnitude of the response particularly in the C + 400; Pr_2 + A + 400; and Oats + 400 treatments. Original responses to treatments Pr_2 + A and Oats have been reduced through compensation. The original treatment responses (liveweight advantage/mean body weight of controls expressed as a percentage) were 13.8%, 19.6%, 11.9% and 18.9% to treatments Pr_2 + A; Pr_2 + A + 400; Oats and Oats + 400 respectively. For the same treatments excluding C + 400, these advantages were reduced through compensation to 3.3%, 8.7%, 3.2% and 10.3% while advantage to the C + 400 treatment increased from 4.5% to 7.3%. Such an increase was also reported in the same treatment in experiment 2 (Site A).

Annual liveweight gains in this experiment are similar for the weaning to 18 month old period recorded in other experiments in this paper. Actual annual gains were 193,218, 209, 235, 212 and 245 kg for treatments C + 400; Pr_2 + A; Pr_2 + A + 400; Oats; and Oats + 400 respectively.

The economic assessment of treatments used in experiment 3 are shown in Table 6. This assessment is based on liveweight gains over the initial 12 month period following weaning. The benefit cost ratio in this experiment shows a financial benefit of the Oats + 400 and C + 400 treatments. The common denominator in both treatments is the HGP - Compudose 400, with the greater return being recorded for a treatment simply involving the implantation of Compudose 400 at weaning. This result reflects results of experiment 2 where a cost benefit ratio of 6.44:1 expressed as increased carcase value was recorded to the same treatment.

In conclusion there are a number of important biological and economical considerations from this series of experiments. To date the most financially attractive regime has included the use of a HGP alone and such benefits can be realised in the live animal or through increasing carcase value. Higher cost input treatments such as protein supplements in combination with growth enhancers may only be financially attractive if animals could be sold at the end of treatment as feeder steers or for the Australian domestic market and prior to loss of advantage through compensatory gain.

We are currently evaluating alternative postweaning nutritional regimes in experiments and field evaluations at the same sites in Central Queensland. In particular we are examining the benefit of protein supplements, rumen modifier and HGP in both postweaning years, energy supplements in the absence of HGP between weaning and turnoff, and tree leucaena for grazing weaners.

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