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High-input systems for northern breeding herds

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Abstract

The potential of northern beef producers to profitably produce 500 kg steers at 2.5 years of age in a dry tropical environment, thus meet specifications of premium markets, using a high-input management (**HIM**) system was examined. HIM included targeted high levels of fortified molasses (**FM**) supplementation, growth promotants in steers and short seasonal mating. It was compared at a full-business level to best-practice, strategic low-input management (**SLIM**) using commercial-scale herds at three sites.

Compared to SLIM herds, early concentrated calving in HIM herds increased weaning weights by ~30 kg, and annual growth by ≥30 kg after wet season weight compensation, enabling almost all steers to exceed 500 kg at 2.5 years of age. Very few contemporary SLIM steers reached this target. HIM was most profitably applied to steers. Where HIM was able to achieve high pregnancy rates in yearlings, its application was recommended in females. Well-managed, appropriate HIM systems increased profits by around $15 per adult equivalent at prevailing beef and supplement prices. A 20% supplement price rise without similar elevation in premiums for young slaughter steers would eliminate this advantage in many situations. HIM should only be applied after SLIM is well developed.

Executive summary

Project

To meet the specifications of premium markets, northern beef producers need to consistently achieve steers live weights of at least 500 kg by 2.5 years of age. This may be achieved with suitable breeding for the specific environment coupled with nutritional management that enables a high proportion of heavy calves at the first annual weaning and high subsequent growth, especially of male castrates. Component research has indicated that this is achievable. However the financial viability has not been previously assessed at a full business level. This project aimed to develop recommendations to profitably achieve 500 kg steers at 2.5 years of age in a dry tropical environment using targeted high levels of supplementation with fortified molasses (**FM**).

Method

Five herds of approximately 300 breeding females with female and male castrate progeny at three sites in north Queensland were established and monitored for 2 years. At two sites, a **strategic low-input management** (**SLIM**) herd that represented prevailing best-practice management in the region was compared to **high-input management** (**HIM**) herd. HIM systems alone were used in one herd at the third site which represented wetter coastal regions. Supplementation enables mating to be shorter and commence a month earlier in HIM systems. This produces heavier older progeny that are supplemented to increase annual growth. The study included steers derived from SLIM herds being managed using HIM systems.

SLIM: mate from January for 5 months; first mating at 2 years; retain only pregnant cows; growth promtants for all steers; FM for small weaners and for survival feeding; dry licks to all cattle continuously when not fed FM. Differences in HIM: mate from December for 3 months; first mating at 1 year if heavy enough; FM to all weaners, yearling steers, and pregnant yearlings all dry season, and to cows from August to the season break. Molasses was fortified with either 8% urea (**M8U** – for breeding cattle) or with 3% urea and 10% protein meal (**MUP** – for growing cattle); all mixes included phosphorus, salt and Rumensin™.

Supplements and cattle

- Over a feeding period average M8U intakes are 0.5% of body weight. MUP intakes are double this. Supplements as-fed in the HIM system typically cost $70 annually for weaners and cows, and twice this for yearlings, depending on the price of molasses.
- HIM systems require 4-7 times as much labour for supplementation as SLIM systems, and this is costed into supplements in business analyses.
- Pregnancy rates of well-managed cows are 80% or better in HIM systems. Their weaners are ~30 kg heavier on average than SLIM weaners, and all are weaned at first round. If pasture nutrition is good enough, yearling pregnancy rates of 80% are consistently achievable.
- Steers in HIM systems consistently achieve annual growth of 160-200 kg. They can gain over 250 kg where better base pasture is available. HGPs add ≥20 kg to steer growth annually. Almost all steers reach at least 500 kg by 2.5 years of age, even when pasture nutrition is poor quality. At this age, over 90% of Brahman still have 2 or less permanent incisors.

Business impacts

- When managed well, the most appropriate HIM systems increased profits by ~$15 per adult equivalent in the herd at the price of molasses as-fed and the premiums expected for high-quality cattle during 2004-06. A supplement price rise of only 20% would be likely to eliminate the potential benefits of HIM systems in many situations, especially in females, and they will be discontinued unless substantial cattle price premiums are available. Molasses cost on site in the

project was \$80-\$100/tonne (15-18 cents/kg for MUP as fed) at the dry sites, and \$65/tonne (13 cents/kg for MUP as fed) at the coastal site.

- The success of HIM systems is mostly due to their effect on steer values at sale. As most female sales do not occur till they approach maturity, it is difficult to recoup the extra value created in female progeny unless yearling mating can be implemented. The success of these systems is dependent on molasses prices and price premiums available for steers at turnoff.
- If pasture nutrition is poor, and HIM is unable to achieve high pregnancy rates in yearlings, then heifers should be managed till first pregnancy using SLIM. This achieved, HIM or SLIM in cows may differ little in profitability while molasses and beef prices remain favourable.
- A fully-costed HIM system includes labour which may complement other business labour requirements to create a full-time position.

Implementing HIM systems

- Only use HIM systems after a business analysis indicates it will increase profitability. Factors to consider include availability of molasses and other components of supplements, price of fortified molasses as-fed, the quality and supply of pasture nutrition, the availability of infrastructure and suitable staff to control cattle and to achieve targeted supplementation, and the availability of sale premiums. A business analysis should examine a range of options to indicate the best choice of herd structure and management. This should be combined with regular additional analyses of the opportunity to apply HIM systems to finishing cattle (surplus females and steers) within a year of slaughter.
- Only use HIM systems when SLIM systems are already well-developed, especially pasture management, seasonal mating, weaning, disease control, and bull fertility evaluation. Do not use HIM systems where pastures are heavily grazed. The substitution of pasture for supplement and the relatively-low growth responses will ultimately create debts rather than profits.
- Stage adoption of HIM systems. As management and facility development allows, start HIM systems in weaner steers. Progress to breeding females and juvenile females when steer feeding and management systems are operating effectively.
- Use professional advice to formulate supplements for various classes of stock to achieve specific targets within HIM systems. Use rumen modifiers in molasses mixes and HGPs to improve the efficiency of HIM systems.
- Pregnant yearlings within HIM systems should be maintained in forward body condition throughout gestation, and particularly during the first and second trimesters, to avoid high calf wastage, calving difficulties and cow deaths.
- HIM systems result in younger cattle having larger mass and feed intake. If yearling mating is implemented, then the business should have up to 25% fewer breeding females over 2 years of age (depending on level of implementation) to maintain similar grazing pressure. When yearling mating is not practised, then 10% fewer breeding females is recommended.

Industry application and impact

It is considered that HIM systems may be applicable to 3.5M cattle in north Australia, but that only 10% of producers would implement HIM systems options, with a benefit to the regional economy of ~\$6M, given the prices of supplements and cattle during the project period.

Those with the best opportunity to implement these systems are closer to sugar mills, and have more ready access to market that provide premiums for high-quality slaughter cattle. However, a 20% rise in supplement costs, without concomitant increases in premiums for high-quality slaughter cattle could result in discontinuation of HIM systems in many areas as the benefits will evaporate.

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1 Background

Grazing beef business is based on utilising pasture to increase the value of a cattle herd by either growth or reproduction. The value of the end product is a combination of quantity (high reproduction, low mortality) and quality (high weight for age, ideal fatness). Concurrent with the development of infrastructure over the past 30 years in particular, the northern beef industry with RD&E support has developed very good strategic low-input management that has substantially improved beef production efficiency. However, weaning rates and weaner weights remain relatively low and variable in many situations, as a function of low and variable rainfall; steer sale ages are high for the same reason.

In response to variable meat quality available to domestic consumers, MLA has supported an RD&E program in recent years to develop Meat Standards Australia. These standards provide a guarantee of eating quality. They require carcasses to have an ossification score of <300. This score is reached at about 3.5 years of age, though is quite variable. In effect, this requires a high proportion of a cohort of steers to reach slaughter weight or the start of the final finishing phase by 2.5 years. This is driving age of steer sales for slaughter lower than is current practice. To achieve lower slaughter age requires new ways of managing breeding cattle and their progeny.

There are three primary strategies to meet target weights at younger ages:

- ***Productive genotype***. Breed is a business choice and breeding objectives should include growth.
- ***Heavy calves at the first weaning***. This is a critical aspect and is a function of reproductive management to achieve concentrated conceptions early in the optimum mating period.
- ***High growth rates***. This is primarily a function of pasture management and strategic dry-lick supplementation combined with energy supplementation.

Many component studies have been conducted on the effects on growth and fertility of supplementing animals in the seasonally-dry tropics with energy concentrates. Dr Stu McLennan and associates initiated studies of *ad lib* feeding fortified molasses in the 1970s at Swan's Lagoon. The use of fortified molasses in the 1982-83 drought proved to be an extremely valuable contribution to our understanding of ruminant nutrition and production in the dry tropics. The fertility of cattle appeared higher than would normally be expected from body condition scores, reproductive status, age and genotype of the cows fed in this drought; this subsequently lead to research that confirmed the effects, and which has since been incorporated into management strategies such as spike feeding (Fordyce *et al* 1996a; Fordyce *et al* 1997). Substantial benefits to heifer fertility by strategic use of energy supplements in weaners have also been demonstrated (Fordyce *et al* 1988; Fordyce *et al* 1996b). In the 1980s and 1990s, Dr John Lindsay conducted a considerable number of studies at Swan's Lagoon demonstrating dry season growth rates of steers in the order of 0.7 kg/day through daily intakes of fortified molasses at ~1% of body weight. The additive effects of HGPs on steer growth are also well documented and have been demonstrated at Swan's Lagoon and elsewhere.

Desk-top systems studies based on component research suggested there was an opportunity to further increase the efficiency of grazing beef production and meet emerging market needs by using longer-term energy supplementation (high input) for most breeding-age and immature females, and for steer progeny. High-input management of steers is applicable to businesses targeting a range of markets, eg, store/live export, and slaughter markets - Jap ox, Korean or domestic. This strategy also enables producers to finish cattle after the end of the pasture-growing season when these marketable cattle are in short supply. In addition, earlier sale of steers saves pasture resources for other uses. The benefits of high-energy inputs for steers are enhanced by the use of HGPs.

It was hypothesised that high-input management could consistently achieve steer live weights of ***500 kg by 2.5 years*** of age when fewer than 25% have more than 2 permanent (incisor) teeth, thereby increasing cash surplus, reducing risk, and potentially improving time efficiency (lifestyle). To test the hypothesis in a manner that would facilitate adoption by the grazing industry, production and financial benefits were evaluated and compared for strategic low-input management (**SLIM**) and high-input management (**HIM**) systems in low-growth regions. HIM systems utilised a high level of fortified molasses (**FM**), whereas SLIM systems relied more on dry licks.

2 Project objectives

By 31 January 2007:

1) Determine the relative production and financial impacts of a high-input management system against low-input management in the dry tropics

2) Develop recommendations for use of high input management systems for commercial cattle producers in the dry tropics of northern Australia.

3 Method

3.1 Sites

The project utilised cattle herds at 3 sites:

	Thalanga Stn	***Swan's Lagoon***	***St Margaret's Creek***
Owner	Robert & Leesa Rebgetz & family	DPI&F, Qld	Stan & Delma Haselton
Location	50 km west of Charters Towers	80 km south-west of Ayr	50 km SE of Townsville
	145.8^{O}E 20.3^{O}S	147.2^{O}E 20.2^{O}S	147.1^{O}E 19.4^{O}S
Climate	Dry tropics Av rainfall: 670 mm	Dry tropics Av rainfall: 839 mm	Seasonally-dry tropics Av rainfall: 1500 mm
Soils	Yellow earths that are mostly acutely-phosphorus deficient	Low-fertility duplex soils that are mostly phosphorus deficient	Low-fertility duplex soils that are mostly phosphorus deficient
Vegetation	Open eucalypt savannah woodland (ironbark and wattles mainly) with a native unimproved pasture predominated by Golden beard, wire and black spear grasses	Open eucalypt savannah woodland with a native unimproved pasture predominated by black spear, Indian couch, and Golden beard grasses	Mostly cleared with sown tropical pasture predominated by *Brachiaria* spp.

	Thalanga Stn	*Swan's Lagoon*	*St Margaret's Creek*
Cattle	Brahman cows with Brahman and Senepol x Red Angus bulls	Brahman crossbred#	Brahman
Herds	HIM & SLIM herds	HIM & SLIM herds	HIM herd

A composite primarily of Brahman and Shorthorn developed by objective selection for growth, fertility, temperament, adaptation, conformation, and milk yield

Agreements were established with each collaborator to maintain operation of the herds as required between April-May 2004 and April-May 2006. A project advisory group assisted the technical operations staff, especially with field days. This group comprised collaborators, project sponsors, commodity suppliers, and interested cattle producers from the region.

3.2 Animals

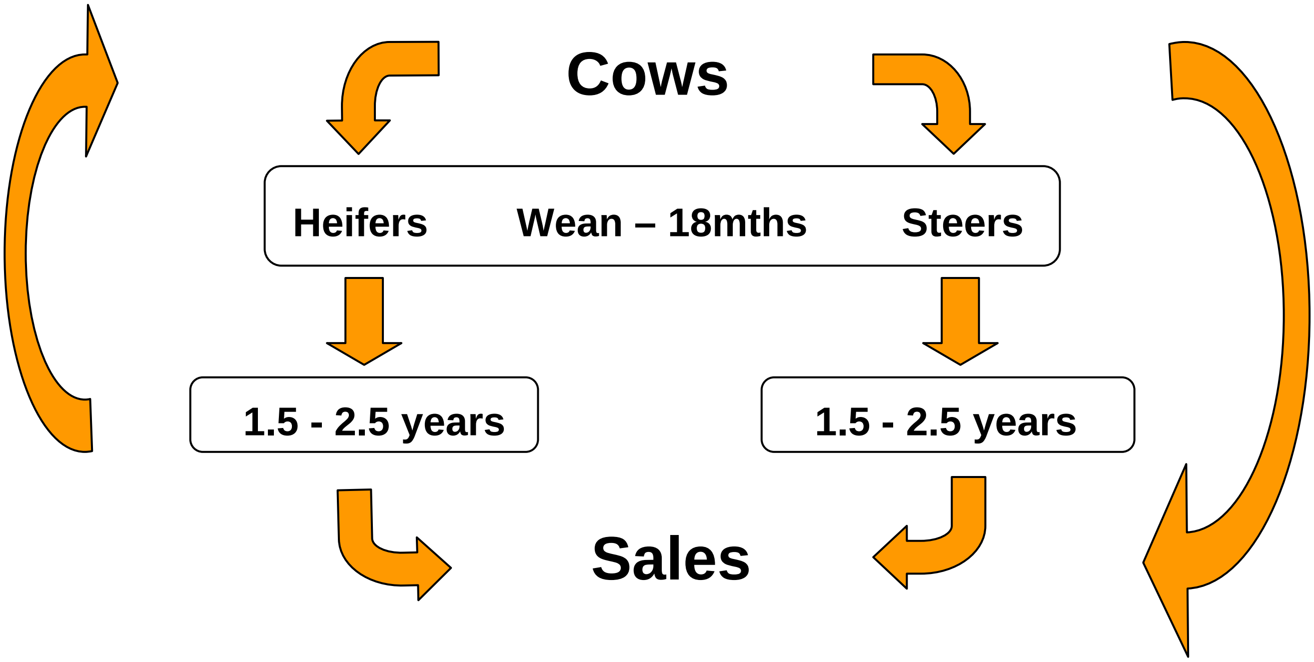
3.2.1 Females

The project established five breeding herds (2 SLIM, 3 HIM), each comprising approximately 300-400 females plus their steer progeny (Table 1; Figure 1). The animals allocated to these herds were selected on the basis of age and stage of pregnancy to represent expected status in an on-going system. Prior mating management and energy supplementation facilitated project establishment in the face of extremely poor seasonal conditions (late 2003 and early 2004). This enabled assessment of whether the applied management would maintain the herd structure and output as hypothesised.

Table 1. Approximate target number of female cattle

Animal age	SLIM herds	HIM herds	HIM herd
	Thalanga & Swan's Lagoon	Thalanga & Swan's Lagoon	St Margaret's Ck
0.5-1.5 yrs	100	75	85
1.5-2.5 yrs	60	40	55
2.5-3.5 yrs	50		
Cows	180	180	135

Figure 1. Herd structure



For the duration of the study, the average number of females in the herds was relatively stable. Cattle moved to their next age management group at the April-May muster. Approximately one third of the SLIM calves were weaned in August-September.

All herds and age groups indicated above within herds were segregated except the Thalanga SLIM herd which comprised individually-identified animals (about 1/3rd) within much larger groups of females. When animals were culled or surplus, they were returned to the owners' main herds.

3.2.2 Steers

At Swan's Lagoon and Thalanga, steers in two age groups (No.04 and No.05 in 2004 and 2005, respectively) were selected from those available by stratified randomisation on weight and allocated to 3 growth pathways:

- **SLIM**: Weaned from the SLIM herd, post-weaning SLIM management; n=30
- **SLIM-HIM**: Weaned from the SLIM herd, post-weaning HIM management; n=40
- **HIM**: Weaned from the HIM herd, post-weaning HIM management; n=40

All SLIM-HIM and HIM steers were managed together. There was one replicate at Thalanga; the steers at Swan's Lagoon were allocated by stratified randomisation on weight to 2 equal replicates.

Each replicate of Swan's Lagoon steers was allocated to 6 growth-management groups in the dry season post-weaning. These groups were on the basis of size (very small, small, big) and supplementation required. During growing seasons, steers were managed as two replicates. From 18 to 24 months of age (dry season), the No.04 steers were managed as 4 groups: 2 replicates by 2 supplementation requirements (SLIM *v* HIM & SLIM-HIM).

The Margaret Creek steers were a replicate of HIM and all available steers were managed as one group.

All steers in the core study received a six-monthly Compudose 200™ implant, or an annual Compudose 400™ implant commencing at weaning. No.04 and No.05 steers were monitored to 2.5 and 1.5 years of age, respectively. At St Margaret's Creek, a subset of No.04 steers (10 of 73) was randomly allocated to receive no HGP. At Thalanga, an extra 20 (HIM) or 30 (SLIM and SLIM HIM) randomly-selected No.04 steers per growth pathway were allocated by stratified randomisation on weight to either:

- No HGP
- Annual Compudose 400™
- One Compudose 400™ at 12 months of age

3.3 Management

3.3.1 Stocking

Pasture management including wet season spelling was implemented, as recommended by GLM Edge (Chilcott *et al.* 2005). All cattle grazed paddocks that were part of programs to achieve either short (~2 months) annual wet-season spelling or full wet season spelling each ~3 years. Short spelling allowed pastures to seed before grazing re-commenced.

Stock numbers were regulated after each age group was advanced to its next management group at the April-May muster by removing aged or non-productive cows. Extra cattle of the same class were added to Swan's Lagoon weaner steer groups to achieve equal pasture utilisation across all 12 paddocks used for these animals. Typical stocking rate at Swan's Lagoon and Thalanga was 5 and 6 ha, respectively, per adult equivalent (one AE eats the same amount of grass as a 450 kg steer). Stocking rate averaged 1 AE per 3 ha on the tropical improved pastures at St Margaret's Creek.

3.3.2 Animal selection

Animals were selected each year as follows:

Selection age	***SLIM***	***HIM***
Weaners	All (~100)	75 (~¾) of those available
Yearlings	60 based primarily on high post-weaning growth, ability to hold body condition in the dry season, good temperament	All pregnant heifers
2.5+ years	All pregnant animals, and cull oldest to bring numbers to correct level. If numbers are insufficient, retain non-pregnant lactating cows aged 3.5 years.	Pregnant animals, and cull oldest to bring numbers to correct level. If numbers are insufficient, retain non-pregnant lactating cows aged 2.5 years.

3.3.3 Mating

All HIM females, including yearlings, were mated for 3-4 months from late December to calve October-December. SLIM females aged 2 years and older were mated for 5-7 months from late January to calve between November and the April-May muster. Bulls were allocated to mating by the owners of the cattle.

3.3.4 Weaning

SLIM calves weighing 100 or more kg and all HIM calves were weaned in April-May each year; the remaining SLIM calves were weaned in August-September.

3.3.5 Supplements

Molasses with 8% urea (**M8U**) and molasses with added protein meal and urea (**MUP**) were the primary fortified molasses mixes fed (Table 2) and these were usually available *ad lib*. MUP was fed to all HIM and SLIM HIM weaners and steers for the dry season. At St Margaret's Creek, MUP is continually available to HIM steers. MUP was fed to SLIM weaners till they reached 150 kg. All HIM females over 18 months were fed M8U from August till the season break. For short periods at various times the level of urea and protein meal in molasses mixes were varied to meet intake objectives.

Table 2. Project supplement constituents

Dry licks used			**Fortified molasses mixes used**		
Ingredients (kg)	***Dry season***	***Wet season***	Ingredients (kg)	***MUP***	***M8U***
Urea	30%	21%	Molasses##	1000	1000
Ammonium sulphate	6%	4%	Urea	30	80
Kynophos 21 **	12%	75%	Protein meal#	100	
Protein meal#	5%		Di-calcium phosphate	10	10
Salt	47%		Flossy fine salt	10	10
Weekly intake/Cow	***1 kg***	***1/3rd kg***	Rumensin™	0.5	0.5

~90% dry matter; Palm kernel extract (~15-20% crude protein, 12.5 MJ of ME) and Copra meal (~20-25% crude protein, ~12.5 MJ of ME) were used in this project.
~75% dry matter and ~13 MJ of ME per kg of dry matter. ** Calcium phosphate

When not fed fortified molasses, all HIM and SLIM cattle were offered dry licks (Table 2) with different formulations for the wet and dry seasons (Dry season: more urea & sulphur, less phosphorus).

3.4 Measurements and analyses

3.4.1 Pasture

All pastures utilised by project herds were monitored using "Stocktake" twice yearly at the interfaces between the wet and dry seasons, ie, in April-June and October-December, to determine pasture yields, ground cover, tree basal areas, and condition of the soil, pasture and ground cover. Stocktake is a standardised system developed by the DPI&F, Queensland for beef producers to objectively assess pasture and soil. Pasture yields are derived using photo standards. Grazing land condition ratings indicate the capacity of land to respond to rain and produce useful forage, as well as being a measure of how well ecosystems function. The ratings used are:

- A - Good condition, characterised by abundant preferred pasture species with little weed, no tree thickening and stable, un-eroded soil with good ground cover.
- B - Fair condition indicates some change away from A and carrying capacity down by 20%. It can readily be recovered to A with management, though could slip to C if mismanaged.

- C - Poor condition is characterised by major reduction in preferred pasture species, obvious erosion and bare ground, and weed invasion and tree thickening, all of which halve carrying capacity. A slow return to B condition is achievable through good management.
- D - Very poor condition. Such land has very low carrying capacity and usually has few preferred pasture species and low yields, scalding or erosion, and thickets of woody plants or weeds. Physical renovation is required to rehabilitate this land.

Photographic records of all monitor sites were taken. Descriptive statistics were prepared for this report.

3.4.2 Animals

All female cattle were mustered in April-May for weaning when their weight, body condition, lactation status, stage of pregnancy and hip height were measured. All measurements except hip height were repeated at the second weaning muster. Mating outcomes were determined by transforming this data into estimated date of conception, success/failure to wean a calf, and date of weaning. Unmated juvenile females were also assessed at the end of the dry season. Steers were assessed approximately each 2 months.

Pre-weaning growth rate of the 2005 and 2006 (No.05 and No.06) calf groups were calculated in the following manner. Calves were known to be born of either first-lactation or older females. From foetal ageing, and an average gestation length of 284 days for Brahman cross (Holroyd *et al* 1979) and 290 days for Brahmans (unpublished Beef CRC data), time of calving was estimated for each cow. Within treatment, lactation group and year, cows that suckled a calf at the April/May muster, were ranked from earliest to latest calving, and blocked into equal size groups (5-15 groups with 5-10 animals per group). Average age of calf at the muster was calculated for each group. Corresponding calves were ranked within sex on weight at the April/May muster and grouped into the same number of equal-sized groups as their dams. Average weight of each calf-sex group was then calculated. Calf birth weights of 27.9 and 29.5 kg were used for female and male Brahman crossbreds, respectively (Fordyce *et al* 1993); 28.5 and 30 kg, respectively, were used in calculations for Brahmans. Growth rate of each calf-sex group was calculated using estimates of increase in weight since birth and time since birth. The overall average of pre-weaning growth rate within treatment, lactation group, year, and calf sex groups was then calculated, and then averaged for both sexes. The average difference between sexes across all groups was also calculated.

Adult equivalence (AE) was calculated for each animal in each year as the average between the first rounds in consecutive years (~May to ~May). An AE was taken as an animal consuming the same amount of grass as a 450 kg steer in prime condition. To calculate this, weights corrected for the products of conception (O'Rourke *et al* 1991) were adjusted to prime condition (27, 29, and 24 kg per condition score [1-9] at Thalanga, Swan's Lagoon, and St Margaret's Creek, respectively) and divided by 450. For females suckling a calf, estimated average weight and suckling period of the calf were multiplied and divided by 450 x 365; this value was added to the cow's average AE calculated from weight and condition, which was initially multiplied by 1.1 to account for increased feed intake due to pregnancy and lactation. AE for second round weaners was taken as the average between weaning and first round in the following year times the proportion of the year left after weaning. The same method was used for No.04 St Margaret's Creek steers sold in October 2005, with start and end points being first round in 2005 and slaughter.

The effect of replicated growth pathway on weights, heights, condition scores and seasonal changes in these parameters in steers at Swan's Lagoon were determined using least squares analyses of variance. All analyses were performed using GenStat for Windows 8th Edition. There were 6 experimental units (EU) in the analyses, ie, two replicates of the three treatments. To assess whether weaning size within cohort differed in growth path over time, preliminary analyses were performed comparing size classes within treatments. These analyses indicated that although there were overall differences between the size classes, there was little interaction between size class and time. Therefore size class was not included as a factor in subsequent analyses. Analyses performed used a mixed model fitted to data over time using restricted maximum likelihood methods. The random model was EU + EU.time + EU.time.animal and fixed effects were treatments*time where time was a factor with between 2 and 5 levels. Dam age (factor with 2 levels of first lactation and cow) was an additional factor for analysis of data from No.05 steers. With only 3 residual degrees of freedom in these analyses, it was difficult to achieve significant differences.

The animal was the experimental unit in analysing the impact of HGPs on weight, height and seasonal changes in these for No.04 St Margaret's Creek steers. A mixed model was fitted to data over time using REML. The random model was sire + sire.animal + sire.animal.time and fixed effects were treatment*time where time was a factor with 5 levels for weight and 3 for height.

Data summaries were used for other growth and fertility analyses in this report.

3.4.3 Supplements

Average daily intake of supplements were calculated for animals in each management group. Costs of supplements were calculated to represent an average over many years, rather than the development costs involved in starting a supplementation program. The cost of supplementation included the cost of:

- Supplements landed on the property. Each component with freight and handling was costed.
- Storage and mixing costs. This included the cost of purchasing and maintaining sheds and molasses mixers. Usual practices and amounts of storage for 6 to 24 months were considered.
- Feeding out costs, including troughs and purchase and maintenance of vehicles and equipment for distribution. Distances and times for feeding each group were considered.
- Labour at $20/hour.

3.4.4 Business performance

The main project objective was to measure systems differences in change in net worth. Key differences are cost of supplementation, cattle handling costs, cattle sales, and asset values. Management costs per weaner were considered not to differ significantly between systems. The primary comparison is made on an adult equivalent (AE) basis because: the beef business increases the value of a herd using the pasture resource supplemented as appropriate; one AE consumes a standard amount of feed, thus enabling comparison on a stocking rate = unit of country basis. The analysis used an adult reference of 450 kg.

Mustering costs, which included helicopter hire ($300/hour), station hand labour (on a contract basis, so included horses and associated equipment), motorbikes and vehicles, were calculated to be approximately $5/animal/muster. Calculations were based on SLIM cattle <18 months and SLIM breeding cattle being mustered twice annually, and all other cattle being mustered once.

The net value (value minus potential selling costs) of each project animal was determined in April-May of each year using the following strategy:

- Weight of pregnant cows was corrected for the products of conception using the method of O'Rourke *et al*. (1991).

- Market values were calculated on value per kg of liveweight. Base value was for score 4 steers at the Charters Towers saleyards in May - $1.71/kg. Values were adjusted for:
  - Body condition: add (Condition score – 4) * $0.10 per kg
  - Class: Heifers less $0.10 and cows less $0.25 per kg in comparison to steers
- The value of a calf (average of male + female) for each cow weaning one in the same year was added to the cow's value after calculation from estimates of calf age (using estimated conception date plus average gestation length) and average pre-weaning growth rates.
- If a cow weaned a calf at the second round in the previous year, its value included the increase in value of the previous year's calf between the first and second rounds using average growth rates estimated for this period at each site.
- Selling costs included a 5% commission plus trucking costs. The latter was based on $1.50/deck/km. The number of animals per deck was calculated as: 48 - 0.047 * Weight. The distance to sale for Thalanga, Swan's Lagoon and St Margaret's Creek was 60, 200, and 150 km, respectively.

The 2004 year group steers at St Margaret's Creek were slaughtered within the trial period. Actual values less trucking costs were analysed in comparison to costs calculated as above.

Comparative accounting analyses assessed the relative change in net worth of each age group within each herd with direct comparison on a net relative return per AE basis. Other than for St Margaret's Creek steers when sold at 2 years of age, no price premiums were included in these analyses.

Economic analyses of overall herd performance were then conducted using the Breedcow Plus component of BREEDCOW (Holmes 2006). Input data was derived from the project herds, with interpolation required for assessing:

- Expected average for a range of years, based on data for two years.
- Alternate strategies.

Adult equivalence was determined from weights, and a value of 0.2 was added for cows producing a calf, calculated thus:

- Feed intake of a 500 kg cow increased by 10%, ie, a 50 kg effect.
- Average calf weight between birth and 5 months of 90 kg, ie a 38 kg effect.
- Addition of these effects divided by weight of 1 AE = (50+38)/450 = 0.2

Management across sites was generally consistent. One variation in the analyses was that yearling heifers were not mated:

- At any time at Thalanga
- In the SLIM system at Swan's
- For the alternate strategy of SLIM systems to 2.5 years for HIM heifer progeny

Selling strategies used in economic analyses were as close to normal practice as possible:

- Thalanga analyses had HIM steer sales at 2.5 years and SLIM steers 2 months later, cows losing calves sold in May each year, cows culled for non-pregnancy and other reasons sold 10 months after removal from the breeding herd. By this time they reach fat-cow values. Surplus heifers were sold in August after first mating.
- Swan's Lagoon analyses had steer sales 2 months after reaching 2.5 years (July), and all surplus heifers sold in May at 2.5 years of age, and all cull cows sold in May each year.
- St Margaret's Creek analyses had steer sales seven months after reaching 1.5 years of age (November), cows that lost their calves sold in April each year, cows culled for non-pregnancy

and other reasons sold 4 months after pregnancy diagnoses by which time they reach fat-cow values, and surplus heifers being sold in July after reaching 2.5 years of age.

Alternate strategies for HIM herd progeny considered were with and without HIM systems for heifers and for yearling steers. Prices used in all analyses were as for comparative accounting analyses, except for premiums for 2.5-year-old steers that were $0.10 and $0.20 per kg live for those receiving HIM management in their first and second years post-weaning, respectively.

Sensitivity analyses were conducted by simply varying the price of 2.5-year-old steers, and incrementing supplement costs for all animals by the levels indicated in the analyses.

3.4.5 Time

The differences in time involved with both systems were compared on the same basis as for business comparisons, ie, aspects where differences occurred. This was only for supplementation and mustering of cows.

3.4.6 Field days

The project and outcomes achieved to the time were presented to the public once at both St Margaret's Creek (September 2005) and Thalanga (May 2006) stations.

4 Results and discussion

4.1 Seasons

The project was initiated immediately after a series of very dry seasons with late seasonal breaks. Total rainfall over the project period (Figures 2-4) continued to be below average and seasonal breaks were one to two months later than average. Seasonal conditions after the project commenced were generally better at Thalanga, relative to average, than at the other two sites.

Figure 2. Homestead (west of Thalanga) rainfall over the project period

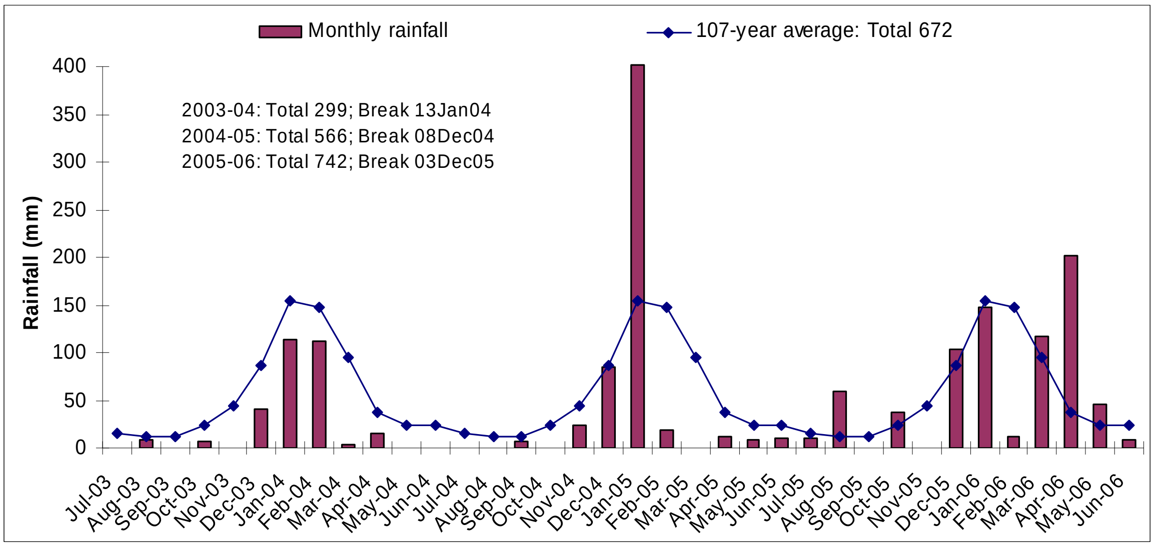


Figure 3. Swan's Lagoon rainfall over the project period

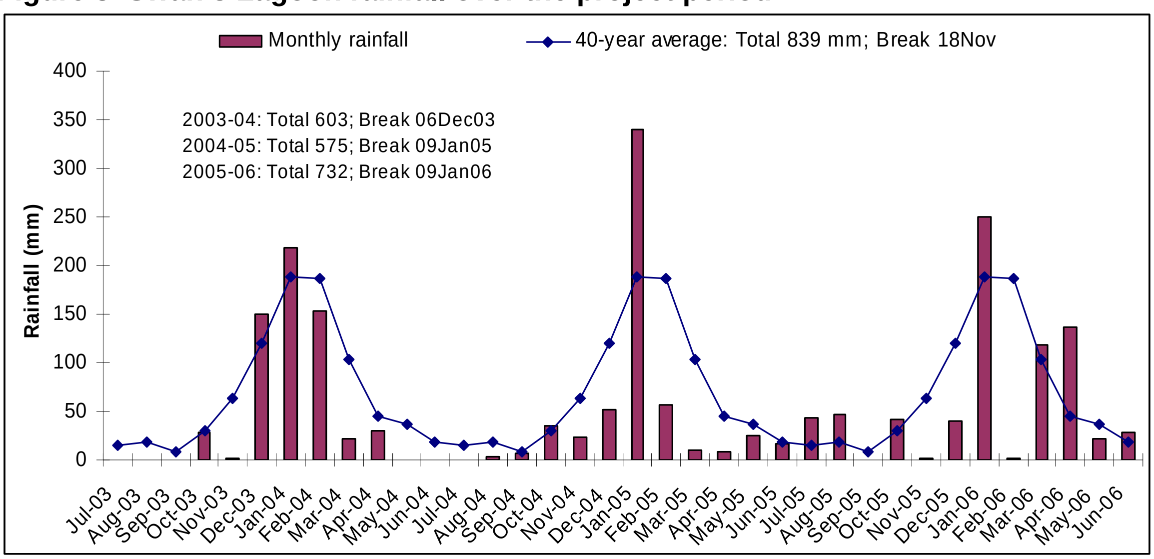
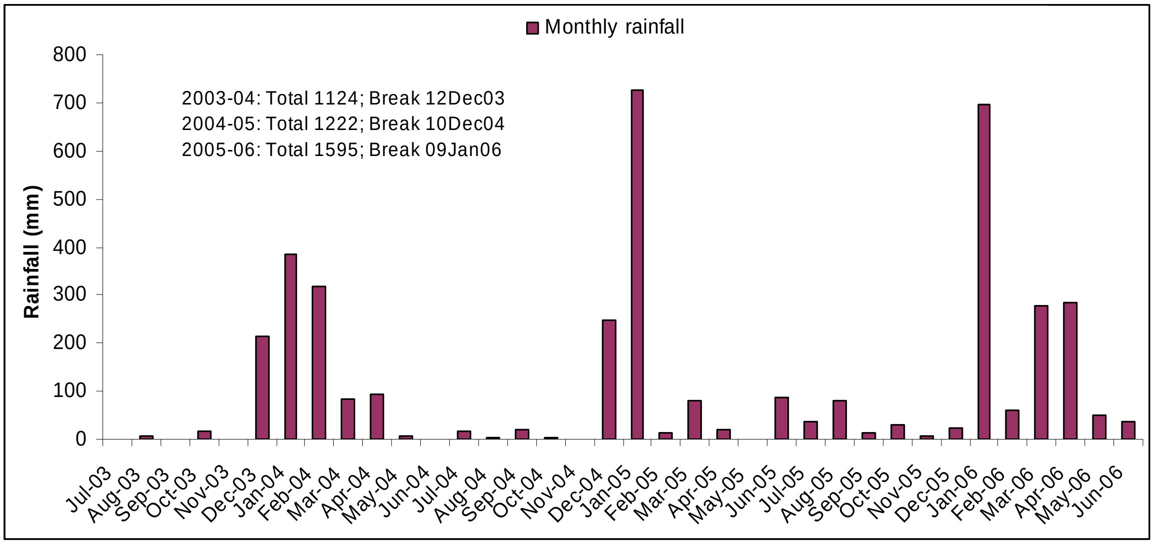


Figure 4. St Margaret's Creek rainfall over the project period



4.2 Pastures

4.2.1 Thalanga

Following the very poor seasons leading into the project, pasture yields at Thalanga (Figure 5) were very low in 2004. But from the break in the season in late 2004, good seasonal conditions were experienced, and pasture yields were 2,000-3,000 kg/ha at the end of the wet season and were 1,500-2,000 kg/ha at the end of the 2005 dry season. Unpalatable species constituted ~20% of yield. About half the property was overall in B condition, with the balance either A or C condition (Table 3). Average tree basal area was 2.9 m^2/ha.

Figure 5. Total estimated standing pasture at Thalanga over the project

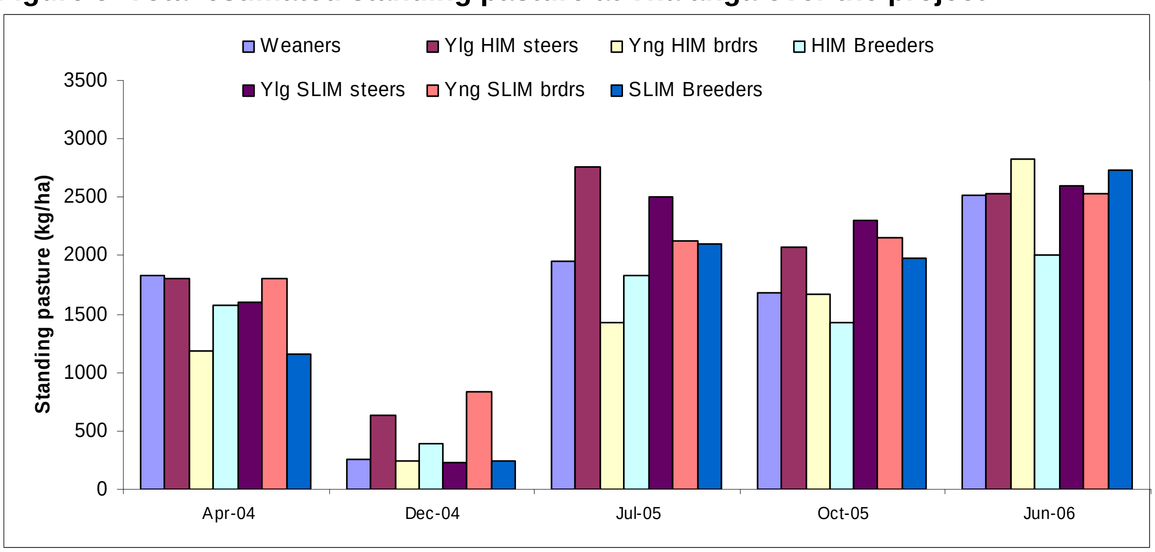


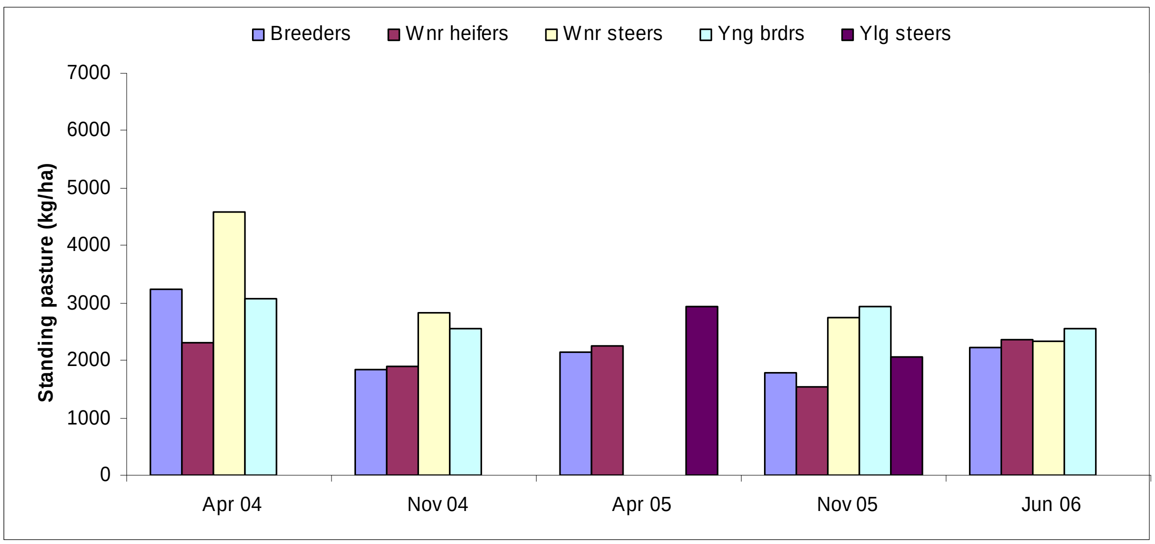
Table 3. Rangeland condition at Thalanga over the project

	Pasture	Soil	Ground cover
A condition	8%	23%	27%
B condition	44%	65%	53%
C condition	47%	11%	19%

4.2.2 Swan's Lagoon

At Swan's Lagoon, pasture yields (Figure 6) were generally at least 1500 kg/ha late in the dry seasons (Nov) and usually 2500-3000 kg/ha late in the wet seasons. An estimated 18% of available pasture was classed as unpalatable over the project period. Soil, pasture and ground cover were in predominately A class condition over the trial period in the paddocks grazed by steers and young breeders. Soil and ground cover condition were generally about half class A and half B class in the breeder and weaner heifer paddocks; pasture condition was in class B over three-quarters of these paddocks, in class A over about 20%, with about 5% in class C. Tree basal area over the paddocks used averaged 3.8 m^2/ha.

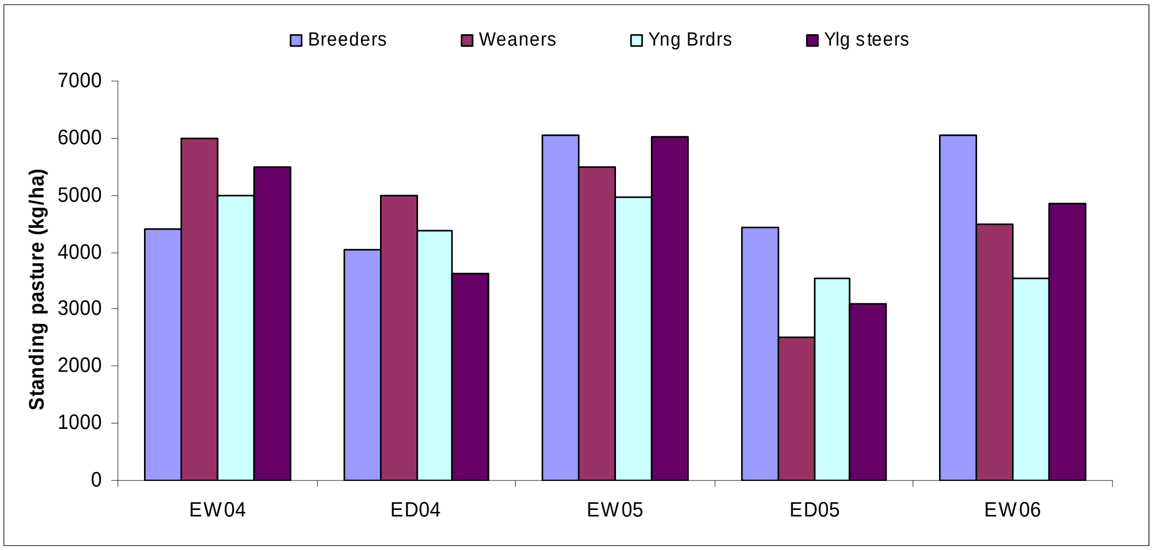
Figure 6. Total estimated standing pasture at Swan's Lagoon during the project



4.2.3 St Margaret's Creek

At St Margaret's Creek, pasture yields (Figure 7) were generally at least 2000 kg/ha late in the dry seasons and usually 4000-6000 kg/ha late in the wet seasons. An estimated 5-10% of available pasture was classed as unpalatable over the project period. Soil, pasture and ground cover were consistently in A class condition, with ground cover generally exceeding 95%. Tree basal area in these mostly-cleared, improved pastures averaged less than 0.5 m^2/ha.

Figure 7. Total estimated standing pasture at St Margaret's Creek during the project



4.3 Cattle

Mortality rates were generally low in the study herds and ranged from 0-4% within year x gender group within site (Tables 4-6). Ten to twenty percent of females were culled in 2005, with fewer culled where the opportunity to have higher numbers of stock arose due to availability of extra stranding feed.

Table 4. Project cattle at Thalanga

	2004 Allocated	2005 Dead/Miss	2005 Culled	2005 Allocated	2006 Dead/Miss	2006 Present
HIM females	***275***	***11***	***33***	***297***	***10***	***287***
94-01	89	5	8	76	1	75
2002	61	4	24	33		33
2003	50		1	49	5	44
2004	75	2		73	1	72
2005			0	66	3	63
		4%	11%		3%	

	2004 Allocated	2005 Dead/Miss	2005 Culled	2005 Allocated	2006 Dead/Miss	2006 Present
SLIM females	***382***	***12***	***98***	***372***	***7***	***365***
94-01	167	6	79	82	1	81
2002	50	2	6	42	5	37
2003	60		13	47		47
2004	105	4		101		101
2005			0	100	1	99
		3%	20%		2%	
No.04 steers	***111***	***3***	***0***	***108***	***0***	***108***
HIM	30	1		29		29
SLIM HIM	41	1		40		40
SLIM	40	1		39		39
		3%			0%	
No.05 steers	***0***	***0***	***43***	***114***	***2***	***112***
HIM			43	30	2	28
SLIM HIM				42		42
SLIM				42		42
					2%	

Table 5. Project cattle at Swan's Lagoon

	2004 Allocated	2005 Dead/Miss	2005 Culled	2005 Allocated	2006 Dead/Miss	2006 Present
HIM females	***275***	***9***	***85***	***283***	***6***	***277***
97-01	126	4	18	104		104
2002	36	1	8	27	1	26
2003	38	2		36		36
2004	75	2	32	41	4	37
2005			27	75	1	74
		3%	17%		2%	
SLIM females	***377***	***2***	***97***	***383***	***5***	***378***
97-01	163		44	119		119
2002	55	1	6	48	2	46
2003	58		4	54	1	53
2004	101	1	40	60		60
2005			3	102	2	100
		0%	20%		1%	
No.04 steers	***111***	***3***	***0***	***108***	***4***	***104***
HIM	30			30	2	28
SLIM HIM	41	1		40	2	38
SLIM	40	2		38		38
		3%			4%	
No.05 steers	***0***	***0***	***65***	***110***	***0***	***110***
HIM			47	30		30
SLIM HIM				40		40
SLIM			18	40		40
					0%	

Table 6. Project cattle at St Margaret's Creek

	2004 Allocated	2005 Dead/Miss	2005 Culled	2005 Allocated	2006 Dead/Miss	2006 Present
HIM females	***266***	***0***	***25***	***326***	***2***	***324***
97-01	93		16	77		77
2002	34		4	30		30
2003	54		5	49		49
2004	85			85	1	84
2005				85	1	84
		0%	9%		1%	
HIM steers	***86***	***1***	***0***	***163***	***2***	***76***
2004	86	1		85#		
2005				78	2	76
		1%	0%		3%	

Slaughtered in late 2005

Young HIM cattle had a higher adult equivalence than similar-age SLIM cattle, but there was no apparent difference between management systems at each site in adult equivalence at maturity (Table 7).

Table 7. Calculated average AE per gender, treatment and year group at each site

	2004-05			**2005-06**		
	Thalanga	Swan's Lag	St Marg Ck	Thalanga	Swan's Lag	St Marg Ck
HIM females#						
97-01	1.13	1.22	1.28	1.26	1.30	1.25
2002	1.01	1.01	1.15	1.12	1.08	1.15
2003	0.78	0.86	0.99	1.23	1.09	1.09
2004	0.47	0.54	0.59	0.84	1.04	0.86
2005				0.54	0.62	0.56
SLIM females#						
97-01	1.08	1.20		1.31	1.33	
2002	1.02	1.03		1.09	1.20	
2003	0.71	0.78		1.09	1.14	
2004	0.40	0.44		0.70	0.78	
2005				0.40	0.51	
No.04 steers						
HIM	0.55	0.59	0.75	0.96	1.00	0.47
SLIM HIM	0.44	0.46		0.82	0.88	
SLIM	0.39	0.43		0.73	0.78	
No.05 steers						
HIM				0.60	0.63	0.72
SLIM HIM				0.48	0.55	
SLIM				0.44	0.51	

Includes suckling calves

4.4 Supplementation

Dry lick intakes during the project were as usual for the classes of cattle used (Table 8). The variation in fortified molasses cost (Table 9) was primarily a function of distance from a sugar mill; molasses cost during the project was approximately $65, $80 and $100/tonne landed at St Margaret's Creek, Swan's Lagoon and Thalanga, respectively. During a dry season, average MUP intake was close to 1% of body weight. When provided *ad lib*, average M8U intake was half this at 0.5% of body weight (Tables 10-12).

Feeding of M8U to cows was for much longer at Swan's Lagoon than at Thalanga, mainly because of better seasonal conditions at Thalanga. At both sites, intakes were relatively low, especially during the severe dry season of 2005 at Swan's Lagoon. Low intakes during feeding at Thalanga may have been related to early rain. But at Swan's Lagoon, supply of M8U was not consistent.

Fortified molasses was only fed to weaners within the SLIM herd at Swan's Lagoon. At both Swan's Lagoon and Thalanga, very poor seasonal conditions in late 2004 resulted in all SLIM weaners being fed fortified molasses. Yearling and two-year-old SLIM heifers were fed M8U in the late dry seasons at Thalanga as part of usual SLIM systems (to reach suitable mating weights, and spike feeding, respectively), and were fed for longer in 2004 because of the seasonal conditions (Table 10).

MUP was offered in the wet season to yearling steers at St Margaret's Creek where intake averaged 1.3 kg/d up to April inclusive (Table 11). From May thru October inclusive, it averaged 2.8 kg/d which was much lower (as was monthly cost) than at Swan's Lagoon or Thalanga, presumably because the quality of the pasture at St Margaret's Creek (Cleveland paddock) was higher (not verified).

Labour at $20/hour constituted on average 4-5% of the total cost of feeding either fortified molasses or dry licks.

Table 8. Average dry lick intake (g/day) when not fed fortified molasses

Property:	*Thalanga*				*Swan's Lagoon*				*St Marg Ck*	
Treatment:	SLIM	SLIM	HIM	HIM	SLIM	SLIM	HIM	HIM	HIM	HIM
Season:	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Cows	150	50	150	50	125	nr#	125	nr	250	65
Yearlings	90	30	120	40	90	nr	80	nr	250	60
Weaners	60	20		25	45	nr				50

not recorded

Table 9. Full cost of supplements

	Thalanga	*Swan's Lagoon*	*St Margaret's Creek*
Fortified molasses per kg			
M8U	$0.17	$0.14	$0.12
MUP	$0.18	$0.15	$0.12-$0.13#
Dry licks per cow equivalent per month			
Dry season	$2.25	$2.80	$4.60
Wet season	$0.75	$0.85	$1.30

Higher cost for steers fed at remote site

Table 10. Average fortified molasses supplement intake at Thalanga

			04 dry: ended 12Dec04		05 dry: ended 03Dec05	
Treatment	Class	Supp	days	kg/d	days	kg/d
HIM#	Weaners	MUP	227	1.6	207	1.6
	Yearling heifers	M8U	80	1.9	88	1.8
		MUP			119	4.0
	Yearling steers	MUP			207	4.0
	Cows	M8U	93	1.7	24	1.5
SLIM	Big weaners	M8U	80	0.9	47	0.8
	R1 Small weaners	MUP	227	1.2	207	1.6
	R2 Small weaners	MUP	176	1.3	95	1.5
	Yearling heifers	M8U	100	1.3	71	1.8
	2-year-old heifers	M8U	80	1.5	40	1.4

Includes SLIM HIM for weaners and steers

Table 11. Average fortified molasses supplement intake at Swan's Lagoon

			04 dry: ended 09Jan05		05 dry: ended 09Jan06	
Treatment	Class	Supp	days	kg/d	days	kg/d
HIM	Weaner steers	MUP	146	2.8	253	2.6
		M8U	85	2.7		
	Weaner heifers	MUP	220	1.8	253	1.7
	Yearling heifers	M8U	55	2.4	64	2.2
		MUP	90	3.3	84	1.9
	Yearling steers	MUP			197	4.1
	Cows	M8U	146	1.6	169	1.1
SLIM	Big weaner steers	M8U	47	0.3	35	2.5
	R1 Small wnr strs	MUP	146	2.4	253	2.1
	R2 Small wnr strs	MUP	84	3.1	126	2.3
	Small wnr heifers	MUP	142	1.6	35	0.5

Table 12. Average fortified molasses supplement intake at St Margaret's Creek

			2004-05		2005-06	
Class	Season	Supp	days	kg/d	days	kg/d
Weaner heifers	Dry	MUP	241	2.6	280	1.9
Weaner steers	Dry	MUP	241	2.4	280	1.8
	Wet	MUP	135	1.2	80	1.8
Yearling heifers	Dry	M8U	107	3.1		
	Dry	MUP			117	2.3
Yearling steers	Dry	MUP			191	2.8
Cows	Dry	M8U	92	3.1	112	3.3

4.5 Growth

4.5.1 Thalanga

Suckling male No.05 calves grew an estimated 7% faster than No.05 female calves. Within the SLIM herd where dam age was recorded, calves suckling cows grew 13% faster than those suckling heifers (Table 13). HIM calf growth rates were an average of 11% and 6% lower than SLIM calves in 2005 and 2006, respectively. This is mostly likely because HIM calves suckled for an average of at least one month more during the late dry season than SLIM calves. In 2005, suckling calves grew at half the rate after first round than they were growing prior to that, presumably because milk supply during the early dry season is much less than during the wet season.

Table 13. Estimated growth rates (kg/d) of suckling calves at Thalanga

Calf year group:	2005	2005	2005	2006
Lactation:	All	Multiple	First	All
HIM: Birth to R1	0.87			1.03
SLIM: Birth to R1		0.98	0.86	1.10
SLIM: R1 to R2	0.49			

Calves from HIM cows were 40 kg heavier than SLIM calves in May 2006; 40% of SLIM calves will be late weaners.

Growth curves for the female cattle at Thalanga showed:

- HIM weaners were ~30 kg heavier than SLIM weaners. This advantage increased to around 70 kg at 18 months of age, but declined to about 50 kg at 2.5 years, reducing further after that (Figures 8-9).
- No.05 HIM heifers reached an average of 320 kg at pregnancy diagnosis (Figure 8). As this is only 20 kg heavier than average weight at puberty, less than half were expected to be pregnant.
- Height of HIM females peaked at 2.5 years of age at ~1370 mm, but a year older in SLIM females (Figures 10-11).
- Despite this, it appears that SLIM cows' mass continues to increase till about 7.5 years of age when a mature weight of approximately 470 kg is reached (Figures 12-13).
- Body condition was similar in HIM and SLIM cows. Juvenile HIM females held significant advantage up to 2 years of age (Figure 14).

Figure 8. Average weights of Thalanga female HIM cattle

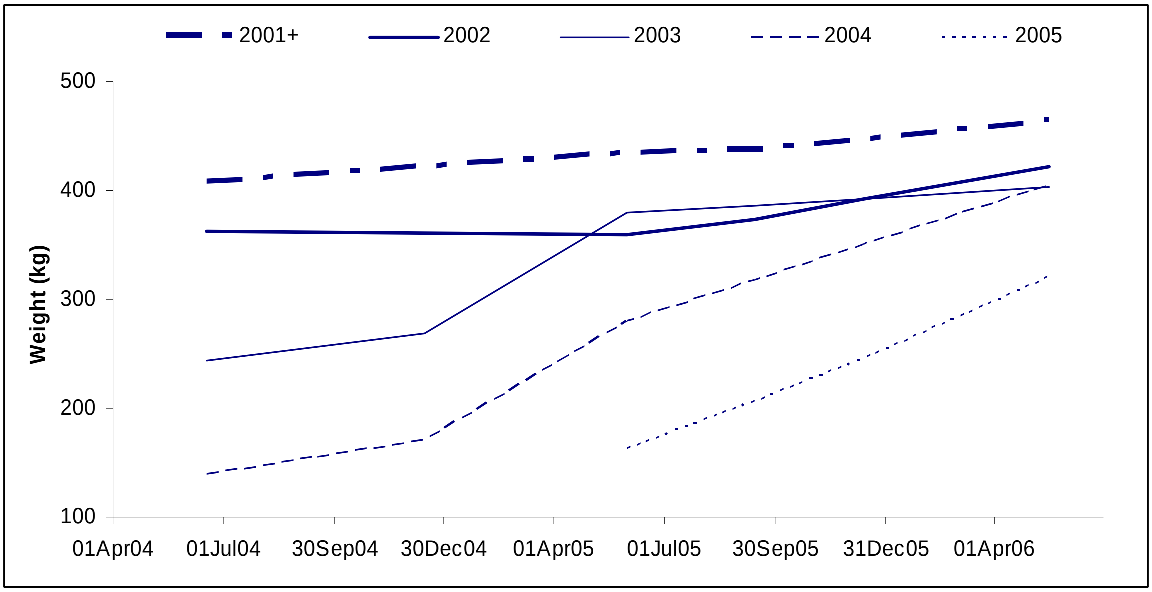


Figure 9. Average weights of Thalanga female SLIM cattle

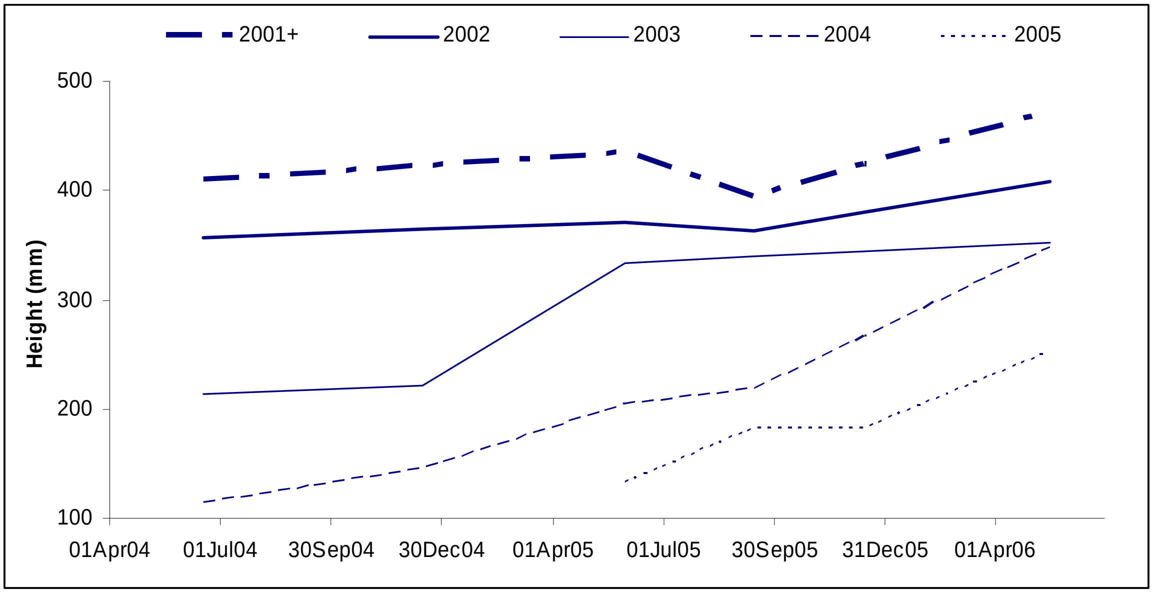


Figure 10. Average heights of Thalanga female HIM cattle

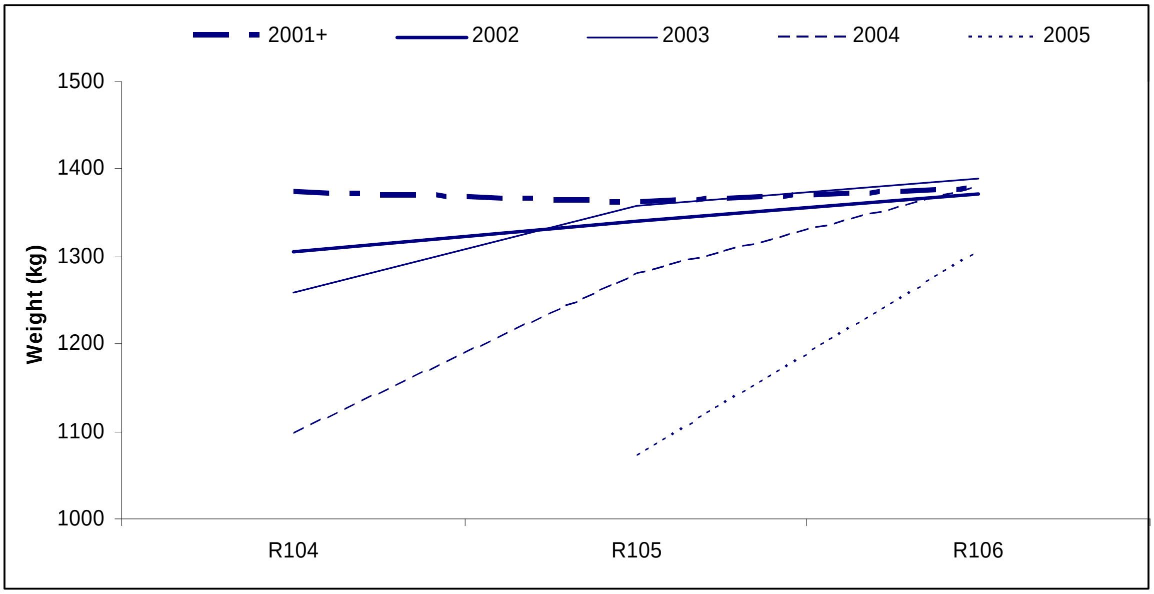


Figure 11. Average heights of Thalanga female SLIM cattle

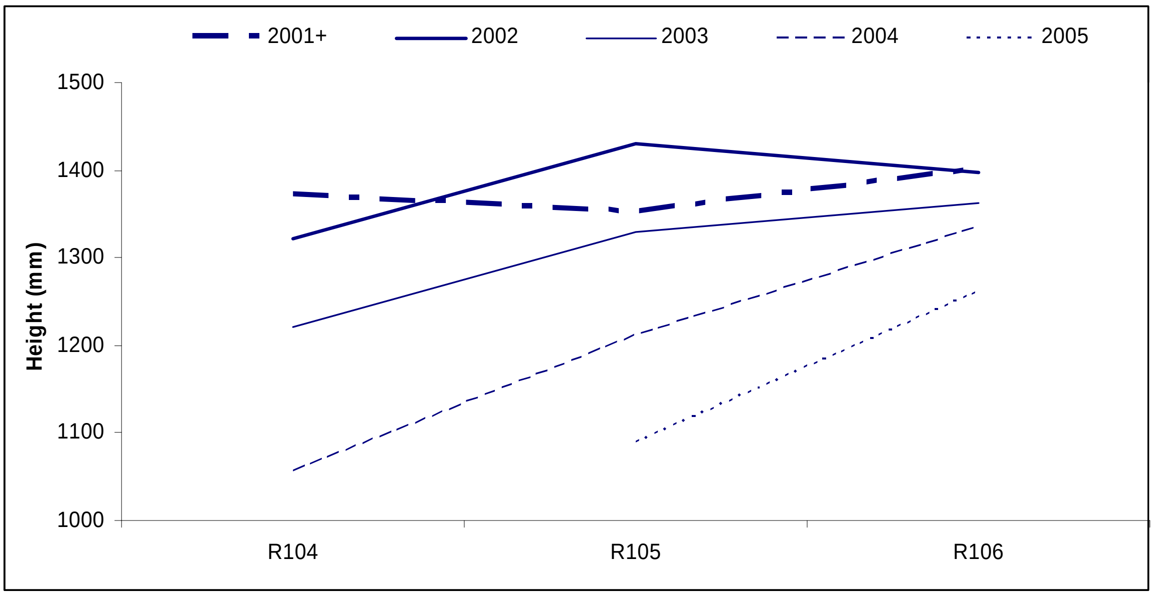


Figure 12. Average weight corrected to condition score 7 (9-point scale) of each year group of Thalanga females at each muster

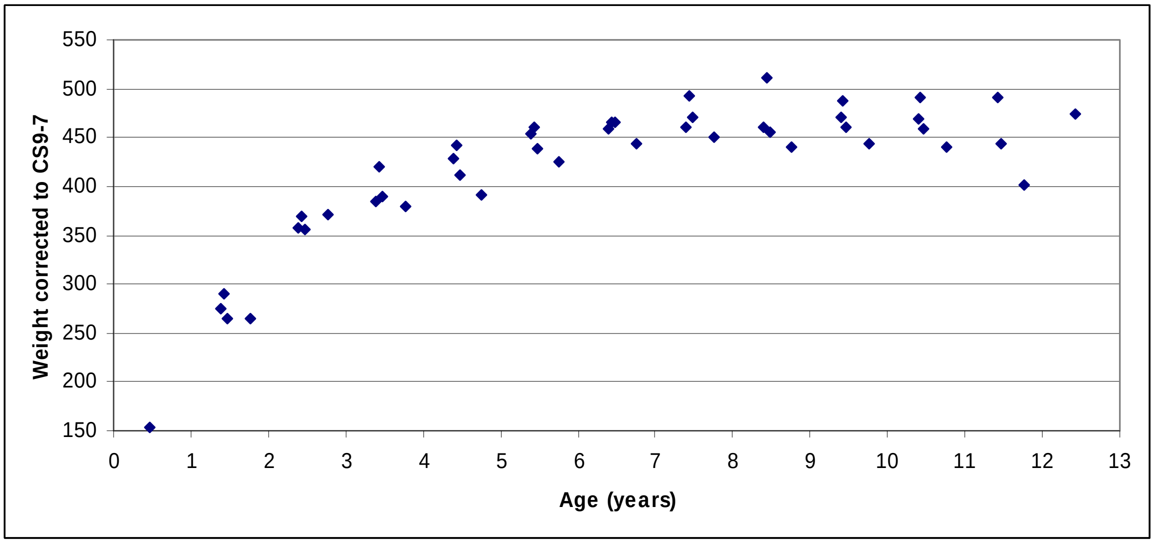


Figure 13. Average height of each year x treatment group of Thalanga females at each muster

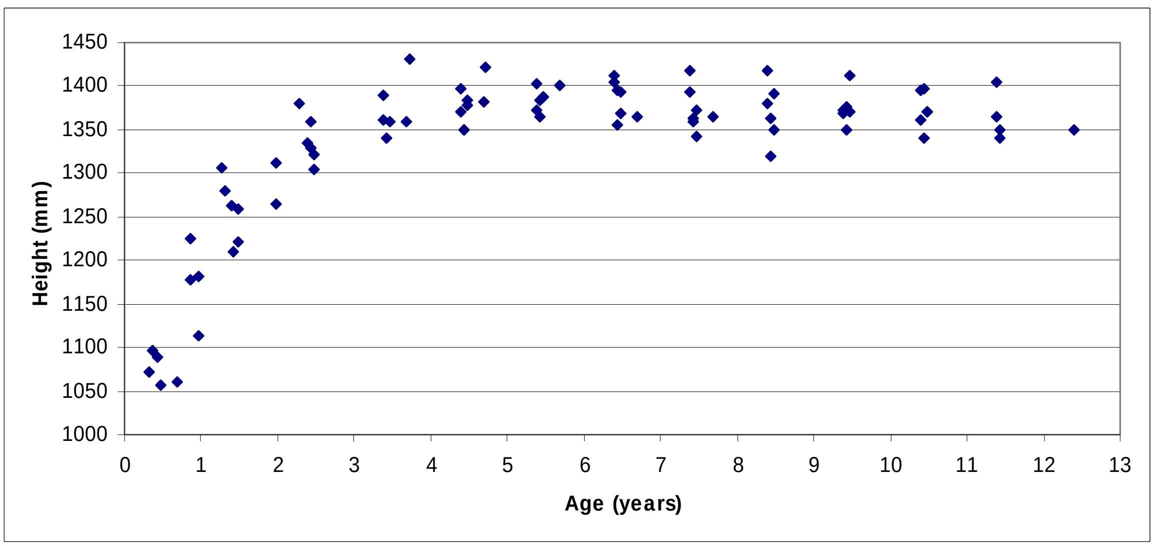
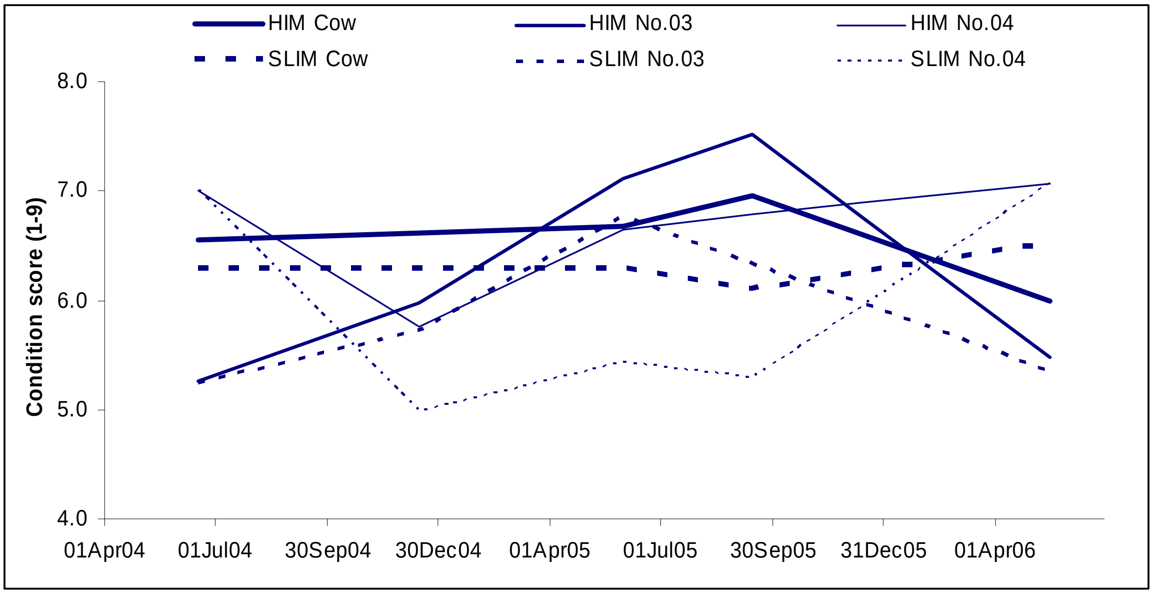


Figure 14. Average condition scores of Thalanga female cattle



Most of the No.04 steers received fortified molasses in the dry season as weaners, so parallel growth between HIM and SLIM steers in that period was expected (Figures 15-16). In the following wet season, the SLIM steers grazed a much poorer-quality paddock than the HIM steers; the reverse occurred during the dry season when they were aged 1.5 to 2 years of age. This explains the growth advantage of the HIM steers during their first wet season, and the apparent lack of growth advantage during supplementation. SLIM steers achieved over 40% weight compensation during their second wet season.

Overall, 86% of HIM, 34% of SLIM HIM and 8% of SLIM steers reached 500 kg by 2.5 years. At this age, 18%, 75% and 7% of steers had 0, 2, and 4 permanent incisors, respectively. A selection of heavier HIM and SLIM steers slaughtered at 2.5 years of age dressed an average of 55.5% with an average P8 fat thickness of 10 mm.

Compudose 400™ annually contributed an average of 22 kg to growth from weaning to 2.5 years in the No.04 steers.

Height change reflected the nutrition and weight changes of the No.04 steers to 2 years (Figure 17). During their second wet season, height change did not compensate in the same manner as weight and remained parallel.

Treatment effects on growth of the No.05 steers were not as confounded to the same degree as in the No.04 steers (Figure 15). HIM and SLIM HIM steers outgrew SLIM steers in the post-weaning dry season, with no apparent compensation in either weight or height in the following wet season. HIM No.05s were 78 kg heavier than SLIM No.05s at 18 months of age, with 31 kg of this difference at weaning.

Figure 15. Average weight of Thalanga steers

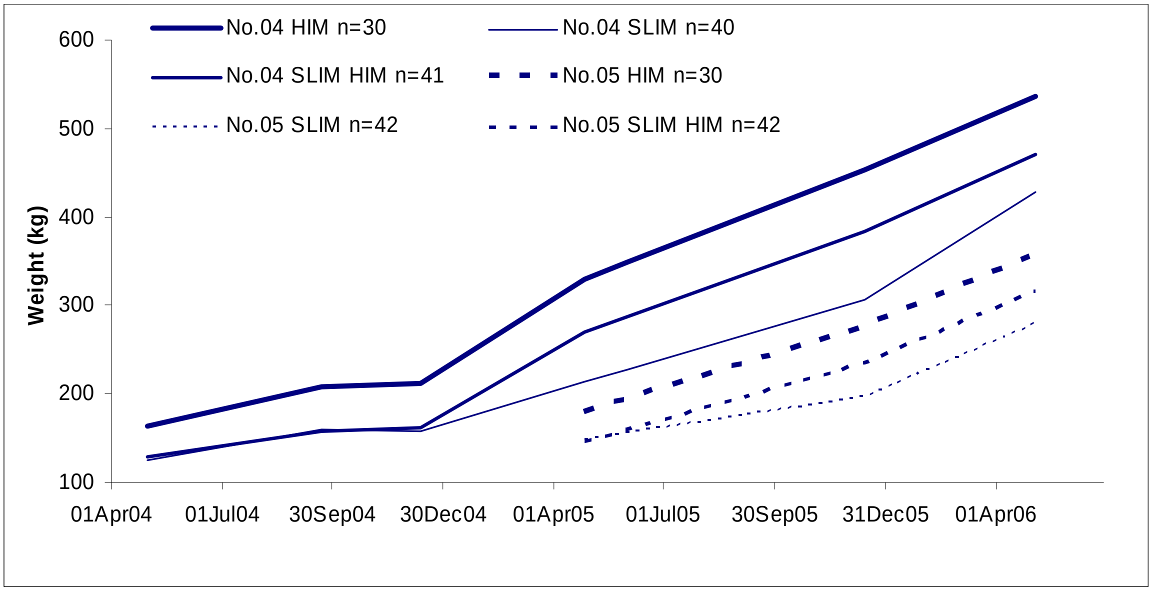


Figure 16. Average condition scores of Thalanga steers

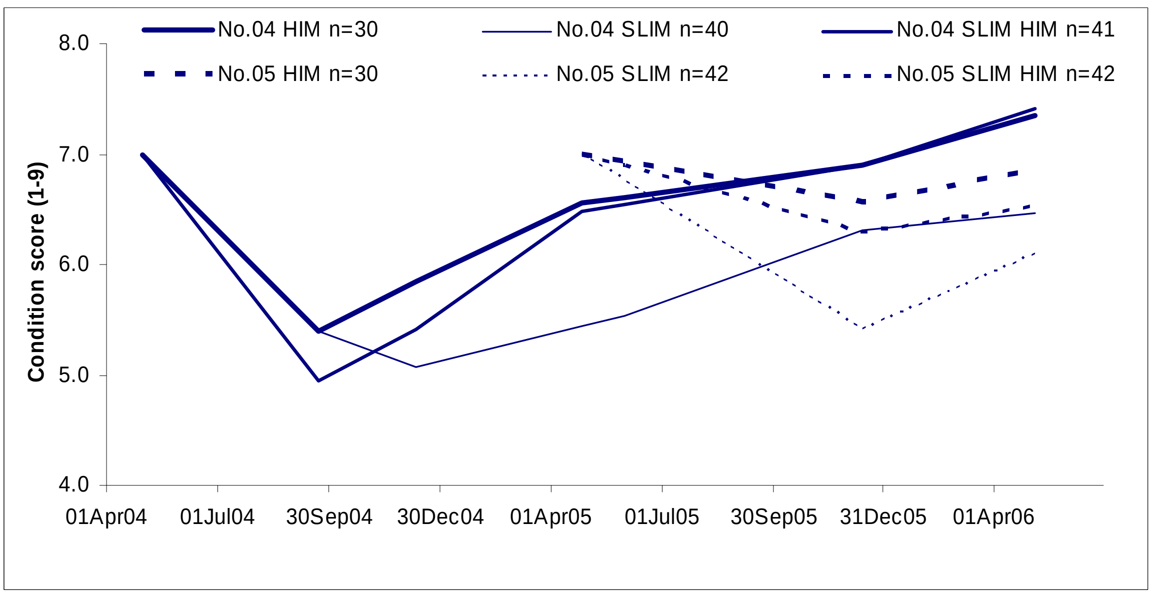
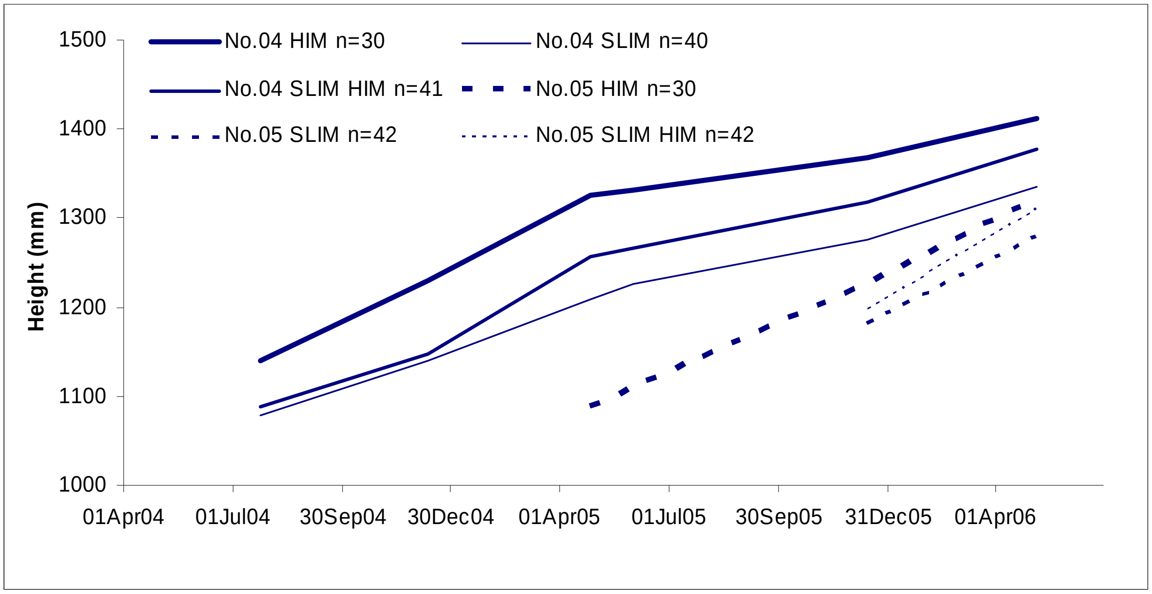


Figure 17. Average height of Thalanga steers



4.5.2 Swan's Lagoon

Suckling male calves grew an estimated 7% faster than female calves. Calves suckling cows grew 17% faster than those suckling heifers (Table 14). Growth of suckling HIM calves was 6% lower than that of SLIM calves in 2006; it was 11% and 30% lower for those suckling cows and heifers, respectively, in 2005. There was no evidence in either year of time of calving affecting pre-weaning calf growth rate.

Table 14. Estimated growth rates (kg/d) of suckling calves at Swan's Lagoon

Calf year group:	2005	2005	2006	2006
Lactation:	Multiple	First	Multiple	First
HIM: Birth to R1	0.89	0.64	0.94	0.85
SLIM: Birth to R1	1.00	0.92	0.98	0.91
SLIM: R1 to R2	0.64			

Growth curves for the female cattle at Swan's Lagoon showed:

- HIM weaners were ~30 kg heavier than SLIM weaners. This advantage increased to around 70 kg at 18 months of age, but declined to about 25 kg at 2.5 years, reducing further after that (Figures 18-19).
- No.05 HIM heifers reached 340 kg at pregnancy diagnosis (Figure 18). As this was over 60 kg more than average expected weight at puberty, well over half of the heifers were expected to be pregnant.
- Height of HIM females peaked at 2.5 years of age, with SLIM cows reaching peak height of ~1350 mm at ~4 years of age (Figures 20-21).
- Despite this, it appears that SLIM cows' mass continues to increase till 7 years of age when a mature size of approximately 500 kg is reached (Figures 22-23).
- Un-supplemented yearling SLIM heifers have the poorest body condition of all cattle at the end of the dry season (Figure 24).

- In 2004-05, the HIM cows dropped a unit of condition score behind the SLIM cows (Figure 24). This may have been a consequence of poorer-quality pasture available, and failure to feed *ad lib* fortified molasses during the dry season.

Figure 18. Average weights for each year group of Swan's Lagoon female HIM cattle

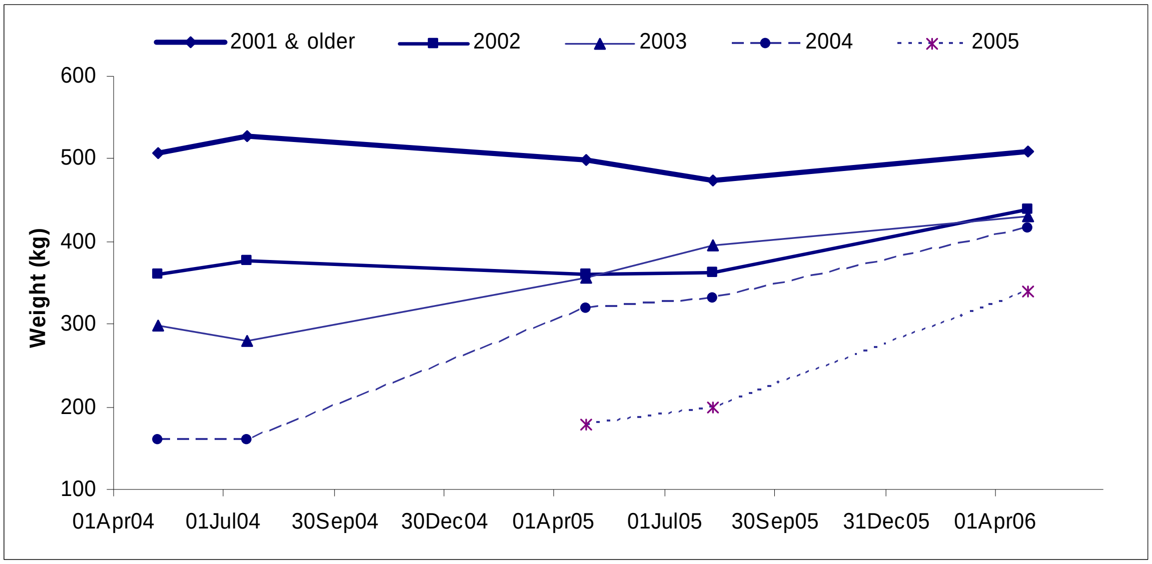


Figure 19. Average weights for each year group of Swan's Lagoon female SLIM cattle

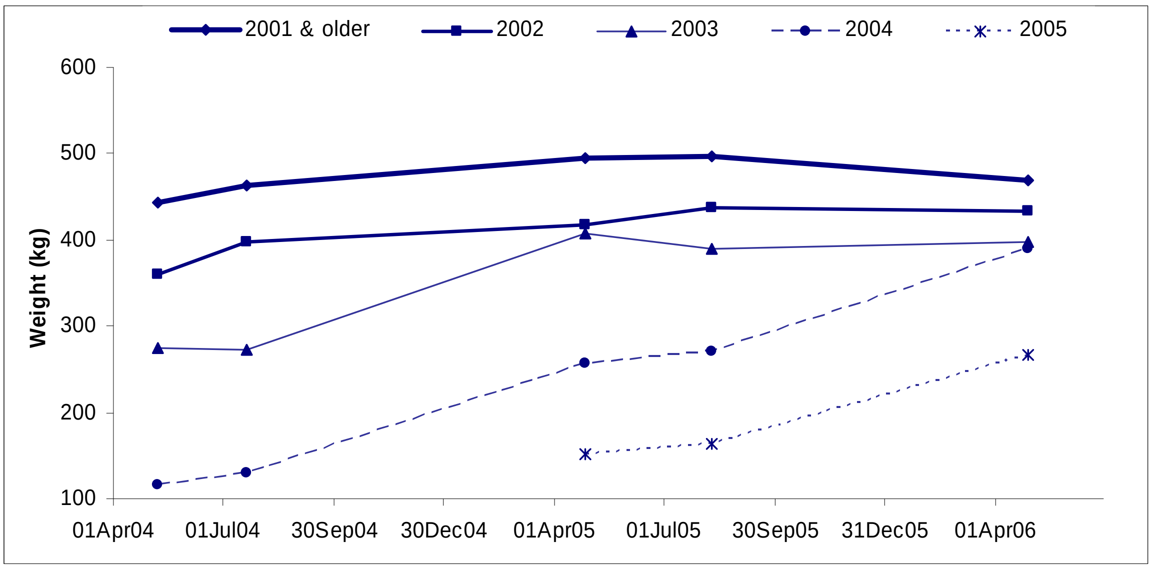


Figure 20. Average heights for each year group of Swan's Lagoon female HIM cattle

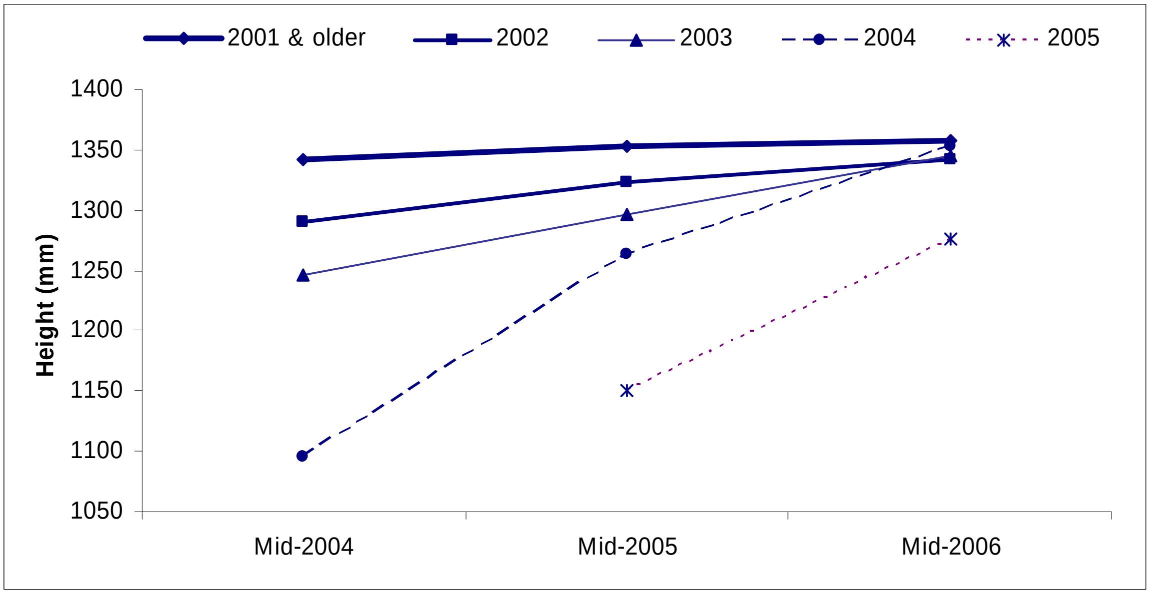


Figure 21. Average heights for each year group of Swan's Lagoon female SLIM cattle

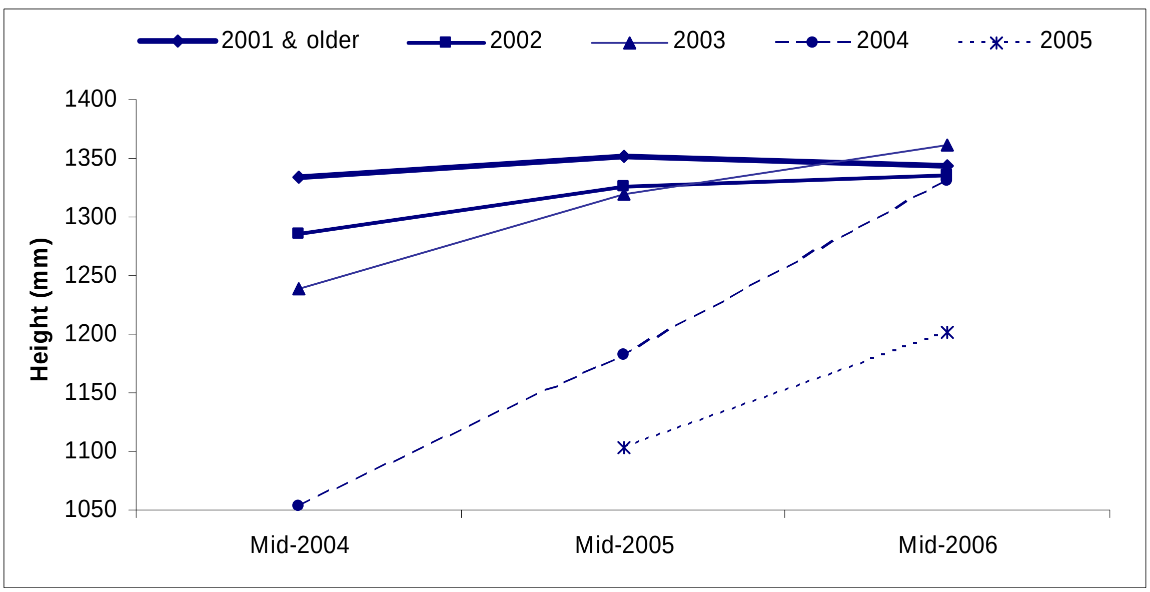


Figure 22. Average weight corrected to condition score 7 (9-point scale) of each year group of Swan's Lagoon females at each muster

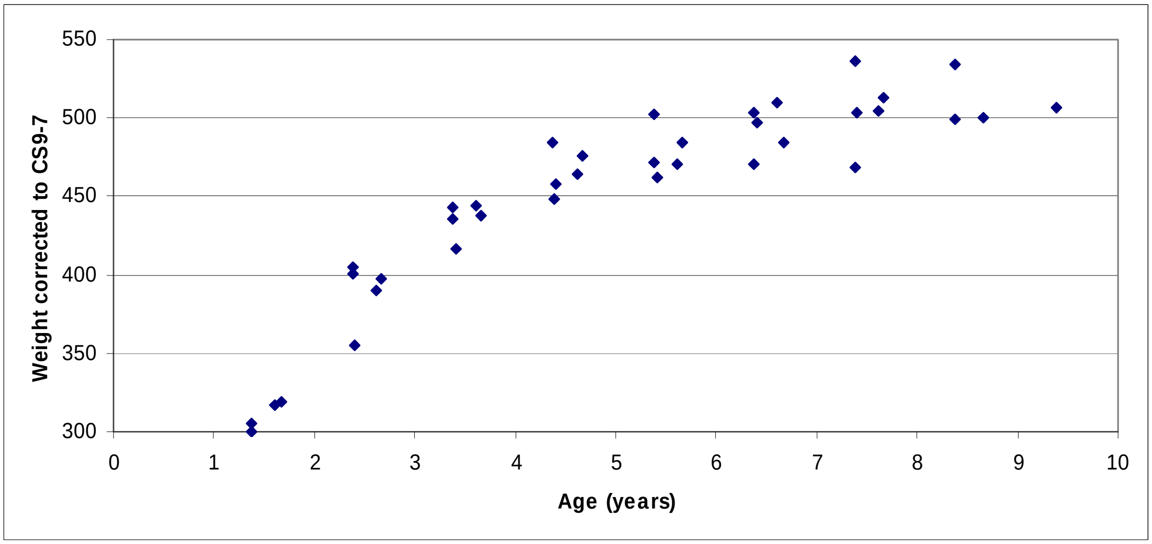


Figure 23. Average height of each year x treatment group of Swan's Lagoon females at each muster

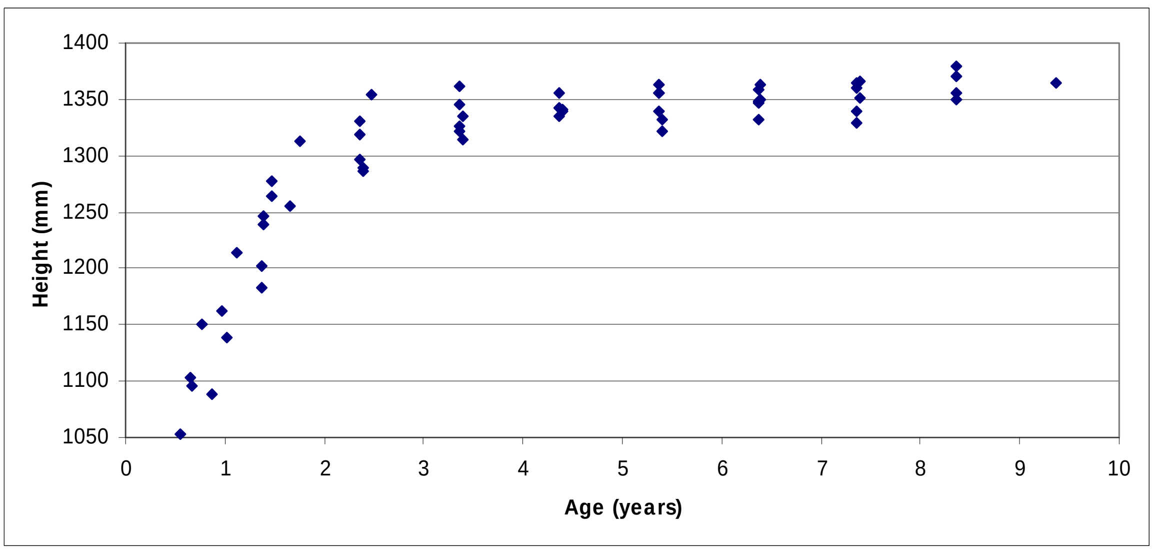
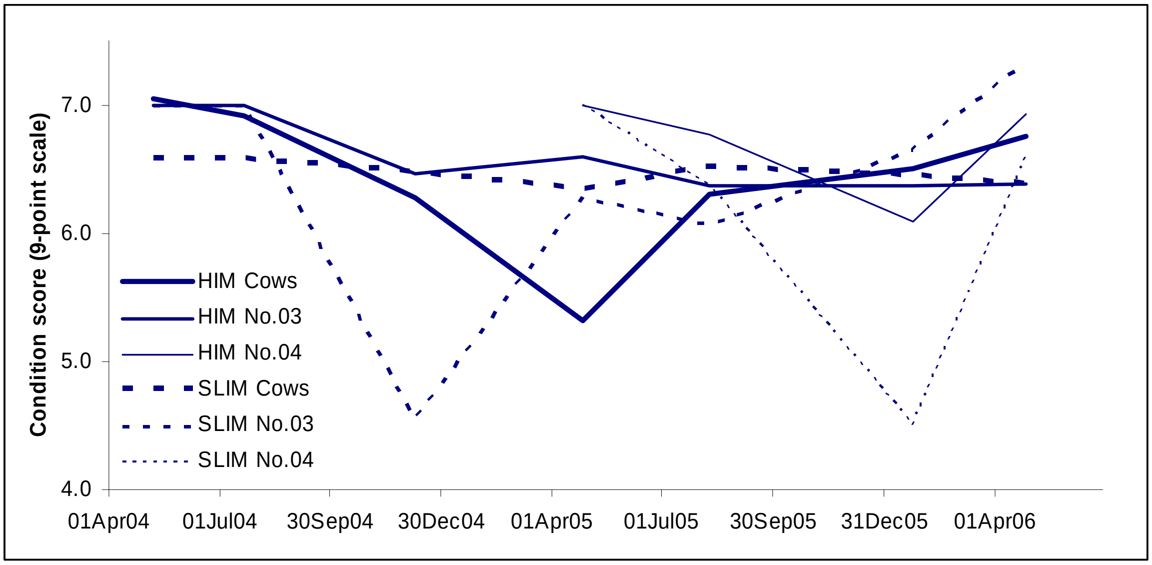
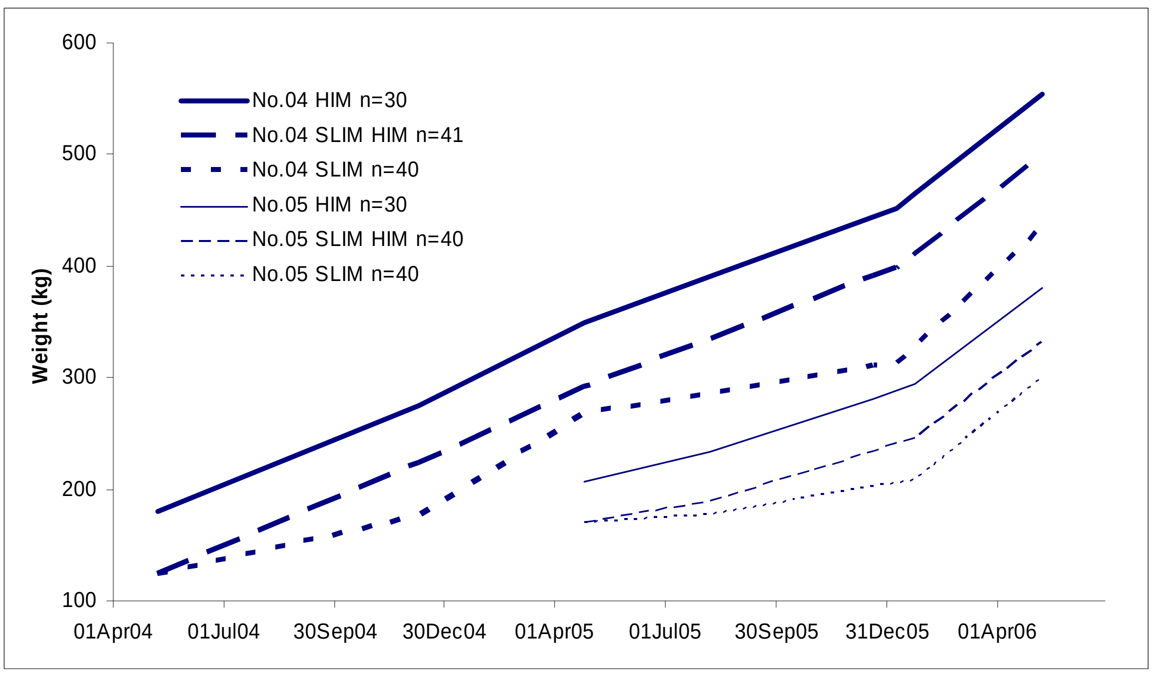


Figure 24. **Average condition scores of female cattle at Swan's Lagoon**



No.04 HIM and SLIM HIM steers gained about 50 kg extra mass during each dry season but weight compensation in ensuing wet seasons resulted in an overall gain of ~30 kg extra each year compared to SLIM steers (Figure 25). By 2.5 years of age, 96% of HIM steers and no SLIM steers were over 500 kg, with average weights of 554 and 435 kg; respective values for SLIM steers were 61% and 502 kg.

Figure 25. Average weight of Swan's Lagoon steers



No.04 SLIM HIM steers gained an extra 8, 16, 10 and 4 mm in each 6 months following weaning than SLIM steers, though this only achieved significance over the first year post-weaning (Figure 26; Table 15; P=0.04). There was no evidence of height compensation during wet seasons. HIM steers gained more height than SLIM steers in the first year post-weaning, but less in the second year (P<0.05), presumably as they were closer to mature height.

The No.04 steers were transferred to new paddocks which contained lantana in April 2005. Three died and 9 steers shows temporary toxicity. HIM and SLIM HIM steers were more severely affected, which may have reduced the growth differences between the groups.

HIM No.05s were 36 kg heavier than SLIM steers at weaning. The weight difference was 85 kg at 12 months of age, and reduced to 80 kg at the end of the following wet season. SLIM HIM steers were 32 kg heavier at 18 months than SLIM steers, also after 10-15% weight compensation during the wet season (Figure 25).

No.05 HIM and SLIM HIM steers gained an extra 30 mm in height than SLIM steers in the post-weaning dry season (Figure 26; Table 15; P<0.05). In the subsequent wet season, height gain of HIM steers was 25-30 less than in SLIM and SLIM HIM steers, with no difference between the latter two groups.

Both No.04 and No.05 steer growth data supports the hypothesis that steers do not achieve height compensation following dry seasons in the same manner that weight compensation occurs. Height may be a useful practical indicator of growth and growth potential as it is not confounded by changes in diet quality and body condition.

Figure 26. Average height of Swan's Lagoon steers

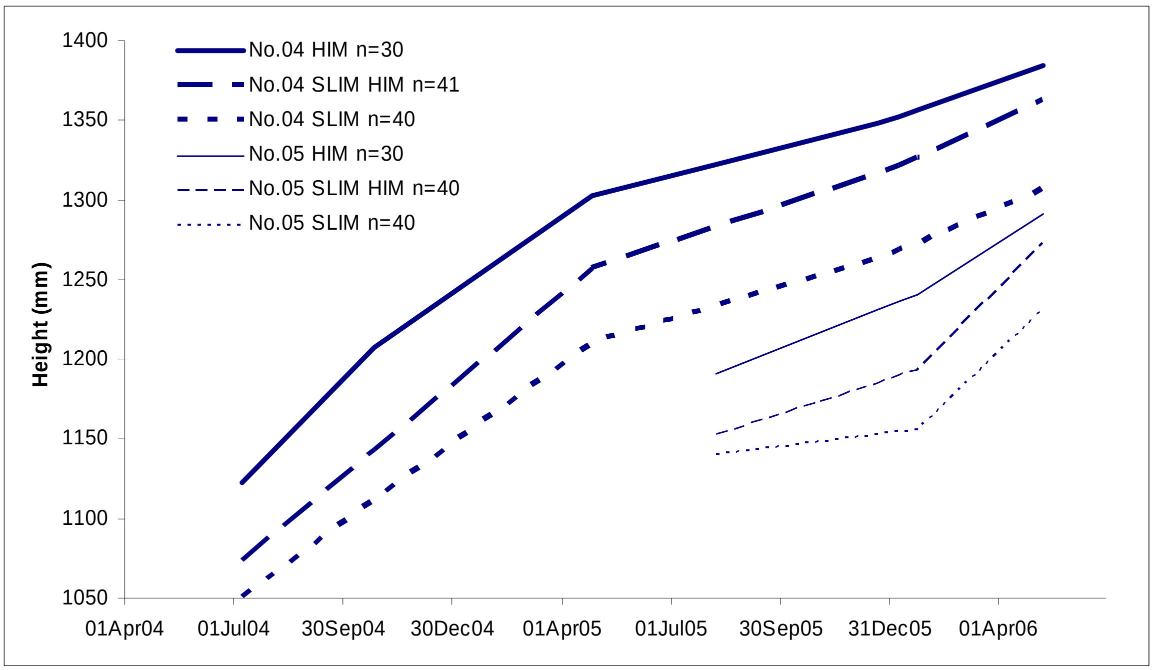


Table 15. Least squares means for seasonal, annual and project weight and height changes for Swan's Lagoon steers

	Weight change (kg)				Height change (mm)			
	HIM	SLIM HIM	SLIM	se	HIM	SLIM HIM	SLIM	se
No.04 steers								
2004 Dry	95a#	100a	51b	3	84	80	72	2
2005 Wet	73b	69b	92a	3	106	115	99	11
2005 Dry	107	110	46	16	49	68	58	6
2006 Wet	102b	103b	122a	3	32	42	38	4
2004-05	168a	169a	143b	4	180ab	197a	165b	5
2005-06	203	213	168	14	80	109	97	6
Wean-30m	373a	360a	293b	12	260	293	259	11
No.05 steers								
2005 Dry	88a	76a	39b	4	50a	51a	20b	6
2006 Wet	87	87	92	4	50	79	76	6
2005-06	174a	162a	131b	5	100	126	96	10

Values within row followed by a different letter are significantly different (P<0.05)

4.5.3 St Margaret's Creek

Male calves grew an estimated 9% and 15% faster than female calves in 2005 and 2006, respectively. The combined average weaning weight of No.04-06 calves was 173 kg for females and 198 kg (14% higher) for steers. Calves suckling cows grew 21% and 28% faster than those suckling heifers in 2005 and 2006, respectively, with those suckling two- and three-year old cows growing at an intermediate rate in 2006 (Table 16). There was no evidence in either year of time of calving affecting pre-weaning calf growth rate.

Table 16. Estimated growth rates (kg/d) of suckling calves at Swan's Lagoon

Calf year group:	2005	2005	2005	2006	2006
Lactation:	> 3rd	2nd & 3rd	First	Multiple	First
HIM: Birth to R1	0.97	0.90	0.80	0.88	0.69

An average gain of 161 kg was achieved by heifers in the year after weaning (Figure 27). Gain in the following year was 81 kg in the No.04s, most of which did not rear a calf (bull infertility problem). In females rearing calves, annual gain from 18 months of age till maturity was approximately 30 kg, and as only fertile females are retained, mature weight of ~520 kg was reached at 7.5 years of age (Figures 29-30).

The females appeared to reach mature height, which averaged 1370 mm, by 4 years of age. In the year after weaning they gained 200 mm in height, and a further 65 mm between 18 months and 2.5 years of age (Figure 28).

The St Margaret's creek cattle were maintained in moderate to forward body condition at all times (Figure 31). There was a trend for older breeding females to be in slightly better body condition, which may explain some of their weight advantage.

Figure 27. Average weights for each year group of St Margaret's Creek female HIM cattle

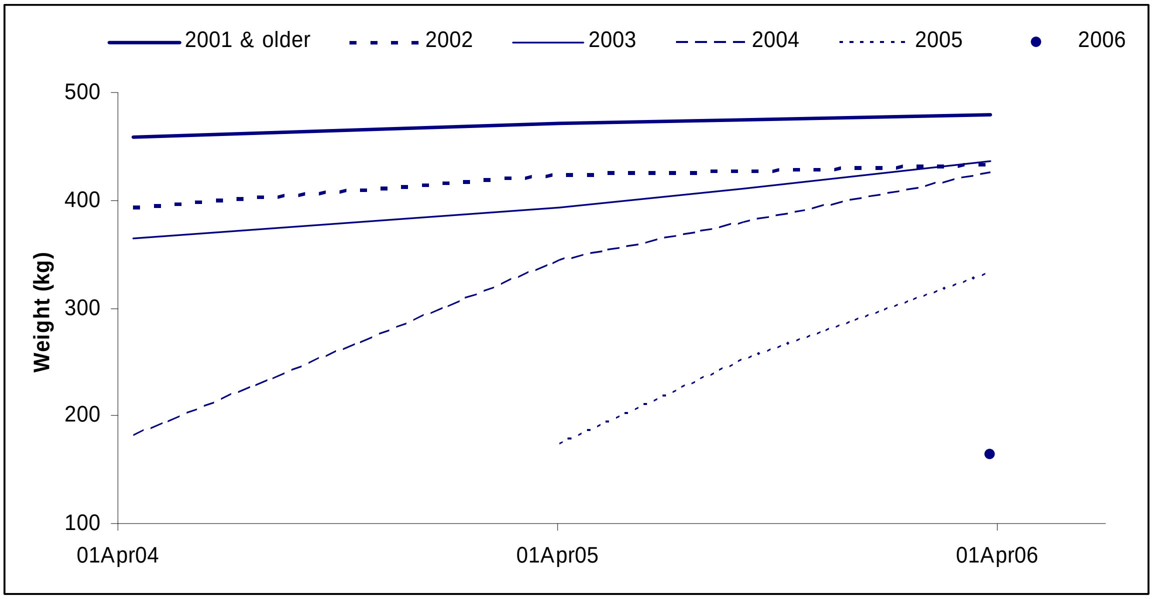


Figure 28. Average heights for each year group of St Margaret's Creek female HIM cattle

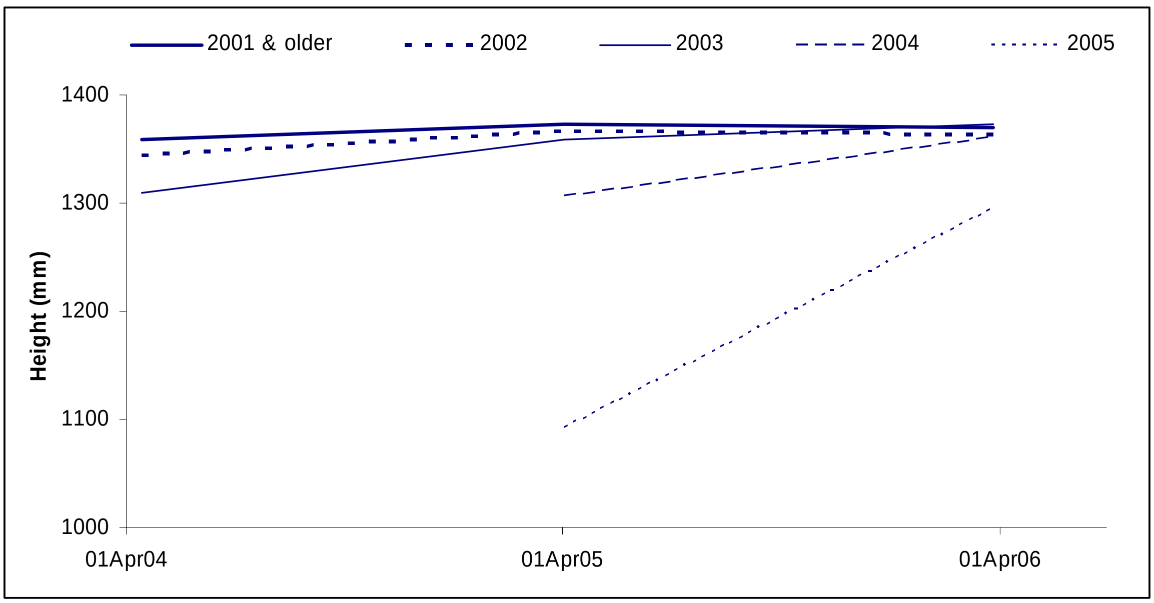


Figure 29. Average weight corrected to condition score 7 (9-point scale) of each year group of St Margaret's Creek females at each muster

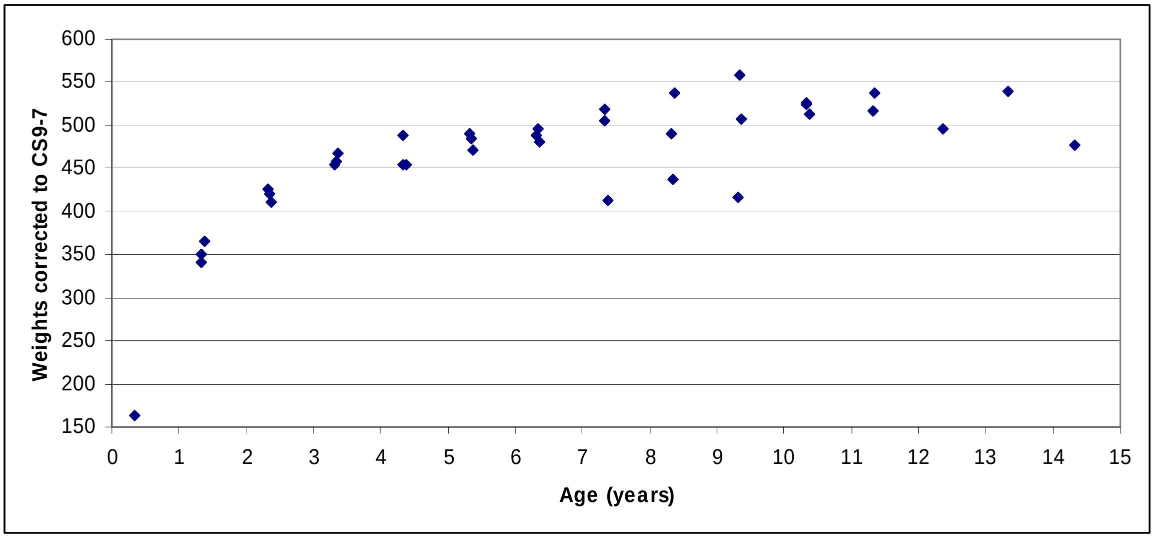
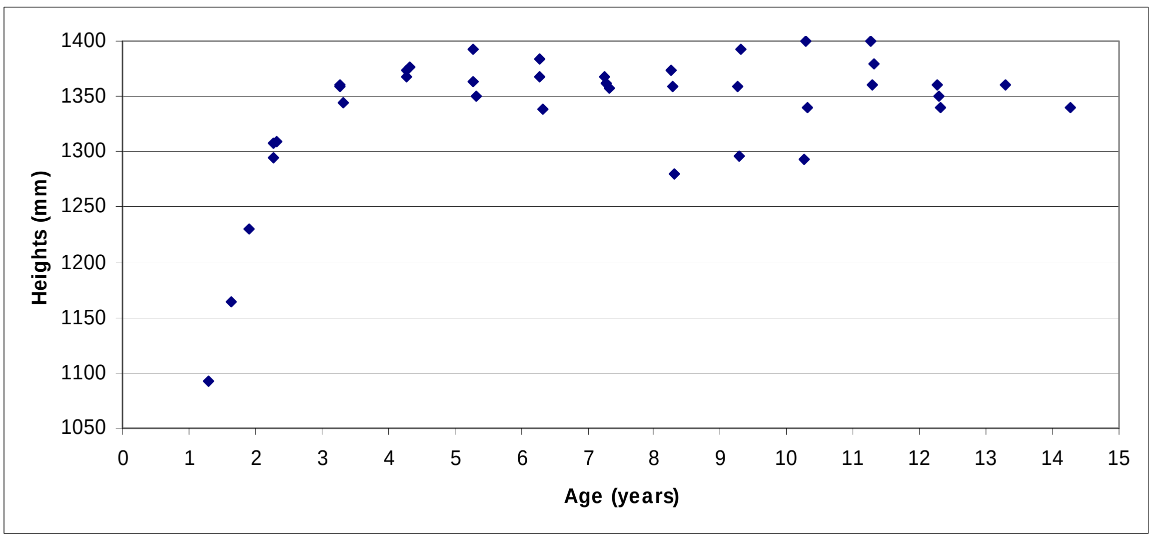


Figure 30. Average height of each year group of St Margaret's Creek females at each muster



The No.04 and No.05 steers gained 270 and 266 kg, respectively, in the year after weaning, ie, an average of 0.66 kg/day (Figure 32). The No.04 steers gained an estimated 120 and 80 mm in height in the dry and wet seasons after weaning, respectively, to reach an average of 1345 mm by 18 months. There was no apparent effect of HGP on skeletal development.

The HGP-treated No.04 steers reached 539 kg by slaughter at 2 years of age; untreated steers were 45 kg lighter. The HGP increased dry and wet season growth rates by 10% and 19%, respectively. Three-quarters of the No.04 steers had no permanent incisors at slaughter. Average P8 fat depth was 11mm with no significant HGP effect. Dressing percentage was 56.3% and 55% in those with and without Compudose 200™, resulting in carcass weights averaging 304 and 271 kg, respectively.

Figure 31. Average condition scores for each year group of St Margaret's Creek female HIM cattle

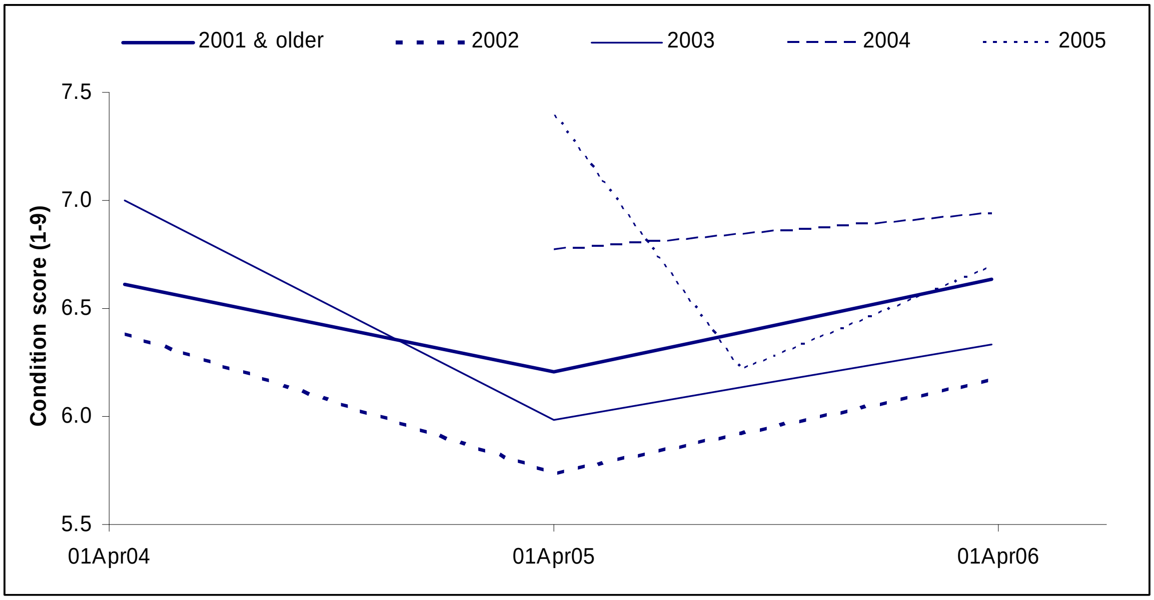
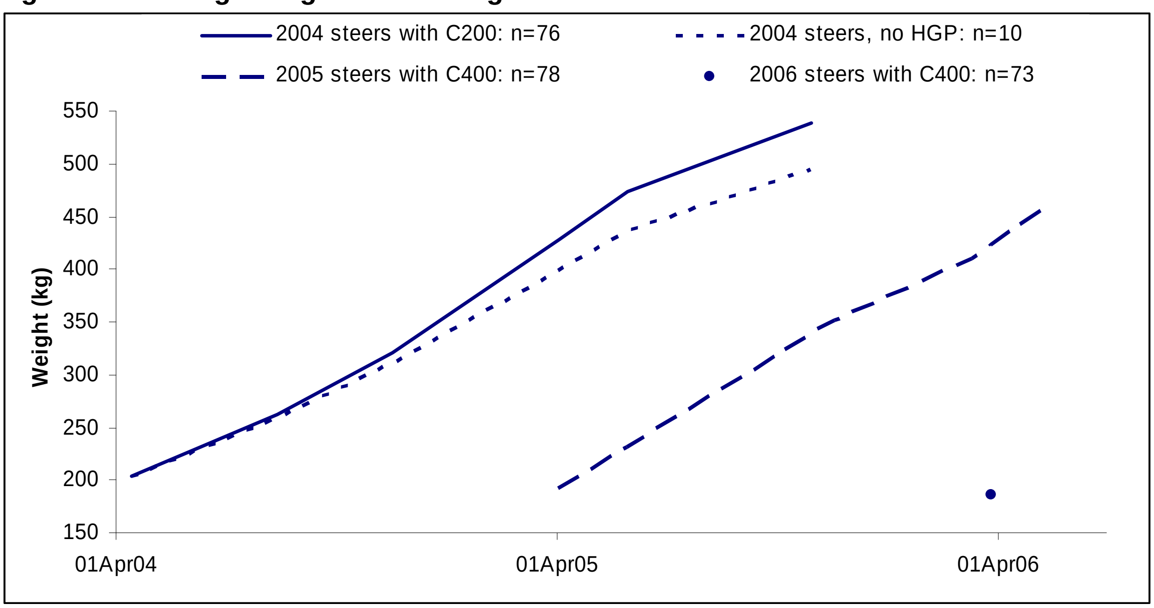


Figure 32. Average weights of St Margaret's Creek steers



4.6 Fertility

4.6.1 Thalanga

In 2005, pregnancy rates (Figures 33-35) of wet HIM cows were high, but only 75% in 2006. Sixty percent of SLIM cows were pregnant in May 2006. In both years, pregnancy rates in lactating cows were relatively low in lactating SLIM cows, though relatively high in first-lactation cows. Calf loss between confirmed pregnancy and weaning was generally less than 10% in both herds, which is normal (Table 17).

Figure 33. Cumulative pregnancies at Thalanga in 2004 in allocated cows

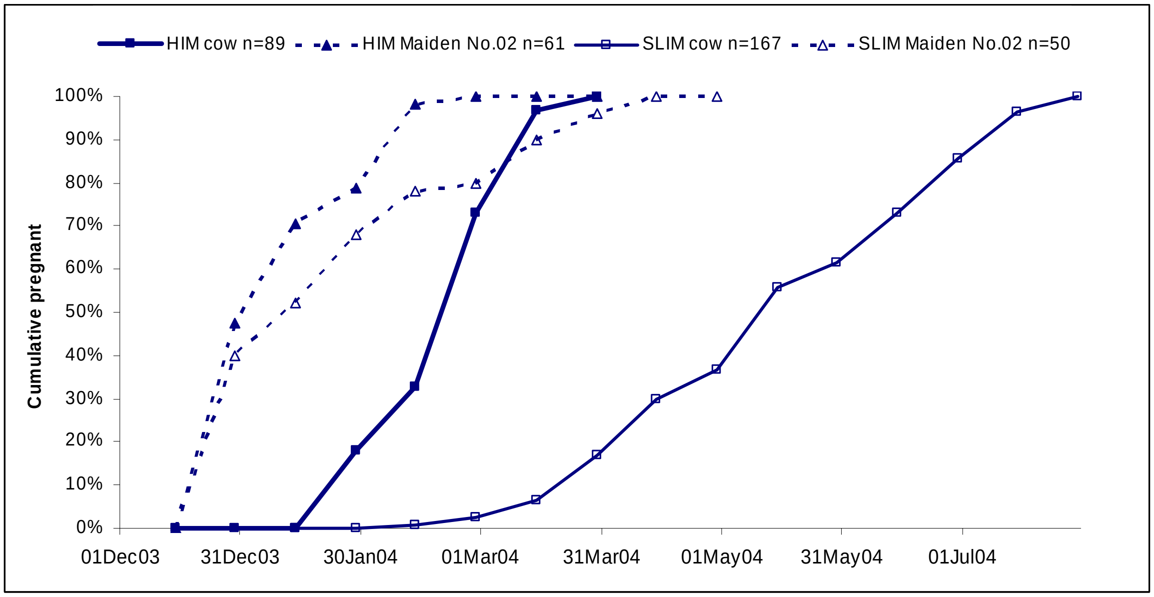


Figure 34. Cumulative pregnancies at Thalanga in 2005

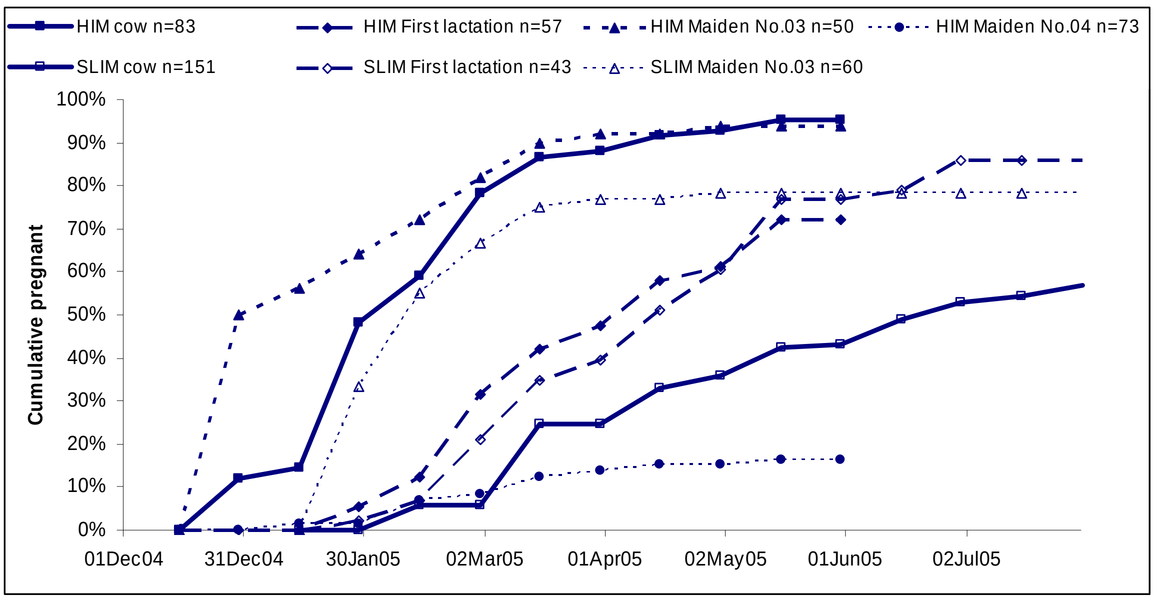
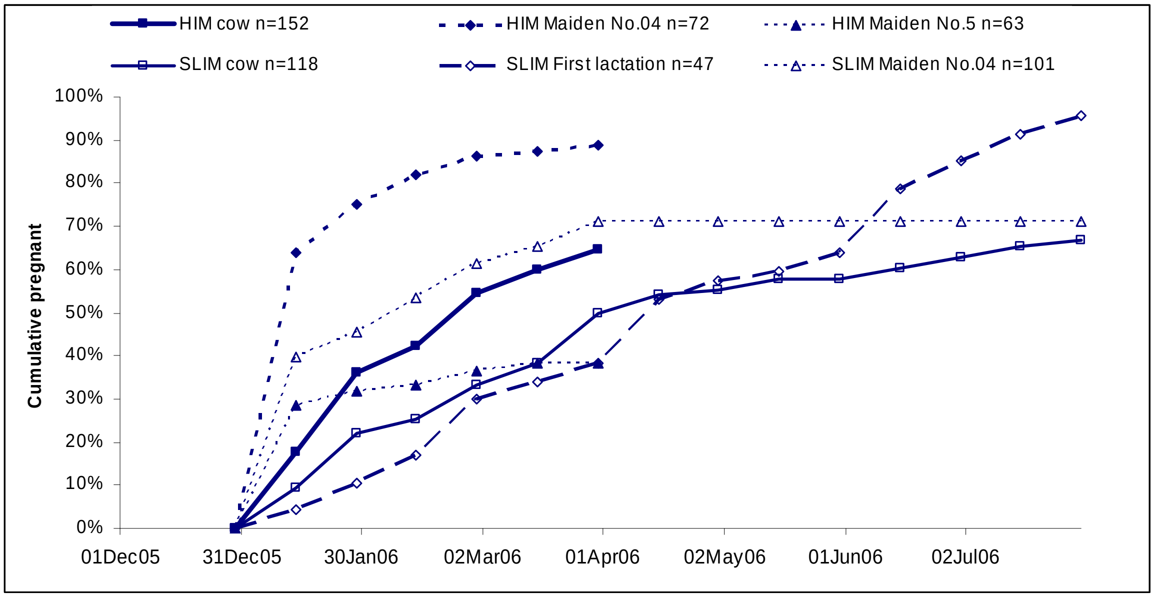


Figure 35. Cumulative pregnancies at Thalanga in 2006



Pregnancy rates in maiden 2-year-old heifers were 16-18% lower in the SLIM herd than in the HIM herd (Table 17). HIM yearlings that conceived did so at an estimated average weight of 269 kg. There was no evidence of dystocia in the small number of No.04 HIM heifers that conceived as yearlings.

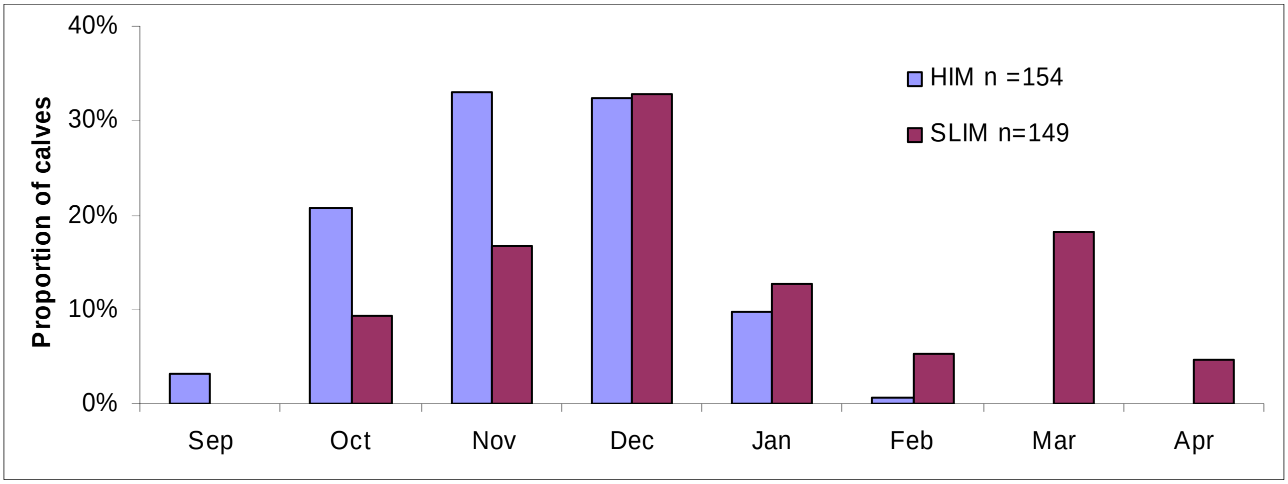
Table 17. Mating outcomes at Thalanga

	HIM Cow#	HIM Lact 1	HIM Maid 2	HIM Maid 1	SLIM Cow	SLIM Lact 1	SLIM Maid 2
Mating 03/04 for No.05 calves							
Allocated (pregnant)	88		61		167		50
Calf loss: Pregnancy to weaning	6%		7%		10%		14%
Mating 04/05 for No.06 calves							
Mated	83	57	50	73	151	43	60
Pregnancy rate	99%	82%	94%	16%	57%	86%	78%
Calf loss: Pregnancy to weaning	6%	2%	6%	17%	12%	5%	9%
Weaning rate	92%	74%	84%	14%	50%	81%	72%
Mating 05/06 for No.07 calves							
Mated	108	44	72	63	118	47	101
Pregnancy rate	74%	61%	89%	38%	70%	96%	71%

Lact 1 = First lactation; Maid 2 = 2-year-old maiden heifer; Maid 1 = 1-year-old maiden heifer

The outcome of mating in the HIM herd was average calving date was 1.3 months earlier (mid-Nov *v* late Dec), and the calving period reduced from 6 to 4 months for 95% of calves in comparison to the SLIM herd (Figure 36).

Figure 36. Calving month at Thalanga for No.06 calves



4.6.2 Swan's Lagoon

In 2005, pregnancy rates in HIM cattle were relatively low, which appeared a consequence of their poorer body condition and insufficient fortified molasses being provided to achieve *ad lib* intakes over the dry season (Figures 37-38). The SLIM cows grazed a better paddock than the HIM cows and their high pregnancy rates in 2005 reflected this.

In 2006, HIM pregnancy rates were high, even in lactating 2-year-old cows, with SLIM pregnancy rates not as high in the first 3 months of mating (Figure 39). Estimated average weight at conception in yearlings was 265 kg.

Figure 37. Cumulative pregnancies at Swan's Lagoon in 2004 in allocated cows

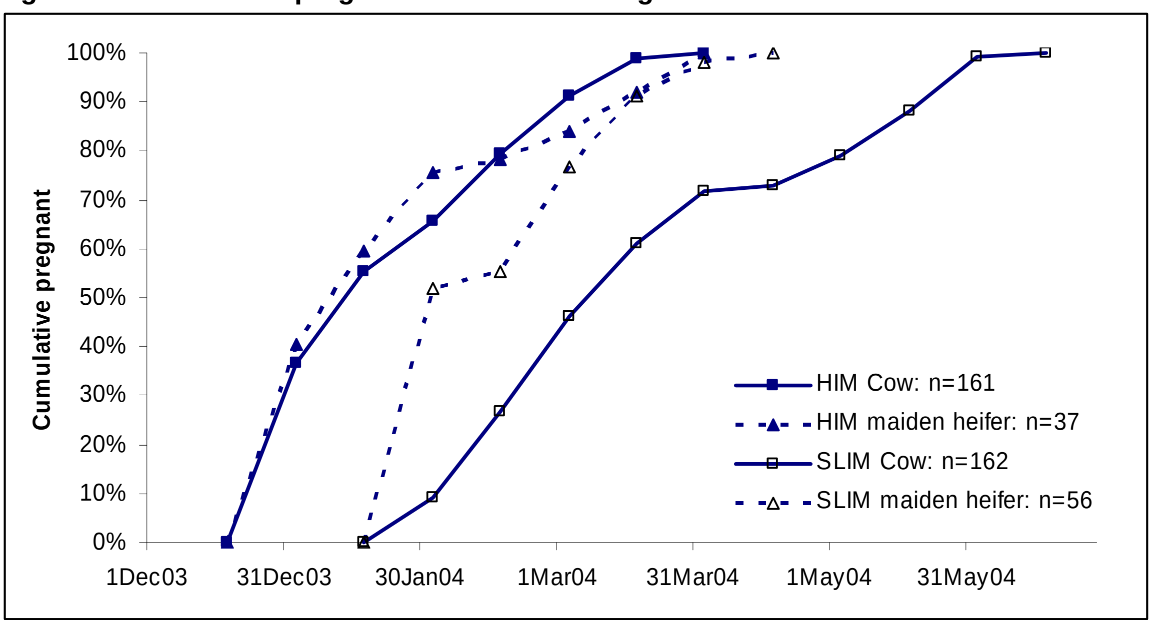


Figure 38. Cumulative pregnancies at Swan's Lagoon in 2005

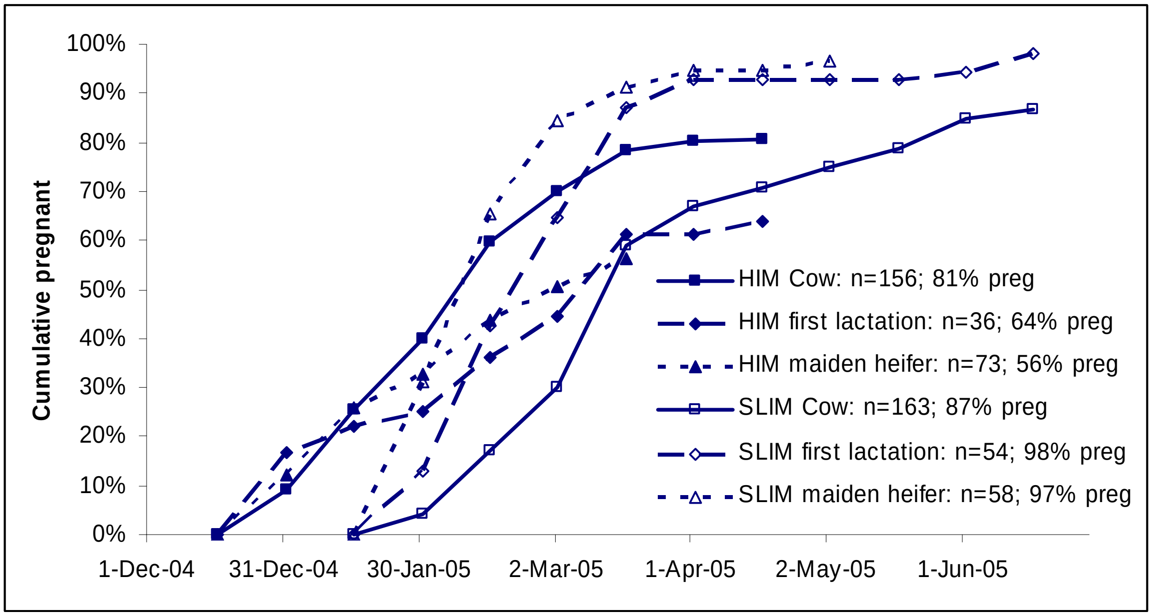
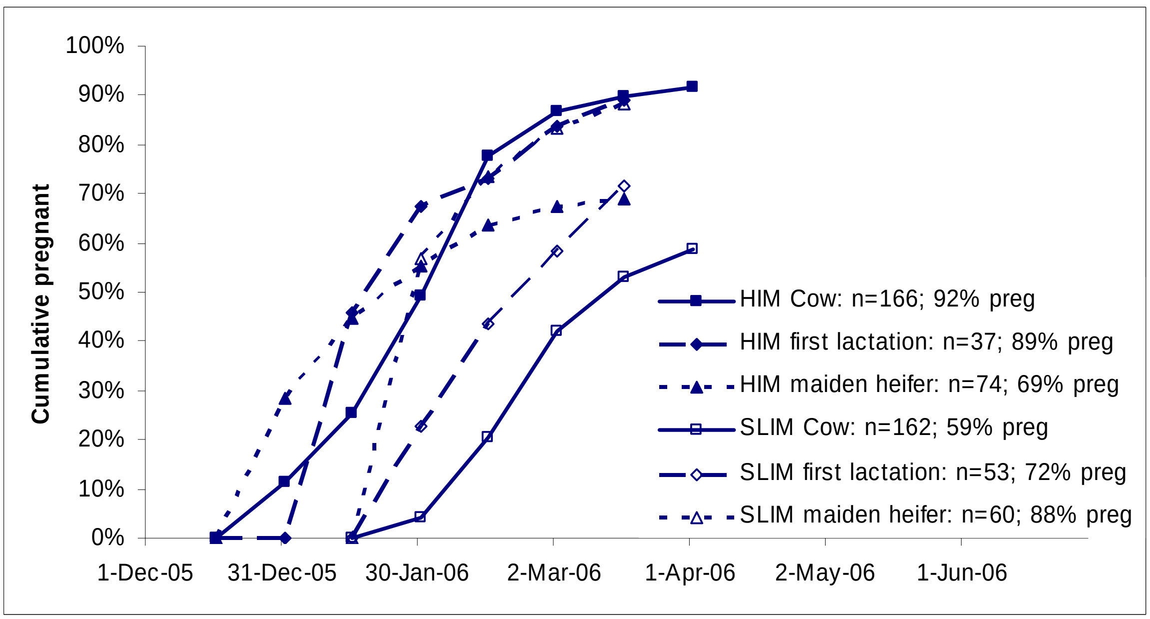


Figure 39. Cumulative pregnancies at Swan's Lagoon in 2006



Calf wastage was within normal range for all groups except for heifers conceiving as yearlings in which losses were 20-30% (Table 18). This included 5-10% that was associated with cow death because of dystocia. Supplementation of these pregnant yearlings was not maintained at a high level in the first half of pregnancy nor throughout the dry season, and as a consequence, it appears that foeto-pelvic disproportion occurred in a significant proportion of pregnancies.

Table 18. Mating outcomes at Swan's Lagoon

	HIM Cows	HIM 2 years	HIM Yearling	SLIM Cows	SLIM 3 years	SLIM 2 years
Mating 03/04 for No.05 calves						
Allocated (pregnant)	126	36	38	117	46	55
Calf loss: Pregnancy to weaning	9%	11%	29%	8%	7%	9%
Calf loss with cow death	3%	6%	5%	0%	0%	2%
Mating 04/05 for No.06 calves						
Mated	156	36	73	163	54	58
Pregnancy rate	81%	64%	56%	87%	98%	97%
Calf loss: Pregnancy to weaning	10%	0%	24%	7%	9%	7%
Calf loss with cow death	0%	0%	10%	0%	2%	0%
Weaning rate	72%	64%	42%	78%	90%	89%
Mating 05/06 for No.07 calves						
Mated	166	37	74	162	53	60
Pregnancy rate	92%	89%	69%	59%	72%	88%

Calving was 1.6 and 1.1 months earlier in the HIM herd than the SLIM herd for the No.05 and No.06 calves, respectively (Figures 40-41). Average calving date was early November in the HIM herd and mid-December in the SLIM herd. About 90% of calves were born over a 3 month period in the HIM herd in comparison to 5 months in the SLIM herd.

Figure 40. Calving month at Swan's Lagoon for No.05 calves

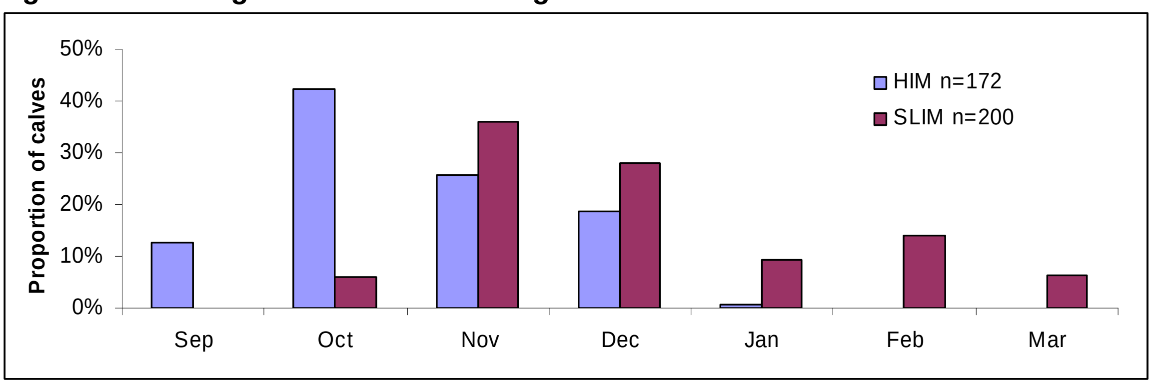
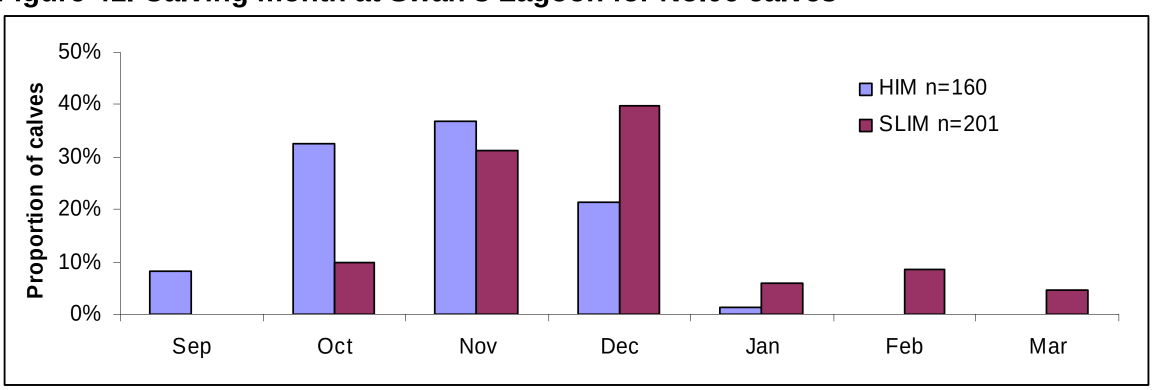


Figure 41. Calving month at Swan's Lagoon for No.06 calves



4.6.3 St Margaret's Creek

Pregnancy rate in lactating cows consistently exceeded 90% with 90% of calving within a 3-month period (Figures 42-45). Almost 80% of yearlings conceived in 2006 at an estimated average weight of 294 kg at conception. Single-sire mating to a bull that was subsequently confirmed to be infertile resulted in no pregnancies during mating of yearlings in 2005; however, a straying bull did impregnate 14% of these heifers at the end of mating; a straying heifer during mating also conceived. Calf wastage generally remained within normal range, though was slightly higher in first-lactation 2-year-old cows bearing No.05 calves (Table 19).

Figure 42. Cumulative pregnancies at St Margaret's Creek in 2004 in allocated cows

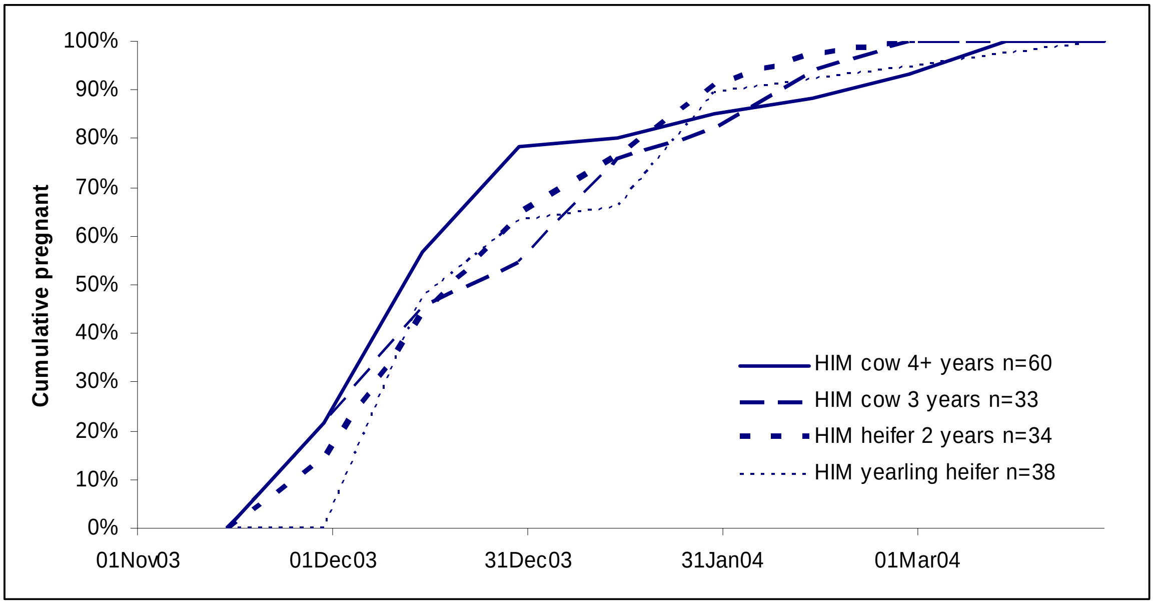


Figure 43. Cumulative pregnancies at St Margaret's Creek in 2005

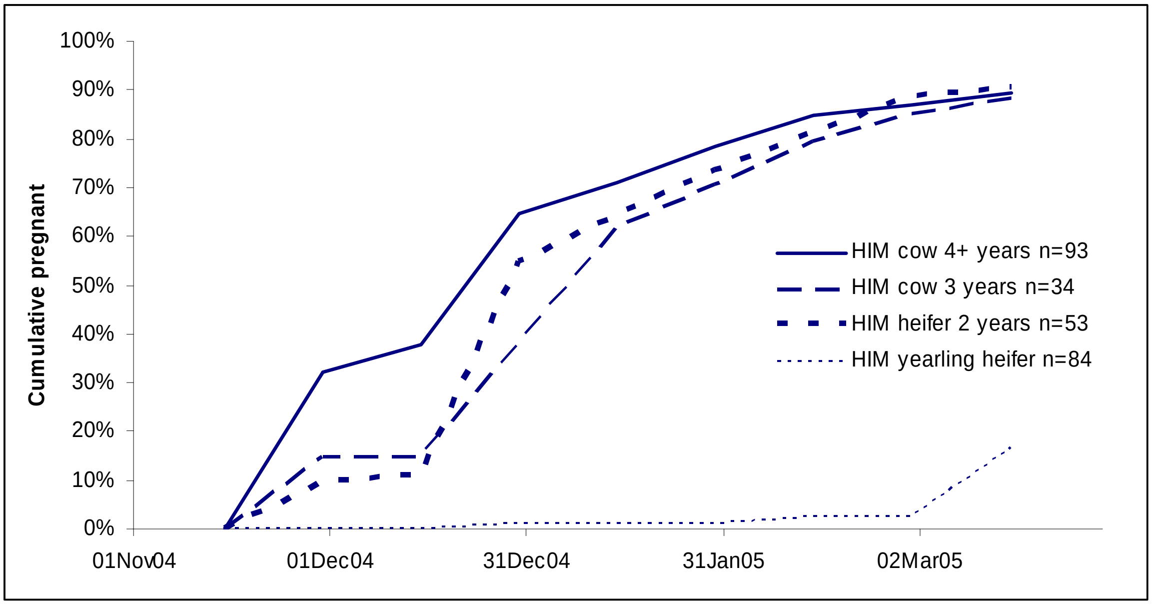


Figure 44. Cumulative pregnancies at St Margaret's Creek in 2006

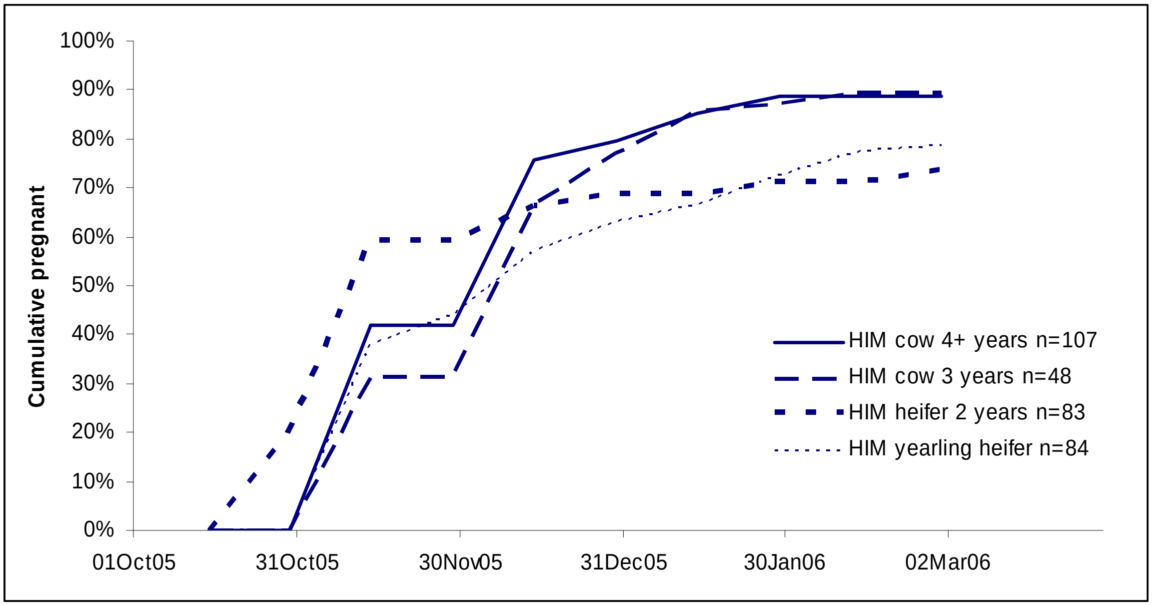


Figure 45. Calving month at St Margaret's Creek

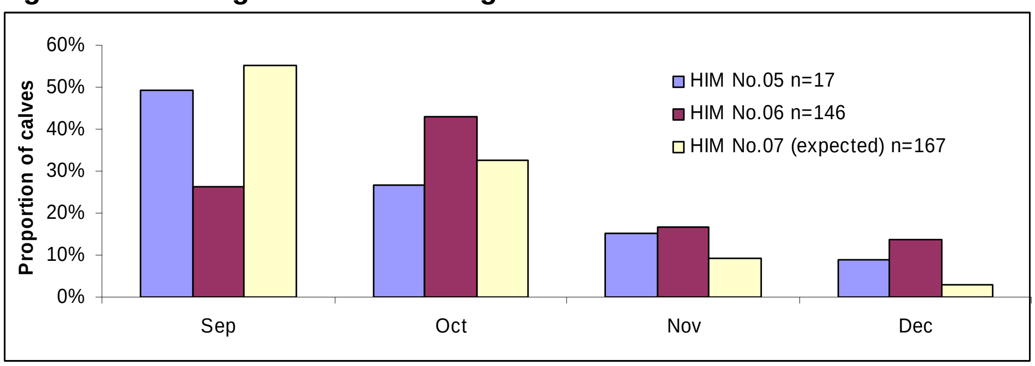


Table 19. Mating outcomes at St Margaret's Creek

	HIM 4-14 years	HIM 3 years	HIM 2 years	HIM Yearlings
Mating 03/04 for No.05 calves				
Allocated (pregnant)	60	33	34	52
Calf loss: Pregnancy to weaning	12%	3%	9%	15%
Mating 04/05 for No.06 calves				
Mated	93	34	54	85
Pregnancy rate	89%	88%	91%	18%#
Calf loss: Pregnancy to weaning	5%	0%	8%	8%
Weaning rate	84%	88%	83%	14%
Mating 05/06 for No.07 calves				
Mated	107	48	83	84
Pregnancy rate	89%	90%	73%	79%

31% acyclic at end of mating; infertile bull used; pregnancies at end of mating by "trespassing" bull

4.7 Time input

Comparisons of time input between the SLIM and HIM systems were made on the basis of 1,000 cow (2.5 years and over) herds (Table 20). These herds included heifer and steer progeny from weaning to 2.5 years of age.

The HIM system required 4-7 times as much labour for supplementation as the SLIM system. The inputs at Thalanga were much lower because of the better seasons there during the project, and relatively high at St Margaret's Creek because of the relatively small size of the herd on which calculations were based.

The extra handling required by SLIM herds did not outweigh the labour required to conduct HIM systems, though at Thalanga under good seasons the overall labour inputs for the two systems were similar.

Table 20. Time input into HIM and SLIM systems at each site

	Supplementation			Mustering			Supps & Musters
	Hours/1,000 cows		Ratio	Hours/1,000 cows		Ratio	Ratio
	HIM	SLIM	HIM/SLIM	HIM	SLIM	HIM/SLIM	HIM/SLIM
Thalanga							
2004	160	35	4.6	120	219	0.5	1.1
2005	170	33	5.2	120	219	0.5	1.1
Swan's Lagoon							
2004	584	106	5.5	115	187	0.6	2.4
2005	736	107	6.9	125	187	0.7	2.9
St Margaret's Creek							
2004	1101			134			
2005	1147			134			

4.8 Business performance

4.8.1 Thalanga

The net relative return per AE value of individual age groups within herd were generally higher in the HIM system than in the SLIM system at Thalanga (Tables 15-16). Value increase of yearling heifers that did not conceive was less in HIM than in SLIM systems. This was also the obvious outcome in steers over 18 months of age when favourable pasture conditions for SLIM steers resulted in them gaining as much weight as heavily-supplemented steers. Net relative returns for first-lactation females tended to be lower than for other classes, mainly because of a shift from fat to average condition.

When all data was combined into gross margins analyses of several business options where all turnoff was at 2.5 years of age or older and **premiums were paid for heavier steers at 2.5 years of age** (Table 23), several outcomes were noted:

- A full HIM system was more profitable than a full SLIM system. When no price premiums were applied for 2.5-year-old steers, overall profitability for the two systems was similar.
- A HIM system runs 12% fewer cattle than a SLIM system.
- With the premiums applied there is generally a small overall advantage in using the HIM system in both years after weaning in steers, rather than just in the post-weaning year.
- When a breeding herd is managed using a HIM system, and mating of heifers is delayed to 2 years, it appears more profitable to minimise supplementation of heifer progeny until they are pregnant.

- The most profitable option is to use SLIM systems in females and HIM systems to 18 months in steer progeny at the molasses and beef prices used in the analyses.

A price sensitivity analysis for Thalanga that compared a full SLIM system to SLIM with HIM for steers to 18 months (Figure 46), which was the most profitable option at that site, showed that:

- A small price premium for steers is required to break even if supplement prices rise more than 20% above the level they were during the project.
- When a price premium of $0.10 is available for 2.5-year-old steers, break-even is experienced when supplement costs rise by 40%.

A price sensitivity analysis for Thalanga that compared a full SLIM system to HIM with SLIM for heifers (Figure 47), which was the second most profitable option at that site showed that a price premium of $0.20 per kg live for 2.5-year-old steers is required to break even if supplement prices rise more than 20% above the level they were during the project.

In 2005-06, 2004 SLIM steers gained 200 kg, as they grazed one of the station's best paddocks as well as experiencing an early seasonal break. Because of this confounding effect, their growth matched that of contemporary HIM and SLIM steers.

Table 21. Relative change in net worth of each HIM and SLIM age x gender group at Thalanga in 2004-05

	Per animal:				Net relative return per:		
	Supps	Musters	Value in	Value add#	Animal	Value in	AE
HIM females							
94-01	$43	$5	$535	$331	$283	53%	$251
2002	$44	$5	$545	$224	$175	32%	$173
2003	$37	$5	$331	$247	$205	62%	$261
2004	$69	$5	$209	$201	$127	61%	$267
SLIM females							
94-01	$21	$10	$528	$217	$185	35%	$171
2002	$36	$10	$541	$241	$194	36%	$190
2003	$32	$10	$290	$211	$169	58%	$240
2004	$48	$10	$173	$105	$47	27%	$117
No.04 steers							
HIM	$69	$5	$265	$248	$174	66%	$317
SLIM HIM	$62	$5	$207	$209	$142	69%	$320
SLIM	$43	$10	$196	$136	$82	42%	$209

For surviving cattle

Table 22. Relative change in net worth of each HIM and SLIM age x gender group at Thalanga in 2005-06

	Per animal: Supps	Musters	Value in	Value add#	Net relative return per: Animal	Value in	AE
HIM females							
94-01	$24	$5	$589	$306	$277	47%	$220
2002	$23	$5	$465	$326	$298	64%	$265
2003	$26	$6	$578	$242	$210	36%	$171
2004	$117	$5	$416	$227	$105	25%	$125
2005	$65	$5	$245	$227	$157	64%	$292
SLIM females							
94-01	$19	$10	$571	$265	$235	41%	$179
2002	$22	$11	$471	$249	$216	46%	$198
2003	$26	$10	$499	$234	$198	40%	$181
2004	$32	$10	$282	$244	$202	72%	$289
2005	$27	$10	$198	$168	$131	66%	$325
No.04 steers							
HIM	$152	$5	$521	$341	$184	35%	$191
SLIM HIM	$152	$5	$422	$343	$186	44%	$227
SLIM	$14	$10	$336	$339	$315	94%	$434
No.05 steers							
HIM	$66	$5	$289	$265	$193	67%	$324
SLIM HIM	$50	$5	$237	$260	$205	86%	$424
SLIM	$38	$10	$239	$189	$141	59%	$316

For surviving cattle

Table 23. Inputs and estimated Gross Margins for management options at Thalanga

Cows	***SLIM***	***SLIM***	***SLIM***	***HIM***	***HIM***	***HIM***	***HIM***
Heifers	***SLIM***	***SLIM***	***SLIM***	***HIM***	***HIM***	***SLIM***#	***SLIM***
Steers	***SLIM***	***HIM***	***HIM 1***##	***HIM***	***HIM 1***	***HIM 1***	***HIM***
Total adult equivalents	2700	2700	2700	2700	2700	2700	2700
Total cattle carried	3454	3265	3307	3026	3055	3166	3144
Weaner heifers retained	513	485	491	470	475	492	489
Total breeders mated	1264	1195	1210	1233	1245	1290	1281
Total breeders mated & kept	1140	1078	1092	1011	1021	1058	1051
Total calves weaned	1026	970	983	940	949	984	977
Overall breeder deaths	3%	3%	3%	3%	3%	3%	3%
Total cows and heifers sold	454	429	435	419	423	438	435
Total steers & bullocks sold	493	466	472	452	456	472	469

Cows	***SLIM***	***SLIM***	***SLIM***	***HIM***	***HIM***	***HIM***	***HIM***
Heifers	***SLIM***	***SLIM***	***SLIM***	***HIM***	***HIM***	***SLIM***#	***SLIM***
Steers	***SLIM***	***HIM***	***HIM 1***##	***HIM***	***HIM 1***	***HIM 1***	***HIM***
Average female price							
	$608	$608	$608	$640	$640	$624	$624
Average steer/bullock price							
	$683	$952	$837	$1,007	$863	$865	$1,007
Capital value of herd							
	$1,519,130	$1,493,464	$1,506,537	$1,508,842	$1,523,125	$1,525,581	$1,515,177
Net cattle sales							
	$612,288	$703,935	$659,237	$723,067	$664,269	$681,680	$744,061
Direct costs							
	$158,878	$219,845	$164,911	$253,952	$200,538	$195,534	$251,655
Gross margin for herd							
	$453,411	$484,091	$494,325	$469,115	$463,732	$486,146	$492,407
GM per adult equivalent							
	$168	$179	$183	$174	$172	$180	$182

Heifers excluded from HIM system till 2.5 years; ## HIM system for steers only to 18 months

Figure 46. Thalanga: Gross margins advantage over a SLIM system of SLIM in females with HIM systems to 18 months in steers as supplement costs and steer premiums increase

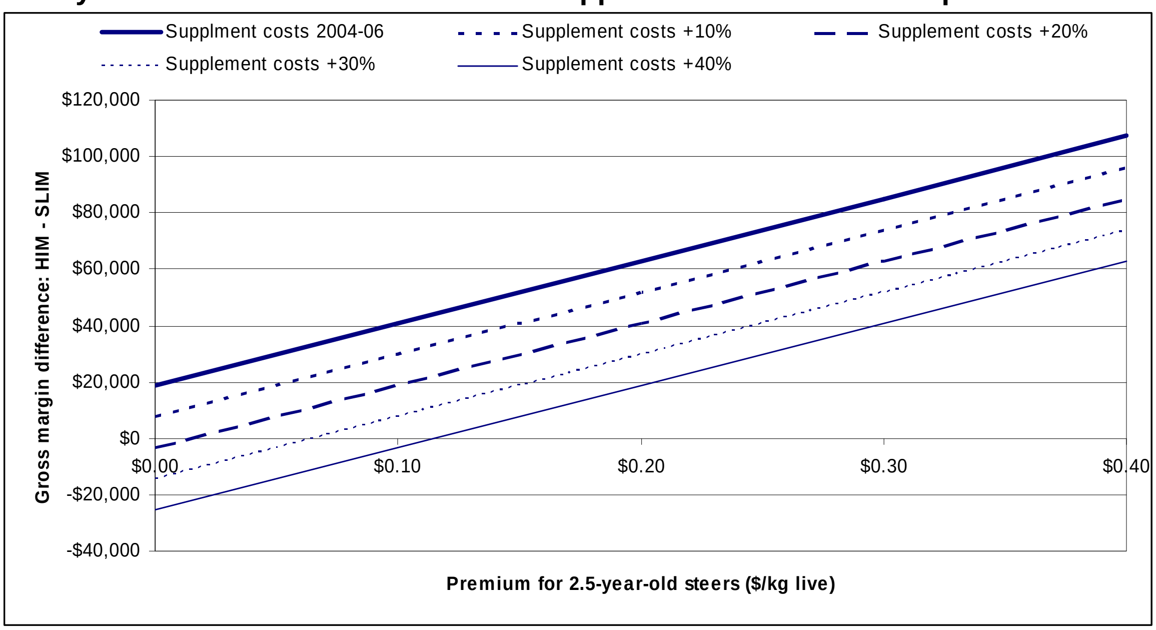
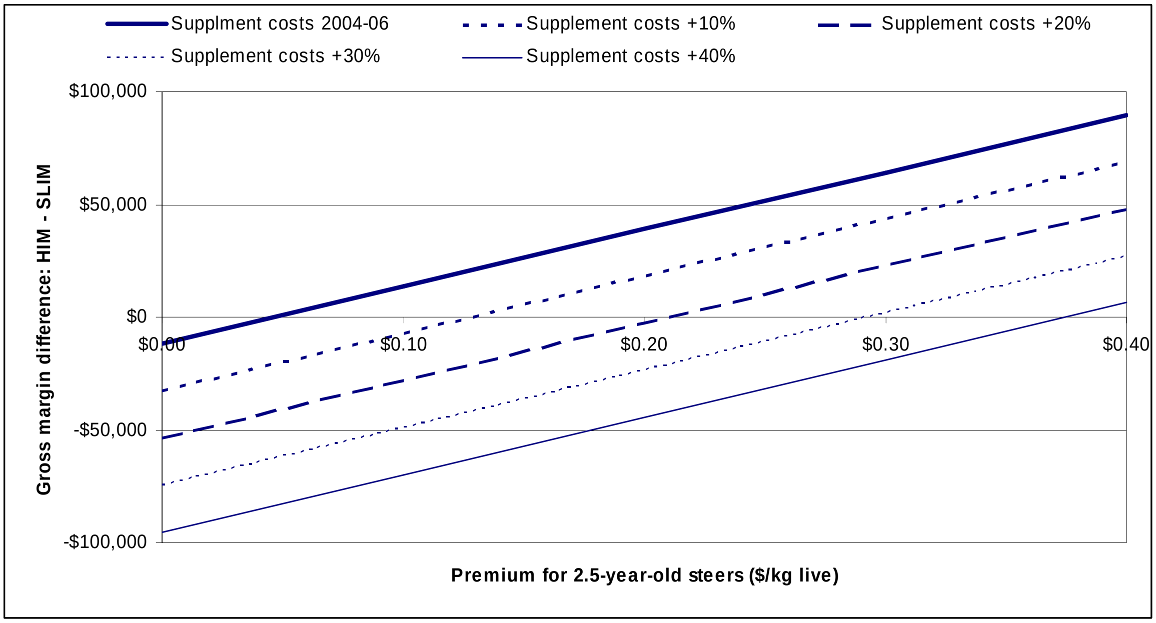


Figure 47. Thalanga: Gross margins advantage of HIM with SLIM for juvenile females over a SLIM system as supplement costs and steer premiums increase



4.8.2 Swan's Lagoon

On the basis of analyses of annual value increase of gender x age groups within treatment, the HIM system appeared less attractive as a business option that the SLIM system in most classes on cattle in 2004 (Tables 24-25). In 2005, the HIM system appeared much better business than the SLIM system in female cattle. However, HIM systems still did not match net relative returns in either weaner or yearling steers in 2005. The inconsistency of comparative performance of the two systems may be due to a combination of:

- high levels of feeding for prolonged periods in the poor seasons experienced at Swan's Lagoon,
- coupled with inconsistency in providing supplements *ad lib* at all times.

The depressive effect of first lactation on value increase mirrored what was seen at Thalanga.

When all data was combined into gross margins analyses of several business options where all turnoff was at 2.5 years of age or older and **premiums were paid for heavier steers at 2.5 years of age** (Table 26), several outcomes were noted:

- A full HIM system was more profitable than a full SLIM system and was the most profitable option to use at the molasses and beef prices used in the analyses.
- A HIM system runs 10% fewer cattle than a SLIM system.
- With the premiums applied there is generally a small overall advantage in using the HIM system in both years after weaning in steers, rather than just in the post-weaning year.
- When a HIM system is used in breeders, it is more profitable to mate yearlings than to defer mating till two years of age.
- When first mating is deferred to two years of age within either breeder management system, there is little difference between HIM and SLIM systems for breeders.

A price sensitivity analysis for Swan's Lagoon that compared SLIM to HIM (Figure 48), which was the most profitable option at that site, showed that:

- A price premium of $0.07 per kg live for steers is required to break even, when supplement prices are as they were during the project.
- When supplement costs rise by 20% on the 2004-06 levels, break-even occurs when a price premium of $0.25 is received.

A price sensitivity analysis that compared a full SLIM system to SLIM with HIM for steers (Figure 49), which was the second most profitable option at that site, showed that:

- A price premium of $0.16 per kg live for steers is required to break even, when supplement prices are as they were during the project.
- When supplement costs rise by 20% on the 2004-06 levels, a price premium of over $0.30 is required to break even.

Table 24. Relative change in net worth of each HIM and SLIM age x gender group at Swan's Lagoon in 2004-05

	Per animal:				Net relative return per:		
	Supps	Musters	Value in	Value add#	Animal	Value in	AE
HIM females							
94-01	$44	$5	$619	$213	$163	26%	$133
2002	$44	$5	$538	$175	$125	23%	$124
2003	$34	$5	$444	$205	$165	37%	$192
2004	$63	$5	$236	$218	$150	64%	$276
SLIM females							
94-01	$24	$10	$576	$285	$251	44%	$209
2002	$24	$10	$542	$225	$190	35%	$184
2003	$18	$10	$392	$218	$191	49%	$245
2004	$35	$10	$170	$190	$145	86%	$332
No.04 steers							
HIM	$95	$5	$286	$266	$165	58%	$281
SLIM HIM	$88	$5	$192	$254	$161	84%	$349
SLIM	$37	$10	$192	$213	$165	86%	$380

For surviving cattle

Table 25. Relative change in net worth of each HIM and SLIM age x gender group at Swan's Lagoon in 2005-06

	Per animal:				Net relative return per:		
	Supps	Musters	Value in	Value add#	Animal	Value in	AE
HIM females							
94-01	$38	$5	$557	$329	$285	51%	$220
2002	$40	$5	$430	$306	$262	61%	$242
2003	$38	$5	$489	$270	$227	46%	$208
2004	$60	$5	$460	$323	$257	56%	$247
2005	$67	$5	$266	$238	$166	63%	$270
SLIM females							
94-01	$28	$10	$640	$235	$197	31%	$148
2002	$29	$10	$519	$280	$240	46%	$201
2003	$28	$10	$612	$140	$101	17%	$89
2004	$21	$10	$361	$210	$179	49%	$229
2005	$19	$10	$227	$161	$132	58%	$260
No.04 steers							
HIM	$137	$5	$552	$303	$160	29%	$159
SLIM HIM	$135	$5	$452	$331	$191	42%	$217
SLIM	$21	$10	$419	$269	$238	57%	$305
No.05 steers							
HIM	$100	$5	$308	$265	$160	52%	$252
SLIM HIM	$95	$5	$262	$241	$141	54%	$258
SLIM	$32	$10	$264	$197	$155	59%	$301

For surviving cattle

Table 26. Inputs and estimated Gross Margins for management options at Swan's Lagoon

Cows	***SLIM***	***SLIM***	***SLIM***	***HIM***	***HIM***	***HIM***	***HIM***
Heifers	***SLIM***	***SLIM***	***SLIM***	***HIM***	***HIM***	***SLIM***#	***SLIM***
Steers	***SLIM***	***HIM***	***HIM 1***##	***HIM***	***HIM 1***	***HIM 1***	***HIM***
Total adult equivalents							
	3000	3000	3000	3000	3000	3000	3000
Total cattle carried							
	3581	3453	3499	3230	3274	3315	3274
Weaner heifers retained							
	578	557	564	576	584	534	528
Total breeders mated							
	1536	1481	1501	1512	1533	1494	1476
Total breeders mated & kept							
	1256	1211	1227	1305	1323	1162	1147
Total calves weaned							
	1155	1114	1129	1153	1169	1069	1055
Overall breeder deaths							
	2%	2%	2%	2%	2%	2%	2%
Total cows and heifers sold							
	530	511	517	535	543	490	484
Total steers & bullocks sold							
	545	526	533	544	552	504	498

Cows	***SLIM***	***SLIM***	***SLIM***	***HIM***	***HIM***	***HIM***	***HIM***
Heifers	***SLIM***	***SLIM***	***SLIM***	***HIM***	***HIM***	***SLIM#***	***SLIM***
Steers	***SLIM***	***HIM***	***HIM 1##***	***HIM***	***HIM 1***	***HIM 1***	***HIM***
Average female price							
	$623	$623	$623	$667	$667	$637	$637
Average steer/bullock price							
	$708	$936	$785	$1,067	$922	$922	$1,068
Capital value of herd							
	$1,583,952	$1,565,838	$1,583,840	$1,545,211	$1,563,716	$1,581,993	$1,565,012
Net cattle sales							
	$722,336	$818,295	$747,479	$948,184	$879,563	$785,216	$849,459
Direct costs							
	$141,413	$229,049	$167,102	$325,182	$262,429	$209,664	$267,857
Gross margin for herd							
	$580,923	$589,246	$580,377	$623,002	$617,134	$575,553	$581,602
GM per adult equivalent							
	$194	$196	$193	$208	$206	$192	$194

Heifers excluded from HIM system till 2.5 years and not mated as yearlings; ## HIM system for steers only to 18 months

Figure 48. Swan's Lagoon: Gross margins advantage of HIM over SLIM as supplement costs and steer premiums increase

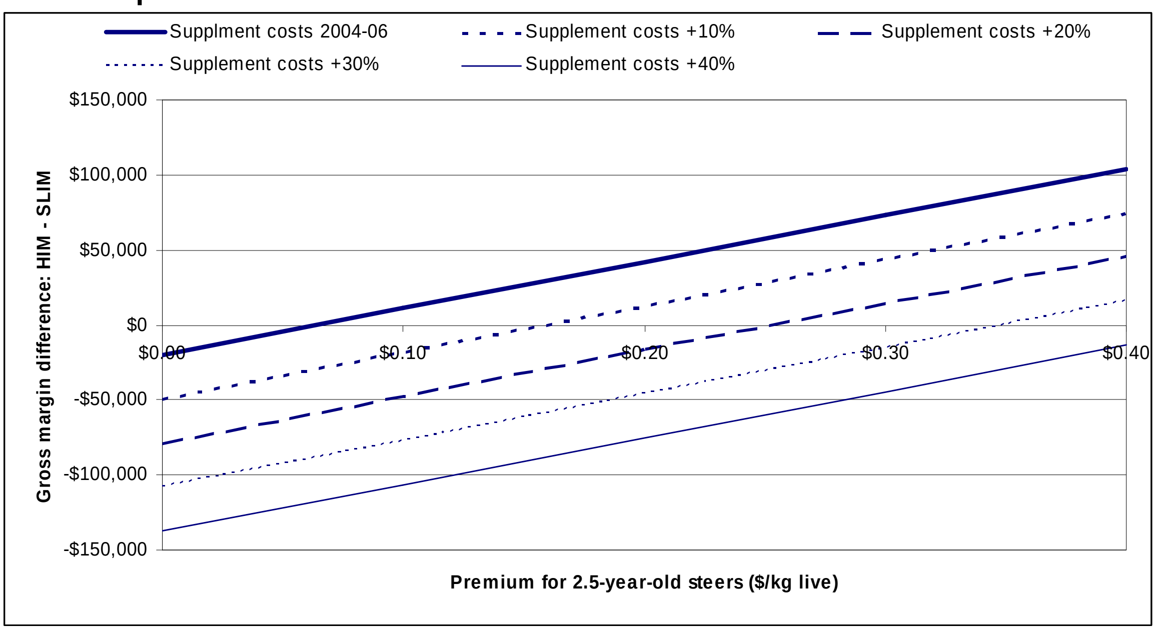
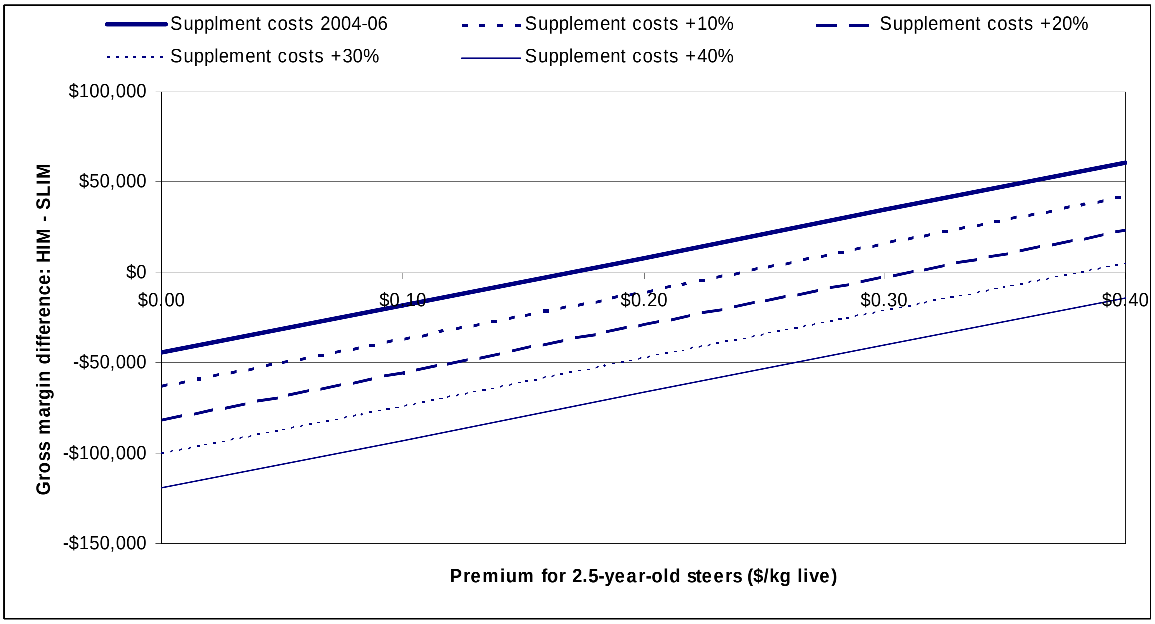


Figure 49. Swan's Lagoon: Gross margins advantage of SLIM with HIM for steers over SLIM as supplement costs and steer premiums increase



4.8.3 St Margaret's Creek

Analyses of annual value increase of each animal class found it to be 2.5 times higher for weaner steers than breeding females, with weaner heifers intermediate (Tables 27-28). Overall gross margins (Table 29) were high in comparison to Thalanga and Swan's Lagoon, probably because of closer access to molasses and slaughter facilities.

The business strategy at St Margaret's Creek was to sell steers at approximately 2 years of age with a carcass weight of 300 kg. Selling time is near the end of the dry season when values for high-quality slaughter cattle are traditionally high. The value of the No.04 steers at slaughter was $135 higher than comparative mid-year saleyard prices, which was equivalent to a premium of $0.25/kg live.

Table 27. Relative change in net worth of each HIM age x gender group at St Margaret's Creek in 2004-05

	Per animal:				Net relative return per:		
	Supps	Musters	Value in	Value add#	Animal	Value in	AE
HIM females							
94-01	$62	$5	$607	$276	$210	35%	$164
2002	$62	$5	$572	$216	$149	26%	$130
2003	$59	$5	$551	$228	$164	30%	$166
2004	$78	$5	$271	$235	$152	56%	$259
HIM steers							
2004	$92	$5	$324	$421	$324	100%	$434

For surviving cattle

Table 28. Relative change in net worth of each HIM age x gender group at St Margaret's Creek in 05-06

	Per animal:				Net relative return per:		
	Supps	Musters	Value in	Value add#	Animal	Value in	AE
HIM females							
94-01	$73	$5	$611	$294	$216	35%	$173
2002	$73	$5	$528	$297	$218	41%	$190
2003	$73	$5	$557	$252	$174	31%	$159
2004	$53	$5	$506	$152	$94	19%	$109
2005	$66	$5	$260	$230	$159	61%	$284
HIM steers							
2004	$70	$5	$751	$241	$166	22%	$357
2005	$83	$5	$306	$418	$330	108%	$456

For surviving cattle

Table 29. Inputs and estimated Gross Margins for management options at St Margaret's Creek

Total adult equivalents	450	Capital value of herd	$204,424
Total cattle carried	381	Net cattle sales	$143,362
Weaner heifers retained	89	Direct costs	$44,503
Total breeders mated	266		
Total breeders mated & kept	194		
Total calves weaned	179		
Overall breeder deaths	1%	Gross margin for herd	**$98,859**
Total cows and heifers sold	87		
Total steers & bullocks sold	89		
Average female price	$725	GM per adult equivalent	**$220**
Average steer/bullock price	$910		

4.8.4 All sites

The productivity of a SLIM system at Swan's Lagoon was greater than at Thalanga, as indicated by higher gross margins. This may reflect generally-poorer nutrition and the higher cost of molasses at Thalanga. These effects are exemplified by:

- the inability to effectively implement yearling mating at Thalanga
- the smaller mature size of Thalanga cattle

The difference in basic nutrition may explain why it is more profitable to use a SLIM than HIM system for breeders at Thalanga, with the reverse applying at Swan's. The extra profit derived by yearling mating at Swan's Lagoon made possible by HIM management is partially the reason for this.

The increase in value of cows in any system over a year is primarily due to the value of the calf they produce. The extra value of weaners produced by HIM systems in comparison to SLIM systems must be realised in sales before it can be deemed more profitable. Therefore, the data presented on relative value increase of cows over a year should not be interpreted directly as indicating relative profit. As female sales do not occur till animals approach maturity, and only pregnant females are retained, it is difficult to recoup the extra value created in female progeny unless yearling mating can be implemented. In contrast, extra value in steer progeny flows through to sales at a young age. The success of HIM systems appears mostly due to their effect on the value of steers at sale.

It is very clear from the analyses that HIM systems applied appropriately to steer progeny will improve profitability, irrespective of management systems applied to breeders or heifers. However, the success of these systems is dependent on price premiums available for steers at turnoff. With sales at 2.5 years, ~90% or more of steers still have only 0 or 2 permanent incisors, and this enables them to attract price premiums if growth is sufficient for them to reach slaughter weights at that age.

The high gross margin achieved at St Margaret's Creek is a clear example of the effect of the HIM system on steer sale values, as analyses of breeder performance show that net relative returns achieved there are less than at the other sites, whilst that for steers are very high. This probably occurs for a number of reasons: historical information indicates that performance under SLIM management at St Margaret's Creek is very low because of very poor soil nutrition despite high average rainfall; the high rainfall on sown pastures produces high pasture dry matter levels which complement fortified molasses feeding very well and result in only moderate supplement intakes by cattle, thus moderate costs.

The value of yearling mating within HIM systems where adequate growth is achieved was clearly shown at the St Margaret's Creek site where the No.04 heifers had the lowest increase in value of any class of animal during the study in 2005-06. This was a consequence of inadvertently mating the heifers to an infertile bull.

The premiums achieved by supplementing steers is a parallel strategy to opportunity feedlotting. It can be applied to any class of cattle destined for slaughter where the input costs are exceeded by the increase in value of the animal created by a combination of higher weights and higher return per kilogram. This strategy was applied at St Margaret's Creek to increase net returns for surplus females following weaning.

We emphasise that all the above discussion is based on herds where infrastructure and management are well-developed, eg, only pregnant females are retained each year, short seasonal mating is practised, and pastures are managed well. It is very important that any enterprise considering adoption of HIM systems analyse best options for their own situation. This is exemplified by the difference in responses to various options between Swan's Lagoon and Thalanga. A key element in analyses is the cost of fortified molasses as fed to cattle.

4.9 Extension

A project Industry Reference Group comprising co-operators (2), other local producers (9), and commodity suppliers (3) was established for the project. This enthusiastic group had a significant role in advising delivery of information to industry, as well as making recommendations on project operations.

Industry Reference Group

Members	***Address***
Stan & Delma Haselton	St Margaret's Creek, Giru
Robert & Leesa Rebgetz	Thalanga, Balfe's Creek
Robert Rea	Lisgar, Home Hill
David Scott	Ingham
Gerard & Elizabeth Lyons	Junction Creek, Charters Towers
Tammy Cross	Ellenvale, Woodstock
Peter Ramsey	Elanco Animal Health
Goscelyn Smith	Stocklick Trading, Charters Towers
Dave Collyer	Hughenden

The project was given a high profile by several media reports and at several field days in 2004, including one in August 2004 when over 50 producers inspected operations at Thalanga Station. The local Dalrymple Landcare committee has supported the project because of its emphasis on responsible grazing management.

The project conducted two major field days: St Margaret's Creek on 08 Sep 2005; Thalanga on 25 May 2006. The Thalanga field day included representatives from at least 64 beef production businesses and 12 commercial businesses. Both field days attracted attendances of approximately 150 people, reflecting enormous regional interest, as few single-project field days in this region ever attract such numbers. At both days, operations and results available at those times were inspected and discussed; this included inspection of cattle managed using the SLIM and HIM systems. Prior to and after both days, there was extensive media coverage that extended for many months.

Feedback from 24 (38%) of the 64 grazing businesses who attended the Thalanga field day (See Section 9.1) demonstrated a wide range of information gleaned by participants. It also demonstrated that participants understood the key messages delivered on the day. The range of perspectives on increased use of fortified molasses highlighted the great range in environments and management, and consequently the large variation in method of applying high-cost supplementation.

4.10 Considerations in implementing high-input management

4.10.1 Applicability of high-input management

Basic requirements to adopt HIM systems include: good cattle control reflecting good infrastructure; well-developed management such as weaning - **critical** elements include seasonal mating and culling non-pregnant females; cattle always have plenty of pasture available; fortified molasses can be accessed, stored and fed at reasonable cost. If any of this does not apply, we advise developing infrastructure and management to where high-input management may then be applicable.

The reason for this is that supplementation should always be used to add value to, and not replace, good management. The success of beef business in north Australia is based on using relatively-inexpensive rangeland resources, rather than expensive imported diets, to increase value of a herd. Over-grazing can be routine practice for some managers, but may occur even when not intended if expected rains don't arrive. Irrespective of how it occurs, if HIM systems are attempted in association with over-grazing, they will at best not be profitable, and may substantially erode profitability of a business, because:

- When insufficient pasture is available to satisfy voluntary intake of cattle, then supplements become substitutes. The more substitution, the closer to feed lotting. Feed lotting is a low-margin business when managed very well, and is unlikely to be profitable when over-grazing.
- At all times, a basic amount of feed consumed is used for maintenance of the animal, ie, no change in the animal, thus no return. Feed eaten in excess of maintenance is used for production, eg, for growth, reproduction and lactation. Pasture is a relatively low-cost commodity. Supplements are high-cost. Efficient HIM management uses pasture and low-cost dry licks to satisfy maintenance, thus enabling energy supplements to be used primarily for dry season production; ie, the return on investment is maximised.

4.10.2 Dystocia

HIM heifers can reach puberty by mating in the year after weaning. If mated, such heifers will conceive. We have achieved up to 80% pregnancy rates in this project. However, we and others have also found that calving difficulties (dystocia) in 2-year-olds causing loss of the calf, and often the cow, can be 10-20% if not managed well. This phenomenon occurs in all breeds, including Brahmans. The primary problem is that the calf becomes relatively too big to pass through the pelvis. The following control strategies are recommended:

- Do not use high-growth bulls or bulls of a different breed over yearlings.
- In *Bos taurus* cattle, it is recommended to avoid mating heifers weighing less than 280 kg and those with small pelvic size, eg, smallest 10%. However, this does not seem to be so important in *Bos indicus* cattle, possibly because of their high relative mass at puberty.
- Keep heifers in forward condition **at all times**. Under-nutrition, rather than high growth, especially during the **first half** of pregnancy, appears more of a problem as it boosts placental development and retards heifer growth resulting in a disproportionately large calf.
- Prevent obesity at calving, ie, calve in late dry-early wet. Fat does not cause physical obstruction; rather, it interferes with hormonal processes that drive birthing.
- Monitor heifers during calving.

When managed well, eg, as at St Margaret's Creek in this project, the incidence of dystocia is very low.

5 Success in achieving objectives

This project fully met its objectives.

5.1 Objective 1

The very detailed replicated full-systems study involving five commercial-scale breeding herds provided the full range of information to determine the relative production and financial impacts of a high-input management system compared to a low-input system in the dry tropics. These are discussed in detail in Section 4 of this report. There is sufficient information presented to enable other businesses to assess the potential for implementation of HIM systems in their own businesses, especially in view of large variation in the cost of energy-dense supplements on an as-fed basis.

5.2 Objective 2

This project has developed recommendations on the use of fortified molasses within high-input systems for commercial beef businesses in the dry tropics. These are outlined in Section 7. These recommendations are expected to be quite robust given they were derived from full business studies on properties where basic nutrition ranged from very poor to above average.

6 Impact on meat and livestock industry – now & in five years time

Currently there is a low but increasing application of high-input systems in north Australian breeding herds. Molasses is the primary energy-dense supplement available. This project has demonstrated that once SLIM systems are well developed, appropriate implementation of HIM systems can increase gross margin by as much as $15 per adult equivalent at prices prevailing prices. With higher molasses costs further from sugar mills, and likely lower efficiency of application that in the project, the overall improvement in return of herd capital might only be half that seen in the project. The application of HIM systems using energy-dense supplements as demonstrated in this project may be best within lower-soil-fertility regions.

A recent “Value in Beef” forum in Townsville attended by ~100 industry participants again highlighted the widespread interest in improving annual cattle growth rates to enable beef businesses to target premium markets. If molasses continues to be readily available, and it remains affordable, it is possible that as much as 70% of the beef herd within low-soil-fertility regions of Queensland may be in a position to adopt HIM systems. We consider that only 10% of those within the target region may take up the option of HIM systems.

A conservative estimate of the potential impact on beef business of HIM can be calculated thus:

Cattle in the target region	A	5 million
Target cattle	B	70%
Average value per animal	C	$400
Increase in value due to HIM systems	D	1.5%
Adoption	E	10%
Overall impact	A * B * C * D * E	$2.1M annually

The overall impact on the economy is usually 3 times the benefit to the industry (Farquharson *et al* 2003), thus ~$6M annually.

It may take as little as 5 years for adoption levels to reach this prediction. However, rate of adoption will be affected by general cattle prices, degree of premiums available for high-quality cattle, and the price of molasses as fed.

Within the adoption group, if only half use HIM systems in females (average of ~120 days of fortified molasses at ~2kg/day), all use SLIM systems in weaner steers, and half continue HIM systems in yearling steers (180 days of feeding ~2 kg/day for weaners and twice this for yearlings), then the industry molasses requirement for HIM systems alone will be 65,000 tonnes. This is in the vicinity of 15% of Queensland’s annual production. Note that this does not include molasses fed to cattle as part of feedlot rations, survival feeding, or routine weaner feeding within SLIM systems.

As indicated in price sensitivity analyses (Section 4.8), molasses demand for HIM systems will evaporate if there is a significant increase in its price, due either to cost at the sugar mill, or transport costs. At the prices during the project, only the premiums available for heavy, young steers made HIM systems viable. Recent price increases in both molasses and transport have made the option less attractive.

7 Conclusions and recommendations

7.1 Conclusions

The following conclusions relate to comparison of well-managed HIM systems in comparison to well-managed SLIM systems in the dry tropics. HIM systems are not directly comparable to under-developed SLIM systems as high levels of energy supplementation in such systems is inadvisable because supplement cannot be targeted to achieve the outcomes desired.

7.1.1 Animal performance

Well-managed fortified molasses supplementation is able to keep breeding cattle in forward body condition through all seasonal conditions when adequate pasture is available.

HIM systems for breeding cows result in earlier calves born over a much shorter period, and all weaning at the optimum time of the year. The extra 30+ kg of weaner weight, with all weaning at first round, is equivalent to a full dry season of fortified molasses supplementation (after wet season compensation) to weaners.

HIM systems enable sufficient pregnancies within a 3-month mating period to only retain pregnant females each year. This is also true for first-lactation females.

If nutrition is adequate, ie, 90% of heifers reach 300 kg by 18 months of age, pregnancy rates of yearling Brahman heifers in HIM systems can reach 80%. Despite HIM system No.05 heifers reaching an average of 320-340 kg at ~18 months of age at each site, pregnancy rates were half at one site than they were at the other sites. A significant contributor appeared to be skewed weight distribution at the latter site where a third of the group was <300 kg, whereas only 5-10% of heifers at the other sites weighed <300 kg. A combined effect with reproductive disease was not discounted in that herd as only 47% of those >300 kg conceived in comparison to 70% and 82% at the other sites; eg, pestivirus was subsequently found to be endemic in the herd (which is the case for a majority of large north Australian herds), whereas the other herds were free of this disease.

If nutrition of pregnant yearlings is not maintained at a high level, especially in the first half of pregnancy, dystocia is likely to occur during at least 5% of births, and overall calf losses between pregnancy and weaning are likely to exceed 20%.

Other than when pregnant yearling nutrition is sub-optimal, there was no evidence that calf loss is different between HIM and SLIM systems.

Growth rates of suckling calves during the wet season usually average ~0.9-1.0 kg/day, except for calves of first-lactation cows that grow 10% lower. HIM calves suckled for an average of at least one month more during the late dry season than SLIM calves, which reduced overall pre-weaning growth rates. Suckling calves grew at half the rate during the early dry season than during the wet season. Both of these effects are presumably related lower milk yields during dry seasons, even when cows are supplemented.

Weight compensation by juvenile cattle in the wet season following dry-season fortified molasses supplementation averaged in the vicinity of 40%. Though the HIM system increased skeletal development in young cattle, no compensation by SLIM cattle appeared evident in wet seasons. Height may be a useful practical indicator of growth and growth potential as it is not confounded by changes in diet quality and body condition.

Steers in HIM systems achieved annual growth of 160-200 kg, and up to 270 kg when pasture quality is moderate.

HIM systems were able to support growth of almost all steers to at least 500 kg by 2.5 years of age, even when pasture nutrition was of poor quality. At this age, over 90% of Brahman steers still have 2 or less permanent incisors.

HIM systems may advance the time the females reach mature height by up to 1 year.

Mature weight of SLIM system cows is not reached till around 7 years of age.

7.1.2 Variable inputs

The as-fed cost of fortified molasses to cattle is acutely affected by the distance from the molasses source.

Heifers that are not to be mated as yearlings should be managed using SLIM systems between weaning and first pregnancy. This does not exclude targeted supplementation within a SLIM system that enables heifers to reach target mating weights.

Intakes of fortified molasses appear higher when the quality of the available pasture is lower.

Average growth promotion achieved by Compudose™ exceeds 20 kg annually.

HIM system supplementation requires 0.2-1.0 hours per cow in the herd over 2 years of age, depending on the length of the dry season; this is approximately 10 times that for SLIM systems supplementation. For example, a 3,000 AE herd with 1,500 cows might require half a man year for annual HIM supplementation, whereas supplementation of an equivalent SLIM system herd would take the equivalent of 3 weeks for one person over one year.

The extra mustering required for SLIM herds amounts to about one man month for a 3000-AE herd, which only partially compensates for the extra supplementation time.

7.1.3 Business outcomes

The potential benefits of any HIM system must be assessed within a whole-business context, as the increase in weaner values that are derived are primarily realised through increased values of steer progeny at sale. Extra value of female progeny is mostly lost when they are sold after demonstrating reproductive inefficiency as a cow. To counter this, mature size may be reached at a younger age, and increase salvage values of younger surplus females and (potentially) early-life productivity; however, the project was unable to determine whether this was true as it ran for only 2 years.

The profitability of HIM systems in comparison to SLIM systems becomes higher when premiums are paid for steer progeny, and high pregnancy rates can be achieved in yearlings. Short-term energy supplementation of surplus breeding-age females is also viable when price premiums are achieved.

If pasture nutrition is poor, HIM systems are best applied to steer progeny only. If pasture nutrition is moderate, enabling high yearling pregnancy rates to be achieved, then application of HIM systems to all sectors of the herd is appropriate.

If managed well, adopting the most appropriate HIM systems may increase gross margins by ~$15 per AE in the herd at the price of molasses as-fed and the premiums expected for high-quality cattle during the project period. This increment will be lower at greater distances from molasses sources. A supplement price rise of only 20% is likely to eliminate the potential benefits of HIM systems, especially in females, and they will be discontinued unless substantial cattle price premiums are available.

HIM systems result in younger cattle having larger mass and feed intake. If yearling mating is implemented, then the business should have up to 25% fewer breeding females over 2 years of age (depending on level of implementation) to maintain similar grazing pressure. When yearling mating is not practised, then 10% fewer breeding females is recommended.

One of the advantages of HIM systems may be that it makes employment of extra labour viable. For example, if a HIM system fully costed is predicted to be a viable option, and requires the equivalent of half a man year to implement (part of the costing), then this may complement other labour requirements to enable the business to employ a full-time person.

7.2 Recommendations

7.2.1 Profitable implementation of HIM systems

HIM systems should only be implemented after full-business analyses indicate a reasonable probability of increased profitability. Factors to consider in the analyses include availability of molasses and other components of supplements, price of fortified molasses as-fed, the quality of pasture nutrition, the availability of infrastructure and suitable personnel to control cattle and to achieve targeted supplementation, the availability of price premiums for slaughter-age steers, and availability of infrastructure and personnel for accurate pregnancy diagnoses.

A business analysis should examine a range of options to indicate the best choice of herd structure and management. This should be combined with regular additional analyses of the opportunity to apply HIM systems to finishing cattle within a year of slaughter.

HIM systems are less likely to be viable where infrastructure and management are not well-developed within an existing SLIM system. This includes pasture management, seasonal mating, weaning, bull fertility evaluation, and adequate control of reproductive diseases such as pestivirus.

It is advisable in many situations to stage adoption of HIM systems. Start HIM systems in weaner steers when management and infrastructure development allows. Progress to breeding females and juvenile females when steer feeding and management systems are operating effectively.

HIM systems are not advised where pastures are heavily grazed as the substitution of pasture for supplement and the relatively-low growth responses will ultimately create debts rather than profits.

If pasture nutrition is poor relative to other regions in the dry tropics, it may be inadvisable to implement HIM systems other than in steers. The criterion for judging this is whether HIM systems can achieve target mating weights in yearling heifers.

Supplement formulation for various classes of stock to achieve specific targets within HIM systems should be determined with professional advice to maximise efficiency.

The efficiency of HIM systems is enhanced by use of hormonal growth promotants in steers, and incorporation of a rumen modifier into fortified molasses.

Heifers that are not destined for yearling mating should be excluded from HIM systems until they reach their first pregnancy.

Maintain pregnant yearlings within HIM systems in forward body condition throughout gestation, and particularly during the first and second trimesters, to avoid high calf wastage, calving difficulties and cow deaths.

Reduce the size of the breeding herd to account for the extra feed intake of young cattle created by implementation of HIM systems.

7.2.2 Future R&D

Are there significant increases in business efficiency by having skeletal growth in focus with live weight when managing growth of juvenile cattle? How does early skeletal growth management impact on growth efficiency in the finishing phase, especially when using energy-dense supplements?

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9 Appendices

9.1 Feedback from Thalanga field day, 25 May 2006

What are the most significant points you got out of today?	What are your opinion/s on the project? Have we missed anything that you think is important?	Do you have any issues/problems in relation to: Achieving high growth rates or the use of molasses
• Importance of seasonal mating to HIM system • Difficulty in getting lactating cows back in calf • Benefit mostly for big weaners • Comparing Slim + Him • Dystocia In Heifers • Benefits of supp feeding • Level of interest • Cease feeding supp < 18 mths • Cost of HIM on older cattle • Highly informative, well presented and interesting • Extra production returns from HIM • Results of HIM very interesting and informative • Weaner growth was significant to me, not so interested in feeding right through to Jap Ox • Very useful on supplement cattle to maintain body weight of cattle as this is critical to cow going into calf • The problems of early calving • Ideas on molasses feeding • Discussions on herd fertility • High input to 18 mths only for steers • Supplementing cows before calving • Input cost relative to sale prices	• Very worth while. Highlights problems with pregnant female in Nth Qld • Have been feeding fortified molasses to weaners & steers when necessary at the dry end of the year, and quite believe it pays at the present price of cattle and molasses • No coverage of the issue that increasing growth rates will necessitate increased consumption of grass – there was no mention of where the extra grass will come from – ie fertiliser vs imported fodder • Excellent project but if possible it would be beneficial to continue for another year or two. • For people with the infrastructure and commitment and management skills, the HIM system would level out seasonal fluctuation in output. • Unfortunately the topography of the country govern the cost of the viability of the project • There is always something but I cannot think of any at present • More emphasis on pasture spelling, when and why	• Country too rough for ease of distribution • The cost of molasses and freight at Julia Creek molasses - $80 per ton freight $82 total $162, 2005 prices. But still think it pays for weaners, but not breeders. • Getting improved pasture into desert uplands country. • Cattle eating too much M8U • Don't know if we have good enough control over individual beast's consumption of the supplement – ie pecking order in herd. • Intake – excess intake need to develop a way of reducing intake without allowing cattle to run out of molasses. • No problem with high growth rates, molasses is heavy and freight is a big concern for people distant from coast. • The topography of our country • You didn't mention molasses in roller drums I find it very economical • It needs a trial of different bulls to test fertility on a cow trial similar to a trial done with bullocks in previous years.

What are the most significant points you got out of today?	What are your opinion/s on the project? Have we missed anything that you think is important?	Do you have any issues/problems in relation to: Achieving high growth rates or the use of molasses
• Value of HIMS in cattle reaching 500+ as early as they do • No. of teeth in 500+ HIMS steers • Condition of HIMS cattle overall Definitions • Importance of condition at critical times i.e. calving • Bringing lactating cows to earlier pregnancy • Cost with older dry cattle • Calving % • Productivity gain and profits from HIM in young stock/ young breeders • HIM not suitable for all situations and be aware of specific issues. • >90% him steers reached 500kg within 2.5 yeas, whereas less than 8% of SLIM steers did. • HIM needs very careful management • The margins are not enormous – molasses and beef prices will drive the feasibility • Supplement HIM breeders at least 2 months prior to mating • HIM weaner up to 18 month • Protein intake required daily • The $10 profit/AE is not enough. As someone pointed out to me today, one can sit with the phone in an air-conditioned office & market your cattle probably will bring in more than this • Whether we should feed steers over 18 months	• Like anything you only back what you put in but the margins here are very volatile, especially taken over a herd situation • Fat & meat colour on steer at works - any dif between slim and him groups • It's very interesting and beneficial for those who have properties that handle HIMs simply and efficiently. • Good project– besides showing how to get high weight gain it also highlights some very basic information strategies • Excellent work, you can see the interest by the number of producers attending field day. • Great to include the economics (Cost: Benefit) • Great field day – well organised • Very well run • The field day turnout illustrates the extremely high level of interest • How do you keep rolling the message out? • Pasture management to increase grass production • I was quite impressed. At the end of the day, everyone has to decide for themselves what they are capable of achieving • Is it the opinion of the project that the biggest input using SLIM to be fed before they get in calf and as weaners?	• I would like to know how this HIMS would relate to Mitchell grass downs country Availability of equipment for the small property users • Molasses is messy. If we could come up with something easier to handle? • The use of molasses and protein meal for meat and fat colour at works (E.U Market) chiller assessment • Needs to be cheaper • Long term availability and cost of molasses (what impacts will sugar industry have?) • Molasses costs will increase • Like the idea of faster growing weaners & can appreciate the economics of this but calving young heifers at 2 years in this part of the world would be of no interest. We need a decent frame for salvage value of old or infertile cows

"Did you find the Field Day informative and/or useful?" (1 = very poor, 5 = extremely useful)

Rating: 1 2 3 4 5

Responses:	1 (4%)	0	3 (13%)	6 (25%)	14 (58%)

9.2 Project sponsors

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9.4 Glossary

Ad lib	Free choice continually
AE	Adult equivalent. In this project, an AE has the equivalent feed intake of a 450kg steer in score 4 condition.
Body condition score	A score from very poor to very fat, usually on a 1 to 5 scale, though scientists often use a 1-9 scale
Bos indicus	Humped cattle derived from southern Asia, represented by Brahmans in Australia
Bos taurus	Cattle adapted to temperate climates, eg, British and European breeds
Deck	A full-length tier of one trailer in which typically 25 cows may be carried.
Dry lick	A cattle supplement in block or granular form with a moisture content usually <90%, of which cattle typically consume 50 to 250 g daily. It delivers key limiting nutrients, eg, nitrogen and sulphur for protein deficiency, or phosphorus. They can be fed throughout the year.
Dystocia	Difficult birth, which often results in the death of dam or calf or both
Energy	The key nutrient in a diet and is highest in carbohydrates and proteins. Molasses is a relatively inexpensive energy supplement for cattle. Cereal grains and protein meals are also common energy supplements.
First round	First weaning muster for the year, usually around the end of the growing season at the interface of the wet and dry seasons
FM	Fortified molasses
Fortified molasses	Molasses with additives (usually urea, protein meal and trace elements) to balance deficiencies
GLM Edge	A package developed for training industry in grazing land management
Height	The height of cattle at the peak of the sacrum, ie, adjacent to the hips
HGP	Hormonal Growth Promotants. Usually naturally-occurring hormones in implants that promote extra growth on good nutrition.
HIM	High Input Management. A system that incorporates high-cost inputs, eg, energy supplements, to achieve higher net returns.
M8U	Molasses mixed with 8% urea by weight; Rumensin™ is also added.
MUP	Molasses mixed with urea (~3%) and protein meal (~10%), as well as a phosphorus source, salt, and Rumensin™
No.04, eg	An indicator of year of birth of cattle, eg, a No.04 is born July 03-June 04 and usually branded in 2004
Puberty	Time when animals can sexually reproduce
R1	First round (see above)
R105 etc	First round in 2005
R2	Second round (see below)
Second round	A muster usually 2-5 months after first round to complete weaning of late calves.
SLIM	Strategic Low Input Management. Good management that efficiently achieves optimal reproduction and growth with minimal inputs.
SLIM HIM	Progeny reared in a SLIM system until weaning, and transferred a HIM system after weaning
Supplement	A deficient nutrient that balances the diet, whilst usually increasing pasture intake, but not reducing it.
Weaner	An animal from the time its suckling is discontinued to about 18 months of age
Yearling	An animal aged between 18 months and 2.5 years of age