# final report

**Project code:** M.112B

**Prepared by:** S Baud, L Hygate, M Goddard

Baud & Associates

**Date published:** March 1996

**ISBN:** 9781741917956

**PUBLISHED BY**
Meat & Livestock Australia Limited
Locked Bag 991
NORTH SYDNEY NSW 2059

# A Feedlot Sire Evaluation Scheme to improve the commercial competitiveness of Australian Grain Fed Beef

**Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.**

# CONTENTS

## ACKNOWLEDGMENTS

The authors wish to acknowledge the assistance of all of the following :

Meat Research Corporation

All Participating Producers

Australian Meat Holdings Pty Ltd- Beef City and Caroona feedlots.

Aronui Feedlot

Charlton Feedlot

ICM Feedlot

Kerwee Feedlot

Killara Feedlot

Ladysmith Feedlot

Regmont Feedlot

Agriculture, Victoria

Animal Genetics and Breeding Unit, Armidale


The authors request that the results be viewed in their wider industry context and not selectively used for promotional purposes by any single interest group.

# PART 1

# EXECUTIVE SUMMARY

## A FEEDLOT SIRE EVALUATION SCHEME TO IMPROVE THE COMMERCIAL COMPETITIVENESS OF AUSTRALIAN GRAIN FED BEEF

Authors

S Baud - Baud & Associates Bairnsdale
L Hygate - Victorian Institute of Animal Science, Agriculture Victoria, Attwood
M Goddard -Animal Genetics & Breeding Unit, University of New England, Armidale

EXECUTIVE SUMMARY

The international competitive nature of the food industry, in which beef is just one of the many food products competing for the consumer's dollar, is driving today's beef exporters away from commodity trading toward providing more specialised, quality assured product(s) that can be brand identified and promoted. The catalyst for change in the Australian beef industry has been increased access to key export markets in Japan.

Whilst no one would argue against the logic of this sharpened market focus, so often promoted, actually being able to purchase and process cattle that perform predictably to the required market specifications remains a major obstacle. With the co-operative support of 9 commercial feedlots throughout eastern Australia, the Meat Research Corporation's M112 (and M8A) project has investigated the reasons for the large variability that exists in feeder steer performance. The projects have collectively evaluated the performance of over 4594 steers representing 371 beef sires purchased from 97 southern Australian beef herds The performance of a further 7748 northern Australian bred steers have also been evaluated. The northern Australian steers were not from known sires but represented 236 vendors and a range of breeds and crosses.

Feeder steer genetics and vendor i.e. property of origin were both found to be key management factors that contributed to the success in achieving the required market specifications and cost effeciency of grain fed beef production. The commercial implications of this result were demonstrated in a performance based payment trial conducted by one of the co-operating commercial feedlots where, after distribution of performance bonuses there was a 49cents/kg liveweight (or $210 per head) difference in bonus payments made to the top and bottom performing vendors participating in the trial. Clearly, Australian grain fed beef's international competitiveness could be improved if producers are encouraged to more closely align their on farm breeding program to specific markets. The catalyst to achieve this is the introduction of performance based payment schemes.

The M112 project has also highlighted that aside from feeder steer genetics and other vendor controlled factors there are other pre feedlot and feedlot related management factors that also have an important influence on commercial feeder steer performance. Performance based payment systems need to reflect this if the premiums and discount paid are to be equitable for both parties.

The key findings of the project were:

(a) Irrespective of where the study has been conducted feeder steer genetics has been shown to be a commercially valuable management tool that industry can use to improve both the commercial competitiveness and consistency of grain fed beef. Results from the southern Australian sire line based component of the study estimated the difference in commercial performance between the top and bottom 5% of individual steers, vendor lines and sire progeny lines within a breed to be $270, $130 and $120 respectively when steers were fed for 200 days without allowing for feed intake effects.

(b) Breed differences did exist in growth, meat yield and marbling traits which producers can utilise in their breeding programs to more successfully achieve end-user specifications (Figures 1.1 ,1.2 & 1.3). The project also highlighted that breed alone was no guarantee of performance. Considerable differences also exist between sires within a breed in these traits.

(c) After correcting for breed and feedlot intake group effects 45% of the variation measured in commercial performance was attributable to the combined effects of feeder steer genetics and vendor (Figure 1.4) using economic analysis procedures detailed in Appendix A.2. Other undefined factors accounted for the remaining variation. These results do support the current policy of feedlotters to re purchase steers on the basis of the past performance of a vendor's line of steers although only part of this variation is repeatable when subsequent lines of cattle are purchased from the same vendor. They also highlight that the Australian grain fed beef's future international competitiveness will be enhanced through a sustained and co-ordinated input into improving feeder steer genetics. To date, genetic improvement in the beef cattle industry has lagged behind that of other intensively fed livestock industries whose products share the same retail display cabinets i.e. pork and chicken.

(d) Marbling (42%), feedlot average daily weight gain (18% after correction for feed intake), dressing percentage (16%), eye muscle area (12%) and P8 fat (12%) were the key genetic traits contributing to the range in commercial performance recorded between the top and bottom 5% of sires (Figure 1.4) based on current price schedules being paid for grain fed beef in Japan with marbled beef attracting price premiums. It is important to also note that the relative ranking of these genetic traits is sensitive to their economic importance in the processor's price schedule. Interestingly, there was a correlation of 0.82 between the breeding index's of M112 Angus sires when calculated for either the "marbled" or "non marbled" markets. This meant 14 of the top 20 ranking bulls were the same for either market. Currently the beef breeding industry can only access Breedplan EBV's for the growth, P8 fat and eye muscle area traits and these are principally derived from productions systems based on grass. The M112 project has demonstrated that this need not be the case if well designed progeny tests can be conducted with the co-operative support of feedlotters and producers.

(e) Other pre-feedlot and feedlot related management factors also had an important influence on commercial feeder steer performance. Figure 1.5 illustrates the range in performance that existed between the 28 separate intake groups of steers fed at different feedlots for varying time durations. Feedlot management also has an important input into whether feeder steers do achieve the market specifications they were fed for.

FIGURE 1.1 SOUTHERN AUSTRALIAN SIRE TRIALS
BREED AND SIRE EFFECTS ON GROWTH AND CARCASS TRAITS

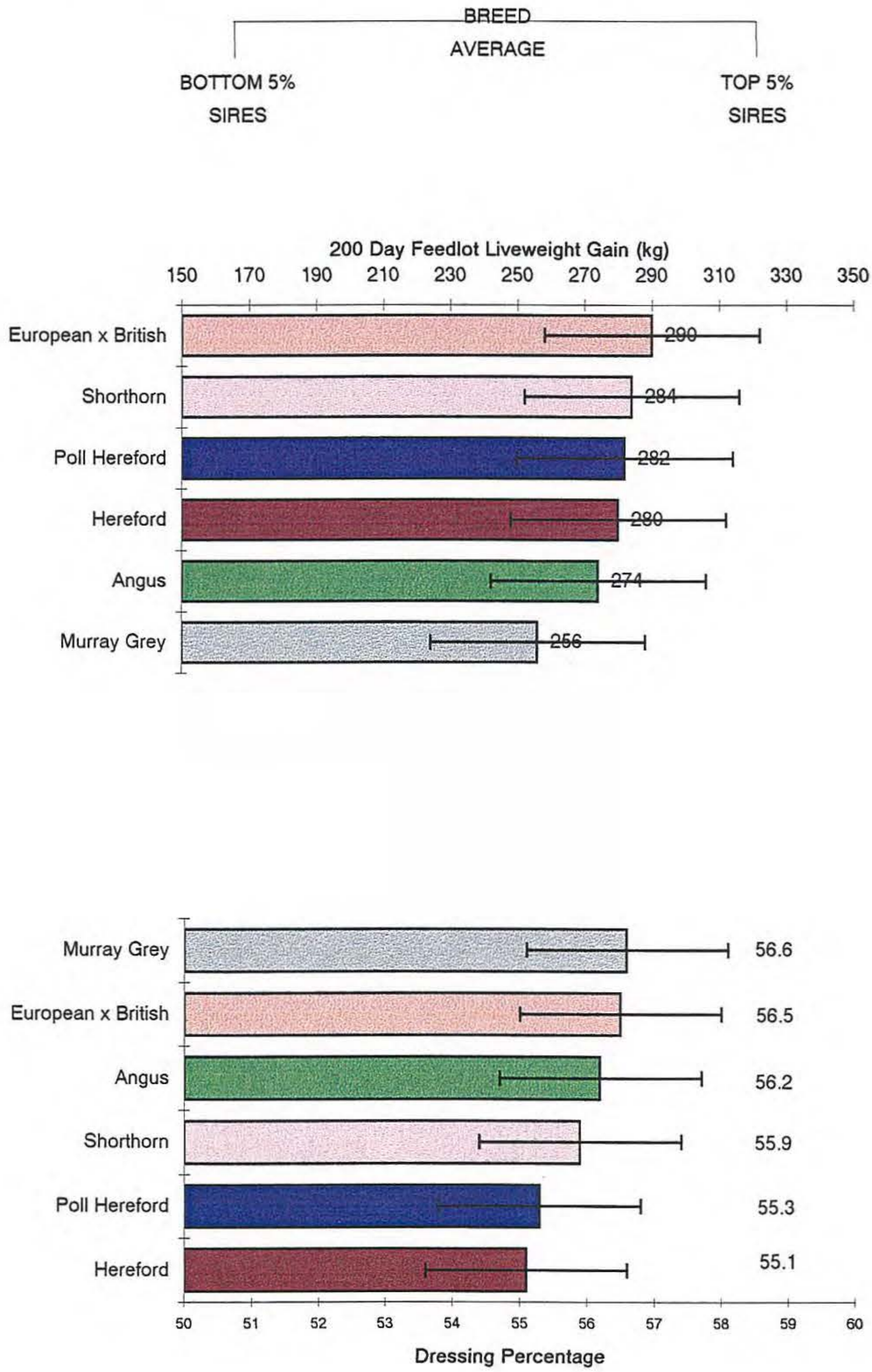


FIGURE 1.1 SOUTHERN AUSTRALIAN SIRE TRIALS
BREED AND SIRE EFFECTS ON GROWTH AND CARCASS TRAITS

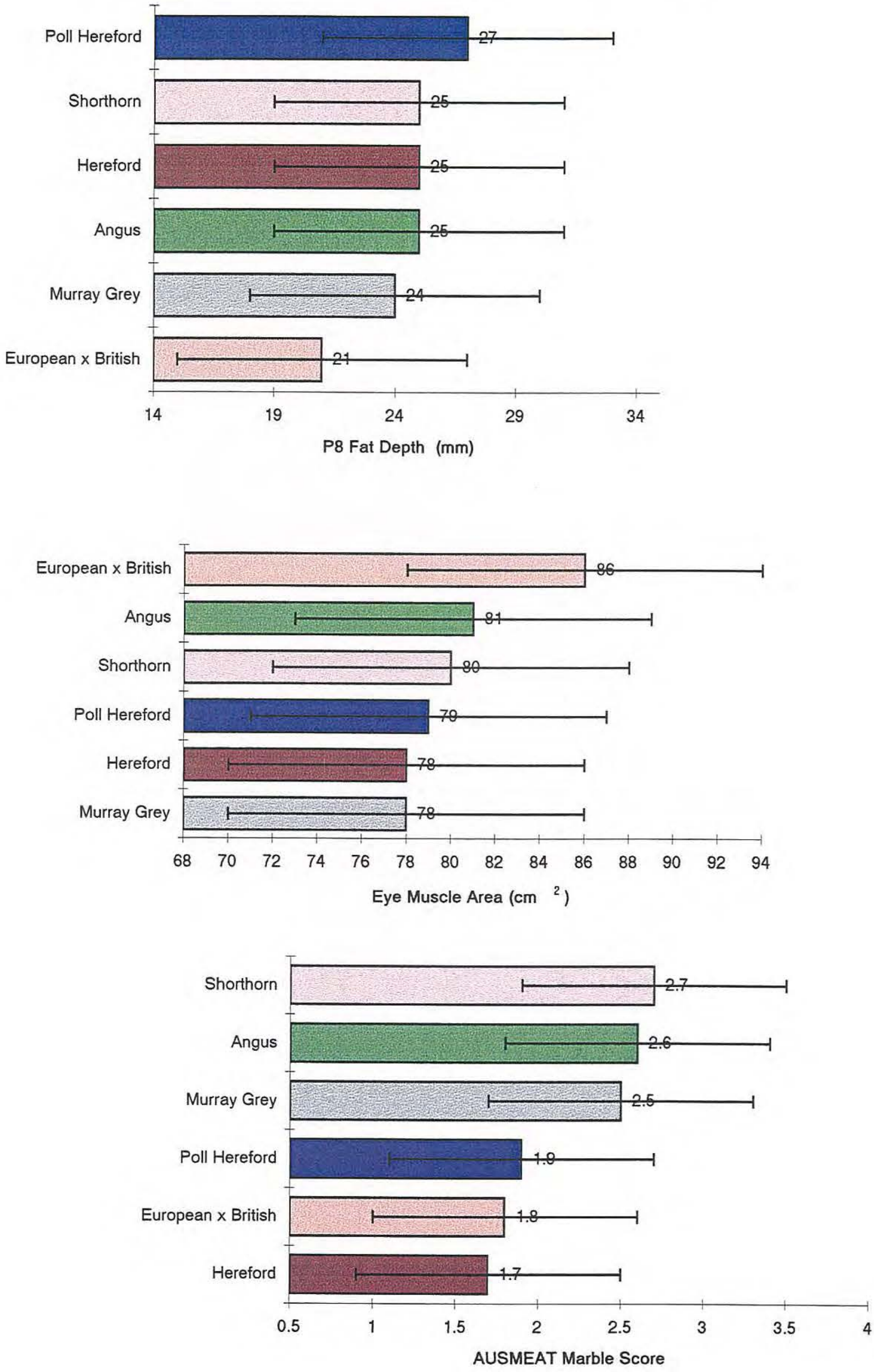
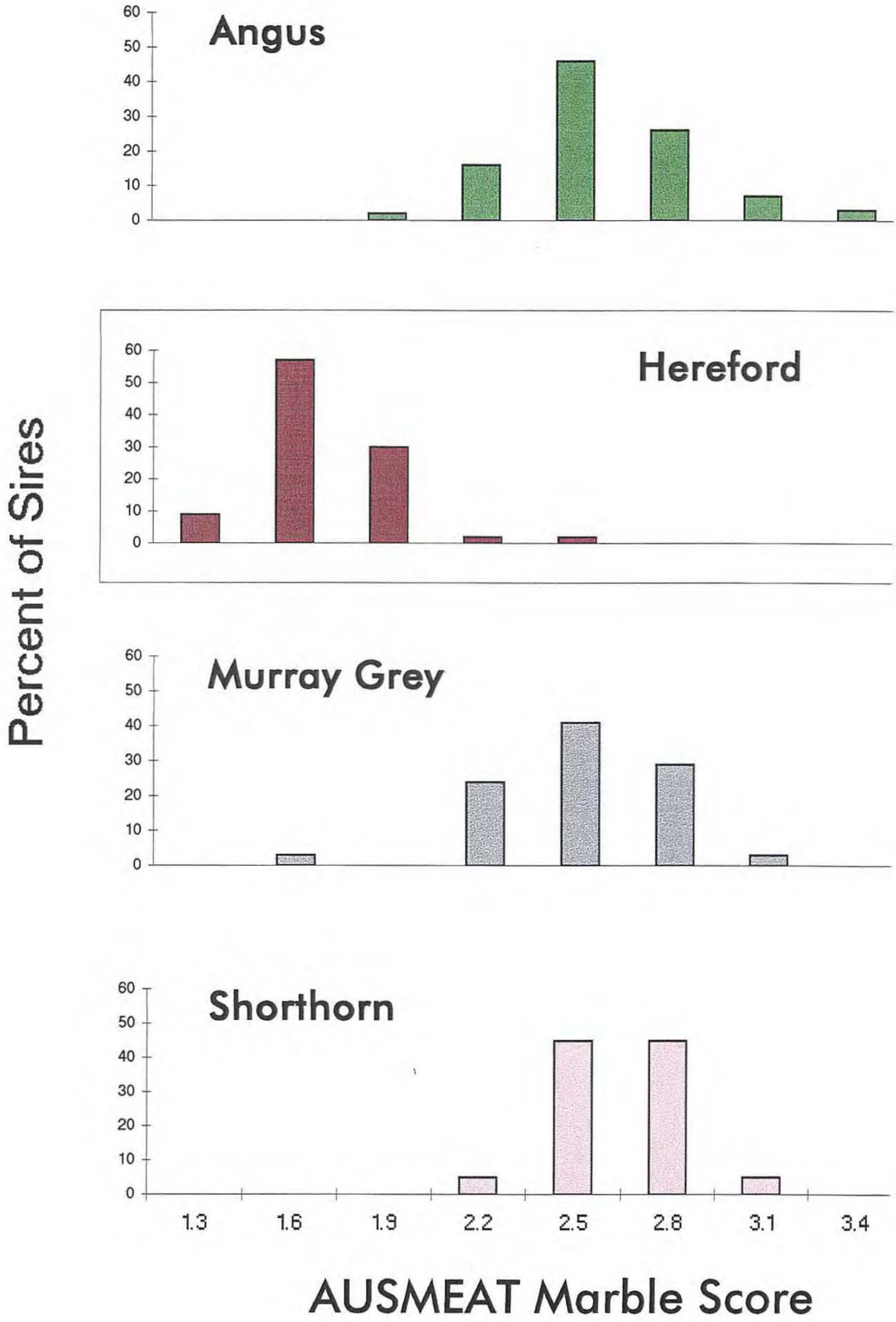
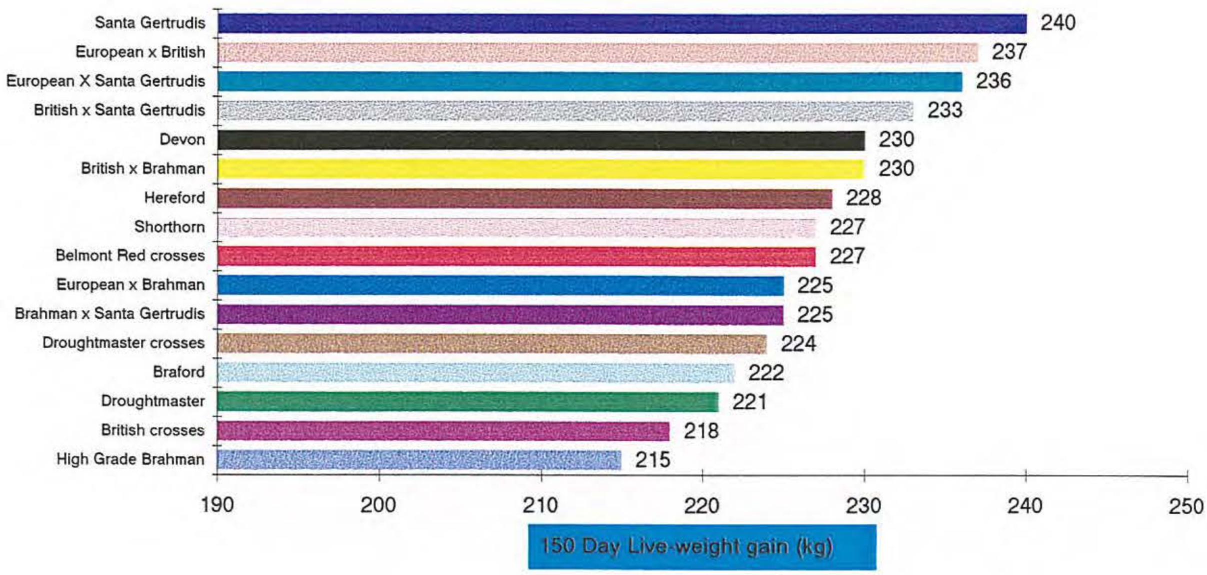
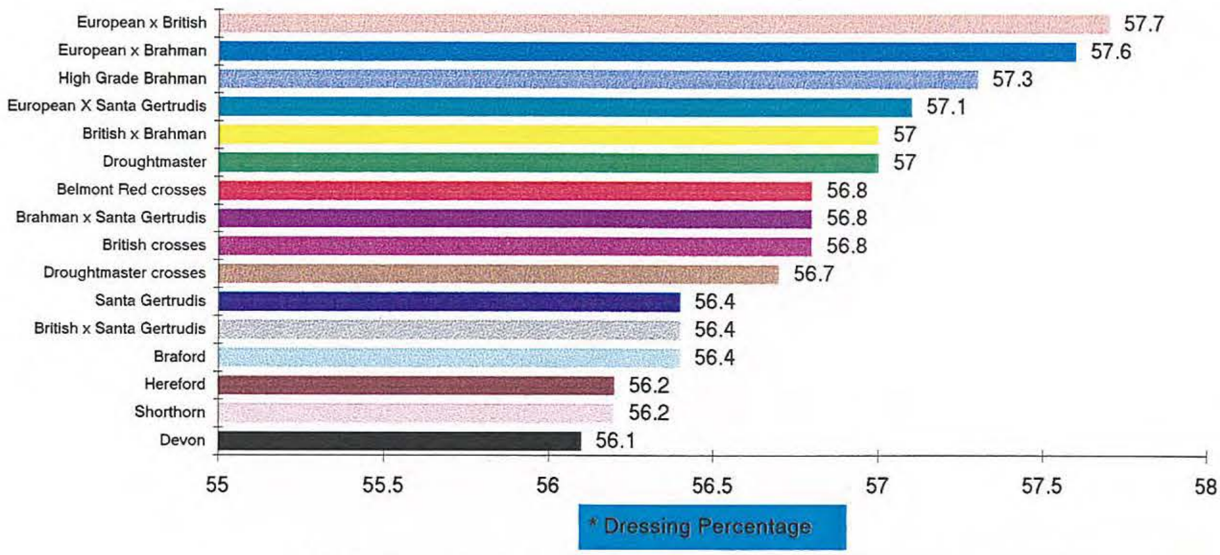


FIGURE 1.2 - ACROSS AND WITHIN BREED VARIATION IN MARBLING SCORE FOR SIRES WHOSE STEER PROGENY WERE GRAINFED FOR 200 DAYS



# Figure 1.3 NORTHERN AUSTRALIAN VENDOR TRIALS BREED EFFECTS ON GROWTH AND CARCASS TRAITS




* Hot carcass weight as % of liveweight after an overnight curfew off feed

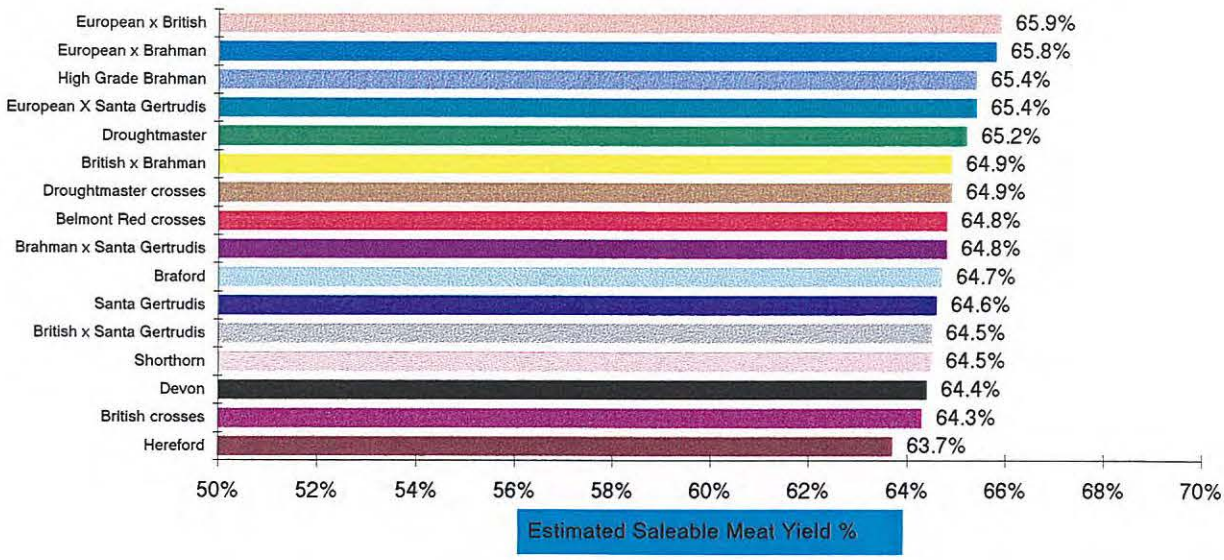
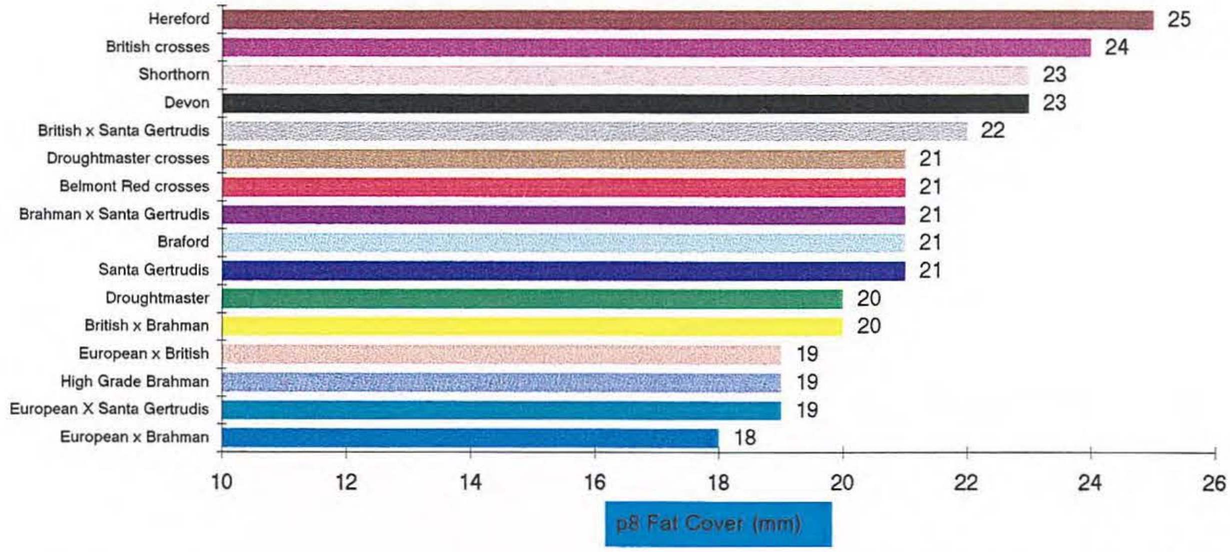
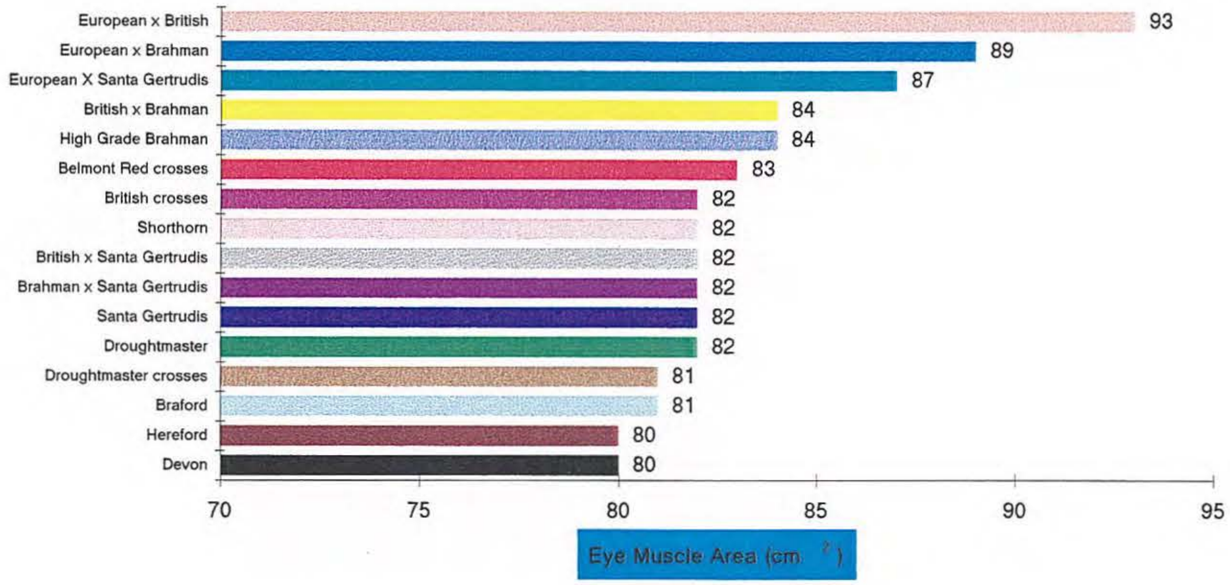


Figure 1.3 NORTHERN AUSTRALIAN VENDOR TRIALS
BREED EFFECTS ON GROWTH AND CARCASS TRAITS



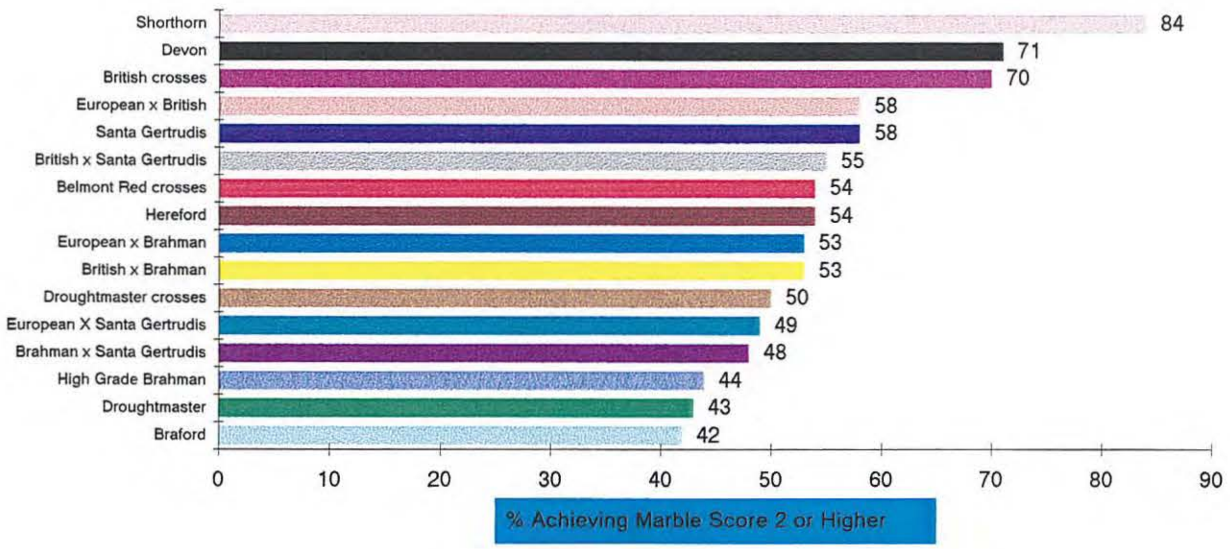
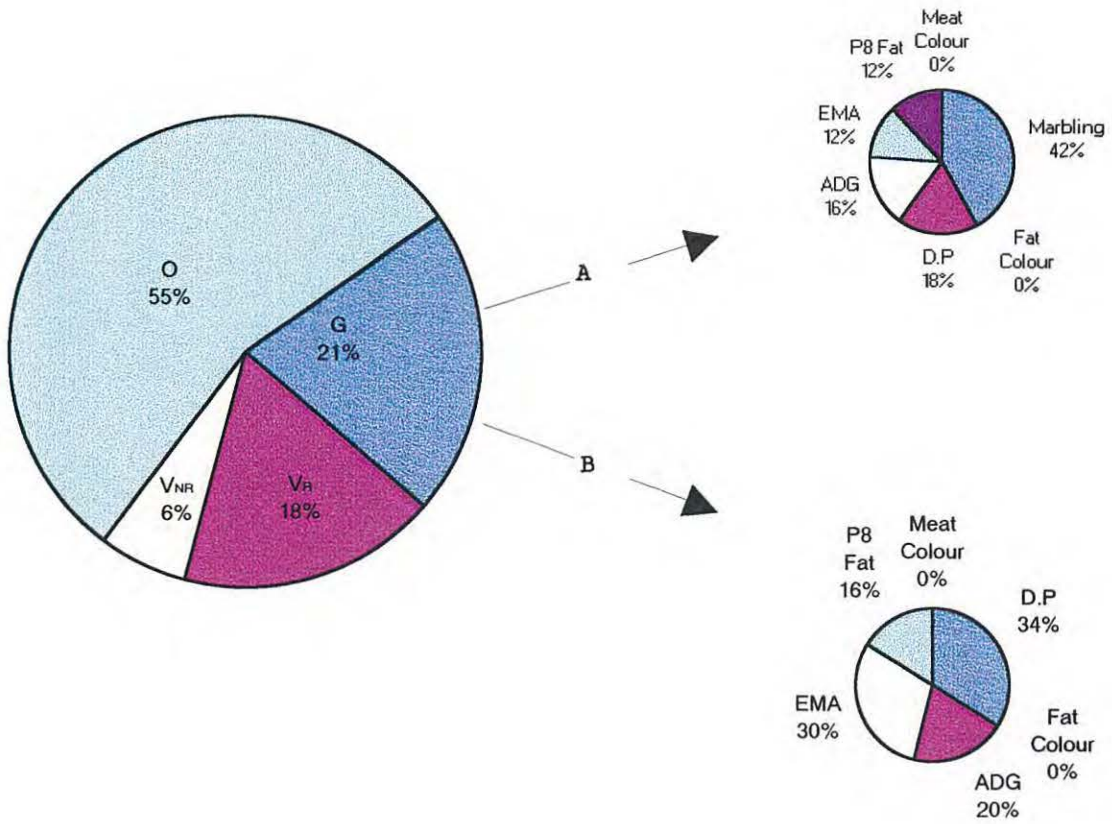



FIGURE 1.4 PROPORTON OF THE TOTAL VARIATION IN COMMERCIAL FEEDLOT PERFORMANCE BETWEEN THE TOP AND BOTTOM 5% OF SIRES ATTRIBUTABLE TO EITHER GENETIC, VENDOR (REPEATABLE AND NON REPEATABLE) OR OTHER FACTORS AFTER CORRECTING FOR BREED AND INTAKE GROUP EFFECTS.

(A)




| Premiums Paid for Marbling (Current Market) | |
|---|---|
| Marbling | 42% |
| Dressing Percentage | 18% |
| Feedlot A.D.G. | 16% |
| Eye Muscle Area | 12% |
| P8 Fat | 12% |
| Meat Colour | 0% |
| Fat Colour | 0% |

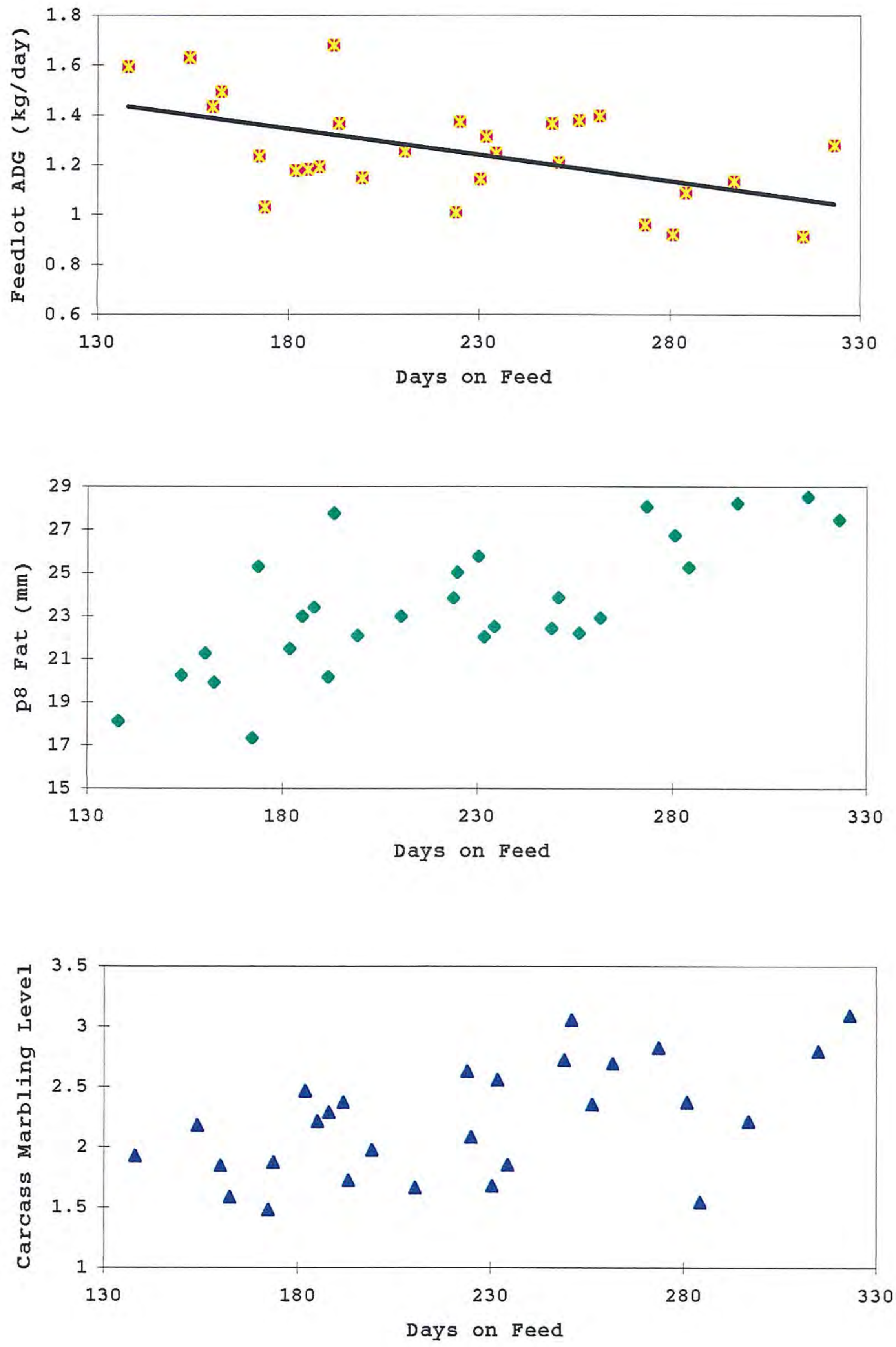
OR (B)

| No Premiums Paid For Marbling | |
|---|---|
| Marbling | 0% |
| Dressing Percentage | 34% |
| Feedlot A.D.G. | 20% |
| Eye Muscle Area | 30% |
| P8 Fat | 16% |
| Meat Colour | 0% |
| Fat Colour | 0% |

LEGEND

| | |
|---|---|
| $V_{NR}$ | = Vendor Factors ( Not Repeatable Between Intake Groups) |
| $V_R$ | = Vendor Factors (Repeatable Between Intake Groups) |
| G | = Genetic Factors |
| O | = Other Environmental Factors |

Figure 1.5 EFFECT OF DURATION OF FEEDING ON FEEDLOT AVERAGE DAILY GAIN, P8 FAT AND MARBLING LEVEL FOR 28 INTAKE GROUPS



# PART 2

# FINAL REPORTS

## 2A Southern Australian Sire Trials

Authors
S Baud - Baud & Associates Bairnsdale
L Hygate - Victorian Institute of Animal Science, Agriculture Victoria, Attwood
M Goddard -Animal Genetics & Breeding Unit, University of New England, Armidale

### 1. BACKGROUND AND INDUSTRY SIGNIFICANCE

Feedlotters are acutely aware of the tremendous variability in performance that exists between feeder steers currently being fed for the Japanese market and the impact this has on their cost competitiveness and ability to meet end-user specifications. Nutritional management has been one of their primary tools to overcome these difficulties. The results of an earlier Meat Research Corporation project (M8A ) had shown that feeder steer genetics is another commercially valuable management tool that could be used to improve commercial feedlot performance. The study showed that the beef cattle feedlot industry is no different to any other intensively fed livestock industry. Without a deliberate policy of improving the genetic merit of the livestock they feed their cost competitiveness and hence market share will be eroded. To date genetic improvement in the beef cattle industry has lagged behind that of other intensively fed livestock industries whose products share the same retail display cabinets i.e. pork and chicken.

With the co-operative support of the commercial feedlot industry an expanded sire evaluation scheme known as M.R.C. project M112 was initiated in January 1991 with a target of involving up to 8 commercial feedlots throughout eastern Australia to progeny test a further 130 or more beef sires. In addition to identifying genetically superior sires for growth, yield and meat quality traits the project would provide participating feedlots with an objective assessment of the commercial range in performance between vendor and sire lines of steers.

### 2. OBJECTIVES

(i) To develop a commercial feedlot based sire progeny evaluation scheme in eastern Australia to improve the commercial competitiveness of Australian grain fed beef.

(ii) To provide industry with objective data on the breeding values of sires for growth, yield and meat quality traits of commercial importance to the Japanese market.

(iii) To facilitate adoption of the results by industry.

# 3. METHODOLOGY

3.1 FEEDER STEER GENETICS Four thousand five hundred and ninety four steers representing 371 sire lines of either Angus, Hereford, Poll Hereford, Murray Grey, Shorthorn, Charolais, Simmental, Saler and Limousin steers and purchased from 97 vendors were collectively evaluated in the M8A and M112 projects. Commercial herds from whom steers were purchased were selected on the basis that each herd must have had at least two sire progeny groups of steers available. In the case of European breeds crossbred steers were purchased provided the cow herd was of a uniform breed type. Preference was given to those herds and sires within herds where the steers were considered better suited to be grown out to export liveweights of 650 kg plus. Steers were purchased in intake groups of between 100-400 head by the co-operating feedlot according to availability.

Table 2.1 summarises the distribution of the steers on a breed, sire within breed and vendor basis.

TABLE 2.1 SUMMARY OF BREED, SIRE LINE AND VENDOR COMPOSITION OF THE TRIAL STEERS

| BREED | NO. OF SIRE LINES | NO. VENDORS | TOTAL NO. OF STEERS |
|---|---|---|---|
| ANGUS | 226 | 40 | 2746 |
| HEREFORD | 49 | 19 | 598 |
| POLL HEREFORD | 24 | 7 | 291 |
| MURRAY GREY | 34 | 10 | 543 |
| SHORTHORN | 22 | 9 | 234 |
| EUROPEAN CROSS | 16 | 11 | 182 |
| TOTAL | 371 | 97 | 4594 |

## 3.2 PRE FEEDLOT MANAGEMENT

After purchase each intake group of steers commenced a grow out phase either on pasture or a silage based ration in a feedlot. The grow-out phase enabled the steers purchased to attain the frame and entry liveweight specification required by the feedlot. It also assisted in diluting any property of origin management effects that could influence feedlot performance or carcass merit traits. The duration of the grow-out phase differed between intake groups but was on average 210 days.

## 3.3 FEEDLOT MANAGEMENT

At the conclusion of the grow-out phase each intake group of steers commenced the grain finishing phase in the feedlot. On entry, the steers were individually weighed, given routine preventative health treatments including 5 in 1 vaccination, anthelmintic treatments for roundworms and liver fluke and Vitamin A, D & E supplementation. In addition all steers were given a growth implant. Individual steer liveweights were again recorded at exit. Details of all steers experiencing health problems which required hospital treatment were recorded.

3.4 NUTRITIONAL MANAGEMENT This project was not designed to evaluate nutritional management effects on performance. Nutritional management effects on feedlot performance have been previously reported in the M8A project final report.

### 3.5 FEEDLOTS

Six feedlots participated in the sire evaluation component of the project . All were located in either NSW or Victoria. Queensland feedlots did not participate in the sire evaluation study because suitable sire lines of steers were not available. Instead, a vendor based study was initiated to assess the performance of northern Australian steers for the Japanese market. A report on the results of this study is detailed in part 2B of this report.

### 3.6 CARCASS MEASUREMENTS

At slaughter individual carcass measurements were recorded for all steers. Hot carcass weight was recorded at the kill floor scales. All other carcass measurements were recorded after post slaughter chilling for at least 24 hours. These measurements included P8 fat depth, carcass muscle score on a scale of 1 to 15, where C muscling equates to 8, C+ = 9, B = 10, etc., eye muscle area on the left side of the carcass, Ausmeat marbling score, Ausmeat meat and fat colour scores. Each feedlot provided their own Ausmeat accredited chiller assessor.

### 3.7 STATISTICAL ANALYSIS

Variance components for sires, vendors and the interactions of vendors with intake group were estimated using the GLM procedure in SAS. The model used to estimate these variance components was:

$$y = m + b_i + v_{ij} + i_k + (v_{ij} * i_k) + s_{ijl} + f_{km} + h_n + e_{ijklmno}$$

where,

$y$ = Dependent variables

$m$ = Mean

$b_i$ = Effect of the i$^{th}$ breed (i = 1..5)

$v_{ij}$ = Effect of the j$^{th}$ vendor within the i$^{th}$ breed

$i_k$ = Effect of the k$^{th}$ intake group (k = 1..21)

$(v_{ij} * i_k)$ = Effect of the interaction between the j$^{th}$ vendor and the k$^{th}$ intake group

$s_{ijl}$ = Effect of the l$^{th}$ sire within the j$^{th}$ vendor within the i$^{th}$ breed group

$f_{km}$ = Effect of the m[th] feeding program (m = 1..4) within the k[th] intake group

$h_n$ = Effect of being hospitalised (n=0,1)

$e_{ijklmno}$ = Error term

From the above analysis, estimates of variance components for sire ($\sigma^2_s$), vendor within breed ($\sigma^2_{V:B}$), and the vendor x intake interaction ($\sigma^2_{V*I}$) were calculated. The between vendor heritability ($h^2$) was calculated as $h^2 = (4*\sigma^2_S) / \sigma^2_P$ , where $\sigma^2_P = (\sigma^2_S + \sigma^2_{V:B} + \sigma^2_{V*I} + \sigma^2_e)$. The vendor repeatability ($t_V$) is defined as $t_V = \sigma^2_{V:B} / (\sigma^2_{V:B} + \sigma^2_{V*I})$ . The genetic standard deviation $\sigma_G$ is defined as $2 * \sqrt{\sigma^2_S}$ . Within intakes, the variation between vendors (V) is due to vendor differences which are repeatable across intakes (V:B) and vendor effects which are specific to one intake (V*I). Consequently, the variation between vendors within intakes is the sum of these two sources of variation. i.e., $\sigma^2_V = \sigma^2_{V:B} + \sigma^2_{V*I}$ . For ease of interpretation $\sigma^2_{V:B}$ is referred to as Vrepeatable and $\sigma^2_{V:I}$ as Vnon repeatable in Figures 1.3, 2.1, 2.4 and Table 2.3.

Additional analyses were carried out using DFREML (Meyer 1993) or Henderson's method 3 (Harvey 1990) using a similar statistical model except that only one vendor random effect was fitted, i.e., an effect for each vendor-intake contribution. These analyses were used to calculate vendor, genetic and phenotypic correlations. The statistical significance of the results are summarised in Appendix A.4.

# 4. FINDINGS AND CONCLUSIONS

The study confirmed the large variation that exists between feeder steers in many of the commercial traits important to the Japanese beef market. After correcting for breed and intake group effects it was estimated that 45% of the variation measured in commercial performance was attributable to the combined effects of feeder steer genetics and vendor i.e. property of origin (Figure 1.4) using economic analysis procedures detailed in Appendix A.2. Other undefined pre-feedlot and feedlot environmental factors accounted for the remaining (55%) variation in commercial performance . This result is in contrast to the common industry mis-conception that when cattle have been managed and fed together since weaning any differences measured during the feedlotting phase must be either vendor and/or genetic in origin. Figure 1.4 also demonstrates that the relative contribution of individual genetic traits to the range in commercial performance measured.

Marbling (42%), feedlot average daily weight gain (18% after correction for feed intake), dressing percentage (16%), eye muscle area (12%) and P8 fat (12%) were the key genetic traits contributing to the range in commercial performance recorded between the top and bottom 5% of sires (Figure 1.4) based on current price schedules being paid for grain fed beef in Japan with marbled beef attracting price premiums. Conversely, if no premiums are paid for marbled beef then the relative ranking of these traits changes to marbling (0%), dressing percentage (34%), eye muscle area (30%), feedlot average daily gain (20%) and P8 fat (16%). Currently the beef breeding industry can only access Breedplan EBV's for the growth, P8 fat and eye muscle area traits and these are principally derived from productions systems based on grass. The M112 project has demonstrated that this need not be the case if well designed progeny tests can be conducted with the co-operative support of feedlotters and producers.

The effects of breed, sire, vendor and intake group are presented and discussed in regard to their effect on four key components of commercial performance, viz pre-feedlot growth performance, feedlot growth performance, meat yield and carcass quality traits.

## 4.1 BREED EFFECTS

Breed effects were significant for all traits except meat colour. Table 2.2 and Figure 1.1 summarise the comparative performance of the major breeds evaluated in the trial for growth and carcass traits. When interpreting the breed group differences found in this study, the large variation between vendors within a breed must be remembered. Consequently, the performance of individual breeds is not estimated precisely e.g. breed differences could be biased if the average preweaning environment of properties supplying one breed differs from that of properties supplying a different breed. This would be more likely to effect growth rate during the grow-out phase than later measurements.

TABLE 2.2 COMPARATIVE PERFORMANCE OF THE ANGUS, HEREFORD, POLL HEREFORD, MURRAY GREY SHORTHORN AND EUROPEAN CROSS STEERS

| TRAIT | Overall Average | Angus | Hereford | Poll Hereford | Murray Grey | Shorthorn | European Crosses |
|---|---|---|---|---|---|---|---|
| Growout Phase | | | | | | | |
| Entry weight | 290 | 294 | 287 | 287 | 288 | 283 | 305 |
| Exit weight | 450 | 452 | 448 | 452 | 437 | 455 | 458 |
| Grass ADG (kg/day) | 0.76 | 0.71 | 0.78 | 0.79 | 0.71 | 0.86 | 0.74 |
| Feedlot Phase | | | | | | | |
| Exit weight | 727 | 733 | 723 | 730 | 694 | 736 | 748 |
| Weight Gain | 282 | 287 | 283 | 284 | 263 | 282 | 295 |
| Feedlot ADG (kg/day) | 1.39 | 1.37 | 1.40 | 1.41 | 1.28 | 1.42 | 1.45 |
| Carcass Traits | | | | | | | |
| Carcass Wt (kg) | 407 | 412 | 400 | 405 | 393 | 412 | 423 |
| Dressing Percent | 55.9 | 56.2 | 55.1 | 55.3 | 56.5 | 55.9 | 56.6 |
| P8 fat (mm) | 24 | 25 | 25 | 27 | 24 | 25 | 21 |
| Eye Muscle Area | 80 | 81 | 78 | 79 | 78 | 80 | 86 |
| Muscle score | | 8.2 | 7.8 | 7.6 | 8.5 | 7.8 | 8.9 |
| Meat Quality | | | | | | | |
| Meat Colour | 1.3 | 1.3 | 1.3 | 1.2 | 1.2 | 1.3 | 1.3 |
| Fat Colour | 0.4 | 0.4 | 0.4 | 0.3 | 0.4 | 0.5 | 0.4 |
| Marbling Level 10/11 | 2.2 | 2.6 | 1.7 | 1.9 | 2.5 | 2.7 | 1.8 |
| No. of steers | 4594 | 2746 | 598 | 291 | 543 | 234 | 182 |

### 4.1.1 Backgrounding pre-feedlot growth performance

There were no breed differences in entry weight at the commencement of the backgrounding phase of the trial. During the backgrounding phase Shorthorn steers had the highest average daily gain and both Angus and Murray Grey steers the lowest. European cross, Hereford and Poll Hereford steers were intermediate.

### 4.1.2 Feedlot growth performance

European cross steers were heaviest on feedlot entry and Murray Grey steers the lightest . During the feedlotting phase European cross steers gained weight faster than Murray Grey steers by 0.17 kg/day. Shorthorn, Poll Hereford, Hereford and Angus steers were intermediate in feedlot growth rate performance. By feedlot exit European cross steers were 54 kg heavier than Murray Grey steers.

### 4.1.3 Saleable Meat Yield Traits

Whilst feedlot growth rate is regarded as an important indicator of commercial performance it does have deficiencies if interpreted in isolation. Feedlotters principally sell their product on a carcass weight basis either bone in or boneless. Consequently if they are to maximise their returns it is essential that the saleable component of the liveweight gain achieved during feeding is also maximised. Dressing percentage at slaughter and muscle and fat composition of the carcass at boning are the key determinants of ultimate saleable meat yield.

European cross steers had the highest dressing percentage at slaughter and Hereford steers the lowest . Murray Grey, Angus, Shorthorn and Poll Hereford steers were intermediate. Despite some re-ranking of breeds with regard to dressing percentage all breeds ranked in the same order for final carcass weight as they did for feedlot exit weight. At slaughter the carcass weight of European cross steers was 30 kg higher than Murray Grey steers.

European cross steers were 6 mm leaner at the P8 site than Poll Hereford steers. Murray Grey, Angus Shorthorn and Hereford steers were intermediate.

European cross steers had 8 $cm^2$ more rib eye muscle area at the 10/11th ribsite than Murray Grey and Hereford steers. There were no only small differences between Angus, Shorthorn and Poll Hereford steers in carcass rib eye area which were intermediate.

Using an industry derived yield equation it is estimated that the European cross steers had 22 kg higher saleable meat yield than Murray Grey steers as a consequence of the combined effects of their carcasses being heavier, leaner and larger rib eye area.

### 4.1.4 Carcass Quality

Intra-muscular marbling level, meat and fat colour are all important carcass quality traits influencing Japanese consumer acceptability and price. Breed differences were evident in intra-muscular marbling level. Shorthorn , Angus and Murray Grey steers outperformed Hereford , Poll Hereford and European cross steers with regard to marbling level attained.

## 4.2 SIRE EFFECTS

Sire effects were significant for all traits except fat and meat colour. Differences measured in growth or carcass traits between steers who belong to the one feedlot management group and who enter and exit a feedlot pen together and fed the same ration are only partly attributable to the sire. There are also genetic differences between steers from the same sire and random non- genetic or environmental differences between steers. The proportion of the total variation which is genetic is called the heritability and can be estimated for each trait. Genetic variation or heritability is calculated from the variation between sires within a vendor lot.

Table 2.3 provides estimates of the vendor and genetic variance components as a proportion of the phenotypic variance and estimated heritabilities for the traits measured.

TABLE 2.3 PHENOTYPIC, VENDOR AND GENETIC VARIANCES FOR GROWTH AND CARCASS TRAITS AND THEIR ESTIMATED HERITABILITIES

| | (1) $\sigma_p$ | (2) V repeatable | (3) V non repeatable | (4) Heritability | EBV RANGE |
|---|---|---|---|---|---|
| Grow out Phase | | | | | |
| Entry weight | 24.63 | 0.07 | 0.37 | 0.31 | |
| Grow out avg Daily Gain (kg/day) | 0.14 | 0 | 0.39 | 0.12 | |
| Feedlot Phase | | | | | |
| Entry weight | 31.13 | 0.06 | 0.31 | 0.28 | |
| Exit weight | 46.72 | 0.09 | 0.09 | 0.33 | |
| Weight gain | 34.23 | 0.03 | 0.10 | 0.23 | |
| Feedlot avg Daily Gain (kg/day) | 0.17 | 0.06 | 0.06 | 0.19 | |
| Feedlot Weight Gain (200 days) | | | | | +46 to -34 |
| Carcass Traits | | | | | |
| Carcass Weight (kg) | 27.67 | 0.07 | 0.11 | 0.38 | |
| 200 day Carcass Weight (kg) | | | | | +28 to -20 |
| Dressing Percentage (%) | 1.51 | 0.03 | 0.02 | 0.25 | +2.2 to -1.3 |
| p8 Fat Cover (mm) | 5.47 | 0.07 | 0.06 | 0.30 | +5 to -4 |
| | | | | | |
| Carcass Muscle Score | 0.77 | | | 0.22 | |
| Eye Muscle Area | 6.67 | 0.05 | 0.03 | 0.35 | +10 to -4 |
| Meat Quality | | | | | |
| Meat Colour | 0.45 | 0.04 | 0.00 | 0.00 | |
| Fat Colour | 0.42 | 0.04 | 0.02 | 0.00 | |
| Marbling | 0.78 | 0.01 | 0.06 | 0.25 | +1.0 to -0.6 |

$$(1)\sigma_p = (\sigma_{v:b}^2 + \sigma_{v:i}^2 + \sigma_s^2 + \sigma_e^2)^{1/2}$$

$$(2)\ \text{Vrepeatable} = \sigma_{v:b}^2 / \sigma_p^2$$

$$(3)\ \text{Vnon repeatable} = \sigma_{v:i}^2 / \sigma_p^2$$

$$(4)\ \text{Heritability} = (4\,\sigma_s^2) / \sigma_p^2$$

Sire effects were significant for all traits except fat and meat colour. Table 2.3 indicates that sire effects are accounting for between 0 to 38% of the total variation measured in individual steer performance depending on the particular trait.

Appendix A.1 provides a summary of the magnitude of the sire effects for feedlot growth and carcass traits at slaughter on a within breed basis for a standardised 200 day feeding program. They are not provided for European breeds of bulls because it is not possible to provide sire EBV estimates on crossbred progeny with sufficient accuracy.

The sire effects are presented in estimated breeding value (EBV) format from the breed average. THE EBV's ARE NOT BREEDPLAN EBV's. As with the M8A study they have been generated independently of Breedplan specifically for this feedlot study. The relationship of the M112 sire EBV's to Group Breedplan EBV's for the same sire was examined by the Animal Genetics and Breeding Unit Armidale. This report is presented in Appendix A.5. The accuracy's of the M112 EBV estimates are indicated at the base of each table. Parameters used to generate estimated breeding values for the traits measured are detailed in Table 2.3. The method used to calculate EBV's assumes that there are no systematic differences in sires used by different vendors. This assumption may not be true. A better design for the progeny test would use reference sires to link vendors . This was not a practical option within the scope of this project.

### 4.2.1 Backgrounding pre-feedlot growth performance

Sire differences occurred between steer progeny in growth performance during the backgrounding phase of the project. Sires whose steers performed above average for growth during the backgrounding phase also tended to perform above average for growth during the feedlotting phase and in most carcass traits at slaughter (Table 2.4). Consequently by slaughter their steers had higher carcass weights, larger eye muscle area, higher marbling levels and lower P8 fat levels. This result is characteristic of genetic traits where bigger cattle tend to grow faster through all phases rather than just in one or more particular phases. Conversely, when assessed on an individual steer basis high pre-feedlot growth rate performance was slightly negatively correlated with subsequent feedlot growth rate presumably because it reduced the potential for steers to express compensatory growth during the feedlotting phase. This result is characteristic of environmental traits where high performance in one phase is followed by reduced performance during the next phase. Despite this, high growth rate steers during the pre feedlot phase generally maintained both a liveweight and carcass weight advantage at slaughter.

TABLE 2.4 CORRELATIONS BETWEEN PRE-FEEDLOT GROWOUT AVERAGE DAILY GAIN AND FEEDLOT GROWTH AND CARCASS TRAITS

| | PHENOTYPIC | VENDOR | GENETIC |
|---|---|---|---|
| GROWOUT ADG & FEEDLOT ADG | -0.11 | -0.29 | 0.36 |
| FEEDLOT LWT GAIN | -0.12 | -0.32 | 0.36 |
| FEEDLOT EXIT LWT | 0.28 | 0.20 | 0.66 |
| CARCASS WT | 0.29 | 0.25 | 0.68 |
| DRESSING % | 0.13 | 0.33 | 0.29 |
| P8 FAT | 0.10 | 0.14 | -0.35 |
| EMA 10/11TH RIB | 0.13 | 0.33 | 0.29 |
| MARBLING LEVEL | 0.08 | 0.39 | 0.16 |

### 4.2.2 Feedlot growth performance

Sire effects on steer feedlot liveweight gain performance were substantial and hence commercially important. Appendix A.1 details the sire differences in EBV that were calculated within a breed, i.e., Angus sires (+46 to -34 kg), Hereford sires (+32 to -40 kg), Poll Hereford sires (+18 to -22 kg), Murray Grey sires (+30 to -38 kg) and Shorthorn sires (+ 20 to -38 kg). For Angus the sire EBV difference of 80 kg in 200 day feedlot liveweight gain would result in a 40 kg liveweight gain advantage in favour of the steers by the higher EBV sire. At a commercial value of $1.80/kg this would represent an additional $72/head gross excluding any additional feed costs.

### 4.2.3 Saleable meat yield traits

Sire EBV differences in dressing percentage within each of the breeds were as follows: Angus (+2.2 to -1.3%), Hereford (+1.2 to -0.9%), Poll Hereford (+1.0 to -1.0%), Murray Grey (+1.6 to -1.3%) and Shorthorn (+1.0 to -1.2%). Of the 371 sires evaluated in the study 87 (23%) had positive EBV's for both feedlot weight gain and dressing percentage. Consequently the EBV ranking of the sires is different for carcass weight compared to feedlot weight gain. From a commercial feedlotters perspective who is principally payed on a carcass weight basis (boneless or bone in) the carcass weight EBV is the most commercially relevant. The phenotypic, vendor and genetic correlations between dressing percentage and feedlot weight gain were -0.21, -0.03 and 0.27 respectively.

Sire EBV differences in P8 fat depth within each of the four breeds were: Angus (-4 to +5 mm), Hereford (-5 to +4 mm), Poll Hereford (-3 to +3 mm) , Murray Grey (-3 to +3 mm) and Shorthorn (-6 to +5 mm). Using an industry derived saleable meat yield formula a sire EBV difference of 9 mm in P8 fat depth would result in around a 4 kg per head higher saleable meat yield advantage in steer progeny by the leaner sire if average carcass weights and eye muscle areas were the same. At a commercial value of $4.25/kg this represents an additional $17/head.

Within breed sire differences in carcass rib eye area were significant with the EBV range as follows: Angus (+10 to -4 sq cm), Hereford (+7 to -7 sq cm), Poll Hereford (+4 to -4 sq cm) , Murray Grey (+3 to -4 sq cm) and Shorthorn ((+4 to -4 sq cm). Using the same saleable meat yield formula a sire EBV difference of 14 sq cm in 10/11th rib eye area would result in around a 3 kg higher saleable meat yield advantage for steer progeny by the better muscled sire if average carcass weights and P8 fat depths were the same. At a commercial value of $4.25/kg this represents an additional $13/head.

### 4.2.4 Carcass Quality

Significant sire differences existed within a breed in intramuscular marbling level. The variation in sire EBV marbling scores within and across breeds is illustrated in Figure 1.2. These results clearly demonstrate that the current industry practise of relying on breed alone to achieve a consistent and moderate level of marbling in steers lot fed for the Japanese market will not succeed. Identifying superior marbling sires within the preferred breeds is essential to achieve progress in this trait.

The relatively high commercial value of this trait to the Japanese market and its moderate heritability has meant there now exists considerable financial incentive for both feedlotters and producers to improve the consistency and level of marbling performance of feeder steers through genetic selection. Unfortunately, identifying and selecting bulls for this trait relies solely on progeny testing which is slow, tedious and requires the co-operative support of producers, feedlotters and processors. This is not easily achievable within a commercial industry environment. Selecting for marbling using other more easily measured traits does not appear to be an option. In this study the phenotypic correlations between marbling and other more easily measured traits were all low . This occurred even for P8 fat depth (0.06) which indicated marbling level was independent of subcutaneous fat deposition . A significant and useful positive genetic correlation existed between marbling and both feedlot growth rate and carcass weight at slaughter (0.47 and 0.20 respectively). This suggests that sires whose steers are superior for feedlot growth rate are likely to be also superior for marbling. The relationship of marbling to carcass weight is further discussed in Section 4.4.4. Correlation coefficients for marbling with the other traits measured are provided in Appendix A.3. .

Fat and Meat Colour -Sire effects were non significant. Nearly all trial steers achieved an Ausmeat meat and/or fat colour score of 3 or less required to achieve the preferred Japanese end-user meat and fat colour specifications. Nutritional and other management effects appear to be the major factors affecting meat and fat colour rather than genetic effects.

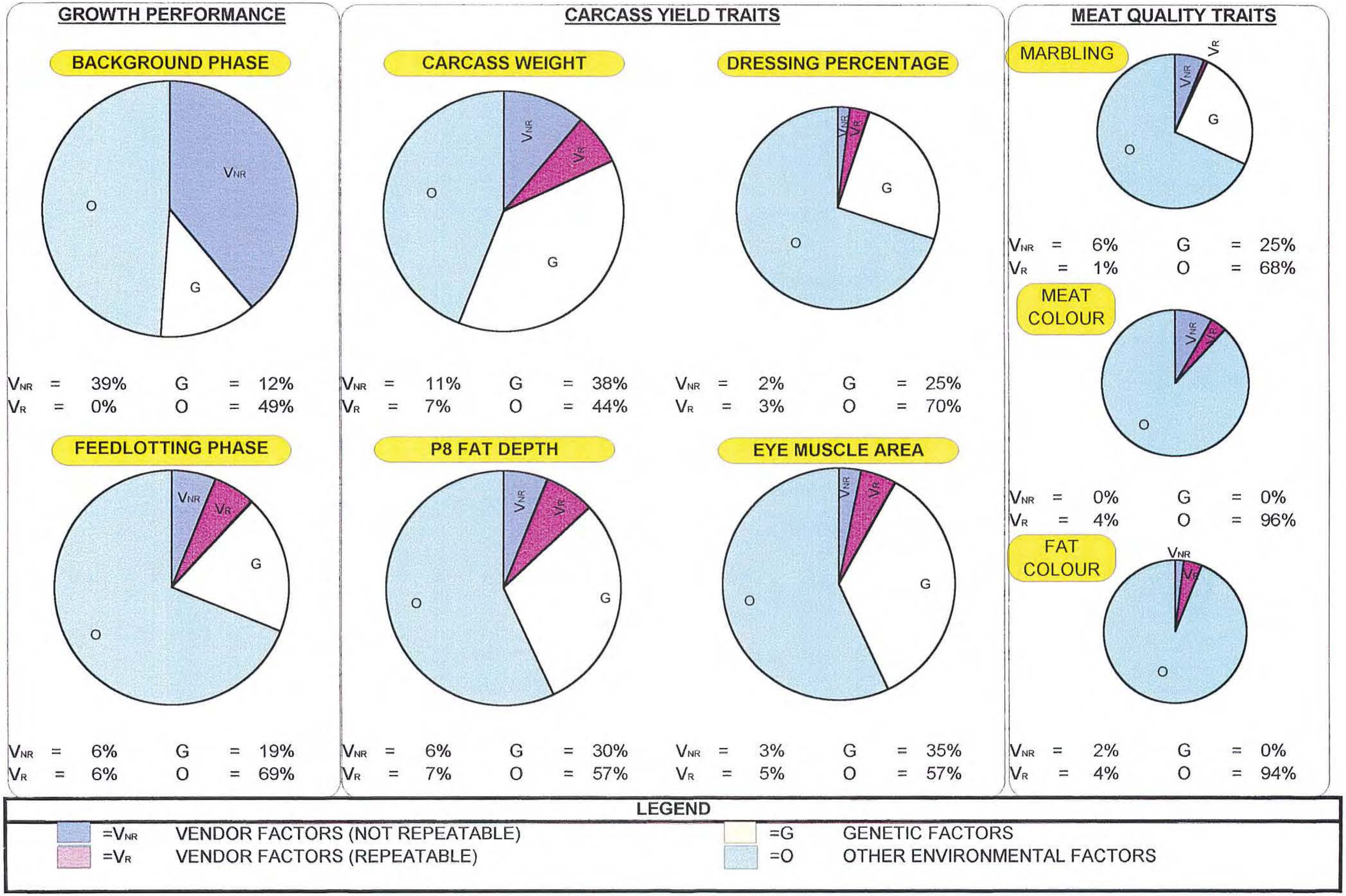
## 4.3 VENDOR EFFECTS

Part of the variation in feedlot and carcass performance is attributable to a carry-over effect from the property of origin which in this report is referred to as vendor. Vendor effects were significant for all traits except meat colour and dressing percentage. The vendor effect has been partitioned into 2 sources Vr and Vnr as defined in section 3.7. Vr is the differences between vendors that are repeatable from year to year. These could be due to differences between vendors in their cow herd (assuming the same cows are used to breed each group of steers) or to relatively permanent environmental effects e.g. pasture type between vendors properties.

Vnr represents the differences between vendors that apply only to one group of steers i.e they are not repeatable from one year to the next. These could be due to the merit of the cows used to produce the steers if these vary from year to year or non permanent environmental effects such as seasonal conditions the steers experienced on farm which have a carry-over effect during the feedlotting phase.

Estimating variance components precisely requires large numbers of animals. The total variation between vendors is estimated with moderate precision because a total of 97 vendors have been sampled. However only 43 vendors have been sampled more than once, so the repeatability of vendor effects can not be estimated accurately. Table 2.3 and Figure 2.1 illustrate that vendor i.e. (Vr + Vnr) accounted for between 4 to 44% of the variation in the traits. It also provides an estimate of the repeatability of vendor performance for each of the traits measured i.e. that proportion of the vendor effect which is constant from one intake group to the next.

FIGURE 2.1 PROPORTION OF THE TOTAL VARIATION IN FEEDLOT PERFORMANCE TRAITS ATTRIBUTABLE TO GENETIC FACTORS



### 4.3.1 Pre-feedlot growth performance

Differences between vendor groups of steers in growth performance during the pre-feedlot phase were significant. Table 2.3 indicates that the pre-feedlot grow out phase was effective in reducing carry-over property of origin effects on feedlot growth performance. Vendor variance in daily weight gain declined from 39% of the total phenotypic variance in the grow-out to 12% in the feedlot phase. This result indicates the importance of retaining a mandatory grow-out phase prior to feedlot entry if accurate genetic comparisons are to be made. It is also important to note that whilst vendor had a substantial effect on the daily weight gain performance of vendor lines of steers during the backgrounding phase this effect was not repeatable from one intake group to the next .

In addition, vendor lines of steers that performed above average for daily weight gain during the backgrounding phase had a reduced average daily weight performance (r= -0.29) during the feedlotting phase. This was considered a consequence of the reduced potential for such high performing vendor lines to exhibit compensatory growth during the feedlotting phase. As previously discussed in section 4.2.1 it indicates the vendor effect is more likely environmental than genetic in origin. High growth rate performing vendor lines of steers in the grow-out phase were still generally heavier, had larger eye muscle areas, higher marbling levels but were fatter at slaughter.

### 4.3.2 Feedlot growth performance

Using the vendor variance estimates provided in Table 2.3 it is estimated that a 0.24 kg/day (17%) difference existed between the top and bottom 5% of vendor lines of steers in feedlot growth performance. Over a 200 day feeding program this would amount to a 48 kg per head liveweight gain difference between the top and bottom 5% of vendor lines of steers. Whilst vendor only accounts for a relatively small part of the total phenotypic variation measured ( 12% for feedlot average daily gain) nearly half of this vendor advantage is repeatable from one intake group to the next . This is in complete contrast to the repeatability of the daily weight gain performance of vendor lines of steers during the growout phase. It is not surprising that feedlotters frequently base their purchasing decisions on the basis of the past performance of a vendors group of steers. However they need to remember that only about half of the excellence or inferiority in growth rate is expected in the next group of steers purchased from the same vendor. Repeated use of excellent sires would also increase the predictability of a vendor's steers.

### 4.3.3 Saleable meat yield traits

Differences between the top and bottom 5% of vendor lines of steers were significant for carcass weight (52 kg), dressing percentage (1.4%) P8 fat depth (8 mm) and carcass rib eye area (8 sq.cm.). However, vendor only accounted for a relatively small proportion (5 % to 18 %) of the total variation in these traits. The small proportion it did account for was of moderate repeatability (0.39 to 0.69).

### 4.3.4 Carcass quality traits

Vendor effects were significant for all meat quality traits except meat colour. Relative to the sire effect, vendor accounted for only a small proportion of the total variation measured in meat colour (4%), fat colour ( 6%) and marbling (7%) (Figure 2.1). Furthermore, the repeatability of the vendor effect on marbling was also low (0.09). Consequently, feedlotters will make little progress in improving carcass marbling level by simply selecting vendor lines of steers that are superior in this trait, unless better vendors are using superior genetics.

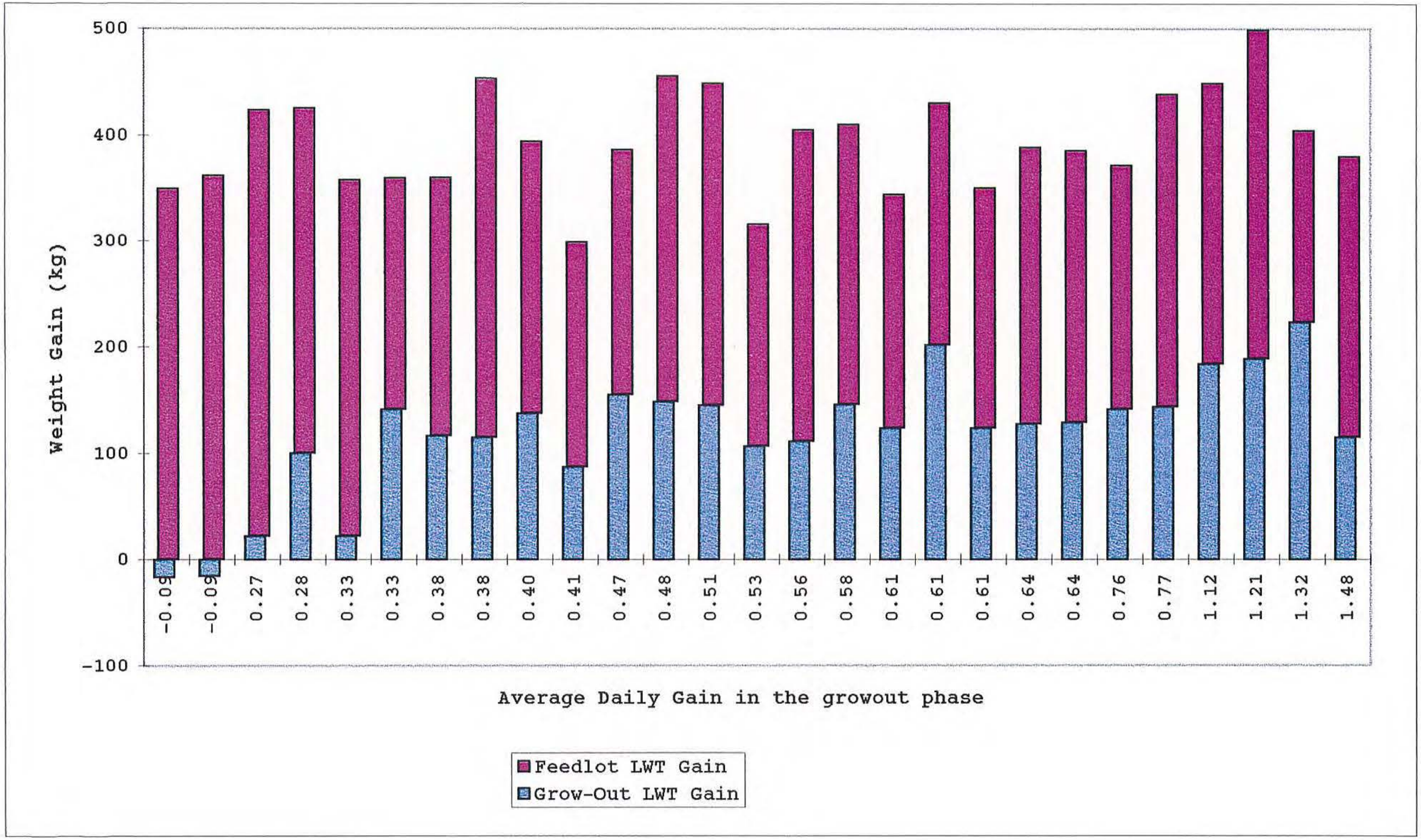
## 4.4 INTAKE GROUP EFFECTS

Intake group effects on feeder steer performance were significant for all traits. Intake group effects encompass a whole range of feedlot management factors many of which vary between feedlots and from one intake group to the next and others that are relatively constant. For example duration of feeding, ration, pen stocking density and the climate (seasonal effects) the steers experienced whilst resident at a particular feedlot can all differ between intake groups and all can effect animal performance. For valid genetic comparisons between sires such intake group effects must be taken into consideration. In addition to ensuring the validity of genetic comparisons intake group effects also have to be considered when developing value based marketing systems between feedlotters and producers if they are to be equitable for both parties. Detailed below are some of the intake group differences observed in the M112 project

### 4.4.1 Backgrounding growth performance

Large differences occurred in pre-feedlot growth performance on pasture between intake groups (Figure 2.2 ). This was considered largely attributable to both the nutritional regime and time of year i.e. seasonal effects the steers experienced during the backgrounding phase whilst either on pasture or fed a silage based ration in the feedlot. The range in grow-out performance between intake groups also highlights the range in profitability that existed between producers who backgrounded most of these steers on a contracted weight gain payment basis. There is considerable industry conjecture on the importance of pre-feedlot management of steers during the backgrounding phase on subsequent feedlotting performance. Whilst the M112 project was not specifically designed to evaluate this relationship there was considerable range recorded in the pre-feedlot growth performance of the M112 steers ( -0.09 kg/day to 1.48 kg/day between intake groups) but this appeared to have only relatively minor effects on subsequent feedlot performance. High pre-feedlot weight gain did depress subsequent feedlot average daily gain between intake groups. As discussed earlier this presumably was because the steers had reduced potential for compensatory growth during the feedlot phase. High pre-feedlot growth performance either had a neutral or a slightly positive relationship with all other commercially important traits measured including marbling previously reported in Table 2.4.

Figure 2.2 RELATIONSHIP BETWEEN PRE FEEDLOT GROW-OUT WEIGHT GAIN PERFORMANCE AND SUBSEQUENT FEEDLOT WEIGHT GAIN PERFORMANCE FOR 27 INTAKE GROUPS



### 4.4.2 Feedlot growth performance

Feedlot growth performance also substantially differed between intake groups. This is considered to be a reflection of a combination of feedlot management factors including ration, time of year i.e. season and days on feed. When negotiating commercial contracts for grain fed beef, Japanese end-users normally include a specification with regard to a minimum time on feed. Increasing the duration of feeding increased marbling levels but depressed feedlot average daily gain and increased carcass subcutaneous P8 fat levels. (Figure 1.5).

### 4.4.3 Estimated saleable meat yield

Dressing percentage, carcass weight and eye muscle area were all significantly influenced by intake group effects. The same factors discussed in 4.4.2 are also likely to have contributed to this result.

### 4.4.4 Carcass quality

Marbling level, fat colour and meat colour were all significantly influenced by intake group but in the case of both meat and fat colour they were of only minor commercial significance. There is a tendency in the industry to rely on duration of feeding as a primary management tool to achieve Japanese end-user marbling level specifications which as evidenced by the wide variation in marbling performance between intake groups fed for the same time duration.(Figure 1.5) may be not be the least cost option nor an infallible management tool. It is possible that the higher marbling level attained from longer feeding programs may be at least partly attributable to the steers exiting the feedlot at higher carcass weights (Table 2.5). If so, then a cheaper management option for feedlots may be to increase the feeder steer induction liveweight specifications instead of feeding for longer periods. The precise reasons that explain this relationship between duration of feeding, carcass weight at slaughter and marbling levels are still uncertain hence require further investigation.

TABLE 2.5 RELATIONSHIP BETWEEN THE PERCENTAGE OF ANGUS STEERS ACHIEVING MARBLE SCORE ≥2, ≥3 OR ≥4 AND CARCASS WEIGHT

| Carcass WT Range (kg) | Ave Carcass Wt (kg) | Ave Marbling Level (ML) | % Steers Achieving a Marbling Level | | |
|---|---|---|---|---|---|
| | | | ML≥2 | ML≥3 | ML≥4 |
| <340 | 326 | 2.39 | 80 | 45 | 18 |
| 341-380 | 363 | 2.55 | 89 | 54 | 18 |
| 381-420 | 399 | 2.70 | 92 | 63 | 21 |
| 421-460 | 436 | 2.71 | 92 | 60 | 23 |
| >460 | 480 | 2.74 | 94 | 59 | 24 |
| Significance | | 0.00 | 0.00 | 0.00 | 0.14 |

## 4.5 CORRELATED TRAITS

Residual, vendor and genetic correlations between traits are provided in the appendix A.3. Residual correlations are the correlations between traits on an individual steer basis within a sire group after correcting for the effects of intake group, breed, feeding program, etc. Vendor correlations show the relationship between traits for vendor groups of steers, i.e., if a vendor group is good in one trait is it also good for another trait . Genetic correlations show the relationship between traits for sire groups of steers. Comments will be restricted to only those correlations of major interest. It is important to note that the standard errors associated with many-of these estimates remain high

### 4.5.1 Pre-feedlot growth performance

As detailed in section 4.2.1 higher growth performance on pasture prior to feedlot entry reduced subsequent feedlot average daily gain when assessed on an individual steer and vendor line basis but not on a sire line basis. This was presumably because the steers had reduced potential for compensatory growth during the feedlot phase. Nonetheless individual steers, vendor lines and sire lines that performed above average in pre feedlot daily weight gain were still heavier at feedlot exit. A current commercial practise used by feedlotters is to purchase weaner steers and then consign them to professional backgrounder's property where the steers are managed to reach a specified feedlot induction weight range. The backgrounder is paid on a per kilogram weight gain basis at an agreed contracted price which, seasonal conditions permitting, encourages high pre feedlot weight gain. From a commercial perspective this payment system could present a potential financial conflict between producers and feedlotters since high performance during the backgrounding phase does reduce growth performance during the feedlotting phase. However, if the cost of liveweight gain is cheaper on grass compared to grain both producers and feedlotters benefit by encouraging high pre-feedlot growth performance. High pre-feedlot growth performance either had a neutral or a slightly positive relationship with all other commercially important traits measured.

### 4.5.2 Feedlot growth performance

Individual steers, vendor lines and sire lines that had above average feedlot average daily liveweight gain had as expected heavier carcass weights with larger eye muscle area and more subcutaneous fat at the P8 site at slaughter. This occurred despite there being a negative relationship between feedlot average daily liveweight gain and dressing percentage at slaughter on an individual steer basis (-0.21) and to a lesser extent on a vendor line basis ( -0.03). Conversely, sire lines with above average growth rate performance also tended to have higher dressing percentages (0.27).

### 4.5.3 Carcass Yield Traits

Carcass P8 fat depth and eye muscle area were both positively related to carcass weight but neither were substantially related to any other trait. There was a negative relationship between P8 fat and eye muscle area either on an individual steer (-0.05), vendor line (-0.29) or sire line (-0.43) basis.

### 4.5.4 Carcass Quality Traits

Carcass marbling level appeared unrelated to most of the other traits measured including sub-cutaneous fat depth. The residual, vendor and genetic correlations between P8 fat depth and marbling level were 0.06, -0.07 and -0.01 respectively. Consequently selecting for a higher marbling level can be achieved without increasing carcass sub-cutaneous fat depth. There was a relatively high genetic correlation (0.47) between feedlot average daily weight gain and marbling. However the individual steer (0.03) and vendor line (-0.16) correlations between these two traits were much lower.

## 5 SUCCESS IN ACHIEVING OBJECTIVES

The project has been successful in meeting all key objectives and project milestones. It has successfully introduced and conducted the sire evaluation scheme with 6 commercial feedlots in eastern Australia and evaluated 4594 steers representing 371 sires. In addition, with the co-operative support of 3 Queensland based feedlots it has evaluated the capabilities of 7748 northern Australian bred cattle representing most northern Australian cattle breeds. Collectively, the M112 and M8A projects have evaluated 12,342 steers purchased from 333 cattle producers throughout eastern Australia in a very cost efficient project actively supported by the commercial feedlotting industry. The results re-enforce and build on those obtained from the M8A study. Irrespective of where the study has been conducted feeder steer genetics has been shown to have a substantial influence on feedlot growth performance, saleable meat yield and carcass quality. The study has attempted to quantify the commercial implications of these results.

## 6 PROGRESS IN COMMERCIALISATION

The M112 project has been an important catalyst in improving awareness amongst both feedlotters and producers as to the contribution feeder steer genetics has on improving the consistency and cost efficiency of grain fed beef. There are now a number of commercial initiatives that are attempting to continue sire progeny testing with the co-operative support of commercial feedlotters. One of these initiatives is the Australian Genetics "Quality beef through genetics" program. Whilst, the high level of commercial industry interest in continuing sire progeny testing is encouraging, there is a danger that too many separate initiatives may be divisive and could result in industry receiving inaccurate and conflicting results. From an industry perspective it would be beneficial if genetic linkages were established between the competing commercial groups.

## 7 IMPACT ON THE MEAT AND LIVESTOCK INDUSTRY

Present

Results from the M112 project has highlighted the need for Australian beef industry to improve feeder steer predictability with regard to growth, yield and meat quality traits as one of several key factors currently limiting export opportunities for grain fed beef in the expanding but tightly specified Japanese market. A catalyst to achieve this would be the introduction of performance based livestock trading systems by feedlotters that encourages producers to more closely align their on farm breeding program to specific markets. Without such “cheque book” incentives there will continue to be too many producers breeding 19th century cattle for 20th century markets.

Within 5 Years

The beef cattle feedlot industry is no different to any other intensively fed livestock industry. Without a deliberate policy of improving the genetic merit of the livestock they feed their cost competitiveness and hence market share will be eroded. To date, the beef industry has lagged behind other intensively fed livestock industries whose products share the same retail display cabinet in supermarkets. Apart from the additional biological handicaps that slow the rate of genetic progress in the beef industry, progress will remain well below its potential until a commercially sustainable financial reward system which focuses industry effort in the right direction is operative. The beef industry and in particular the feedlot sector of the industry, cannot afford to forgo such potential cost savings. There is general agreement amongst both processors and producers in the principle of paying producers according to the yield and quality attributes of their cattle. However, the conversion of this principle into a practical trading system(s) that is acceptable to both parties is a more difficult task. Given the necessary technical input it is highly likely that within the next 3 years professionally operated feedlots will implement an objectively based feeder steer purchasing policy that encourages and rewards producers to breed commercially superior feeder steers. This will provide strong incentive for producers to buy bulls with suitable EBV's for carcass and feedlot traits and therefore for stud breeders to participate in genetic evaluation schemes such as Australian Genetics "Quality Beef Through Genetics'. There is a time lag between starting to evaluate sires and having commercial herd bulls available with suitable EBV's, so it is important that genetic evaluation schemes continue to maintain the momentum and industry support the M112 project has generated.

## 8 TOTAL FUNDING AND MRC CONTRIBUTION

| | | |
|---|---|---|
| Contribution by MRC | nbv | 580,000 |
| Contribution by Feedlots | | 13,500,000 |
| (capital and associated operating costs) | | |
| | | |
| TOTAL | | $14,080,000 |

## 9 MAIN RESULTS AND CONCLUSIONS

Irrespective of where the study has been conducted feeder steer genetics has been shown to be a commercially valuable management tool that industry can use to improve both the commercial competitiveness and consistency of grain fed beef. Results from the southern Australian sire line based component of the study estimated the difference in commercial performance between the top and bottom 5% of individual steers, vendor lines and sire progeny lines within a breed to be $270, $130 and $120 respectively when steers were fed for 200 days without allowing for feed intake effects. Breed differences did exist in growth, meat yield and marbling traits which producers can utilise in their breeding programs to more successfully achieve end-user specifications The project also highlighted that breed alone was no guarantee of performance. Considerable differences also exist between sires within a breed in these traits.

After correcting for intake group and breed effects it was estimated that the combined effects of feeder steer genetics and vendor accounted for 45% of the total variation in commercial feedlot performance. Other undefined environmental factors accounted for the remaining variation. These results do support the current policy of feedlotters to re purchase steers on the basis of the past performance of a vendors line of steers. They also highlight that the Australian grain fed beef's future international competitiveness will be enhanced through a sustained and co-ordinated input into improving feeder steer genetics. To date, genetic improvement in the beef cattle industry has lagged behind that of other intensively fed livestock industries whose products share the same retail display cabinets i.e. pork and chicken.

Marbling (42%), feedlot average daily weight gain (18% after correction for feed intake), dressing percentage (16%), eye muscle area (12%) and P8 fat (12%) were the key genetic traits contributing to the range in commercial performance recorded between the top and bottom 5% of sires based on current price schedules being paid for grain fed beef in Japan with marbled beef attracting price premiums. Conversely, if no premiums are paid for marbled beef then the relative ranking of these traits changes to marbling (0%), dressing percentage (34%), eye muscle area

(30%), feedlot average daily gain (20%) and P8 fat (16%). Currently the beef breeding industry can only access Breedplan EBV's for the growth, P8 fat and eye muscle area traits and these are principally derived from productions systems based on grass. The M112 project has demonstrated that this need not be the case if well designed progeny tests can be conducted with the co-operative support of feedlotters and producers.

When the M112 Angus sires were ranked on their overall economic breeding value for either a marbled or non marbled market there was a high correlation (0.82) in sire rankings between them. This meant 14 Angus bulls were in common in the top 20 ranked Angus bulls on their commercial breeding index irrespective of whether or not a premium was paid for marbling . This occurred because the index was calculated on the combined effects of growth, yield and meat quality traits according to both the genetic merit of the sire for the particular trait and the traits relative commercial value. Growth and yield traits are important requirements of both markets. Selection for marbling, within a breed, was either complimentary or had a neutral effect on growth and yield traits. For example, there was also little or no relationship between marbling level and subcutaneous fat level which meant high marbling levels could be achieved without excess subcutaneous levels.

Whilst the project has improved our knowledge of what factors do and don't influence commercial feedlot performance many of the steers purchased and fed for this market still fail to meet the market specification they were purchased for. As a consequence, Australian grain fed beef's international competitiveness will continue to be handicapped until industry addresses the key factors currently limiting its performance which include the improvement in feeder steer genetics. The catalyst to achieve this is the introduction of performance based livestock trading systems by feedlotters that encourages producers to more closely align their on farm breeding program to specific markets. In comparison to comparable systems for slaughter cattle the implementation of such payment systems for feeder steers is complicated by the extended grain feeding phase between purchase from a producer to the slaughter of the cattle. During this phase, producers do not normally have direct control of the management of their cattle. The M112 results demonstrate that during this phase, feedlot management also has an important input into whether feeder steers do achieve the market specifications they were fed for. Performance based payment systems for feeder steers need to reflect this if the premiums and discounts paid under such trading systems are to be equitable for both producers and feedlotters.

## 10 RECOMMENDATIONS

1. It is recommended that the results of this study be released to industry to encourage their adoption by feedlotters and producers targeting this market. The authors request that the results should be viewed in their wider industry context and not selectively used for promotional purposes by any single interest group.

2. Australian grainfed beef's future international competitiveness will be enhanced through a sustained and co-ordinated input into improving feeder steer genetics. Currently, the industry can only access Breedplan EBV's i.e. growth, P8 fat and eye muscle area for some of the genetic traits that contribute to commercial feedlot performance and these are principally derived on pasture. The M112 project has demonstrated that this need not be the case. Experience has also shown that progeny tests must be well designed, managed and analysed if sires are to be accurately assessed. Ideally, the EBV's generated should be part of the BREEDPLAN system to avoid industry confusion. The Board may consider the Corporation should have a continuing role in facilitating the integrity of commercial sire progeny testing.

3. The introduction of commercially sustainable performance payment systems that rewards producers to breed superior feeder steers will focus greater industry effort in this area. Whilst there is general agreement amongst both processors and producers in the principle of paying producers according to the yield and quality attributes of their cattle the conversion of this principle into a practical trading system(s) that is acceptable to both parties is a more difficult task. The MRC's involvement, as an independent auditor, in the performance payment trial conducted by Australian Meat Holdings facilitated this process for store cattle. The Board may consider they should continue this facilitation role.

# PART 2 - FINAL REPORTS

## APPENDIX A1 Sire estimated breeding value tables

| SIRE I.D. | NO. STEER PROGENY | SIRE CODE | # FEEDLOT LIVEWEIGHT GAIN | DRESSING PERCENTAGE | # CARCASS WEIGHT (kg) | P8 FAT COVER (mm) | MARBLING SCORE | EYE MUSCLE AREA (sq cm) |
|---|---|---|---|---|---|---|---|---|
| | M112 SIRE FEEDLOT EBVs - ANGUS | | | | | | | |
| Ballanee Dambuster | 13 | 24 | 0 | -1.1 | -7 | 2.2 | 0.1 | 2.2 |
| Ballanee J84 | 8 | 251 | -2 | 0.3 | 1 | -1.6 | -0.3 | -1.6 |
| Ballanee Patriot 70 | 8 | 180 | 22 | 0.2 | 14 | 0.4 | 0.5 | 4.6 |
| Ballangeich 86/52 | 13 | 19 | 11 | 0.5 | 9 | -1.3 | 0.2 | -0.5 |
| Ballangeich 88/363 | 12 | 218 | -21 | -0.1 | -13 | -0.6 | -0.3 | -4.8 |
| Ballangeich B144 | 12 | 18 | 9 | -0.5 | 2 | 3.4 | -0.6 | -2.7 |
| Ballangeich K261 | 10 | 327 | -18 | 0.5 | -7 | -2.6 | 0.0 | 2.7 |
| Ballangeich K357 | 9 | 326 | 18 | -0.2 | 9 | -0.2 | -0.1 | 0.1 |
| Ballangeich L117 | 16 | 342 | -4 | 0.3 | 0 | 0.5 | 0.2 | 5.4 |
| Barwidgee Elite 61 | 15 | 16 | -4 | 0.1 | -2 | -3.4 | -0.1 | 1.3 |
| Barwidgee J222 | 10 | 287 | 3 | -0.1 | 1 | 3.1 | 0.1 | -3.5 |
| Barwidgee Past Co 8663 | 24 | 57 | -6 | 0.2 | -2 | -1.9 | 0.0 | 2.4 |
| Barwidgee Past Co E78 | 12 | 56 | -9 | 0.2 | -4 | 1.4 | 0.3 | 2.0 |
| Beniagh E85 | 12 | 61 | 20 | 0.1 | 12 | 0.0 | -0.3 | 0.8 |
| Beniagh H1 | 11 | 200 | 6 | 1.0 | 9 | -0.8 | 0.1 | -1.4 |
| Blackrock Roscoe J48 | 12 | 303 | 31 | 0.1 | 18 | -0.2 | -0.1 | -3.1 |
| Blackrock Roscoe K50 | 7 | 361 | 18 | 0.0 | 10 | 1.2 | -0.1 | -3.1 |
| Blackwood 8/87 | 12 | 312 | 7 | -0.4 | 1 | 0.8 | -0.1 | -2.6 |
| Boorahman G64 | 10 | 311 | -8 | 0.7 | 0 | 2.9 | 0.0 | 1.7 |
| Bronmar Beau B6 | 7 | 162 | 12 | -0.1 | 6 | 0.3 | -0.3 | -1.4 |
| Brookfield Park D16 | 12 | 271 | 0 | -0.3 | -2 | -2.7 | 0.2 | 4.6 |
| Brookfield Park Zoro B67 | 24 | 126 | 17 | -0.3 | 8 | 4.6 | -0.3 | 1.7 |
| Cobble Pond Yankee | 10 | 58 | -8 | -0.9 | -10 | -2.9 | 0.7 | -0.6 |
| Colleen Powerplay E32 | 12 | 210 | -1 | -0.1 | -1 | -0.4 | -0.3 | 1.2 |
| Coolana Poundmaker B27 | 10 | 17 | -2 | -0.3 | -3 | -2.3 | 0.7 | -1.9 |
| Farrer Hyscore H31 | 16 | 163 | 13 | -0.2 | 6 | -0.6 | -0.3 | 0.0 |
| Forres Hamlet H74 | 10 | 166 | 21 | -0.5 | 9 | -0.4 | -0.1 | -2.0 |
| Forres Hymen H108 | 10 | 165 | 15 | 0.3 | 10 | -2.7 | -0.1 | 1.2 |
| Forres Jackpot J13 | 9 | 164 | 18 | 0.0 | 10 | -2.6 | -0.3 | -3.8 |
| Four M C8 | 15 | 2 | -4 | -1.1 | -9 | 1.3 | -0.1 | -1.3 |
| Four M Mr. A | 15 | 1 | -16 | 1.1 | -2 | -1.0 | 0.0 | 1.2 |
| Glen Bold Dameron J46 | 14 | 336 | 1 | -0.7 | -4 | -2.1 | 0.2 | -3.4 |
| Glen Bold Hallmark H13 | 36 | 195 | 42 | 0.6 | 28 | 0.5 | 0.6 | -0.2 |
| Glen Bold Houston F26 | 35 | 51 | -7 | 0.1 | -4 | 0.5 | -0.1 | 0.9 |
| Glen Bold Jackson G03 | 26 | 194 | -11 | 0.3 | -4 | -0.8 | -0.1 | 1.1 |
| Glen Bold Mandrake D11 | 12 | 53 | -26 | -0.7 | -19 | 0.2 | 0.0 | -0.3 |
| Glen Bold Mendana D75 | 26 | 52 | -9 | -1.0 | -11 | 0.5 | 0.0 | -4.6 |
| Glen Bold Powerpack E27 | 17 | 193 | -2 | 1.2 | 6 | 2.7 | 0.0 | 0.9 |
| Glen Bold Rosco H11 | 9 | 198 | 21 | 0.3 | 14 | 0.9 | 0.3 | -3.8 |
| Glen Bold Trudeau C06 | 12 | 220 | 7 | -0.9 | -2 | 1.5 | 0.3 | -1.8 |
| Glenaroua G124 | 13 | 197 | 0 | -0.8 | -5 | 0.4 | -0.3 | 2.7 |
| Glenaroua G39 | 9 | 224 | -24 | -1.0 | -19 | 0.5 | -0.2 | 3.8 |
| Glenaroua H90 | 18 | 196 | 19 | 0.2 | 12 | 2.3 | -0.1 | 0.4 |
| Glendowner Evolution H28 | 7 | 212 | 2 | -0.4 | -1 | 2.4 | 0.6 | -3.8 |
| Glendowner Navigator H31 | 10 | 213 | -8 | 0.0 | -4 | -2.6 | -0.5 | -4.1 |
| Glendowner Northern Light G49 | 17 | 214 | 8 | -0.1 | 4 | 2.0 | -0.1 | 4.2 |
| Gowrie 192 | 7 | 245 | -8 | -0.1 | -5 | -1.5 | 0.2 | -3.3 |

| SIRE I.D. | M112 SIRE FEEDLOT EBVs - ANGUS | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | NO. STEER PROGENY | SIRE CODE | # FEEDLOT LIVEWEIGHT GAIN | DRESSING PERCENTAGE | # CARCASS WEIGHT (kg) | P8 FAT COVER (mm) | MARBLING SCORE | EYE MUSCLE AREA (sq cm) |
| Hazeldean 8717 | 21 | 234 | 24 | 0.9 | 20 | 4.5 | -0.2 | 0.2 |
| Hazeldean 8736 | 21 | 233 | 5 | 0.2 | 4 | 1.7 | -0.2 | 1.8 |
| Hazeldean 8761 | 19 | 235 | -8 | -0.3 | -6 | -2.4 | 0.0 | 6.1 |
| Hazeldean 879113 | 11 | 231 | 13 | -0.2 | 6 | 0.3 | -0.5 | -3.0 |
| Hazeldean 8797 | 7 | 232 | -10 | -1.3 | -14 | 1.7 | 0.2 | -2.4 |
| Hazeldean 88102 | 14 | 184 | -14 | 0.4 | -6 | 3.3 | -0.6 | -0.3 |
| Hazeldean D56 | 9 | 230 | 5 | -0.3 | 1 | -0.1 | -0.1 | -2.4 |
| Hazeldean G19 | 30 | 123 | -6 | -0.7 | -8 | 4.1 | -0.3 | -0.9 |
| Hazeldean H14 | 8 | 183 | 1 | 0.2 | 2 | -3.0 | 0.2 | 4.6 |
| Hazeldean J10 | 14 | 304 | -6 | -0.3 | -5 | -2.1 | -0.1 | 1.6 |
| Hazeldean J19 | 9 | 305 | -9 | 0.2 | -4 | -2.1 | 0.0 | 2.3 |
| Hazeldean J30 | 7 | 306 | -7 | 1.4 | 5 | -3.2 | 0.0 | 4.3 |
| Hazeldean J372 | 11 | 297 | -12 | -0.3 | -9 | 1.0 | -0.2 | -1.0 |
| Hazeldean J399 | 11 | 307 | -9 | -0.4 | -8 | -1.0 | 0.4 | 1.8 |
| Hazeldean J415 | 16 | 300 | -11 | -0.3 | -8 | -0.4 | -0.2 | -3.7 |
| Hazeldean J419 | 9 | 301 | 12 | 0.0 | 7 | 0.7 | -0.1 | -0.2 |
| Hazeldean J451 | 23 | 296 | -4 | 0.0 | -2 | -0.6 | 0.1 | 0.5 |
| Hazeldean J461 | 10 | 308 | 1 | -0.7 | -4 | 2.5 | 0.1 | -3.6 |
| Hazeldean K110 | 12 | 299 | 8 | -0.9 | -1 | 1.6 | 0.0 | -2.8 |
| Hazeldean K473 | 15 | 358 | 14 | 0.0 | 8 | 2.4 | 0.2 | -1.4 |
| Hazeldean K583 | 10 | 362 | -16 | -0.2 | -10 | -1.3 | 0.2 | 4.0 |
| Hazeldean K584 | 11 | 363 | -34 | -0.1 | -20 | -3.7 | -0.1 | 1.1 |
| Hazeldean K597 | 10 | 364 | -24 | -0.5 | -16 | -2.2 | 0.0 | -0.4 |
| Hazeldean K614 | 11 | 359 | 9 | 0.3 | 7 | 0.2 | 0.2 | -6.5 |
| Hazeldean K650 | 15 | 356 | 0 | 0.4 | 3 | -1.4 | 0.0 | 5.8 |
| Hazeldean K670 | 13 | 357 | 8 | 1.2 | 12 | 2.5 | 0.1 | 2.2 |
| HB 0719 | 15 | 337 | -25 | 2.2 | 0 | 1.6 | -0.2 | -1.6 |
| HB J19 | 19 | 338 | 9 | -0.3 | 3 | 2.9 | -0.1 | -2.4 |
| HB K186 | 27 | 339 | 0 | -0.4 | -3 | -0.6 | -0.3 | 3.4 |
| HB L24 | 7 | 343 | 7 | -0.3 | 2 | 1.5 | 0.0 | 1.8 |
| Innesdale Jarrah J141 | 19 | 279 | 9 | 0.2 | 6 | -1.9 | -0.2 | -1.3 |
| Innesdale Justice J101 | 19 | 252 | -11 | 0.3 | -4 | 0.0 | -0.2 | 0.8 |
| Innesdale King F123 | 10 | 288 | 14 | -0.8 | 3 | -0.2 | -0.3 | 2.5 |
| Kaharau Zulu 851 | 15 | 140 | -8 | -0.1 | -6 | -0.1 | -0.1 | 1.3 |
| King Country Massive U68 | 11 | 85 | -15 | -0.4 | -11 | 0.4 | -0.2 | -3.4 |
| Kingfield Kristan K16 | 11 | 388 | -27 | 0.6 | -12 | -4.1 | 0.4 | 1.5 |
| Massive 831 of Kaharau (NZE) | 14 | 86 | -13 | -0.4 | -10 | 0.4 | -0.1 | -0.3 |
| Millah-Murrah F39 | 22 | 270 | 4 | 0.1 | 3 | 0.7 | 0.4 | -2.7 |
| Millah-Murrah J59 | 8 | 382 | -13 | -0.4 | -10 | 0.2 | -0.2 | -1.3 |
| Millah-Murrah J60 | 12 | 383 | 13 | 0.9 | 13 | 1.2 | -0.1 | -0.7 |
| Millah-Murrah J76 | 10 | 381 | -3 | 0.1 | -2 | -0.4 | 0.6 | -1.3 |
| Milong H12 | 18 | 203 | 4 | 0.3 | 5 | 2.6 | -0.1 | 1.0 |
| Mordallup King B72 | 10 | 302 | 0 | -0.5 | -3 | 3.8 | 0.0 | -1.8 |
| Nanena 916 | 16 | 386 | 0 | 0.6 | 3 | -0.2 | -0.1 | -0.5 |
| Narangi Quatic | 8 | 285 | -5 | -0.2 | -4 | -2.8 | 0.5 | 2.0 |
| Narrangullen 0014 | 13 | 255 | 10 | 0.9 | 11 | 1.7 | 0.3 | -1.8 |
| Narrangullen 0024 | 12 | 249 | -8 | 0.6 | -1 | 3.4 | 0.3 | -4.8 |
| Narrangullen G13 | 7 | 371 | 26 | -0.4 | 12 | 0.4 | 0.0 | 2.7 |
| Narrangullen G5 | 8 | 372 | 10 | -0.2 | 5 | 0.0 | -0.2 | 3.3 |
| Narrangullen H1 | 8 | 369 | 7 | -0.6 | 0 | 0.8 | -0.3 | -5.3 |
| Narrangullen H13 | 9 | 370 | -7 | -0.9 | -10 | -2.2 | -0.2 | 0.7 |
| Noonee Everist | 14 | 97 | -6 | 0.1 | -3 | -2.8 | -0.2 | -0.6 |

| SIRE I.D. | M112 SIRE FEEDLOT EBVs - ANGUS NO. STEER PROGENY | SIRE CODE | # FEEDLOT LIVEWEIGHT GAIN | DRESSING PERCENTAGE | # CARCASS WEIGHT (kg) | P8 FAT COVER (mm) | MARBLING SCORE | EYE MUSCLE AREA (sq cm) |
|---|---|---|---|---|---|---|---|---|
| Paramount Ambush USA 2172 | 9 | 323 | -7 | 0.3 | -2 | -1.1 | 0.2 | 2.5 |
| Pinecreek Mr Premiere G34 | 22 | 96 | -12 | -0.3 | -9 | -2.2 | 0.1 | 1.1 |
| Pinecreek Mr Premiere H59 | 9 | 208 | 14 | 0.0 | 8 | -1.1 | 0.3 | 2.1 |
| Pinecreek Superstar | 9 | 95 | -17 | -0.7 | -14 | 1.3 | 0.2 | -2.6 |
| Pinora Destiny D41 | 14 | 29 | 0 | -0.1 | -1 | -3.2 | -0.2 | 3.1 |
| QAS Traveler 23-4 (USA) | 13 | 225 | -11 | 0.8 | -2 | -1.0 | 0.0 | -4.7 |
| R A Powerplay 501 (USA) | 27 | 227 | 9 | -0.2 | 4 | -1.3 | 0.3 | 0.7 |
| Ranui Director (Imp NZ) | 21 | 142 | -27 | 0.2 | -14 | -1.6 | -0.2 | 4.3 |
| Rito 5H7 (USA) | 18 | 219 | -6 | 0.6 | 1 | -2.6 | 0.0 | -3.8 |
| Silveiras Cartel (Imp USA) | 12 | 217 | 13 | 0.7 | 12 | -0.1 | -0.1 | 1.4 |
| Silveiras Stockbroker (USA) | 22 | 59 | 5 | -0.1 | 2 | -0.8 | -0.3 | 1.6 |
| Six Plus F102 | 7 | 247 | 2 | 0.2 | 3 | 0.8 | -0.2 | -1.1 |
| Six Plus Wampum | 9 | 248 | 17 | 0.9 | 16 | -2.4 | -0.1 | 2.5 |
| Sparta Bordeaux H67 | 29 | 145 | -2 | 1.5 | 8 | 0.8 | 0.3 | 2.8 |
| Sparta Creation 36/81 | 31 | 143 | -4 | -0.2 | -3 | 0.7 | 0.4 | -1.7 |
| Sparta E49 | 49 | 25 | 8 | -0.1 | 4 | 1.4 | 0.3 | 3.4 |
| Sparta Tornado B39 | 25 | 144 | -6 | 0.0 | -3 | -3.2 | -0.1 | -1.5 |
| Springwell 52 | 10 | 105 | -14 | -0.3 | -10 | 0.4 | -0.1 | -2.9 |
| Springwell 637 | 10 | 106 | 0 | 0.8 | 5 | -1.0 | -0.2 | 0.0 |
| Springwell 862 | 12 | 156 | 22 | -0.9 | 6 | 1.1 | 0.1 | -0.6 |
| Stonebrook X128 | 14 | 121 | -7 | -0.3 | -5 | 0.1 | -0.5 | -1.3 |
| Tadgroup D318 | 11 | 71 | 7 | 0.2 | 5 | -1.0 | 0.3 | -0.3 |
| Tadgroup E447 | 10 | 72 | -4 | -0.3 | -4 | 0.1 | -0.5 | -0.4 |
| Talooby Domino Lad | 20 | 128 | 0 | 0.2 | 1 | 3.1 | 0.1 | -0.1 |
| Talooby Embassy E12 | 22 | 130 | 11 | -0.5 | 3 | 0.4 | 0.0 | -4.1 |
| Talooby Falcon F19 | 26 | 129 | 0 | 0.4 | 3 | -0.8 | 0.1 | 0.0 |
| Talooby Finder F8 | 13 | 127 | -11 | -0.6 | -10 | -1.0 | 0.3 | -4.2 |
| Te Mania Campbell | 8 | 228 | 14 | -0.5 | 4 | 2.5 | -0.3 | -3.6 |
| Te Mania Demon | 9 | 221 | -1 | -0.6 | -5 | 0.0 | -0.3 | -1.3 |
| Te Mania E166 | 11 | 313 | 7 | 0.4 | 7 | -0.6 | -0.2 | 3.0 |
| Te Mania Emphatic | 15 | 6 | 1 | 0.2 | 2 | 1.3 | -0.4 | -1.5 |
| Te Mania Esteem E158 | 14 | 5 | 7 | -0.3 | 2 | 0.9 | 0.6 | 3.6 |
| Te Mania Fanatic F100 | 14 | 317 | 3 | 0.4 | 4 | 1.9 | -0.1 | 3.5 |
| Te Mania Farlap | 19 | 226 | -3 | 0.2 | 0 | 1.9 | -0.3 | 3.3 |
| Te Mania Farthing F151 | 13 | 122 | 10 | 0.4 | 9 | -0.9 | -0.2 | 4.0 |
| Te Mania Hackle H95 | 14 | 207 | 9 | 1.8 | 17 | 1.5 | 0.7 | 9.6 |
| Te Mania Hall H14 | 10 | 139 | -2 | -0.4 | -3 | 3.4 | -0.1 | -6.2 |
| Te Mania Harvard | 7 | 309 | 5 | -0.9 | -3 | -0.3 | -0.4 | -1.5 |
| Te Mania J150 | 10 | 334 | 5 | -0.6 | -1 | 4.0 | -0.1 | -7.5 |
| Te Mania Jock J71 | 32 | 316 | 13 | 0.4 | 10 | -1.9 | -0.6 | 8.6 |
| Te Mania Joel J31 | 24 | 278 | 7 | 0.5 | 7 | 2.6 | 0.2 | 3.2 |
| Te Mania Joseph J123 | 9 | 277 | 28 | -1.1 | 8 | 0.2 | 0.0 | -1.5 |
| Te Mania Judo J53 | 30 | 335 | -2 | -0.1 | -2 | -1.8 | 0.3 | -1.2 |
| Te Mania Kirkman K254 | 10 | 387 | -5 | 0.2 | -1 | 1.7 | 0.7 | 2.9 |
| Te Mania Knight K206 | 13 | 341 | -2 | 0.1 | 0 | 2.0 | 0.8 | -0.4 |
| Te Mania Knowledge K202 | 11 | 377 | -22 | 0.2 | -11 | 0.7 | 0.4 | 1.2 |
| Te Mania Z32 | 14 | 27 | 5 | -0.3 | 1 | 2.1 | -0.2 | 0.5 |
| The Basin Ansett SMB340 | 11 | 14 | -8 | 0.9 | 2 | -2.7 | 0.1 | 0.7 |
| Tibooburra F28 | 10 | 298 | 14 | 0.3 | 10 | -3.6 | -0.3 | 5.5 |
| Tinamba 81A 8111 | 15 | 28 | 13 | -1.3 | -1 | -0.6 | 0.2 | -2.0 |
| Tinamba Extra Power E36 | 48 | 26 | -13 | -0.2 | -8 | 2.1 | -0.4 | -1.0 |
| Tinamba Gladiator G16 | 41 | 120 | -8 | -0.2 | -6 | -0.6 | 0.0 | 4.8 |

| SIRE I.D. | M112 SIRE FEEDLOT EBVs - ANGUS NO. STEER PROGENY | SIRE CODE | # FEEDLOT LIVEWEIGHT GAIN | DRESSING PERCENTAGE | # CARCASS WEIGHT (kg) | P8 FAT COVER (mm) | MARBLING SCORE | EYE MUSCLE AREA (sq cm) |
|---|---|---|---|---|---|---|---|---|
| Tinamba Hallmark H9 | 37 | 118 | 13 | 0.5 | 10 | 1.6 | 0.2 | -8.6 |
| Tinamba J49 | 9 | 150 | 6 | 1.4 | 12 | 0.9 | 0.0 | 4.8 |
| Tinamba J75 | 8 | 151 | -7 | 1.3 | 4 | -3.4 | 0.3 | 4.3 |
| Tinamba K60 | 15 | 253 | 6 | -0.3 | 2 | 1.5 | -0.4 | -4.6 |
| Trangie Marsh H53 | 8 | 272 | -9 | 0.1 | -4 | 1.5 | -0.1 | 1.1 |
| Tulagi Z55 | 19 | 98 | -5 | 0.2 | -1 | 0.1 | 0.0 | -3.9 |
| Victoree Hallmark G7 | 31 | 119 | -7 | 0.7 | 1 | -1.4 | 0.3 | -3.1 |
| Victoree Kingston K16 | 9 | 328 | -8 | 0.6 | -1 | -1.3 | 1.0 | -1.2 |
| Wanterenui Monty 601 | 14 | 254 | -24 | 0.6 | -10 | -1.6 | -0.4 | 1.1 |
| Weeran D937 | 14 | 15 | 1 | -0.5 | -3 | 3.0 | -0.6 | -1.2 |
| Wilson Downs Bud (Imp NZ) | 8 | 229 | 46 | 0.3 | 28 | -3.1 | 0.2 | 4.1 |
| Wilson Downs Geneva | 13 | 240 | 13 | 0.4 | 10 | 1.3 | -0.3 | -1.0 |
| Ythanbrae G87 | 31 | 222 | -26 | 0.1 | -14 | 0.8 | -0.2 | -1.2 |
| Ythanbrae GC10 | 26 | 223 | 3 | 1.1 | 9 | -0.7 | 0.2 | 3.6 |
| Ythanbrae H61 | 13 | 201 | 6 | -0.4 | 1 | 0.5 | 0.1 | -4.9 |
| BREED AVERAGE | | | 274 | 56.2 | 412 | 25 | 2.6 | 81 |

*** 10/11th rib**

Accuracy estimates for the EBV's calculated are

5-10 steer progeny 55%
10-15 steer progeny 60%
15-20 steer progeny 65%

NB: No inference can be taken as to the comparative performance of the breed involved or other sires outside of this sample. The EBV's calculated for the traits measured <u>are not</u> Breedplan EBV's.

# Grain fed for 200 days

| M112 SIRE FEEDLOT EBVs - ANGUS TRAIT LEADERS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SIRE I.D. | NO. STEER PROGENY | SIRE CODE | # FEEDLOT LIVEWEIGHT GAIN | DRESSING PERCENTAGE | # CARCASS WEIGHT (kg) | P8 FAT COVER (mm) | MARBLING SCORE | EYE MUSCLE AREA (sq cm) |
| ***FEEDLOT WEIGHT GAIN*** | | | | | | | | |
| Wilson Downs Bud (Imp NZ) | 8 | 229 | 46 | 0.3 | 28 | -3.1 | 0.2 | 4.1 |
| Glen Bold Hallmark H13 | 36 | 195 | 42 | 0.6 | 28 | 0.5 | 0.6 | -0.2 |
| Blackrock Roscoe J48 | 12 | 303 | 31 | 0.1 | 18 | -0.2 | -0.1 | -3.1 |
| Te Mania Joseph J123 | 9 | 277 | 28 | -1.1 | 8 | 0.2 | 0.0 | -1.5 |
| Narrangullen G13 | 7 | 371 | 26 | -0.4 | 12 | 0.4 | 0.0 | 2.7 |
| Hazeldean 8717 | 21 | 234 | 24 | 0.9 | 20 | 4.5 | -0.2 | 0.2 |
| Springwell 862 | 12 | 156 | 22 | -0.9 | 6 | 1.1 | 0.1 | -0.6 |
| Ballanee Patriot 70 | 8 | 180 | 22 | 0.2 | 14 | 0.4 | 0.5 | 4.6 |
| Forres Hamlet H74 | 10 | 166 | 21 | -0.5 | 9 | -0.4 | -0.1 | -2.0 |
| Glen Bold Rosco H11 | 9 | 198 | 21 | 0.3 | 14 | 0.9 | 0.3 | -3.8 |
| | | | | | | | | |
| ***DRESSING PERCENTAGE*** | | | | | | | | |
| HB 0719 | 15 | 337 | -25 | 2.2 | 0 | 1.6 | -0.2 | -1.6 |
| Te Mania Hackle H95 | 14 | 207 | 9 | 1.8 | 17 | 1.5 | 0.7 | 9.6 |
| Sparta Bordeaux H67 | 29 | 145 | -2 | 1.5 | 8 | 0.8 | 0.3 | 2.8 |
| Hazeldean J30 | 7 | 306 | -7 | 1.4 | 5 | -3.2 | 0.0 | 4.3 |
| Tinamba J49 | 9 | 150 | 6 | 1.4 | 12 | 0.9 | 0.0 | 4.8 |
| Tinamba J75 | 8 | 151 | -7 | 1.3 | 4 | -3.4 | 0.3 | 4.3 |
| Hazeldean K670 | 13 | 357 | 8 | 1.2 | 12 | 2.5 | 0.1 | 2.2 |
| Glen Bold Powerpack E27 | 17 | 193 | -2 | 1.2 | 6 | 2.7 | 0.0 | 0.9 |
| Ythanbrae GC10 | 26 | 223 | 3 | 1.1 | 9 | -0.7 | 0.2 | 3.6 |
| Four M Mr. A | 15 | 1 | -16 | 1.1 | -2 | -1.0 | 0.0 | 1.2 |
| Beniagh H1 | 11 | 200 | 6 | 1.0 | 9 | -0.8 | 0.1 | -1.4 |
| The Basin Ansett | 11 | 14 | -8 | 0.9 | 2 | -2.7 | 0.1 | 0.7 |
| | | | | | | | | |
| ***CARCASS WEIGHT*** | | | | | | | | |
| Wilson Downs Bud (Imp NZ) | 8 | 229 | 46 | 0.3 | 28 | -3.1 | 0.2 | 4.1 |
| Glen Bold Hallmark H13 | 36 | 195 | 42 | 0.6 | 28 | 0.5 | 0.6 | -0.2 |
| Hazeldean 8717 | 21 | 234 | 24 | 0.9 | 20 | 4.5 | -0.2 | 0.2 |
| Blackrock Roscoe J48 | 12 | 303 | 31 | 0.1 | 18 | -0.2 | -0.1 | -3.1 |
| Te Mania Hackle H95 | 14 | 207 | 9 | 1.8 | 17 | 1.5 | 0.7 | 9.6 |
| Six Plus Wampum | 9 | 248 | 17 | 0.9 | 16 | -2.4 | -0.1 | 2.5 |
| Glen Bold Rosco H11 | 9 | 198 | 21 | 0.3 | 14 | 0.9 | 0.3 | -3.8 |
| Ballanee Patriot 70 | 8 | 180 | 22 | 0.2 | 14 | 0.4 | 0.5 | 4.6 |
| Millah-Murrah J60 | 12 | 383 | 13 | 0.9 | 13 | 1.2 | -0.1 | -0.7 |
| Tinamba J49 | 9 | 150 | 6 | 1.4 | 12 | 0.9 | 0.0 | 4.8 |
| Silveiras Cartel (Imp USA) | 12 | 217 | 13 | 0.7 | 12 | -0.1 | -0.1 | 1.4 |
| | | | | | | | | |
| ***P8 FAT DEPTH*** | | | | | | | | |
| Kingfield Kristan K16 | 11 | 388 | -27 | 0.6 | -12 | -4.1 | 0.4 | 1.5 |
| Hazeldean K584 | 11 | 363 | -34 | -0.1 | -20 | -3.7 | -0.1 | 1.1 |
| Tibooburra F38 | 10 | 298 | 14 | 0.3 | 10 | -3.6 | -0.3 | 5.5 |
| Tinamba J75 | 8 | 151 | -7 | 1.3 | 4 | -3.4 | 0.3 | 4.3 |
| Barwidgee Elite 61 | 15 | 16 | -4 | 0.1 | -2 | -3.4 | -0.1 | 1.3 |
| Sparta Tornado B39 | 25 | 144 | -6 | 0.0 | -3 | -3.2 | -0.1 | -1.5 |

| | | | M112 SIRE FEEDLOT EBVs - ANGUS TRAIT LEADERS | | | | | |
|---|---|---|---|---|---|---|---|---|
| SIRE I.D. | NO. STEER PROGENY | SIRE CODE | # FEEDLOT LIVEWEIGHT GAIN | DRESSING PERCENTAGE | # CARCASS WEIGHT (kg) | P8 FAT COVER (mm) | MARBLING SCORE | EYE MUSCLE AREA (sq cm) |
| Pinora Destiny D41 | 14 | 29 | 0 | -0.1 | -1 | -3.2 | -0.2 | 3.1 |
| Hazeldean J30 | 7 | 306 | -7 | 1.4 | 5 | -3.2 | 0.0 | 4.3 |
| Wilson Downs Bud (Imp NZ) | 8 | 229 | 46 | 0.3 | 28 | -3.1 | 0.2 | 4.1 |
| Hazeldean H14 | 8 | 183 | 1 | 0.2 | 2 | -3.0 | 0.2 | 4.6 |
| Cobble Pond Yankee | 10 | 58 | -8 | -0.9 | -10 | -2.9 | 0.7 | -0.6 |
| Noonee Everist | 14 | 97 | -6 | 0.1 | -3 | -2.8 | -0.2 | -0.6 |
| | | | | | | | | |
| *MARBLING* | | | | | | | | |
| Victoree Kingston K16 | 9 | 328 | -8 | 0.6 | -1 | -1.3 | 1.0 | -1.2 |
| Te Mania Knight K206 | 13 | 341 | -2 | 0.1 | 0 | 2.0 | 0.8 | -0.4 |
| Te Mania Hackle H95 | 14 | 207 | 9 | 1.8 | 17 | 1.5 | 0.7 | 9.6 |
| Cobble Pond Yankee | 10 | 58 | -8 | -0.9 | -10 | -2.9 | 0.7 | -0.6 |
| Te Mania Kirkman K254 | 10 | 387 | -5 | 0.2 | -1 | 1.7 | 0.7 | 2.9 |
| Coolana Poundmaker B27 | 10 | 17 | -2 | -0.3 | -3 | -2.3 | 0.7 | -1.9 |
| Millah-Murrah J76 | 10 | 381 | -3 | 0.1 | -2 | -0.4 | 0.6 | -1.3 |
| Te Mania Esteem E158 | 14 | 5 | 7 | -0.3 | 2 | 0.9 | 0.6 | 3.6 |
| Glendowner Evolution H28 | 7 | 212 | 2 | -0.4 | -1 | 2.4 | 0.6 | -3.8 |
| Glen Bold Hallmark H13 | 36 | 195 | 42 | 0.6 | 28 | 0.5 | 0.6 | -0.2 |
| | | | | | | | | |
| *EYE MUSCLE AREA* | | | | | | | | |
| Te Mania Hackle H95 | 14 | 207 | 9 | 1.8 | 17 | 1.5 | 0.7 | 9.6 |
| Te Mania Jock J71 | 32 | 316 | 13 | 0.4 | 10 | -1.9 | -0.6 | 8.6 |
| Hazeldean 8761 | 19 | 235 | -8 | -0.3 | -6 | -2.4 | 0.0 | 6.1 |
| Hazeldean K650 | 15 | 356 | 0 | 0.4 | 3 | -1.4 | 0.0 | 5.8 |
| Tibooburra F38 | 10 | 298 | 14 | 0.3 | 10 | -3.6 | -0.3 | 5.5 |
| Ballangeich L117 | 16 | 342 | -4 | 0.3 | 0 | 0.5 | 0.2 | 5.4 |
| Tinamba J49 | 9 | 150 | 6 | 1.4 | 12 | 0.9 | 0.0 | 4.8 |
| Tinamba Gladiator G16 | 41 | 120 | -8 | -0.2 | -6 | -0.6 | 0.0 | 4.8 |
| Ballanee Patriot 70 | 8 | 180 | 22 | 0.2 | 14 | 0.4 | 0.5 | 4.6 |
| Hazeldean H14 | 8 | 183 | 1 | 0.2 | 2 | -3.0 | 0.2 | 4.6 |
| Brookfield Park D16 | 12 | 271 | 0 | -0.3 | -2 | -2.7 | 0.2 | 4.6 |
| Hazeldean J30 | 7 | 306 | -7 | 1.4 | 5 | -3.2 | 0.0 | 4.3 |

*** 10/11th rib**

Accuracy estimates for the EBV's calculated are

5-10 steer progeny 55 %
10-15 steer progeny 60 %
15-20 steer progeny 65 %

NB: No inference can be taken as to the comparative performance of the breed involved or other sires outside of this sample. The EBV's calculated for the traits measured <u>are not</u> Breedplan EBV's.

# Grain fed for 200 days

| SIRE I.D. | NO. STEER PROGENY | SIRE CODE | # FEEDLOT LIVEWEIGHT GAIN | DRESSING PERCENTAGE | # CARCASS WEIGHT (kg) | P8 FAT COVER (mm) | MARBLING SCORE | EYE MUSCLE AREA (sq cm) |
|---|---|---|---|---|---|---|---|---|
| | | M112 SIRE FEEDLOT EBVs - HEREFORD | | | | | | |
| Academy Pharoah J24 | 10 | 365 | 1 | -0.5 | -3 | 2.4 | 0.3 | -3.8 |
| Amir Dillon | 22 | 83 | 8 | -0.6 | 0 | 0.0 | -0.1 | 4.8 |
| Amir Duncan | 8 | 168 | 7 | -0.1 | 4 | -2.3 | -0.1 | -1.9 |
| Amir Edgar | 7 | 167 | 13 | 0.5 | 11 | -2.3 | 0.1 | -0.6 |
| Amir HB1 | 14 | 30 | -18 | 0.5 | -8 | 2.2 | -0.4 | 0.5 |
| Amir HB2 | 10 | 87 | 2 | -0.5 | -2 | 0.0 | 0.1 | 4.9 |
| Amir HB3 | 8 | 169 | 20 | 0.3 | 13 | -3.0 | -0.2 | -1.6 |
| Amir Menzies | 13 | 31 | 2 | 0.6 | 5 | 2.9 | 0.8 | -1.6 |
| Benoni Rebate | 7 | 116 | 5 | 0.3 | 5 | 1.2 | 0.1 | 1.8 |
| Charnock Fulham | 11 | 46 | -13 | 0.0 | -7 | -2.3 | 0.0 | 0.5 |
| Coora Ottawa A1 | 13 | 10 | 19 | 1.2 | 19 | 2.8 | -0.3 | 3.9 |
| Courallie Kalamazoo K326 | 10 | 366 | 3 | -0.2 | 0 | 2.4 | 0.0 | 2.8 |
| Crystal Creeks 4146 | 15 | 64 | 0 | -0.8 | -5 | 0.2 | 0.2 | -0.5 |
| Dunoon Ceres K166 | 15 | 389 | -39 | 0.2 | -21 | 1.3 | 0.2 | -3.0 |
| Dunoon Cunnamulla | 19 | 390 | 2 | 0.5 | 4 | -1.0 | -0.2 | 3.2 |
| Fassifern Macmillan | 10 | 76 | 1 | 0.9 | 6 | 0.8 | -0.2 | -0.7 |
| Glentrevor Omen | 10 | 9 | 7 | -0.1 | 3 | -0.7 | -0.1 | -0.4 |
| Glentrevor Velour | 15 | 185 | -28 | -0.8 | -21 | -1.6 | -0.2 | -4.1 |
| Glentrevor Worker | 14 | 63 | 2 | 0.9 | 7 | 0.0 | -0.3 | 0.4 |
| Injemira Jamaica | 10 | 69 | 5 | -0.3 | 1 | 0.0 | -0.1 | -0.9 |
| Injemira Outback | 12 | 68 | -7 | 0.5 | 0 | -2.3 | 0.0 | 6.6 |
| Invermate Lidell | 12 | 77 | -2 | -0.9 | -7 | -1.0 | 0.2 | -2.2 |
| Karachi Index | 14 | 92 | 6 | 0.2 | 5 | 1.1 | -0.1 | -1.4 |
| Lana Lionel 31 | 21 | 45 | 2 | 0.4 | 4 | 0.7 | 0.0 | 2.7 |
| Lana Mark | 7 | 170 | 24 | 0.1 | 14 | -0.6 | -0.2 | -2.1 |
| Landillo Findlow | 10 | 84 | 11 | -0.1 | 6 | -2.4 | 0.0 | 0.9 |
| Lowestoft Jasper | 11 | 111 | 2 | 0.2 | 2 | 1.4 | 0.0 | 1.9 |
| Lowestoft Joker | 8 | 113 | 7 | -0.6 | 0 | 1.4 | 0.0 | -2.2 |
| Myrna Downs H45 | 15 | 8 | 10 | -0.3 | 3 | 1.6 | -0.1 | 0.3 |
| Nareen 82/307 | 9 | 12 | 13 | 0.5 | 11 | 3.0 | 0.3 | -1.7 |
| Nareen 83/165 | 11 | 13 | -41 | 1.0 | -17 | -4.9 | 0.1 | 0.6 |
| Nareen 84/161 | 10 | 11 | 24 | -0.9 | 7 | 3.2 | -0.2 | -1.3 |
| RH Prospector 8611251 (USA) | 11 | 186 | -31 | -0.5 | -20 | -2.9 | 0.6 | -1.0 |
| Widgiewa H116 | 12 | 314 | 14 | -0.4 | 5 | 1.6 | 0.1 | 1.7 |
| Widgiewa H132 | 8 | 315 | 7 | -0.1 | 3 | 2.7 | -0.3 | -1.5 |
| Widgiewa H271 | 20 | 188 | -30 | 0.2 | -15 | -3.2 | 0.0 | 1.6 |
| Widgiewa Ivanoff W48 | 25 | 43 | -8 | -0.6 | -8 | 1.4 | -0.1 | -1.9 |
| Widgiewa Sylvenvale Genus 16 | 15 | 44 | -9 | 0.4 | -3 | 3.8 | 0.0 | -0.2 |
| Widgiewa W59 | 14 | 187 | -14 | -0.1 | -8 | -2.9 | 0.3 | -7.2 |
| BREED AVERAGE | | | 280 | 55.1 | 400 | 25 | 1.7 | 78 |

*** 10/11th rib**

Accuracy estimates for the EBV's calculated are

5-10 steer progeny 55%
10-15 steer progeny 60%
15-20 steer progeny 65%

NB: No inference can be taken as to the comparative performance of the breed involved or other sires outside of this sample. The EBV's calculated for the traits measured <u>are not</u> Breedplan EBV's.

# Grain fed for 200 days

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | M112 SIRE FEEDLOT EBVs - POLL HEREFORD | | | | | | |
| SIRE I.D. | NO. STEER PROGENY | SIRE CODE | # FEEDLOT LIVEWEIGHT GAIN | DRESSING PERCENTAGE | # CARCASS WEIGHT (kg) | P8 FAT COVER (mm) | MARBLING SCORE | EYE MUSCLE AREA (sq cm) |
| Bowen Ebony E31 | 18 | 42 | -5 | 0.0 | -3 | 2.5 | 0.1 | -4.1 |
| Bowen Elite E17 | 10 | 93 | 15 | 0.0 | 8 | -2.9 | -0.3 | 3.5 |
| Bowen Fathom F43 | 10 | 94 | 10 | 1.0 | 12 | -0.1 | -0.1 | 2.7 |
| Bunyarra Mecedon | 11 | 65 | 4 | 0.4 | 5 | 2.6 | -0.4 | 3.6 |
| Cass Tudor Viking B52 | 9 | 41 | 13 | -0.6 | 4 | -1.0 | 0.0 | 1.0 |
| Dimbi Trent Llandillo K24 | 17 | 378 | -2 | 0.1 | 0 | 1.3 | 0.0 | -2.6 |
| Dunoon H16 | 13 | 295 | -4 | -0.6 | -6 | -0.7 | 0.3 | 3.0 |
| Emu Holes Monash F60 | 12 | 290 | -2 | 0.3 | 1 | 2.2 | 0.6 | -3.6 |
| Felton 524 (IMP USA) | 9 | 384 | 5 | -0.4 | 0 | 3.3 | -0.1 | 4.4 |
| Llandillo Kowboy K18 | 18 | 379 | 3 | -0.2 | 1 | 1.0 | 0.1 | -0.7 |
| The Braes Coxald | 10 | 48 | -8 | 0.0 | -5 | 1.7 | 0.0 | 2.7 |
| The Braes Granite | 10 | 47 | -4 | 0.1 | -2 | -2.2 | -0.1 | -0.5 |
| Wol Bull Santiego | 11 | 66 | 19 | 0.0 | 10 | -0.1 | -0.2 | 3.3 |
| Wollbull Lachlan G91 | 11 | 291 | -23 | -0.6 | -17 | -1.9 | 0.2 | -4.1 |
| Womboyne Lancelot A71 | 14 | 39 | -4 | -0.6 | -6 | 1.7 | -0.2 | -1.5 |
| Womboyne Oregon D45 | 21 | 38 | 9 | -1.0 | -1 | -0.4 | -0.2 | -1.7 |
| Womboyne Oslo D28 | 11 | 82 | -7 | -0.1 | -5 | -0.6 | 0.1 | -3.4 |
| Womboyne Vacant B77 | 11 | 37 | -3 | 0.8 | 4 | -3.4 | -0.4 | -0.5 |
| Yalgoo Arrow C138 | 15 | 40 | 6 | 0.9 | 10 | 0.6 | 0.5 | -1.3 |
| BREED AVERAGE | | | 282 | 55.3 | 405 | 27 | 1.9 | 79 |

*** 10/11th rib**

Accuracy estimates for the EBV's calculated are

5-10 steer progeny 55%
10-15 steer progeny 60%
15-20 steer progeny 65%

NB: No inference can be taken as to the comparative performance of the breed involved or other sires outside of this sample. The EBV's calculated for the traits measured <u>are not</u> Breedplan EBV's.

\# Grain fed for 200 days

| SIRE I.D. | NO. STEER PROGENY | SIRE CODE | # FEEDLOT LIVEWEIGHT GAIN | DRESSING PERCENTAGE | # CARCASS WEIGHT (kg) | P8 FAT COVER (mm) | MARBLING SCORE | EYE MUSCLE AREA (sq cm) |
|---|---|---|---|---|---|---|---|---|
| | | | M112 SIRE FEEDLOT EBVs - MURRAY GREY | | | | | |
| Cloverdale Dallas | 9 | 238 | -1 | -0.3 | -3 | 0.6 | -0.1 | -1.0 |
| Cloverdale Gypsum | 11 | 239 | -14 | 0.7 | -4 | -2.5 | 0.3 | 0.1 |
| Deanlaw Bojangles | 11 | 237 | 9 | -0.3 | 3 | 1.3 | -0.2 | 0.3 |
| Glen Busker | 7 | 109 | -7 | 0.0 | -4 | -0.5 | -0.1 | -2.1 |
| Glen Whittler | 11 | 88 | -14 | 0.3 | -6 | 2.3 | 0.0 | 0.8 |
| Glengarret Camelot | 13 | 67 | -18 | 1.2 | -3 | 2.0 | -0.1 | -3.4 |
| Glengarret Chester | 18 | 89 | -12 | 0.1 | -6 | -0.1 | 0.2 | 0.3 |
| Glengarret Dargo | 27 | 22 | 8 | -0.2 | 3 | 1.2 | -0.1 | 2.6 |
| Greybuck Aussie Glen 510 | 21 | 60 | 14 | 0.1 | 9 | -1.3 | -0.3 | 1.9 |
| Greybuck Glen 3837 | 10 | 3 | -8 | 0.4 | -2 | -1.2 | 0.3 | 2.3 |
| Kydrabah Detective | 24 | 33 | 14 | -0.1 | 7 | -1.3 | 0.2 | -0.7 |
| Malparara Jupitor | 10 | 81 | -7 | 0.4 | -1 | -1.6 | 0.1 | -1.7 |
| Moema Alexander | 9 | 80 | 18 | -0.4 | 7 | 1.0 | -0.3 | 2.7 |
| Orcadia Park Toyota | 32 | 4 | 15 | -0.3 | 6 | -0.4 | 0.2 | 0.1 |
| Orcadia Park Ultra-star | 10 | 182 | -7 | -0.4 | -7 | -1.0 | 0.1 | -1.3 |
| Pinemount Apex | 15 | 23 | -1 | 0.1 | 0 | -0.9 | -0.1 | 2.4 |
| Robe HB 1 | 12 | 55 | 30 | -1.3 | 8 | -0.6 | 0.3 | 1.1 |
| Robe HB 39 | 24 | 190 | -37 | 0.1 | -21 | -2.1 | -1.1 | 3.2 |
| Robe HB 41 | 32 | 54 | 14 | 1.6 | 19 | 0.9 | 0.2 | 3.0 |
| Robe HB 48 | 26 | 189 | -2 | -0.5 | -5 | 0.2 | 0.5 | -4.1 |
| Robe HB 58 | 24 | 236 | -4 | -0.1 | -3 | 0.4 | -0.3 | 0.6 |
| Robe HB F100 | 10 | 321 | -25 | -0.5 | -17 | -0.8 | 0.1 | -0.2 |
| Robe HB 128 | 19 | 320 | 13 | 0.1 | 8 | -0.1 | 0.4 | -3.8 |
| Rossmar Fortune | 7 | 206 | -2 | -0.6 | -5 | -0.7 | -0.1 | -2.6 |
| Rossmar Merlin | 16 | 205 | -4 | -0.4 | -5 | 1.7 | 0.4 | 2.4 |
| Southern Cross French Horn 505 | 13 | 283 | 14 | 0.0 | 8 | 0.9 | 0.3 | 2.4 |
| The Glen Sherlock | 14 | 20 | -9 | 0.5 | -2 | 1.7 | -0.1 | 1.2 |
| The Glen Warcry 1128 | 23 | 32 | 13 | 0.0 | 7 | 1.1 | -0.2 | -0.1 |
| Vernon Park Macdhui 696 | 15 | 21 | 8 | -0.2 | 3 | 0.1 | 0.1 | -2.7 |
| Willalooka Osborne | 26 | 90 | -13 | -0.1 | -8 | 0.5 | -0.2 | -1.3 |
| BREED AVERAGE | | | 256 | 56.5 | 393 | 24 | 2.5 | 78 |

*** 10/11th rib**

Accuracy estimates for the EBV's calculated are

5-10 steer progeny 55%

10-15 steer progeny 60%

15-20 steer progeny 65%

NB: No inference can be taken as to the comparative performance of the breed involved or other sires outside of this sample. The EBV's calculated for the traits measured <u>are not</u> Breedplan EBV's.

\# Grain fed for 200 days

| | M112 SIRE FEEDLOT EBVs - SHORTHORN | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SIRE I.D. | NO. STEER PROGENY | SIRE CODE | # FEEDLOT LIVEWEIGHT GAIN | DRESSING PERCENTAGE | # CARCASS WEIGHT (kg) | P8 FAT COVER (mm) | MARBLING SCORE | EYE MUSCLE AREA (sq cm) |
| Belmore Starlight | 10 | 373 | 17 | 1.2 | 18 | 0.3 | 0.2 | 3.1 |
| Claremont 28-86 | 9 | 375 | -5 | -0.7 | -7 | 2.0 | -0.1 | -1.9 |
| Claremont L82 | 10 | 374 | 10 | 0.0 | 6 | -2.7 | -0.1 | 0.6 |
| Domino HB | 10 | 262 | -21 | -0.8 | -17 | -2.8 | 0.2 | -0.8 |
| Doolibah Alex 41st | 9 | 103 | 3 | -0.5 | -1 | 2.3 | -0.1 | -1.2 |
| Doolibah Prophet | 31 | 157 | -3 | 0.4 | 1 | -2.5 | 0.2 | 1.0 |
| Doolibah Supreme | 8 | 102 | 6 | 0.3 | 5 | 0.2 | -0.1 | 0.4 |
| Marellan Optimist | 7 | 101 | -6 | 0.6 | 0 | -3.1 | 0.1 | 0.0 |
| Marrington JR | 10 | 267 | 4 | 0.0 | 2 | -1.3 | 0.1 | 3.2 |
| Marrington League | 9 | 265 | -4 | -1.0 | -9 | 1.2 | 0.0 | -1.3 |
| Moombe Beef Baron | 10 | 266 | -12 | -0.3 | -9 | -0.7 | 0.2 | -1.3 |
| Narbrook 87/21 | 7 | 244 | 7 | 0.4 | 6 | 3.4 | 0.1 | -1.0 |
| Narbrook Corker 87/32 | 10 | 294 | -2 | 0.1 | 0 | 5.4 | -0.2 | -3.0 |
| Narbrook Profit 88/23 | 23 | 242 | -8 | 0.0 | -4 | -2.7 | 0.5 | 0.8 |
| Prophet HB | 10 | 263 | -6 | 0.4 | -1 | 1.4 | -0.1 | 2.9 |
| Springwood Station Spender | 9 | 264 | -5 | -0.2 | -4 | -1.6 | -0.1 | 3.7 |
| Stars & Stripes 10th | 12 | 241 | -6 | 0.5 | 0 | -5.6 | -0.5 | 0.1 |
| BREED AVERAGE | | | 284 | 55.9 | 412 | 25 | 2.7 | 80 |

*** 10/11th rib**

Accuracy estimates for the EBV's calculated are

5-10 steer progeny 55%
10-15 steer progeny 60%
15-20 steer progeny 65%

NB: No inference can be taken as to the comparative performance of the breed involved or other sires outside of this sample. The EBV's calculated for the traits measured <u>are not</u> Breedplan EBV's.

# Grain fed for 200 days

## APPENDIX A.2

## METHODOLOGY USED TO CALCULATE THE RELATIVE ECONOMIC VALUE OF FEEDLOT PERFORMANCE TRAITS

Detailed below is the methodology used to calculate the average increase in value per steer. Following this calculation, the average effect of increasing each trait by one unit was calculated and the difference between this and the average increase in value is considered to be the economic value of that trait.

Calculation of the feedlot profit equation

Feedlot profit was defined as the total income received from the carcass, less the costs of producing that carcass, namely, purchase costs and feedcosts. Carcass value was determined using a price grid obtained from a reputable industry source and was based on the defined meat quality criteria of marbling, meat colour and fat colour.

i.e., Feedlot Profit = Total Income (Carcass Value) - Variable costs of production (Feedcosts + Purchase costs)

*where*

Total income
= Total SMY x Carcass value (based on MARB, MC, FC)

Total variable costs of production
= Purchase costs + Feedcosts

*where*

Purchase costs
= (Entry liveweight at purchase * 1.25)

Feed costs
= (Total energy required for maintenance + Total energy required to achieve production) * Price per MJ.

Total Income

Table 1 shows the company price grid which was used to determine carcass value. The saleable meat yield price shown in table 1 allows for 2/3 of the carcass sold to Japan at full-set prices and 1/3 of the carcass receiving trimming prices.

TABLE 1 PRICE GRID USED TO DETERMINE ECONOMIC VALUE

| Marbling Level | Meat Colour Range | Fat Colour Range | Price ($/kg SMY) |
|---|---|---|---|
| Any level | > 5 | > 5 | 300 |
| Any level | ≤ 5 | ≤ 5 | 375 |
| = 1 or 2 | ≤ 3 | ≤ 3 | 425 |
| = 3 | ≤ 3 | ≤ 3 | 470 |
| ≥ 4 | ≤ 3 | ≤ 3 | 500 |

Using the measures of p8 fat depth, EMA, and cwt, SMY was calculated using the formula below: (This was supplied by Ausmeat):

$$SMY = 24.58 + (0.53x\,CWT) + (0.458x\,EMA) - (0.803x\,P8\ \text{fat})$$

Total variable costs of production

Purchase costs

The liveweight of each animal at purchase (after weaning) was record and multiplied by $1.25. There was no discrimination for the different breeds, with all breeds receiving the same average purchase price. (It is unlikely that this occurs in practice).

Feed costs

Using standardised equations for expected energy requirements, the estimated energy requirement (in MJ) was calculated for each animal. This was based on an average energy requirement for maintenance (based on the average of the feedlot exit and entry liveweights) as well as an additional requirement for the production levels which these animals were achieving. The additional requirement was based on the animals average daily gain during this period. For this phase, it was assumed that feed costs were $150 / tonne as feed and that the feed had an ME of 11 MJ/kg. Thus, the cost per MJ was 0.15/11 = $0.0136.

No account was made of differences between animals for efficiency of utilisation of energy and the amount of fat and the relative inefficiency of converting feed to fat. However, it is important to include estimated feed costs in a profit equation such as this, so as not to give too high a weighting to animals which grow faster, as these have a higher cost in terms of energy requirements.

Calculation of the relative economic value for each trait

From the above profit equation, the average increase in value per steer (over the whole dataset) could be calculated. If one trait at a time was allowed to increase by one unit, the difference between the increase in value will be the relative economic value for the trait.

For example, suppose the average increase in value per steer is $100 for the data set as it is currently. If we increase eye muscle area by 1 sq cm, there will be a higher proportion of SMY, resulting in an increase in value over that calculated previously. Suppose this increase in value is $105. The difference between these two values is the relative economic value for that trait. (i.e., $105-$100 = $5). Thus, the value of one sq cm of EMA is $5.

Using this principle, all the traits were increased by one unit and their relative economic value was calculated.

Results

The relative economic value for each of the traits is shown in table 2. In order to examine the relative merits of each trait, the economic value was multiplied by the difference between the top and bottom ebv for that trait . This example provides an extreme example for the relative values of each trait. To make this example more realistic, the relative economic value has been multiplied by the difference in ebv between the top 20 % and the bottom 20 % of bulls.

TABLE 2 ECONOMIC WEIGHTS AND RELATIVE VALUE OF EACH TRAIT FOR A MARBLED MARKET

| | Economic Value | Relative Economic Value |
|---|---|---|
| | Marbled Market | Top 20% and the Bottom 20% of Bulls |
| FADG | 144.9 | 24.36 |
| Dressing Percentage | 15.62 | 24.20 |
| Eye Muscle Area | 2.02 | 17.50 |
| p8 Fat Depth | -3.53 | 18.00 |
| Marbling | 48.27 | 37.65 |
| Fat Colour | -7.95 | 2.27 |
| Meat Colour | -13.34 | 1.22 |

As can be observed from this table, although FADG has the highest economic value, since there is a small amount of variation between the bulls for this trait, when the economic for each trait is multiplied by the range in ebv, marbling becomes the most valuable trait. However, even though the economic value for EMA is low ($2.40), because there is a large variation between the top performing bulls and the low performing bulls, it assumes a higher economic value. Although marbling is the most important trait in this equation, the importance of the saleable meat yield traits (EMA, p8fat and dressing percentage) should not be overlooked.

Using a similar approach to that used above, economic values were calcualated using no premiums for marbling. The results of this can be observed in table 3, below.

TABLE 3 ECONOMIC WEIGHTS AND THE RELATIVE VALUE OF EACH TRAIT FOR A NON-MARBLED MARKET

| | Economic Value | Relative Economic Value |
|---|---|---|
| | Non-Marbled Market | Top 20% and the Bottom 20% of Bulls |
| FADG | 132.1 | 22.46 |
| Dressing Percentage | 15.01 | 23.27 |
| Eye Muscle Area | 1.94 | 16.82 |
| p8 Fat Depth | -3.39 | 17.29 |
| Marbling | 0 | 0 |
| Fat Colour | -8.53 | 1.45 |
| Meat Colour | -6.18 | 0.93 |

Calculating the index

Using the above sets of economic weights, if we multiply the ebv of a bull for each trait by the respective economic weight, and add these, we can create an index value for each bull for both a marbled market and a non-marbled market. Using this index, we can rank the bulls on their potential to produce high quality carcasses for the Japanese market.

Ranking the bulls on this index shows the relative value of bulls and the potential of their progeny to produce high value carcasses, based on the combination of their breeding values for each of the traits. The range value of the index for each of the bulls is shown in table 4.

TABLE 4 RANGE IN INDEX VALUES FOR THE ANGUS BULLS EVALUATED IN THIS TRIAL

| | Difference between the top and bottom ranked bull | Difference between the top and bottom 5% of bulls | Difference between the top and bottom 20% of bulls |
|---|---|---|---|
| Marbled market | 136.83 | 97.63 | 66.18 |
| Non-marbled market | 93.28 | 70.64 | 47.84 |

Using the results from table 4, we can see that the difference in average economic value between the top and bottom 5% of bulls is \$97.63 for the marbled market and \$70.64 for the non-marbled market. Since these values are the sum of the ebvs multiplied by their respective economic values, we can calcuate the relative value of each trait in the determining the value of the bulls. This is shown in table 5.

TABLE 5 RELATIVE VALUE OF EACH TRAIT IN DETERMINING THE INDEX (using angus data only)

| Trait | Proportion of trait contributing to the total index | |
|---|---|---|
| | Marbled market | Non-marbled market |
| Marbling | 42% | 0 % |
| Dressing Percentage | 18 % | 34 % |
| Feedlot ADG | 16 % | 20 % |
| Eye Muscle Area | 12 % | 30 % |
| p8 Fat Depth | 12 % | 16 % |
| Meat Colour | 0.0012 % | 0.0003 % |
| Fat Colour | 0.0051 % | 0.0028 % |

## APPENDIX A.3

**Vendor correlations between traits measured *n = 4593***

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| FLENTLWT | | | | | | | | |
| FLWTEXIT | 0.84±0.03 | | | | | | | |
| FLWTGAIN | -0.23±0.08 | 0.33±0.08 | | | | | | |
| FADG | -0.25±0.08 | 0.32±0.08 | 1.00±0.004 | | | | | |
| CWT | 0.83±0.03 | 0.97±0.01 | 0.29±0.08 | 0.29±0.08 | | | | |
| DP | 0.22±0.09 | 0.17±l.09 | -0.08±0.10 | -0.03±0.10 | 0.40±0.08 | | | |
| P8FAT | 0.32±0.08 | 0.30±0.08 | -0.01±0.10 | 0.03±0.10 | 0.23±0.08 | -0.17±0.10 | | |
| EMA | 0.37±0.08 | 0.41±0.08 | 0.09±0.10 | 0.09±0.10 | 0.45±0.07 | 0.30±0.09 | -0.29±0.09 | |
| MARBLING | 0.38±0.08 | 0.28±0.09 | -0.16±0.10 | -0.16±0.10 | 0.31±0.09 | 0.18±0.11 | -0.07±0.10 | 0.14±0.10 |
| | FLENTLWT | FLWTEXIT | FLWTGAIN | FADG | CWT | DP | P8FAT | EMA |

# APPENDIX A.3

## Genetic correlations between the measured traits *n=4593*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| FLENTLWT | | | | | | | | |
| FLWTEXIT | 0.82±0.05 | | | | | | | |
| FLWTGAIN | 0.20±0.15 | 0.72±0.08 | | | | | | |
| FADG | 0.25±0.15 | 0.77±0.08 | 1.01±0.02 | | | | | |
| CWT | 0.81±0.05 | 0.96±0.01 | 0.66±0.09 | 0.76±0.08 | | | | |
| DP | 0.29±0.14 | 0.24±0.14 | 0.05±0.16 | 0.27±0.18 | 0.50±0.11 | | | |
| P8FAT | -0.01±0.13 | 0.09±0.13 | 0.17±0.14 | 0.21±0.15 | 0.03±0.12 | -0.17±0.14 | | |
| EMA | 0.22±0.13 | 0.14±0.13 | -0.03±0.15 | 0.00±0.15 | 0.26±0.11 | 0.45±0.13 | -0.43±0.13 | |
| MARBLING | 0.00±0.15 | 0.17±0.14 | 0.30±0.16 | 0.47±0.16 | 0.20±0.13 | 0.16±0.16 | -0.01±0.14 | -0.11±0.14 |
| | FLENTLWT | FLWTEXIT | FLWTGAIN | FADG | CWT | DP | P8FAT | EMA |

## APPENDIX A.3

**Residual correlations between the traits measured, *n=4593***

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| FLENTLWT | | | | | | | | |
| FLWTEXIT | 0.66 | | | | | | | |
| FLWTGAIN | 0.004 | 0.76 | | | | | | |
| FADG | 0.05 | 0.70 | 0.89 | | | | | |
| CWT | 0.65 | 0.92 | 0.66 | 0.58 | | | | |
| DP | 0.06 | -0.07 | -0.15 | -0.21 | 0.32 | | | |
| P8FAT | 0.15 | 0.27 | 0.22 | 0.16 | 0.27 | 0.05 | | |
| EMA | 0.20 | 0.29 | 0.21 | 0.19 | 0.36 | 0.21 | -0.05 | |
| MARBLING | 0.04 | 0.07 | 0.05 | 0.03 | 0.08 | 0.03 | 0.06 | -0.0002 |
| | FLENTLWT | FLWTEXIT | FLWTGAIN | FADG | CWT | DP | P8FAT | EMA |

## APPENDIX A.4

## SOUTHERN AUSTRALIAN SIRE TRIAL- SUMMARY OF THE SIGNIFICANCE OF BREED, SIRE, VENDOR, INTAKE GROUP AND HOSPITAL EFFECTS ON GROWTH AND CARCASS TRAITS

| | BREED | SIRE | VENDOR | INTAKE GROUP | HOSP |
|---|---|---|---|---|---|
| Grow-out Phase | | | | | |
| Grow-out entry Liveweight | N | Y | Y | Y | - |
| Grow-out ADG | Y | Y | Y | Y | - |
| Feedlot Phase | | | | | |
| Entry Liveweight | Y | Y | Y | Y | N |
| Exit Liveweight | Y | Y | Y | Y | Y |
| Weight Gain | Y | Y | Y | Y | Y |
| Average Daily Gain | Y | Y | Y | Y | Y |
| Carcass Weight | Y | Y | Y | Y | Y |
| Eye Muscle Area | Y | Y | Y | Y | N |
| Dressing Percentage | Y | Y | N | Y | N |
| p8 Fat Depth | Y | Y | Y | Y | N |
| Marbling | Y | Y | Y | Y | N |
| Meat Colour | N | N | N | Y | N |
| Fat Colour | Y | N | Y | Y | N |

Y= P< .05
N=P>.05

**APPENDIX A.5**

## TECHNICAL REPORT

# Investigation of results from the M112 Project (sire evaluation)

David Johnston, Hans-Ulrich Graser and Mike Goddard

Animal Genetics and Breeding Unit, UNE, Armidale

### SUMMARY

The recent publication of M112 EBVs for feedlot traits and the ensuing press releases and public statements has lead to a worrying interpretation that BREEDPLAN EBVs are a poor if not useless predictor of feedlot performance. We strongly disagree with this interpretation and to the contrary have shown, based on the M112 results, that BREEDPLAN EBVs are in fact good predictors of some of the feedlot traits. Our work has clearly shown the accuracies of the M112 EBVs are low (less than 60%) as are the accuracies on the BREEDPLAN EBVs for many of the bulls used and this fact alone has lead to the apparently poor correlation between the two sets of EBVs. In addition, certain design limitations of the M112 project have resulted in the actual accuracies being much less than 60% and therefore the EBV results are not suitable to use as a benchmark for comparing other genetic evaluation systems, such as BREEDPLAN.

## 1.0 Introduction

This study investigated possible reasons for the apparent lack of correlation between BREEDPLAN EBVs and those produced from the M112 project. Also investigated were claims that the M112 trial has proven BREEDPLAN EBVs for growth traits "... *are not an accurate guide to the performance of bullocks being finished in feedlots....*" and for scan carcase traits that "..*it is a virtual waste of time scanning bulls...*".

## 2.0 Methods

Angus data from the M112 Project were used to examine several factors that may have contributed to the apparent disparity between their results and conclusions and BREEDPLAN EBVs. The data consisted of a reduced records file, M112 EBVs and BREEDPLAN growth and scan EBVs (for most, but not all sires). Several preliminary analyses conducted investigated questions of linkage and accuracies of the EBVs. Further analyses regarding correlations and regressions between M112 results and BREEDPLAN EBVs were performed. Finally several BLUPs investigated possible data structure effects on the prediction of EBVs. In all instances relationships between sires that may have existed were not considered.

## 3.0 Results

### 3.1 Accuracy of M112 EBVs

The accuracy of the M112 EBV is crucial in allowing assessment of their usefulness as a tool for selection and as a for benchmark for comparing other systems, such as BREEDPLAN. Several key statistics estimated from the data allowed an approximate accuracy be computed.

#### 3.1.1 Linkage

Linkage of the M112 data helped quantify data structure. Linkage or connectedness was determined for the entire dataset by grouping sires that had contemporary progeny (ie progeny in the same defined group). An iterative procedure accumulated linked sires across groups. For this study only one progeny of a sire was required for a link to be established. No genetic linkage was considered (ie sons or brothers). A total of 167 Angus sires existed in the dataset. Three different group structures were considered:

a) Intake groups (15 groups): Sires used in Intake groups 1, 4 and 16 were not linked to any other group and as a consequence their EBVs cannot (or should not) be compared to any other sires outside their group. These disconnected groups of sires comprise 30 sires out of 167 total sires.

b) Vendor (36 vendors): Many sires used in a vendor group were not linked to any other vendor group. The consequence of this in the prediction of EBVs is unknown, however vendors were modelled as a random effect in the BLUP and assumes no systematic differences in sires used by different vendors. This assumption may have been violated given some large differences that existed between vendors based on BREEDPLAN growth EBVs of the sires used. For example Vendor 36 used 2 bulls with a mean 600-d wt EBV of 11.5 kg, whereas VENDOR 68 used 5 bulls with a mean 600-d wt EBV of 51.0 kg a 39.5 kg difference.

c) Intake||Vendor (62 groups): Many sires in intake||vendor groups were unlinked (9 sires were in single sire intake||vendor groups). As well, within an intake group, sires were completely nested within vendor. Also 18 vendors (50%) were only used in one intake. This effect would have the consequence of possible problems in the partitioning of genetic and vendor effects in the BLUP prediction of EBVs.

It should be noted that the linkage analyses were only done for Angus sires. Linkage for some of the disconnected intakes was achieved through sires from other breeds.

### 3.1.2 Effective number of progeny and approximate accuracies

Approximate accuracies for the M112 feedlot gain EBVs were calculated using effective number of progeny and a heritability of 0.33 (ie. the heritability used in M112 BLUP).

The average number of progeny per sire was 12.5 (range 1-49) and effective number and accuracies were computed for 2 different group definitions, results are presented in Table 1.

Table 1: Effective number of progeny and accuracies for three different grouping methods

| Group | av. Effective number of progeny | av. accuracy | accuracy range |
|---|---|---|---|
| Intake | 11.49 | 0.68 | 0.29 - 0.89 |
| Intake\|\|Vendor | 8.23 | 0.60 | 0.00 - 0.86 |

When vendor groups were considered the number of effective progeny dropped sharply because many vendors had offspring from only 2 sires.
The average accuracy of 0.60 would be correct if there were no differences between sire groups within a vendor except for sire. However in some cases there were other differences between sire groups that were not recorded and so could not be included in the analyses. For instance, sire groups may have differed in:

- age or dam age
- management groups
- genetic merit of dams
- selection of steers within the sire group for suitability to 'longfed Jap OX'

In addition, within some intakes (the early ones) time on feed was split into at least 2 groups. The EBVs may be biased if the criteria used to split the group was based on individual performance. Finally, different abattoirs were used (after different lengths of time on feed) and may have affected carcase measurements and may explain some of lack of correlation between EBVs.

### 3.1.3 Correlation between EBVs from the same sire

To estimate the accuracy of the M112 EBVs we examined bulls that had offspring in more than one intake group. Half the offspring from each sire was treated as if they came from another bull and separate EBVs for each bull calculated. The correlation between the 2 independent EBVs for the same bulls was then calculated.

A preliminary analysis that attempted to mimic the M112 evaluation for feedlot gain resulted in a correlation of 0.95 between EBVs from our analysis and those published from M112. The AGBU analysis did not take into account relationships between sires which explains the non-unity correlation. Additional BLUP runs were then done using different methods to reallocate progeny and then correlate the sire's EBVs.

a). Randomly assigning half a sire's progeny within each intake to a new phantom sire. For 38 sires the correlation between EBVs was 0.36. This is the correlation expected if each EBV had an accuracy of 0.60.

b). Assigning **all** repeat intake progeny to a new phantom sire. For 36 sires the correlation between EBVs was 0.19. If sires with less than 7 progeny in an intake group were removed the correlation dropped to zero. The low correlation indicated that biases of the type identified above (in section 2) were affecting the offspring of a sire in one intake group but different biases applied in other intake groups. This implies the real accuracy of the M112 EBVs is well below 0.60.

### 3.2 Accuracy of BREEDPLAN EBVs

The accuracy of a BREEDPLAN EBV depends on the amount of information available on the sires. Many of the bulls used were young bulls (no progeny records) and were not used in other BREEDPLAN recording herds. Therefore the accuracy of EBVs from the bulls would be low, especially if they themselves didn't have the trait recorded eg. scan traits. It could be expected that an average accuracy of young bulls would be about 60% for growth and scan traits. However some of the widely used AI sires had accuracies for all traits in the high nineties.

### 3.3 Traits analysed

The BREEDPLAN 400 and 600 day weight EBVs are based on weights recorded around this age. BREEDPLAN scan carcase traits are recorded around 450 days of age in bulls, steers and heifers. The 1994 Angus GROUP BREEDPLAN included 60401 400-d weights, 38281 600-d weights, 11784 rump and rib fats and 11771 eye muscle areas.

M112 EBVs were computed from 2094 Angus steer data. Traits included feedlot gain, dressing percentage, carcase weight gain*, carcase weight (not published), P8 fat, marbling score and eye muscle area.

* the published trait carcase weight (gain) requires careful interpretation. It is not computed from actual carcase weight. The EBV is computed using a sire's EBVs for dressing percent and feedlot gain and adjusted using trial average values for entry liveweight, feedlot gain, dressing percentage and carcase weight. Therefore the EBV is for gain in carcase weight after an average of 200 days on feed.

The BREEDPLAN traits and the M112 traits are not the same traits. That is the genetic correlation between the pairs of traits is not one. This needs to be considered when examining correlations between EBVs particularly if weights versus gains are being compared.

### 3.4 Literature estimates

Published estimates of the genetic correlation between liveweights, growth rates and carcase weights were surveyed and are presented in Table 2.

Table 2: Literature estimates of genetic correlations

| | Weaning Weight | Post weaning gain | Yearling weight | Carcase weight | Mature cow weight |
|---|---|---|---|---|---|
| Wwt | - | 0.39 | 0.78 | 0.84 | 0.66 |
| Pwg | | - | 0.81 | 0.77 | 0.10 |
| Ywt | | | - | 0.91 | 0.66 |
| Carc wt | | | | - | 0.21 |
| Mat cow wt | | | | | - |

From Koots et al. (1994)

Other reviews and studies also report correlations of around 0.4 to 0.8 between weights and gains.

### 3.5 Correlations

#### 3.5.1 M112 and Angus BREEDPLAN EBVs

Using the information regarding accuracies (M112 and BREEDPLAN) and genetic correlations between traits *expected correlations* were computed and compared to the observed correlations. Table 3 contains correlations between EBVs for all sires with both M112 and BREEDPLAN EBVs. The correlations were also calculated within a small group of sires with high accuracy BREEDPLAN EBVs and their corresponding M112 EBVs (Table 4).

Table 3: Correlations between EBVs for all sires with both M112 and BREEDPLAN

| | | M112 EBV | | | | | |
|---|---|---|---|---|---|---|---|
| BREEDPLAN EBV | Number of sires | Feedlot gain | Dressing % | Carcase weight gain (200d) | Carcase weight | Carcase EMA | Carcase Fat |
| 400-d wt | 102 | 0.23 | 0.20 | 0.29 | 0.37 | 0.05 | 0.01 |
| 600-d wt | 102 | 0.19 | 0.17 | 0.24 | 0.34 | 0.03 | -0.01 |
| 600d-400d | 102 | 0.03 | 0.05 | 0.04 | 0.14 | -0.03 | -0.06 |
| scan EMA | 59 | -0.07 | 0.21 | 0.05 | 0.04 | 0.14 | -0.14 |
| scan Fat | 59 | 0.03 | 0.01 | 0.04 | 0.07 | -0.13 | 0.22 |

The expected correlation between BP 400-d wt EBV and M112 carcase weight gain EBV is calculated as:

expected correlation = (accuracy M112 carcase weight gain EBV) x (accuracy BP 400-d EBV) x (genetic correlation between the 2 traits)

= 0.60 x 0.60 x 0.8

= **0.28**, which is close to the observed.

Table 4: Correlation between EBVs for published Angus sires and M112.

| BREEDPLAN EBV | Number of sires | M112 EBV: Feedlot gain | Dressing % | Carcase weight gain (200d) | Carcase weight | Carcase EMA |
|---|---|---|---|---|---|---|
| 400-d wt | 24 | 0.06 | 0.23 | 0.15 | 0.41 | -0.34 |
| 600-d wt | 24 | 0.02 | 0.19 | 0.10 | 0.46 | -0.34 |
| scan EMA | 15 | 0.03 | 0.40 | 0.22 | 0.51 | 0.28 |
| scan Fat | 15 | 0.23 | -0.39 | 0.02 | -0.21 | 0.00 |

Note average BP accuracies for 400-d wt, 600-d wt, scan EMA and p8 fat were 93, 90, 83 and 89 % respectively for these sires.

On the basis of the accuracies of the BREEDPLAN EBVs for these high accuracy published sires the observed correlations are higher than in Table 3 but in many cases is below the expected. Particular concern exists for the negative correlation between the BREEDPLAN growth EBVs and the M112 Carcase EMA. However the correlations between the scan and Carcase EBVs for these sires are at least slightly positive (expected about 0.50).

Correlation of EBVs was also done within the 4 connected groups. Some correlations were encouraging whilst others were not so, even negative.

### 3.5.2 BREEDPLAN and US Angus Carcase Evaluation

Correlations between EBVs of high accuracy Angus sires in both Australia and the US showed for growth traits the correlation was about 0.80 (N = 30). The correlation between eye muscle area EBVs was 0.61 (N = 10). Note this correlation is between scan eye muscle area measured at 450 days on bulls and heifers in Australia with progeny carcase eye muscle area in the US. However the correlation between Rib fat EBVs was very low (0.05, N=13).

### 3.6 Regressions

An important measure of the suitability of BREEDPLAN EBVs to predict feedlot performance is to examine the regression of phenotypic performance in the feedlot on BREEDPLAN EBVs. This eliminates any potential problems with the calculations of the M112 EBVs. Generalised least squares analyses were done for several BREEDPLAN EBVs and related phenotypic measures from M112. Included in all models was a fixed effect of intake x vendor x feed group. Analyses were weighted by the number of progeny per sire.

From Table 5 the results can be interpreted as follows: A 1kg increase in BREEDPLAN 400-d weight EBV resulted in an average difference in final liveweight in M112 progeny of 0.65 kg. Since progeny receive half their genes from their sires, we would expect a 0.5 kg increase in 400 day weight of progeny for every 1 kg increase in sire's 400-day weight EBV. Therefore the observed increase in final liveweight of 0.65 kg is very reasonable because the final weights are heavier then 400 day weights. Similar relationships existed between the other BP growth EBVs and the various measures of feedlot growth and weight.

Table 5: Average performance differences in M112 progeny for a unit BP EBV difference

| | M112 trait | | | | |
|---|---|---|---|---|---|
| BREEDPLAN EBV | Final live weight* | Actual carcase weight | feedlot gain (200d) | Carcase EMA | Carcase Fat |
| 400-d wt | 0.65 (0.16) | 0.39 (0.10) | 0.24 (0.12) | | |
| 600-d wt | 0.51 (0.12) | 0.30 (0.08) | 0.19 (0.09) | | |
| 600d-400d | | | 0.32 (0.23) | | |
| scan EMA | | | | 0.19 (0.21) | |
| scan Fat | | | | | 0.23 (0.36) |

* carcase weight x dressing percentage

The regression of EMA and fat on the corresponding BREEDPLAN EBVs are low and have large standard errors. This could be due to the lack of accuracy within the M112 data and/or poor prediction of steer carcase measurements from sire scan measurement. Fat depth in heavy weight steers and yearling bulls is very different so it is possible that the prediction of fat depth in steers from measurements on their sires is not so accurate. In addition, scan eye muscle area measurements are taken at the 12/13 rib whereas the M112 carcase eye muscle areas were taken at 5/6 rib in the early intakes (adjusted to 11/12 th) and the 11/12 rib for the rest. This may have contributed to the low regression.

It should be noted that for all these regressions big differences occurred between individual bulls however averaged over all bulls the relationship was very favourable for all the BP growth EBVs and the feedlot performance.

**4.0 Conclusions**

1) Low accuracies of both the M112 and BREDPLAN EBVs will result in low observed correlations. That is, EBVs will change as more information is added.

2) Limitations in the design of the M112 project have meant the accuracies may be less than the approximated. As well lack of linkage within breed between certain intakes means that EBVs from those sires should not be compared.

3) The M112 phenotypic results show BREEDPLAN EBVs are a good predictor of feedlot performance, particularly actual carcase weight. However discrepancies still exist for the carcase/scan traits and requires further investigation.

4) We strongly refute the claims that M112 project has demonstrated the inability of BREEDPLAN EBVs to indicate feedlot performance.

5) This study has highlighted potential problems with using data from industry 'trials' suitable for a genetic evaluation.

# PART 2 - FINAL REPORTS

## 2B NORTHERN AUSTRALIAN VENDOR TRIALS

## PERFORMANCE OF NORTHERN AUSTRALIAN STEERS GRAIN FINISHED FOR THE JAPANESE MARKET

AUTHORS
S. Baud - Baud & Associates, Bairnsdale

L. Hygate - Victorian Institute of Animal Science, Agriculture Victoria Attwood

Dr. M. Goddard - Animal Genetics & Breeding Unit, University of New England Armidale

1. BACKGROUND AND INDUSTRY SIGNIFICANCE

Liberalisation of the Japanese beef market has substantially enhanced the export market opportunities for Australian grain fed beef. The results of an earlier Meat Research Corporation project (M8A) showed that feeder steer genetics was having a major commercial influence on the Australian beef feedlot industry's international competitiveness in producing grain fed beef with regard to both price and quality. This work had focused exclusively on southern Australian cattle. To assess the capabilities of northern Australian bred steers for the Japanese (B2) grain fed beef market a study was conducted on the growth and carcass merit of steers, representative of northern Australian breeds that were grain finished for around 150 days. The steers were principally purchased from Queensland , Northern Territory and northern New South Wales beef breeding herds.

2. OBJECTIVES

(i) To assess the capabilities of northern Australian bred cattle for the Japanese (B2) grain fed beef market.

(ii) To identify other factors affecting the cost efficiency and product quality of grain fed beef production.

(iii) To facilitate the adoption of these findings by industry.

3. METHODOLOGY

3.1 FEEDER STEER GENETICS

Over 3 years, 1993-1995 inclusive feeder steers were purchased from 236 commercial beef breeding herds across the Northern Territory, Queensland and northern New South Wales and consigned to two different feedlots (Australian Meat Holdings- Beef City and a joint co-operative trial between Aronui and Kerwee feedlots). All steers were within a specified feedlot entry liveweight of 400 - 500 kg and were grainfed for the Japanese market. Table 3.1 shows the distribution of cattle across feedlots and years.

TABLE 3.1 DISTRIBUTION OF CATTLE ACROSS FEEDLOTS AND YEARS

| | Number of Cattle | | Number of Vendors | | Total | |
|---|---|---|---|---|---|---|
| | Aronui | Beef City | Aronui | Beef City | Steers | Vendors |
| 1993 | 144 | 1724 | 8 | 48 | 1868 | 56 |
| 1994 | - | 4430 | - | 137 | 4430 | 137 |
| 1995 | - | 1450 | - | 43 | 1450 | 43 |
| TOTAL | 144 | 7604 | 8 | 228 | 7748 | 236 |

Growth and carcass data were complete for 7748 steers. The range of breed types and their crosses are shown in Table 3.2. Due to the large number of breeds and their crosses the steers were place into 16 breed groups for analysis. Many vendor lines contained more than one breed or breed cross.

TABLE 3.2 BREEDS REPRESENTED IN THE STUDY

| BREED GROUP | NO OF STEERS | NO OF VENDORS | BREEDS REPRESENTED |
|---|---|---|---|
| Hereford | 1101 | 40 | |
| Shorthorn | 312 | 19 | |
| Devon | 299 | 10 | |
| British Crosses | 203 | 17 | Angus X Hereford<br>Devon X Shorthorn<br>Hereford X Shorthorn<br>Murray Grey<br>Murray Grey X Hereford<br>Shorthorn X Angus<br>Shorthorn X Devon<br>South Devon X Devon |
| European X British Crosses | 659 | 21 | Limousin X Shorthorn<br>Limousin X Devon<br>Charolais X Hereford<br>Charolais X Shorthorn<br>Saler X Devon<br>Maine Anjoue X Devon<br>Maine Anjoue X Shorthorn<br>Red Angus - Limousin X Beefmaker |
| Santa Gertrudis | 1563 | 61 | |
| Braford | 633 | 22 | |
| Droughtmaster | 266 | 10 | |
| Droughtmaster Crosses | 90 | 8 | Droughtmaster/Braford<br>Droughtmaster/Shorthorn |
| Santa X Brahman | 208 | 16 | Santa/Brahman<br>Brahman/Santa |
| Santa X British | 661 | 44 | Santa X Devon<br>Santa X Hereford<br>Santa X Angus<br>Santa X Shorthorn |
| Brahman X British | 310 | 18 | Brahman X Shorthorn<br>Brahman X Santa/Hereford<br>Brahman X Santa |

| BREED GROUP | NO OF STEERS | NO OF VENDORS | BREEDS REPRESENTED |
|---|---|---|---|
| | | | Brahman X Hereford<br>Brangus<br>Brangus X Hereford<br>Brahman X Santa/Shorthorn |
| European X Santa | 180 | 17 | Limousin/Santa<br>Saler/Santa<br>Simmental/Santa<br>Charolais/Santa<br>Maine Anjoe/Santa<br>Charolais/Simm/Angus/Santa |
| European X Brahman | 692 | 26 | Brahman/Simmental-Hereford<br>Brahman/Simmental-Santa<br>Charolais/Brahman-Charolais<br>Charolais/Simmental/Brahman<br>Charolais/Brahman<br>Saler/Brahman<br>Simbrah<br>Charbray<br>Simmental/Brahman<br>Simmental/Santa X Droughtmaster |
| High Grade Brahman | 331 | 15 | High (>70%) Brahman content |
| Belmont Red crosses | 194 | 6 | Belmont Red/Chianina<br>Belmont Red/Santa<br>Belmont Red/Shorthorn<br>Belmont Red/Shorthorn X Droughtmaster |

## 3.2 FEEDLOT MANAGEMENT

The steers were fed at either Beef City or Aronui feedlots entering September/October and exiting in February/March of each year. On entry all steers were individually weighed and received vitamin A, D & E and '5 in 1' injections. At Beef City, all steers were treated with HGP's and had dentition recorded. The steers fed at Aronui feedlot were not treated with HGP's.

Due to the large numbers of steers within intake groups at the Beef City feedlot, different pens were used for the steers. The steers at the Aronui feedlot were fed in one pen. Given the commercial constraints of the feedlot, vendors were totally confounded with pen. However, there were common breed groupings across pens. Some vendors had cattle represented in each year of the trial. The breeds and their crosses represented were similar for all years of the trial. The cattle were managed within a commercial feedlot regime for the duration of the trial at the two different feedlots each year. Unlike the sire evaluation component of the study there was no pre-trial common backgrounding phase in this trial. Steers requiring veterinary care were treated and temporarily resided in a "hospital" pen. Those animals which were treated on this basis were recorded. At the conclusion of the feeding program, the steers were individually re-weighed and hot carcass weight , p8 fat cover were recorded at slaughter. Dressing percentage was calculated as DP = CWT / $LWT_{EXIT}$. An accredited AusMeat chiller assessor recorded measurements for marbling, fat colour and meat colour within 24 hours post slaughter at the 10/11th ribsite. Eye muscle area measurements at the 10/11th ribsite were measured by one of two techniques. In the 1993 intake group, tracings of all the eye muscles were taken and the area measured using an electronic planimeter. In the 1994 and the 1995 slaughter groups, eye muscle area (EMA) was measured using AusMeat eye muscle area grids and counted squares. Feedlot differences in performance are not included in the results as this was not the purpose of the trial.

## 3.3 STATISTICAL ANALYSIS

Data from the 3 years of the trial were pooled to produce estimates of the age and breed group effects for this study. Due to the confounding of pen and vendor, various models were examined, in order to find that most appropriate. The model which gave the lowest error variance was the one which included the fixed effects of pen, vendor within pen, breed, age and hospitalisation. As year was confounded with pen, it was also not fitted in the model. Fitting pen had the effect of also fitting year. The actual days in the feedlot ranged from 138 to 167 days, due to the large number of cattle involved. The cattle at the Aronui feedlot did not have their dentition recorded, accordingly, for the purposes of analysis, the average age for the cattle at Beef City (i.e., 2.14) was given to all cattle managed at Aronui feedlot. Weight gain in the feedlot (FLWTGAIN) was calculated as the difference between $LWT_{EXIT}$ and $LWT_{ENT}$. Feedlot average daily gain (FADG) was defined as FLWTGAIN/days in the feedlot. Saleable meat yield (SMY) was calculated using an AusMeat derived equation :

$$SMY = 24.58 + (0.53 \times CWT) + (0.458 \times EMA) - (0.803 \times P8FAT).$$

From this equation, a yield grade was calculated. Yield grade (YG) was defined as the percentage of SMY to CWT, i.e., YG=SMY/CWT. Using guidelines provided by the boning room manager of the abattoir, cattle were graded either, YG1, YG2 or YG3, with YG1= YG $\geq$ 0.69, YG2= <0.69 to YG $\geq$ 0.65, YG3=YG <0.65. The meat processor's preferred specifications for carcass traits were that cattle had a marbling score of 2 or greater, a yield grade equal to or greater than 0.65 (i.e., scored YG1 & YQ2), with fat colour and meat colour less than 3. Cattle were given a meat quality grade (MQG). This was based on either meeting the specifications (MQG=1) or not meeting the specifications (MQG=0). These data were analysed as a binomial trait.

The between vendor variation, $r_v$, was expressed as the proportion the total random variation (i.e., between vendors plus between steers within vendors) i.e., $r_v = \sigma_v^2 / (\sigma_v^2 + \sigma_e^2)$. Using the above model, treating vendors as a random effect, the fixed effects of pen, breed, age/dentition and hospitalisation were calculated. From the same analysis, between vendor correlations and the residual correlations between the traits were calculated. A summary of the statistical significance of the result is provided in Appendix B.2

# 4. FINDINGS AND CONCLUSIONS

The effects of breed, vendor (property of origin), pen, and age are presented and discussed in regard to their effect on three key components of commercial feedlot performance viz., feedlot growth performance, estimated saleable meat yield and carcass quality.

## 4.1 BREED EFFECTS

Since there was no common grow-out phase, differences between breeds may be confounded with vendor effects, particularly if some breeds come from 'better' regions than others.

### 4.1.1 Feedlot Growth Performance

The average feedlot daily gain achieved was 1.50 kg/day . Table 3.3 summarises the growth performance of the steers during the feedlotting phase with regard to breed group differences. Santa Gertrudis steers had the highest growth performance and high grade Brahman steers the lowest. Other breed groups were intermediate. Figures 1.3 illustrates the variation in feedlot growth performance for the 16 breed groups.

TABLE 3.3 BREED GROUP DIFFERENCES IN FEEDLOT ENTRY LIVEWEIGHT, EXIT LIVEWEIGHT AND GROWTH PERFORMANCE

| Breed Group | Entry Liveweight (kg) | Exit Liveweight (kg) | Average Daily Gain (kg/day) |
|---|---|---|---|
| Hereford | 442 | 679 | 1.52 |
| Devon | 443 | 682 | 1.53 |
| Shorthorn | 445 | 680 | 1.51 |
| British crosses | 452 | 679 | 1.45 |
| European x British | 458 | 704 | 1.58 |
| Santa Gertrudis | 450 | 701 | 1.60 |
| Braford | 450 | 683 | 1.48 |
| Droughtmaster | 446 | 678 | 1.47 |
| Droughtmaster crosses | 441 | 673 | 1.49 |
| British x Santa | 452 | 694 | 1.55 |
| British x Brahman | 457 | 698 | 1.53 |
| European x Santa | 456 | 702 | 1.57 |
| Brahman Santa | 452 | 687 | 1.50 |
| European x Brahman | 455 | 691 | 1.50 |
| High grade Brahman | 451 | 675 | 1.43 |
| Belmont Red & crosses | 457 | 694 | 1.51 |
| Overall Average | 453 | 688 | 1.50 |

### 4.1.2 Estimated Saleable Meat Yield

Breed group differences occurred for a number of carcass traits determining saleable meat yield, namely dressing percentage, P8 fat depth and eye muscle area. Table 3.4 summarises the performance of the breed groups for carcass traits. Figure 1.3 illustrate the variation in dressing percentage, p8 fat cover and eye muscle area for the 16 breed groups.

TABLE 3.4 BREED GROUP DIFFERENCES IN CARCASS MEAT YIELD AND QUALITY TRAITS

| Breed Group | Carcass Weight (kg) | Dressing Percentage | Eye Muscle Area ($cm^2$) | p8 fat cover (mm) | Estimated Saleable Meat Yield Percentage | Fat Colour (0-10) | Meat Colour (1-10) | Marbling (1-12) |
|---|---|---|---|---|---|---|---|---|
| Hereford | 381 | 56.2 | 80 | 25 | 63.7 | 0.5 | 1.0 | 1.6 |
| Devon | 383 | 56.1 | 80 | 23 | 64.4 | 0.3 | 1.0 | 1.9 |
| Shorthorn | 383 | 56.2 | 82 | 23 | 64.5 | 0.6 | 1.0 | 2.1 |
| British crosses | 385 | 56.8 | 82 | 24 | 64.3 | 0.5 | 1.0 | 2.0 |
| European x British | 406 | 57.7 | 93 | 19 | 65.9 | 0.5 | 1.0 | 1.7 |
| Santa Gertrudis | 396 | 56.4 | 82 | 21 | 64.6 | 0.5 | 1.0 | 1.6 |
| Braford | 385 | 56.4 | 81 | 21 | 64.7 | 0.4 | 1.1 | 1.5 |
| Droughtmaster | 384 | 57.0 | 82 | 20 | 65.2 | 0.5 | 1.0 | 1.5 |
| Droughtmaster crosses | 382 | 56.7 | 81 | 21 | 64.9 | 0.6 | 1.0 | 1.5 |
| British x Santa | 392 | 56.4 | 82 | 22 | 64.5 | 0.5 | 1.0 | 1.7 |
| British x Brahman | 397 | 57.0 | 84 | 20 | 64.9 | 0.5 | 1.0 | 1.7 |
| European x Santa | 401 | 57.1 | 87 | 19 | 65.4 | 0.4 | 1.1 | 1.6 |
| Brahman x Santa | 391 | 56.8 | 82 | 21 | 64.8 | 0.3 | 1.0 | 1.6 |
| European x Brahman | 398 | 57.6 | 89 | 18 | 65.8 | 0.5 | 1.0 | 1.7 |
| High grade Brahman | 385 | 57.3 | 84 | 19 | 65.4 | 0.5 | 1.0 | 1.5 |
| Belmont Red & crosses | 393 | 56.8 | 83 | 21 | 64.8 | 0.5 | 1.0 | 1.6 |
| Overall Ave. | 391 | 56.8 | 83 | 21 | 64.9 | 0.5 | 1.0 | 1.7 |

Breed group differences in estimated saleable meat yield (using an industry derived yield equation) occurred due to the combined effect of these yield traits. Boning room yield represents that proportion of carcass weight that can be boned, packed and sold as saleable meat cuts. Using an industry derived yield equation it was estimated that the average boning room yield of saleable meat cuts as a proportion of carcass weight was 64.9%. The combined traits of carcass weight, P8 fat depth and eye muscle area were used in this equation which predicted that only 45% of the steers achieved the preferred boning room meat yield of 65% or higher. The use of European bulls on either British or Bos indicus cows increased both carcass weight and muscling and reduced carcass subcutaneous fat levels. As a consequence European/British and European/Brahman cross steers were estimated to achieve 2.2% and 2.1% respectively higher saleable meat yields than Hereford steers. Other breed groups were intermediate (Figure 1.3).

### 4.1.3 Carcass Quality

Meat and fat colour levels attained by all breed groups after 150 days on grain were all highly acceptable. Breed group differences in marbling score were significant and large from a commercial perspective. When expressed as the proportion of steers attaining an Ausmeat marble score 2 or higher (the level required to meet the Japanese B2 market specification), Shorthorn steers (84%) outperformed high grade Brahman (44%), Droughtmaster (43%) and Braford (42%) steers with the other breed groups intermediate (Figure 1.3).

## 4.2 VENDOR EFFECTS

Vendors effects were significant for all traits except meat colour. Table 3.5 provides an estimate of the total proportion of variation measured due to vendor. This varied from 2% for meat colour to 35% for feedlot entry weight. Table 3.5 also provides an estimate of the range in performances between the top and bottom 5% of vendors i.e.(+ or - 2 standard deviations from the mean of each trait). Since the sire identity of the steers in the northern Australian trial were unknown the vendor effects represent differences between vendors due to genetic differences in the cattle, environmental differences between the properties and pre feedlot management differences. Genetic differences are probably limited because each property uses a number of bulls which might vary widely in breeding values for carcass traits. Practical use of the differences between vendors depends on the extent to which they are repeatable from one purchase groups to another which could not be assessed from this study .

### 4.2.1 Feedlot Growth Performance

Feedlot growth performance varied by up to 0.56 kg/day (37 %) between the top and bottom 5% of vendors after correcting for pen and breed effects. Table 3.6 provides an estimate of the commercial value of the range in performance for each trait. Southern feedlot based sire line trials have shown that the variation in feedlot average daily gain due to vendor is much lower when vendor lines have been backgrounded together prior to the feedlotting phase. Also only part of the vendor effect is constant from one year to the next. The predictability of feedlot growth performance is substantially enhanced if feedlotters had previous performance information on both the genetics and vendor of the steers to be purchased. Therefore, to accelerate improvement in commercially important traits it is necessary to identify these sires (and cows ) that are genetically superior in the commercially important and heritable traits dictating performance.

TABLE 3.5 ESTIMATED PERFORMANCE DIFFERENCES BETWEEN THE TOP AND BOTTOM 5% OF VENDORS IN GROWTH AND CARCASS TRAITS

| Trait | Average | Top 5% of Vendors (+2 s.d.)* | Bottom 5% of Vendors (-2 s.d.)* | Range | Percentage of the total variation attributable to between vendor differences |
|---|---|---|---|---|---|
| Entry Liveweight (kg) | 453 | 491 | 415 | 76 | 35 |
| Exit Liveweight (kg) | 688 | 740 | 636 | 104 | 25 |
| Weight Gain (kg) | 236 | 278 | 194 | 84 | 26 |
| Average Daily Gain (kg/day) | 1.50 | 1.78 | 1.22 | 0.56 | 26 |
| Carcass Weight (kg) | 391 | 420 | 362 | 58 | 24 |
| Dressing Percentage | 56.8 | 57.9 | 55.7 | 2.2 | 10 |
| P8 Fat Cover (mm) | 21 | 25 | 17 | 8 | 11 |
| Eye Muscle Area (cm2) | 83 | 89 | 77 | 12 | 12 |
| Marbling | 1.7 | 2.1 | 1.3 | 0.8 | 8 |
| Meat Colour | 1.0 | 1.0 | 1.0 | 0 | 2 |
| Fat Colour | 0.5 | 0.8 | 0.2 | 0.6 | 12 |

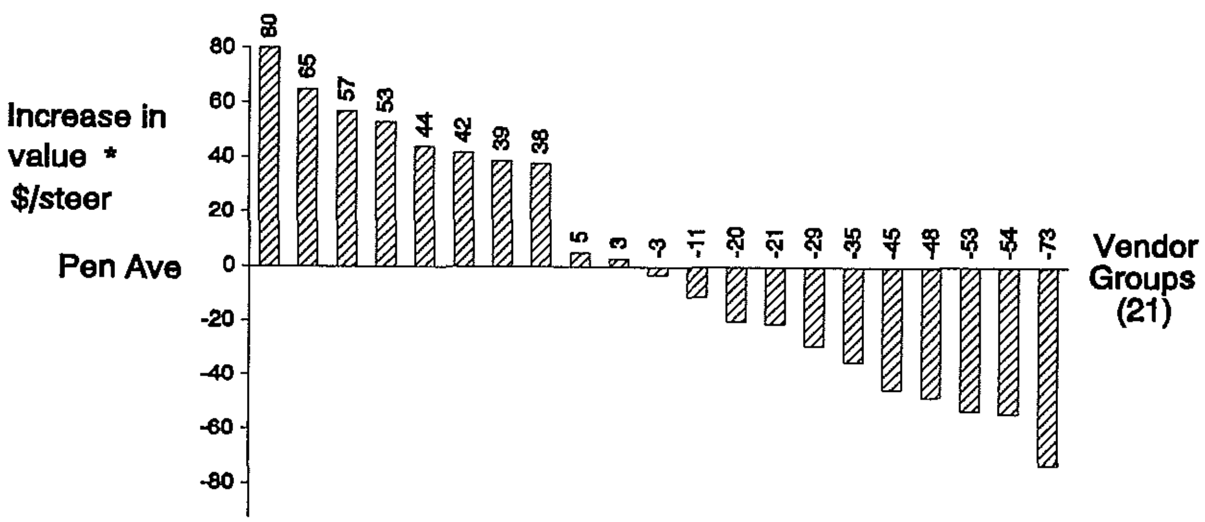
* s.d. = standard deviation

TABLE 3.6 ESTIMATED RANGE IN COMMERCIAL VALUE BETWEEN THE TOP AND BOTTOM 5% OF VENDORS FOR GROWTH AND CARCASS TRAITS ($/STEER)

| TRAIT | VENDOR RANGE | PRODUCTION GAIN (kg) | PRODUCT VALUE ($/kg) | $/HD ADVANTAGE (gross) |
|---|---|---|---|---|
| 150 Day Liveweight Gain | 84 kg | 84 kg LWT | $1.60/kg | $134 |
| Dressing Percentage | 2.2% | 15.1 kg CWT | $2.80/kg | $42 |
| p8 Fat Depth | 8 mm | 6 kg SMY | $4.20/kg | $25 |
| Eye Muscle Area | 12 $cm^2$ | 5.5 kg SMY | $4.20/kg | $23 |
| Marbling Level | 0.8 score | - | $0.50/kg/ fullset/ marble score | $68 |

Figure 3.1 illustrates the range in commercial performance estimated between 21 vendors of Santa Gertrudis steers fed at Beef City feedlot in 1994.

FIGURE 3.1 RANGE IN ESTIMATED COMMERCIAL PERFORMANCE BETWEEN 21 VENDOR LINES OF SANTA GERTRUDIS STEERS GRAIN FED FOR 150 DAYS




* Based on feedlot growth performance, estimated boning room yield and product quality grade.

### 4.2.2 Estimated Saleable Meat Yield

Differences between the top and bottom 5% of vendors in dressing percentage, carcass P8 fat depth and eye muscle area, the major traits influencing estimated saleable meat yield are presented in Table 3.5. The proportion of the total variation due to vendor is again small (12% P8 fat depth, 10% dressing percentage and 12% for eye muscle area) suggesting that selecting superior feeder steers on vendor performance alone would be slow.

### 4.2.3 Carcass Quality

Differences between highest and lowest ranking vendors for fat colour and meat colour were small. Both meat and fat colour were commercially highly acceptable for all vendors steers. Past feedlot trials have shown that both these traits are principally influenced by feedlot management and duration of feeding.

The range observed between vendors in marbling level was of greater commercial importance. Some vendors steers achieved an Ausmeat marbling score specification of 2 or higher more successfully than others. However, vendor alone is not an accurate predictor of future marbling potential. Again, southern based feedlot sire progeny trials have shown to achieve sustained improvement in this trait it is necessary to identify the sires within a breed that are genetically superior for propensity to marble.

## 4.3 AGE EFFECTS

Feeder steer age, which was assessed by dentition, had a significant effect on feedlot growth and some carcass traits.

### 4.3.1 Feedlot Growth Performance

Steers with milk teeth were lighter at feedlot entry but grew 6% (or 0.09 kg/day) faster than steers with 4 permanent teeth. Steers with 2 permanent teeth erupted were intermediate in their growth performance. There was no significant difference in feedlot exit liveweight between the different age groups of steers. Table 3.7 details the effect of age at entry (by dentition) on feedlot growth performance.

TABLE 3.7 EFFECT OF AGE (DENTITION) AT ENTRY ON FEEDLOT GROWTH PERFORMANCE AND CARCASS TRAITS

| Age | 0 | 2 | 4 | 6 |
|---|---|---|---|---|
| Number of Animals | 2578 | 3631 | 1549 | 52 |
| Entry Liveweight (kg) | 441 | 450 | 460 | 459 |
| Exit Liveweight (kg) | 688 | 690 | 692 | 684 |
| Weight Gain (kg) | 247 | 240 | 232 | 225 |
| Average Daily Gain (kg/day) | 1.57 | 1.53 | 1.48 | 1.44 |
| Carcass Weight (kg) | 390 | 391 | 393 | 388 |
| Dressing Percentage (%) | 56.7 | 56.7 | 56.8 | 56.9 |
| Eye Muscle Area ($cm^2$) | 83 | 83 | 83 | 84 |
| p8 Fat Cover (mm) | 20 | 21 | 21 | 21 |
| Fat Colour | 0.44 | 0.48 | 0.50 | 0.52 |
| Meat Colour | 1 | 1 | 1 | 1 |
| Marbling | 1.56 | 1.64 | 1.70 | 1.73 |

### 4.3.2 Estimated Saleable Meat Yield

Age at entry had no measurable effect on dressing percentage or eye muscle area. It did have a small but significant effect on P8 fat depth with milk teeth steers 1 mm leaner than 2 and 4 teeth steers at slaughter (Table 3.7).

### 4.3.3 Carcass Quality

Age at entry had no measurable effect on meat colour. It did have a small effect on both fat colour and marbling level attained. Four teeth steers achieved a 0.14 higher marbling score than milk teeth steers but had slightly yellowier (0.06 score) fat colour (Table 3.7). Two teeth steers were intermediate.

## 4.4 PEN EFFECTS

### 4.4.1 Feedlot Growth Performance

Pen effects on feedlot growth performance were significant . These differences are due in part to differences between the vendors and breeds represented in each pen, i.e., genetic differences in the steers and pre-feedlot environmental differences. However there is likely to be unintended environmental differences between pens within a feedlot that contribute to the variation measured in performance.

### 4.4.2 Estimated Saleable Meat Yield

P8 fat cover, eye muscle area and dressing percentage differences also existed between the pen groups of steers. The same reasons already outlined in 4.3.1 above are also considered to explain this result.

### 4.4.3 Carcass Quality

Fat colour, meat colour and marbling levels attained also differed between the pen groups of steers. The pen differences measured in meat and fat colour whilst statistically significant were of minor commercial value. The differences observed in marbling levels are again largely for the reasons detailed in 4.4.1.

## 4.5 CORRELATED TRAITS

Appendix B.1 provides estimates of the between vendor and phenotypic correlation co-efficients between the traits measured.

Co-efficient estimates are not provided between estimated saleable meat yield and carcass weight, P8 fat depth and eye muscle area because estimated saleable meat yield was calculated using a regression equation which included these 3 traits as variables.

## APPENDIX B.1

## VENDOR CORRELATION CO-EFFECIENTS

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Entry liveweight | 1.00 | | | | | | | | | | | |
| Exit liveweight | 0.57 | 1.00 | | | | | | | | | | |
| Weight gain | -0.20 | 0.69 | 1.00 | | | | | | | | | |
| Average Dail Gain | -0.20 | 0.67 | 0.98 | 1.00 | | | | | | | | |
| Carcass Weight | 0.61 | 0.96 | 0.61 | 0.59 | 1.00 | | | | | | | |
| Dressing Percentage | 0.14 | -0.10 | -0.25 | -0.27 | 0.16 | 1.00 | | | | | | |
| P8 Fat cover | 0.37 | 0.32 | 0.06 | 0.05 | 0.30 | -0.07 | 1.00 | | | | | |
| Eye Muscle Area | 0.32 | 0.50 | 0.32 | 0.29 | 0.61 | 0.43 | -0.02 | 1.00 | | | | |
| Marbling | 0.14 | -0.02 | -0.15 | -0.17 | -0.07 | -0.17 | 0.11 | 0.00 | -0.08 | 1.00 | | |
| Meat Colour | 0.32 | 0.08 | -0.19 | -0.20 | 0.13 | 0.16 | 0.11 | 0.07 | 0.11 | -0.17 | 1.00 | |
| Fat Colour | 0.01 | -0.05 | -0.06 | -0.06 | 0.00 | 0.17 | 0.02 | -0.15 | -0.03 | 0.23 | 0.08 | 1.00 |

## APPENDIX B.1

## PHENOTYPIC CORRELATION CO-EFFECIENTS

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Entry liveweight | 1.00 | | | | | | | | | | | |
| Exit liveweight | 0.59 | 1.00 | | | | | | | | | | |
| Weight gain | -0.04 | 0.78 | 1.00 | | | | | | | | | |
| Average Daily Gain | -0.04 | 0.78 | 0.99 | 1.00 | | | | | | | | |
| Carcass Weight | 0.58 | 0.91 | 0.68 | 0.68 | 1.00 | | | | | | | |
| Dressing Percentage | 0.03 | -0.13 | -0.19 | -0.19 | 0.28 | 1.00 | | | | | | |
| P8 Fat cover | 0.11 | 0.15 | 0.10 | 0.10 | 0.10 | -0.10 | 1.00 | | | | | |
| Eye Muscle Area | 0.22 | 0.33 | 0.24 | 0.24 | 0.43 | 0.28 | -0.10 | 1.00 | | | | |
| Marbling | 0.05 | 0.06 | 0.04 | 0.04 | 0.03 | -0.06 | 0.06 | 0.02 | 0.02 | 1.00 | | |
| Meat Colour | 0.04 | -0.03 | -0.07 | -0.07 | -0.05 | -0.05 | -0.01 | 0.01 | -0.04 | -0.05 | 1.00 | |
| Fat Colour | 0.02 | -0.05 | -0.08 | -0.07 | -0.03 | 0.03 | -0.02 | -0.02 | -0.03 | 0.04 | 0.00 | 1.00 |

# APPENDIX B.2

## NORTHERN AUSTRALIAN VENDOR TRIALS

### SUMMARY OF SIGNIFICANCE OF BREED, VENDOR, AGE, PEN AND HOSPITALEFFECTS ON GROWTH AND CARCASS TRAITS

| | BREED | VENDOR | AGE | PEN | HOSP |
|---|---|---|---|---|---|
| Entry Liveweight | Y | Y | Y | Y | N |
| Exit Liveweight | Y | Y | N | Y | Y |
| Weight Gain | Y | Y | Y | Y | Y |
| Average Daily Gain | Y | Y | Y | Y | Y |
| Carcass Weight | Y | Y | N | Y | Y |
| Eye Muscle Area | Y | Y | N | Y | Y |
| Dressing Percentage | Y | Y | N | Y | N |
| p8 Fat Depth | Y | Y | Y | Y | N |
| Marbling | Y | Y | Y | Y | N |
| Meat Colour | N | N | N | Y | N |
| Fat Colour | N | Y | Y | Y | N |

Y= P<.05

N= P>.05

# PART 2 - FINAL REPORTS

## 2C PERFORMANCE BASED LIVESTOCK TRADING SYSTEMS FOR FEEDER STEERS

### 1 BACKGROUND

Results from the M112 project has highlighted the need for Australian beef industry to improve feeder steer predictability with regard to growth, yield and meat quality traits as one of several key factors, within the constraints of the global marketplace, currently limiting export opportunities for grain fed beef in the Japanese market. A catalyst to achieve this would be the introduction of performance based livestock trading systems by feedlotters that encourages producers to more closely align their on farm breeding program to specific markets. Without such "cheque book" incentives there will continue to be too many producers breeding 19th century cattle for 20th century markets.

There is general agreement amongst both processors and producers in the principle of paying producers according to the yield and quality attributes of their cattle. However, the conversion of this principle into a practical trading system(s) that is acceptable to both parties is a more difficult task.

One of the objectives of the M112 project was to develop and implement performance based feeder steer livestock trading systems in at least 2 commercial feedlots by June 1995. Whilst all participating feedlots agreed in this concept only one, namely Australia Meat Holdings Pty Ltd actually conducted a performance based payment trial with their clients. A summary of the trial results is detailed below. Since the primary purpose was to "trial" a performance based payment sytem neither breed nor vendor identity details are reported.

### 2 PERFORMANCE PAYMENT TRIAL- BEEF CITY

### 2.1 TRIAL MANAGEMENT

The trial involved 1500 steers purchased from 44 producers across Northern Territiory, Queensland and northern New South Wales. All steers were within a specified feedlot entry liveweight of 400-500kg and were fed for the Japanese market at Beef City feedlot . The trial steers entered the feedlot in September and October 1994 and were slaughtered in March 1995.

It is important to note that A.M.H. totally managed this trial within their own resources including:

1. inviting clients to participate
2. development of the performance payment price schedule
3. collecting and collating all performance results

4. providing clients the opportunity to inspect their steers both live and as carcasses.
5. providing feedback reports to participating clients

The role of the Meat Research Corporation in this trial, represented by Stuart Baud was one of an independant auditor for the performance figures recorded and used as the basis for calculating the performance bonus payments made to participating vendors.

Performance Payment Schedule

The performance payment schedule was developed by A.M.H. livestock management and was conveyed to all potential participants in writing prior to the commencement of the trial (Appendix C.1). The payment schedule adopted opted to guarantee bonus payments to the top 70% of all steers completing the trial rather than pay bonuses only to those steers achieving the company specifications. AMH livestock management considered the former option would encourage more producers to particpate.

The payment schedule was as follows:

1. All steers complying with the feedlot induction specifcations received an initial payment of $1.00 per kg payable within AMH's normal trading terms i.e. within 10 days of delivery.

2. A performance payment payed within fourteen days of slaughter of the last lot within the total trial . The performance payment made based on individual animals and was paid as follows:

| | | | | | | |
|---|---|---|---|---|---|---|
| TOP | | | 10% OF ANIMALS | ADDITIONAL | 80 CENTS | PER KG |
| Animals between top | | | 10.1% to 20% | " | 70 | " |
| " | " | " | 20.1 % to 30% | " | 60 | " |
| " | " | " | 30.1% to 40% | " | 50 | " |
| " | " | " | 40.1% to 50% | " | 40 | " |
| " | " | " | 50.1% to 60% | " | 30 | " |
| " | " | " | 60.1% to 70% | " | 20 | " |

Animals which fell in the bottom 30% on performance did not attract an additional payment. The additional payment was based on the individual liveweight recorded at feedlot induction with the performance ranking of individual steers calculated according to the formula specified in Clause 9 of Appendix C.1.

## 2.2 RESULTS

A summary of the trial performance results in relation to each performance bonus category is provided in Table 4.1. These results highlight the variation in performance that existed between the trial steers in feedlot growth performance, carcass yield and meat quality traits and the commercial value of the performance premiums paid for individual steers in each bonus category.

TABLE 4.1 PERFORMANCE OF THE TRIAL STEERS IN RELATION TO BONUS PAYMENT CATEGORY

| Bonus Category | Top 10% | 10.1-20% | 20.1 - 30% | 30.1-40% | 40.1-50% | 50.1-60% | 60.1-70% | 70.1-100% | Trial Ave |
|---|---|---|---|---|---|---|---|---|---|
| Performance Bonus cents/kg | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 0 | |
| Total $ Bonuses Paid | 51597 | 45262 | 39234 | 32671 | 26067 | 19533 | 12914 | 0 | |
| No. of Steers | 151 | 151 | 151 | 151 | 151 | 151 | 151 | 450 | |
| Ave. Bonus $/Steer | 342 | 300 | 260 | 216 | 173 | 129 | 86 | 0 | |
| Feedlot Performance | | | | | | | | | |
| Entry weight | 428 | 428 | 433 | 433 | 432 | 431 | 428 | 434 | 431 |
| Exit weight | 729 | 678 | 666 | 662 | 663 | 667 | 662 | 662 | 672 |
| Feedlot ADG $_{(kg/day)}$ | 1.79 | 1.49 | 1.39 | 1.36 | 1.38 | 1.40 | 1.39 | 1.36 | 1.42 |
| Carcass Traits | | | | | | | | | |
| Carcass Wt $_{(kg)}$ | 406 | 390 | 383 | 378 | 381 | 385 | 387 | 375 | 384 |
| Dressing Percent | 55.7 | 57.5 | 57.5 | 57.1 | 57.5 | 57.7 | 58.5 | 56.6 | 57.3 |
| P8 fat $_{(mm)}$ | 17 | 21 | 23 | 23 | 23 | 20 | 20 | 25 | 22 |
| Marbling Level $_{10/11}$ | 2.5 | 2.2 | 2.2 | 2.0 | 1.7 | 1.3 | 1.1 | 1.0 | 1.6 |

There was also a considerable range in performance between vendors. Figures 4.1 & 4.2 illustrate the performance of the top and bottom performing vendors. After distribution of performance bonuses the differences in payments between the two vendors was 49 cents/kg liveweight or around $210 per head (Tables 4.2 and 4.3).

## 4.4 DISCUSSION

The key benefits gained from this trial were:

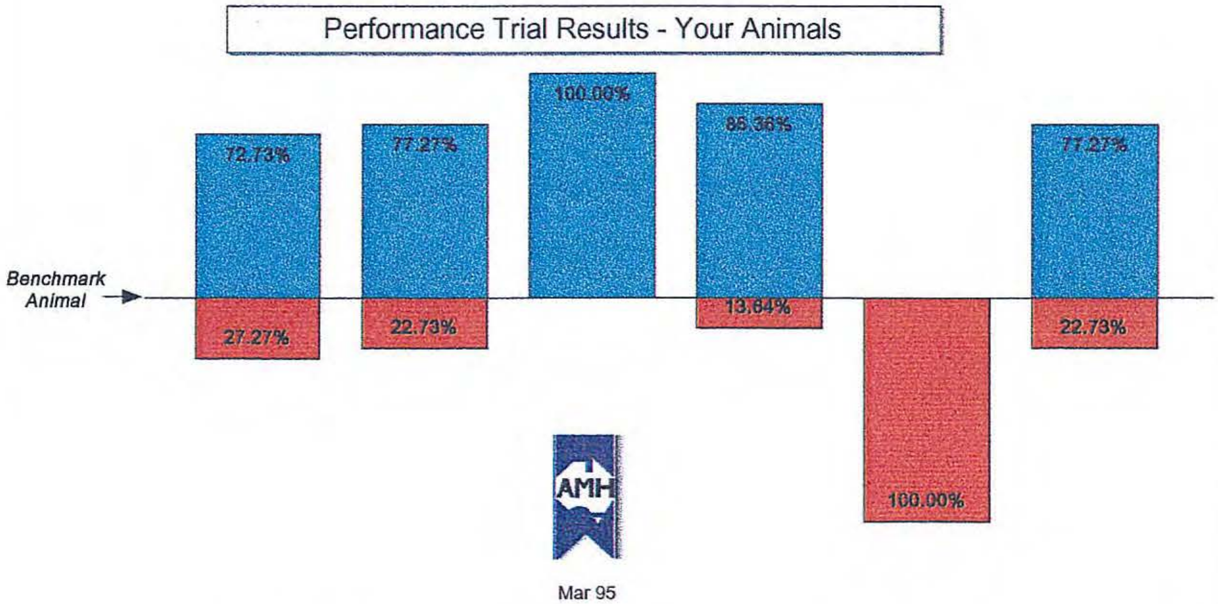
1. The trial was extremely successful in trialing the principles of performance based trading for store cattle. Personal discussions with many of the vendors participating in the trial indicated that their primary reason for being involved was both as a learning exercise about the actual commercial performance of their cattle and to support this trading system concept. Naturally, most were also keen to achieve a positive final financial outcome from their participation.

The conduct and management of the trial by AMH was extremely professional which also greatly contributed to its success.

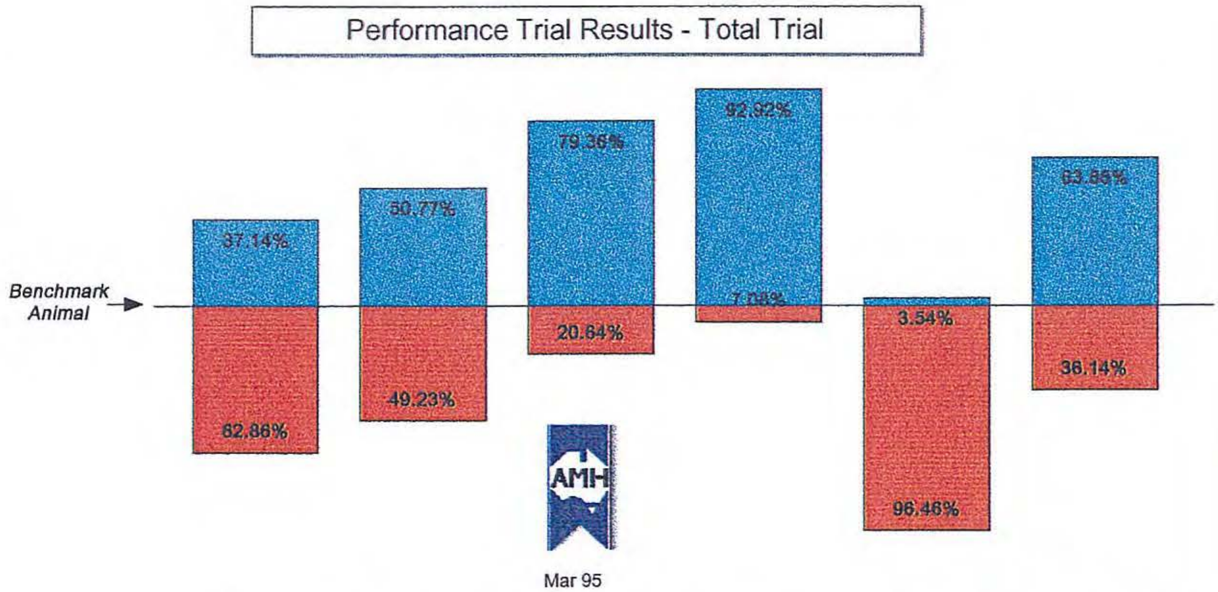
2. From a meat companies perspective it is important to adopt a payment schedule that is attractive to producers to ensure throughput is maintained but one that still financially links price with performance. AMH. 's decision to adopt a payment schedule that guaranteed 70% of all steers participating in the trial received a bonus achieved this balance. However, the payment schedule did also result in some 20% of steers receiving bonus payments despite the fact they still did not achieve the 2 plus marbling specifications they were purchased for. Commercially sustainable, performance payment schemes can obviously only pay premiums or discounts according to the actual actual growth,yield and quality grading performance of the cattle.

3. All cattle participating in this trial experienced much more uniform feedlot managment conditions than what occurs under normal commercial feedlot management because they were purchased, grainfed and slaughtered as one management group. Variability in feedlot management does further complicate the introduction of year round performance based payment systems for feeder steers since these feedlot management variables, that cattle experience during the grain feeding phase also affect performance. Under such circumstances both feedlotters and producers have an input into whether feeder steers achieve the market specifications they were fed for. Performance based payment systems for feeder steers need to reflect this if the premiums and discounts paid are to be equitable for both parties.

FIGURE 4.1
PERFORMANCE OF THE TOP PERFORMING VENDOR'S STEERS RELATIVE TO THE BENCHMARK STEER

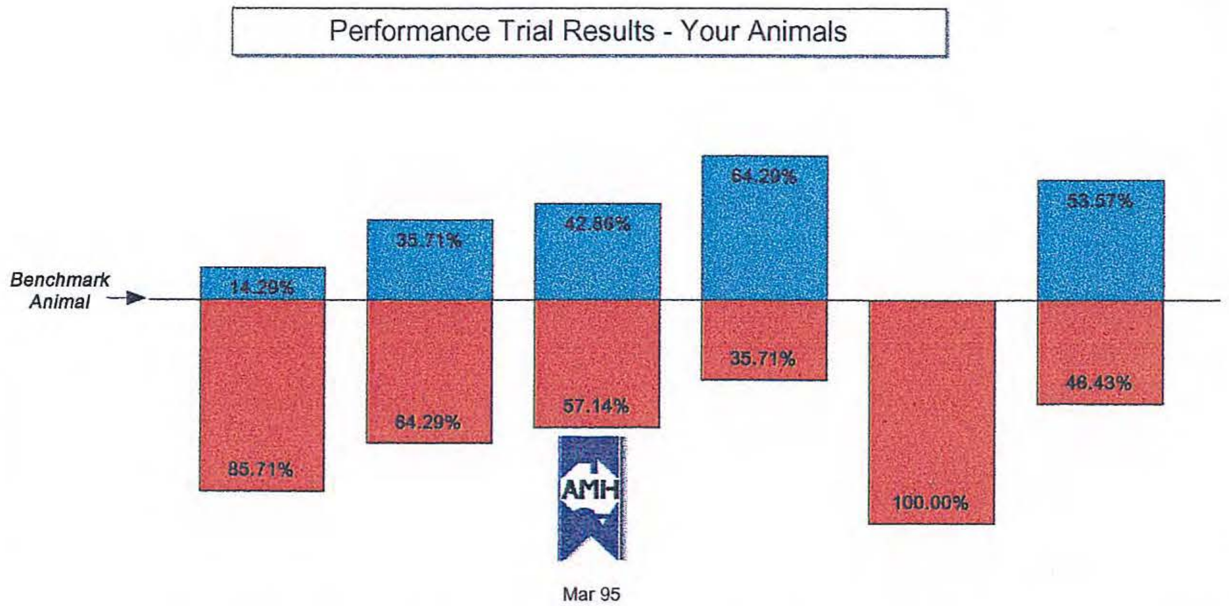



| | Avg Daily Gain | Marble Score | Dressing % | Hospital | P8 Fat Depth | Eye Muscle Area |
|---|---|---|---|---|---|---|
| Best | 1.9503 | 3 | 60.1254% | $0.00 | 10.60 | 114.00 |
| Average | 1.5978 | 1.95 | 58.4947% | $0.47 | 19.33 | 91.36 |
| Worst | 1.3497 | 1 | 56.4787% | ($6.48) | 33.30 | 69.00 |
| **Placing out of 50 Vendors** | 5 | 8 | 3 | 29 | 9 | 4 |

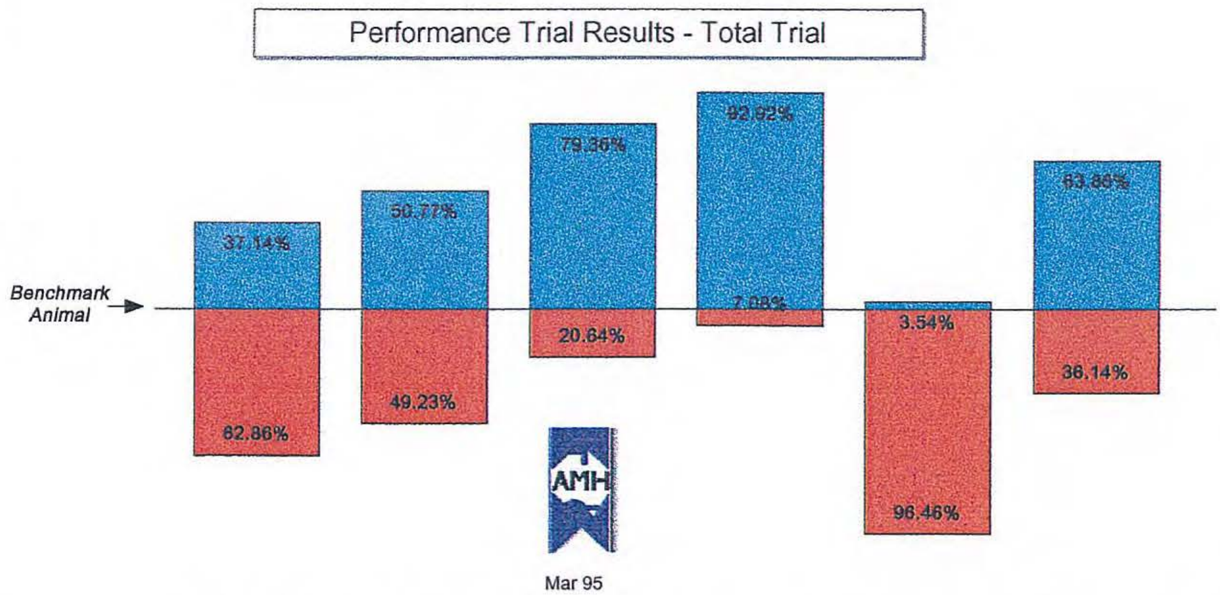



| | Avg Daily Gain | Marble Score | Dressing % | Hospital | P8 Fat Depth | Eye Muscle Area |
|---|---|---|---|---|---|---|
| Best | 2.3356 | 5 | 62.9278% | $0.00 | 7.00 | 119.00 |
| Average | 1.4225 | 1.61 | 57.3214% | ($0.62) | 21.99 | 82.94 |
| Worst | 0.6497 | 1 | 51.2154% | ($37.11) | 49.90 | 57.00 |

FIGURE 4.2
PERFORMANCE OF THE BOTTOM PERFORMING VENDOR'S STEERS RELATIVE TO THE BENCHMARK STEER




| | Avg Daily Gain | Marble Score | Dressing % | Hospital | P8 Fat Depth | Eye Muscle Area |
|---|---|---|---|---|---|---|
| Best | 1.7240 | 2 | 57.7605% | $0.00 | 18.10 | 93.00 |
| Average | 1.3879 | 1.36 | 55.6131% | $1.38 | 29.09 | 80.43 |
| Worst | 1.0314 | 1 | 53.7804% | ($6.48) | 41.00 | 67.00 |
| **Placing out of 50 Vendors** | 32 | 42 | 47 | 44 | 48 | 36 |




| | Avg Daily Gain | Marble Score | Dressing % | Hospital | P8 Fat Depth | Eye Muscle Area |
|---|---|---|---|---|---|---|
| Best | 2.3356 | 5 | 62.9278% | $0.00 | 7.00 | 119.00 |
| Average | 1.4225 | 1.61 | 57.3214% | ($0.62) | 21.99 | 82.94 |
| Worst | 0.6497 | 1 | 51.2154% | ($37.11) | 49.90 | 57.00 |

TABLE 4.2
BONUS PERFORMANCE PAYMENTS MADE TO THE TOP PERFORMING VENDOR

## Vendor Summary - Performance Based Trial
## Beef City - March 1995

This document groups your animals into Bonus Categories. If a Category, from 1 to 8 is not listed, then none of your animals scored within the category range. This table lists the cut off scores for each Bonus Category. You can check the individual listing (attached) to ensure animals are correctly categorised.

| Bonus Category | Upper Limit | Lower Limit |
|---|---|---|
| 1 | $188.60 | $16.33 |
| 2 | $15.68 | ($29.83) |
| 3 | ($29.88) | ($59.77) |
| 4 | ($59.86) | ($95.58) |
| 5 | ($95.61) | ($128.00) |
| 6 | ($128.23) | ($159.33) |
| 7 | ($159.53) | ($185.40) |
| 8 | ($185.41) | ($857.00) |

| Bonus Category | No of Head in Category | Total Weight at Induction Centre* | Bonus per kg | Avg Bonus per Head | Total Amt Payable |
|---|---|---|---|---|---|
| 1 | 8 | 3,454.00 | $0.80 | $345.40 | $2,763.20 |
| 2 | 7 | 2,974.00 | $0.70 | $297.40 | $2,081.80 |
| 3 | 1 | 452.00 | $0.60 | $271.20 | $271.20 |
| 4 | 1 | 380.00 | $0.50 | $190.00 | $190.00 |
| 5 | 1 | 400.00 | $0.40 | $160.00 | $160.00 |
| 6 | 2 | 894.00 | $0.30 | $134.10 | $268.20 |
| 7 | 2 | 850.00 | $0.20 | $85.00 | $170.00 |
| **Totals** | **22** | **9,404.00** | | | **$5,904.40** |

### Consignment Details

| | |
|---|---|
| Head Consigned : | 22 |
| Total In Weight** : | 9,300.00 |
| Average Weight **: | 422.73 |
| Initial Payment : | $9,300.00 |

**Weight from Weighbridge
*Weight from Induction Centre

### Trial Completion Details

| | |
|---|---|
| Head Completed : | 22 |
| Initial Payment : | $9,300.00 |
| Initial Payment + Bonus : | $15,204.40 |
| Avg Price per Kg : | $1.63 |

TABLE 4.3
BONUS PERFORMANCE PAYMENTS MADE TO THE BOTTOM PERFORMING VENDOR

AMH

## Vendor Summary - Performance Based Trial
## Beef City - March 1995

This document groups your animals into Bonus Categories. If a Category, from 1 to 8 is not listed, then none of your animals scored within the category range. This table lists the cut off scores for each Bonus Category. You can check the individual listing (attached) to ensure animals are correctly categorised.

| Bonus Category | Upper Limit | Lower Limit |
|---|---|---|
| 1 | $188.60 | $16.33 |
| 2 | $15.68 | ($29.83) |
| 3 | ($29.88) | ($59.77) |
| 4 | ($59.86) | ($95.58) |
| 5 | ($95.61) | ($128.00) |
| 6 | ($128.23) | ($159.33) |
| 7 | ($159.53) | ($185.40) |
| 8 | ($185.41) | ($857.00) |

| Bonus Category | No of Head in Category | Total Weight at Induction Centre* | Bonus per kg | Avg Bonus per Head | Total Amt Payable |
|---|---|---|---|---|---|
| 4 | 3 | 1,300.00 | $0.50 | $216.67 | $650.00 |
| 5 | 3 | 1,338.00 | $0.40 | $178.40 | $535.20 |
| 6 | 3 | 1,360.00 | $0.30 | $136.00 | $408.00 |
| 7 | 1 | 420.00 | $0.20 | $84.00 | $84.00 |
| 8 | 18 | 7,776.00 | $0.00 | $0.00 | $0.00 |
| **Totals** | **28** | **12,194.00** | | | **$1,677.20** |

### Consignment Details

| | |
|---|---|
| **Head Consigned :** | 28 |
| **Total In Weight** :** | 12,200.00 |
| **Average Weight **:** | 435.72 |
| **Initial Payment :** | $12,200.00 |

### Trial Completion Details

| | |
|---|---|
| **Head Completed :** | 28 |
| **Initial Payment :** | $12,200.00 |
| **Initial Payment + Bonus :** | $13,877.20 |
| **Avg Price per Kg :** | $1.14 |

**Weight from Weighbridge
*Weight from Induction Centre

Riverview Road Dinmore Queensland 4303 Postal Address : P.O. Box 139 Booval 4304
Tel : (07) 810 2100 Tlx : AA144666 'AMHBMR' Fax : (07) 282 3693

APPENDIX C.1

Head Office

LIVESTOCK MANAGERS
LIVESTOCK BUYERS

8th September 1994

**RE: BEEF CITY TRIAL, SEPTEMBER/OCTOBER 94 INTAKE**

By now most of you have advised Ross Keane of the names of the interested clients from your area wishing to participate in the above feedback trial. Response has been most encouraging. Up to date no price has been set.

Over the period of previous trials, vendors visiting Beef City to watch their cattle killed have expressed an interest in a ***performance based*** purchasing system. Most vendors indicated they would be in favour of selling their cattle on flat rate plus a bonus type payment program. This is in line with the Company's view, that the processors and feedlotters should pay the producer for what he in fact produces. We have decided to conduct this trial on a ***performance basis***. Below are the details:

1. AMH will undertake to purchase a minimum consignment of 20 head which conform to the specifications, maximum of 60 head, being cattle account the breeder to weigh on a live weight basis at Beef City.

2. Any breed or cross is acceptable, provided the cattle type is not less than 20 head of each particular cross. i.e. 20 Simmental Angus cross is acceptable but 15 of the same cross is not. However there must be a minimum of 20 head within the specifications. These cattle must be able to stand 150 days on feed. i.e. the cattle must be structurally sound, and from past experience this is most critical with cattle of higher Bos Indicus content.

3. Age 4 tooth and less.

4. Fat 0 to 10mm - cattle in store condition only.

5. Weight, individually 400-500 kg at the Induction Centre Scales. However in the event the animal weighs between 380-400kg and is milk tooth, it shall be accepted as part of the trial.

6. Intake period 12/09/94 to 14/10/94.

7. No animals accepted which have horn either untipped or tipped longer than the length of the ear.

8. Because we have chosen to remunerate vendors in this trial on a ***performance basis*** we will pay as follows:

   i) Initial payment of $1.00 per kg live payable within AMH's normal trading terms. ie within 10 days of delivery.

   ii) *Performance* based payment payable within fourteen days of the completion of slaughter of the last lot within the total trial. For example, animals which perform and fall within the top ten percent of the trial as measured and valued by characteristics detailed in Clause 9, an additional 80 cents per kg will be paid based on their individual live weight at the Induction Centre Scales. ("Starting Weight").

Riverview Road Dinmore Queensland 4303 Postal Address: P.O. Box 139 Booval 4304
Tel: (07) 810 2100 Tlx: AA144666 'AMHBMR' Fax: (07) 282 3693

Please be aware there is a time difference between weighing on the bulk scale and induction and this time difference will be the reason for any variances between the initial payment weight and the aggregate of the starting weights for any individual vendor.

The *performance payment* is as follows and will be based on *individual* animals.

| | | | |
|---|---|---|---|
| TOP | 10% OF ANIMALS | ADDITIONAL | 80 CENTS PER KG |
| Animals between top | 10.1% to 20% | " | 70 cents per kg |
| " " " | 20.1% to 30% | " | 60 cents per kg |
| " " " | 30.1% to 40% | " | 50 cents per kg |
| " " " | 40.1% to 50% | " | 40 cents per kg |
| " " " | 50.1% to 60% | " | 30 cents per kg |
| " " " | 60.1% to 70% | " | 20 cents per kg |

Animals which fall in the bottom 30% on performance will not attract an additional payment.

9. We have chosen to use as a average or benchmark steer - steer A as over. Measurement and value of characteristics will be made using the following factors relative to steer A.

(i) **Live Weight** - Animals will be purchased on a bulk weight at the Beef City registered weighbridge, after a wet curfew. (i.e. in tonight commence weighing at 7.00am tomorrow), and the Vendors initial payment shall be based on this weight. Animals will then proceed to the Induction Centre where in the course of Induction, animals are identified individually and weighed individually. This will be the animal's individual "Starting Weight". At the completion of the approx.150 day feeding period animals will be drafted into their vendors of origin, proceed to the kill floor, where their individual weight is recorded on a "dead rail" after slaughter. The difference in weight between these two figures represents gain which is then divided by the number of days on feed to give an actual daily weight gain. For those animals which gain above or below the benchmark we will value the daily gain at $1.00 per kg for animals which subsequently grade marble score 2 or better and 80c per kg which subsequently grade less than marble score 2.

(ii) **Dressing Percentage** - Hot dressed weight with a trim to Beef City specifications is expressed as a percentage of live weight on the dead rail to arrive at this figure. Value of Dressing Percentage is calculated at the rate of $16.90 per percent or pro-rata thereof. Calculation on the basis of 650kg live at a value of $2.60 cents per kg HDW.

(iii) **Fat Depth** - Our figures indicate a value of $5.00 per millimetre for variation between fat depths as measured at the P8 site. M.R.C figures support this value. We propose to use a base fat depth of 10mm which is our maximum fat depth on any cut. For animals less than 10mm but with 7mm or greater a positive value of $5 per mm variation will apply, whereas those animals greater than 10mm the variation will be $5 per mm negative. For animals with 6 or less mm a negative value of 40 c/kg of the animal's HDW will apply because of market unsuitability.

(iv) **Marbling** - Beef City requirement is for animals which marble score 2 or better. For those carcasses which achieve a marble score of 1, a negative figure of 40 cents per kg of the animals HDW will apply. For those carcasses which achieve scores of better than 2, a premium of 20 cents per kg HDW will apply for each additional score greater than 2. This will apply on the individual animals carcase weight.

(v) **Hospitalisation or Salvage Slaughter** - Any animal which for whatever reason goes to the hospital will bear the value of the drug used e.g. Pneumonia $16.10 per head per treatment. Prolaps Prefuce $20.80 per head per treatement. Quite obviously any animals which die or are sent to salvage slaughter, will be in the bottom 30% of performers.

The Benchmark animal (Steer A) at Beef City is one which has:

| | |
|---|---|
| Average Daily Weight Gain | 1.50 kg |
| Dressing Percentage | 56 % |
| Fat Depth | 10 mm |
| Marbling | 2 |
| Hospital | NIL |

By way of example you will find some better and some worse performing animals at say 350kg HDW as below:

| | Steer A | Steer B | Steer C | Steer D | Steer E | Steer F |
|---|---|---|---|---|---|---|
| A.D.G. | 1.5 | 1.80 | 1.6 | 1.3 | 1.7 | 1.8 |
| Dressing % | 56 | 58 | 60 | 55 | 56 | 60 |
| Fat Depth | 10 | 10 | 12 | 20 | 20 | 13 |
| Marbling | 2 | 2 | 1 | 2 | 3 | 1 |
| Hospital | NIL | NIL | NIL | $15 | $25 | ---- |

To compare the values use the figures as per clause 9 as compared to steer A which is the "base":

| | Steer A | Steer B | Steer C | Steer D | Steer E | Steer F |
|---|---|---|---|---|---|---|
| A.D.G. | | +45.00 | +12.00 | -30.00 | +30.00 | +36.00 |
| Dressing % | | +33.80 | +67.60 | -16.90 | ----- | +67.60 |
| Fat Depth | | ---- | -10.00 | -50.00 | -50.00 | -15.00 |
| Marbling | | ---- | -140.00 | ---- | +70.00 | -140.00 |
| Hospital | | ---- | ---- | -15.00 | -25.00 | ---- |
| | | **+78.80** | **-70.40** | **-111.90** | **+25.00** | **-51.40** |

That is using Steer A as the base:

| | |
|---|---|
| Steer B is better by | +78.80 |
| Steer C is worse by | - 70.40 |
| Steer D is worse by | -111.90 |
| Steer E is better by | +25.00 |
| Steer F is worse by | - 51.40 |

All this exercise does is rank each animal on the values as outlined in Clause 9 relevant to their companion animals, using animal A as the benchmark.

To oversee the total project the Company has asked the M.R.C, represented by Stuart Baud, to collate and audit the figures to maintain transparency. Stuart is a well respected person in the industry who has previously collated trials at Beef City and other feedlots conducted under the auspicious of the MRC and will release a report on breed performance and comparison in this trial but will not identify vendors. Like ourselves the M.R.C are assisting the industry toward a payment system based on performance criteria. However , as this is the first attempt to introduce a trading system based on performance criteria, there are a number of relative values which may be proven in time to be incorrect. You should make participants aware that the values of the characteristics in clause 9 will be applicable in this instance.

Prices for cattle outside of specifications (i.e. not eligible for performance based payments) or for those vendors who wish to sell us the cattle but are not comfortable with the trial concept we are prepared to purchase the cattle at prices as below. However, vendors who take this option will not be invited to Beef City to inspect their animals prior to kill nor will the Company provide detailed feedback, as has been available to previous trial participants.

Animal 7.8 teeth will be slaughtered at Dinmore, at Dinmore rates of the day.

Animals with 5/6 teeth or 4 teeth animals over 500kg live, and animals below the minimum weights will be priced as below:

| | |
|---|---|
| 440 +kg | 1.25 c/kg |
| 420/440 | 1.23 c/kg |
| 400/420 | 1.20 c/kg |
| 380/400 | 1.15 c/kg |
| 360/380 | 1.10 c/kg |

I have written this so that you may discuss its contents with producers who are interested and in the case of vendors who wish to participate, I suggest you give them a copy of this correspondence.

Re bookings or deliveries etc. Please make contact with Ross Keane who will coordinate deliveries on a first in best dressed basis at the rate of 1200 per week spread over five receival days each week.

John Keir

JOHN KEIR
General Manager Livestock