final report

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Flight Speed Culling

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Project Objectives

a. Monitor the effects of temperament (as measured by flight time) on performance in the feedlot or crop finishing. Specifically
   - To assess the effects of temperament as indicated by flight time, on feedlot or crop finishing performance in Bos Taurus animals.
   - To determine if there is a flight time threshold at which it becomes significantly less economic to feedlot or crop finish animals.

b. To assess the usefulness of flight time recording for genetic selection and collect data which in the future can be used to contribute to the establishment of Flight Time EBVs for a specific breed.

Background

The cattle industry has long recognised the benefits of having cattle with good temperament. The perceived benefits include:

- Reduced handling costs eg mustering and processing in the yards
- Reduced damage and therefore repair costs for fencing, yards etc
- Reduced risk to handlers
- Probable improved performance eg growth rate
- Probable improved meat quality.

However, in the past, the absence of objective measures of temperament has prevented 'proof' that these outcomes are in fact real, and reduced the potential rate of progress made through selection. For example, an industry survey conducted in 1994 showed clearly that industry saw the value in having 'quieter' cattle, but was addressing the issue by 'culling' animals with obviously 'poor' temperament, rather than 'selecting' animals with better temperament. It is well known that the rate of genetic change in any trait is much greater when a small number of superior sires is selected from the top end of the normal distribution curve, rather than just 'culling' the group that are at the bottom end of the normal distribution curve.

The majority of studies which have looked objectively at the association between temperament and feedlot average daily gain (ADG) have been conducted from the late 1990's to present, including the work of Burrow & Dillon (1997), Voisnet et al (1997a), Fell et al (1999), Petherick et al (2002) and Colditz et al (2006). Most focus has been on performance in the feedlot, however work conducted by Fordyce et al (1985, 1988) under pasture conditions showed that Bos Indicus crossbred cattle with a quiet or calm temperament (based on crush score), had higher liveweights on pasture. However, it is widely recognised that the differences are much less likely to be apparent under more extensive conditions ie less interactions with humans and infrastructure (potential stressors).

Collectively the results from the feedlot performance work confirm that cattle with poor temperament (as measured by short flight time or high crush scores), grow at slower rates during feedlot finishing. Examples of these results are outlined below.

Fell *et al* (1999) divergently selected British breed steers for temperament from 209 weaner steers. The average flight speed of the calm group was 1.85 seconds and 0.78 seconds for the nervous group. The nervous group grew at 1.04 kg/day and the calm steers grew at 1.46 kg/day over 78 days in the feedlot. In addition, no calm animal was "pulled" during feedlot period whereas 42% of the nervous animals were taken to the hospital pen. See figures 1 and 2.

Figure 1 Average flight speed of nervous vs calm groups

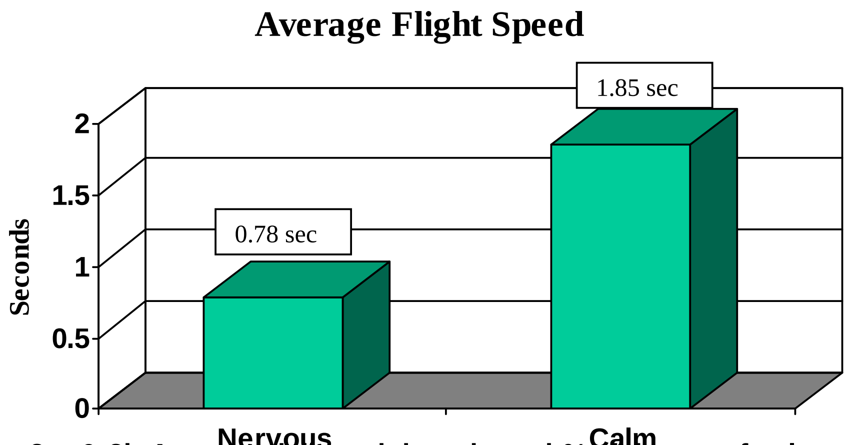
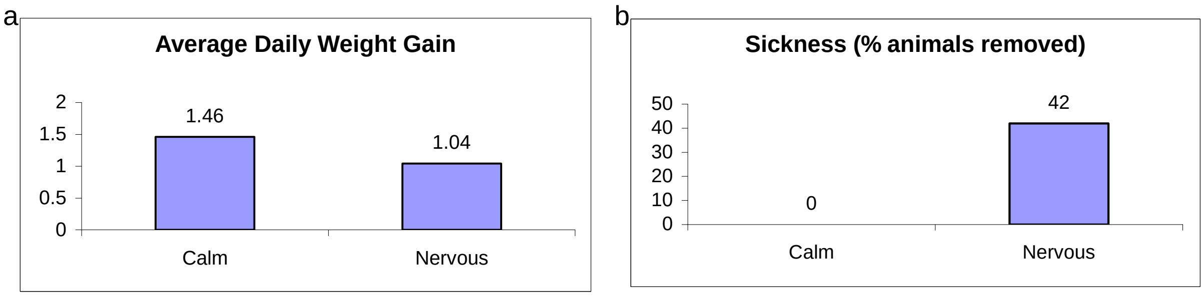


Figure 2 a & 2b Average daily weight gain and % sickness of calm vs nervous animals

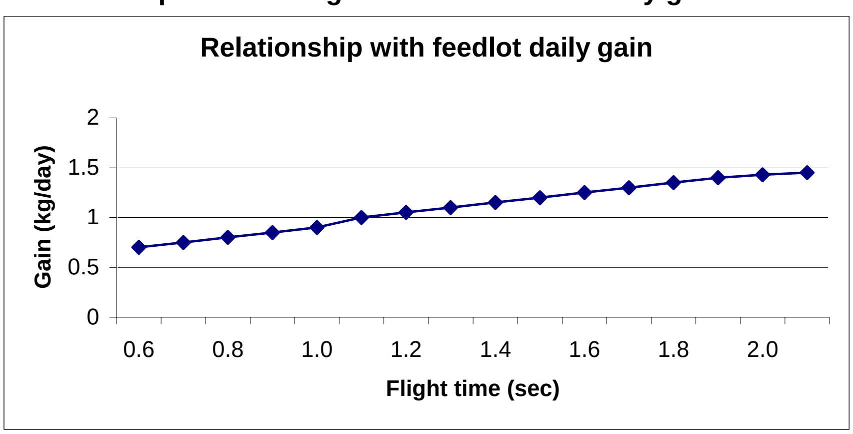


Similarly, work done with Bos indicus cattle showed a similar trend. In CRCI, a single flight time measurement taken at weaning on Brahman and Brahman crossbreds *(n = 1283)*, which were finished at "Tullimba" or "Goonoo" feedlot, showed that:

- Each 0.1 sec increase in flight time increased ADG by 0.04 kg/day *(difference across range = 0.45 kg/day)*
- Each 0.1 sec increase in flight time increased HSCW by 2.3 kg *(difference across range = 58 kg)*

See figure 3.

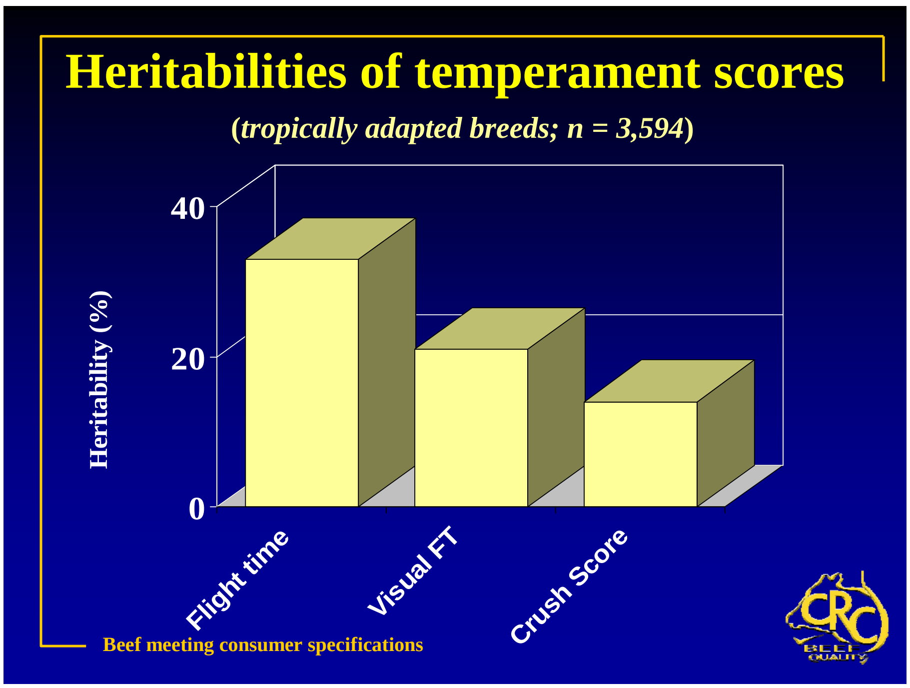
Figure 3 Relationship between flight time and feedlot daily gain



Further work by Burrow and Dillon showed clearly that typically short/low flight time animals (ie poorer temperament) will perform at a lower level in the feedlot and that it did not matter whether the animals were quieter because of genetics or intensive handling.

Whilst various methods have been used to measure temperament over time including yard test scoring (1-5), crush test scoring (1-5), flight time recording and various subjective measures, research has shown that flight time recording offers the highest heritability when used as a selection tool. Hence this PIRD has focussed on the use of the flight time test which simply measures the time for an animal to move a distance of 1.7m (varies from about 1.6 to 2m across sites but is standardised within a site or study). Two electric eyes are used to start and stop a timing device. Relative heritabilities between temperament selection methods (flight time, visual flight time and crush score) are shown below in figure 4.

Figure 4 Heritabilities of three temperament scoring systems



Methodology

a. Effects of temperament on performance

This project was conducted at 'Riverglen', a property with a Charolais seedstock herd which is recorded in Breedplan and a commercial crossbred herd (largely Hereford, Santa cross). During each of three years (2002, 2003 and 2004), commercial animals that could be followed through as a contemporary group (i.e. weaned at the same time, fed and treated in the same way) to slaughter (preferably after a feedlot finishing phase), were to be weighed and flight time recorded. Similarly, purebred seedstock animals that were to be analysed in Breedplan were to be recorded as well.

During each of the three years (2002, 2003 and 2004), calves were weighed and flight time recorded at weaning or soon after, if the equipment was available. Some animals were not flight time recorded at weaning but were recorded at a subsequent time when the equipment was available. A subset of animals had multiple recordings which may have included a feedlot entry recording. Unfortunately, because the animals were a combination of breeds/breed mixes, weaning groups, weaning years and measurement times, of the very large number of recorded flight times, limited numbers of animals could be used in analysis.

Table 1 outlines a summary of the number of identifiable weaning groups, the number of weaner weights recorded and the number of weaner flight times recorded for each of the three years.

Table 1 Weaning Groups

Weaning Year	No. of weaning groups	Number of weaner weights recorded	Number of weaner flight times recorded
2002	11	364	326
2003	10	286	148
2004	13	480	373

In addition, significant numbers of animals had post weaning flight times recorded. These are summarised in Table 2.

Table 2 Post weaning groups

Weaning Year	No. of post weaning groups	Number of post weaning flight times recorded
2002	2	348
2003	3	199
2004	1	93

The animals that had one or more flight time recording were split across numerous feed groups ie identifiable groups of cattle that were fed via a common regime which may have included finishing in a feedlot, oats or pasture only. Table 3 outlines a summary of the feed group details.

Table 3 Feed Groups

Weaning Year	No. of feeding groups	No. of animals
2002	4	152
2003	6	195
2004-2005	3	284

As can be seen from these tables, a large amount of complex data (across breed mixes) was recorded.

b. Flight time recording for the development of Charolais Docility EBVs

With reference to part b of the project, the property owner did at various times approach the Charolais breed society to discuss the possibility of analysing the flight time data recorded on the seedstock animals to develop EBVs for docility (flight time), which has been done by other breed societies already.

c. Flight time vs tenderness from lot fed steers

A further side activity to the project involved the flight time recording of 17 pens of 7 head of steers fed in a western Downs feedlot for the 100 day grain section at the 2004 RNA. One animal from each pen was then chosen by the exhibitors (including the Riverglen property owner), to enter a taste test section of the competition. As a part of this activity, tenderness scores were related to flight time (see results in the next section). A field day was held in association with this activity.

Results

a. Effects of temperament on performance

The complexity of the data and difficulties with recording and manipulation of data have made the results unclear and inconclusive. Various avenues were used to analyse sub-sets of ‘apparently’ comparable data using weaning groups, breed, feeding groups etc, however no conclusions can be drawn. Examples of some of the different parameters for analysis are shown in figures 5 to 8 below.

Figure 5 Scatterplot of weaning flight time vs average daily gain in the feedlot, for all useable wean group by feed group by breed group combinations, across all weight gains.

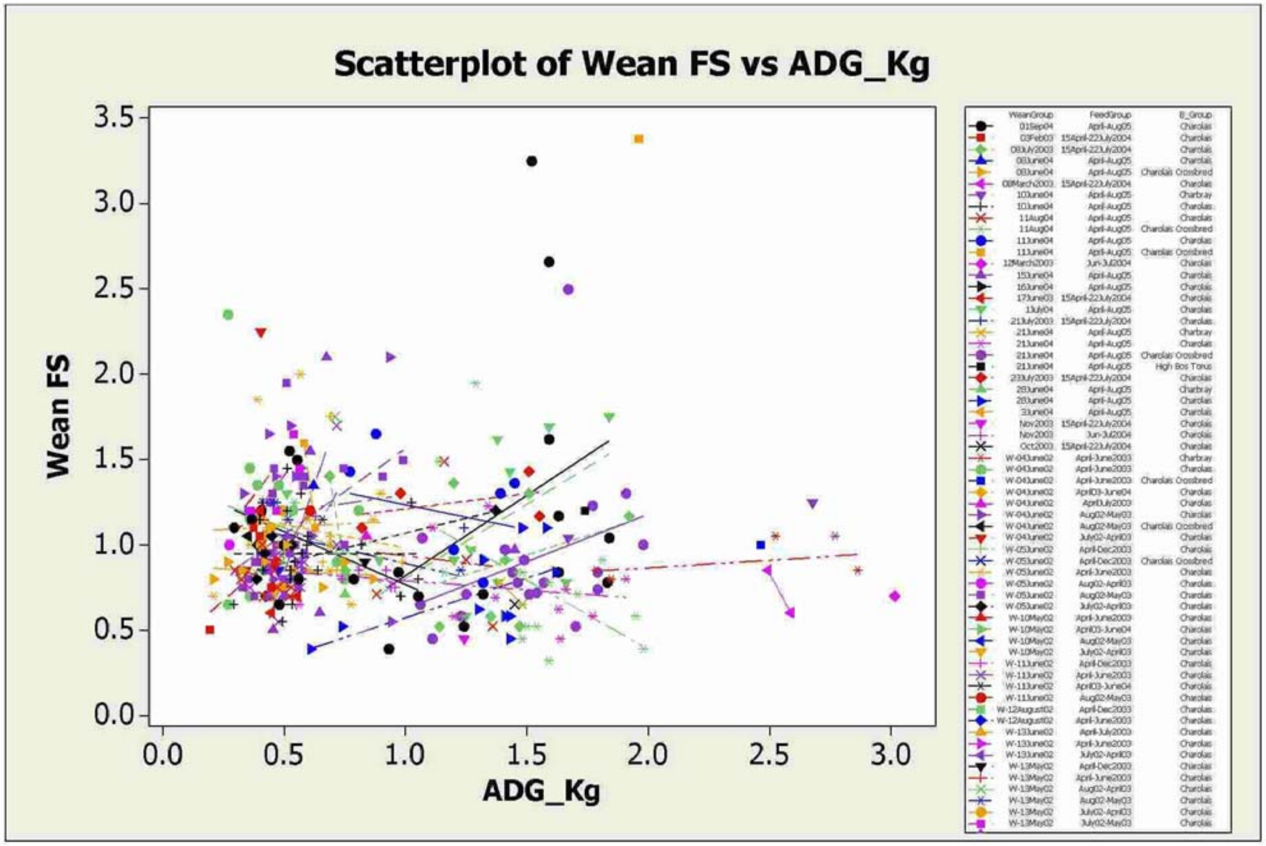


Figure 6 Scatterplot of weaning flight time vs average daily gain in the feedlot, for all useable wean group by feed group combinations, for weight gains greater than 0.5kg/hd/d.

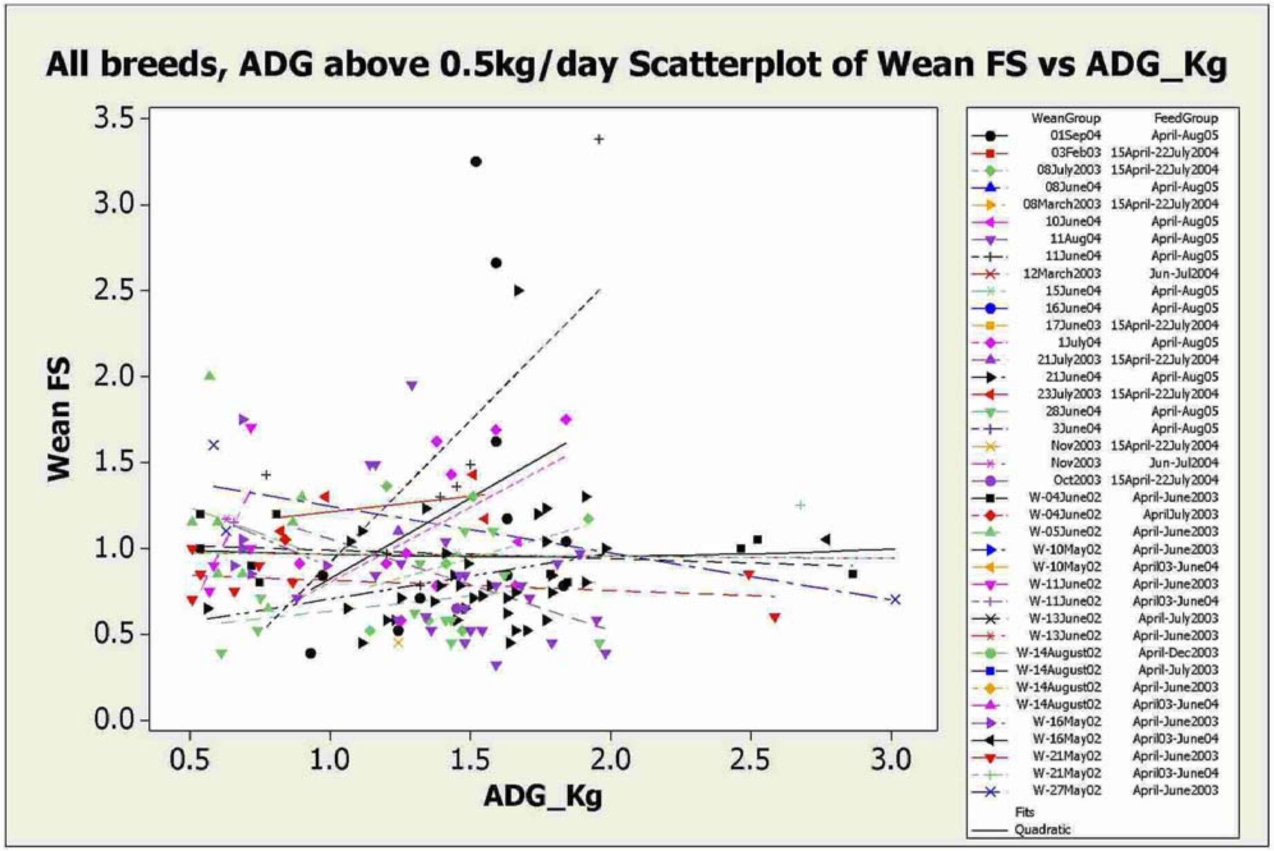


Figure 7 Scatterplot of weaning flight time vs average daily gain in the feedlot, across breed group by feed group combinations.

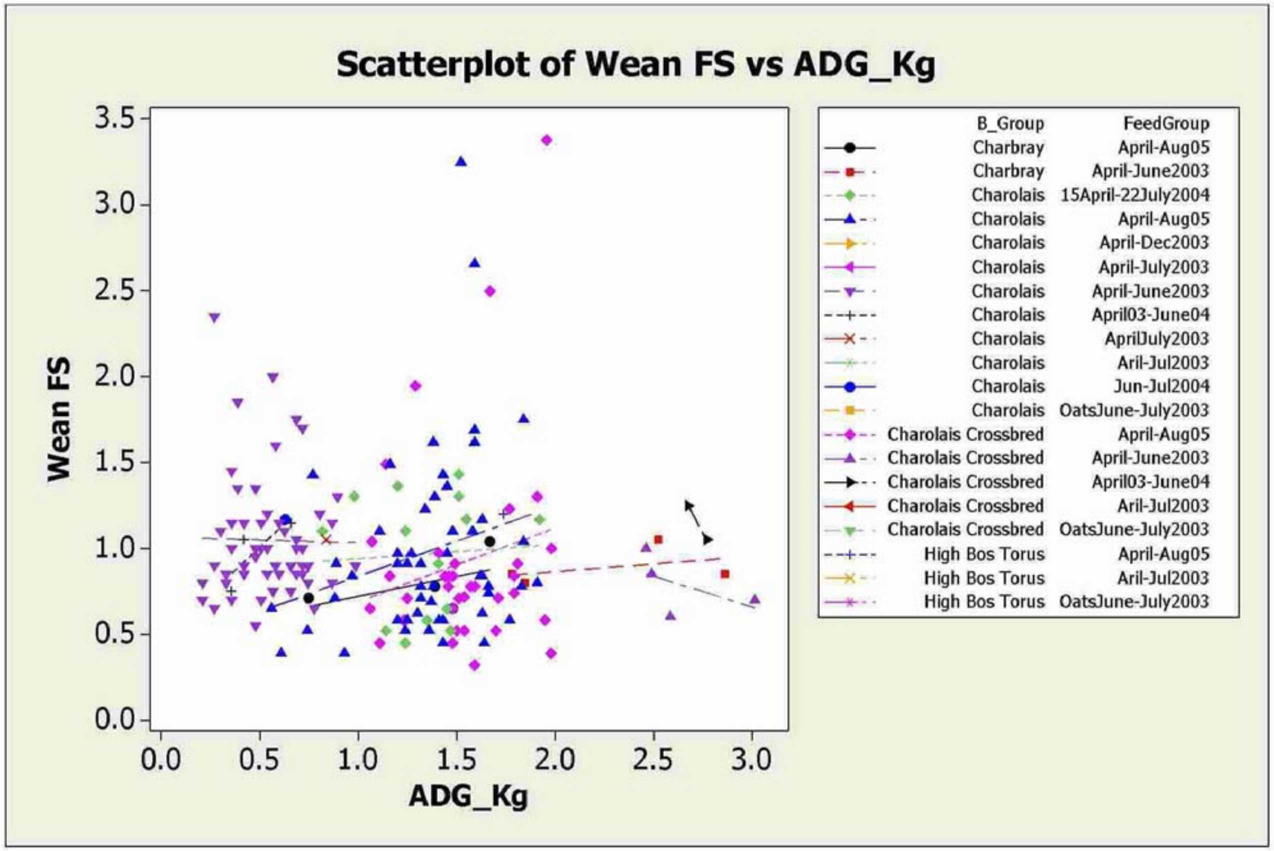
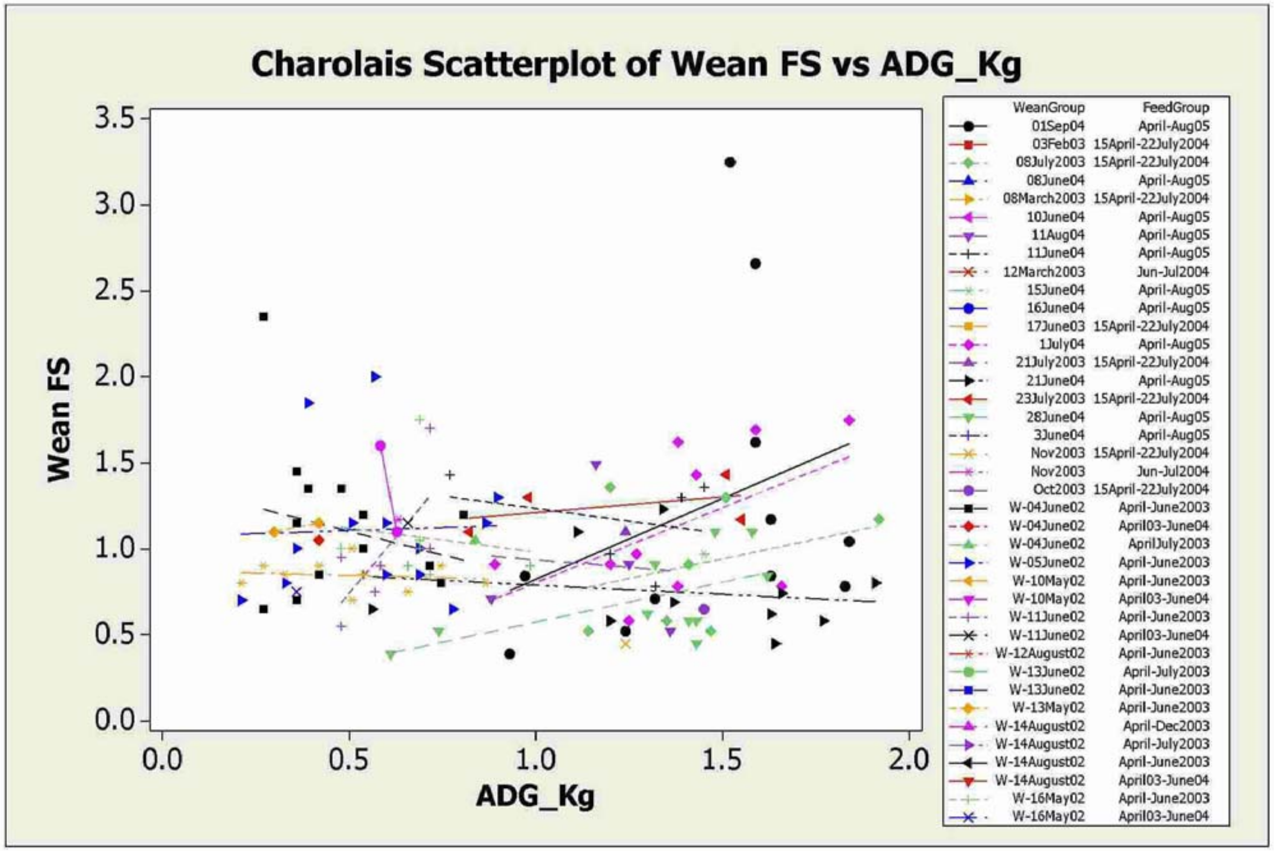


Figure 8 Scatterplot of weaning flight time vs average daily gain in the feedlot, across wean group by feed group combinations for Charolais only.

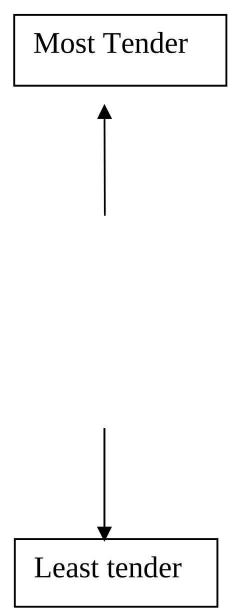


b. Flight time recording for the development of Charolais Docility EBVs
To date there has been no support from the breed society to pursue docility (flight time EBVs) as an avenue for genetic improvement, despite the fact there is very sound evidence of the value of the trait and the availability of the technology to produce these EBVs (see discussion below).

c. Flight time vs tenderness from lot fed steers
Results (tenderness score vs flight time) for the sub-set of 17 animals from the RNA competition are listed in table 4 below.

Table 4 Tenderness Score vs Flight Time

Animal ID	Total Tenderness Score	Flight Time
1	60.5	1.36
2	59.75	1.69
3	55.25	0.65
4	54.75	2.34
5	53.25	1.17
6	52.5	2.21
7	52.25	Control
8	51.75	1.3
9	51	0.78
10	50.5	0.97
11	48.5	0.91
12	48.5	0.84
13	47.75	1.75
14	44.75	1.23
15	42.5	0.78
16	38	0.84
17	36.25	0.91
18	29.25	1.69



A field day at the associated feedlot was held involving the exhibitors of the stock and other interested people (35 in total).

Analysis of Data and Discussion

a. Effects of temperament on performance
Due to the complexity of the data and subsequent difficulties with recording and manipulation of data, the results are unclear and inconclusive. No useful trends could be drawn from the analysis undertaken.

A number of issues have been highlighted.

- The method of data recording and tracking of management groups made it very difficult to identify and group comparable cohorts of animals for analysis.
- There were many multiples of variables across the three years including a large number of mating groups, paddocks and properties, weaning dates (groups), feeding groups and breed groups. Therefore it is difficult to identify groups of like treated animals that could be compared appropriately.

- The flight time recording equipment was not always available when required and therefore the timing/methodology for recording was not consistent. As a result, a large number of measurements were unable to be used in analysis and quite feasibly, many others may have been used in the analysis, but possibly should have been excluded.
- Over time, the method of recording appears to have varied due to experience and additional knowledge gained over the time, and potential differences in the facilities at different sites, handlers etc.
- A large number of the animals appeared to perform quite poorly ie less than 0.5kg/hd/d. At lower weight gains, it is more difficult to see the expression of differences ie they are more compressed.
- Large amounts of data were collected opportunistically rather than collecting data on defined groups of like treated animals.

This range of factors has resulted in the cooperator spending exhorbitant amounts of time getting the data together and great frustration by the people trying to analyse it.

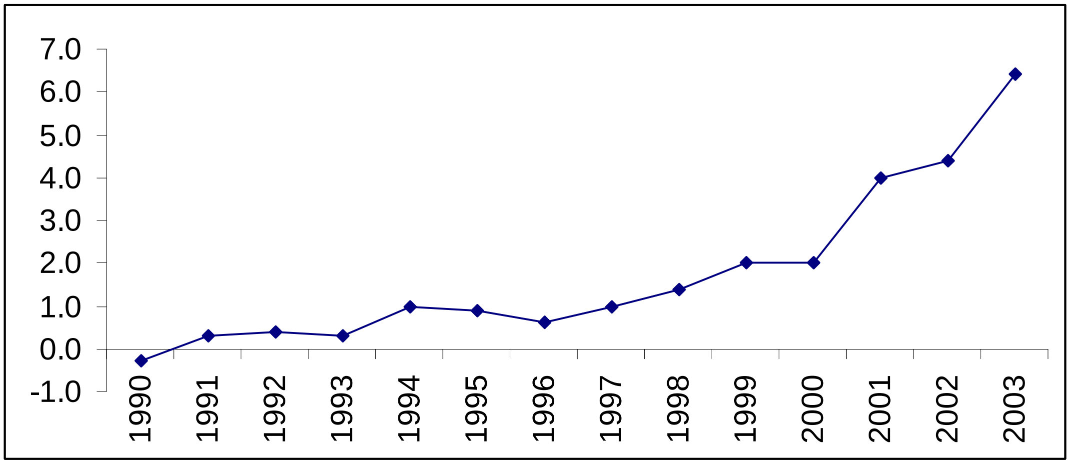
b. Flight time recording for the development of Charolais Docility EBVs

With regard to the development and publishing of docility EBVs in the Charolais breed, no progress was made. This is disappointing both from the perspective of this project, but also for the breed as whole, when the success of other breeds using this tool is considered. As an example, the Limousin Society recognised a temperament problem within the breed in the early 90's. They initially addressed this by using subjective scoring systems from 1995. They now have well over 12,000 useful scores. The problem with raw scores (and a subjective system) include variation in prior handling and variation between scorers. To take out these effects, they started to use scores to calculate EBVs for docility for sires from 2000. Docility EBVs for sires, dams and calves have been available since 2002. From 2003 docility EBVs have been available in sale catalogues. Table 4 outlines the progress achieved in AI sires within the breed, and Figure 9 shows the genetic trend made by the breed as they have addressed the problem. It should be noted that the increase in the rate of genetic improvement has been achieved since EBVs were first started to be calculated in 2000.

Table 4 Progress in improved docility for Limousin AI sires

20 most widely used AI sires of *1998* born calves	**20 most widely used AI sires of *2003* born calves**
Average Docility EBV +1.6	Average Docility EBV +20.4
11 sires with negative EBVs	2 sires with negative EBVs

Figure 9 Genetic trend of docility of limousin calves

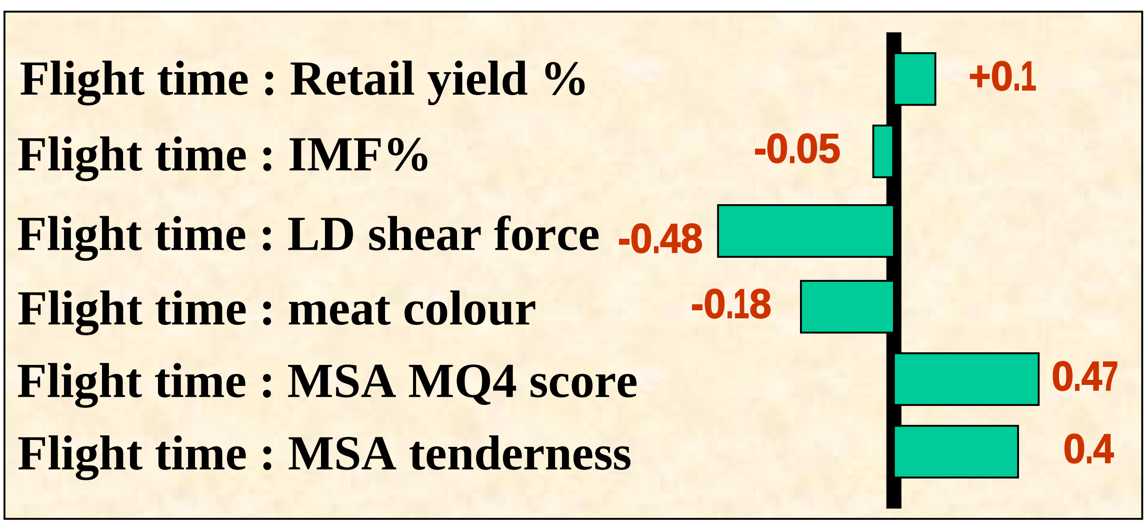


c. Flight time vs tenderness from lot fed steers

From the small taste test exercise conducted as a part of the RNA 100 day feedlot competition, a general relationship between longer flight time and more tender meat was observed, however there were a couple of distinct anomalies. Besides the numbers being too small to be significant, difficulties with the set up of the flight time recording equipment and a potential reduction in the accuracy of measurements, was reported.

There has however been significant Australian research investigating the relationship between flight time and carcase and beef quality traits. In the CRC I straight breeding project 4137 tropically adapted steers and heifers (Brahman, Belmont Red, Santa Gertrudis) had a single measure of flight time at weaning (approximately 6 months). The animals were slaughtered using best-practice processing (good handling prior to slaughter; effective electrical stimulation; optimum chilling etc). The phenotypic and genetic relationships were estimated. The genetic relationships are shown in figure 10.

Figure 10 Genetic relationship between flight time and carcase and meat quality measures.



Where a perfect relationship would be indicated by negative one or positive 1, it can be clearly seen that flight time has a relatively strong negative relationship with

Longissimus dorsi (LD) shear force (a laboratory measure of toughness) ie longer flight time (quieter) = lower shear force (more tender). Similarly, longer flight times are positively related to higher MSA (Meat Standards Australia) MQ4 score (Meat Quality 4- tenderness, juiciness, flavour and overall liking – score), and the MSA tenderness score.

Conclusions and recommendations from the trial results and the conduct of the PIRD

No useful or accurate conclusion, (and therefore recommendation to the beef industry), about the value of using flight time as an indicator of temperament and therefore animal performance etc, can be drawn from this PIRD due to the inability to analyse the data set provided.

However, a number of other conclusions can be drawn about the ***conduct*** of PIRDs such as this.

Most producers who embark on relatively complex projects such as this will require considerable technical support to better understand:

- what the project is trying to achieve,
- what needs to be done to meet those objectives,
- how it should be done (including identification of management groups etc),
- how results should be recorded and
- how data needs to be presented for analysis.

Project budgets need to cover appropriate technical support. A significant benefit arising from this would be a far more efficient process (time and money) for all involved, and subsequent improvements in project outcomes.

Discussion of Group Learnings

Achievement of planned results

In short, the ‘planned’ results were not achieved. This was disappointing and frustrating, particularly for the ‘Riverglen’ owner and staff who invested significant effort in the project. However, the ‘Riverglen’ herd does have a major head-start in achieving genetic improvement for temperament and therefore animal performance when at some stage in the future the data recorded on the seedstock animals can be analysed within Breedplan.

Impact

In itself, this PIRD is unlikely to have any significant impact on the uptake of flight time recording to identify prospective better performers in the feedlot or in the broader industry using docility EBVs as a selection tool. All members have a greater understanding of the recording equipment involved and the outcomes of scientific studies in this field.

Trial Measurements
The results of the PIRD did not show any economic benefit to producers, contrary to all of the scientific studies.

Environmental Benefits
There were no environmental benefits arising from this PIRD.

Overall Comments
It is unlikely at this point that the group would recommend to other groups that they undertake projects such as this. That is, this project and others conducted by the same group have a high level of complexity and require a substantial input of technical support to ensure they are structured and conducted in the most appropriate and efficient manner possible. The in-kind contributions by many individuals in this project have way exceeded what should be expected. A much simpler project could be considered.
The group acknowledges that the quality and usefulness of data collected could have been increased dramatically had there been funds to access a much greater input of technical expertise and guidance from the start. In part there is recognition that the cooperators underestimated the complexity of the project and lacked the understanding and planning skills to ensure that data was collected and recorded appropriately.
This highlights the need for future PIRDs and the like to have realistic budget limits that can accommodate the cost of the level of expertise required to achieve good outcomes. One source of frustration for the group has been the willingness of the funding organisation to pay for any 'private' consultant, but not appropriately qualified government employees. In regional Queensland, such expertise exists almost exclusively within government organisations.

Acknowledgements
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- the MLA PIRD funding and patience of Gerald Martin;
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- Kay Taylor - for collating results and drafting this report.

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