ULTRASOUND PROFICIENCY TESTING

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SUMMARY

Scanning of live beef cattle for the estimation of breeding values for carcase traits is an important facet of the selection of beef cattle through BREEDPLAN EBVs. Scans are collected by real time ultrasound contractors who must undergo a proficiency test prior to their data being accepted by the breed societies for analysis. May '97 and June '98 proficiency tests included scanning for intra-muscular fat as well as subcutaneous fat and eye muscle area. Proficiency testing of operators has led to confidence in the measurement technique and rapid adoption of the technology for genetic evaluation.

Keywords: Beef cattle, carcase, ultrasound scanning

INTRODUCTION

Since 1989, real time ultrasound measurements of subcutaneous fat and eye muscle area (EMA) have been successfully used for Australian genetic evaluations of beef cattle. Scanning for percent intra-muscular fat (PIMF) has been researched at AGBU for the last five years via a Meat and Livestock Australia (MLA) supported research project. Heritabilities of scanned PIMF are estimated to be 0.297 (I 0.029) for heifers and 0.121 (I 0.027) for bulls (Reverter 1999).

To maintain the standard of data records for use in BREEDPLAN the contract scanners who have taken the measurements have been required to undergo proficiency tests on a regular basis. Accreditation is awarded, based on satisfactory proficiency, by the Performance Beef Breeders Association (PBBA) who represent the major Australian breeds undertaking BREEDPLAN genetic evaluations. This accreditation allows those scanners who have received accreditation to submit data into the individual breed society data bases for analysis by BREEDPLAN.

This paper reports the conduct and results from the two most recent proficiency tests. These were heavily subsidised by MLA Validation projects that were designed to research and develop new traits for BREEDPLAN. In the last five years considerable emphasis has been on the development of techniques to assess intra-muscular fat and these proficiency tests were essential to introduce the technology to the seedstock industry.

CONDUCT OF THE PROFICIENCY TESTS

Thirty cattle of different age and sex were accumulated for each of the two tests. Accreditation was attempted for ultrasound recording of rump and rib fat depth, eye muscle area (EMA), eye muscle depth (EMD) and intramuscular fat. All animals were scanned twice by each scanner in two separate

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* AGBU is a joint institute of NSW Agriculture and the University of New England

runs with identities of the cattle changed between runs to conceal the real identity from the scanners. The cattle were slaughtered within three days of scanning.

Thirteen scanners attempted accreditation in May '97 (3 using PIE and 10 using Aloka ultrasound machines) and 16 in June '98 (6 PIE and 10 Aloka). The majority of scanners who sat for accreditation in '97 re-sat the test in '98 because of changes to the PIMF scanning technology. Two previous Aloka operators switched to using PIE equipment.

CARCASS RESULTS

Carcass data were recorded in the chiller the day after slaughter, by three different AGBU staff in the chiller. All measurements were taken for both the left and right sides of the carcass. This effectively meant that six records were taken for each of the traits evaluated. Eye muscle areas were traced on acetate sheets by the three independent operators. EMA was calculated using a computerised digitizer by an AGBU staff member. A cross sections slice of the longissimus dorsi (eye muscle) approximately 10 mm thick was taken from the forequarter and analysed for percent intramuscular fat (PIMF) by the Meat Science Laboratory of UNE using replicated Soxlet extraction procedure. All carcass data were averaged over the six records for comparison with the scanner data. Table 1 presents a summary of the carcass data.

Table 1. Summary of carcass data May '97 and June '98 proficiency tests

	May 1997			June 1998		
Trait	Range	Mean	SD	Range	Mean	SD
P8 (mm)	2.8-14.7	8.5	3.25	4.7-18.0	9.8	2.99
Rib fat (mm)	2.2-12.5	6.1	2.58	1.7-12.2	5.6	2.99
EMA (cm^2)	53.2-75.0	63.0	6.20	58.4-88.8	71.0	9.09
PIMF	0.28-6.50	1.95	1.34	2.0-7.75	3.95	1.31

The May '97 test used only grass fed cattle but the June '98 test had cattle specifically prepared for the course. It should be noted that eye muscle area and intra-muscular fat were higher in the June '98 test but the subcutaneous fats were similar. The standard deviation of EMA was also larger for '98 than for the '97 test.

RESULTS FOR SCANNERS

Scanners are assessed for their ability to be repeatable and for their relationship to the carcase values. Repeatability is tested using the standard deviation of the difference between repeated scans on the same animals. The relationship to the carcase is tested using both as the standard deviation of the difference between live scan measurements and the carcase values as well as the correlation between live and carcase results.

Repeatability. The standard deviations between first and second scans on the same animal for PIMF in the June '98 test were considerably smaller than for the May '97 test. Three of the more likely reasons being that the scanners were more experienced, scanners were advised to use the average of 5 scans rather than the 3, as in '97 and the cattle had higher mean PIMF values. Both the Aloka (ISU software) and the PIE systems appear to work best between about 2 and 8 % PIMF.

Table 2. Standard deviations of the difference between first and seconds scans - May '97 and June '98 proficiency tests

Trait	Profic Level [a]	May 1997 Mean	Min	Max	June 1998 Mean	Min	Max
P8 mm	≤ 1.5	1.25	0.60	2.30	1.07	0.58	1.82
Rib fat mm	≤ 1.0	0.96	0.60	1.80	0.93	0.55	1.34
EMA cm^2	≤ 6.0	3.61	1.50	6.40	3.71	1.59	6.42
PIMF	≤ 1.1	0.95	0.59	1.19	0.68	0.33	1.65

[a] Proficiency Level = acceptance level for proficient scanners

Accuracy with Carcase Measures. Correlations of scans with mean carcass measurements (average of six measures for each carcase: 3 abattoir measurers; left and right) are presented in Table 3 and the standard deviation of the difference between live and scan in Table 4.

Table 3. Correlations of scans with mean carcass measurements - May '97 and June '98

Trait	Profic Level [a]	May 1997 Mean	Min	Max	June 1998 Mean	Min	Max
P8 mm	> 0.90	0.87	0.80	0.92	0.87	0.75	0.90
Rib fat mm	> 0.90	0.84	0.81	0.92	0.88	0.73	0.96
EMA cm^2	> 0.80 [b]	0.65	0.42	0.82	0.85	0.77	0.90
PIMF[a]	> 0.70 [b]	0.71	0.63	0.83	0.77	0.72	0.83

[a] Proficiency Level = acceptance level for proficient scanners
[b] Proficiency levels were adjusted in 1997 to 0.65 for EMA and 0.50 for PIMF due to lower mean and standard deviations

Table 4. Standard deviation of difference of (Scan-Carcass-Bias) - May '97 and June '98 tests

Trait	Profic Level [a]	May 1997 Mean	Min	Max	June 1998 Mean	Min	Max
P8 mm	≤ 1.5	2.01	1.6	2.4	1.51	1.17	2.09
Rib fat mm	≤ 1.0	1.37	1.00	2.20	1.48	0.82	2.07
EMA cm^2	≤ 5.5	5.44	3.60	7.30	4.91	3.96	5.89
PIMF	≤ 1.0	1.07	0.77	1.32	0.93	0.82	1.41

[a] Proficiency Level = acceptance level for proficient scanners

In the June '98 test the correlation between scans and carcase for EMA and PIMF are considerably higher than results for May '97. The cattle used in May '97 had lower mean EMA and a smaller standard deviation. The required level to pass the '97 proficiency test was adjusted to account for the lower mean and standard deviation. The mean value of PIMF in May '97 was also low and this almost certainly contributed to the lower correlations between scan and carcase. Taking the '98 results into account, and provided that a similar standard deviation of carcase PIMF can be obtained in future test animals, it has been recommended that the threshold for the correlation between scan and carcase PIMF be increased to 0.75.

Proficiency was awarded for all three traits (Fat, EMA and PIMF) to 7 scanners in the May '97 test and 10 scanners in the June '98 test. Other scanners were accredited for individual traits.

DISCUSSION

Proficiency testing of scanners for submitting data to BREEDPLAN has resulted in high credibility of the data and the resulting EBVs. Scanned data are the highest cost of any data collection currently used to produce EBVs in BREEDPLAN yet the growth in scanned data has increased dramatically as demonstrated by the Angus statistics with 10,000 scans recorded in 1993 jumping to 53,000 analysed in the 1999 group BREEDPLAN.

Proficiency standards for EMA and subcutaneous fats have remained the same from the first proficiency test in 1989 and field research has shown that heritabilities of carcass traits based on scans taken by the accredited scanners is moderate. Standards for PIMF have been set only in the last two years but the first estimates of heritability for scanned PIMF are also moderate.

The mean and the range of trait values for the cattle used in the test are critical if repeated tests are to be equitable as the statistics used can be influenced by the value. This is especially evident in the PIMF trait where the current algorithms used in the computation are calibrated for a relatively small range of values. Knowledge of the background of the cattle and pre-course preparation in a feedlot is almost certainly necessary to ensure suitability.

There are a number of issues that need to be addressed for future testing. Currently the PBBA stipulates that currency of accreditation requires a test every three years. To date the tests (with the exception of one) have been conducted at Armidale but have been subsidised by research funds as they have been essential to the research objectives. As the system becomes strictly user pay, relatively high costs will be incurred by the scanners to attend the proficiency tests. The estimate from the June '98 test was an overhead cost to run the course of $1000 per participant which did not include salaries for organisers nor did it include travel and accommodation for scanners.

Currently no formal training is available for new and aspiring scanners. Training has been conducted 'on the job' by the contract scanners who are accredited. This has been successful but is limiting the entry of new scanners into the industry as contractors are disinterested in training competition and have trained only new members of their team. If the requirement for scanning continues to grow at the current rate the issue of training and proficiency testing may need to be addressed.

REFERENCES

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