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The Alliance Central Progeny Test: Preliminary results and future directions

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ABSTRACT

The Alliance Central Progeny Test (CPT) was established in 2001 with the aims of improving the carcass dollar value of sires under the Alliance grading system and establishing links among ram breeders so Alliance can identify the best rams for their clients. In the 2002/2003 season 22 terminal sires from nine different breeds were evaluated. Each ram was mated to 30 ewes at the AgResearch Woodlands research farm. Progeny numbers for each ram ranged from 13-46. Initial early results showed that breeding values for weaning weight were well spread among sires (range over 2.5 kg) indicating there were genetic differences among sires used. Lambs were slaughtered in four slaughter groups between December 16th, 2002 and March 11th, 2003. Analyses from the full data set will be available from May 2003. The next cycle of the Alliance CPT begins with mating in April, 2003, with an emphasis on dual-purpose sires.

Keywords: Progeny testing; meat sire evaluation

INTRODUCTION

The initiative to set up a New Zealand central progeny test (CPT) finally crystallized in 2001 and was led by a group consisting of Alliance Group Ltd, AgResearch, Sheep Improvement Limited and Abacus Biotech Ltd. The CPT (known as the Alliance CPT) was primarily established for meat sire evaluation.

The two main aims of the Alliance CPT are:

1) To improve the carcass dollar value under the current and future Alliance grading system
2) To establish links among breeders, so Alliance can identify the best rams for their clients

It is important to note that the trial is not intended to be for breed comparison, rather, to identify high performing rams regardless of breed.

Prior to the initiation of the Alliance CPT, the *de facto* standard of genetic evaluation in the New Zealand sheep industry has been across-flock evaluation. There are a number of sire-reference groups around the country with across-flock evaluations, some of which have been operating for more than 15 years. However, genetic linkages among sire-reference groups, and among breeds, are generally poor or non-existent. These links are required if the sheep industry is to move beyond across-flock (within-breed) sire reference comparisons and compete successfully with the Australian sheep meat industry.

An Australian CPT has operated successfully at Rutherglen and other sites for many years with core funding from Meat and Livestock Australia (Banks *et al.*, 1995; Fogarty *et al.*, 2002). The Australian sheep industry is currently reaping the benefits. Their CPT system enables them to link disparate breeds and groups. It also enables them to collect sires and evaluate them for novel traits (e.g., more detailed carcass traits for key industry sires). This information is provided as a series of lists, with one for each of the traits evaluated (e.g., growth rate, eye muscle area, and fat depth). Links between the Australian CPT and the New Zealand CPT will also enable between-country evaluations to be carried out and enable the New Zealand industry to leverage on the many years of work that the Australians have already undertaken.

What does the Alliance CPT mean for the NZ sheep industry?

The benefits to the industry should occur both in the seedstock and production sectors:

- Sire reference groups will be able to compare their rams with those in other sire reference groups, both within- and across-breeds. They will also be able to leverage on the years of genetic progress that has been made in Australia via their CPT
- When purchasing rams, producers will be able to compare rams on the basis of performance across different breeds, rather than choosing a breed and then selecting from a breeder within that breed.

The CPT should go some way towards advancing sheep genetic improvement programmes towards the level of sophistication currently found in the dairy industry.

OPERATIONAL DETAILS (CYCLE ONE 2002-2003)

The CPT was established in 2001 to run over three full mating-slaughter cycles. The first mating was carried out in 2002 at the AgResearch Woodlands farm (10 km north of Invercargill). The CPT management committee decided to concentrate on terminal sire breeds in the first year and 22 terminal sires from nine different breeds were selected by their various breed societies on the basis of their industry performance and linkage (Table 1).

Mating

Each sire was randomly allocated 30 mixed-age ewes (total of 660 ewes) for mating. The ewes were mainly pure Coopworth with approximately 100 ¼ East Fresian x Coopworth making up the remainder. Statistical analysis confirmed no significant differences (P>0.05) in

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TABLE 1: Terminal sires used in the 2002-2003 Alliance Central Progeny Test

Ram breed	Ram breeder	Flock name	Tag Number
Dorset Down	A & C Busch	Trackly	51/00
Composite	Landcorp Farming Ltd (c/o G Nicoll)	Turnberry	140/00
Romney	D Daniell	Wairere	2165/97
Composite	Kelso Ltd (c/o R Marshall)	Kelso	435/98
Composite	GM & CA Shaw	Wharatoa	t533/01
Hampshire	JG & JL Buchanan	Bilberry Oak	4012/99
Hampshire	JG & JL Buchanan	Teviotdale	1144/99
Horned Dorset	P Ponsonby	Douglas Downs	77/95
Poll Dorset	TR Potter	Ohio	106/99
Poll Dorset	IE & KM Prentice (c/o AJ & CS Brown)	Kurralea	211
Poll Dorset	H Leigh (c/o AJ & CS Brown)	Ivadene	154/99
Southdown	C Medlicott	Charleston	c57/99
Southdown	C Medlicott	Tasvic Downs	41/00
South Suffolk	RJ & EA Berney	Craig-Annat	929/00
South Suffolk	HM & ED King	Pohiwi	125/98
Suffolk	DA & JM Brown	Punchbowl	s419/96
Suffolk	AFG & RW Blakely + MG & AM Millar	Mornish	u33/97
Suffolk	AR & J Lindsay	Torresdale	165/00
Texel	Landcorp Farming (GB Nicoll)	Waikite	299/00
Texel	RJ & RA Gardyne	The Burn	xa2/99
Texel	PD Black + KR Shipley & Sons	Brandes Burton	400/00
Texel	Mt Linton Station (c/o M Monteith)	Mt Linton	2855/00

the makeup of ewes mated to any of the rams. All ewes were synchronised using CIDRs prior to mating and of the 22 rams used, 12 were mated using artificial insemination, with the remainder mated naturally to a synchronised oestrus (ram with ewes for one week).

Lambing

After pregnancy scanning, single-bearing ewes were run separately for lambing only, at around 40/50 per paddock. Ewes with triplets were marked and spread over the sheltered paddocks at a rate of seven to ten per paddock while ewes with twins were run with them to make up the numbers per paddock to approximately 25. During lambing the lambed ewes were randomly mobbed to achieve five groups of around 75 to 80 ewes with all sires represented in each mob. A lamb from triplet-bearing ewes was mothered onto a single-bearing ewe if the opportunity arose. The smaller triplet was normally taken off (this was adjusted for in all later analyses). Grazing from docking to weaning was arranged to try and minimise the environmental differences among the groups.

Docking

Lambs were docked at four weeks of age. At docking, lambs were vaccinated for scabby mouth, given a “Smartshot” treatment for preventing B-12 deficiency, and all ram lambs were made into crypt-orchids. Live weight was recorded on all lambs and docking group recorded.

Animal Health

Ewes were vaccinated with camylovexin, toxovax two-tooths, salvexin B, and 5 in 1, (in line with normal farm practices), drenched with a preventative oral internal parasite drench at docking, and treated with potassium iodide pre-mating and pre-lambing. All ewes were pregnancy scanned and ewes with triplets were run separately and fed barley at 300 grams/ewe/day for 35 days prior to lambing.

Weaning

Weaning was carried out on the 16th December (which coincided with the first slaughter date). A WormFEC faecal sample was taken from 10 lambs of each sire prior to the weaning drench and remaining lambs were drenched with Ivomec. A WormFEC sample was taken from 10 lambs per sire in total.

Drafting to works

Animals were drafted at 35kg liveweight for the first slaughter (17th December 2002) and 36 kg for the 2nd and 3rd slaughters (15th January and 11th February 2003, respectively). The final slaughter included all remaining lambs (11th March 2003). In addition to drafting on the basis of weights, a visual conformation score with three categories (based on hindleg, loin and shoulder conformation) was taken, and a dag score (four categories) was recorded at this time.

Slaughter Protocol

Lambs were processed over the same time period for each slaughter (9am onwards). On the day of slaughter, data were collected for pelts, yield grades (ViaScan-based on the Meat Board National Grading system) and hot carcass weight. Additional data collected in the chiller included: carcass length, hind leg length, GR on both sides (definition see Table 2) and a visual carcass conformation score. The following day (24 hours post slaughter), ultimate carcass pH and fat colour (definition see Table 2) were measured in the chiller prior to boning out. In the boning room, measurements included: eye muscle width (A), depth (B), and fat depth over the eye muscle (C) and eye muscle colour after allowing 30 minutes for the cut surface to bloom (see definition in Table 2). The trimmed cut weights recorded were French leg (H-bone out), loin saddle (cap off), standard rack (cap off), fore quarter – square cut (shoulder not tied), weight of trim, bone and total remaining other cuts (which were not included in previous cuts). The same trimmers were used throughout the trial.

Data Analysis

TABLE 2: Full definitions of slaughter measurements from Alliance Central Progeny Test lambs taken at the Alliance Mataura Plant

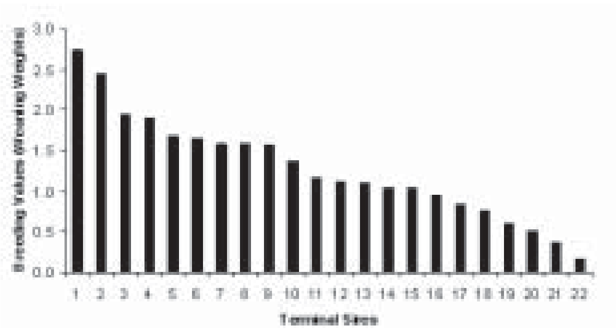
A (mm)	Width of the eye muscle at it widest point, located behind the last rib
B (mm)	Depth of the eye muscle at its deepest point, perpendicular to "A" and located behind the last rib
C (mm)	The depth of fat over the eye muscle, measured from the extension of the line "B", located behind the last rib
EMA (mm^2)	The area of the traced eye muscle area (*Longissimus dorsi* only), located behind the last rib
GR (mm)	Tissue depth over the 12th rib,110mm from the midline
Fat and meat colour	Measured using a Minolta Chromometer. The colour measurements are expressed with three variables; L, a and b • L - the lightness of the sample • a - the amount of red or green • b - the amount of blue or yellow. Fat can be measured at any time. However, meat must be given sufficient time for the cut surface to "bloom"
Bloom	When meat is cut, the cut surface must be given time for the colour to stabilise. This is called blooming, and it is actually the process of the surface being oxidized. This is seen as a change from a brown colour to a red colour. This process takes approximately 30 minutes for a fresh cut of meat, or as long as 2 hours for vacuum packaged product.

BLUP breeding values were estimated across breeds for the sires using a sire model as the CPT sires were assumed to be unrelated. The variance components used were estimated from the CPT data itself. Components were estimated using an animal model applying a Restricted Maximum Likelihood procedure using ASREML (Gilmour et al. 1999). The direct genetic effects were fitted as a random effect in all models. The maternal genetic effects were fitted as a random effect for weaning weight (the direct and maternal genetic effects were assumed to be uncorrelated). Weaning weight and pre-slaughter live weight were fitted in models including terms for age of dam, birth rearing rank and sex. Birth-day deviation and age at measurement were also included as covariates for weaning weight and pre-slaughter live weight, respectively. Primal cut weights, and other carcass linear or area measurements were analysed in a model that included sex and slaughter mob as fixed effects and cold carcass weight as a covariate. Meat quality measures (e.g. pH, meat and fat colour) were analysed fitting sex and slaughter mob as fixed effects. As the CPT is planned to run for an initial three-year period, year will be fitted as a fixed effect in all future models.

RESULTS AND DISCUSSION

Number of lambs born to each sire ranged from 13-46 (means listed in Table 3). A total of 94, 212, 213 and 120 lambs were slaughtered for the first, second, third and fourth slaughters respectively. Results from all slaughter measurements are yet to be analysed. Both this and across-sire-reference-groups analyses are expected to be complete by May 2003. Breeding values estimated for weaning weights were well spread (Figure 1) indicating significant genetic variation for pre-weaning growth weight amongst the sires. The range of breeding values was over 2.5 kg, or 10% of the mean weaning weight of 29.8 kg.

FIGURE 1: Graph showing spread of breeding values for weaning weights for 22 terminal sires used in cycle one of the Alliance Central Progeny Test



The second cycle of the Alliance CPT starts with mating in April 2003. The emphasis again is on evaluating sires for carcass traits and all progeny will be slaughtered. Rams chosen for the second cycle are mostly dual purpose breeds (15), while eight new terminal sires and two link terminal sires complete the selection.

This programme is novel in a number of ways in that it will provide valuable information to aid commercial farmers supplying the Alliance meat company with their sire selection as well as providing information for the ram breeders themselves. Secondly, it will act as a vehicle to refine the economic weightings of the selection criteria for meat breeds. Perhaps most importantly, the project provides a good working model of where all the major parties concerned with genetic improvement of the sheep meat industry (breeders, researchers, evaluation services and processors) have combined for the overall benefit of the industry as a whole.

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TABLE 3: Lamb numbers for the Alliance Central Progeny Test, production summary (cycle one: 2002)

	AI average	**Natural mating average**
Number of ewes lambing (average per sire)	16.8	19.6
Lambs born per ewe lambing	1.96	2.12
Survival to tagging (%)	84%	83%
Live lambs at tagging (average per sire)	27.7	34.8

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