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Mohair Research Update No. 13
--Improving the assessment of carcass production from Angora goats
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Introduction
Meat production is an important component of the financial returns from fibre and wool producing systems of animal production. South African and Texan Angora genotypes were released from quarantine onto Australian farms in the early 1990s. While the production and quality of mohair from these genotypes has been reported, there have been no reports on their meat production.

There are several important reasons to assess live goats before they are sold for meat including:
To decide if goats need additional feeding to maintain growth rate and reach target weights;
To estimate carcass attributes of goats before sale for meat; and
To avoid being penalised for failing to meet buyer specifications.

As part of the recent mohair enterprise benchmarking study, the carcass yields and commercial value of carcasses from various Angora goat genotypes were evaluated. The value of these studies is that prediction equations can be developed which enable farmers to better predict the carcass weight of Angora goats sold as surplus. This enables farmers, livestock agents and meat processors to improve their estimates of carcass and meat production and financial returns.

Carcass evaluation
Full details of the animals, their management and origin are provided in the mohair benchmark report published by RIRDC (McGregor, 2010a). The goats were born at Horsham as part of the Sire evaluation study (Ferguson and McGregor, 2005). Only the wether portion of the flock was transferred to the research institute at Attwood, Victoria where more detailed studies were conducted. The Sires were from South African, Texan and combinations of these and Australian genotypes.

At 6 years of age, and prior to slaughter, the eye muscle depth (mm) and subcutaneous fat depth (mm) of the goats were determined by ultrasonic scanning. The goats were weighed and body condition scored and then transport to the meat works at Wodonga. Hot carcass weight was recorded by electronic scales. Following chilling, carcasses were carefully inspected to ensure conformance with the standard carcass requirements and other measurements were then taken (Fig. 1).

Fig. 1. The carcasses of 6-year-old Angora wether goats from Texan, South African and mixed genotypes in the chiller at the Wodonga meat works prior to carcass quality assessment.
The data were analysed to determine the importance of factors affecting carcass yield. Data collected for the goats during the Sire evaluation study were available for analysis including sire, birth date, birth weight and dam age (Ferguson and McGregor, 2005).

Attributes of Angora goats and carcasses
The mean and range for average live weight and for body and carcass attributes for goats are shown in Table 1. The average live weight at slaughter was 62.8 kg with the heaviest goats weighing 77.5 kg. Body condition score averaged 2.7 but ranged from 1.0 to 4.3. Carcass attributes showed a range in values reflecting the range in carcass weights (Table 1, Fig. 1).

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Mean</th>
<th>s.d.</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average live weight (kg)</td>
<td>62.8</td>
<td>7.66</td>
<td>35.8</td>
<td>77.5</td>
</tr>
<tr>
<td>Condition score</td>
<td>2.7</td>
<td>0.63</td>
<td>1.0</td>
<td>4.3</td>
</tr>
<tr>
<td>Eye muscle depth (mm)</td>
<td>28</td>
<td>3.4</td>
<td>17</td>
<td>35</td>
</tr>
<tr>
<td>Subcutaneous fat depth (mm)</td>
<td>3.1</td>
<td>0.98</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Carcass weight (kg)</td>
<td>24.4</td>
<td>3.87</td>
<td>11.6</td>
<td>33.2</td>
</tr>
<tr>
<td>Birth weight (kg)</td>
<td>2.9</td>
<td>0.54</td>
<td>1.6</td>
<td>4.2</td>
</tr>
</tbody>
</table>

Fig. 2. The relationship between the carcass weight and the live weight of Angora wether goats slaughtered at 6 years of age.

The best prediction equation for carcass weight accounted for 91.5% of the variation.
This prediction equation included terms for live weight, subcutaneous fat depth, eye muscle depth and sire with subcutaneous fat depth and eye muscle depth accounting for a further 5.3% and sire a further 2.4% of the variation in carcass weight.
The equation was:
Carcass weight (kg) = (Live weight (kg) \( \hat{\beta} \) 0.343) + (Subcutaneous fat depth (mm) \( \hat{\beta} \) 0.77) + (Eye muscle depth (mm) \( \hat{\beta} \) 0.17) + (Sire effect which ranged from + 2.0 to - 0.8 kg) - 4.2
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In this study farmers could have obtained almost as good a prediction of carcass weight without the cost of external contractors needed to measure subcutaneous fat depth and eye muscle area by using live weight and body condition scores which together accounted for 87% of the variation in carcass weight. This equation was:

\[
\text{Carcass weight (kg)} = (\text{Live weight (kg) } \times 0.380) + (\text{Body condition score } \times 1.53) - 3.6
\]

The regression coefficients indicate that when used separately, for each 1 kg increase in live weight, carcass weight increased by 463 g, while for each 1 unit increase in body condition score carcass weight increased by 4.6 kg but when used together the coefficients were 380 g and 1.53 kg respectively.

Differences between sires were significant with a sire range of 2.78 kg in the carcass weight of their progeny at 6 years of age.

Eye muscle depth
The best prediction equation for the eye muscle depth included only body condition score and carcass weight accounting for 66% of the variation in eye muscle depth. The on-farm measurements of live weight and body condition score used together accounted for nearly 58% of the variation in eye muscle depth. Body condition score alone accounted for 51% of the variation.

It appears practical and reasonably reliable to use body condition score with or without live weight as an indirect measure to select goats for eye muscle depth. No sire effect was detected.

Financial returns
Most of the carcass weight sold (88%) achieved the heaviest category for financial returns at the time of sale. The average sale price per goat was $36. After direct costs were deducted the net sale price was $25.56 per goat. The financial returns from these Angora goats slaughtered for meat were about 10% less than similar sized sheep based on the prices reported during the same period (McGregor, 2010a). The prices available for Angora goat carcasses at the time were about 10% less than those for Australian rangeland goats, whose premium is partly related to the quantity of these goats available in larger consignments.

There has been a view that Angora goats are too fat for the commodity market but this view overlooks the facts that carcasses from Merino sheep are fatter than similar sized Angora goats and Merino sheep of greater body condition score obtain higher prices in the market. Provided Angora goats are supplied in the appropriate body condition there should be no objection on the basis of carcass fatness as body condition score is a good predictor of carcass fatness in Angora goats (McGregor, 1992; McGregor, 2010a,b).

Mature Angora goats produce large carcasses that provide a high return per head. In more favourable market conditions for meat, when Angora carcass prices exceed $1.80 c/kg, the return from carcass sales of heavy Angora goats (carcass weight > 20 kg) is likely to range from $36 to $50 per head.

Conclusions
On-farm measurements of live weight and body condition score of Angora goats are valuable predictors of carcass yield and eye muscle area. Farmers can use prediction equations for carcass yield to manage their goats to optimise financial returns. At 6 years of age there are differences of up to 2.8 kg between Angora sires in the carcass yield of their progeny.

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References and further reading