PROBLEMS OF COOPWORTH SHEEP SELECTION FOR WOOL GROWTH BASED ON 8 MONTH HOGGET FLEECE GROWTH

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SUMMARY
Fleece growth in Coopworth sheep is known to be influenced by season with maximum growth in late spring early summer. As replacement sheep are selected on the basis of hogget fleece weights which do not include the maximum wool growth period data were analysed to determine whether hogget fleece weights were correlated with adult fleece production.

Three years fleece weight data from a small Coopworth stud flock was examined to determine the correlation between fleece production, over an 8 month period, from December to July, in ewe hoggets, compared with adult yearly fleece production in pregnant two tooth ewes. For one age group the two tooth and four tooth fleece performances were compared. Eight month fleece weights were not a good indicator of adult performance (r=0.27) whereas two tooth fleece weight grown over a full year correlated significantly (r=0.86) with four tooth fleeces grown over the same period. Ewe parity up to mid to late pregnancy did not influence the hogget or two tooth relationship. Implications for selection of replacements is discussed.

Keywords: Coopworth, fleece weight, phenotypic correlation, pregnancy

INTRODUCTION
The commercial dual purpose sheep producer relies on the lifetime wool production from the ewe flock for a significant proportion of income. Any fleece weight gains through selection at the stud level are expected to be passed on to the commercial buyer of selected rams. The stud producer, although primarily interested in ram sales, anticipates that selection of ewe and ram replacements based on superior fleece weight as hoggets will slowly improve lifetime ewe wool cut. Fleece weight in long wool dual purpose breeds such as Coopworths, based on hogget fleece records, is regarded as moderately heritable 0.28 (Brash et al. 1994), and thought to be highly repeatable. No values for adult fleece weight appear to have been recorded as weighing of adult ewe fleeces is not normal commercial or stud practice.

Sumner et al. (1994) found that the repeatability of yearling Merino wool growth records with adult records was only about half that of the repeatability between adult records. Part of this difference was ascribed to the effects of liveweight change with the remainder of the variation due to phenotypic differences in seasonal wool growth pattern. They reported that under New Zealand conditions the Merino exhibits a less seasonal wool growth cycle than the British long wool breeds.

Seasonal fleece growth patterns in Coopworth and Romney were similar with ewes carrying twins producing 5% less fleece than ewes with singles when shorn in July at the time of minimum wool
growth (Summer and McCall 1989). Champion and Robards (1995) demonstrated a seasonal relationship between wool production and live weight in four carpet wool breeds, Romney and Merino sheep. With the exception of one carpetwool breed and the Merino they indicated that the highest producers of wool in winter were not necessarily the highest producers in summer and wool growth was not related to live weight. A lack of relationship between summer and winter wool growth has also been demonstrated in Merino sheep after seasonal differences in feed quality of green pasture compared with dry feed were taken into account (Adams et al. 1996).

The marked variance in green and dry feed availability across seasons in the Mediterranean type environmental zones used for prime lamb production in Australia together with the known seasonal or photoperiodic effects (Champion and Robards 1995) may therefore materially impact on the accuracy of selection practices for replacement animals in these systems where wool is an important component of total income. Selection based on an 8 month wool growth to yearling age, following lamb shearing, may not provide sufficient accuracy to achieve the long term objectives of increasing total lifetime wool production from ewes.

An observed lack of expected fleece growth in some adult ewes led to the analysis of three years of data from a small Coopworth stud in NSW, Australia to examine the correlation of the 8 month wool growth values used in stud replacement selection with subsequent adult ewe performance.

MATERIALS AND METHODS
In the years 1993 to 1996 normal stud recording practices for the Coopworth breed were followed with the addition of fleece weighing of two tooth ewes at shearing prelambing in June. Lambs born in the spring of each year were identified at birth, weighed at weaning in November, lamb shorn in December, then hogget weighed and shorn in July to allow ranking and selection of superior animals prior to sales in November. Retained ewe hoggets were selected on the basis of their combined index based on ewe fertility, weaning weight, yearling weight and hogget fleece weight. They were joined as two tooths in the following March and fleece weighed again prelambing in June with the rest of the adult ewes prior to lambing in August September. In 1996 four tooth fleece weights were also recorded.

Records were analysed on a year basis to establish phenotypic correlations between fleece weight at hogget shearing and two tooth shearing without correction for non genetic effects.

RESULTS AND DISCUSSION
The phenotypic correlation (r=0.27) for the three years complete data (n=50) for hogget fleece weight of selected ewe hogget replacements and two tooth fleece weight measured in late pregnancy was not significant. Correlations analysed by year and grouped by pregnancy status were not significant and are included as Table 1. The significant correlation between the 1996 four tooth fleece weights (n=12) and the same ewe fleece weights taken as two tooths the year before, independent of pregnancy status, was 0.86 (P< 0.001). When these values were correlated on the basis of parity (2 singles, 8 twins, 2 triplets) little difference was noted.
Table 1. Hogget fleece weight correlations with two tooth fleece weights in pregnant Coopworth ewes across three years records (n= number per group)

<table>
<thead>
<tr>
<th>Ewe status / years</th>
<th>1993-94</th>
<th>1994-95</th>
<th>1995-96</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full group independent of parity</td>
<td>0.28 n=17</td>
<td>0.24 n=18</td>
<td>0.36 n=15</td>
</tr>
<tr>
<td>Single bearing</td>
<td>0.25 n=4</td>
<td>0.29 n=6</td>
<td>0.61 n=5</td>
</tr>
<tr>
<td>Twin bearing</td>
<td>0.31 n=13</td>
<td>0.17 n=12</td>
<td>0.31 n=10</td>
</tr>
</tbody>
</table>

The summer of 1996 was wetter with a definite autumn break which had not been present the previous years. The additional green feed available may have improved the correlation across all ewes when compared with the previous seasons. Fleece weight ranking changed markedly in all year groups between hogget and two tooth records. An example of the change is given in Table 2 for the 1995-96 grouping.

Table 2. Change in ranking based on fleece weight, measured as hoggets in 1995 compared with two tooth values in 1996

<table>
<thead>
<tr>
<th>Hogget rank</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>3</th>
<th>5</th>
<th>5</th>
<th>7</th>
<th>8</th>
<th>8</th>
<th>10</th>
<th>10</th>
<th>12</th>
<th>12</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>2Tooth rank</td>
<td>1</td>
<td>12</td>
<td>7</td>
<td>11</td>
<td>2</td>
<td>4</td>
<td>12</td>
<td>3</td>
<td>6</td>
<td>9</td>
<td>14</td>
<td>4</td>
<td>7</td>
<td>10</td>
<td>14</td>
</tr>
</tbody>
</table>

The inherent seasonal cycle of wool growth in sheep has been well reviewed (Sumner and Bigham 1993). Wool growth maximises in summer and in long wool breeds is up to four times greater in summer than winter (Hawker and Crosbie 1985; Woods and Orwin 1988; Champion and Robards 1995). The normal program of replacement selection in the long wool breeds does not include the spring and early summer wool growth periods on lush green feed in the measurement of fleece growth in hoggets. This program has been based on the need for early performance information on hogget growth and fleece characteristics for data processing prior to sales together with the need to have sufficient wool regrowth for purchase inspections by November. It has been presumed that selected sheep would perform during the summer period in a similar or repeatable fashion to their autumn and winter performance and the selected advantage would be passed on. Johnson et al. (1995) have clearly demonstrated that in Romney sheep single trait selection for hogget fleece weight has resulted in a gain of 0.047kg/yr. What has not been demonstrated, however, is whether this advantage has been taken through to the adult and lifetime performance of ewes.

The significant differences in Merino wool growth in sheep grazing dry or green pastures (Adams et al. 1996) together with the highest producers in winter not being the highest producers in summer (Champion and Robards 1995) may be reflected in the findings of this study. The extreme ranking changes from high to low producers during the hogget to two tooth period with low correlations, independent of parity, questions the usefulness of the current selection program. Parity
status was not found to materially influence fleece correlations and supported the findings of Sumner and McCall (1989) that twin or triplet pregnancies to mid-pregnancy stage only reduced fleece weight by 5% and 6% respectively compared with single bearers. The highly significant correlation of two tooth to four tooth fleece weights found in 1996 suggests two tooth values are a more accurate estimate of genetic potential and reinforces the need to examine current practice if accurate selection for adult fleece production is required.

If lifetime increases in adult ewe fleece weight of long wool sheep are to be achieved through selection then the practice of shearing ewe and ram hoggets, after 8 months wool growth, to identify superior wool cutters as adults must change. Many problems are immediately evident if stud managers are expected to carry yearlings through the summer feed period prior to shearing. Ewe and ram fleece data may not be processed prior to selection before the next joining. Ram sales will be concentrated in the late summer period restricting summer joining of merino ewes for first cross production to joinings with older rams. Rams will need to be sold with little wool growth capable of demonstrating physical fleece characteristics. The current programs although appearing to be flawed will by necessity remain for rams. Stud breeders may, however, retain a larger number of ewe replacements, fleece weigh two tooth ewes and reselect the high producers. Those that do not perform even though the hogget fleece weight component of their selection index indicated they should have been flock improvers can be reappraised. By introducing a routine weighing of adult fleece growth into selection programs selection based on BLUP breeding values for multiple trait selection may improve accuracy but must be measured against the increased cost.

REFERENCES

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