# Lamb and hogget wool production from crosses of new and traditional sheep breeds

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## ABSTRACT

In addition to advantages offered to the lamb trade by the new sheep breeds they also offer opportunities to the wool industry. The influence of new breeds imported by Lamb XL on lamb and hogget wool production and characteristics was examined for Texel, Oxford Down, Whiteheaded Marsh and Finnish Landrace crossbreds compared with Romneys. Fleece weights were similar for the Oxford Down, Whiteheaded Marsh and Romney crosses but Texel crosses had a 12 % reduction in hogget fleece weight.

Texel and Oxford Down cross hoggets produced wool with high bulk and staple strength compared to the Romney cross hoggets. These characteristics are currently of special interest in the wool industry, with premiums existing for bulk and anticipated in the near future for staple strength. There were no practical differences in other wool characteristics between Romney, Texel, Oxford Down and Whiteheaded Marsh cross hoggets including fibre diameter, yield, colour, vegetable matter contamination and position of break. Finnish Landrace crosses produced lighter, finer fleeces. However half Finnish Landrace crosses are unlikely to be used in farming systems and reductions in fleece weight will be lower in the anticipated quarter or eighth Finnish Landrace crosses.

Lamb and hogget wool production and characteristics from the exotic crossbreds compare favourably with New Zealand Romneys and offer increases in wool production compared to traditional terminal sires.

**Keywords** Sheep, Breeds, Texel, Oxford Down, Whiteheaded Marsh, Finnish Landrace, Romney, Coopworth, wool production, hogget.

## INTRODUCTION

With the introduction of several new sheep breeds into New Zealand there is considerable interest in their effects on the current products of the sheep industry. Many of the new breeds have been imported to improve the lamb carcass characteristics, however they also have some different wool characteristics. This experiment was designed to compare wool characteristics of crossbreds from the new with a traditional wool breed. Breeds imported by Lamb XL and included in this trial were Texel, Oxford Down, Whiteheaded Marsh and Finnish Landrace.

## MATERIALS AND METHODS

Two different age groups were involved in this study. One group (Group 1), born in July 1989, consisted of progeny from Romney, Texel and Oxford Down rams mated to Coopworth ewes. The Texels were from two sources, Denmark and Finland. The second group (Group 2), born in September 1989, consisted of progeny from Romney, Whiteheaded Marsh and Finnish Landrace rams mated to Romney ewes. The Finnish Landrace rams were also mated to Coopworth ewes.

Lambing occurred over a 10 day period in each group. Only ram lambs were selected for this study and were weighed at birth, docking, weaning and at each monthly wool sampling date. The lambs/hoggets were grazed together as one mob from weaning.

Lamb shearing was at 19 weeks of age for Group 1 and at 17 weeks of age for Group 2. From 3 months of age a sample was taken from each animal from the same midside area once a month to measure wool growth rate. Wool growth rate was calculated from the patch area in milligrams per centimetre square per day. At 3, 6 and 9 months of age there was an additional midside sample taken for mean fibre diameter and yield analysis. Clean fleece weight at lamb shearing was calculated using yield measured on the 3 month sample.

At 12 months of age rams were again shorn. Individual samples were collected for mean fibre diameter and yield analysis and a combined sample for each breed taken to determine further fleece characteristics, including colour, bulk, staple length and strength.

**TABLE 1** Wool characteristics and liveweight of sire breed groups at three monthly intervals.

| | Group 1 | | | Group 2 | | |
|---|---|---|---|---|---|---|
| | Romney | Texel | Oxford Down | Romney | Whiteheaded Marsh | Finnish Landrace |
| Number of animals | 27 | 56 | 31 | 22 | 32 | 61 |
| Mean fibre diameter (microns) | | | | | | |
| 3 months | 29.8±0.3 | 29.7±0.2 | 30.5±0.3 | 29.5±0.4$^{a}$ | 28.7±0.3$^{a}$ | 27.0±0.2$^{b}$ |
| 6 months | 36.4±0.4 | 36.3±0.3 | 36.6±0.4 | 33.5±0.5$^{a}$ | 34.4±0.4$^{a}$ | 30.0±0.3$^{b}$ |
| 9 months | 37.8±0.4$^{ab}$ | 38.1±0.3$^{a}$ | 37.1±0.4$^{b}$ | 34.0±0.5$^{a}$ | 34.3±0.4$^{a}$ | 30.6±0.3$^{b}$ |
| 12 months | 36.3±0.4 | 36.4±0.3 | 36.4±0.4 | 33.3±0.5$^{a}$ | 33.7±0.4$^{a}$ | 28.6±0.3$^{b}$ |
| Yield (%) | | | | | | |
| 3 months | 76.2±0.6$^{a}$ | 80.0±0.4$^{b}$ | 77.7±0.6$^{a}$ | 79.5±0.7$^{a}$ | 82.8±0.6$^{b}$ | 81.4±0.4$^{b}$ |
| 6 months | 85.4±0.5$^{a}$ | 87.1±0.4$^{b}$ | 85.9±0.5$^{a}$ | 87.0±0.7 | 88.7±0.7 | 87.8±0.4 |
| 9 months | 72.0±0.9$^{a}$ | 76.7±0.7$^{b}$ | 73.6±0.9$^{a}$ | 53.8±1.1$^{d}$ | 55.1±0.9$^{d}$ | 55.8±0.7$^{d}$ |
| 12 months | 74.2±0.7$^{a}$ | 78.2±0.5$^{b}$ | 76.8±0.5$^{b}$ | 71.0±0.9$^{a}$ | 74.4±0.7$^{b}$ | 75.1±0.5$^{b}$ |
| Greasy fleece weight (kg) | | | | | | |
| 3 months | 1.45±0.04$^{a}$ | 1.27±0.03$^{b}$ | 1.46±0.04$^{a}$ | 1.08±0.05$^{ab}$ | 1.09±0.04$^{a}$ | 0.96±0.03$^{b}$ |
| 12 months | 3.75±0.09$^{a}$ | 3.26±0.06$^{b}$ | 3.59±0.08$^{a}$ | 3.91±0.10$^{a}$ | 3.82±0.08$^{a}$ | 2.55±0.06$^{b}$ |
| Clean fleece weight (kg) | | | | | | |
| 3 months | 1.10±0.04$^{ab}$ | 1.03±0.03$^{a}$ | 1.12±0.03$^{b}$ | 0.87±0.04$^{ab}$ | 0.90±0.03$^{a}$ | 0.79±0.05$^{b}$ |
| 12 months | 2.78±0.07$^{a}$ | 2.55±0.05$^{b}$ | 2.75±0.07$^{a}$ | 2.77±0.08$^{a}$ | 2.85±0.07 | 1.92±0.05$^{b}$ |
| Liveweight (kg) | | | | | | |
| 3 months | 26.1±0.8$^{a}$ | 29.4±0.6$^{b}$ | 31.3±0.8$^{c}$ | 22.0±0.8$^{a}$ | 21.9±0.6$^{a}$ | 26.6±0.4$^{b}$ |
| 6 months | 44.1±1.0$^{a}$ | 50.5±0.7$^{b}$ | 51.5±1.0$^{b}$ | 31.1±1.0$^{a}$ | 33.8±0.8$^{b}$ | 38.3±0.6$^{c}$ |
| 9 months | 48.8±0.9$^{a}$ | 56.2±0.7$^{b}$ | 55.2±0.9$^{b}$ | 39.0±1.0$^{a}$ | 41.3±0.8$^{a}$ | 43.6±0.6$^{b}$ |
| 12 months | 55.2±1.1$^{a}$ | 60.1±0.7$^{b}$ | 60.1±1.0$^{b}$ | 43.7±1.0 | 41.7±0.8 | 42.5±0.6 |

$^{a,b,c}$ indicate significant differences ($P<0.05$) between sire breeds within each group; $^{d}$ samples wet when taken

The data was analyzed using generalized least squares. The effects fitted were breed, birth rank (lamb born a single or multiple) and their interaction. The effect of age was not important due to the narrow lambing period within each group. As the control treatment in each group differed i.e. Romney x Coopworth in Group 1 and Romney x Romney in Group 2, and none of the crosses were repeated, it is not possible to compare Group 1 with Group 2 and each group was analyzed separately.

## RESULTS AND DISCUSSION

### Texel

There were no significant differences between the wool characteristics of the two sources of Texels, Danish or Finnish. Analyses were therefore carried out with the Texels treated as one group.

Mean fibre diameter of the Texel crosses was very similar to the Romney control group at every sampling. Yields were significantly higher in the Texel crosses by about 4 % (Table 1).

Monthly wool growth rates for the Texel crosses

**TABLE 2** Greasy wool growth rates (milligrams/cm$^2$/day) of sire breed groups.

| | Group 1 | | | Group 2 | | |
|---|---|---|---|---|---|---|
| | Romney | Texel | Oxford Down | Romney | Whiteheaded Marsh | Finnish Landrace |
| Birth to 6 November | 1.20±0.04$^a$ | 1.04±0.03$^b$ | 1.13±0.04$^{ab}$ | | | |
| Birth to 6 December | 1.82±0.07$^a$ | 1.58±0.06$^b$ | 1.40±0.04$^c$ | | | |
| 6 November to 6 December | 1.68±0.07 | 1.58±0.05 | 1.67±0.06 | | | |
| 6 December to 4 January | 1.62±0.06$^a$ | 1.42±0.04$^b$ | 1.30±0.05$^b$ | 1.98±0.10$^a$ | 1.80±0.08$^a$ | 1.59±0.05$^b$ |
| 4 January to 31 January | 1.68±0.06$^a$ | 1.57±0.04$^{ab}$ | 1.48±0.05$^b$ | 1.40±0.05$^a$ | 1.37±0.04$^a$ | 1.19±0.03$^b$ |
| 31 January to 28 February | 1.88±0.06$^a$ | 1.79±0.04$^{ab}$ | 1.71±0.06$^b$ | 1.96±0.07$^a$ | 1.89±0.06$^a$ | 1.44±0.04$^b$ |
| 28 February to 28 March | 1.51±0.06$^a$ | 1.45±0.04$^{ab}$ | 1.32±0.06$^b$ | 1.46±0.06$^a$ | 1.34±0.05$^a$ | 1.22±0.04$^b$ |
| 28 March to 27 April | 1.61±0.06 | 1.63±0.05 | 1.51±0.06 | 1.88±0.07$^a$ | 1.80±0.06$^a$ | 1.56±0.04$^b$ |
| 27 April to 23 May | 1.47±0.05$^a$ | 1.37±0.04$^{ab}$ | 1.30±0.05$^b$ | 1.75±0.06$^a$ | 1.61±0.05$^a$ | 1.17±0.04$^b$ |
| 23 May to 22 June | 1.20±0.06 | 1.23±0.04 | 1.24±0.05 | 1.58±0.07$^a$ | 1.50±0.05$^a$ | 1.04±0.04$^b$ |
| 22 June to 18 July | 1.58±0.06$^a$ | 1.32±0.04$^b$ | 1.45±0.06$^{ab}$ | 1.91±0.08$^a$ | 1.58±0.07$^b$ | 1.07±0.05$^c$ |
| 18 July to 16 August | | | | 1.97±0.09$^a$ | 1.68±0.07$^b$ | 1.14±0.05$^c$ |
| 16 August to 12 September | | | | 1.36±0.05$^a$ | 0.94±0.04$^b$ | 0.77±0.03$^c$ |

$^{a,b,c}$ indicate significant differences ($P<0.05$) between sire breeds within each group.

were generally lower than for the Romney crosses but differences were only significant in two of the nine months (Table 2). The greasy fleece weights of the Texels were significantly lower at lamb and hogget shearing. However at the lamb shearing the higher yield of the Texels meant there was no difference between the clean fleece weights. At hogget shearing the higher yield reduced the differences between the Texel and Romney crosses to 0.25 kilograms but the Texel still had a significantly lower clean fleece weight. The difference in hogget fleece weight was reflected in the shorter staple length of the Texel crosses.

Texels had a higher staple strength than Romney crosses (Table 3), a characteristic which is just beginning to be measured prior to sale, and in future stronger wools such as the Texel will attract price premiums.

The supposed bulk advantages of the Texel wool are frequently promoted and were confirmed in this study. The bulk of the Texel cross wool was high (27 cm$^3$/g) compared to the Romney (22 cm$^3$/g). Such increases in bulk are desired by many end users, especially carpet manufacturers. The average premium for increased bulk is 5c per unit, so Texel cross wool could obtain a premium of 25 c/kg, which will offset some of the reduced returns due to a lower fleece weight.

## Oxford Down

Initially monthly wool growth rates were significantly lower for the Oxford Down crosses compared to the Romney crosses, but only during one of the last four months was there a significantly lower wool growth rate (Table 2). Despite the earlier differences in wool growth rates there were no differences in fleece weights at lamb or hogget shearing (Table 1).

There were few differences between the Romney cross and the Oxford Down cross wool in fibre diameter or yield at lamb or hogget shearing, except for a significantly higher yield for the Oxford Down cross. This did not result in any differences in clean fleece weights. The Oxford Down cross had a significantly lower fibre diameter at the 9 month sampling, however this would not have any practical importance and did not recur at 12 months. Similarity to the Romney cross wool continued in the hogget fleece characteristics for colour, vegetable matter base and staple length.

The difference between the Oxford Down cross and the Romney cross was in the staple strength and bulk characteristics. The Oxford Down cross wool had

**TABLE 3** Hogget fleece characteristics for sire breed groups.

| | Romney | Texel | Sire breed group Oxford Down | Whiteheaded Marsh | Finnish Landrace |
|---|---|---|---|---|---|
| Mean fibre diameter (microns) | 35.3 | 36.2 | 36.6 | 34.0 | 30.0 |
| Yield (%) | 71.2 | 75.4 | 76.8 | 74.9 | 73.8 |
| Colour | | | | | |
| X | 59.0 | 60.0 | 59.0 | 60.0 | 62.3 |
| Y | 60.5 | 61.0 | 60.5 | 61.6 | 64.3 |
| Z | 57.0 | 58.0 | 56.5 | 58.5 | 62.0 |
| Y-Z | 3.5 | 3.0 | 4.0 | 3.0 | 2.3 |
| Vegetable matter base (%) | 0.2 | 0.3 | 0.2 | 0.1 | 0.0 |
| Bulk ($cm^3$/gram) | 21.7 | 27.5 | 27.2 | 22.7 | 23.5 |
| Mean staple length (mm) | 121 | 108 | 123 | 123 | 106 |
| CV of staple length (%) | 11 | 9.5 | 13 | 11 | 13 |
| Mean staple length (Nt/ktex) | 39 | 48 | 49 | 43 | 36 |
| Position of break (%) | | | | | |
| Tip | 53 | 62 | 63 | 42 | 15 |
| Middle | 41 | 19 | 26 | 53 | 60 |
| Base | 6 | 19 | 11 | 5 | 25 |

the same staple strength and bulk attributes as the Texel crosses (Table 3). The bulk of the Oxford Down was 5 $cm^3$/g higher than the Romney and the staple strength 10 Nt/Ktex greater.

With no differences in fleece weight the advantages of the Oxford Down over the Romney in terms of bulk and staple strength would result in an increased wool return for the Oxford Down crosses.

## Whiteheaded Marsh

Wool characteristics of the Whiteheaded Marsh crosses were similar to the Romney (Table 1). There was no significant differences in the mean fibre diameter at any time. The yield of the Whiteheaded Marsh cross was higher at 3 and 12 months but there were no significant differences in greasy and clean fleece weights. Only during the last 3 months did Whiteheaded Marsh crosses have significantly lower wool growth rates (Table 2).

The hogget fleece characteristics were the same for the Romney and Whiteheaded Marsh crosses, in terms of fibre diameter, yield, colour, vegetable matter base, bulk, staple length, staple strength and position of break (Table 3).

## Finnish Landrace

There was little difference in wool characteristics between the two Finnish Landrace crosses comprising Romney and Coopworth dams. Only at 6 months of age was the Finnish Landrace Romney cross wool significantly finer ($P<0.05$) than that from the Finnish Landrace Coopworth cross (29.4 vs 30.5 microns). The difference means little in practical terms. Analyses were therefore carried out with the Finnish Landrace crosses treated as one group and data for separate dam breeds is not shown.

The Finnish Landrace crosses had significantly

finer fibre than the Romneys over the entire trial period (Table 1). The premium obtained by finer wool is reflected in the respective Wool Board 1990/91 minimum wool prices. The Finnish Landrace cross hogget wool would fall into the Halfbred and Corriedale 25 to 32 micron category while the other sire groups would fall into the Crossbred (Romney and other long wool breeds) 31 microns and stronger, resulting in a premium for fineness to the Finnish Landrace cross hogget wool of about 45 cents per kilogram clean.

Wool growth rates were lower in the Finnish Landrace crosses than in the Romney in all months (Table 2). Fleece weights of the Finnish Landrace crosses were not significantly different from the Romney at lamb shearing but were significantly lighter at hogget shearing when greasy fleece weights were lighter by over 1 kg. However the Finnish Landrace crosses had significantly higher yields than the Romneys which reduced the differences in clean fleece weight to 0.8 kg (Table 1). The lower returns due to reduced fleece weight would not be compensated for by the premium for fineness. The effect of an increase in the number of lambs and hoggets shorn in a system including Finnish Landrace cross ewes would need to be calculated to determine any overall difference in income from a decreased wool production per head compared to Romneys.

The Finnish Landrace cross wool was brighter, ie had a higher Y colour value, and whiter, with a lower Y-Z value, than other sire breed hogget wools (Table 3). Staple strength of the Finnish Landrace wool was lower than for the Romney but adequate for processing. The position of break in the Finnish Landrace wool tended to be more in the centre and base region compared to the other sire groups where the break tended to occur at the tip and centre regions.

## CONCLUSIONS

Wool from some exotics in New Zealand quarantine stations have shown good fleece weights and characteristics but few had been compared to traditional New Zealand sheep breeds under identical conditions. In this trial, where exotic crossbred progeny were grazed together with traditional wool breeds, results are extremely favourable for many of the new breeds.

With increasing interest in the wool market in high bulk and staple strength the exotics provide opportunities to obtain premiums for these characteristics. Texel and Oxford Down cross hoggets produced wool with high bulk and high staple strength compared to the Romney cross hoggets. The Oxford Down crosses produced the same fleece weights as the Romney crosses, however the Texel cross hoggets had a 12 % lower fleece weight.

Whiteheaded Marsh cross lamb and hogget wool production and characteristics were identical to the Romney. The Finnish Landrace cross had the greatest differences in wool production compared to the Romney, with lighter, finer fleeces. A premium would be obtained for the finer wool, but this would not compensate for the 30 % lower fleece weight. However the Finnish Landrace is unlikely to be used as a first cross and the differences in wool returns will be lower in quarter or eighth Finnish Landrace crosses.

Most of the exotic sheep breeds have been imported into New Zealand for the lamb slaughter trade. In these roles they will compete with the traditional terminal sires, the down breeds. Previous trials in New Zealand have indicated that lamb fleece weight was considerably lower in down breeds compared to the traditional long wool breeds. For example, as a percentage of Southdown production (Carter *et al.*, 1974) found that lamb wool weights (average age 100 days) when crossed with Romney ewes were: Southdown, 100; Suffolk, 102; Romney, 128; Border Leicester, 124. In this study the Oxford Down and Whiteheaded Marsh crosses produced the same lamb and hogget fleece weights as the Romney. The lighter fleece weights of the Texel would still result in greater fleece production than the current down breeds.

Lamb and hogget wool production and characteristics from exotic sheep breeds compare favourably with New Zealand Romneys and offer increases in wool production compared to traditional terminal sires. Wool production from older ewes would need to be investigated to determine the impact of using exotic crossbreds as dam breeds.

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