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**Mubashir Ali Rather**

Sheep Husbandry Officer at  
Government Sheep Breeding  
Farm Balnoi, Poonch, Jammu  
and Kashmir, India

## Factors affecting greasy fleece yield in Rambouillet sheep

**Mubashir Ali Rather**

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### Abstract

Greasy wool yield in sheep is an important trait governed by genetic and environmental factors during pre- and postnatal life. A study was, therefore, undertaken to study the wool yield and some environmental factors affecting it in Rambouillet sheep. The data spread over three years (2018 to 2020) pertaining to Rambouillet sheep maintained at Government Sheep Breeding Farm Balnoi was analyzed by least squares and maximum likelihood computer program, PC-2 version (Harvey, 1990). The least square mean of  $1.77 \pm 0.01$  kg for greasy fleece yield (GFY) in Rambouillet sheep was observed. All the factors non-genetic (age, sex and year) included in the model influenced GFY significantly ( $P < 0.01$ ) in the present study. Highest wool yield was observed in the animal in 5 years of age with variable decline thereafter. Therefore, it is concluded that environmental in particular age and sex are a significant source of variation in wool yield in Rambouillet sheep.

**Keywords:** Rambouillet sheep, greasy fleece, environmental factors, wool

### Introduction

Sheep rearing is a major source of livelihood earning of poor and marginal Indian farmers. Sheep are reared for wool and mutton. Wool is a natural fibre in demand. Wool yield is governed by the interaction of genetic and environmental factors during pre- and postnatal life. The environmental factors which influence wool yield includes age and sex of the animal and reproduction in the ewe <sup>[15]</sup>. Inadequate supply of nutrients during prenatal period damages wool follicles in sheep <sup>[20]</sup> thus affect wool yield. The number and ratio of primary and secondary follicles change with age, thus affect wool yield. Maximum fleece weights are obtained from sheep of 3 to 5 years of age with variable rates of decline thereafter <sup>[1]</sup>. Therefore, a study was undertaken to investigate the effects of age and sex of the animal and year of shearing on greasy fleece yield (GFY) in Rambouillet sheep in an organized farm.

### Materials and Methods

Data (n=1635) on greasy fleece yield (GFY) of Rambouillet sheep maintained at the Sheep Breeding Farm Balnoi from 2018 to 2021 were used for this study. The farm is located in Poonch district about 2000 km from Srinagar. Ewes were mated from August to the end of September. The ewes were divided into groups based on body weight and GFY. Lambing commenced in January. The animals were machine-shorn once a year in the month of October after downward migration from highland pastures Seri-Magayana. The data were classified to study the major effect of non-genetic factors like age, sex (male and female) and year of the shearing (3 periods). Data were analyzed by least squares and maximum likelihood computer program, PC-2 version (Harvey, 1990) <sup>[6]</sup> using following model:

$$Y_{ijkl} = \mu + A_i + G_j + P_k + e_{ijkl}$$

Where,  $Y_{ijkl}$  is observation of  $l^{\text{th}}$  sheep, recorded in  $k^{\text{th}}$  year having  $j^{\text{th}}$  sex and  $i^{\text{th}}$  age in years  $\mu$  is overall mean,  $A_i$ ,  $G_j$  and  $P_k$  are fixed effect age of animal, sex of animal and year of shearing, respectively, whereas  $e_{ijkl}$  is random error associated with all these fixed factors with,  $N(0, e)$ . <sup>2</sup>. The statistical significance of various fixed effects in the least squares model was determined by 'F' test using SPSS software. For significant effects, the differences between pairs of levels of effects of the period were tested by Duncan's multiple range test (DMRT) as modified by Kramer (1957) <sup>[9]</sup>.

**Corresponding Author:**

**Mubashir Ali Rather**

Sheep Husbandry Officer at  
Government Sheep Breeding  
Farm Balnoi, Poonch, Jammu  
and Kashmir, India

## Results and Discussion

The least square mean of  $1.77 \pm 0.01$  kg for greasy fleece yield (GFY) in Rambouillet sheep was observed in the present study. However, Rather *et al.* (2021) [18] in Kashmir Merino sheep observed six months greasy wool yield of  $1.36 \pm 0.01$  kg. Therefore, Kashmir Merino sheep produce more GFY as compared to Rambouillet sheep. However, the number of clips and environment may also be a contributing factor for increased wool yield in Kashmir Merino. Qureshi *et al.* (2013) [22] reported overall greasy fleece yield (kg), staple length (cm), fiber diameter ( $\mu$ ), medullation (%), clean yield percent, clean wool yield and wool bulk (cm<sup>3</sup>/gm) of  $2.19 \pm 0.082$ ,  $8.88 \pm 0.054$ ,  $26.36 \pm 0.825$ ,  $3.08 \pm 1.485$ ,  $68.14 \pm 2.553$  and  $25.87 \pm 0.594$  crossbred,  $1.92 \pm 0.116$ ,  $7.89 \pm 0.673$ ,  $27.93 \pm 0.584$ ,  $8.89 \pm 1.052$ ,  $71.08 \pm 2.117$  and  $26.46 \pm 0.493$  in Poonchi sheep and  $2.36 \pm 0.091$ ,  $0.477$ ,  $20.02 \pm 0.650$ ,  $6.09 \pm 1.171$ ,  $69.78 \pm 2.578$  and  $25.92 \pm 0.600$  in Rambouillet sheep, respectively. As presented in Table 1, all the non-genetic factors included in the model influenced GFY significantly ( $p < 0.01$ ). Highest wool yield was observed in the animal in 5 years (at around 4.5) of age with variable decline thereafter. Rather *et al.* (2021) [18] in Kashmir Merino sheep also reported highest wool yield in animals in 5<sup>th</sup> year of age with variable decline thereafter. Maximum fleece weights were obtained from sheep of 3.5 to 6.5 years of age. However, Corbett, (2001) [1] reported maximum fleece weights from 3 to 5 years aged sheep with variable rates of decline thereafter. Less wool yield was observed in young and old sheep. The less wool yield in young sheep may be attributed to small surface area of skin for wool growth as compared to adults. Further, the active competition for nutrients between follicles and other tissues in young growing sheep results in less wool production in them than animals which have completed growth (Khan *et al.*, 2012; Rather *et al.*, 2021) [7, 19]. However, the decrease in wool yield with age after 5 years could be attributed to decrease in number of active follicles and their synthetic ability [1], change in feeding pattern and diet selection (Khan *et al.*, 2012; Rather *et al.*, 2021) [7, 18]. Dixit *et al.*, (2009) [3] in 3/4<sup>th</sup> bred Bharat Merino sheep reported that the younger sheep between 2-5 years of age produced the heaviest clip of 1.307 kg to 1.342 kg, whereas older animals of age more than 6 years produced the lowest clip of 1.201 kg.

Rather *et al.*, (2021) [18] in Kashmir Merino sheep reported a significant effect of age on wool yield. Dixit *et al.*, (2009) [3] reported that age of lamb influenced first and subsequent six-monthly clips in 3/4<sup>th</sup> bred Bharat Merino sheep. The effect of sex was highly significant ( $p < 0.01$ ) on the greasy fleece yield with sexual dimorphism in favour of males in Rambouillet sheep in the present study.

The higher wool yield in males than females could be attributed to the fact that males are always heavier than females [14] under influence of male sex hormones and differences in sexual chromosomes and position of genes [17], thereby providing more surface area of their skin for wool growth [4]. Further, ewes have to compensate for physiological stresses of pregnancy, parturition and lactation. Higher wool yield in males than females was also reported by Gupta, (2000) [5] and Sarkar (2008) [21] in different sheep strains/Breeds, Dixit *et al.* (2009) [3] in Bharat Merino Sheep, Lalit *et al.* (2016) [10] in Harnali sheep, Khan *et al.* (2015) [8] in Rambouillet crossbred sheep, Das *et al.* (2014)<sup>2</sup> and Rather *et al.* (2019) [19] in Kashmir Merino sheep. The sexual

dimorphism in favour of males was also reported in earlier studies [2, 10, 11, 12, 13, 19, 18]. The year of shearing was also a significant ( $p < 0.01$ ) source of variation for GFY for Rambouillet sheep in the current study. Dixit *et al.* (2009) [3] in Bharat Merino Sheep, Qureshi *et al.* (2013) [16] in Poonchi, Rambouillet and crossbred sheep and Rather *et al.*, (2021) [18] in Kashmir Merino sheep also reported significant differences due to year/ period of shearing in GFY. The variation in GFY due to year of shearing may be caused by differences in rainfall, availability of grazing in pastures and management differences.

## Conclusion

It is concluded that environmental in particular age and sex are a significant source of variation in wool yield in sheep. The wool yield increases with age up to the 5<sup>th</sup> year of age with variable decrease thereafter. Therefore, it is not economical to sheep in farm after 7.5 years age. Further, management and climatic variation play significant role in wool production.

**Table 1:** Least squares means for greasy fleece yield in Rambouillet sheep

Effect	N	GFY (kg)
Overall	1635	$1.77 \pm 0.01$
Year		0.000**
2018	500	$1.74 \pm 0.02^a$
2019	538	$1.88 \pm 0.02^b$
2020	597	$1.68 \pm 0.02^c$
Sex		0.008**
Female	1211	$1.74 \pm 0.01$
Male	424	$1.80 \pm 0.02$
Age		0.000**
0.5 years	541	$0.88 \pm 0.02^a$
1.5 years	330	$1.48 \pm 0.02^b$
2.5 years	253	$1.83 \pm 0.02^c$
3.5 years	142	$1.95 \pm 0.03^d$
4.5 years	109	$2.12 \pm 0.03^e$
5.5 years	68	$2.01 \pm 0.04^{de}$
6.5 years	106	$2.01 \pm 0.03^d$
7.5 years	67	$1.96 \pm 0.04^d$
8.5 years	19	$1.68 \pm 0.08^b$

Means with different superscripts in the columns differ significantly; \*\* - Significant ( $p < 0.001$ ); N is number of observations

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