

# EFFECT OF THE $Fec^B$ ALLELE OF THE BOORoola MERINO ON WEIGHT OF LAMB MARKETED PER EWE WHEN INTROGRESSED INTO A RAMBOUILLET FLOCK

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## Objectives

1) Determine the effect of the  $Fec^B$  allele of the Booroola Merino in a U.S. sheep population unconfounded by background genotype, and 2) develop a flock of high percentage Rambouillets with the  $Fec^B$  allele.

## Procedures

A project to introgress the  $Fec^B$  allele into a Rambouillet flock was initiated at the Dixon Springs Agricultural Center of the University of Illinois in 1985, and the project was moved to the Arlington Agricultural Research Station of the University of Wisconsin-Madison in 1991. This report presents results obtained during the four lambing seasons from 1996 through 1999.

Rambouillet ( $Fec^{++}$ ) and Booroola Merino ( $Fec^{BB}$ ) rams initially were mated to a flock of Rambouillet ewes during the autumns of 1985 through 1988. Booroola Merino-Rambouillet cross female progeny from this mating and subsequent matings were backcrossed to Rambouillet rams, and Rambouillet ewes continued to be mated to Rambouillet rams. The same Rambouillet rams were mated with the Rambouillet and Booroola Merino-cross ewes. Lambs were weaned at approximately 60 days of age. Rambouillet replacement ewes and rams were selected on estimated genetic merit for litter size using the "Number of Lambs Born" FEPDs from NSIP. Rambouillet/Booroola Merino-cross (RB) replacement ewes had to be an  $F_1$  or have a dam that had been classified as a carrier ( $Fec^{B+}$ ). Selection preference was given to RB ewe lambs with higher percentages of Rambouillet breeding. Ewes were mated in order to lamb first at approximately 2 years of age and annually thereafter. Prior to breeding each year, ovulation rate of ewes was determined by counting number of corpora lutea viewed with a laparoscope. RB ewes were classed as carriers ( $Fec^{B+}$ ) if they had 3 or more ovulations at their first examination at approximately 19 months of age and as non-carriers ( $Fec^{++}$ ) if they had 1 or 2 ovulations. After their first or second lambing, the  $Fec^{++}$  RB ewes generally were culled to make room for RB replacements from dams classified as  $Fec^{B+}$ . Approximately 60 Rambouillet and 60 RB ewes were mated each year. From 1996, the majority of the RB ewes were of 7/8 or greater Rambouillet breeding.

## Results

Previous summaries of this study have shown no significant difference between Rambouillet and RB  $Fec^{B+}$  ewes for ewe productivity to weaning (total weight of lambs at 60 days postpartum per ewe exposed). Even though the RB  $Fec^{B+}$  ewes gave birth to more lambs, their lamb mortality was greater and their lambs had lighter weaning weights than the Rambouillet ewes. However, more lambs were raised to market weight from RB  $Fec^{B+}$  than Rambouillet

ewes and that may give the RB Fec<sup>B+</sup> ewes an economic advantage. This study compares RB Fec<sup>B+</sup> and Rambouillet ewes for lamb production to market endpoints.

Table 1 presents the productivity of the two ewe groups when lambs are marketed at either 180 d of age or at 54.4 kg (120 lb.) live weight. At 180 d after lambing, each RB Fec<sup>B+</sup> ewe has .33 more lambs than each Rambouillet ewe. This is a large advantage in lamb production for the RB Fec<sup>B+</sup> ewes. However, much of this potential advantage in lamb production is not realized due to the lower weight for each lamb raised (48.9 vs. 53.9 kg. for RB Fec<sup>B+</sup> and Rambouillet ewes).

When lambs are taken to a market endpoint of 180 d or 54.4 kg, RB Fec<sup>B+</sup> ewes were, in fact, more productive than Rambouillet ewes. When lambs were marketed at 180 d of age, RB Fec<sup>B+</sup> ewes marketed 7 kg (15.4 lb.) more lamb per ewe mated than did Rambouillet ewes. This difference was not large enough to be statistically significant. When lambs were marketed as they reached 54.4 kg (120 lb.), the difference between the ewe groups was significant and favored the RB ewes by 16.5 kg. (36.3 lb.).

**Table 1.** Lamb production of ewe groups when lambs are marketed at age or weight endpoints

Trait	Ewe Breeding	
	Rambouillet	RB Fec <sup>B+</sup>
Fertility, %	93.8 ± 2.5	91.0 ± 2.2
Litter size, no.	1.69 ± .07 <sup>b</sup>	2.40 ± .07 <sup>a</sup>
Lamb survival to 180 d, %	90.9 ± 2.5 <sup>a</sup>	81.4 ± 2.0 <sup>b</sup>
Lambs/ewe exposed at 180 d, not analyzed	1.44	1.77
Lamb weight at 180 d, kg	53.9 ± .6 <sup>a</sup>	48.9 ± .5 <sup>b</sup>
Ewe productivity at 180 d, kg	78.9 ± 3.9	85.9 ± 3.5
Ewe productivity at 54.4 kg, kg	79.5 ± 4.4 <sup>b</sup>	96.0 ± 3.9 <sup>a</sup>

<sup>a,b</sup> Means within a row with different superscripts differ ( $P < .05$ ).

A simple economic analysis was conducted to determine if the increased productivity of RB Fec<sup>B+</sup> ewes was translated into increased economic returns. The results are presented in Table 2. The RB Fec<sup>B+</sup> ewes were more profitable than Rambouillet ewes to both lamb market endpoints, but only by a small margin. Many of the values used in the economic analysis were assumed based on the data available. A major problem with the analysis was relatively poor data on growth rates of these lambs close to the time they reached market weight. This resulted in abnormally high estimates for feed consumption late in the growing period that penalized the RB Fec<sup>B+</sup> ewes more than the Rambouillet ewes.

The results do suggest however that the Fec<sup>B+</sup> allele is not detrimental to overall economic returns and may, in fact, be of benefit.

Future research should determine if the advantage of RB Fec<sup>B+</sup> ewes can be enhanced through increased milk production (perhaps by crossing with dairy breeds) or by mating them to

meat breeds to increase lamb growth and feed efficiency. More intensive management systems that result in reduced lamb mortality may also result in an increased economic advantage of RB Fec<sup>B+</sup> ewes.

**Table 2.** Net income (\$) per ewe when lambs are marketed at an age (180 d) or weight (54.4 kg) endpoint

Income/Expense	Market at 180 d		Market at 54.4 kg	
	Rambouillet	RB Fec <sup>B+</sup>	Rambouillet	RB Fec <sup>B+</sup>
Lamb sales	137.21	157.65	138.30	175.13
Wool sales	6.02	5.70	6.02	5.70
Total sales	143.23	163.35	144.32	180.83
Ewe non-feed costs	34.50	34.50	34.50	34.50
Ewe feed costs	41.56	39.78	41.56	39.78
Ewe labor costs	40.44	41.45	40.44	41.45
Lamb non-feed costs	8.26	10.75	8.26	10.75
Lamb feed costs	52.70	63.85	60.65	85.04
Lamb yardage costs	11.23	14.33	13.08	19.24
Total costs	188.69	204.66	198.49	230.76
Net income	-45.46	-41.31	-54.17	-49.93
RB Fec <sup>B+</sup> - Rambouillet		4.15		4.24