

Exploring Genetic Trends in Elite Canadian Rams

Sirlene Fernandes Lázaro^{a,*}, Hinayah Rojas de Oliveira^b, Flavio Schramm Schenkel^a

^aDepartment of Animal Biosciences, University of Guelph, Guelph, N1G 2W1, ON, Canada; ^bDepartment of Animal Science, Purdue University, West Lafayette, 47907, IN, USA



*sirlene@uoguelph.ca

INTRODUCTION

Genetic gain in the Canadian sheep industry has increased profitability over the past 10 years. Among the traits currently evaluated in the national breeding program are lamb survival (SURV), birth weight (BWT), adjusted 50 days weight (ADJW50), gain 50-100 days (GAIN), loin thickness (LOIN), and fat thickness (FAT).

OBJECTIVE

Estimate the genetic trends in the Canadian sheep population based on all animals with records and compare these trends to the ones observed in elite rams.

MATERIAL AND METHODS

- Canada's National Sheep Evaluation combines all purebred and composite breeds using a genetic group strategy to address individual breed effects;
- 719,842 individual records (2012-2022) including 5,733 sires and 90,403 dams with at least one progeny;
- Breeding values estimated by BLUP using a multi-trait animal model in the MiXBLUP software (Ten Napel et al., 2021):

$$y = X\beta + Wcg + Z_1a + Z_1m + Z_2pe + e$$

- where **y** is the vector of traits phenotypic records; **β** is the vector of systematic effects (i.e., year-month of lambing, age birth dam-sex lambs born and age rise dam-sex lambs born); **cg** is the vector of contemporary group (herd-year-management group) effects; **a** is the vector of additive genetic effects; **m** is the vector of maternal genetic effects (birth dams and raise dams); **pe** is the vector of maternal permanent environment effects (birth dams and raise dams); **e** is the residual vector; and **X**, **W**, **Z₁**, **Z₂** are the incidence matrices for **β**, **cg**, **a**, **m**, and **pe**, respectively;
- The annual genetic gains were estimated in R (R Core Team, 2019) by regressing estimated breeding values on year of birth of the animal considering all animals, sires, dams and the top 10% sires in each year and then the gains were expressed as units of additive standard deviations of each trait.

RESULTS AND DISCUSSION

The estimated annual genetic gains are shown in the Table 1. The corresponding genetic trends are displayed in Figure 1.

Table 1. Standardized estimated genetic annual gains considering all animals (2012-2022), sires and dams with at least one progeny and in the top 10% sires for each trait evaluated.

	All	Dam	Sire	Sire Top10
SURV	0.058	0.074	0.049	0.095
BWT	0.020	0.014	0.027	0.049
ADJW50	0.031	0.033	0.060	0.110
GAIN	0.053	0.064	0.086	0.200
LOIN	0.027	0.023	0.042	0.100
FAT	0.021	0.021	0.027	0.060

ACKNOWLEDGEMENTS

Mitacs and the industry partners (Canadian Sheep Breeders' Association, Centre d'Expertise en Production Ovine du Québec Inc., and Ontario Sheep Farmers) are acknowledge for their financial support to this research.

RESULTS AND DISCUSSION

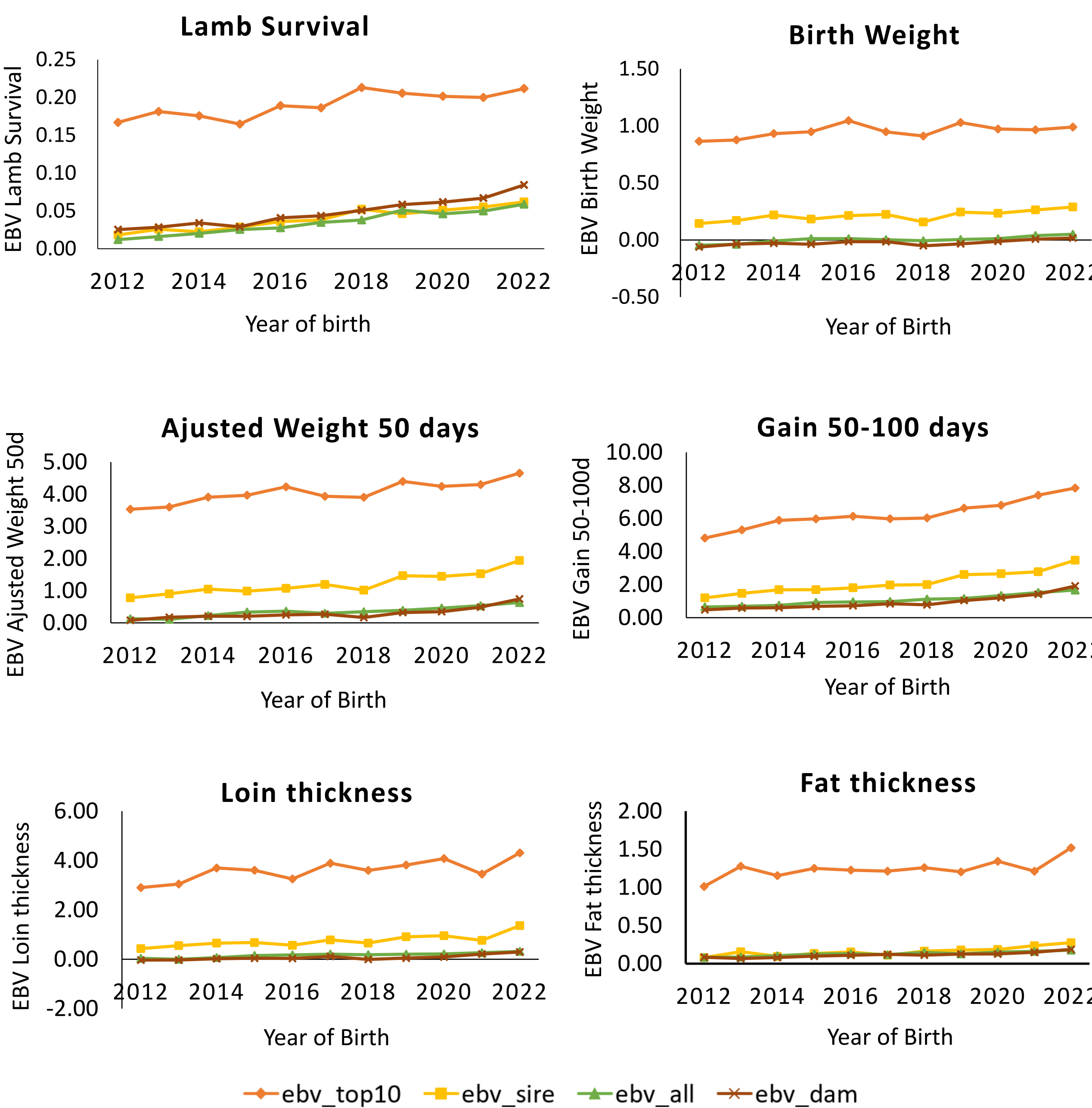


Figure 1. Genetic trends for lamb survival, birth weight, adjusted 50 days weight, gain 50-100 days, loin thickness, and fat thickness considering all animals, sires, dams and the top 10% sires in each year.

- The dams contributed more to genetic improvement of lamb survival.
- The sires had a greater impact on genetic gain for growth and carcass traits.
- Birth weight showed the smallest genetic trend, as it was expected for an intermediate optimum trait.
- There is a lot of room for improvement of all traits, as illustrated by the higher estimated annual genetic gains for the top 10% sires.

CONCLUSIONS

- Genetic trends in the population were in a favorable direction, indicating genetic progress for all the traits over the years, but still with a lot of room for improvement.

REFERENCES

- R Core Team (2019). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <http://www.R-project.org/>.
- Ten Napel, J., Vandenplas, J., Lidauer, M., Strandén, I., et al. (2021) Manual – MiXBLUP 3.0.1 manual, V3.0 – 2021-11. Available at:https://www.mixblup.eu/documents/8412108060_ASG_WLR_MixBlup%20Manual_LR.pdf.

