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Supplement

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Stochastic simulation of sheep breeding schemes for Iceland, with a focus on ewe trait improvement

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APPENDIX 1

Table A1. Proportion of sizes of flock (those 252 with > 200 ewes, from 344 flocks with 15 years recording history in Iceland, 1995 to 2010).

Flock size								
201- 300	301-400	401-450	451-500	501-550	551-600	601-700	701-800	801-950
Proportion								
0.16	0.23	0.11	0.10	0.10	0.08	0.11	0.06	0.05

Table A2. Proportion of ewes and elite rams in various age classes (from 344 flocks with 15 years recording history in Iceland, 1995 to 2010).

	Age-class								
	1	2	3	4	5	6	7	8	≥ 9
	Proportion								
Ewes	0.17	0.17	0.15	0.13	0.11	0.10	0.08	0.05	0.04
Elite rams	0.00	0.46	0.29	0.15	0.06	0.02	0.01	0.00	0.00[a]

[a] Largest age for elite rams was ≥ 9 years.

Table A3. Genetic parameters (heritability, genetic and environmental correlations; on, above and below diagonal, respectively) as well as genetic (σ_A) and environmental (σ_E) standard deviations. Carcass traits from Einarsson et al. (2015) and ewe traits from Árnason & Jónmundsson (2008).

	wwd[a]	**cw**[b]	**cc**[c]	**cf**[d]	**wwm**[e]	**nl1**[f]	**nl2**[g]	**nl3**[h]
wwd	**0.22**	0.84	0.00	0.00	0.55	0.00	0.00	0.00
cw	0.00	**0.18**	0.00	0.00	0.00	0.00	0.00	0.00
cc	0.00	0.00	**0.35**	0.40	0.00	0.00	0.00	0.00
cf	0.00	0.00	0.00	**0.31**	0.00	0.00	0.00	0.00
wwm	0.00	0.00	0.00	0.00	**0.09**	0.00	0.00	0.00
nl1	0.00	0.00	0.00	0.00	0.00	**0.17**	0.68	0.64
nl2	0.00	0.00	0.00	0.00	0.00	0.00	**0.14**	0.87
nl3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.11**
σ_A	1.70	0.87	0.82	0.74	1.10	0.17	0.20	0.20
σ_E	2.65	1.52	1.11	1.10	2.65	0.38	0.50	0.48

[a] wwd = weaning weight, individual (kg).
[b] cw = carcass weight (kg).
[c] cc = carcass conformation grade.
[d] cf = carcass fatness grade.
[e] wwm = weaning weight, maternal-genetic (kg).
[f] nl1 = number of lambs born, 1 year of age.
[g] nl2 = number of lambs born, 2 years of age.
[h] nl3 = number of lambs born, 3 years of age.

Table A4. Cumulative proportion of ewes culled per age class, of those recruited at 6 months of age (from 344 flocks with 15 years recording history in Iceland, 1995 to 2010).

Age-class									
1 ½	2 ½	3 ½	4 ½	5 ½	6 ½	7 ½	8 ½	9 ½	10 ½
Cumulative proportion									
0.06	0.14	0.22	0.31	0.41	0.53	0.70	0.87	0.96	1.0

Table A5. Proportions of ewes with a variable number of lambs born, by ewe age (from 344 flocks with 15 years recording history in Iceland, 1995 to 2010).

Number of lambs born	**1**	**2**	**3**	**4**
Ewe age	**Proportion of ewes**			
1	0.77	0.23	0.00	0.00
2	0.23	0.75	0.02	0.00
≥ 3	0.14	0.76	0.09	0.01

Table A6. Proportion of lambs surviving until weaning for ewes of different age (from 344 flocks with 15 years recording history in Iceland, 1995 to 2010).

Ewe age	
1	≥2
Proportion	
0.82	0.91

APPENDIX 2

Using the notation of Smith (1964), the breeding goal of the one line (T) can be written: $aG_D + G_S$, in the sire line: G_S, and in the dam line: $aG_D + 1/2G_S$, with a being the relative economic value, and G_D and G_S the breeding values of the two traits.

Taking account of proportions of slaughter s, d and c, from the sire line, the dam line and from the crosses, respectively, the breeding goal of the sire line (T_s) can be modified as:

$$T_s = s(aG_D + G_S) + cG_S$$

Assuming $s = 0$ gives $T_s = G_S$, while $s = 1$ gives $T_s = aG_D + G_S = T$.

Similarly,

$$T_d = d(aG_D + G_S) + c(aG_D + 1/2G_S)$$

Assuming $d = 0$ gives $T_d = aG_D + 1/2G_S$, while $d = 1$ gives $T_d = aG_D + G_S = T$.

Thus, T is approached as s or d increases.