SLU

Comparison of male selection strategies in Finnish blue fox population using stochastic simulation

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Introduction

Breeding goals in blue fox production:

- ✓Better fur quality
- ✓Larger pelt
- ✓Better fertility
- ✓Better feed efficiency
- ✓Better leg conformation

Introduction

Production structure:

- ✓ More than 95 % AI
- ✓ All farms have their own:
    - Database
    - BV evaluation (BLUP)
    - Female selection
    - Male selection
    - Mating planning
    - Some exchange of breeding animals between farms

Introduction

Production structure:

- ✓ 2015 common national database and BV evaluation (BLUP)
- ✓ But still all farms have their own:
  - Female selection
  - Male selection
  - Mating planning

- ➢ Possibility to more accurate selection, especially males
- ➢ **Possibility to alternative selection strategies**

Goal of the study

A. **What is the difference in genetic gain and rate of inbreeding between different male selection scenarios:**

   ✓Selection within farm using truncation selection

   ✓Selection across farms using truncation selection

Sensitivity test:

•10 vs. 25 females/male

• 10 vs. 50 % genotyped male pups

B. **If rate of inbreeding is fixed to level of A what would be the genetic gain if optimal contribution is used?**

Methods

Traits in selection objective (all selection scenarios):

- ✓ Animal size at grading, scale 1-5
- ✓ Pelt quality, scale 1-5
- ✓ Litter size at birth
- ✓ Front leg conformation, scale 1-5
- ✓ Feed efficiency g growth / kg DM feed

Selection scenarios

Methods

			Selection scenario	Females/ male	Genotyped male pups (%)	Selection method
	Scenario I	**a**	Within farm	10	50	Truncation
		b	Within farm	10	10	Truncation
		c	Within farm	25	50	Truncation
		d	Within farm	25	10	Truncation
	Scenario II	**a**	Across farms	10	50	Truncation
		b	Across farms	10	10	Truncation
		c	Across farms	25	50	Truncation
		d	Across farms	25	10	Truncation
	Scenario III		Across farms	10	50	Optimal contribution

Methods

- Direct genomic breeding value without simulating markers, genes or chromosomes was applied using pseudo-genomic method (Buch *et al.* 2012)

- Accuracies of GBV's were the same for all traits within each scenario (0.50)

Methods

All scenarios had:

- ✓ 5 farms with equal herd size (1352 females, 140 males)
- ✓ Fixed age structure within farm and litter size:

Age (years)	Females		Males
	n (%)	Litter size	n (%)
1	600 (44)	7	92 (66)
2	352 (26)	9	34 (24)
3	200 (15)	9	14 (10)
4	128 (9)	9	-
5	72 (5)	8	-

Methods

Heritabilities, economic values, and genetic correlations:

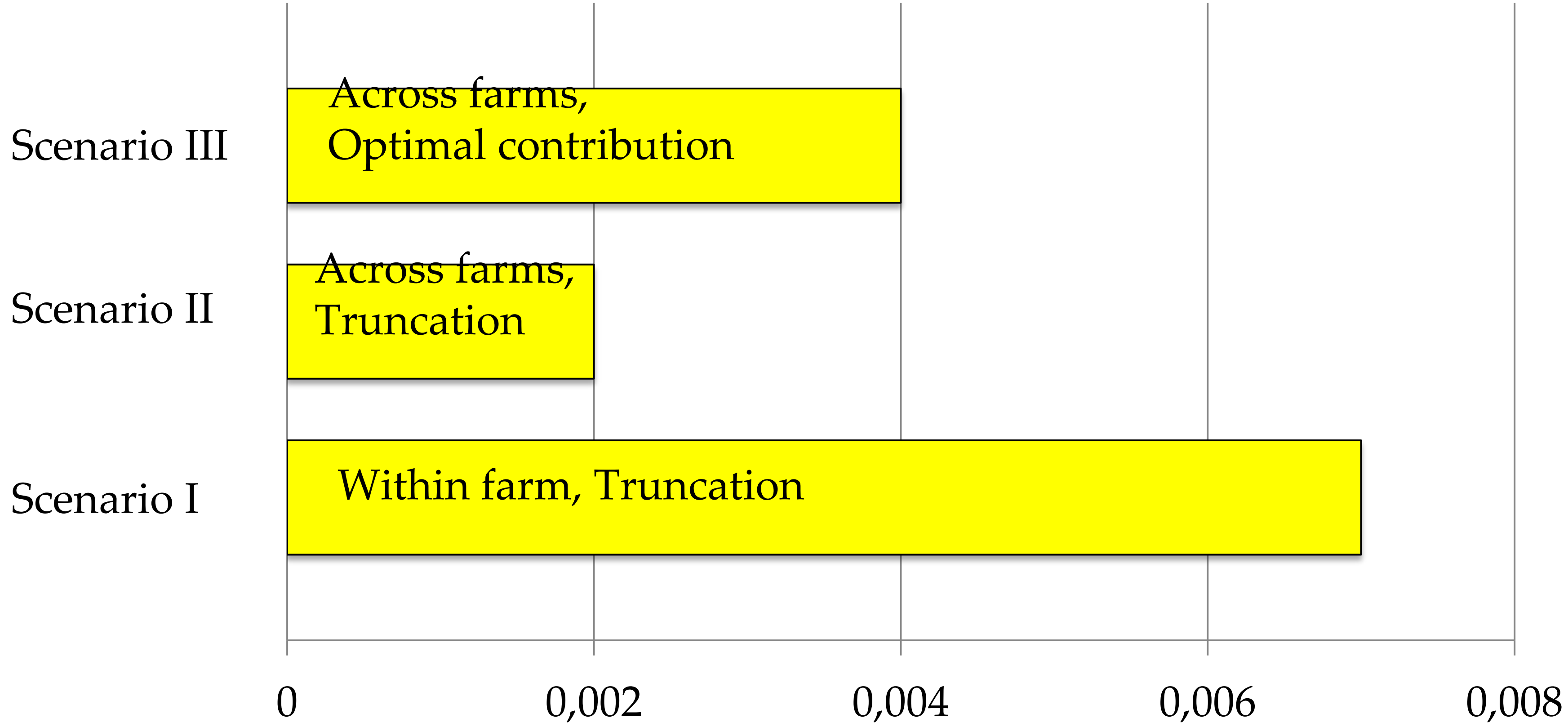
	EUR/unit	h^2	Pelt quality	Litter size	Front leg conf.	Feed efficiency
Animal size	**8.43**	**0.32**	**0.17**	**-0.10**	**-0.51**	**-0.09**
Pelt quality	**26.08**	**0.28**		**-0.05**	0.00	**0.05**
Litter size	**14.91**	**0.12**			0.00	0.00
Front leg conf.	0.00	**0.22**				**-0.11**
Feed efficiency	**0.40**	**0.25**				

Methods

- 10 years, 50 replicates
- Average genetic gain and rate of inbreeding were estimated between years 6 and 10
- Stochastic simulation by ADAM software (Pedersen *et al.* 2009) was used to estimate genetic gain and rate of inbreeding
- Breeding values were estimated using multitrait animal model with DMU software (Madsen *et al.* 2006)

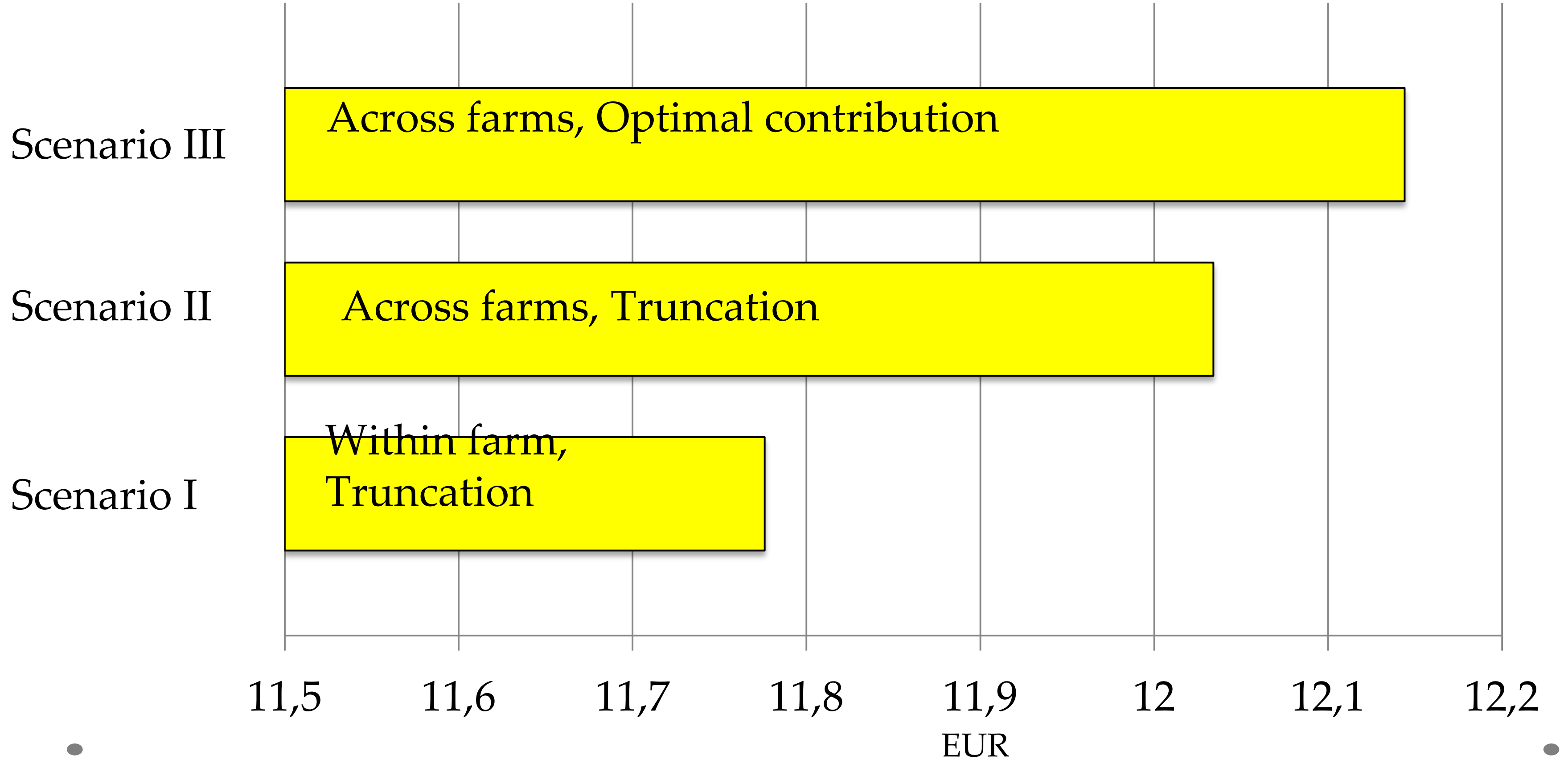
Results

Rate of inbreeding / year



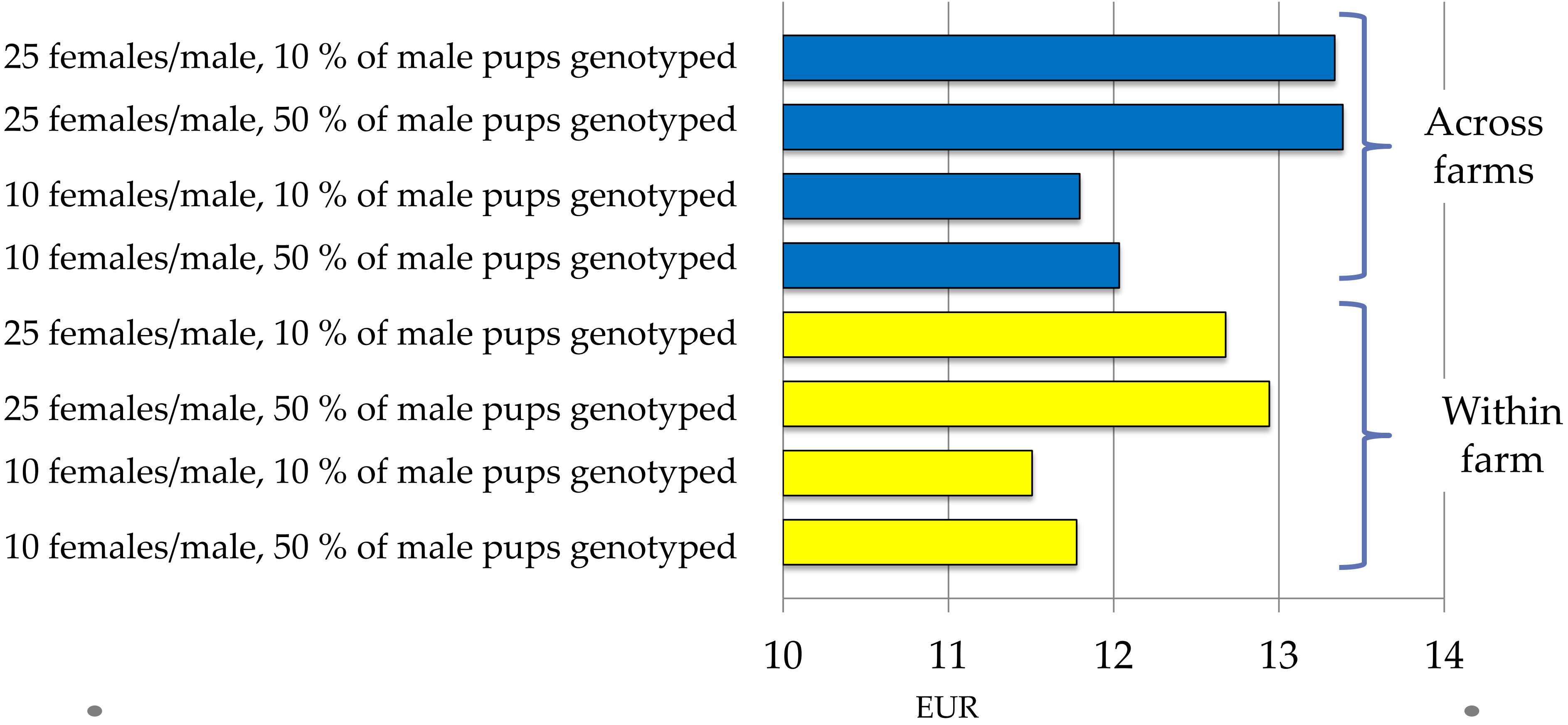
Results

Genetic gain: Value of total genetic gain (EUR)

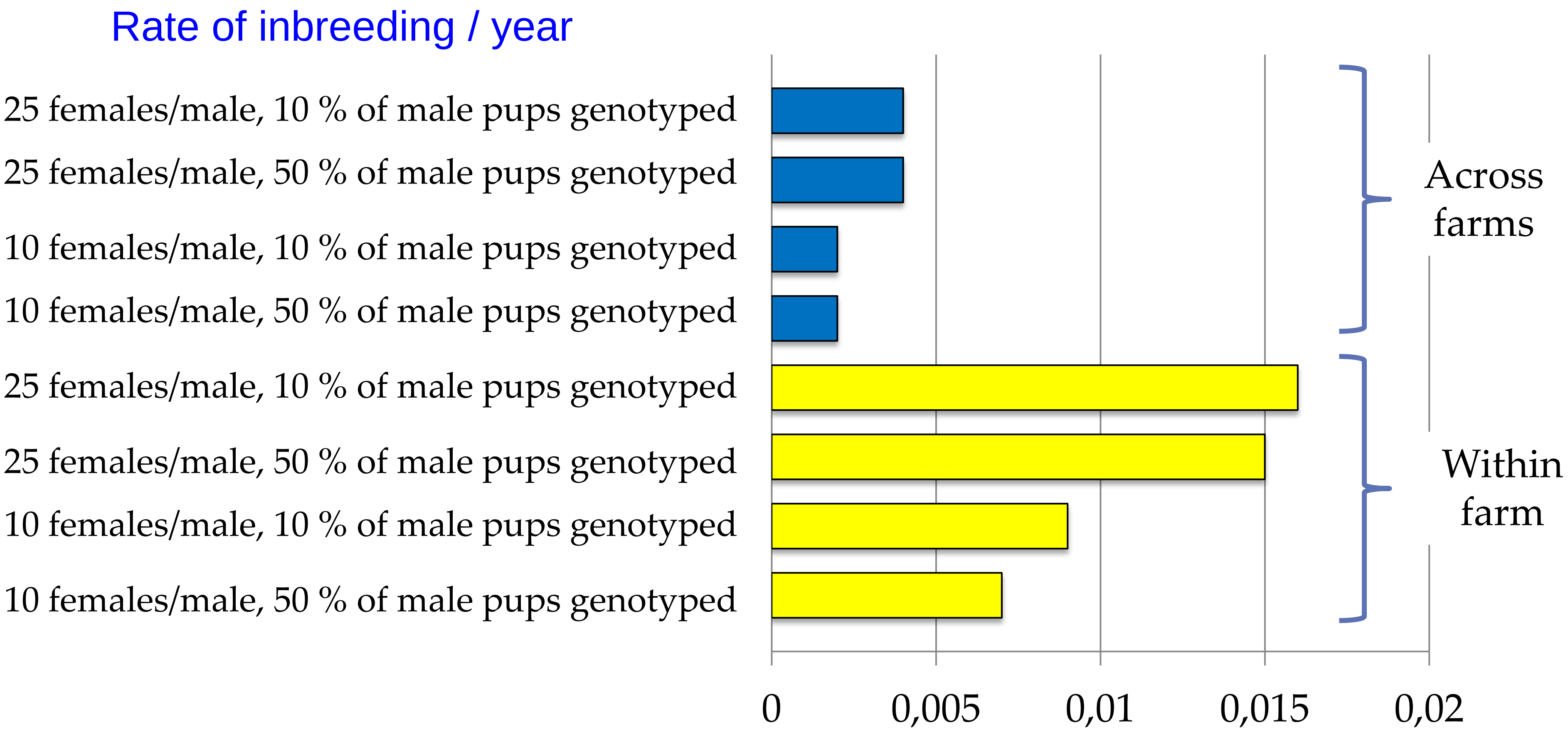


Results

Genetic gain: Value of total genetic gain (EUR)



Results


Rate of inbreeding / year
25 females/male, 10 % of male pups genotyped
25 females/male, 50 % of male pups genotyped
10 females/male, 10 % of male pups genotyped
10 females/male, 50 % of male pups genotyped
25 females/male, 10 % of male pups genotyped
25 females/male, 50 % of male pups genotyped
10 females/male, 10 % of male pups genotyped
10 females/male, 50 % of male pups genotyped
Across farms
Within farm
0
0,005
0,01
0,015
0,02

Conclusions

Genetic gain

- ✓ Scenarios with across farms selection gives higher genetic gain (EUR) than within farm selection scenario
- ✓ Rate of inbreeding is not a problem with current structure

  - ➢ **BUT**, if rate of inbreeding is fixed to same level as in truncation selection, optimal contribution selection gives higher genetic gain (EUR) than truncation selection

Conclusions

Sensitivity test

- ✓ Females / male have clear effect to both genetic gain and rate of inbreeding, more females > higher genetic gain and and higher rate of inbreeding

- ✓ Proportion of genotyped male pups had only mild effect to genetic gain and rate of inbreeding, higher proportion > higher genetic gain and lower rate of inbreeding

Conclusions

To be improved

- ✓ Missing genetic correlations unlikely 0
  - ➢ Genetic gain of litter size may be overestimated
  - ➢ Value of total genetic gain may be overestimated
- ✓ True economic value of leg conformation is not 0
  - ➢ What should the economic value be to avoid decrease in leg conformation?
  - ➢ How much genetic gain do we lose in other traits?

Conclusions

The next question/research topics are:

- How much does the improvements (update of genetic correlations, economic values and % of genotyped male pups) affect the results?
- **What is the profitability of the each selection strategies?**

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ProFur

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