Genetic parameters for milk traits using fixed regression models for Pag sheep in Croatia

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Introduction

- Sheep breeding – autohtonous breeds
- Milk production
- Mediterranean area - extensive breeding
- Pag sheep

Pag sheep

- Breeding program since 2000
- Cheese processing
  - Great demand due to tourism
- Aim: Estimate genetic parameters for
  - Daily milk, fat and protein yields
  - Somatic cell score

Milk recording

- ICAR rules
- Croatian Agricultural Agency
- Central Laboratory for Milk Control
- AT4 method

Material

- Test-day records
- Pedigree information
- Central database of Croatian Agricultural Agency
- From January 2003 to March 2010

Data preparation

- Parity (1-6)
- Days in milk (6-180)
- Litter size (1, 2+)
- SCS ⟶ logSCS = $\log_2$ (SCS/100.000)

- Data editing:
  - Animals without birth, lambing, or test-date
  - Age at lambing within parity (12-85)
  - Flock
  - Test-day (less then 10 test-days per flock deleted)

Descriptive statistics

Trait	n	$\bar{x}$	σ
DMY (kg)	37,916	0.786	0.342
DFY (kg)	37,880	0.058	1.347
DPY (kg)	37,857	0.047	0.020
SCS	34,753	7.08	1.87

Pedigree structure

	No.
Animals with records	4,449
Non base animals:	
- both parents known	1,895
- only sire known	18
- only dam known	288
Base animals (%)	58.2
Total number of animals	5,260

Models

Single-trait fixed regression repeatability test-day model

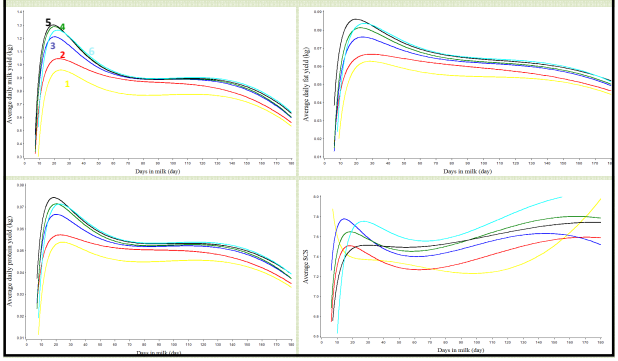
Trait	Fixed effects in the model					
	Parity	Litter size	Lambing season	Flock	Days in milk	Age at lambing
DMY, DFY, DPY	✓	✓	✓	✓	✓	✓
SCS	✓	✓	✓	✓	✓	

	Random effects in the model		
	Flock-test-date	Permanent environment	Additive genetic effect
DMY, DFY, DPY, SCS	✓	✓	✓

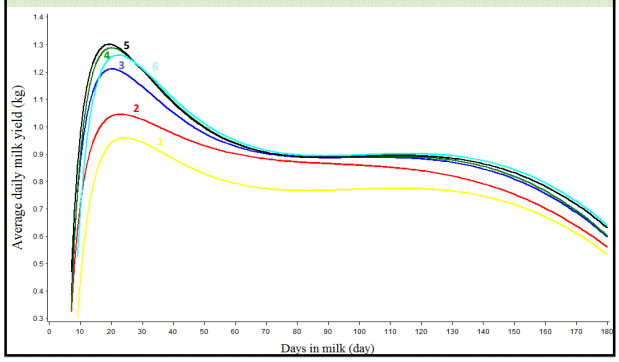
Method

- SAS
  - SQL
  - GLM procedure (SAS/STAT)
  - Data coding
- Variance components estimation - method REML in VCE-6

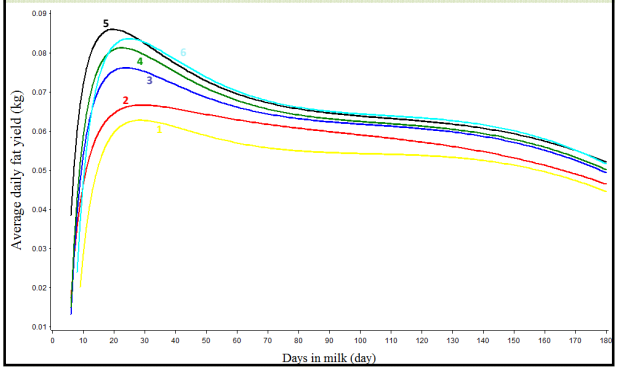
Estimated lactation curves nested within parity for DMY, DFY, DPY, and SCS



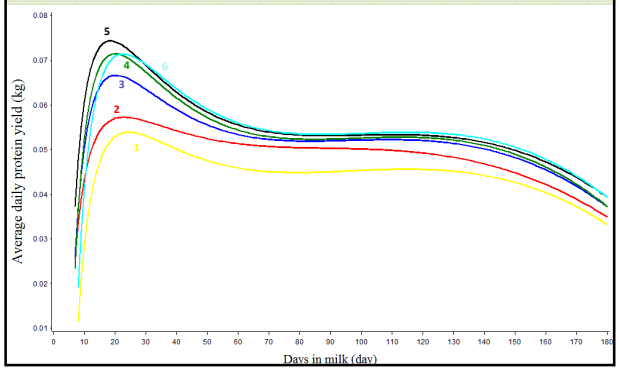
Estimated lactation curves nested within parity for DMY



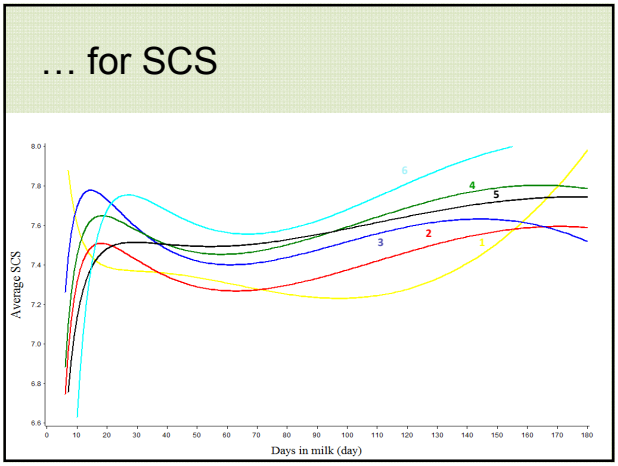
… for DFY



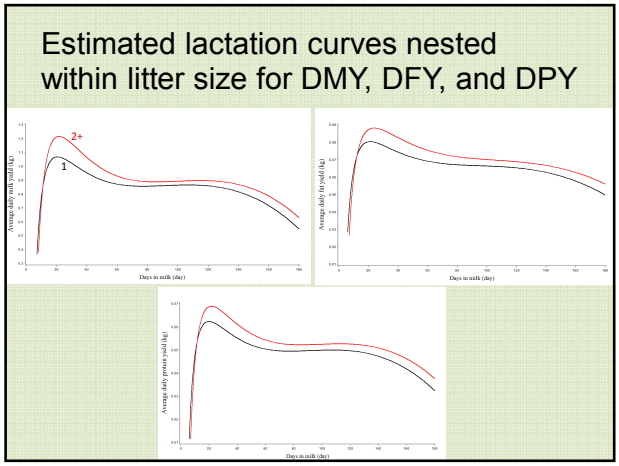
… for DPY



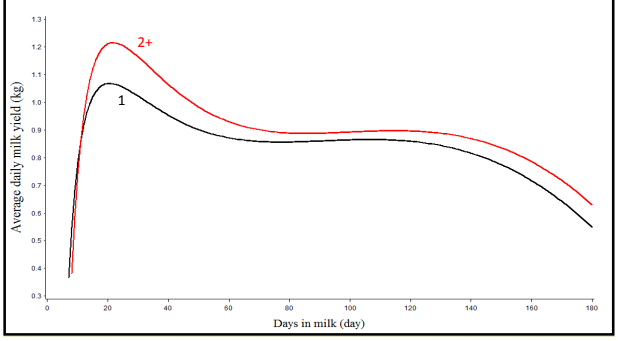
… for SCS



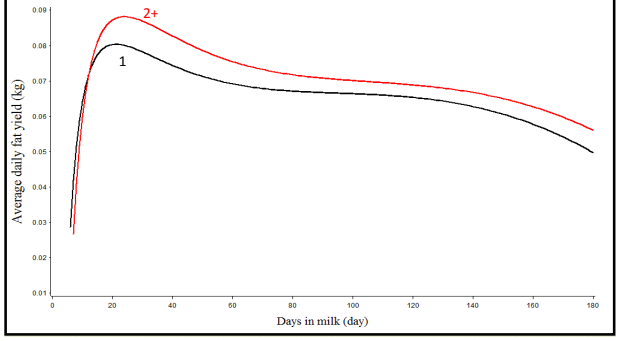
Estimated lactation curves nested within litter size for DMY, DFY, and DPY



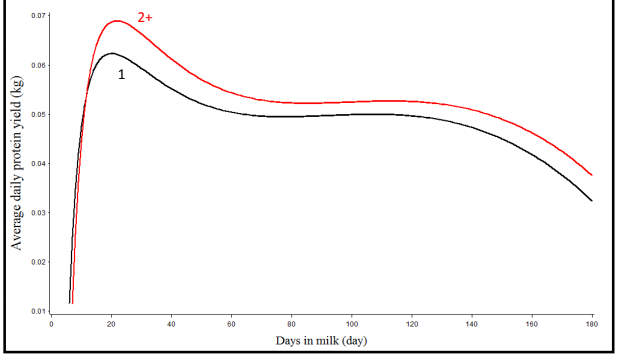
Estimated lactation curves nested within litter size for DMY



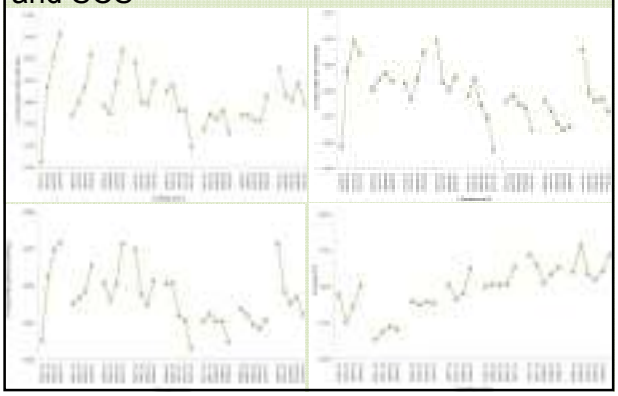
… for DFY



… for DPY

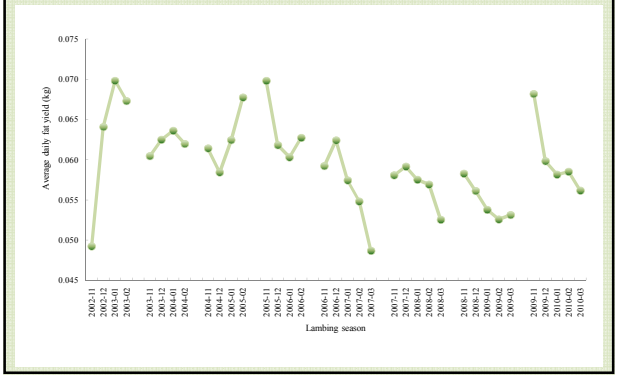


Lambing season effect for DMY, DFY, DPY, and SCS

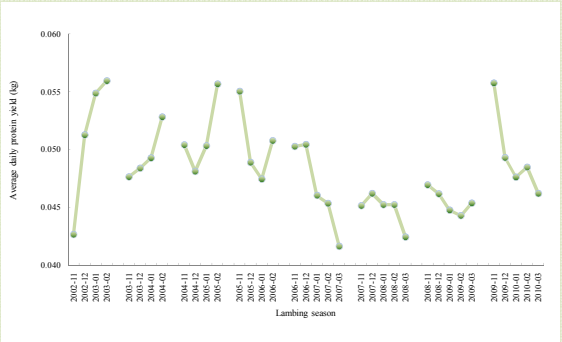


Lambing season effect for DMY

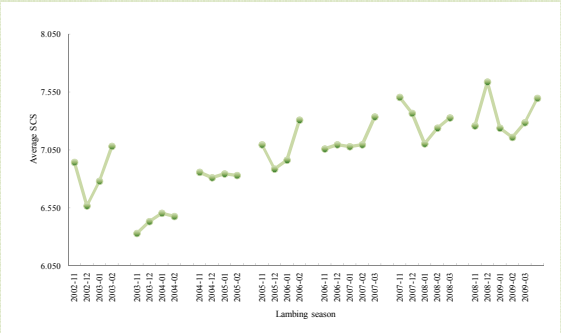
… for DFY



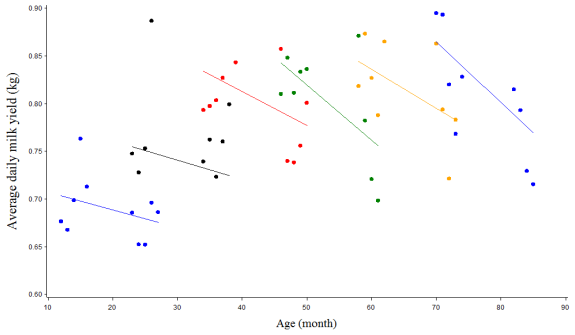
… for DPY



… for SCS



Age at lambing within parity



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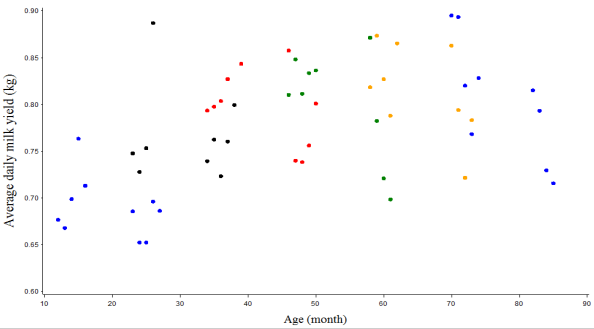

Estimated ratios

Trait	σ_a	σ_{htd}	σ_{permp}	σ_{perm}
DMY (kg)	0.26±0.01	0.24±0.01	0.22±0.01	
	0.03±0.01	0.25±0.01		0.30±0.02
DFY (kg)	0.25±0.01	0.16±0.01	0.23±0.01	
	0.04±0.02	0.17±0.01		0.30±0.02
DPY (kg)	0.24±0.01	0.26±0.01	0.21±0.01	
	0.03±0.01	0.27±0.01		0.29±0.02
SCS	0.19±0.01	0.06±0.01	0.19±0.01	
	0.03±0.02	0.07±0.01		0.23±0.02

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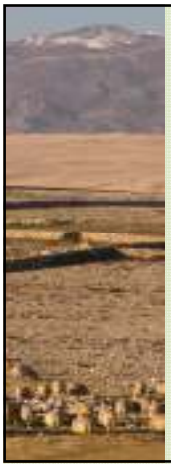
Bayesian analysis

- Bayesian analysis (the same priors as in REML)
- Methods
  - Markov chain Monte Carlo (MCMC)
  - Integrated Nested Laplace Approximation (INLA)

Conclusions

- Heritability for milk traits were in expected range
- Results indicate the possibility of using test-day records for genetic evaluation of the Pag sheep in Croatia



Thank you for attention!