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Effect of Crossbreeding on Milk Production, Udder Health and Fertility on Dutch Organic Dairy Farms

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Introduction:

Organic dairy farming:

- 312 farms in Netherlands
- 55 milking cows/farm
- Still ~ 65% HF blood
- ~ 6650 kg milk/ha
- ~ 6200 kg milk/cow
- 25% natural mating

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Introduction:

Organic dairy farming

- Holsteins, Dutch breeds, foreign breeds and crosses
- Restrictions:
  - No fertilizer, less concentrates and AB
  - Cows on the pasture
- High variation in management
  - More depending on farm environment
  - Less possibilities to steer

Breeds:

Holstein
Frisian

Dutch
Friesian

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Breeds:

Brown Swiss

Jersey

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Breeds:

MRIJ

Blaarkop

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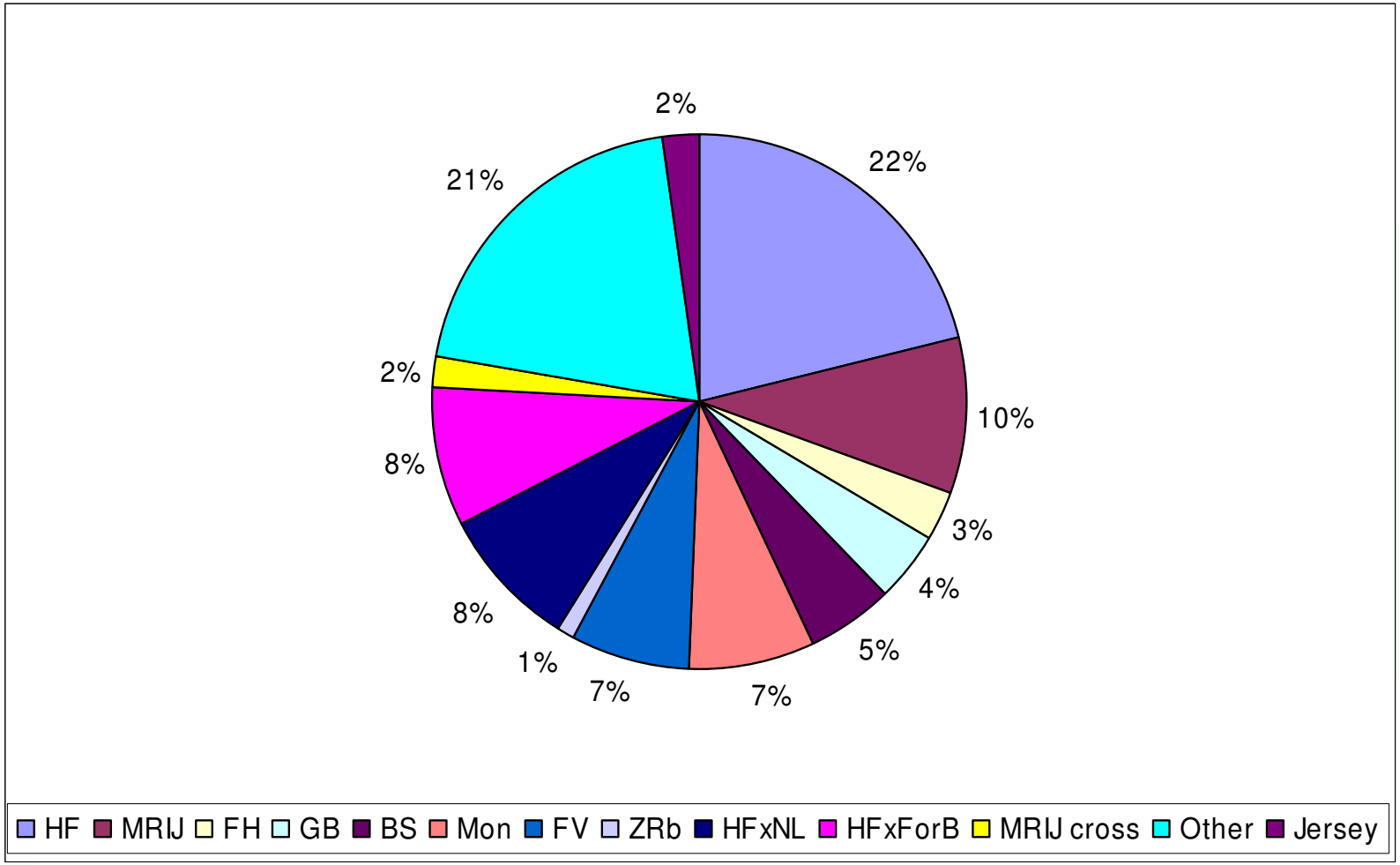
Breeds and crosses:



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Aim:

- The aim of this study was
  - to analyze an unique dataset with 24 different breeds and their crosses
  - to estimate the effects of crossbreeding for milk production, udder health and fertility
  - to investigate if these effects differ according to soil type and housing systems.

Available data:

- 113 Dutch organic farms
- January 1st, 2003 - February 1st, 2009
- 33,788 lactations on 15,015 individual cows (average yearly herd size of 50 cows/farm)
- 28% primiparous cows,
  23% 2nd lactation cows,
  49% 3rd or more lactation cows

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Analyzed traits:

- Animal data
- Traits
  - Milk production
  - Fat and protein corrected milk yield
  - Fertility
  - Udder health
- Farm data
  - Soil type (sand *vs.* no sand)
  - Housing (cubicles *vs.* no cubicles)

Analysed breeds:

- 24 breeds in total
- 6 breeds most presented:
  - Holstein-Friesian (HF),
  - Brown Swiss (BS),
  - Dutch Friesian (DF),
  - Groningen White Headed (GWH),
  - Jersey (J),
  - Meuse-Rhine-Yssel (MRY)

Statistical analyses:

- Regression on all breed fractions, expected heterosis and recombination with ASREML
- Least square means for purebred Holsteins and crosses (F1 and backcross) with 5 other breeds

- $Y = \mu + \text{fixed effects} + \Sigma\, b_i * \text{breed}_i + b_2 * \text{heterosis} + b_3 * \text{recombination} + \text{animal} + \text{error}$

Results overall:

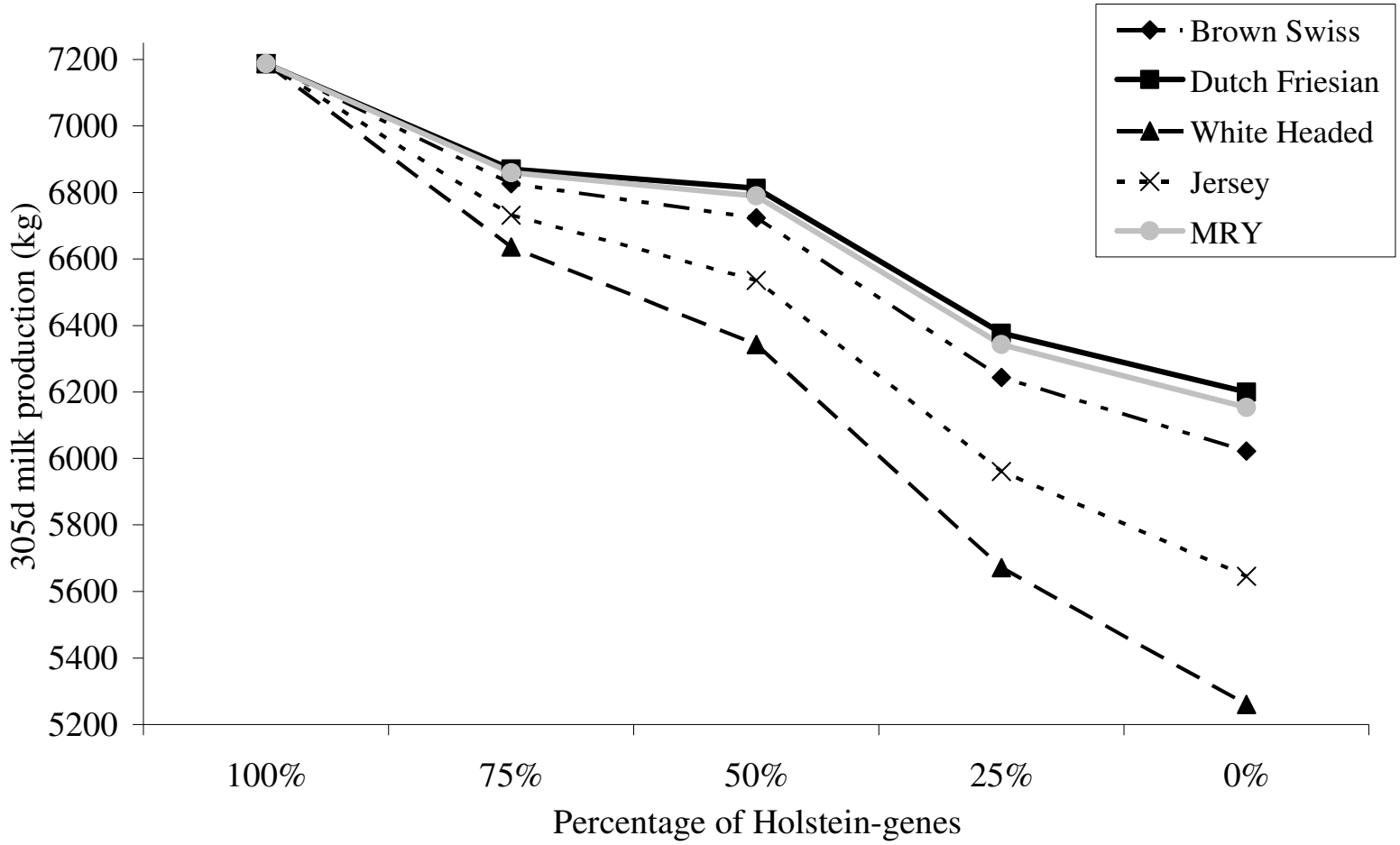
- Average milk production traits:
  - 6858 kg in 305 days
  - 300 kg fat and 235 kg protein

- Average functional traits:
  - Calving interval was 411 days
  - The lactation-average SCS was 1730 (~266,000 cells/ml)

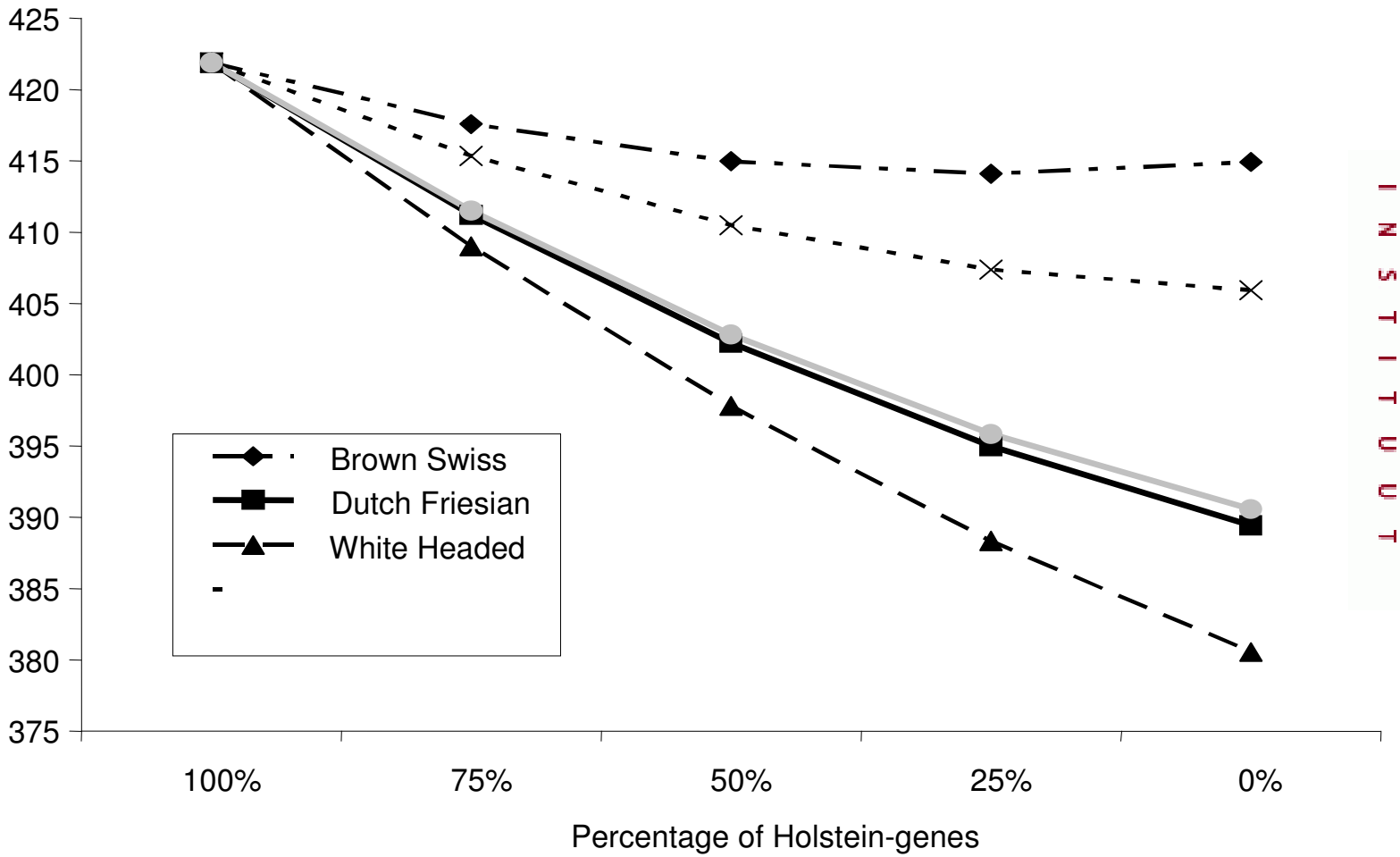
Results; regression coefficients:

- Regression coefficients:
  - Heterosis had a favorable effect ($p<0.10$) on milk, FPCM and CI, but unfavorable for SCS
  - Recombination was unfavorable for the milk traits, but favorable for the functional traits
  - Regression coefficients differed per breed

Predicted milk production per % of HF genes :



Predicted calving interval per % of HF genes



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Results regression soil type:

	Milk		FPCM		SCS		CI	
	Sand	No S	Sand	No S	Sand	No S	Sand	No S
Heterosis	104.9	123.9	124.5	134.3	4.5	3.6	-2.2	-3.1
Recombination	-526.6	-516.5	-312.7	-420.2	**-41.9***	-8.9	-3.7	-3.7
Brown Swiss	**-6.2***	-75.0	**-7.2***	-50.7	-5.2	-4.0	3.2	2.6
Dutch Friesian	-28.3	-25.2	-14.8	-39.3	-1.2	-1.0	-2.0	1.6
White Headed	-113.9	-161.8	-137.4	-160.7	**12.1***	4.0	-2.0	-1.4
Holstein	**114.7***	79.3	**46.5***	74.0	1.0	1.2	3.7	3.7
Jersey	**-62.3***	-135.7	-14.3	-59.2	4.1	4.3	**2.9***	-0.4
MRY	**-7.0***	-66.6	**-20.4***	-59.5	1.8	1.0	0.3	-0.9

* P-value < 0.10

Results regression barn type:

	Milk		FPCM		SCS		CI	
	Cub	No C	Cub	No C	Cub	No C	Cub	No C
Heterosis	69.0	183.5	121.5	199.7	1.9	13.7	-1.7	-5.3
Recombination	-583.9	-365.5	-434.9	-267.7	-19.7	-35.6	-8.5	7.6
Brown Swiss	-43.7	-88.7	**-17.7***	78.6	-5.5	2.2	3.4	0.7
Dutch Friesian	1.6	-120.1	-5.3	-105.5	**-3.5***	6.9	0.4	-2.2
White Headed	**-155.5***	-142.9	-162.9	-139.8	**6.1***	3.9	-1.6	-1.9
Holstein	**107.0***	54.1	**97.0***	49.9	0.5	3.0	**4.5***	1.4
Jersey	-83.6	-149.2	-20.1	-86.5	**1.6***	8.2	1.4	1.2
MRY	**-21.5***	-86.7	**-24.3***	-90.5	1.3	0.7	0.5	-2.4

* P-value < 0.10

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Conclusions:

- Breeds: large differences between breeds
- Crossbreeding HF with other breeds:
  - Decreases milk production and FPCM
  - Improves fertility
  - Improves udder health in certain crosses
- Soil type and housing affected regression coefficients on breed components

→ **It is mportant to choose the right breed or cross breed for the divers organic farm systems**

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Thanks for your attention,

Any questions?

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