Holstein-Friesian vs 3-breed crossbred dairy cows within a low and moderate concentrate input system

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Introduction (I)

- Holstein-Friesian: high milk production efficiency, but suffered a long term decline in some functional traits (fertility and health) due to historical selection programmes

- How can we address the problem?
  - Nutritional strategies
  - Genetic strategies
    - Alter breeding goals/selection indexes
    - Breed substitution
    - Crossbreeding

- Why consider crossbreeding?
  - Breed complementarity: introduction of desirable traits from a second breed which may be absent of occur at a low frequency in the recipient breed
  - Hybrid vigour
  - Reduce inbreeding

Introduction (II)

- Previous AFBI research on crossbreeding examined Jersey x Holstein crossbred cows
- Smaller cows, but similar yield of milk solids as Holstein cows within low and moderate input systems
- Improved fertility, fewer cases of mastitis and hoof problems
- Improved longevity and profit
- But how should we breed the F_1 crossbred ?
  - Criss-crossing ?
  - Proven crossbred sires ?
  - Three-way rotational cross ?
- The latter should maximise hybrid vigour

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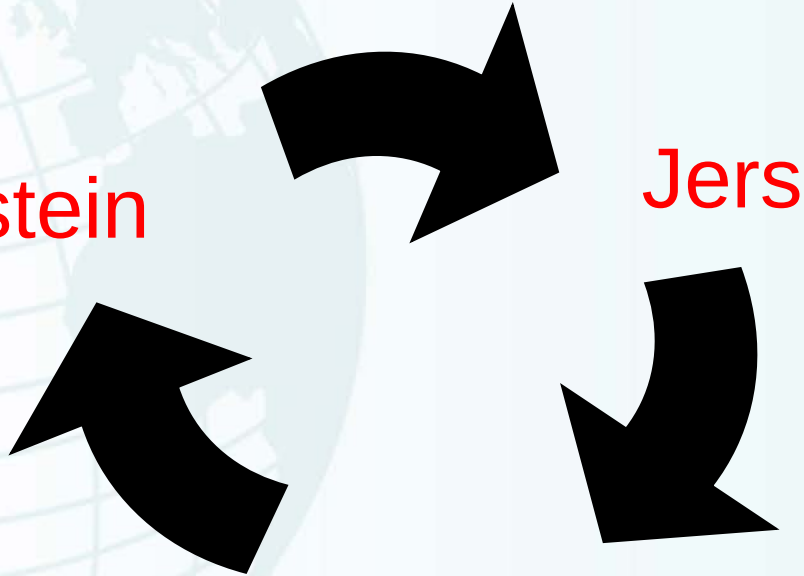
Three-breed rotational crossbreeding scheme adopted




82
98


3
58

Objective of the current study

To examine the performance of Holstein-Friesian and 3-breed crossbred dairy cows within a low and moderate concentrate input system

Methodology (I)

- 2 x 2 factorial design experiment (2 genotypes x 2 systems)
- 68 Spring calving dairy cows
  - 34 Holstein-Friesian (HF)
  - 34 '3-breed crossbreds
    - Swedish Red x Jersey x Holstein-Friesian (SRx)
      - mean lactation number, 2.8
      - mean calving date, 15 February
- 2 production systems:
  - Low concentrate input (Low)
  - Moderate concentrate input (Moderate)
- Full lactation study

Methodology (II)
Description of systems

	Low input	Moderate input
Early lactation (calving until turnout)	Grass silage + concentrates (mixed in 70 : 30 DM ratio)	Grass silage + concentrates (mixed in a 40 : 60 DM ratio)
Mid lactation	Grazed grass plus 1.0 kg concentrate	Grazed grass plus 4.0 kg concentrate
Late lactation (re-housing until drying off)	Grass silage + concentrates (85 : 15 DM ratio)	Grass silage + concentrates (70 : 30 DM ratio)
Total concentrate (t /cow)	0.85	2.1

Dry matter intakes in early lactation

	System		Genotype			Significance		
	Low input	Moderate input	Hol	SR x	s.e.d.	Sys.	G	Sys. x G
Concentrate	4.9	11.5	8.6	7.8	0.26	***	***	NS
Silage	9.3	7.1	8.8	8.1	0.23	***	*	NS
Total	14.2	19.2	17.4	15.9	0.45	***	***	NS

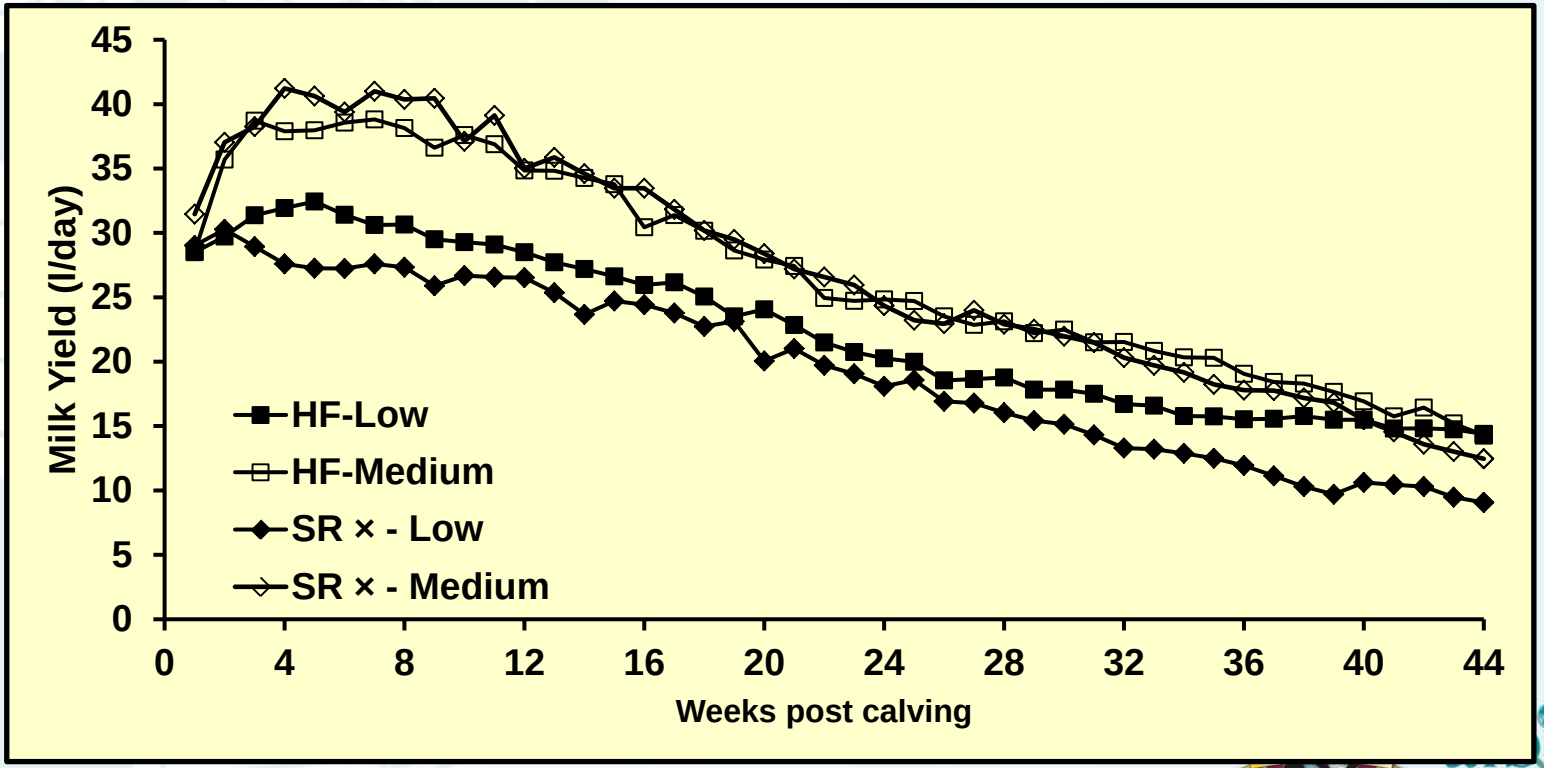
Dry matter intakes in late lactation

	System		Genotype			Significance		
	Low input	Moderate input	Hol	SR x	s.e.d.	Sys.	G	Sys. x G
Concentrate	3.2	7.6	5.5	5.3	0.16	***	NS	NS
Silage	11.0	9.7	10.4	10.2	0.44	*	NS	NS
Total	14.0	16.4	15.2	15.1	0.76	***	NS	NS

Full lactation milk production

	System		Genotype			Significance		
	Low input	Moderate input	Hol	SR x	s.e.d.	Sys.	G	Sys. x G
Milk Yield (kg/cow/day)	6043	7645	7310	6378	267.5	***	***	NS
Milk fat (g/kg)	44.2	43.6	41.5	46.3	1.02	NS	***	NS
Milk protein (g/kg)	34.0	34.8	33.4	35.4	0.46	NS P = 0.088	***	NS
Energy-corrected milk yield (kg/lactation)	6278	8004	7370	6914	268.2	***	NS P = 0.070	NS
Somatic Cell Score (log^e basis)	11.34	11.54	11.22	11.66	0.081	NS	*	NS

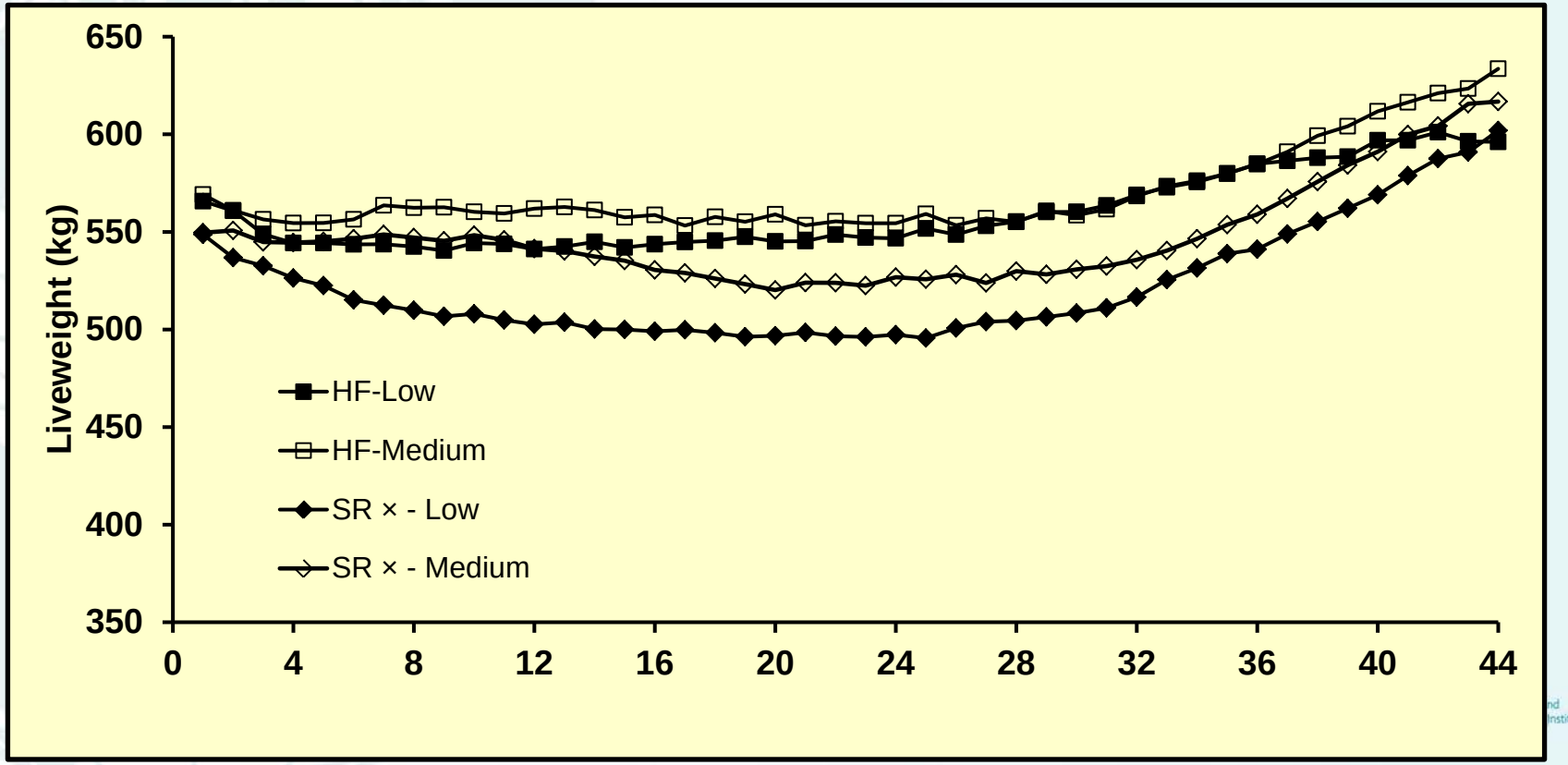
Lactation curves over the first 44 weeks of lactation



Mean live-weight and BCS

	System		Genotype			Significance		
	Low input	Moderate input	HoI	SR x	s.e.d.	Sys.	G	Sys. x G
Mean liveweight	535	554	560	530	5.4	***	***	NS P = 0.064
Mean BCS	2.26	2.31	2.16	2.42	0.033	NS	***	NS

Live-weight changes over the first 44 weeks of lactation



Fertility performance

	System		Genotype			Significance		
	Low input	Moderate input	Hol	SR x	s.e.d	Sys.	G	Sys. x G
Days to 1st observed heat	32	37	37	32	5.2	NS	NS	NS
Conception to 1st + 2nd service (%)	76	53	70	60	11.3	NS P= 0.077	NS	*
Pregnancy after 14 weeks (%)	86	82	78	90	8.1	NS	NS	*

Mastitis and lameness incidence

	System		Genotype			Significance		
	Low input	Moderate input	Hol	SR x	s.e.	Sys.	G	Sys. x G
At least 1 case of mastitis (%)	16	17	26	6	7.7	NS	*	NS P = 0.10
At least 1 case of lameness (%)	16	6	10	13	7.6	NS	NS	NS

Conclusions

- Crossbred cows had lower intakes in early lactation
- Crossbred cows had a lower full lactation milk yield, but produced milk with a higher fat and protein content
- No effect of genotype on milk solids yield
- No interaction between genotype and production system for milk yield
- Crossbred cows were lighter than Holstein cows, but had a higher body condition score
- Fertility not improved with crossbred cows
- Crossbred cows had fewer incidences of mastitis

Acknowledgements

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