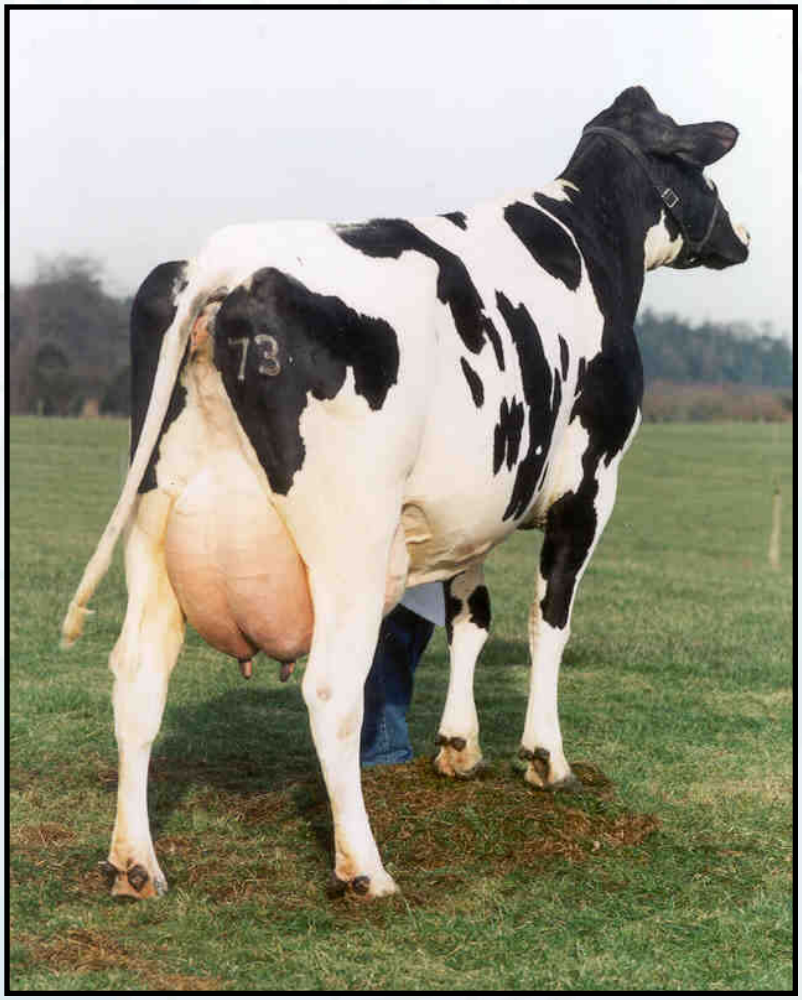
Alternative breeds and crossbreeding – their role within organic and low input systems

Organic Producers Conference
Conrad Ferris

27 November 2014

The Holstein-Friesian



- A breed with great ‘type traits’
- A breed with huge potential to produce milk
- Milk yield/cow in Northern Ireland has increased from 4600 litres in 1984 to 6900 litres in today
- But does she really produce milk more efficiently?
- NO!
- The Holstein digests her food and uses the absorbed nutrients with the exact same efficiency as any other breed!

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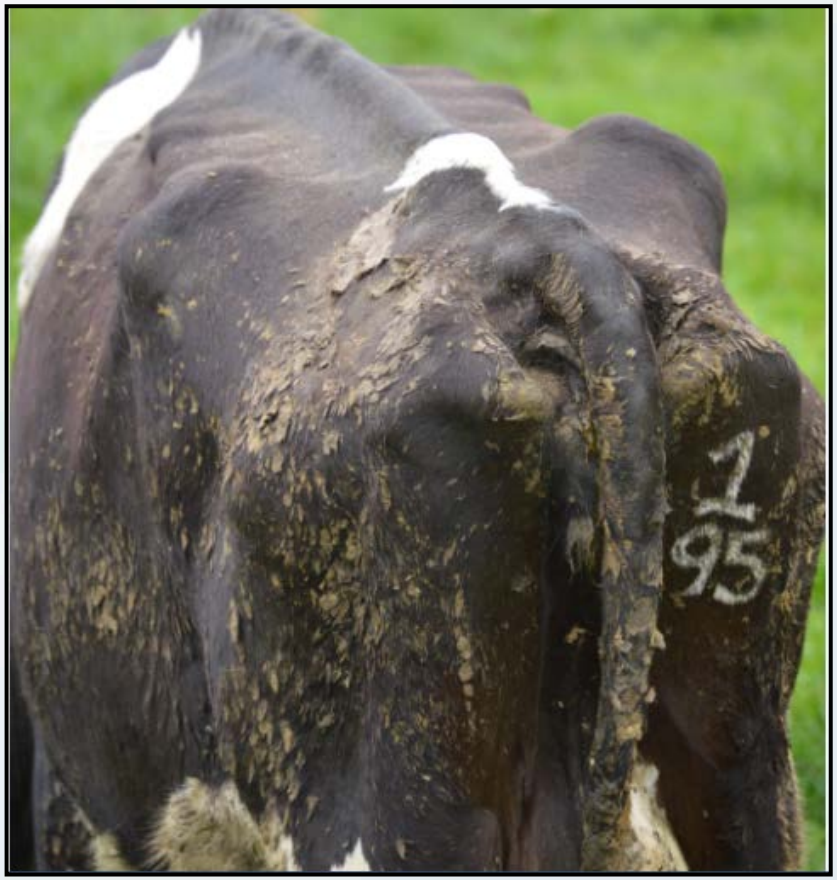
So where does the extra milk come from?

- Higher milk yields are due to:
  - To higher intakes
  - Burning up own body tissue reserves!!
- In selecting Holsteins that produce more and more milk, we have selected cows that produce milk by getting thin!
- Thin cows are less fertile, less healthy, and will not survive as long in the herd!
- We have created the problem…but can we solve it?



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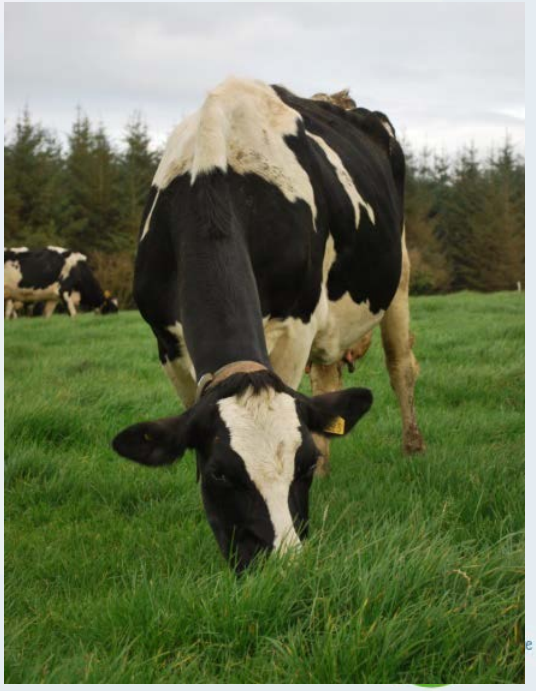
Possible solutions?

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



(I) Breed-substitution

Comparison of Norwegian Red and Holstein Dairy cows

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Breed substitution?

- There are lots of alternative breeds……but how do they compete with the Holstein in terms of performance, health, fertility, ease of management, and profitability?

- The only real way to find out is in controlled research study

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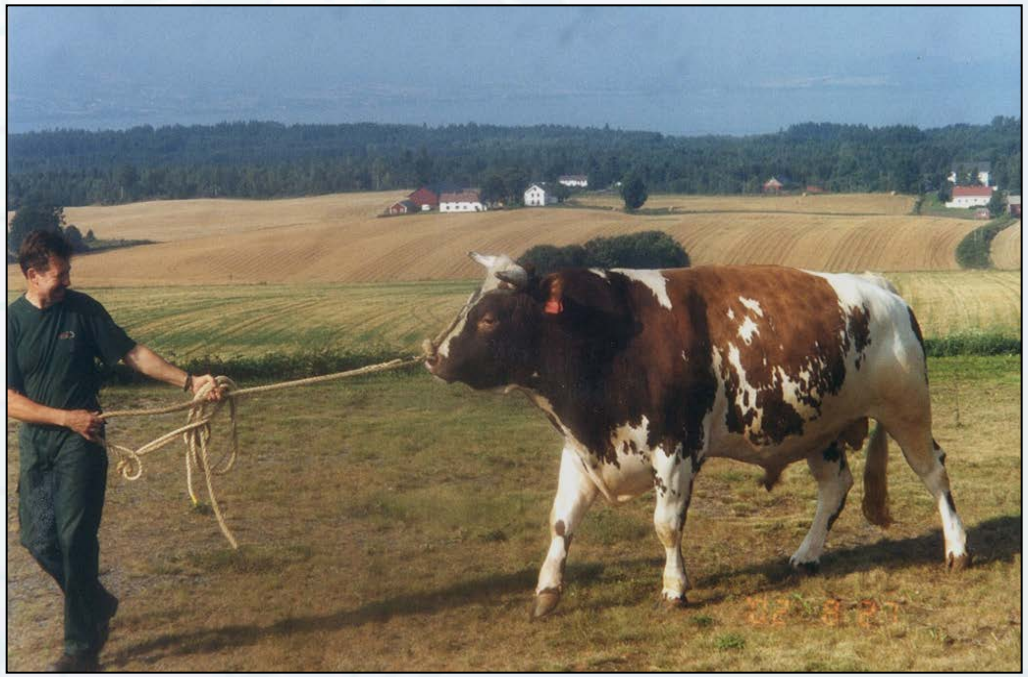
Why the Norwegian Red?

- In Scandinavia the focus has not just been on milk yield, but also on ‘functional traits:

Improved fertility



Less mastitis

Fewer diseases

Calving ease

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Current weighting on traits within Total Merit Index in Norway

Protein yield	28
Mastitis	21
Fertility of daughters	18
Udder and teats	15
Beef	6
Legs	6
Temperament	2
Other diseases	2
Milking speed	1
Stillbirths	0,5
Calving ease	0,5

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Why examine Norwegian red cows in Northern Ireland?

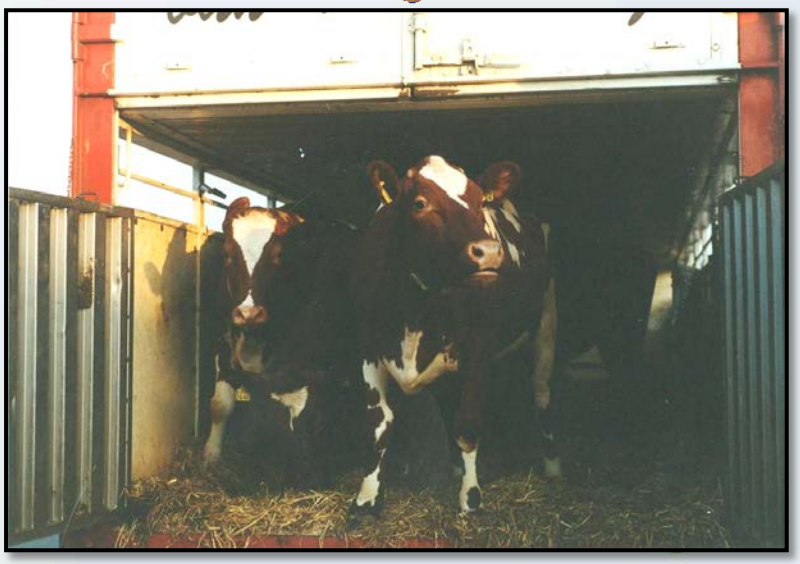
- But dairy systems in Norway are very different from those within Northern Ireland



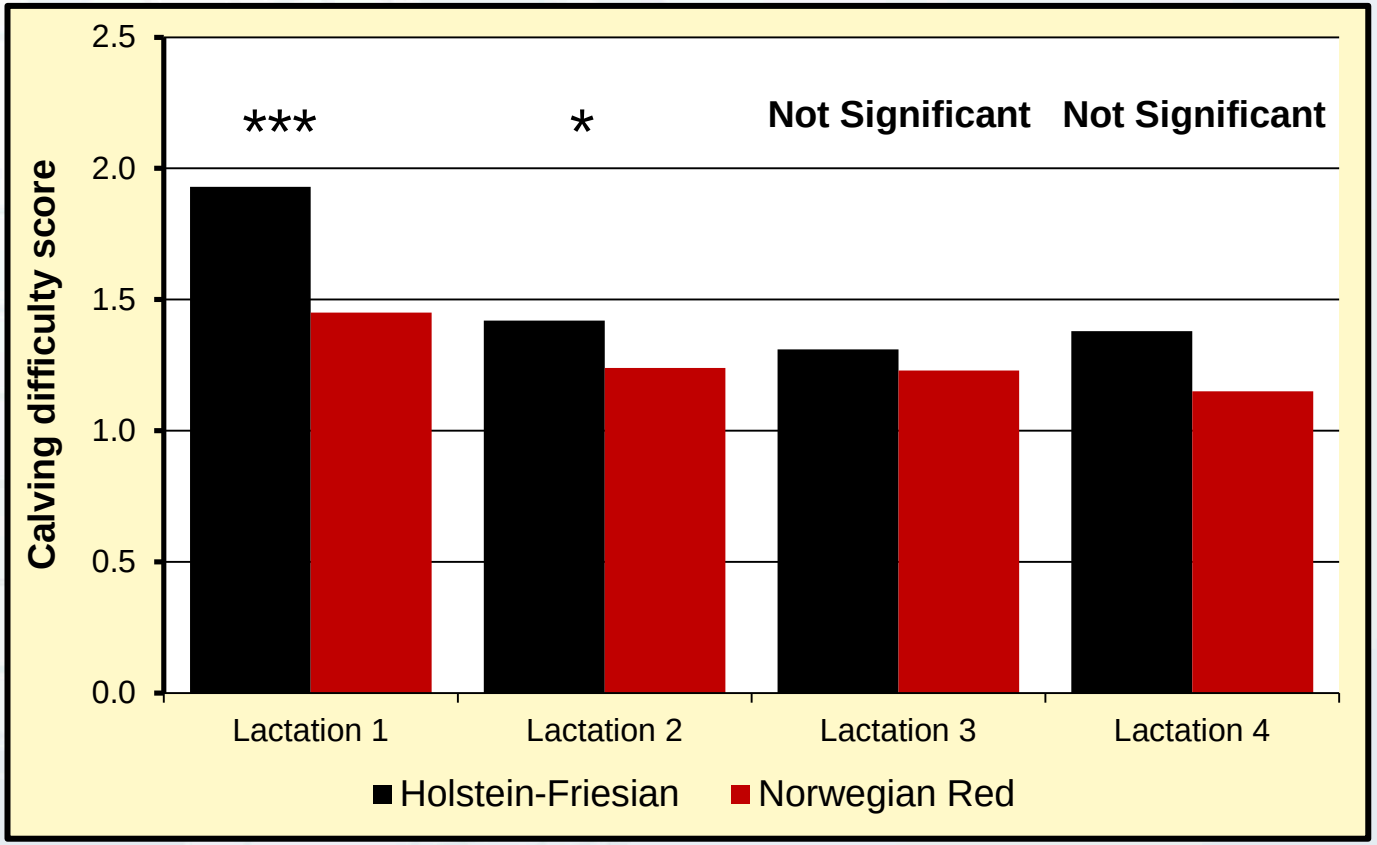


Outline of research project

- On-farm research programme to complement programme at Hillsborough
- 220 Norwegian Red cattle imported from Norway (as heifers)
- Placed on 20 commercial dairy farms
- Compared with home bred Holstein-Friesian cows
- Cows monitored until start of lactation 6, or until culled



Effect of breed on calving difficulty score during lactations 1-4



1-5 scale where 1 = unassisted, 5 = caesarean section

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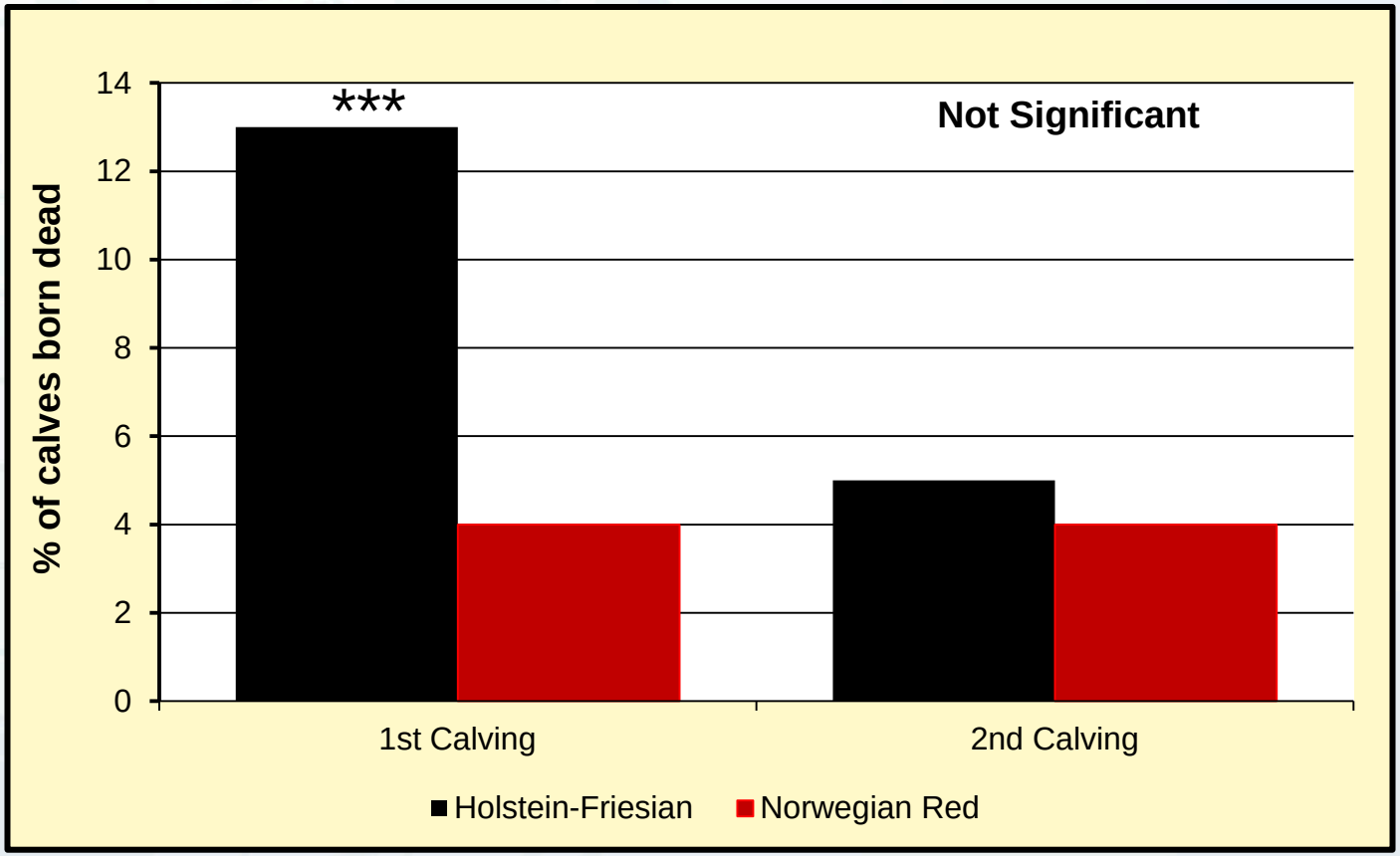
Effect of breed on the percentage of calves born dead



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Milking temperament score - % of cows that stood calmly during milking

		Holstein-Friesian	Norwegian Red
Lactation 1	48 hours	37	31
	3 weeks	91	80
Lactation 2	48 hours	82	75
	3 weeks	97	94

1 - 4 scale where 1 = stands calmly and 4 = extremely agitated – milked with difficulty

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Effect of dairy cow breed on full lactation milk production (kg)

	Holstein-Friesian	Norwegian Red	% difference from the Holstein
Lactation 1	6264	5956	-5%
Lactation 2	6789	6550	-4%
Lactation 3	7415	7257	-2%
Lactation 4	7826	7506	-4%
Lactation 5	7397	7466	+1%

Milk composition (mean for lactations 1 – 5)

	Holstein-Friesian	Norwegian Red
Fat %	3.75	3.85
Protein %	3.24	3.32

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Effect of dairy cow breed on full lactation fat+protein yield (kg)

	Holstein-Friesian	Norwegian Red	% difference compared to Holsteins
Lactation 1	443	427	-4%
Lactation 2	471	464	-1%
Lactation 3	516	520	0
Lactation 4	555	543	-2%
Lactation 5	514	540	+5%

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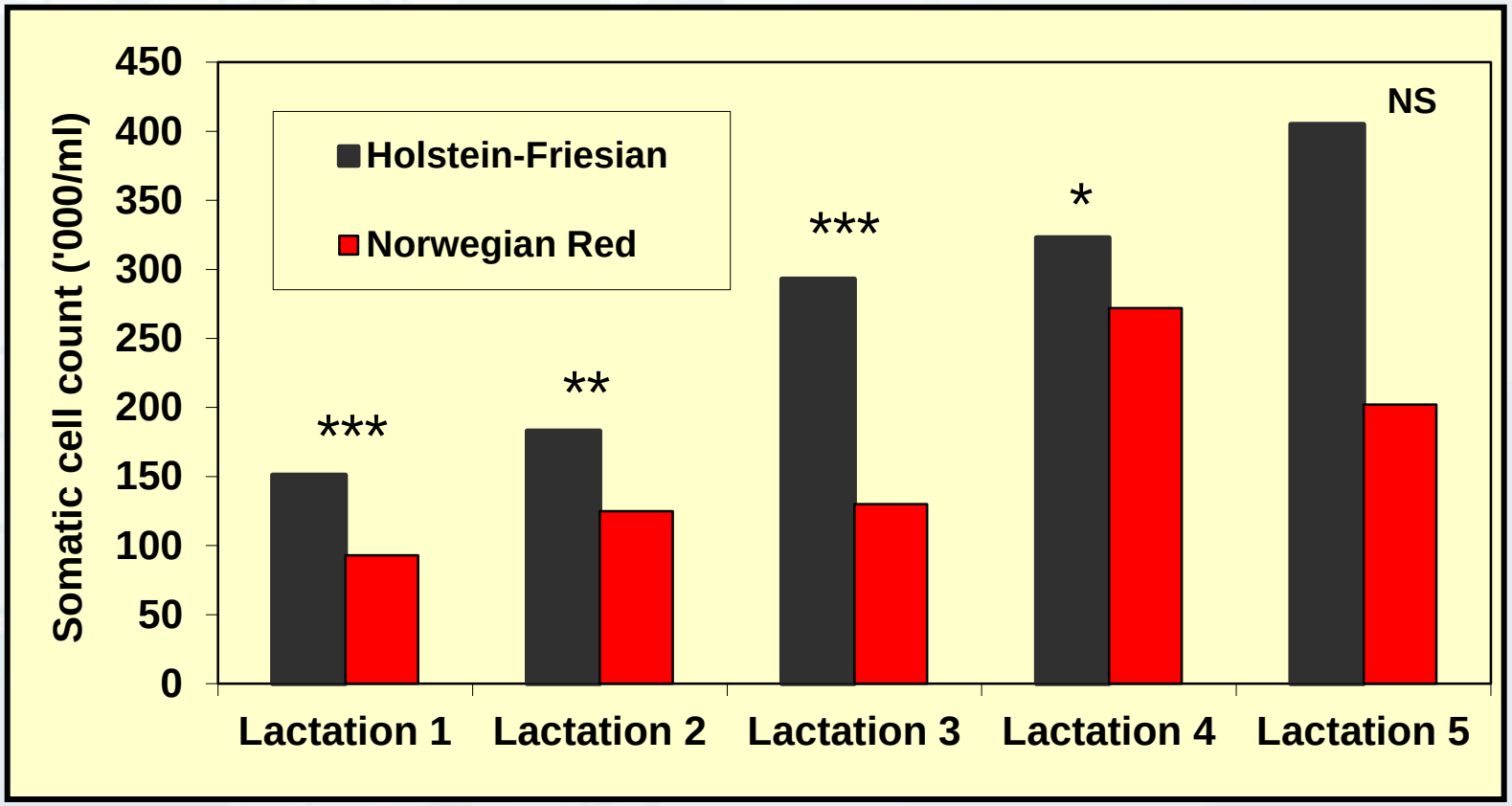
Somatic cell count during lactations 1-5 ('000/ml)



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Are Norwegian cows more fertile? Conception rate to 1st AI

	Holstein-Friesian	Norwegian Red
Heifers	58%	66%
Lactation 1	41%	55%
Lactation 2	39%	60%
Lactation 3	35%	65%
Lactation 4	52%	59%

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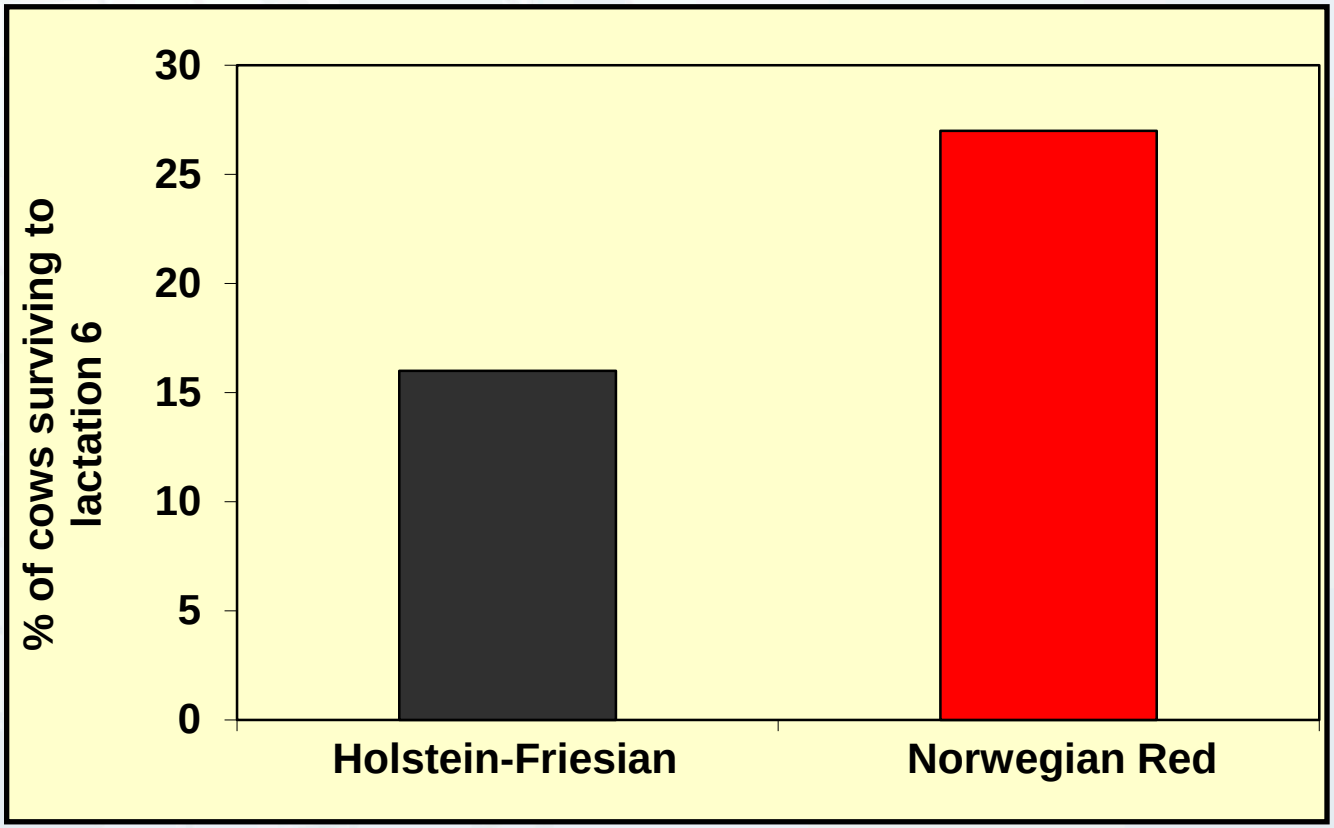
Percentage of cows surviving until the sixth lactation



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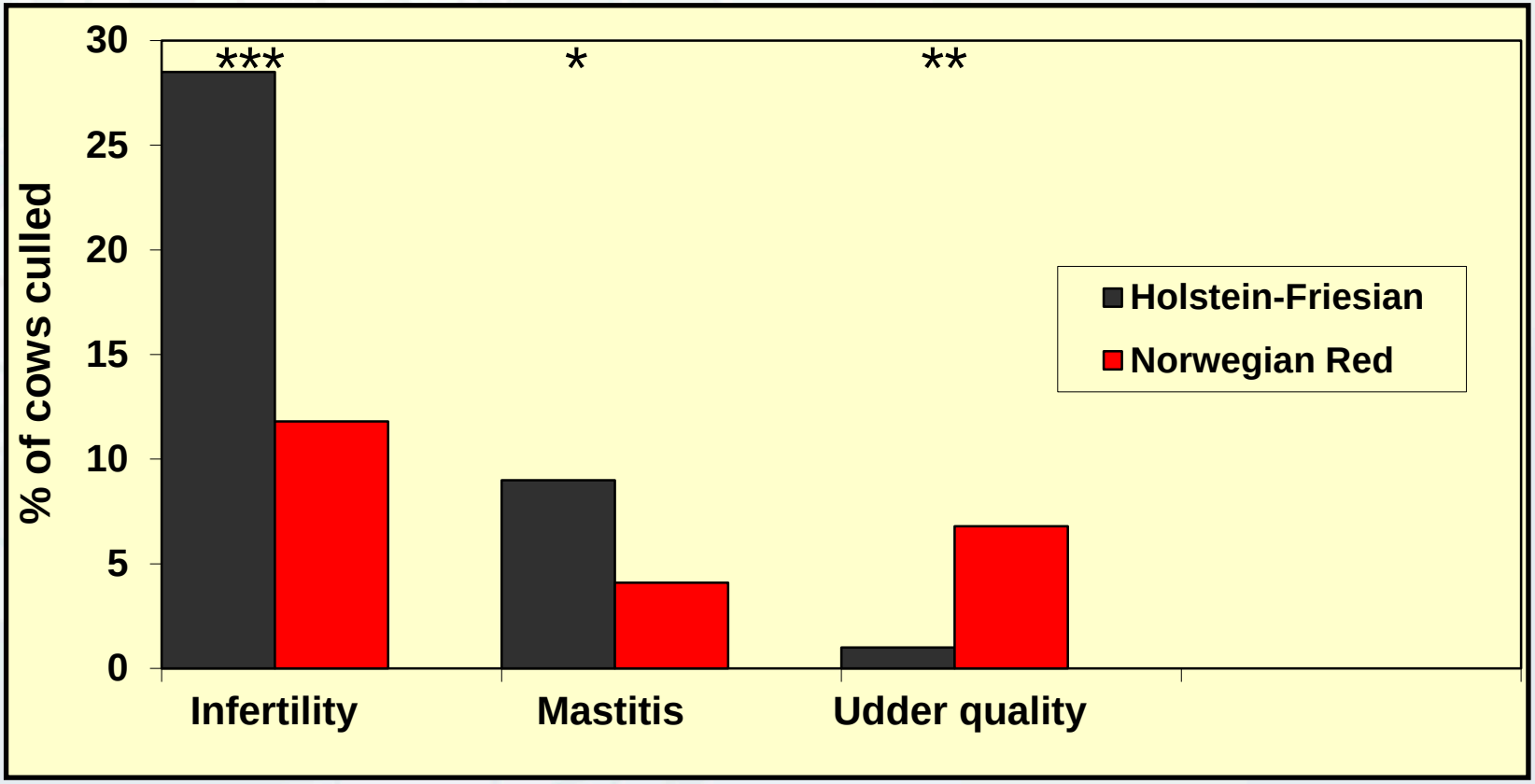
Main reasons for culling cows



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Economic comparison of Norwegian Red vs Holstein cows

	Holstein-Friesian	Norwegian Red
Milk solid (litres/cow/year)	6582	6508
Fat (%)	3.78	3.87
Protein (%)	3.25	3.33
Outputs (£/cow/year)		
Milk sold	1700	1708
Calves sold	89	104
Cull cows sold	198	164
Less replacement charge	374	309
Total outputs	1613	1668
Variable costs (£/cow/year)	763	739
Gross margin (£/cow/year)	851	929
Overhead costs (£/cow/year)	490	490
Net profit (£/cow/year)	361	439

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CONCLUSIONS

- NR cows outperformed the Holstein cows in the traits that they had been heavily selected for
- Contrary to ‘popular’ believe, milk production performance of NR cows was similar to that of Holsteins
- Behaviour was an issue, but ‘type’ issues perhaps key limitation to uptake
- Economic analysis suggest that the NR can be as profitable, if not more so, that the Holstein: net profit £78/cow higher

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(II) Crossbreeding

Evaluation of Jersey crossbred cows

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Crossbreeding

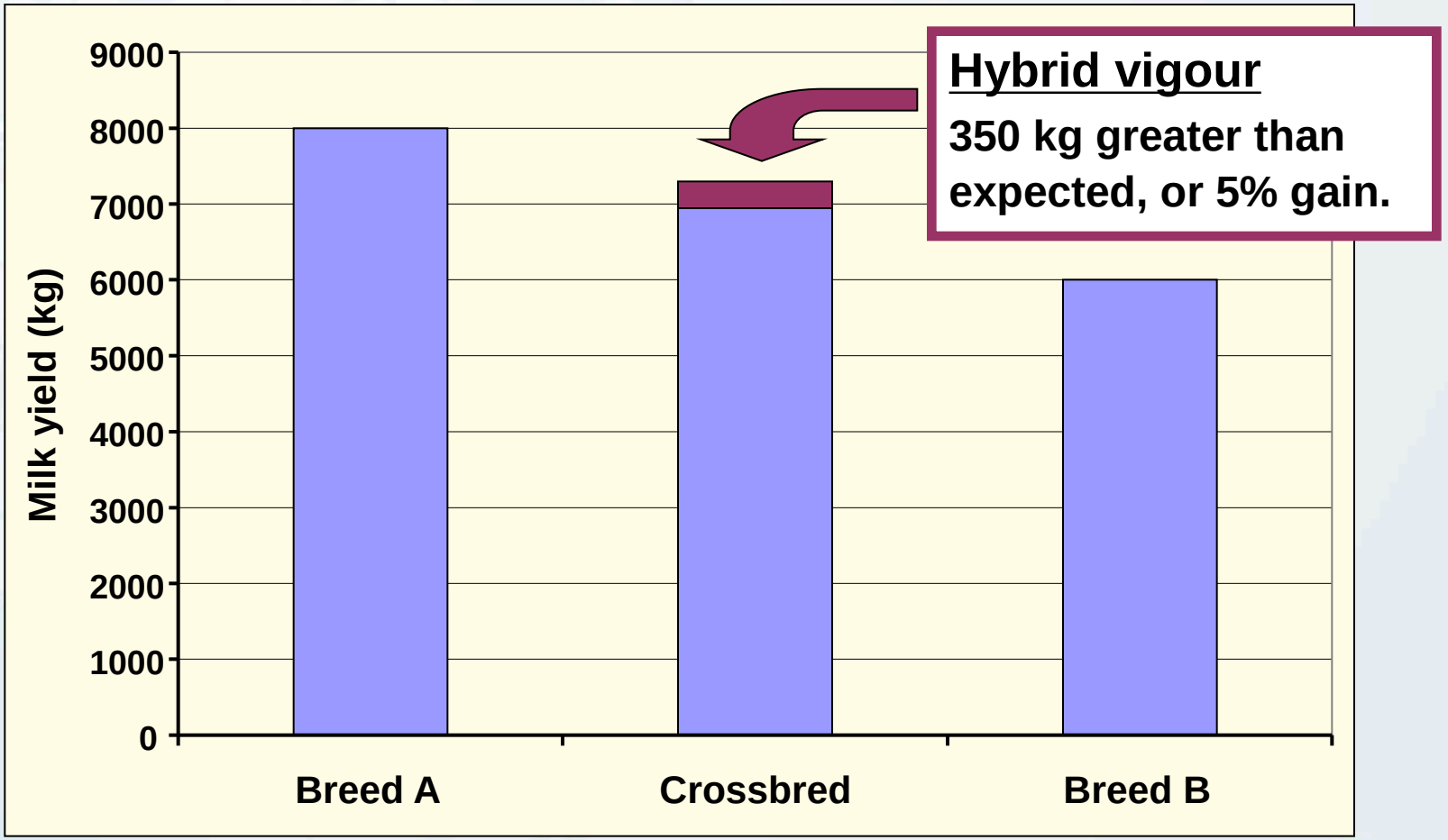
- Why consider crossbreeding?

1) The introduction of desirable traits from a second breed which may be absent or occur at a low frequency in receipent breed

2) To reduce levels of inbreeding

3) Hybrid vigour:
   - ‘opposite of inbreeding depression’

What is Hybrid vigour ('heterosis')



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Hillsborough studies have evaluated Jersey x Holstein crossbred cows

- 3 year study
- Spring calving dairy cows
- Average concentrate input = 1.1 t/cow

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Effect of cow genotype on milk production

	Hol	*J x Hol*
Average live weight (kg)	513	469
Food intake pre turnout (kg DM/cow/day)	14.7	14.8
Milk Yield (litres/cow/lactation)	6070	5463
Fat (%)	4.20	4.78
Protein (%)	3.30	3.59
Fat + Protein yield (kg/cow/lactation)	467	471
SCC (000/ml)	218	173

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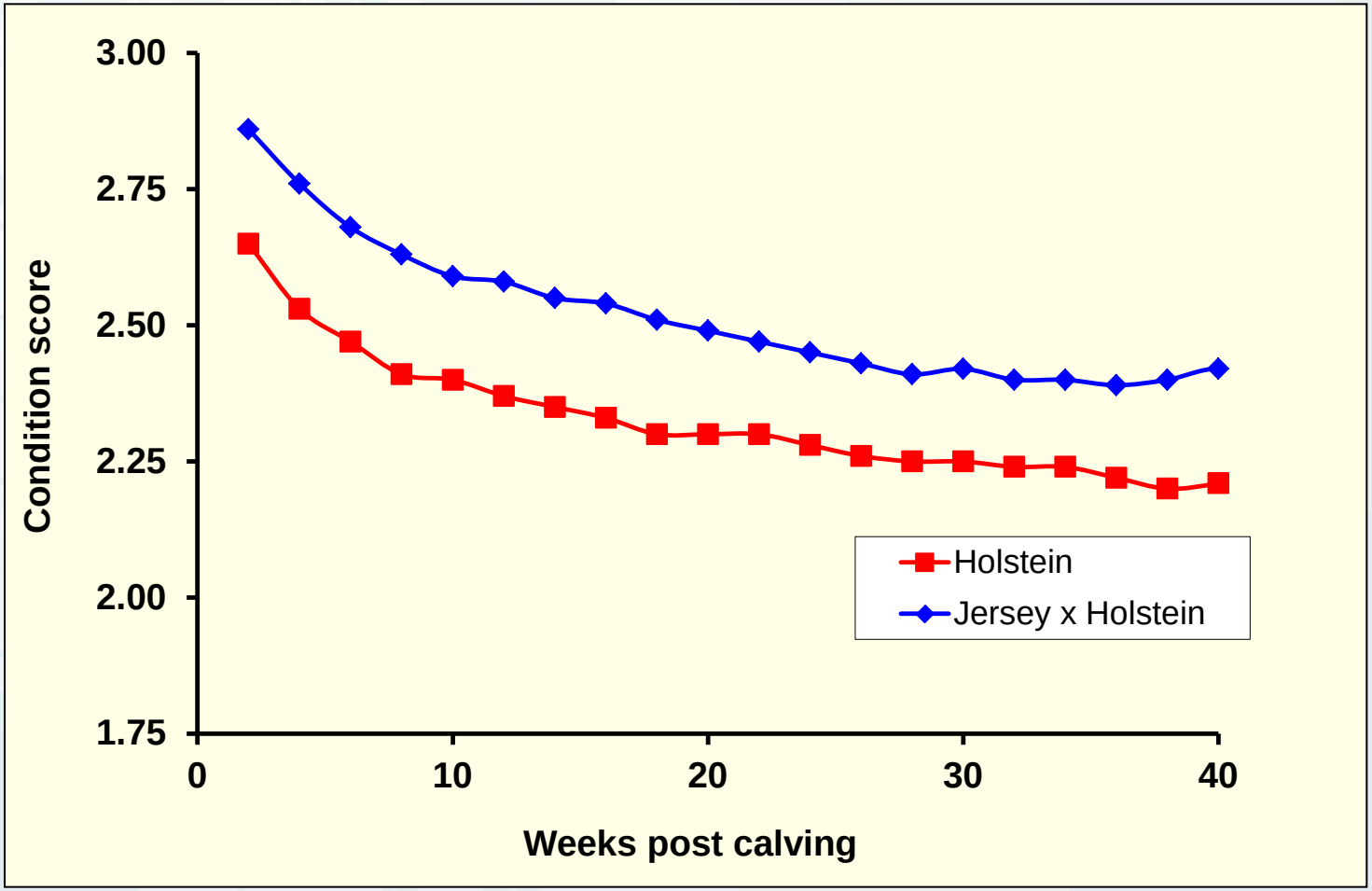
Changes in condition score during lactation



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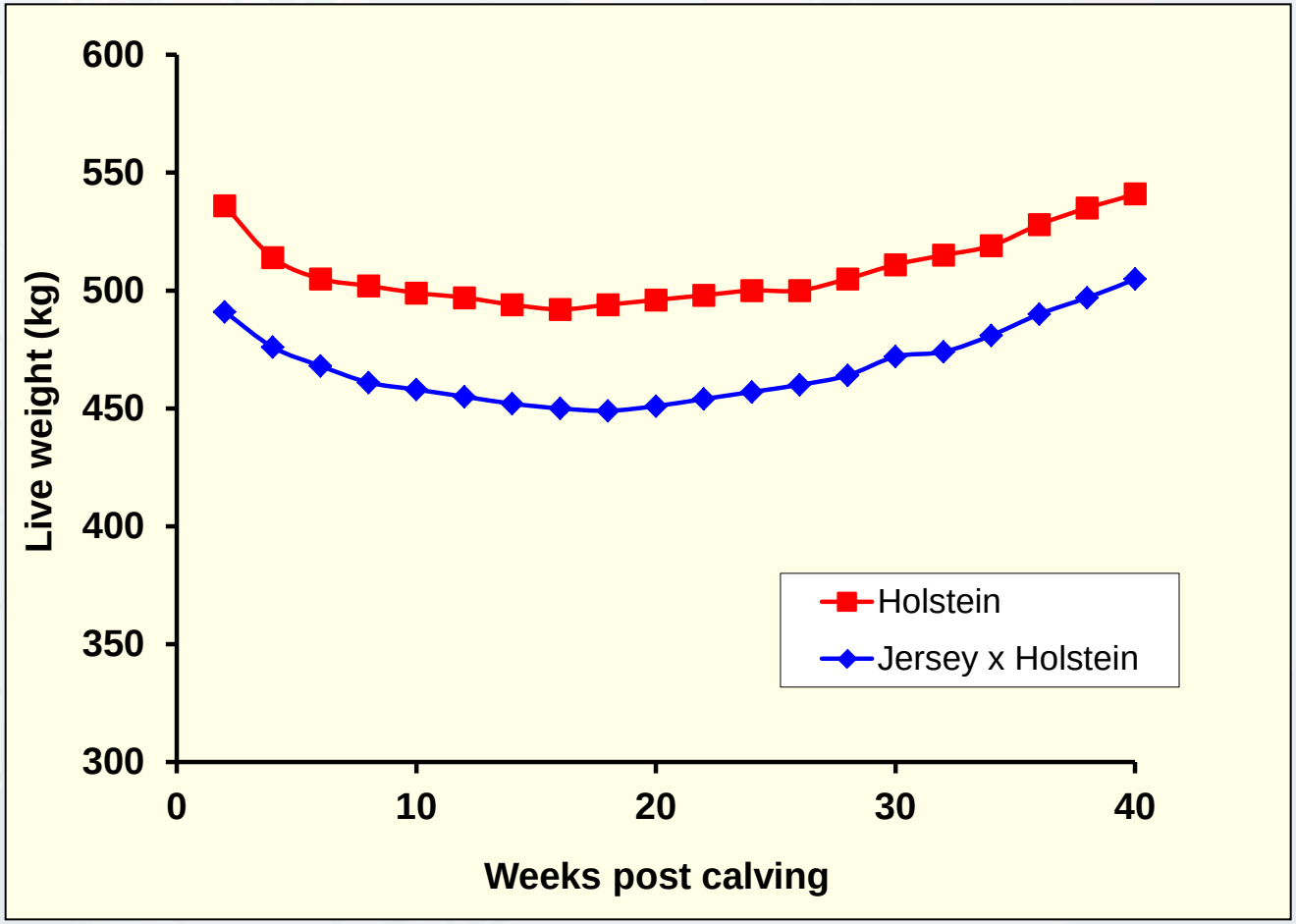
Changes in live weight during lactation



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The effect of cow genotype on fertility performance

	Hol	*J x Hol*
Cows starting to cycle pre-day 42 (%)	78	90
Days to first observed heat	51	42
Conception to 1st + 2nd AI (%)	51	79
Pregnancy rate after 12 weeks of breeding (%)	65	85

Health problems

	Holstein	*Jersey crossbred*
(% of cows with at least one case)		
Mastitis	29	16
Lameness	19	11
Displaced abomasum	7	0

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Performance of Jersey crossbred cows on Northern Ireland dairy farms

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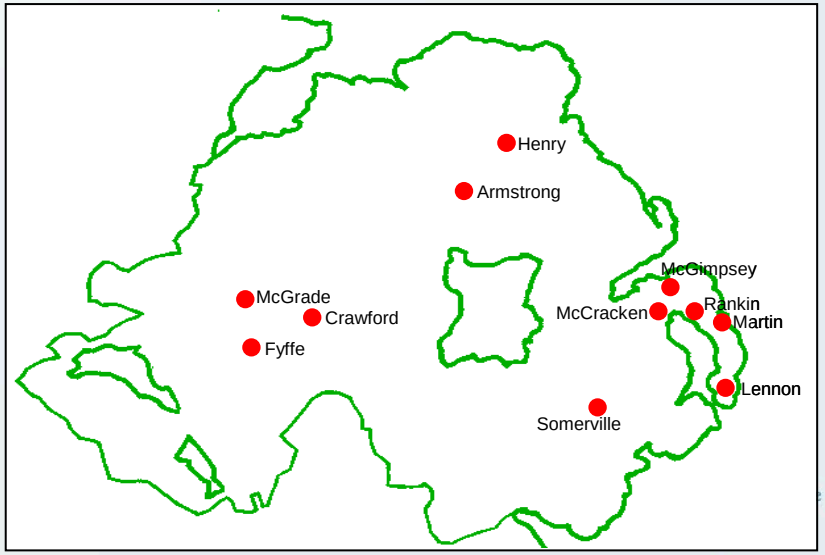
The research programme

- 11 farms
- Cows on study
  - 192 Holstein cows
  - 189 Jersey x Holstein cows
- All cows on study for 4 lactations



Effect of breed on the percentage of cows with unassisted calvings

	Holstein-Friesian	**Jersey crossbred**
1st calving	87	91
2nd calving	97	98

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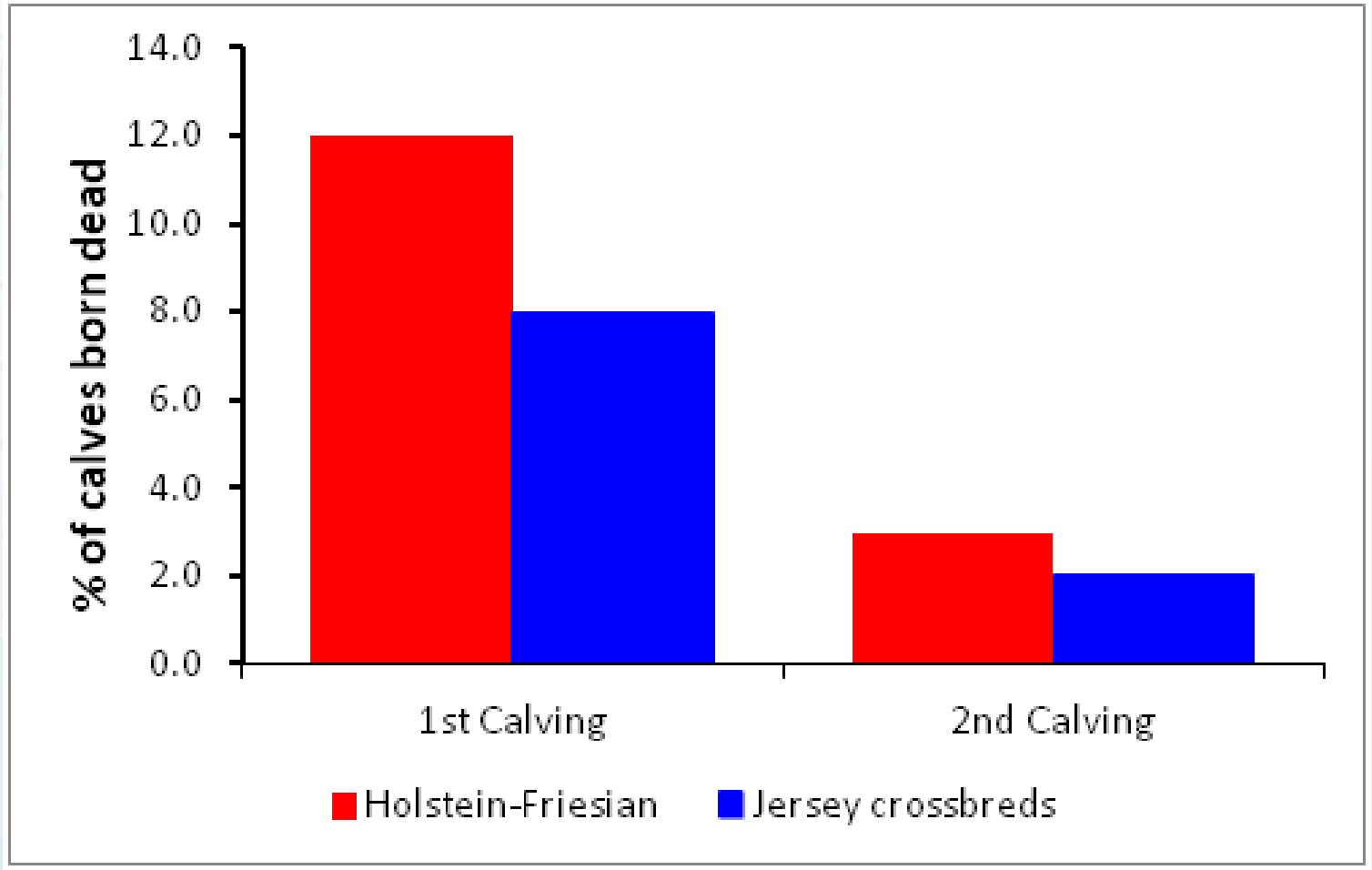
Effect of breed on the percentage of calves born dead



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Effect of dairy cow breed on full lactation milk production (kg)

	Holstein-Friesian	Jersey crossbred	% difference compared to Holstein
Lactation 1	6084	5486	-10%
Lactation 2	6783	6152	-9%
Lactation 3	7320	6226	-15%
Lactation 4	7417	6647	-10%
Lactation 5	7550	6395	-15%

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Milk composition (mean for lactations 1 – 5)

	Holstein-Friesian	Jersey crossbreds	% difference compared to Holsteins
Fat %	4.18	4.71	12.6
Protein %	3.39	3.58	5.6

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Effect of dairy cow breed on full lactation fat + protein yield(kg)

	Holstein-Friesian	Jersey crossbred	% difference compared to Holstein
Lactation 1	453	444	-2%
Lactation 2	518	508	-2%
Lactation 3	556	520	-6%
Lactation 4	559	558	-0%
Lactation 5	570	516	-9%

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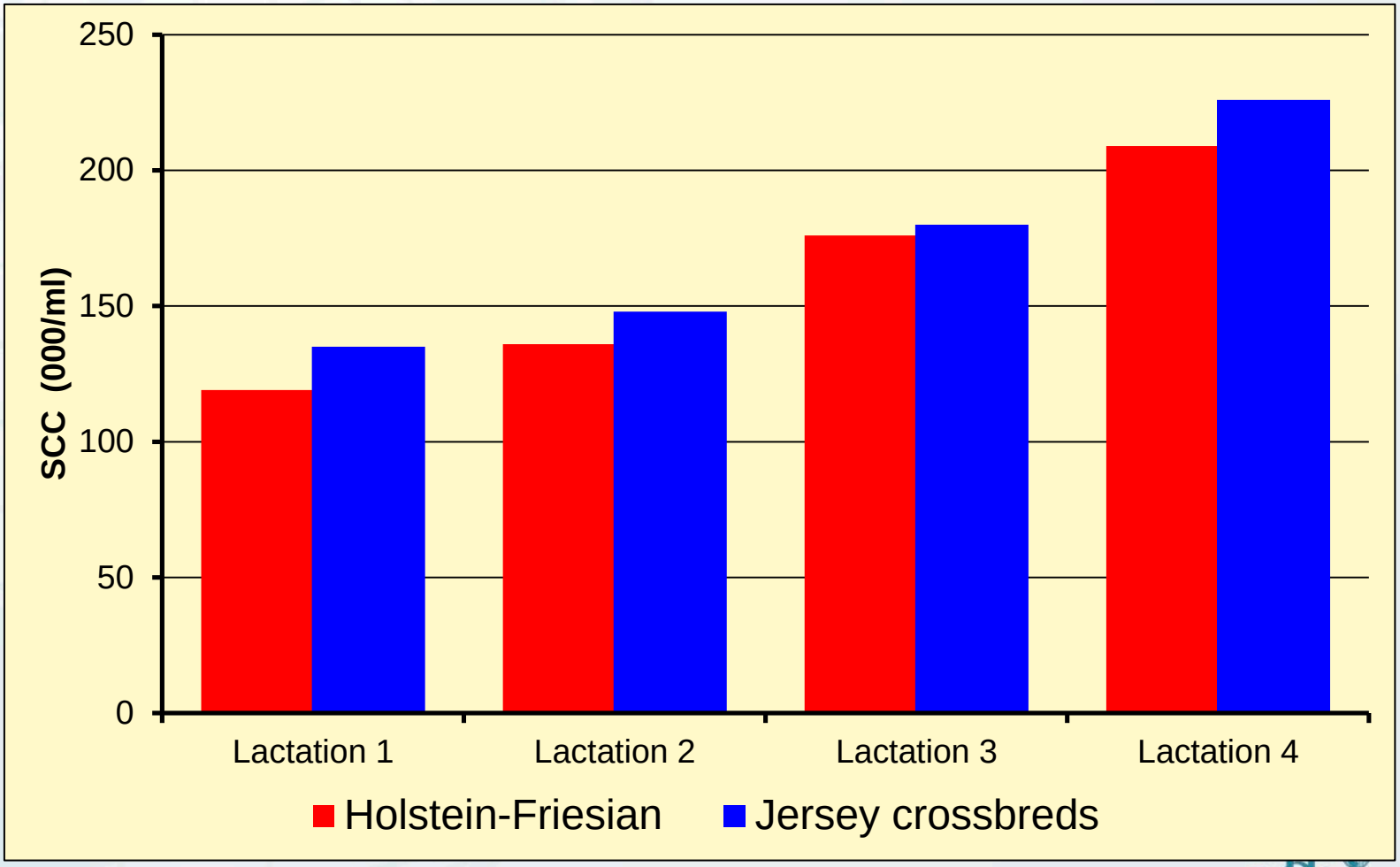
Somatic cell count during lactations 1-4 ('000/ml)



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Are Jersey crossbred cows more fertile? Conception rate to 1st AI

	Holstein-Friesian	Jersey crossbreds	% difference compared to Holstein
Heifers	61%	72%	18%
Lactation 1	46%	54%	17%
Lactation 2	44%	54%	22%
Lactation 3	51%	55%	8%
Lactation 4	45%	52%	15%

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Main reasons for culling cows (lactations 1 – 4)

	Holstein-Friesian	Jersey crossbreds
Infertile (%)	30.2	25.0
Slipped calving pattern (%)	5.5	4.1
Mastitis (%)	2.7	2.7
High SCC (%)	3.0	2.8
Feet and leg problems (%)	4.1	0.5
Low milk yield (%)	2.3	1.1
% of cows completing four lactations on the study	38.8	47.9

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Economic comparison of Holstein and Jersey crossbred cows

	Holstein-Friesian	Jersey crossbred
Milk solid (litres/cow/year)	6372	5973
Fat (%)	4.17	4.74
Protein (%)	3.39	3.59
Outputs (£/cow/year)		
Milk sold	1728	1739
Calves sold	91	71
Cull cows sold	165	96
Less replacement charge	358	266
Total outputs	1626	1640
Variable costs (£/cow/year)	763	750
Gross margin (£/cow/year)	863	890
Overhead costs (£/cow/year)	490	490
Net profit (£/cow/year)	373	400

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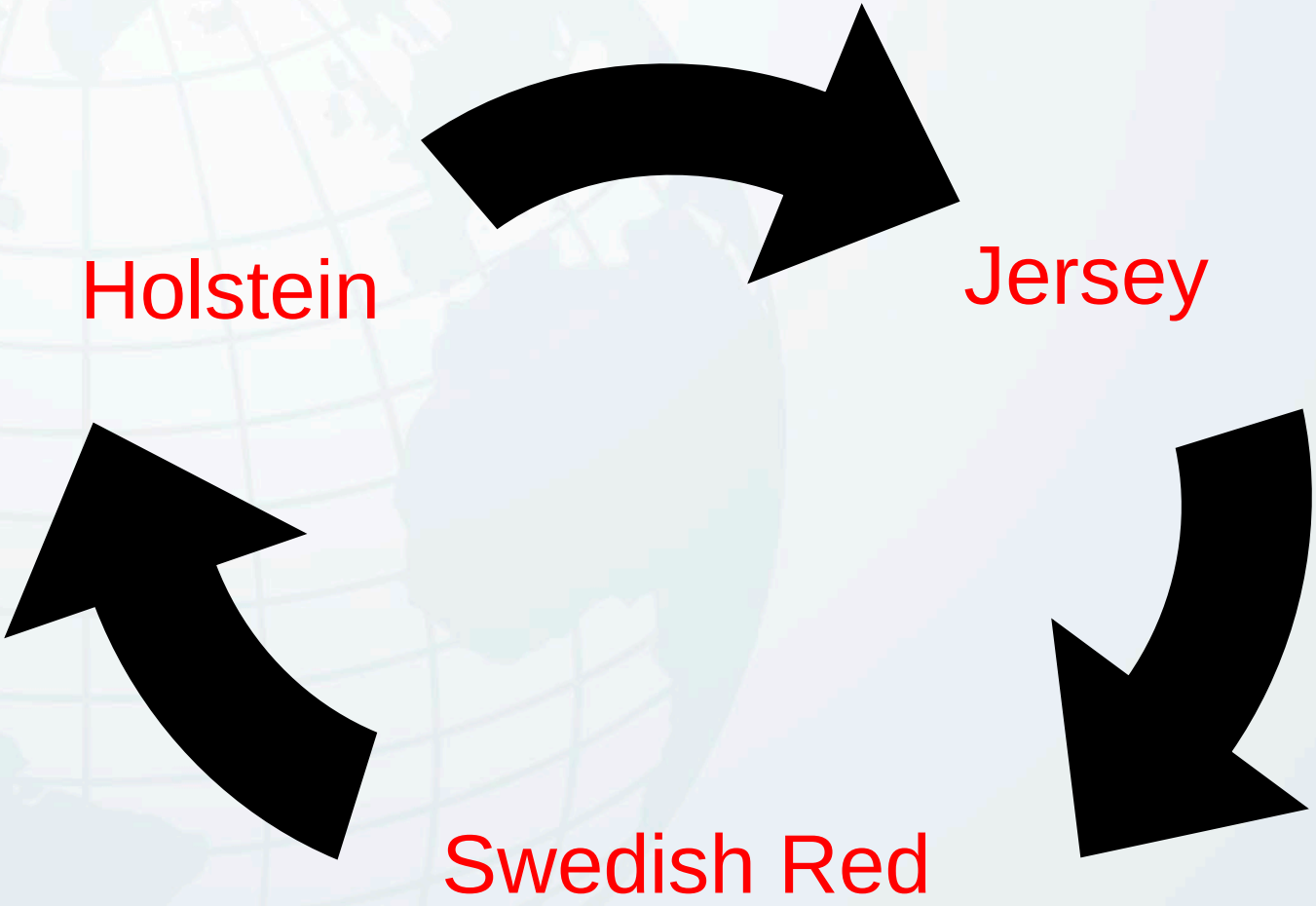
Where do you go after the first cross?

- Criss-crossing
- Proven crossbred sires
- Three-way rotational cross ?
  - Crossbreeding systems should use three breeds to capitalize on hybrid vigor
  - Two breeds limits impact of hybrid vigor?
  - Four breeds limits impact of single breeds ?
  - Select three breeds carefully (Les Hansen)

Three-breed rotational cross scheme being used at Hillsborough



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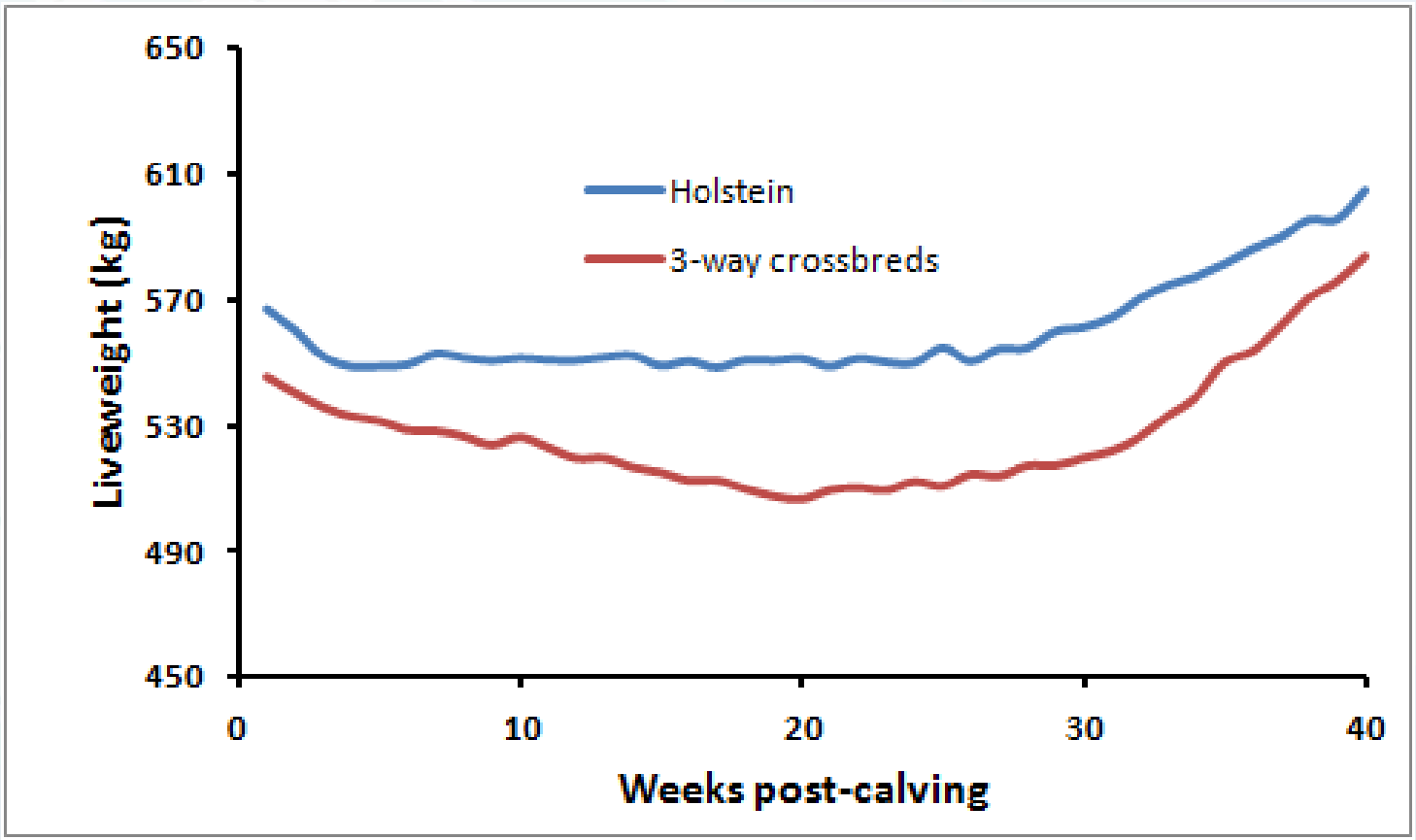
82
98


58

Performance of three-way crossbred cows

	Low input		Moderate input	
	Holstein	3-way crossbreds	Holstein	3-way crossbreds
Concentrate input (t)	0.7 t	0.7 t	1.6 t	1.6 t
Milk output (kg)	6370	5325	7647	7120
Fat (%)	3.6	4.1	3.6	4.1
Protein (%)	2.8	3.2	3.0	3.2
Milk solids (kg)	410	395	511	526
SCC (000/ml)	135	121	82	206

Live-weight changes of Holsteins and three-way crossbred cows



Practical considerations when considering crossbreeding

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Key genetic issues to consider

- Crossbreeding is not ‘true’ genetic improvement…..but it can compliment it.....
- ……by introducing desirable genes/traits from another breed
- Hybrid vigour should be viewed as an added bonus from crossbreeding…..not the primary reason
  - Benefits can be considerable, BUT variable
  - Not passed to next generation
- Crossbreeding can be used to reduce inbreeding depression,
  - but this is not a major issue in most UK herds at present

Choice of breed and sire

- Breeds choice?
  - Select breeds for specific needs/traits, while normally aiming to minimise loss of milk
  - Select breeds with robust progeny testing programmes (which focus on traits of economic importance)
  - Maintaining genetic distance should increase heterosis
- Choice of sire within breed? – perhaps most critical decision!
  - Use top sires from within the breed selected for economic traits of importance
- Establish a clear breeding strategy for next generation
  - Two breed rotational cross (67% heterosis)
  - Three breed rotational cross (86% heterosis)
  - Use of progeny tested crossbred sires

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Management issues

- Crossbreeding should not be adopted to solve problems associated with poor management (it might just 'mask' the problems)
- 'Crossbreeding' is a long term commitment
- Can complicate management issues
- Impacts on value of male calves, cull cows, surplus breeding stock and herd valuation
- Evidence from other parts of the world indicate that well planned and well managed crossbreeding programmes can result in robust cows and improved profitability – AFBI research supports this

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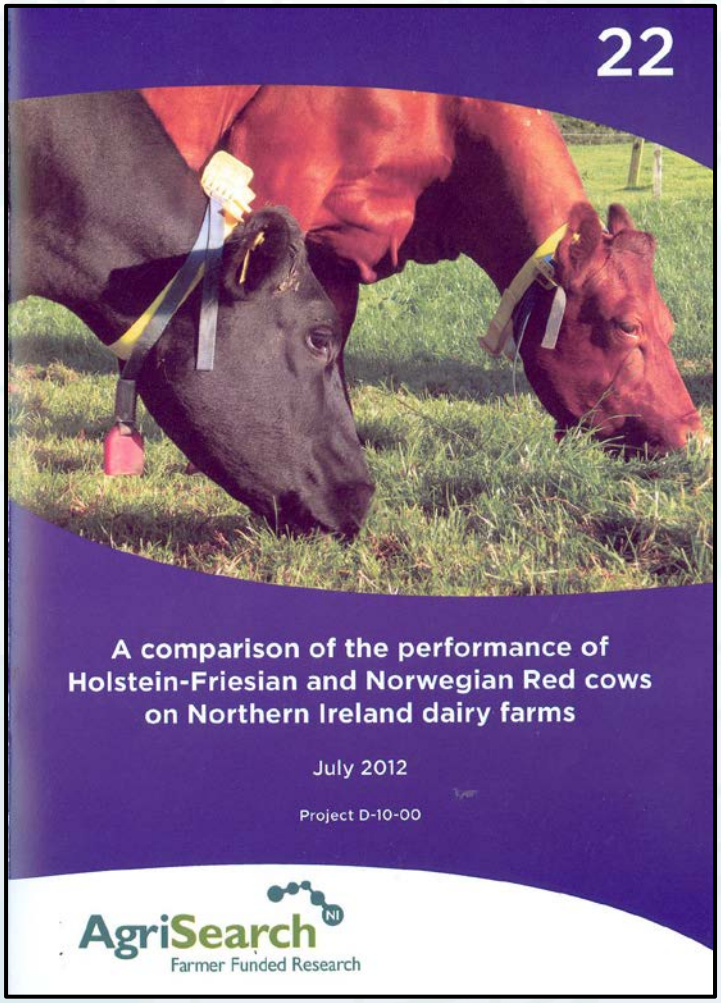
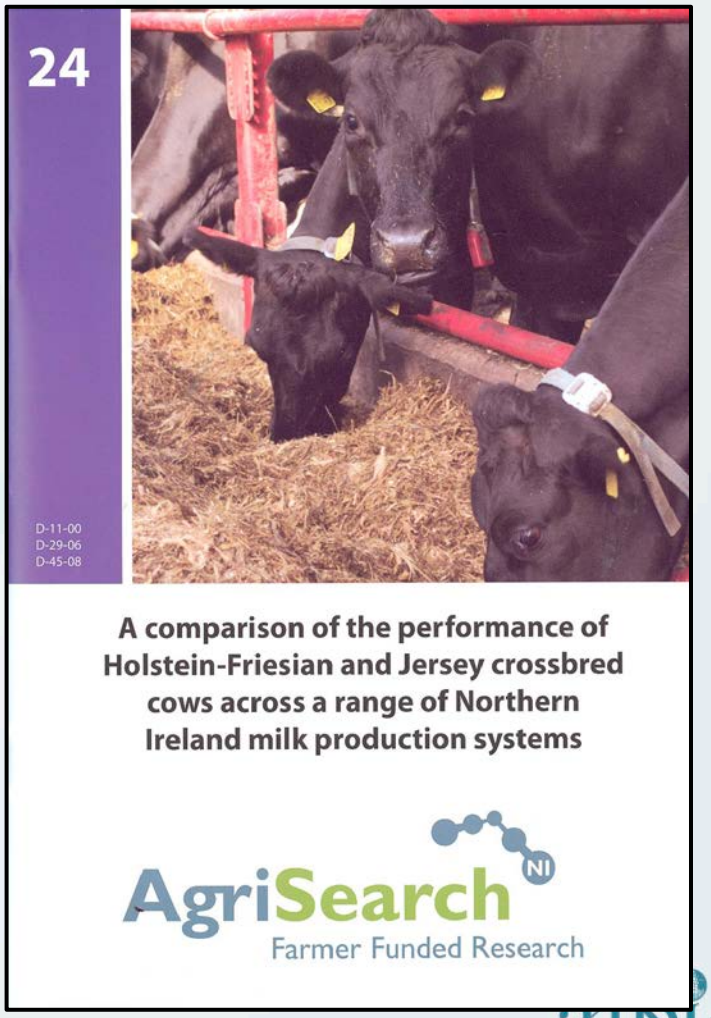
‘Farmer booklets’ available on AgriSearch website





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