The Ideal Dairy Cow for Pasture-based Production Systems

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Grass based farming: all aspects

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Why pasture-based systems ?

- Lower cost per unit of milk production
- Superior milk composition
- Grass based systems have greater sustainability:
  - Economic- family farming business
  - Social- both internal and external
  - Ecological- climate, water, soil, fauna & flora

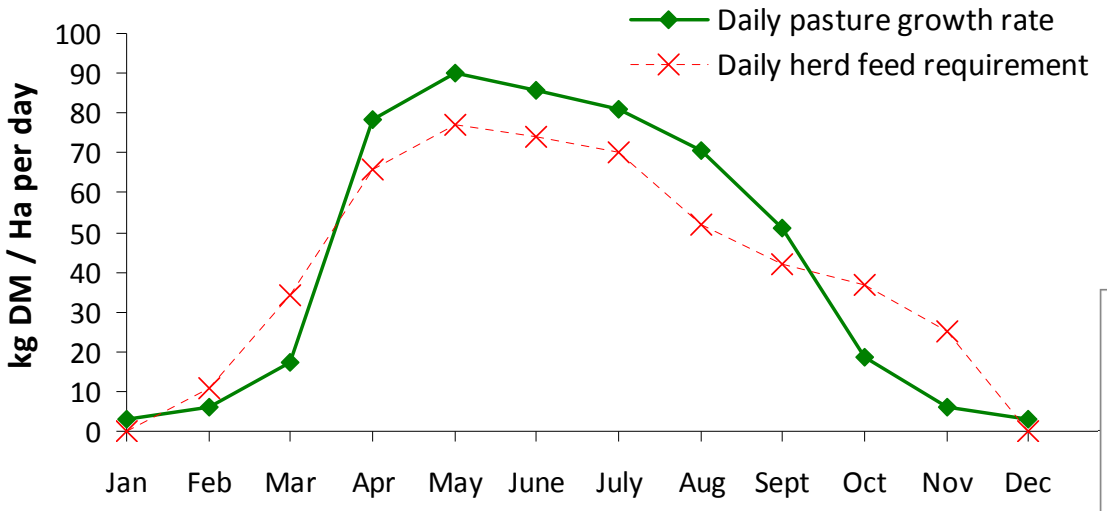
Key components of a profitable and sustainable pasture-based system

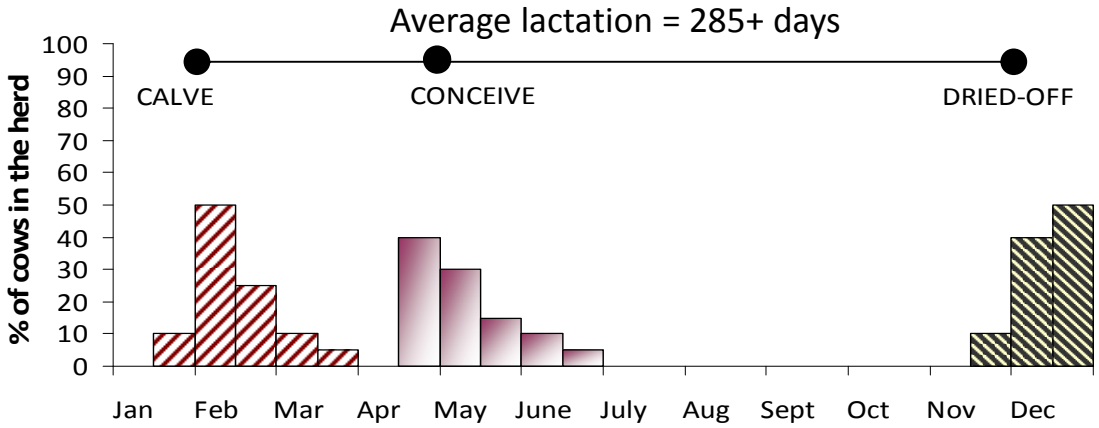
- High grass production & utilisation
- High milk productivity per hectare
- High nutrient use efficiency
- Key requirements:
    - Excellent grazing management
    - Pasture-based genetics

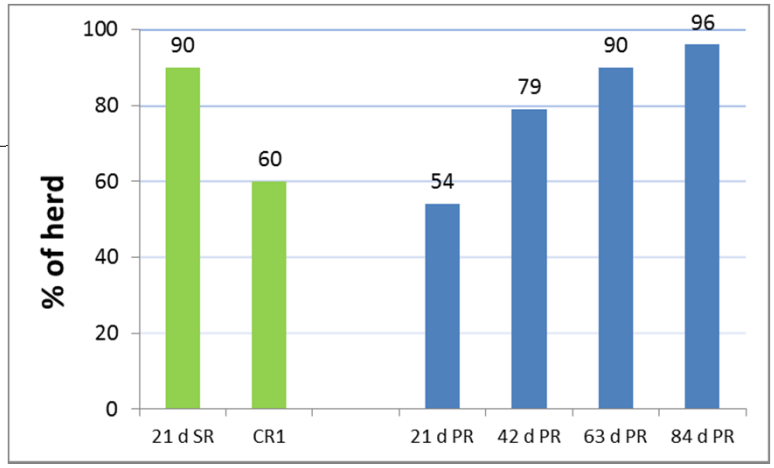
Attributes of Pasture-based Genetics

1. Propensity for high grass DM intake- %BW
2. High milk output per unit area: High Stocking Rate
3. High fertility and longevity: seasonal calving
4. Diet (predominantly) grass- feed budget
5. Robust to fluctuations in grass quality and quantity

Seasonal, pasture-based milk production







Milk production systems in Ireland

- Predominantly seasonal calving pasture-based
- Annual grass production of 12 – 15 t DM / ha
- Long grass growing season of 270 to 330 days
- Grazed grass constitutes 65 – 70% of diet
- 90% of milk is used in the manufacture of dairy products
- Milk supply pattern is highly seasonal

Cow Fertility Performance- 1990-2001

(Ross *et al.*, 2006, Animal Science)

Year	Milk (kg)	Calv1 (%)	Calv-1&2 (%)	No. Services	Parity
1990	5033	55.2	76.8	1.54	4.3
199		53.0	74.3	1.65	4.6
199		52.5	76.2	1.63	4.3
1993	5307		77.0	1.67	4.0
1994	5383		73.5	1.77	4.0
1995	5490	49.4		1.66	3.9
1996	5594	44.4		1.70	3.7
1997	5629	48.7	71.3		3.5
1998	5504	49.9	70.1		3.4
1999	5605	46.2	68.1		
2000	5609	42.8	67.3	1.89	
2001	5775	44.0	70.0	1.75	

+69kg/year (p<0.001)

-0.96%/year (p < 0.001)

-0.84%/year (p<0.001)

+0.022 serv/yr (p<0.005)

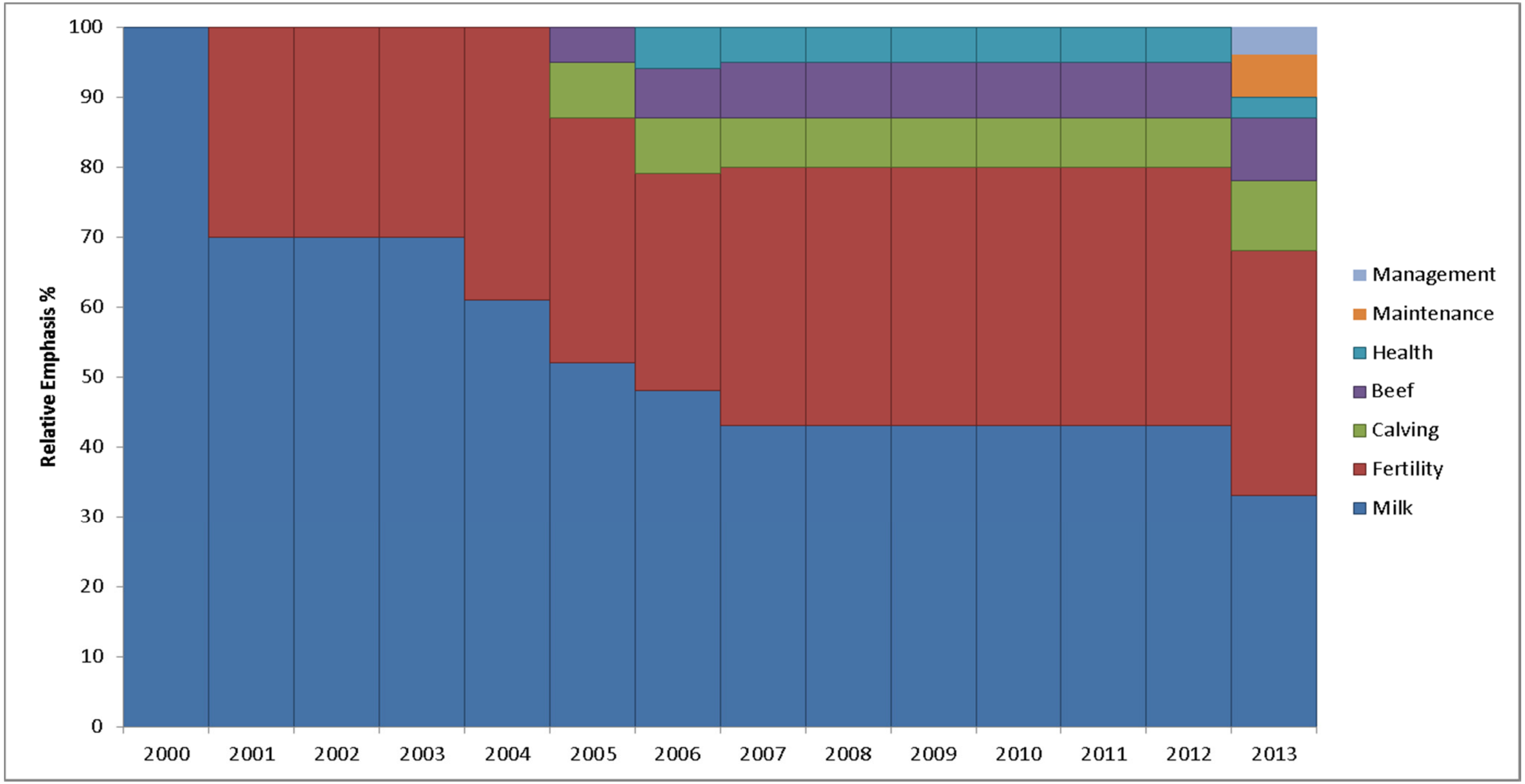
-0.1 lact/yr (p<0.001)

Breed/strain & SR comparison studies

Summary

- Genotypes selected based solely on increased milk production:
  - Increase milk production (G*E interaction)
  - Reduced reproductive performance- no feeding system effect
  - Greater negative energy balance- especially in early lactation
  - Reduced farm profitability- both per hectare and per cow
- Increased Stocking Rate:
  - Very high SR (>3.5 cows/ha) increased incidence of anoestrous
  - No effect on pregnancy rate if treated P4 Ovsynch at MSD

Economic Breeding Index (EBI) 2000- 2013



Single Trait Selection → Balance Breeding Objective

Sub-index	Trait	Weight	Emphasis	Emphasis
Production	Milk (kg)	-0.09	11%	33%
	Fat (kg)	1.04	3%	
	Protein (kg)	6.64	19%	
Fertility	Calving interval (d)	-12.43	24%	35%
	Survival (%)	12.01	11%	
Calving	Calving difficulty dir (%)	-3.52	3%	9%
	Calving difficulty mat (%)	-1.73	1%	
	Gestation (d)	-7.50	4%	
	Calf mortality (%)	-2.58	1%	
Maintenance	Cow (kg)	-1.65	7%	7%
Beef	Carcase weight (kg)	1.38	5%	9%
	Carcase conformation (units)	10.32	2%	
	Carcase fat (units)	-11.71	1%	
	Cull cow (kg)	0.15	1%	
Health	Lameness (%)	-54.26	0.6%	3%
	Mastitis (%)	-77.10	1%	
	SCC (Log_e)	-43.49	2%	
Management	Milking duration (seconds)	0.25	2%	4%
	Temperament (units)	-33.69	2%	

EBI- Increase Profit

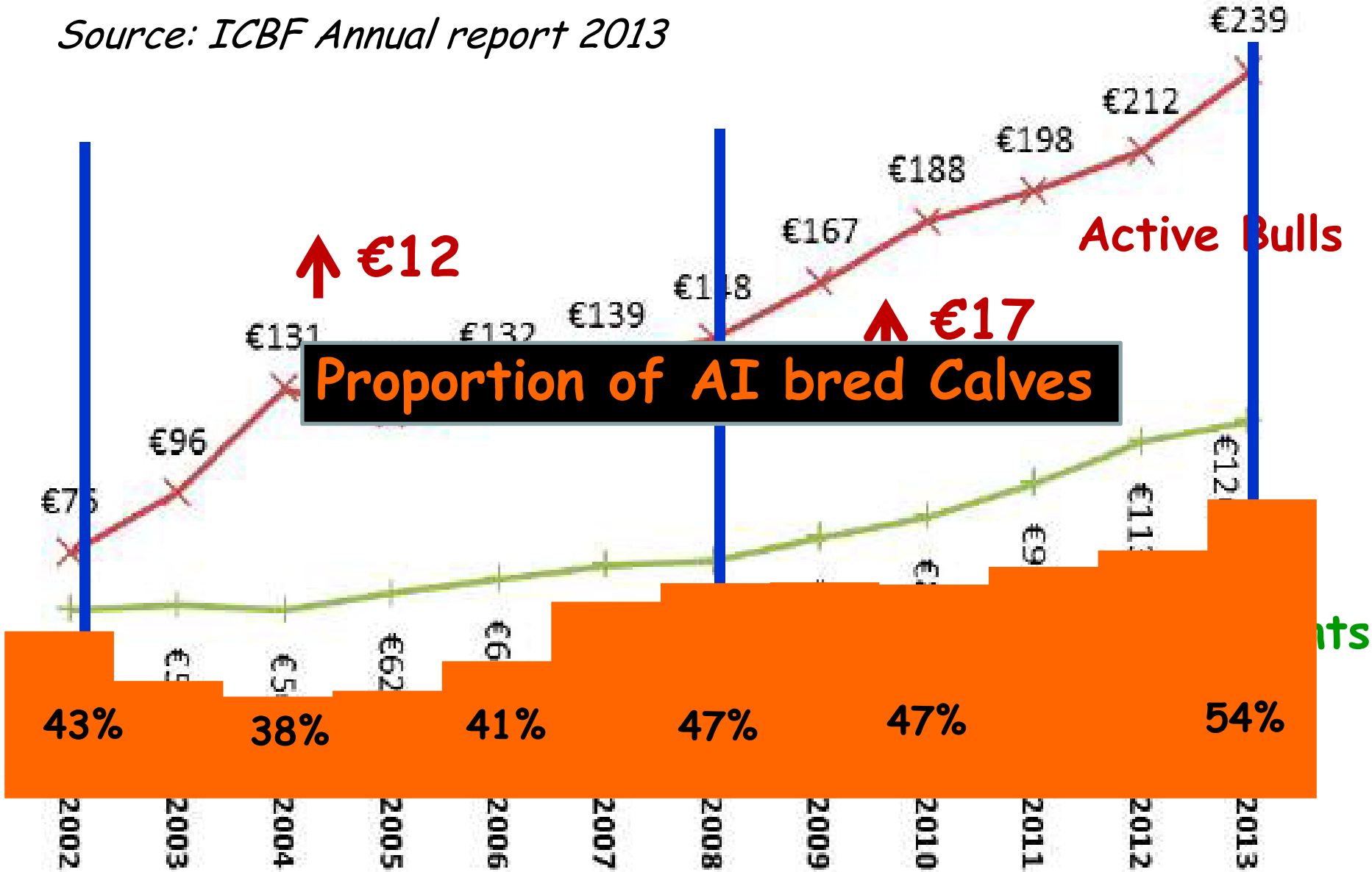
EBI Group	Age 1ST Calving	Calving Interval (1-2)	Calving Interval (2-3)	Milk Solids (Lact 1-3)
Top 20%	25.2	388	377	1034
Bottom 20%	27.3	402	388	941
Difference	-2.1	-14	-11	+93

Proof of Principle- €1.92 per €1 EBI-Profit Monitor

(Ramsbottom *et al.*, 2012 Animal)

EBI of Active Bulls & Replacements

Source: ICBF Annual report 2013



New Study: Next Generation Herd

Variables	High EBI	National Average	Diff
EBI	250	130	
Milk Yield (1st lact) (kg)	4262	4435	-173
Fat (%)	4.38	4.12	+0.26
Protein (%)	3.64	3.47	+0.17
Average weight (kg)	466	472	-6
Average BCS	2.88	2.73	+0.15
Submission rate (%)	91	84	+7
Pregnancy 1st Service	62	51	+11
Pregnancy 6-week	74	61	+13
Final preg- 12 weeks (%)	92	85	+7

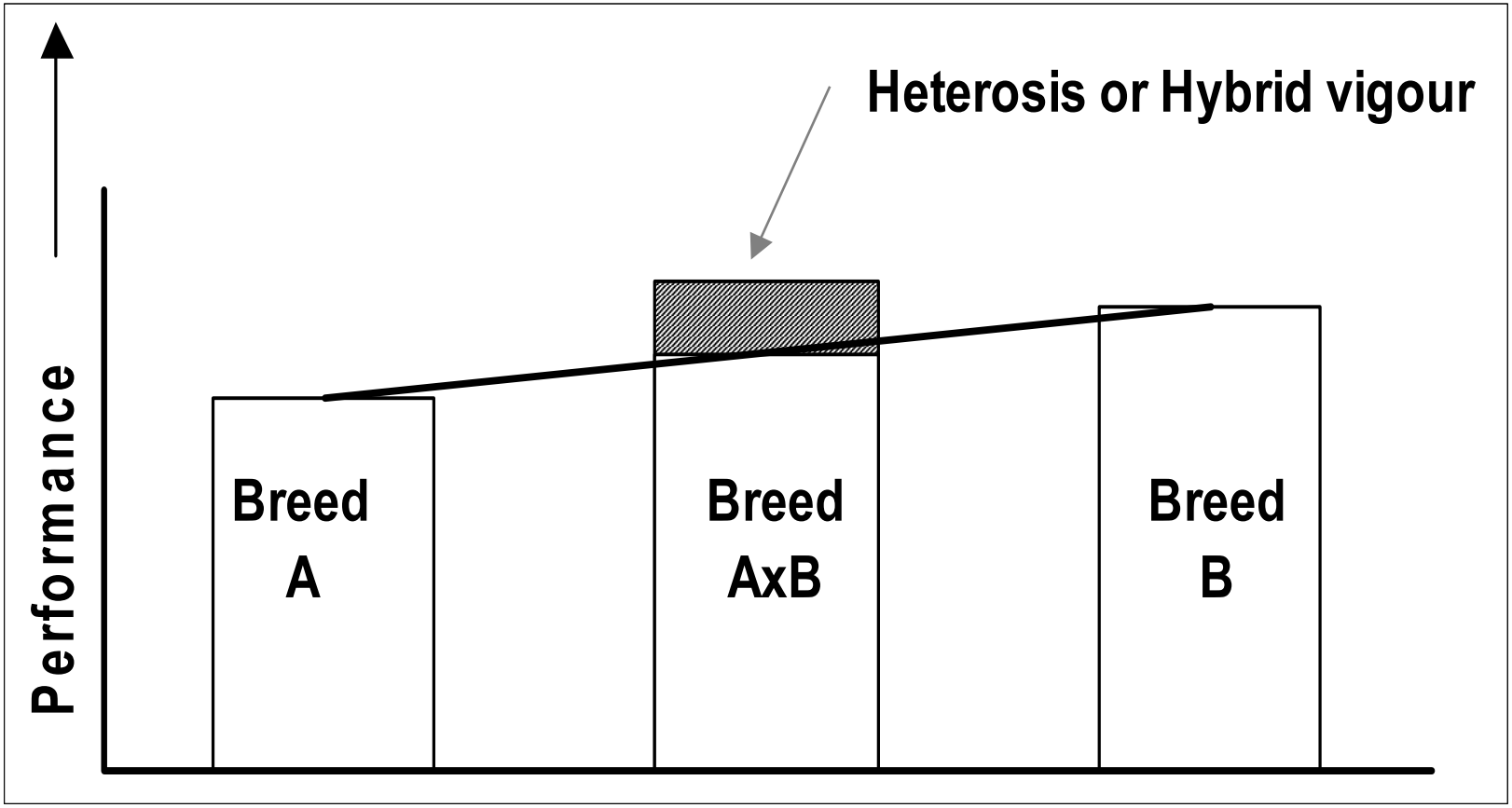
Crossbreeding

Does it have a role in pasture-based systems?

What is Crossbreeding?

- Introduce favourable genes from another breed
- Remove the negative effects associated with inbreeding
- Heterosis or hybrid vigour

BREED & HETEROSIS EFFECTS



HV = Extra performance above mid-parent mean.

What Breeds?

Norwegian Red

Jersey

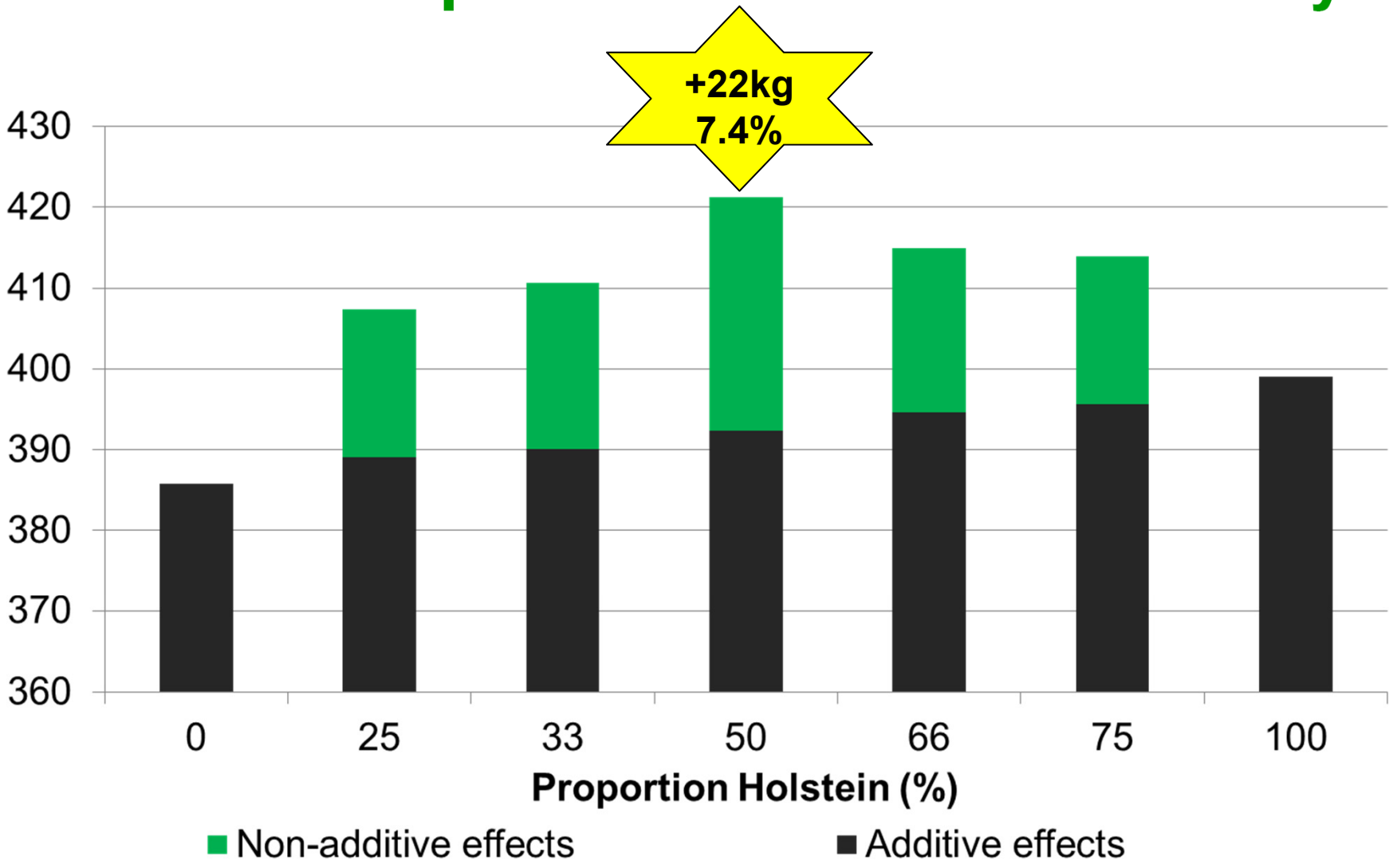
Summary:Farm Profit

	HF	J	JX	NR	NRX
Labour cost (€)	27,760	32,811	28,463	29,005	28,230
Replacement costs (€)	38,904	45,982	26,935	27,447	26,715
Total costs (€)	149,852	16	.786	13	37,268
Livestock sales (€)	28,675		74	2	401
Profit Farm (€)	37,499	28,423	55,678	43,615	50,356

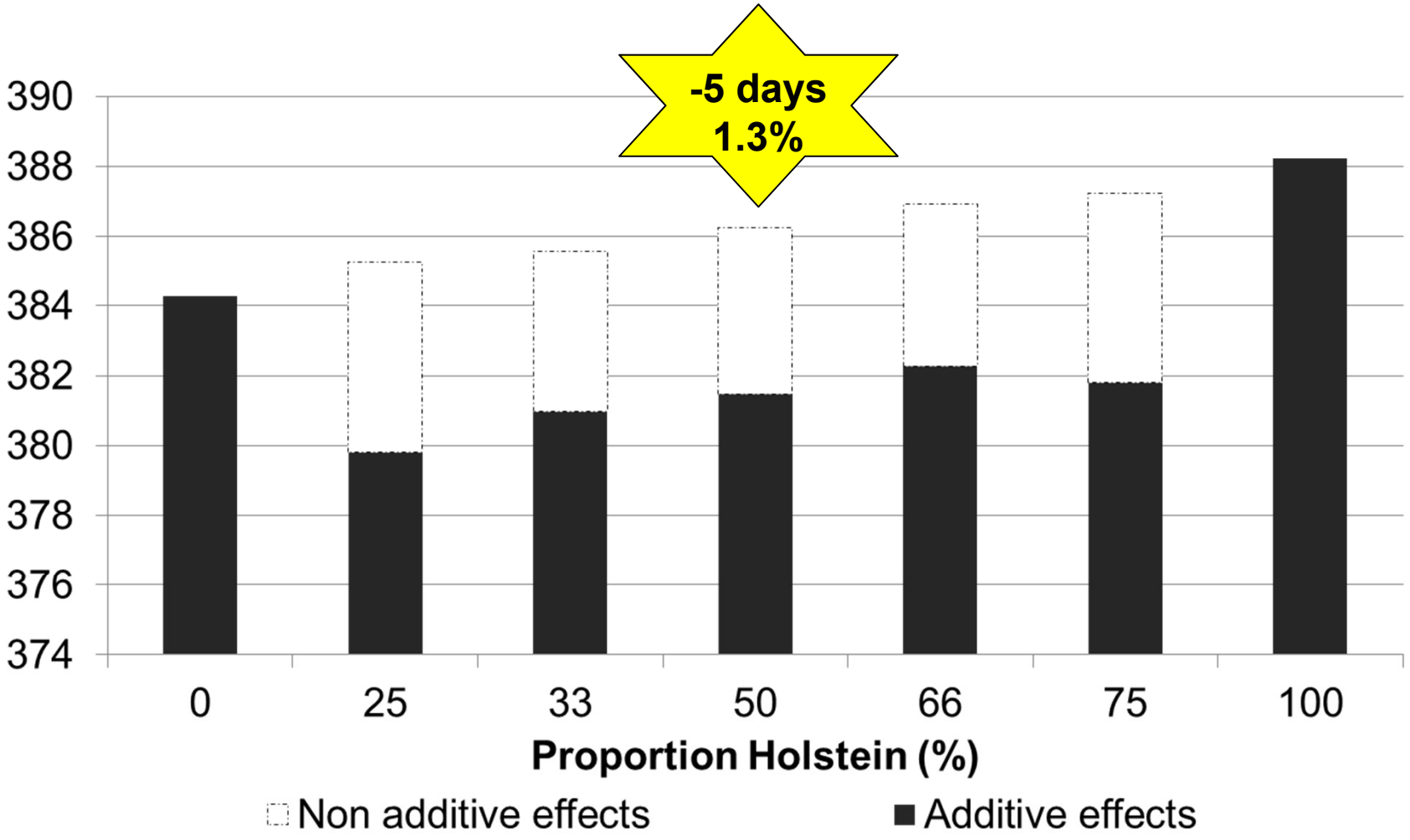
+€18k

+€13k

Milk solids production: New Irish Study

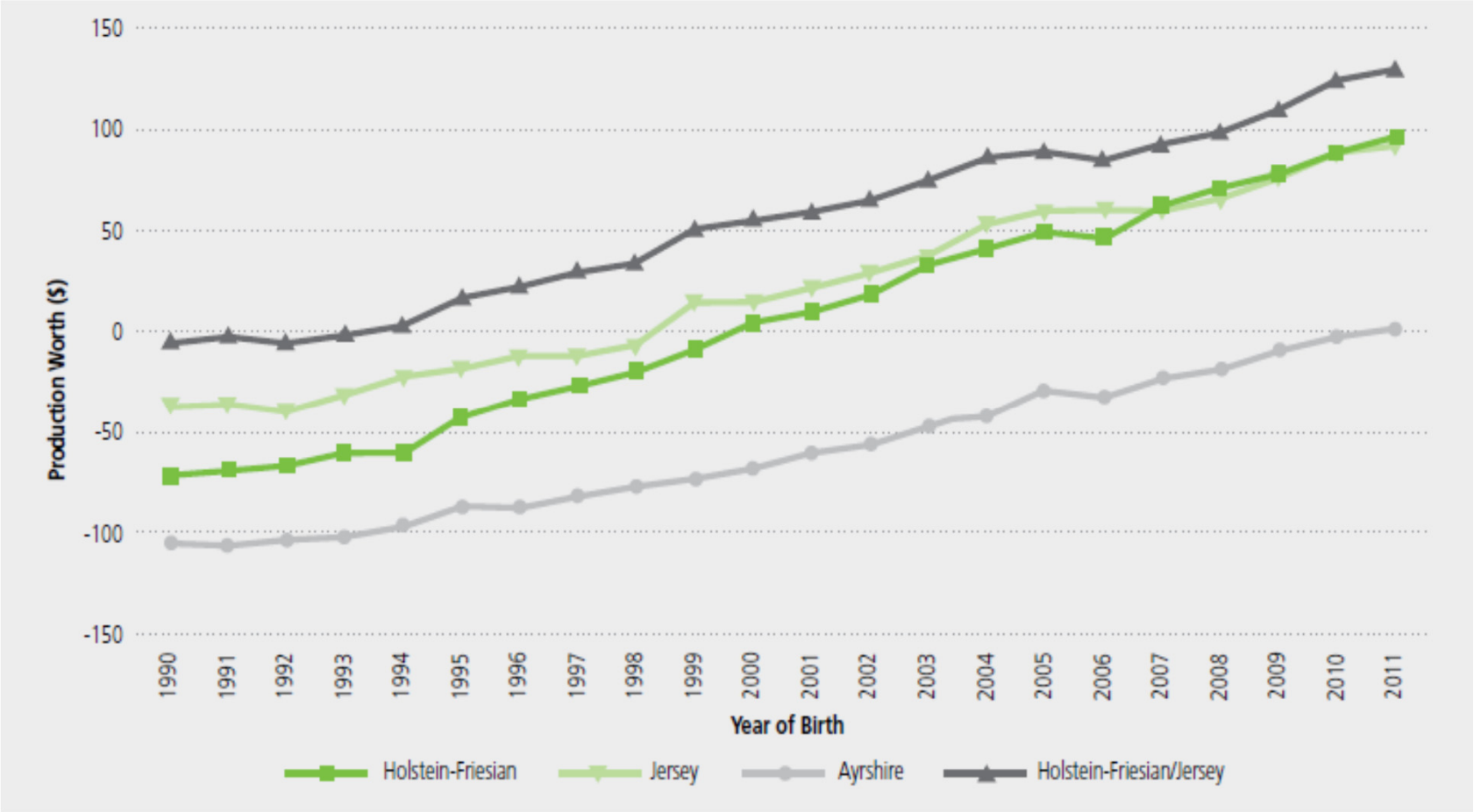


Calving interval




HV worth
€100 per Lactation
- ICBF Database
Elly Geverink

Trend in NZ PW



Conclusions

- The ideal dairy cow for pasture-based production system must be an efficient converter of grazed pasture into milk solids

- The target can be achieved through:
  - Within breed selection
  - Across breed selection
  - Both can be complementary

- Must use Balanced Breeding Objectives