TEAGASC RESEARCH INSIGHTS
LEADING RESEARCH FOR TOMORROW'S AGRI-FOOD SYSTEMS

Basics of Genetic Evaluations

Dr Sinead McParland
Teagasc Moorepark

Advances in Animal Breeding Webinar

3rd March, 2021

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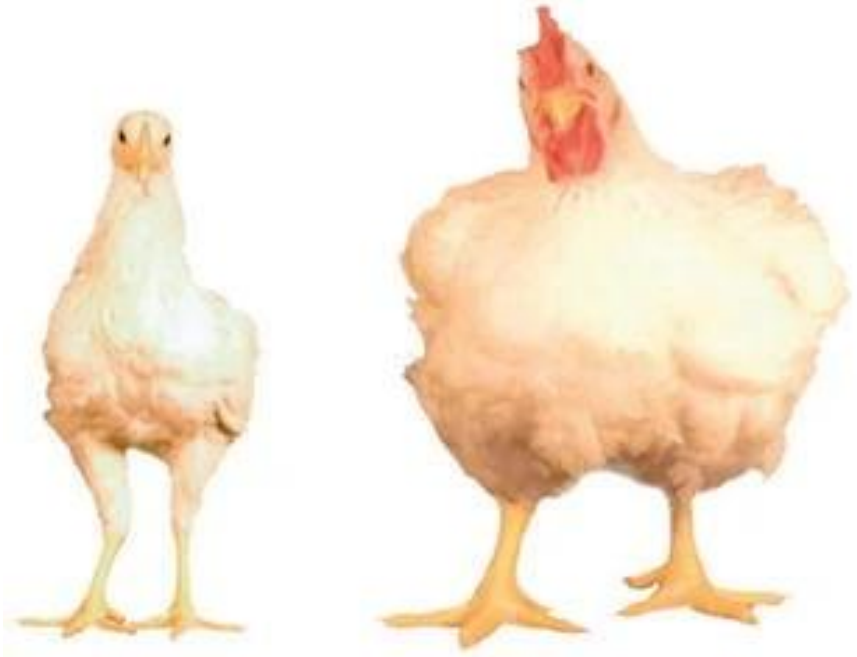

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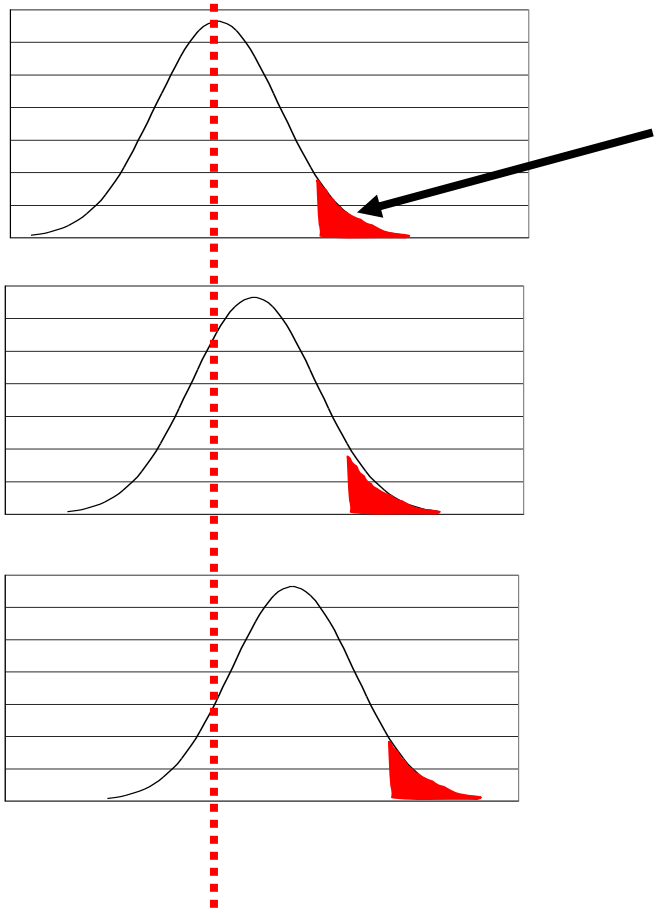
Genetic Gain: Improvement seen each generation



Parents of the next generation

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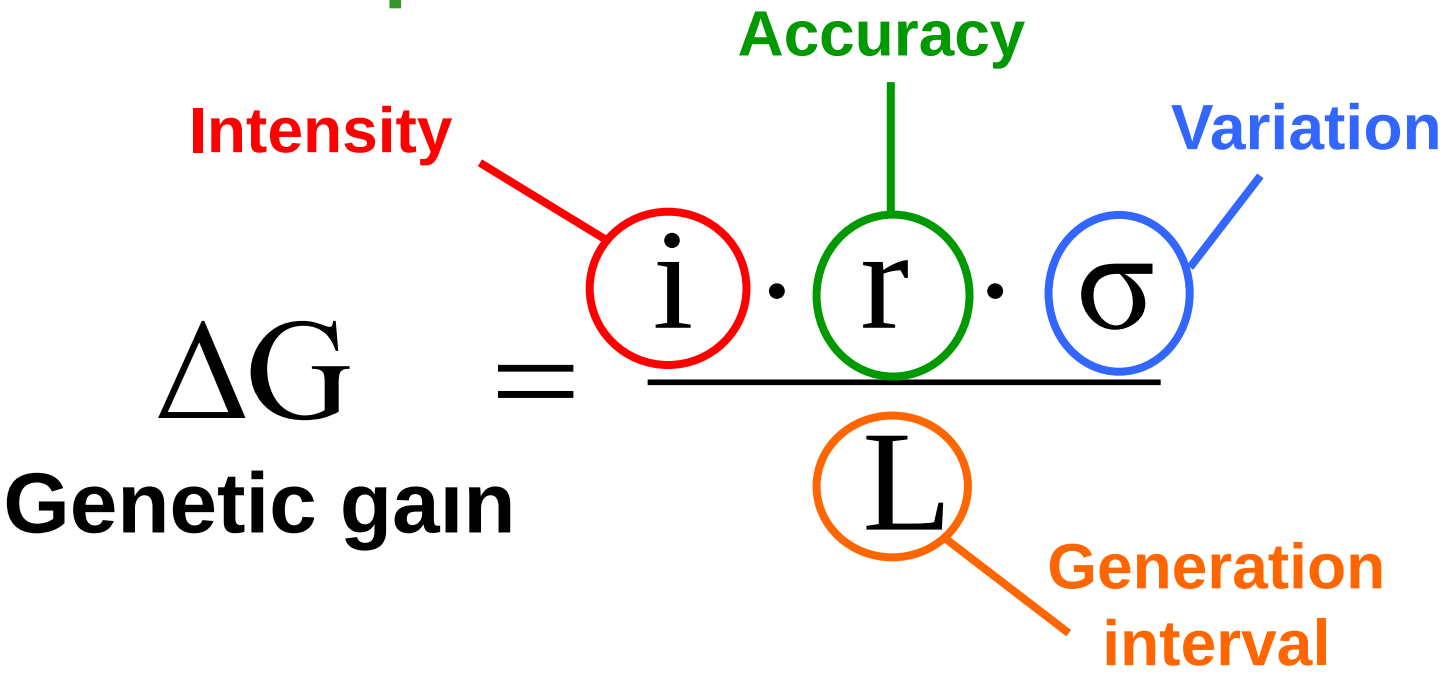
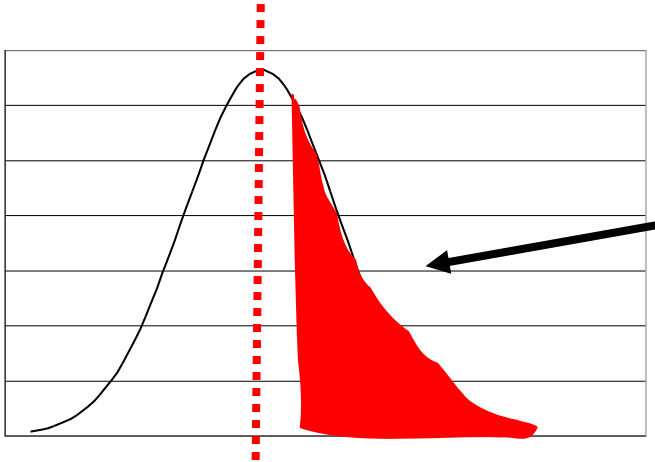
Genetic Gain Equation

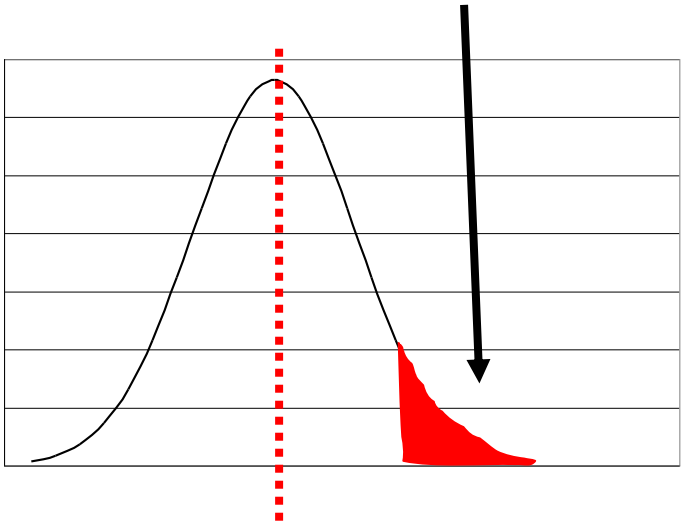


1. Intensity of Selection

$$\Delta G = \frac{i \cdot r \cdot \sigma}{L}$$



Parents of the next generation



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2. Accuracy of Selection

$$\Delta G = \frac{i \cdot r \cdot \sigma}{L}$$

How well can we identify the best animals?

- Is the trait highly heritable?
  - Is variation passed from parent to offspring?
  - Management influenced traits need representation from a wider variation of environments

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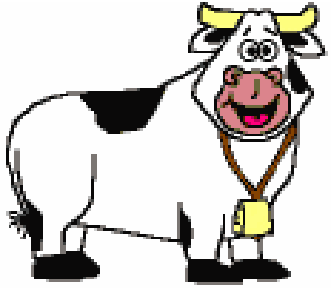

~~Height~~

~~Milk / Meat Production~~

Fertility

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Essential to record performance data representing different

- **Production environments**
- **Management systems**
- **Animal characteristics (age, breed . . .)**

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Fertility

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2. Accuracy of Selection

$$\Delta G = \frac{i \cdot r \cdot \sigma}{L}$$

How well can we identify the best animals?

- Is the trait highly heritable?
  - Is variation passed from parent to offspring?
  - Management influenced traits need representation from a wider variation of environments
- Who is data recorded on?
  - Sire fertility monitored through daughters

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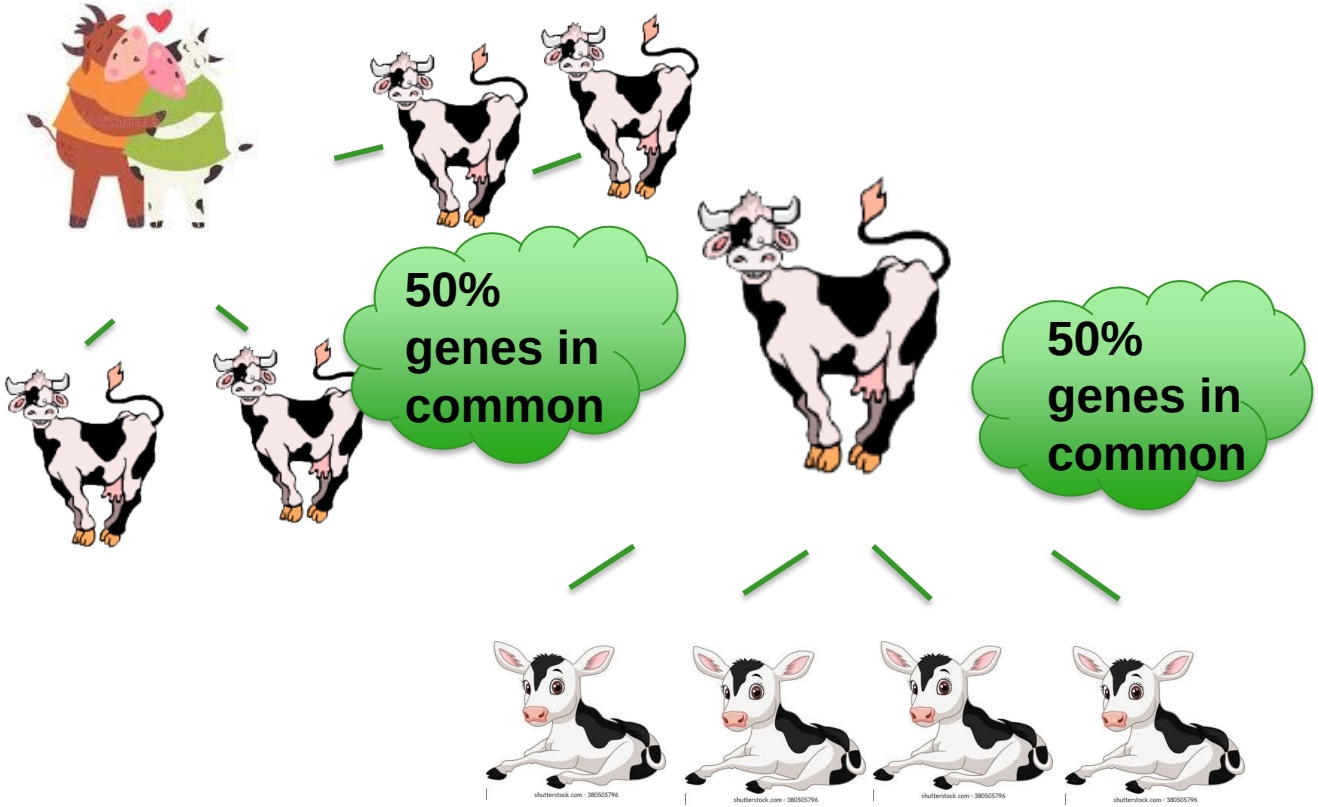
Data sources for genetic evaluations



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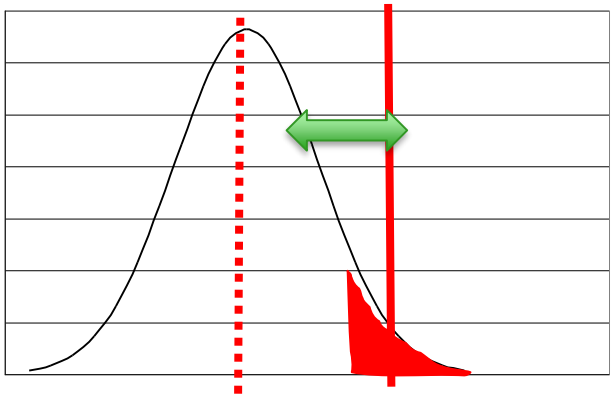
3. Genetic Variation

$$\Delta G = \frac{i \cdot r \cdot \sigma}{L}$$



- **Many traits are controlled by lots of genes with small effects**

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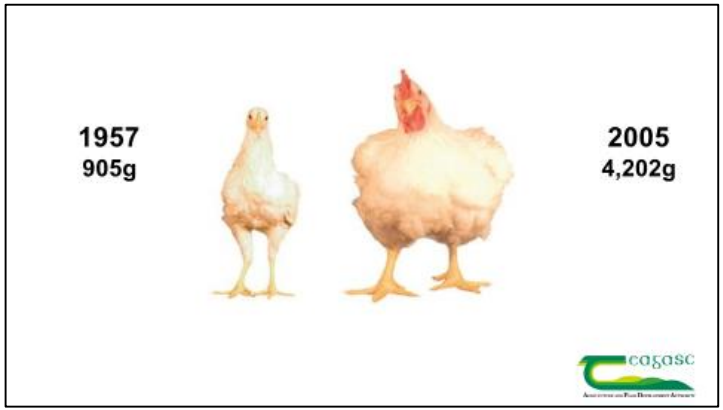
4. Generation Interval

$$\Delta G = \frac{i \cdot r \cdot \sigma}{L}$$

- **Average age of parents when offspring are born**
- **Shortening this leads to faster genetic gain**



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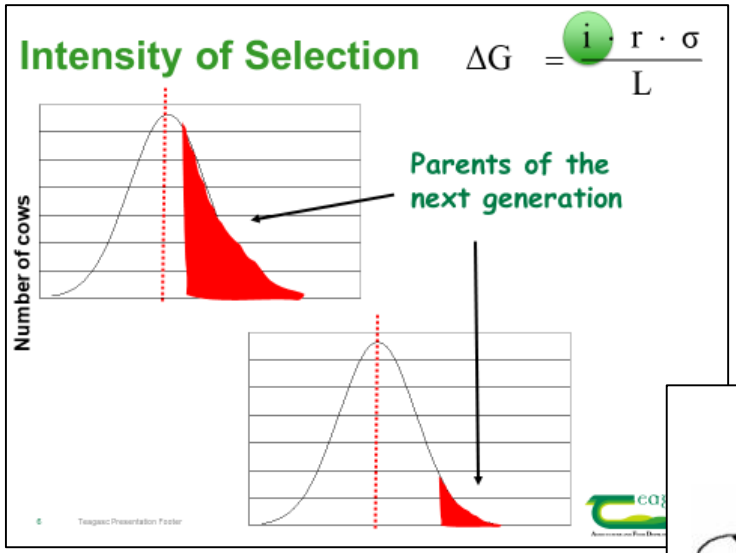

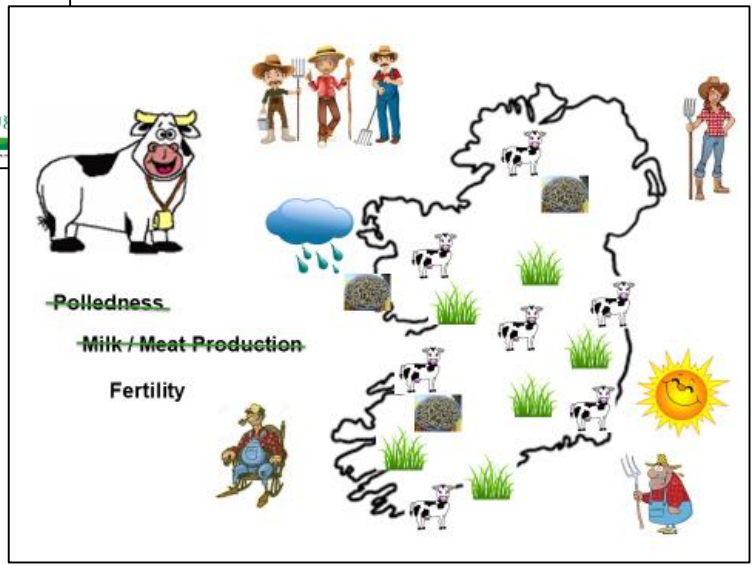

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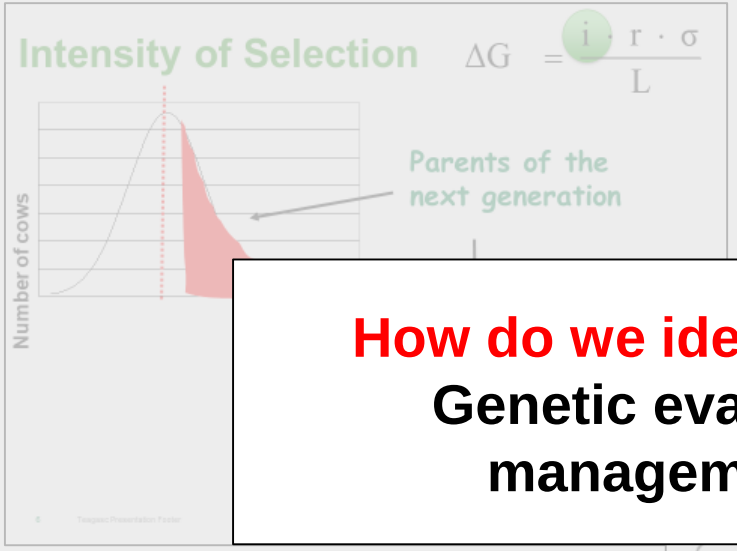
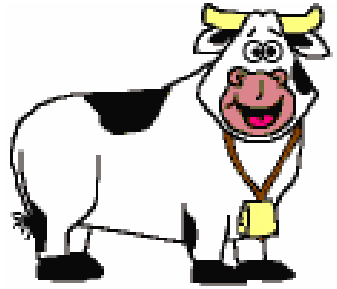
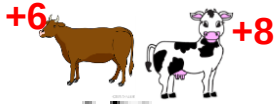


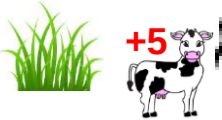
How do we identify the best animals?

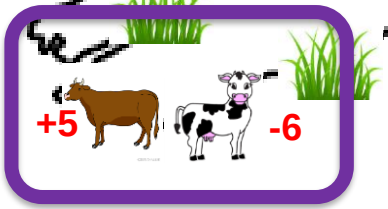
Genetic evaluations: Disentangling management from genetics

Contemporary Comparisons









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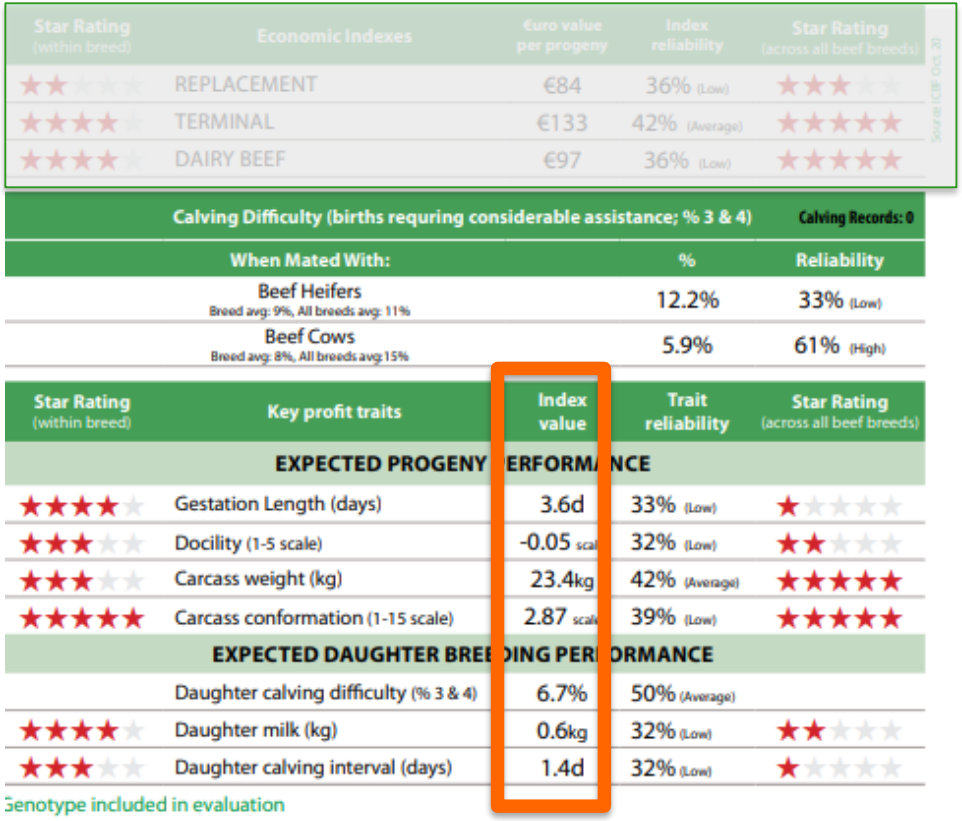
What you see. . .



Star Rating (within breed)	Economic Indexes	€uro value per progeny	Index reliability	Star Rating (across all beef breeds)
★★☆☆☆	REPLACEMENT	€84	36% (Low)	★★★☆☆
★★★★☆	TERMINAL	€133	42% (Average)	★★★★★
★★★★☆	DAIRY BEEF	€97	36% (Low)	★★★★★

Source ICBF Oct. 20

Calving Difficulty (births requring considerable assistance; % 3 & 4)		Calving Records: 0
When Mated With:	%	Reliability
Beef Heifers Breed avg: 9%, All breeds avg: 11%	12.2%	33% (Low)
Beef Cows Breed avg: 8%, All breeds avg:15%	5.9%	61% (High)

Star Rating (within breed)	Key profit traits	Index value	Trait reliability	Star Rating (across all beef breeds)
	EXPECTED PROGENY ERFORMA NCE			
★★★★☆	Gestation Length (days)	3.6d	33% (Low)	★☆☆☆☆
★★★☆☆	Docility (1-5 scale)	-0.05 sca	32% (Low)	★★☆☆☆
★★★☆☆	Carcass weight (kg)	23.4kg	42% (Average)	★★★★★
★★★★★	Carcass conformation (1-15 scale)	2.87 scal	39% (Low)	★★★★★
	EXPECTED DAUGHTER BREE DING PER ORMANCE			
	Daughter calving difficulty (% 3 & 4)	6.7%	50% (Average)	
★★★★☆	Daughter milk (kg)	0.6kg	32% (Low)	★★☆☆☆
★★★☆☆	Daughter calving interval (days)	1.4d	32% (Low)	★☆☆☆☆

Genotype included in evaluation

Fíona covering later this morning

Expected performance of progeny

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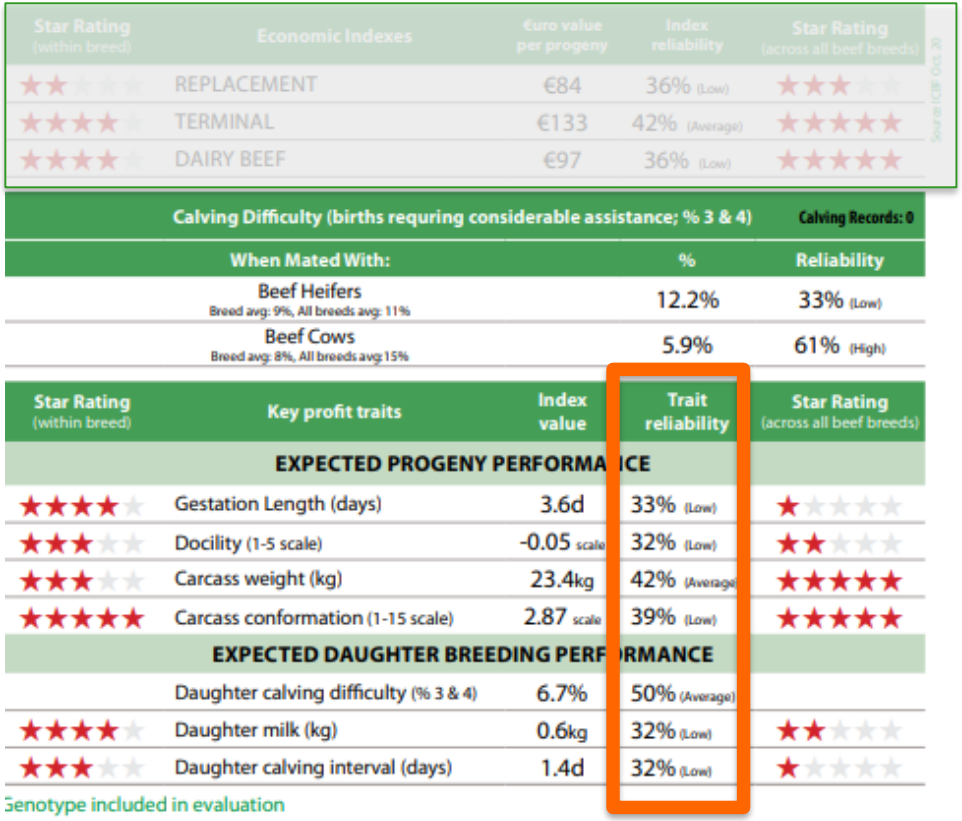
What you see. . .



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Genotype included in evaluation

Fíona covering later this morning

What confidence do we have in these figures?

- heritability
- number of records

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Summary of Genetic Evaluations

Disentangle management from genetics

Accurately, **intensely**, identifying the **best** animals at a **young** age as parents will maximise genetic gain

Data recording is vital

Accurate

Across production environments

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