



IRISH CATTLE BREEDING FEDERATION

# Cow Own Worth (COW) Index



Margaret Kelleher PhD

# Purpose

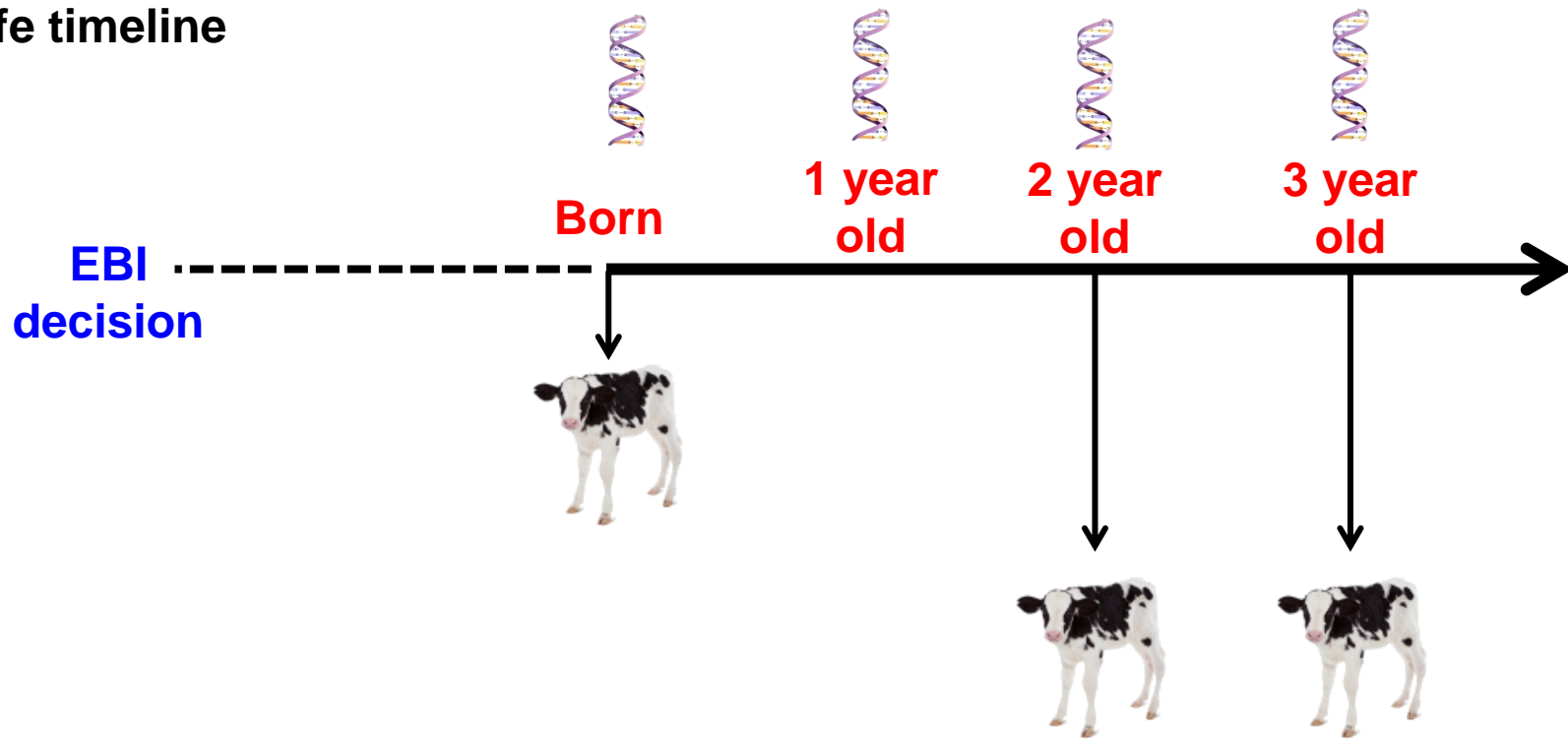
**The COW index = Cow Own Worth**

**Designed to represent more closely the future **phenotypic (actual) performance** of dairy females**

**A new system to rank females on predicted profit potential**

# Economic Breeding Index (EBI)

Life timeline



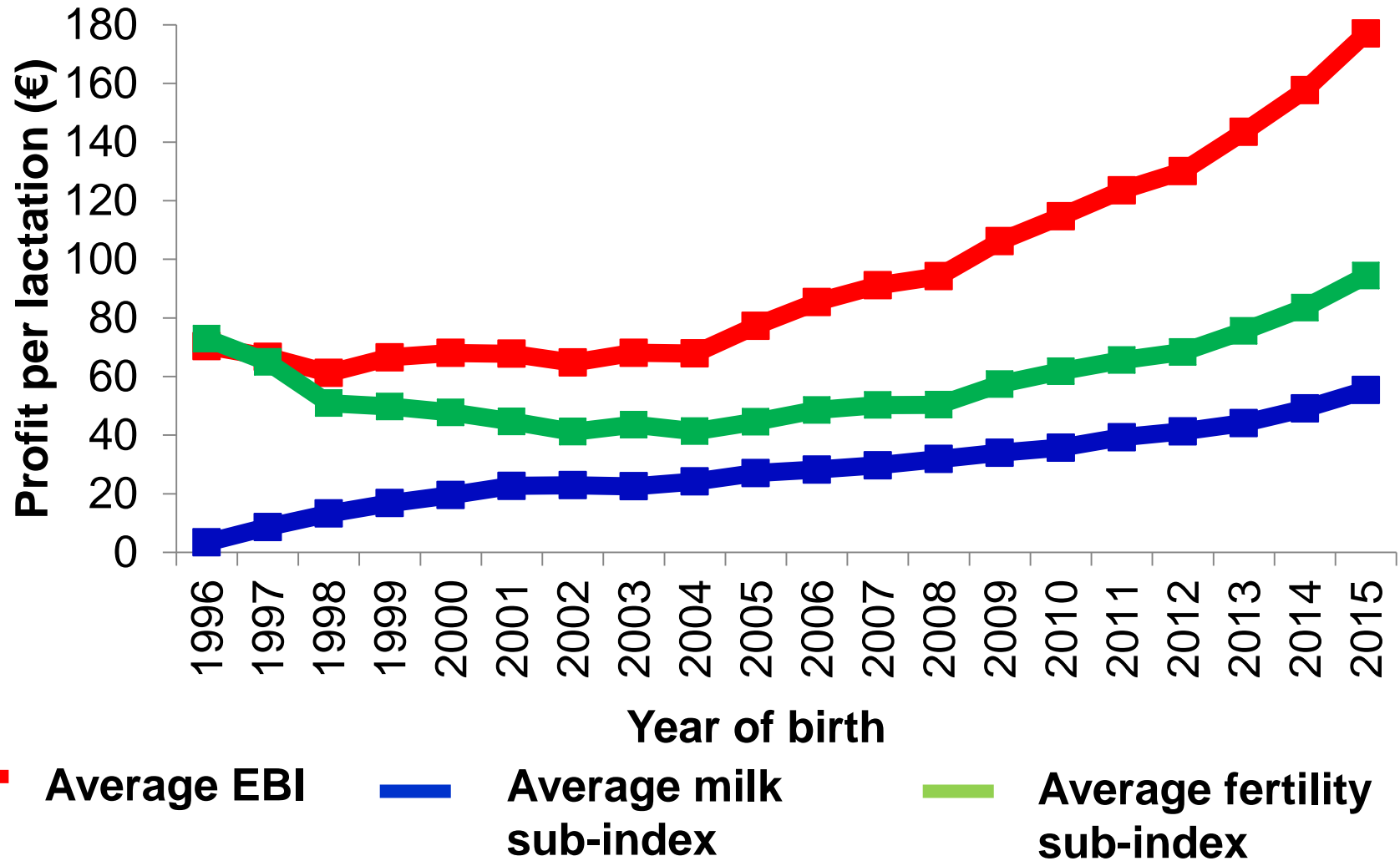
EBI identifies most profitable bulls and cows for breeding dairy replacements

**Table 1.** Economic values and % emphasis of the various traits in the EBI formula.

2014 Economic values and % emphasis for traits in the EBI				
Sub-Index	Trait	Economic Weight	Trait Emphasis	Overall Emphasis
Production	Milk	-€0.09	10.6%	33%
	Fat	€1.04	3.4%	
	Protein	€6.64	18.9%	
Fertility	Calving Interval	-€12.43	24.0%	35%
	Survival	€12.01	10.9%	
Calving	Direct Calving Difficulty	-€3.52	2.8%	9%
	Maternal Calving Difficulty	-€1.73	1.3%	
	Gestation Length	-€7.49	4.1%	
	Calf Mortality	-€2.58	1.0%	
Beef	Cull Cow Weight	€0.15	0.7%	9%
	Carcass Weight	€1.38	5.1%	
	Carcass Conformation	€10.32	1.7%	
	Carcase Fat	-€11.71	1.1%	
Maintenance	Cull Cow Weight	-€1.65	7.2%	7%
Management	Milking Time	-€0.25	2.1%	4%
	Milking Temperament	€33.69	1.9%	
Health	Lameness	-€54.26	0.6%	3%
	SCC	-€43.49	1.8%	
	Mastitis	-€77.10	0.8%	

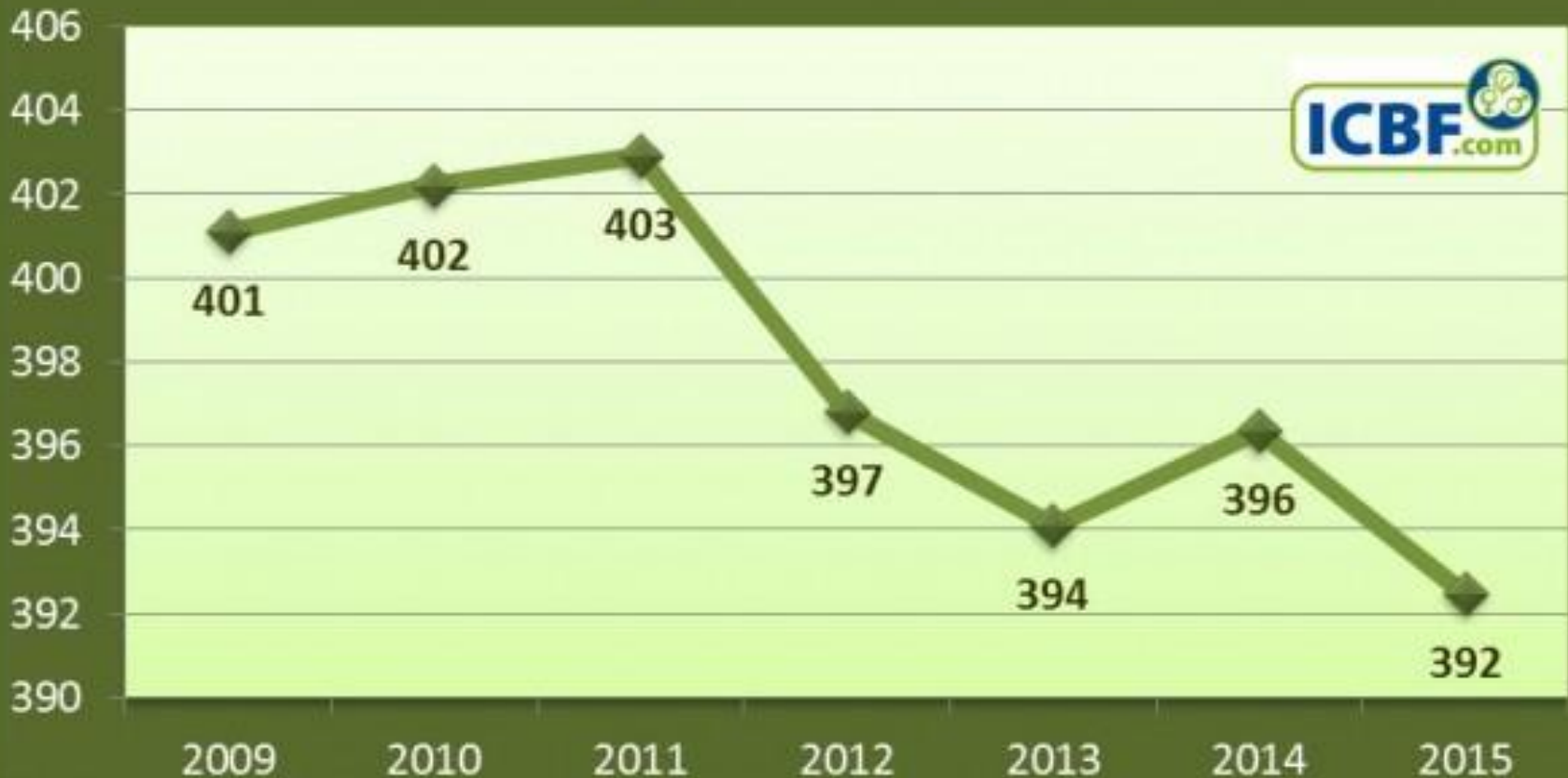
The diagram shows arrows from the 'Overall Emphasis' column of the table pointing to a central box labeled 'EBI'. The box contains four Euro symbols (€ € € €) above the text 'EBI' and four Euro symbols (€ € € €) below it. Arrows point from the overall emphasis values of 33%, 35%, 9%, 9%, 7%, 4%, and 3% to the central box.

# Genetic trend in EBI



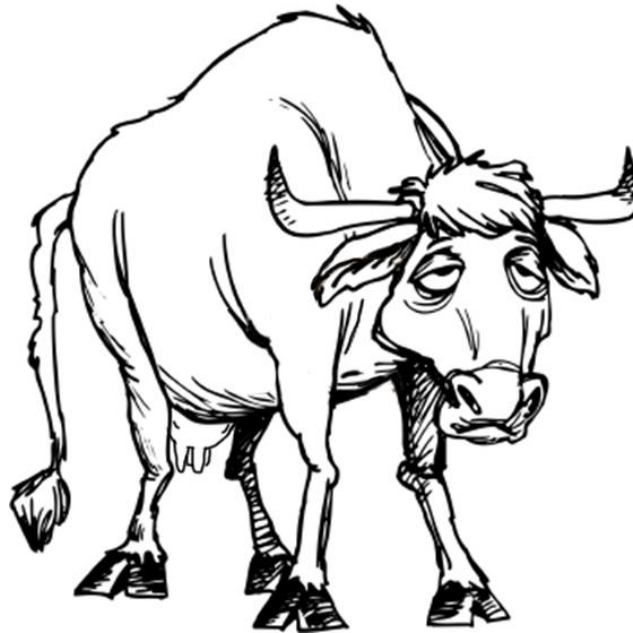
# Phenotypic performance

## Calving Interval (days)



# Phenotypic performance

- Genetic gain materialising into phenotypic gains
- BUT.....



*“Sometimes my best cow on paper doesn’t **perform** like my best cow!”*

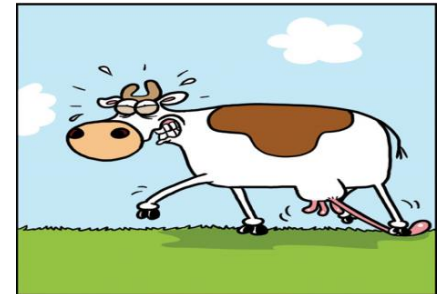
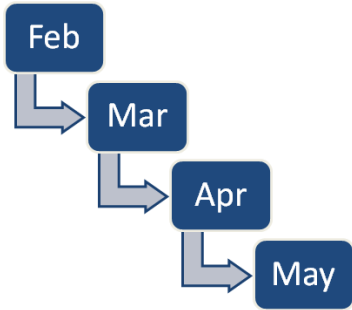
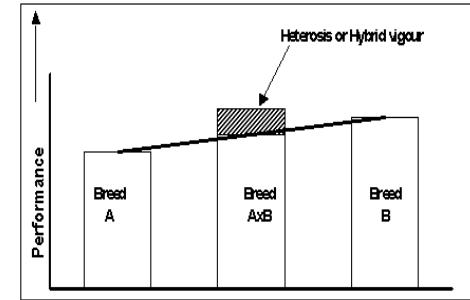
# Cow Own Worth (COW)

QPI Genetic Evaluation Service

AI Code:	QJ	Breed:	HO (100%)	Sex:	HEIFER
Animal Name:	Q REE HANFRED_107CE	Owner:	EUROGENEAL H BULLS	Dam:	MEER-HEAD-OWS ELJEZBEEL ET / 611545909
Date of Birth:	09-04-1999	Date of Evaluation:	Apr 2012	Pedigree Status:	CEU
National ID:		EB Summary:	106	Fertility:	
International ID:	KOLIGARD012258213	Health:		Teats:	

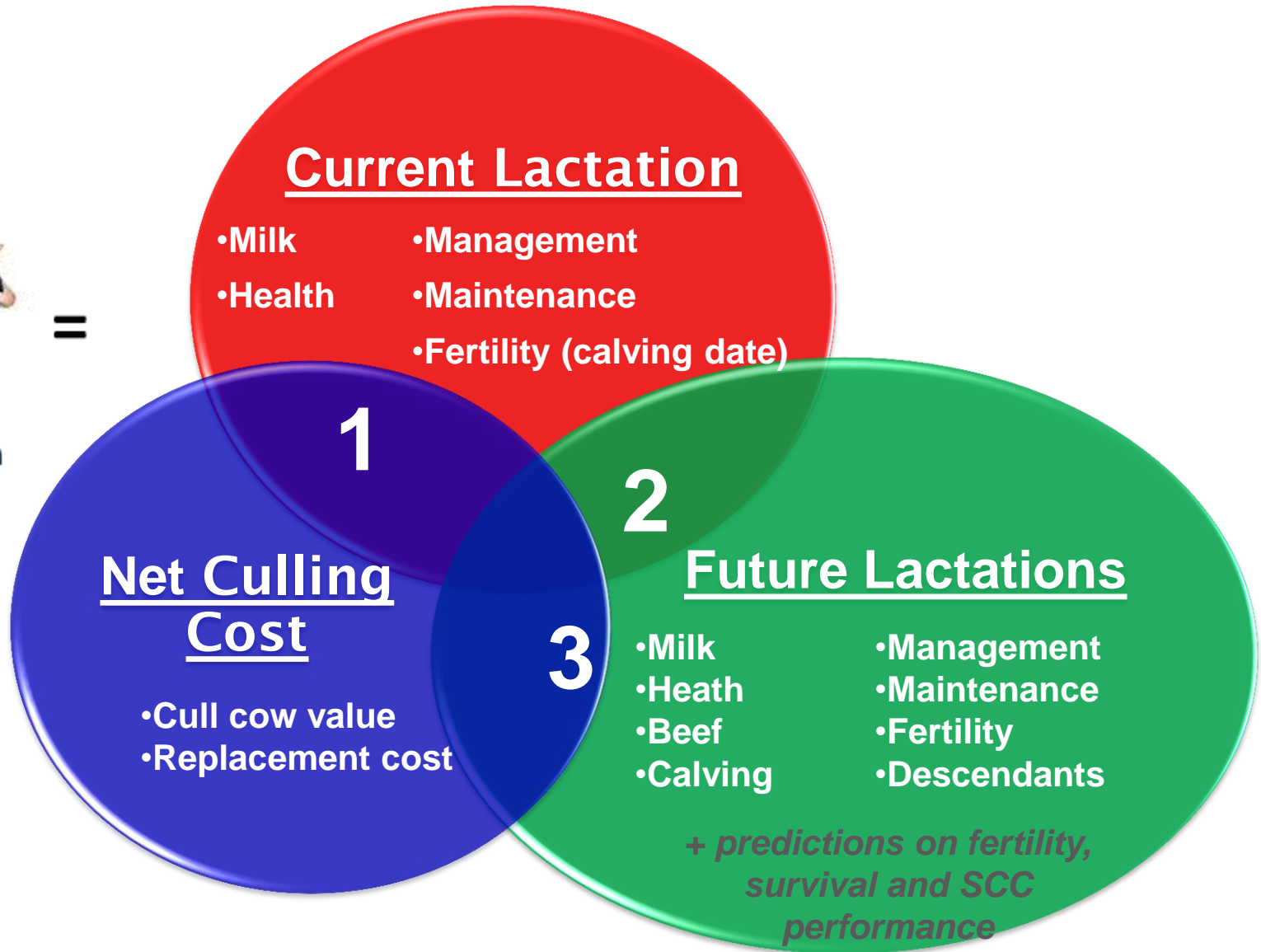
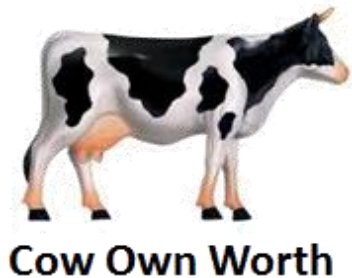
Help on understanding EB, PTs and Breeding Values

Index	Score	Percentile
EB	227	97%
1000 Sub Index	93	99%
Fertility Sub Index	97	99%
Caring Sub Index	42	99%
Beef Sub Index	-6	99%
Health Sub Index	8	99%
Maintenance Sub Index	-7	99%





# Expected profit from:



# Current lactation profit

Genetics effects

Age of cow

Crossbreeding effects



Calving date

Individual effects



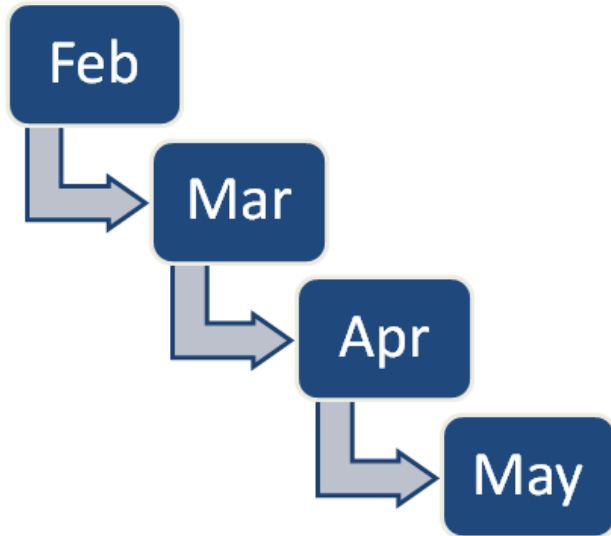
Current milk price

## Current Lactation

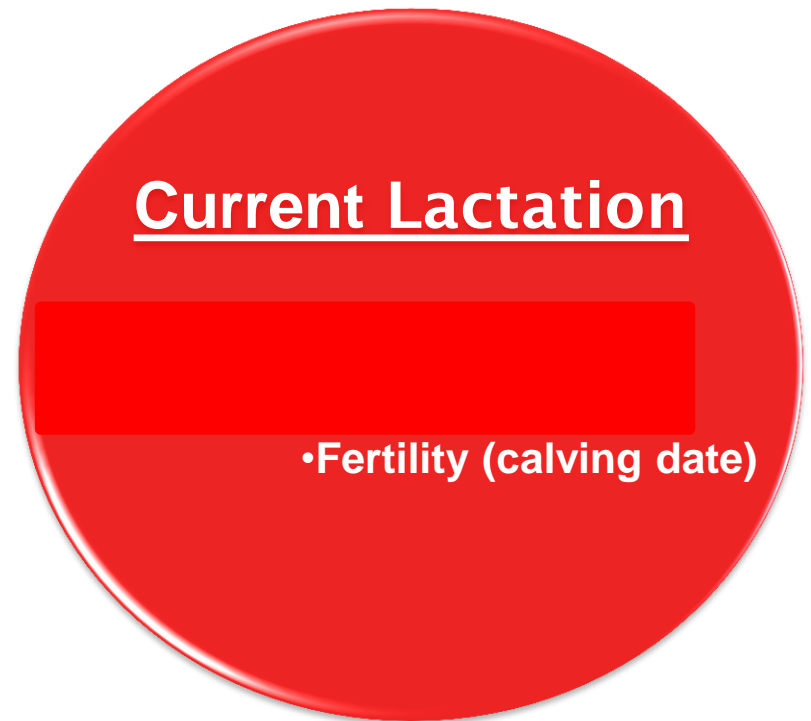
- Milk
- Health
- Management
- Maintenance

# Current lactation profit

Actual calving date



Costs per calving month MDSM



# Expected profit from:



=

## Current Lactation

- Milk
- Health
- Management
- Maintenance
- Fertility (calving date)

1

## Net Culling Cost

- Cull cow value
- Replacement cost

2

## Future Lactations

- Milk
- Heath
- Beef
- Calving
- Management
- Maintenance
- Fertility
- Descendants

3

+ *predictions on fertility, survival and SCC performance*

# Future lactations profit

## Future Lactations

- Milk
- Heath
- Beef
- Calving
- Management
- Maintenance
- Fertility
- Descendants

*+ predictions on fertility,  
survival and SCC  
performance*

# Future lactations profit

Genetics effects

Age of cow

Crossbreeding effects



Calving date

Individual effects

## Future Lactations

- Milk
- Heath
- Beef
- Calving
- Management
- Maintenance

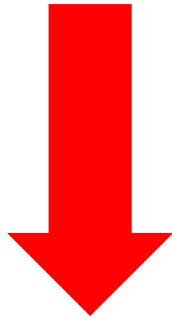


Future milk price MDSM

# Future lactations profit



EBI times  
Cumulative Discounted Expression

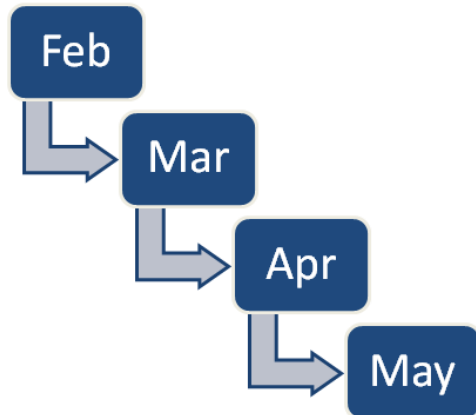


Future Lactations

•Descendants

# Future lactations profit

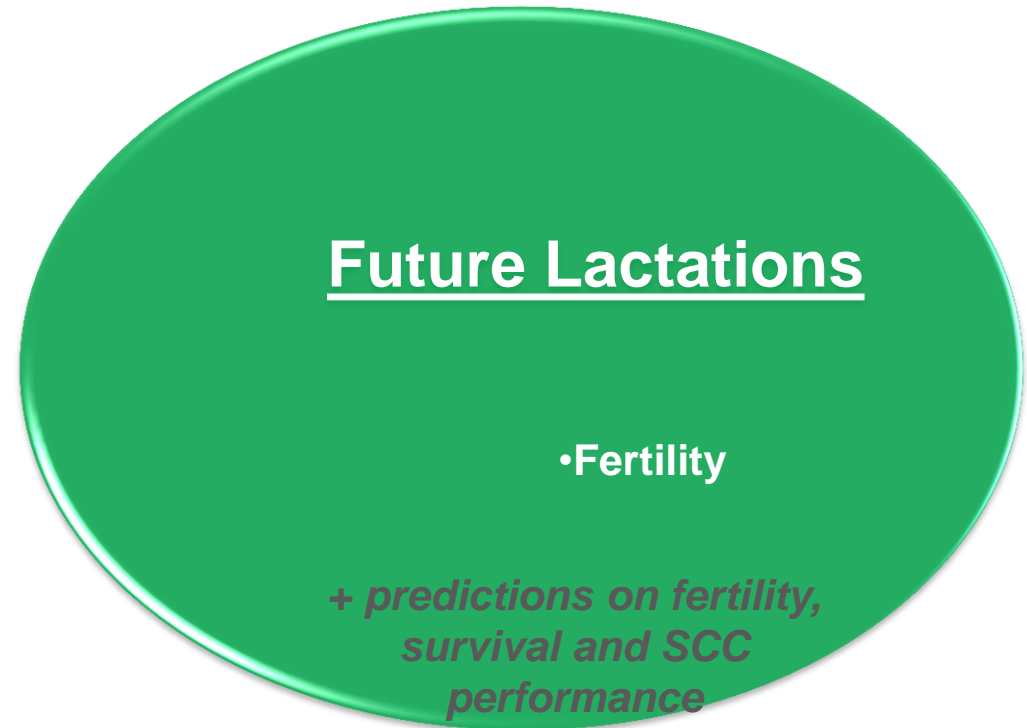
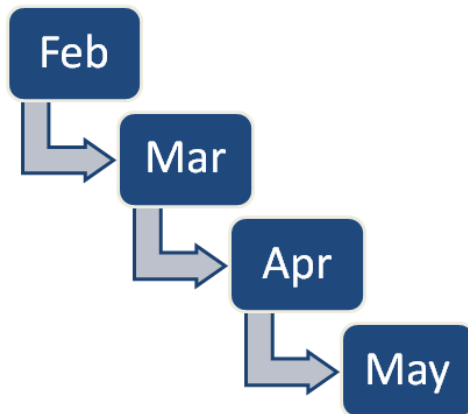
## Actual calving date



## Genetic effects



## Next calving date





# Future fertility performance

## Transition matrices

**Best Genetics**



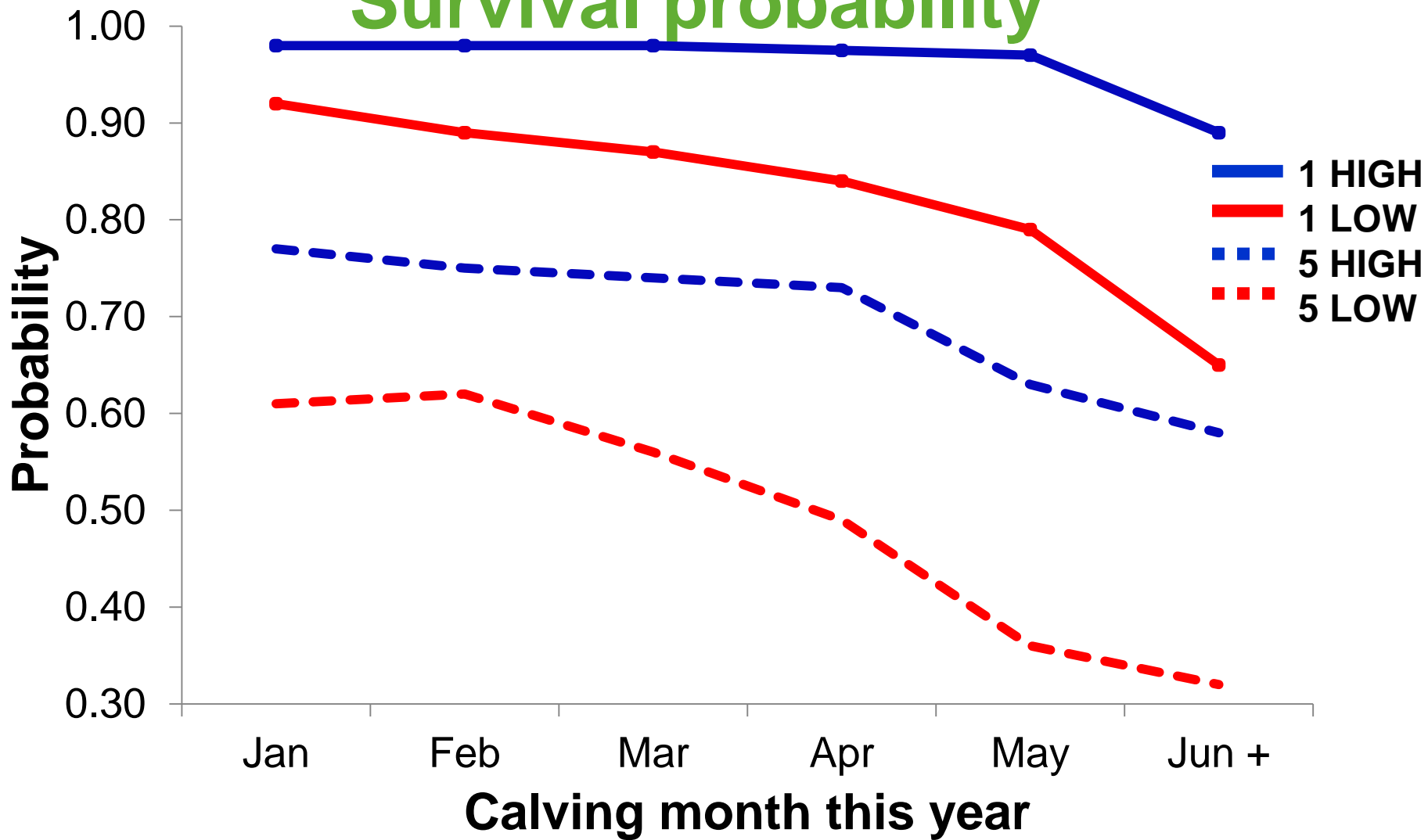
	Jan	Feb	Mar	Apr	May
<b>Proportion</b>	<b>0.14</b>	<b>0.53</b>	<b>0.22</b>	<b>0.08</b>	<b>0.03</b>
<b>Cost (€)</b>	<b>0.00</b>	<b>0.00</b>	<b>-151.00</b>	<b>-210.00</b>	<b>-437.00</b>
	Jan	Feb	Mar	Apr	May
<b>Proportion</b>	<b>0.13</b>	<b>0.39</b>	<b>0.25</b>	<b>0.15</b>	<b>0.07</b>
<b>Cost (€)</b>	<b>0.00</b>	<b>0.00</b>	<b>-151.00</b>	<b>-210.00</b>	<b>-437.00</b>

**Difference of €36.71**

# Fertility probability



# Survival probability



# Expected profit from:



=

## Current Lactation

- Milk
- Health
- Management
- Maintenance
- Fertility (calving date)

1

## Net Culling Cost

- Cull cow value
- Replacement cost

2

## Future Lactations

- Milk
- Heath
- Beef
- Calving
- Management
- Maintenance
- Fertility
- Descendants

3

+ *predictions on fertility, survival and SCC performance*

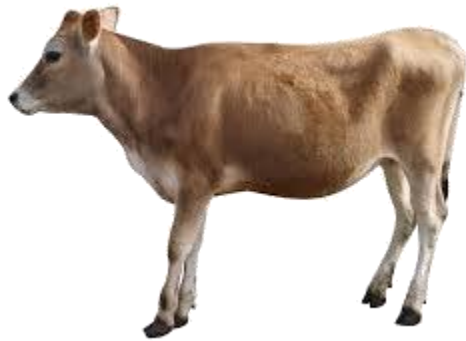
# Net culling cost



Cull  
value



Salvage value  
+  
Genetics<sub>CWT</sub>



Long term  
replacement  
requirement



Replacement  
cost

Net Culling  
Cost

# Does the COW index work?

- Validation dataset (Kelleher *et al.*, 2015)
  - 2011 genetic evaluation data
  - 2012 phenotypic data
- Pilot herds
  - 2016 spring calved herds ranked
  - Feedback

# Results: Milk production

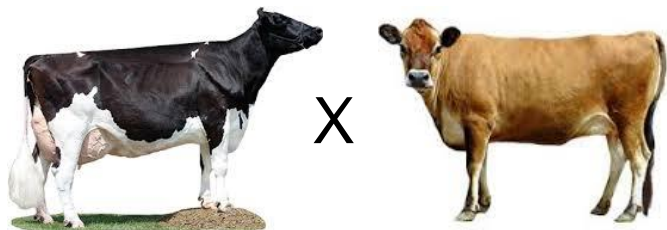
€360 more value per cow per lactation  
for cows in top 25% versus bottom 25%

Group	Milk (kg)		Fat (g/100g)		Protein (g/100g)	
	COW	EBI	COW	EBI	COW	EBI
Best (Top 25%)	6965 (6.17)	6674 (6.32)	4.07 (0.003)	4.11 (0.003)	3.57 (0.001)	3.57 (0.003)
Good	6695 (6.45)	6580 (6.38)	4.03 (0.003)	4.04 (0.003)	3.52 (0.001)	3.52 (0.003)
Poor	6512 (6.18)	6530 (6.27)	4.01 (0.003)	4.00 (0.003)	3.49 (0.001)	3.49 (0.003)

# Results: Crossbreeding

Breed specific heterosis effects for F1 crossbred over lifetime

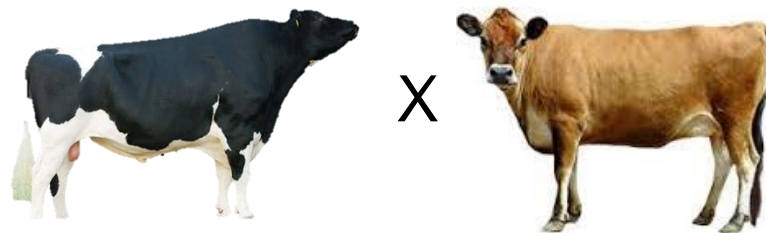
## Holstein x Jersey



- €472 more profit
- €105 *per lactation assuming average lifetime 4.5 lactations*

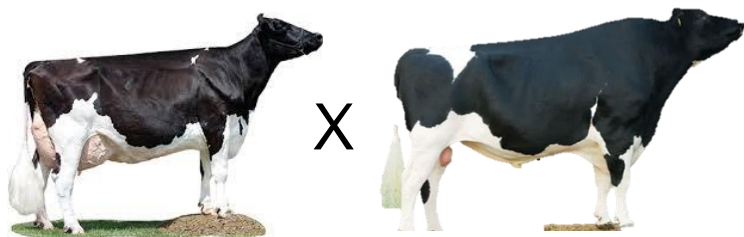
## Friesian x Jersey

- €597 more profit
- €132 *per lactation assuming average lifetime 4.5 lactations*



## Holstein x Friesian

- €245 more profit over her lifetime
- Half the extra gain in performance compared to HOxJE due to closeness of breed origin
- But does exist



## COW: NOT a crossbreeding index

Other effects have major impact on ranking of cows in herd;

EG: **Calving date**

**Individual effect**

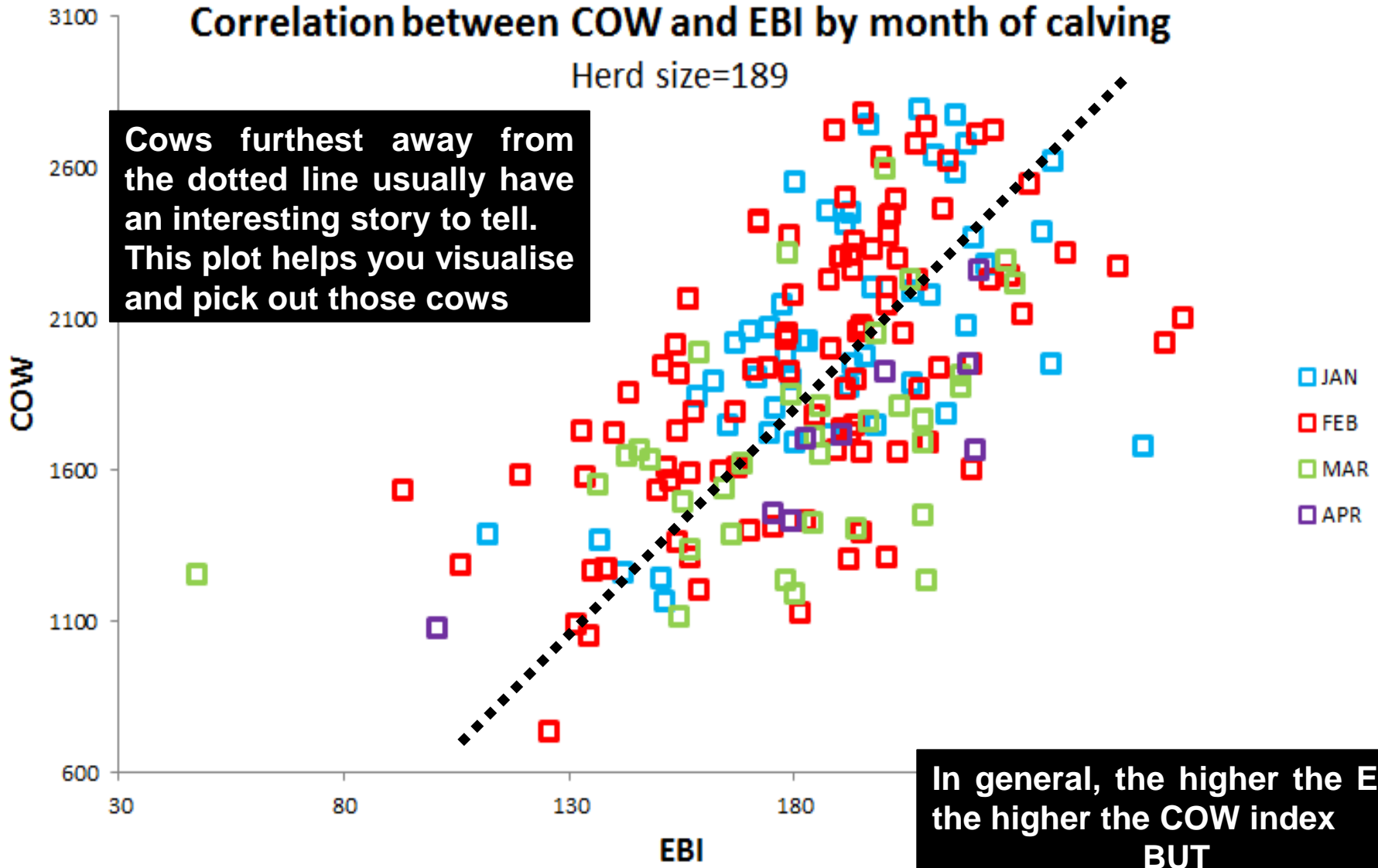
**SCC penalty**



# COW and EBI : Pilot herd

## Correlation between COW and EBI by month of calving

Herd size=189

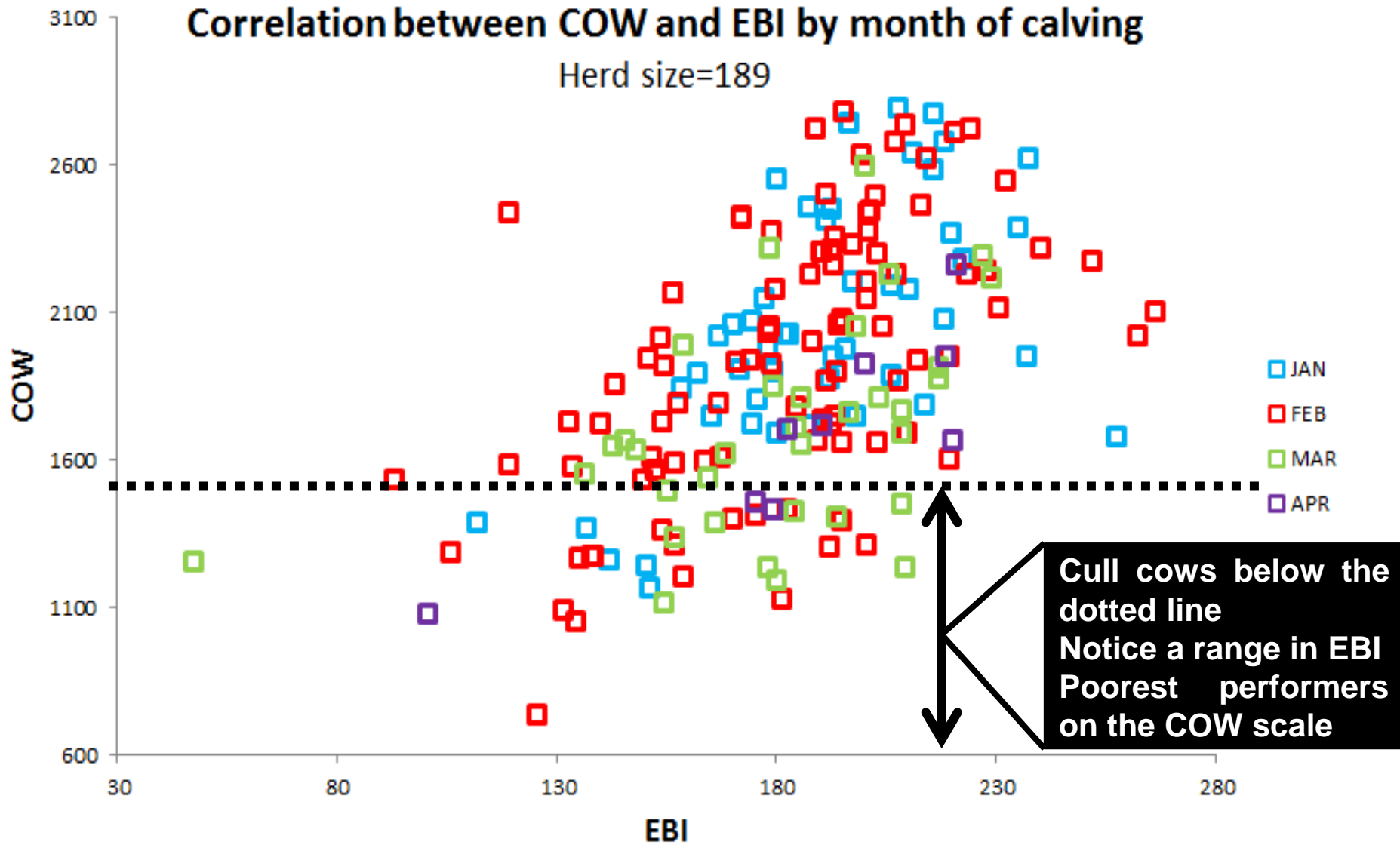


Cows furthest away from the dotted line usually have an interesting story to tell. This plot helps you visualise and pick out those cows

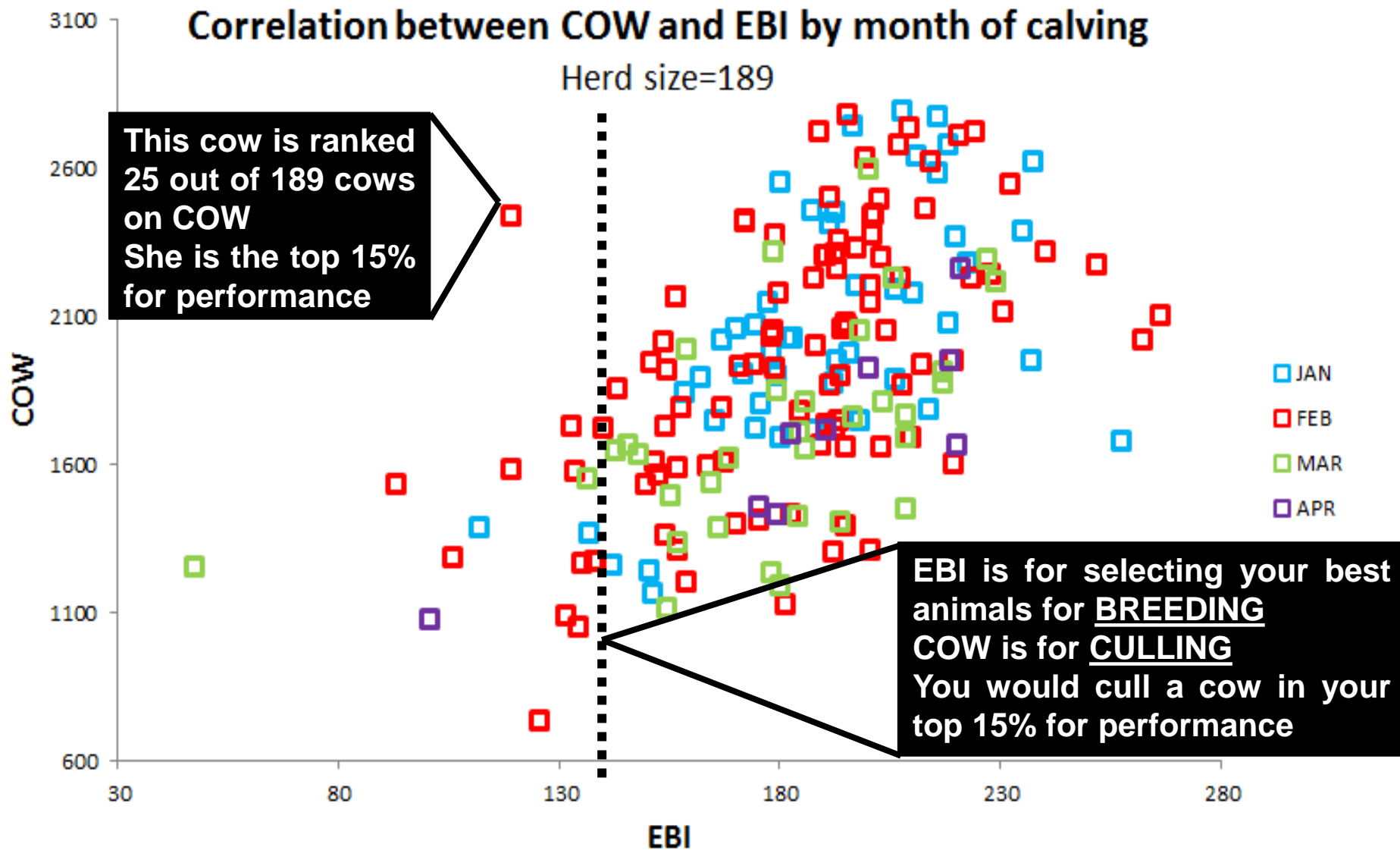
In general, the higher the EBI, the higher the COW index  
**BUT**  
you can see some low EBI cows performing better than higher EBI cows



# Culling: Cull cows below dotted line



# Do not cull on EBI



# Summary facts about COW

- Rank dairy cows on expected profitability
- Complimentary to EBI
- More accurate for milk recorded herds
- Pregnancy diagnosis has a huge impact on a cow's rank in the herd
- Potential to include new traits of importance
- Genomics will improve the accuracy

Purpose	EBI	COW
Breeding	✓	X
Culling & Purchasing	X	✓
Males	✓	X
Females	✓	✓
Scale	Per lactation	Lifetime
Genetics		
PTA	✓	X
EBV	X	✓
Crossbreeding	X	✓
Individual effects	X	✓
Age	X	✓
Calving date	X	✓