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Genetics for Life®

Custom-tailored genetic solutions to maximize dairy farm profitability

EPKK Aretuskonverents 2022, 8th April 2022

Euroopa Liit maaelu arenguks

Euroopa Maaelu Arengu Põllumajandusfond: Euroopa investeeringud maapiirkondadesse

Who Am I?

- **Peter van Beek, MSc**
  Director, Global Key Accounts
- Born and raised on a dairy farm in south of the Netherlands
- Obtained a Master degree in Animal Sciences at Wageningen University
- Specialized in genetics, young calf nutrition and dairy farm economics

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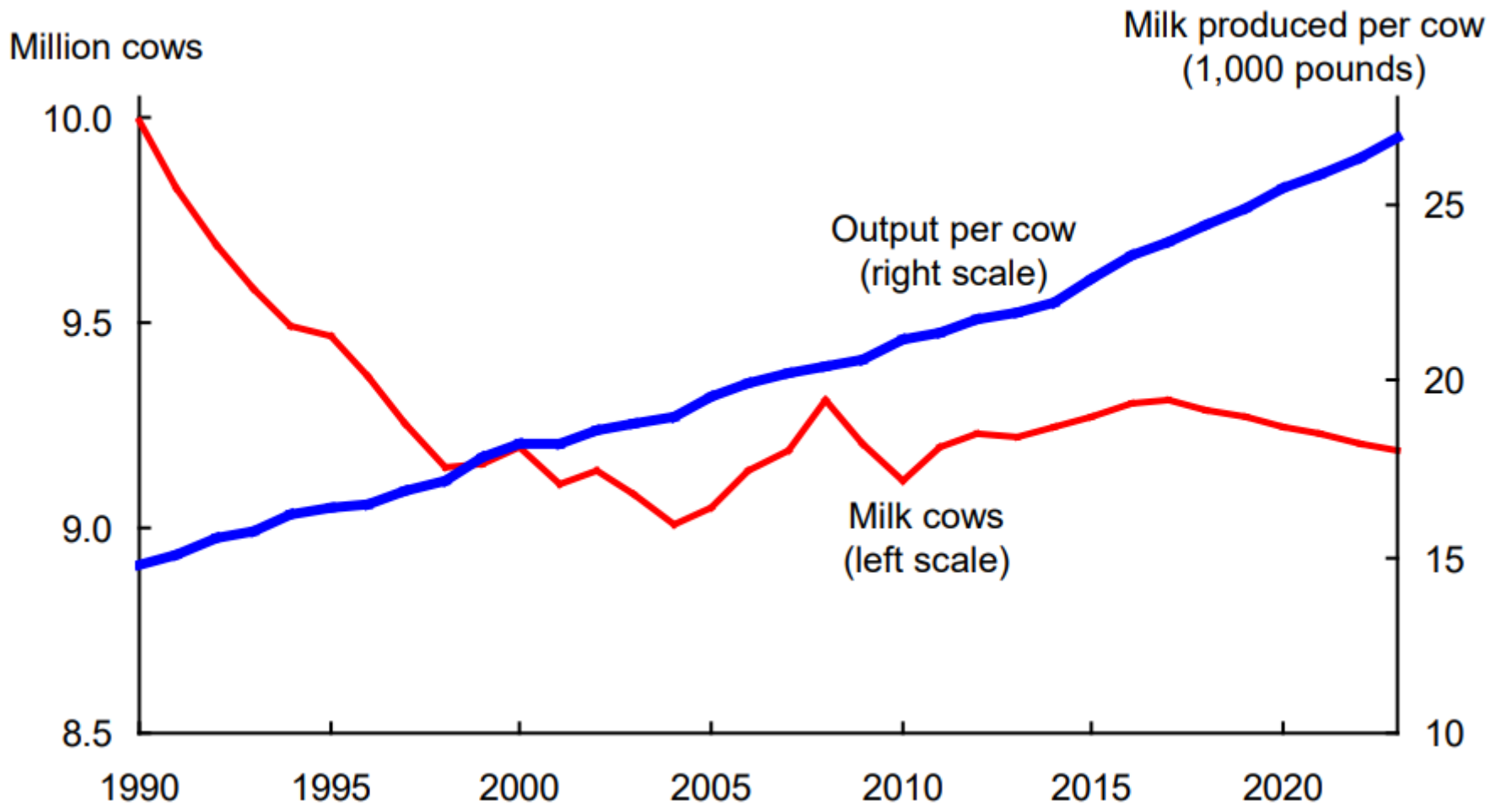
U.S. Dairy Herd and Milk Production Per Cow



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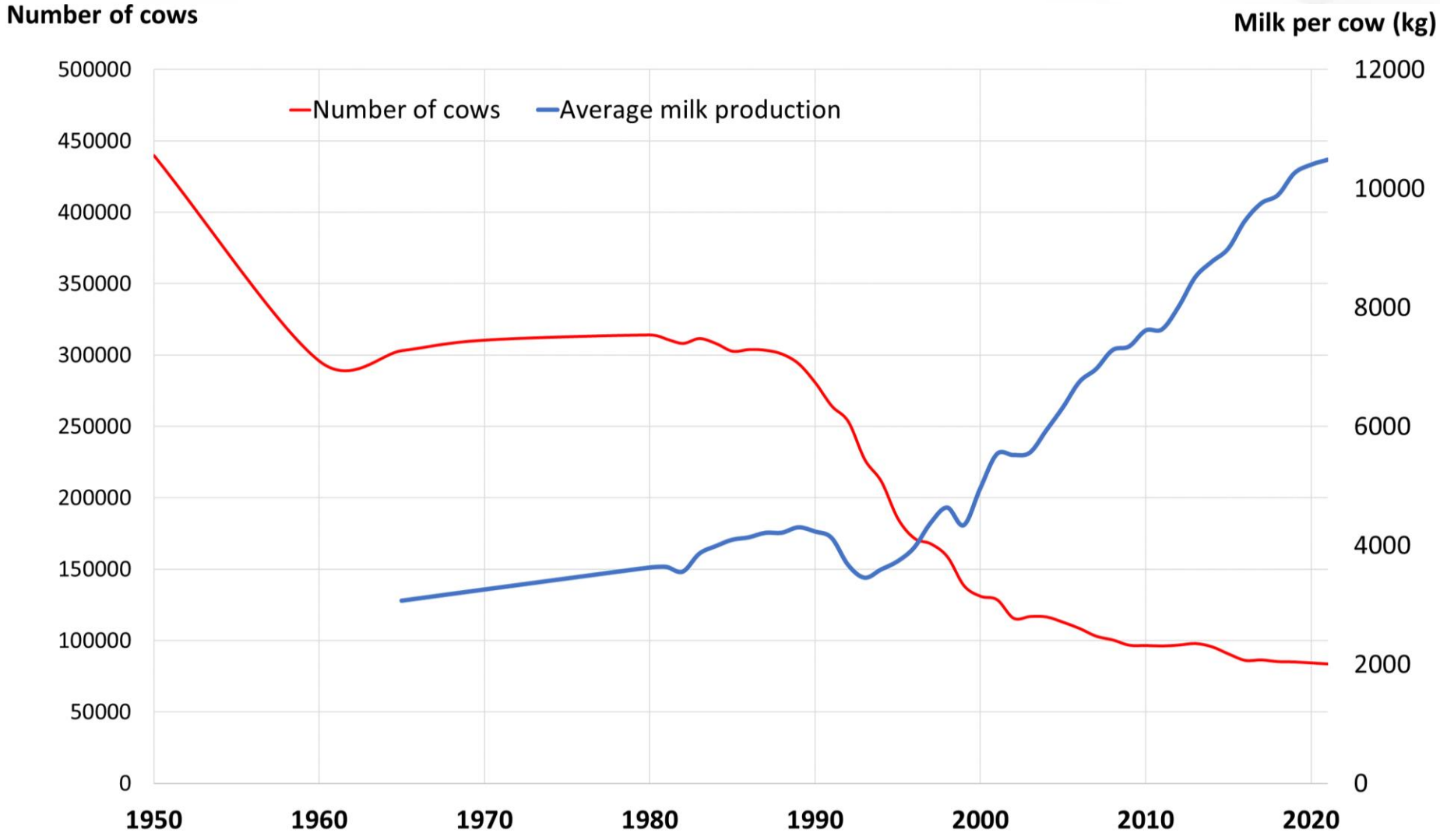
Estonian Dairy Herd and Milk Production Per Cow



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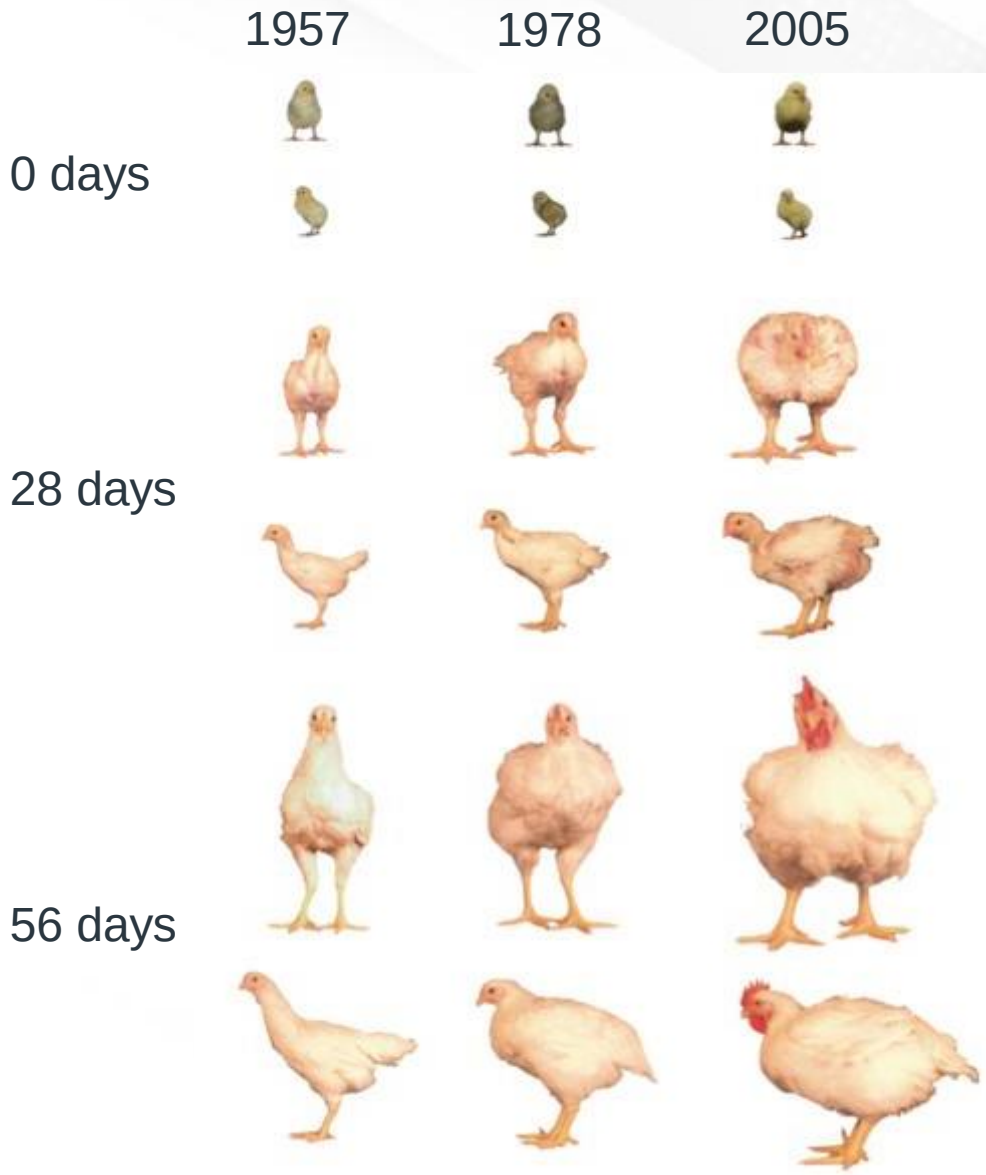
Genetic Progress



Source: Zuidhof et al., 2014

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Genetic Selection Theory

$$\text{Genetic Progress} = \frac{Selection\ Intensity\ x\ Accuracy\ x\ Variation}{Generation\ Interval}$$

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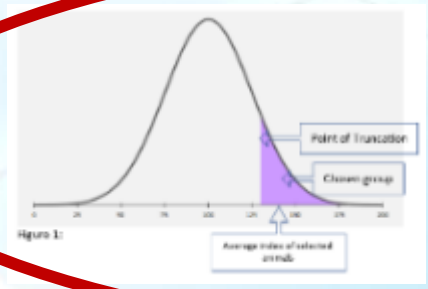
Genetic Selection Theory

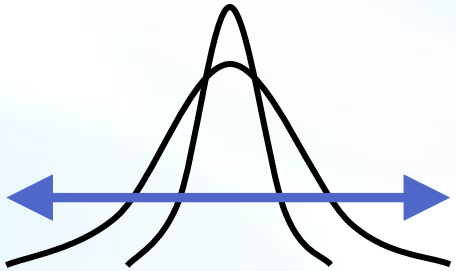


Selection Intensity

Average genetic superiority of selected group over herd average

Selection Accuracy

Correlation of the estimated transmitting abilities (ETA) with the true breeding values



Genetic Variation

Variability of breeding values within the herd

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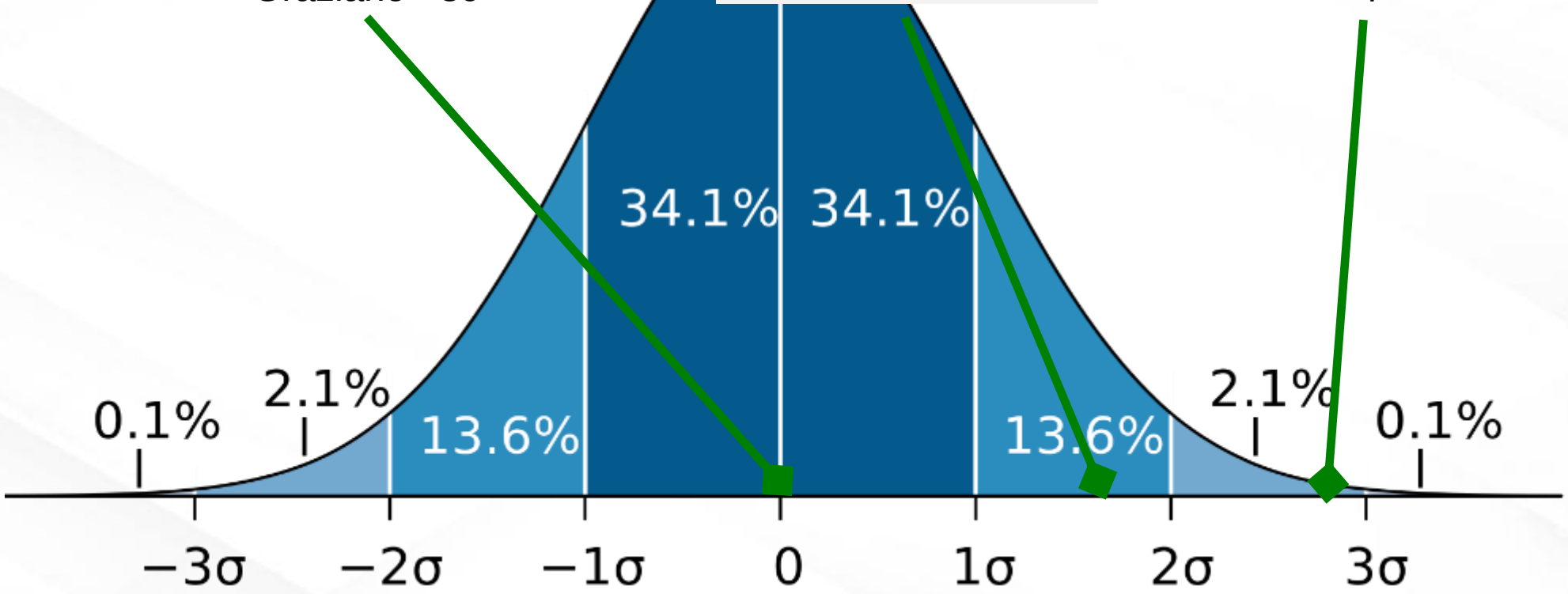
Milk

Graziano +89

Raptors +924

Fellowship +1572



USA (PTA / Lbs)	-1698	-1132	-566	0	+566	+1132	+1698

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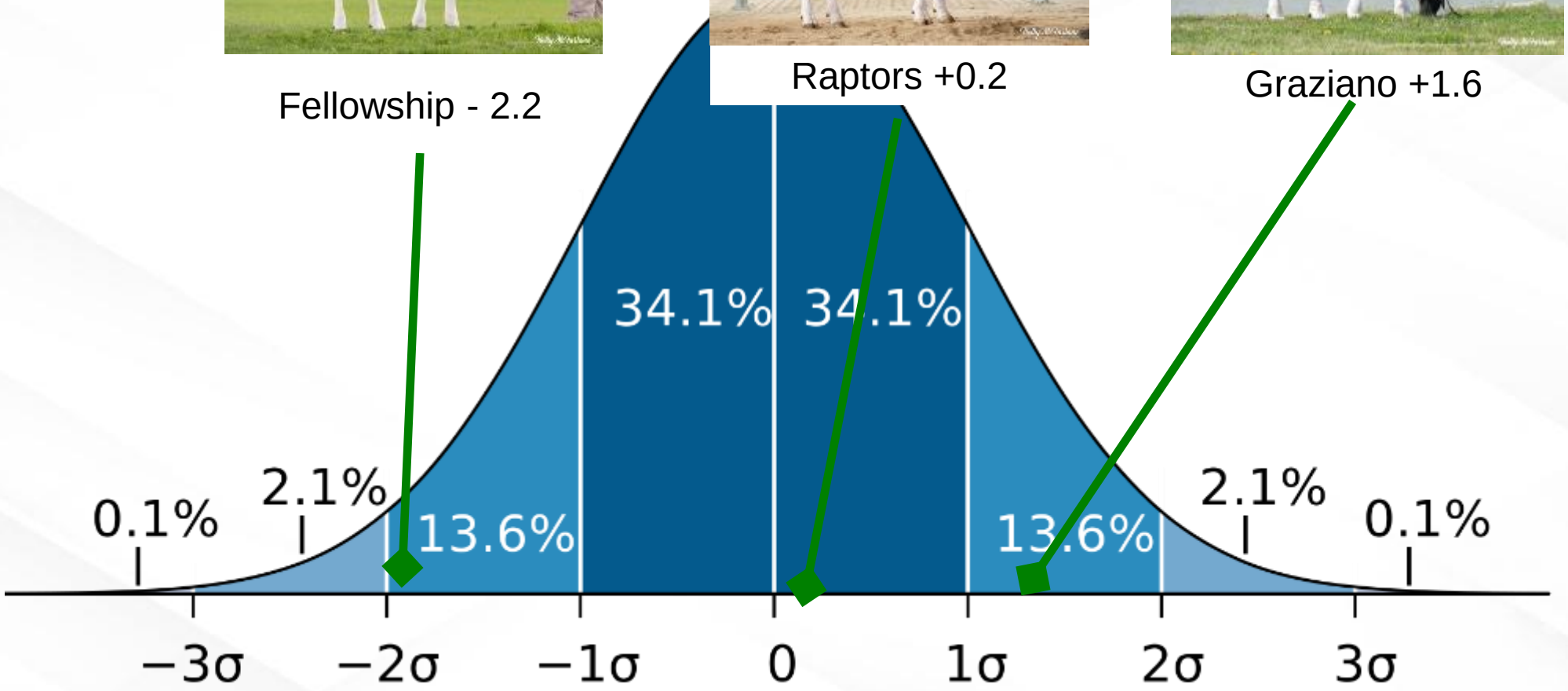
Daughter Fertility

Fellowship - 2.2

Raptors +0.2

Graziano +1.6



USA (PTA)	-3.9	-2.6	-1.3	0	+1.3	+2.6	+3.9

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No Single Trait Selection

- Multiple traits a getting a weight
- To make them comparable at the same scale, they are standardized

$$Total\ Merit\ Index =$$

$$Weight\%\ t1\ x\ \frac{t1\ EBV}{t1\ STDEV} + Weight\%\ t2\ x\ \frac{t2\ EBV}{t2\ STDEV} + \ldots$$

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What Gets Focus, Gets Results!

		TPI	PTAM	DPR	70% PTAM 30% DPR	50% PTAM 50% DPR	30% PTAM 70% DPR
Graziano		3001	+89	+1.6	479	694	**909**
Raptors		2935	+924	+0.2	1189	**893**	597
Fellowship		2988	+1572	-2.2	**1436**	542	-35

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Total Merit Index

- A selection tool, which combines multiple traits (production, health and fertility, conformation). It assists farms to select the best bulls ranked according to a country index

- In general, each country has one or two selection indexes, based on:
  - Desired gains (SKAV, TPI, LPI, RZG, NVI)
  - Economics (PRO$, NM$, RZ€)

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Desired Gains Index

Advisory committee or board decides

National genetic trends by birth year for Holstein cows

Lactanet Canada, August 2020

Year	Cows	LPI	Milk	Fat	Protein	Fat%	Protein%	Pers	SCS	Conf	DS	F&L	MS	Rump	HL	DF	DCA
2007	158783	1755	-471	-24.5	-19.2	-0.06	-0.03	98.0	97.9	-5.1	-1.9	-3.4	-5.5	-1.0	97.6	100.3	98.4
2008	166039	1809	-405	-22.0	-16.7	-0.06	-0.02	98.0	98.3	-4.3	-1.4	-2.9	-4.8	-0.4	97.9	100.2	98.7
2009	168435	1847	-318	-19.1	-14.6	-0.06	-0.03	97.8	98.3	-3.9	-1.3	-2.8	-4.4	-0.3	98.1	100.1	98.5
2010	166815	1914	-227	-14.1	-10.5	-0.04	-0.02	98.3	98.4	-3.1	-0.7	-2.1	-3.7	0.2	98.2	99.9	98.6
2011	163433	1998	-167	-9.3	-7.7	-0.02	-0.02	98.3	98.7	-2.0	-0.2	-1.3	-2.7	0.6	98.9	99.8	99.5
2012	164218	2087	-109	-4.0	-4.2	0.01	-0.00	98.5	98.9	-0.9	0.3	-0.5	-1.6	0.8	99.3	99.8	99.9
2013	155693	2174	36	0.6	0.9	-0.00	-0.00	98.5	99.4	-0.1	0.5	0.2	-0.7	1.0	99.9	99.9	100.0
2014	151114	2267	127	5.9	5.1	0.02	0.01	99.0	100.2	0.8	0.7	1.0	0.1	1.2	100.7	100.2	100.4
2015	150327	2354	222	10.9	9.2	0.03	0.02	99.2	100.7	1.7	1.2	1.7	1.1	1.4	101.3	100.3	100.8
2016	138598	2449	357	17.3	14.2	0.04	0.02	99.5	101.1	2.5	1.6	2.2	1.8	1.5	101.8	100.7	101.5
2017	112073	2540	470	22.1	18.8	0.04	0.03	99.9	101.7	3.5	2.1	2.9	2.9	2.0	102.4	100.8	101.9

Annual trends

Years	LPI	Milk	Fat	Protein	Fat%	Protein%	Pers	SCS	Conf	DS	F&L	MS	Rump	HL	DF	DCA
2007-2017	79	94	4.7	3.8	0.01	0.01	0.2	0.4	0.9	0.4	0.6	0.8	0.3	0.5	0.1	0.3
2012-2017	91	116	5.2	4.6	0.01	0.01	0.3	0.6	0.9	0.4	0.7	0.9	0.2	0.6	0.2	0.4

Look into historical and projected genetic trends

Holstein USA Selection Index

TPI:

Production (46%)	Health & Fertility (28%)	Conformation (25%)
19% Protein (Lbs)	13% Fertility Index	11% Udder Composite
19% Fat (Lbs)	5% Productive life	8% PTAT (overall type)
8% Feed efficiency $	-4% Somatic Cell Score	6% Feet & Leg Composite
	3% Livability	
	2% Health Trait Index	
	-0.5% Daughter Calving Ease	
	-1.5% Daughter Stillbirth	

Source: Holstein USA, 2021

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Economic Index

Scientists calculate the economic impact of improving relevant traits

In consideration:

- Milk payment System
- Feed costs
- Rearing costs
- Rest value (slaughter)
- Costs diseases and treatment
- Costs reproduction (open days, ai costs)
- Technical performance, e.g. milk production, somatic cell count, reproduction
- Effects of multiple trait at productive life

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Economic Impact Calculation

Trait	Units	SD	Value ($/PTA unit)
			NM$
Milk	Pounds	567	0.002
Fat	Pounds	25	4.18
Protein	Pounds	15	4.67
PL	Months	1.7	34
SCS[1]	Log	0.14	−74
BWC	Composite	0.76	−45
UDC	Composite	0.65	19
FLC	Composite	0.53	3
DPR	Percent	1.4	11
CA$	Dollars	10.41	1
HCR	Percent	1.3	1.1
CCR	Percent	1.6	2.2
LIV	Percent	1.6	9.8
HTH$	Dollars	4.54	1.0
RFI	Pounds	46.2	−0.30
EFC	Days	2.05	2.1
HLIV	Percent	0.4	5.0

[1]SCS = somatic cell score

Source: USDA April, 2021

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Council on Dairy Cattle Breeding (CDBC) Selection Index: Lifetime Net Merit

NM$:

Production (52.3%)

28.6% Fat (Lbs)

19.6% Protein (Lbs)

-3.8% Residual Feed Intake

0.3% Milk (Lbs)

Health & Fertility (34.4%)

15.9% Productive Life

4.4% Livability

4.1% DPR

2.9% Calving Ability $

-2.8% Somatic Cell Score

1.2% Health Trait Index

1.2% Early First Calving

1.0% Cow Conception rate

0.5% Heifer Livability

0.4% Heifer Conception rate

Conformation (13.2%)

- 9.4% Body Weight Composite

3.4% Udder Composite

0.4% Feet & Leg Composite

Source: USDA April, 2021

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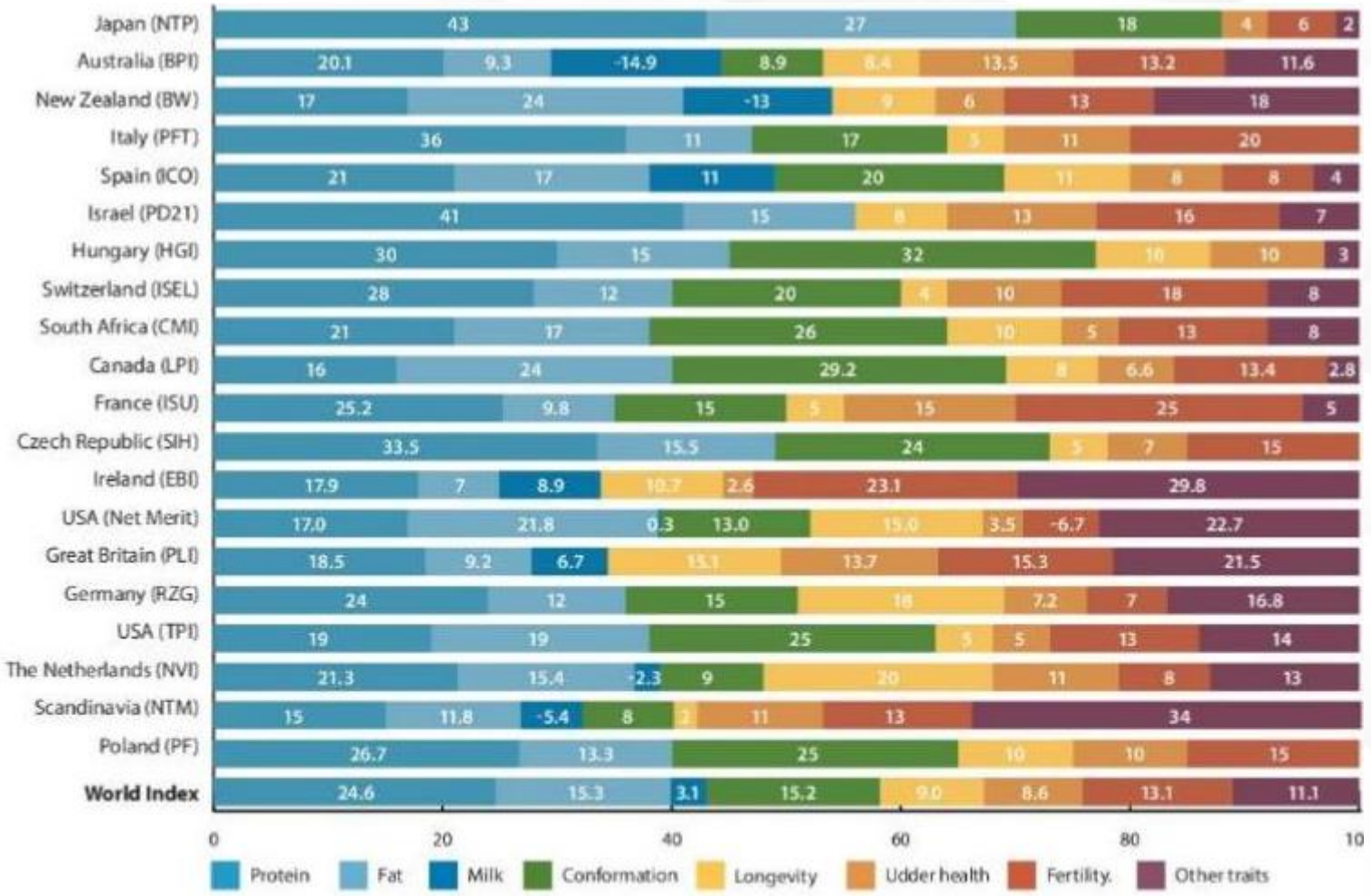
Global Indexes



Source: Holstein International, Dec 2021

Estonia (SKAV)

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Economic index vs. Desired Gains index

- Reflects actual economic opportunity
- Hard to anticipate to future economic developments
- Flexible, but less rational
- Opportunity to put lots of emphasis at traits where trends need to be corrected

Are generic country indexes the best choice for each and every farm?

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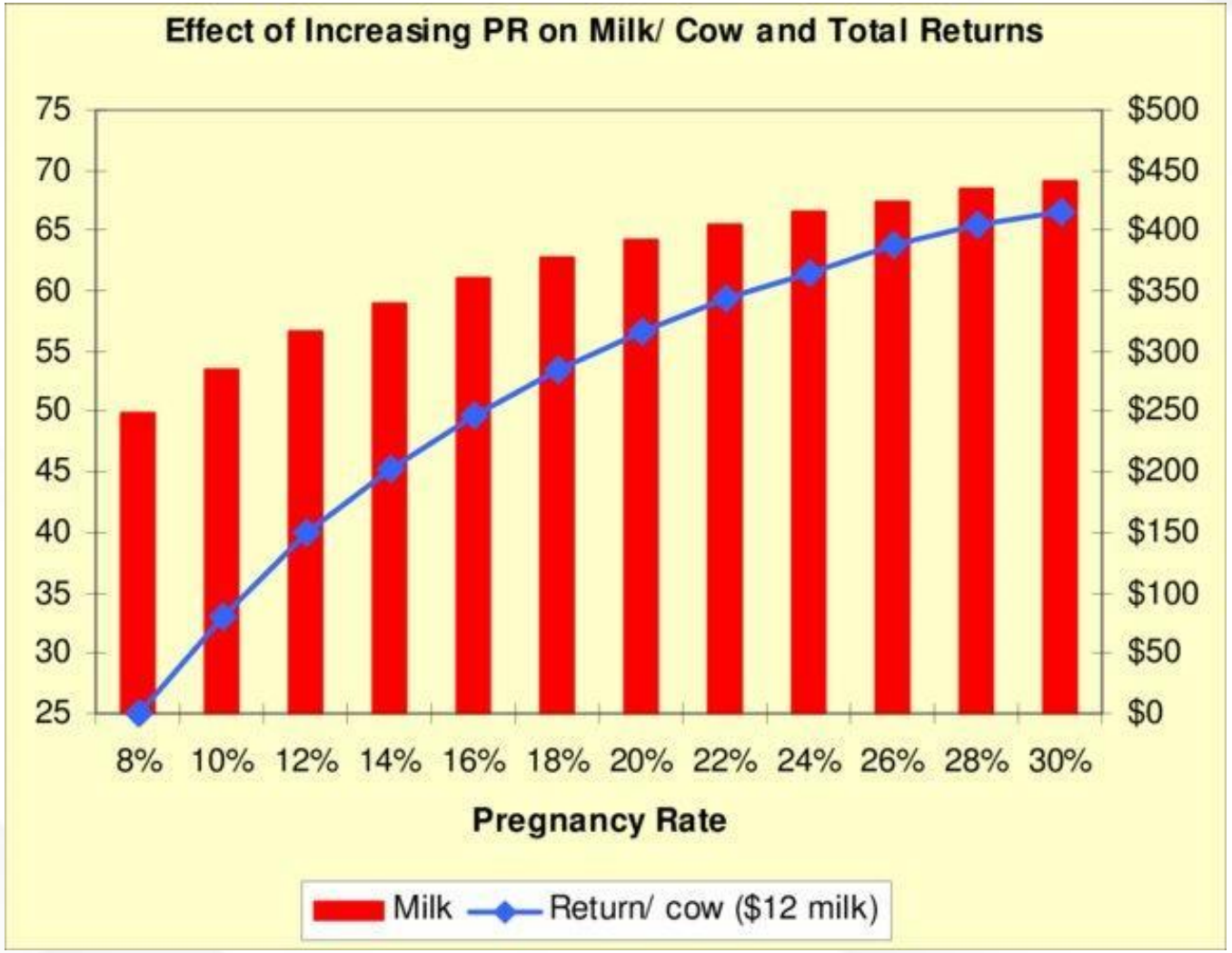
Economic Impact Trait Is Not Equal For Every Herd

Milk / Cow / Day (Lbs)



Financial Returns (US$)

Source: Fricke et al., Dec 2005

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ASTRONAUT


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Generic Index Or Herd Specific Index?

There is no such thing as an average dairy farm!

- Milk payment system
- Robot herd or normal parlor
- Slatted floor, closed floor or dry lot
- Genetic background: North American Holsteins, crossbreds or European
- Sand, compost or matrasses stall bedding
- Most important, what are the goals of the dairy?
- …

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SemexWorks™
A STANDOUT TOOL FOR MAKING
GENETIC DECISIONS
SEMEX®
Genetics for Life®

Farm-specific economic values and ROI

Rank sires best for your dairy

SemexWorks™

SemexWorks is a powerful, easy to use tool empowering the client to define their farm economics and the specific needs for their operation from a genetic viewpoint.

Clients compare their farm-specific economic values and return on investment by looking at the different genetic options available. It's an open book - The Semex genetic consultant simply helps the client determine the future that is best for him.

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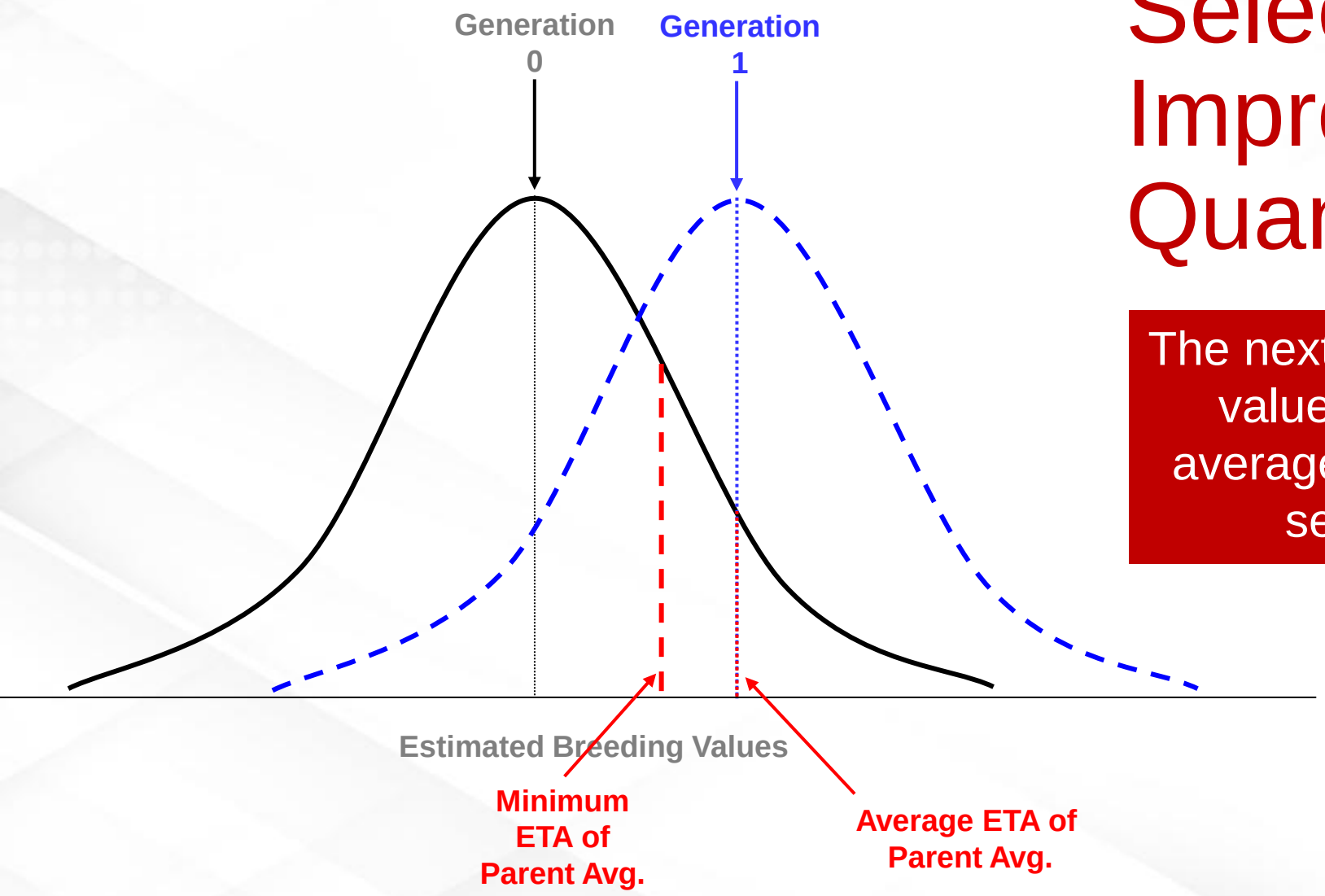

Selection Improvement of Quantitative Traits

The next generation breeding values are equal to the average breeding values of selected parents

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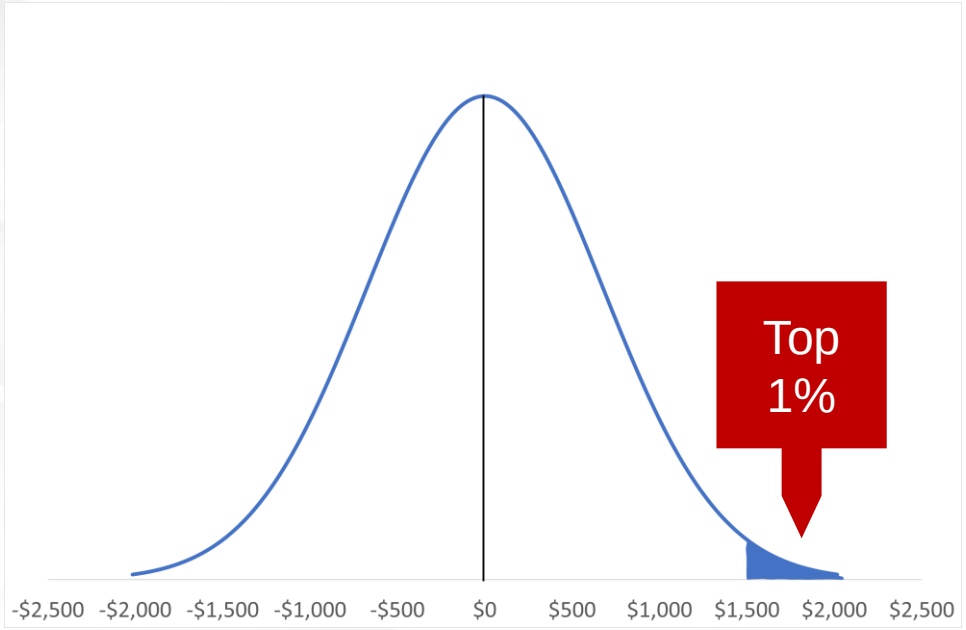
Genetic Progress =

$$\frac{Selection\ Intensity\ x\ Accuracy\ x\ Variation}{Generation\ Interval}$$

Bulls



Cows and Heifers

What Is The Intensity Of Our Selection?

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Do We Have Better Selection Possibilities In Cows and Heifers Today?

- Improved replacement rates (lower!) allow to raise less replacements and be selective on which to be raised
- Sexed semen in combination with a terminal cross with beef semen help to be more decisive in choosing dams of next generation
- Genomics helps to be more accurate in selecting the best females to produce the next generation

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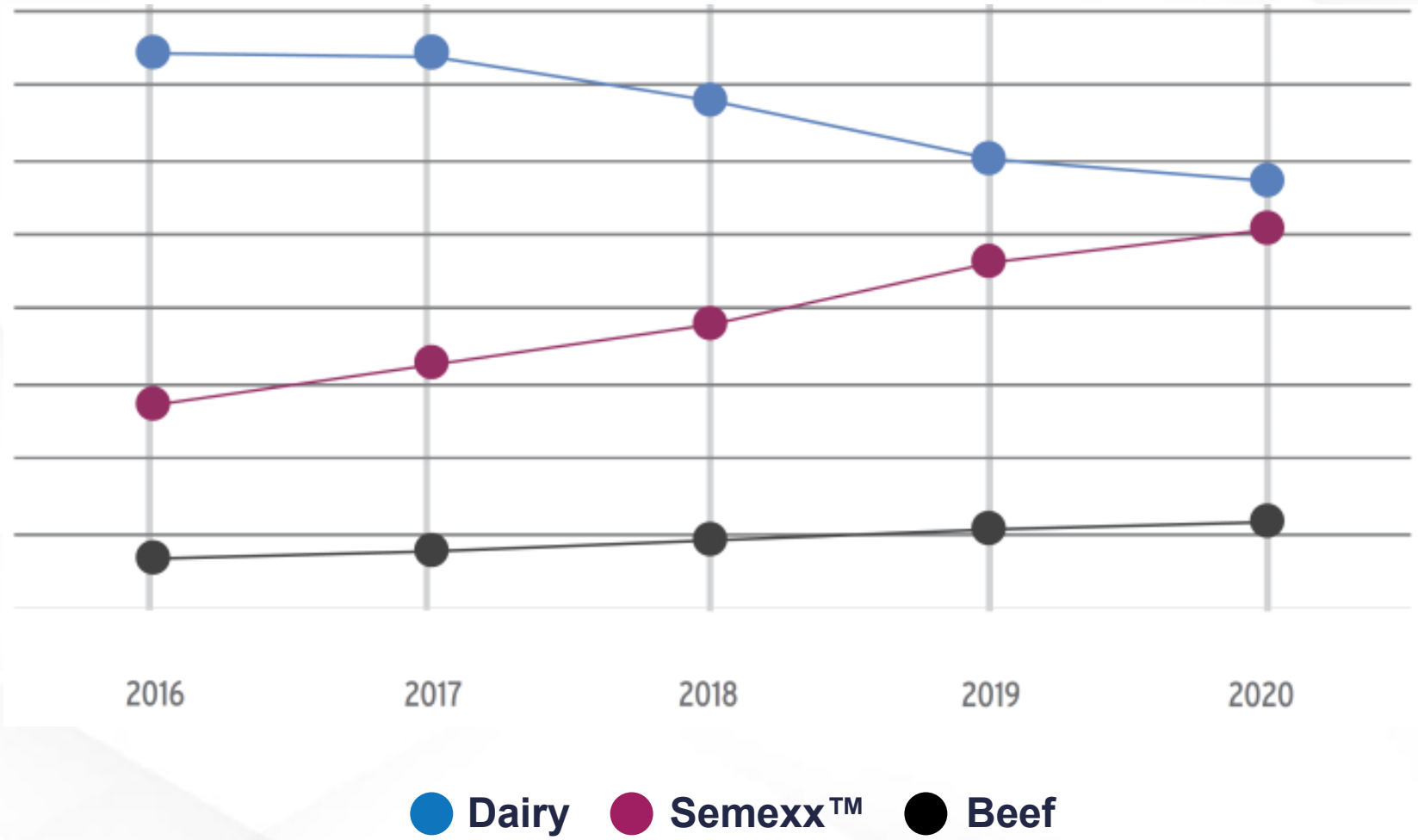
SEMEN SALES TREND



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Accuracy of genomics

Selection Accuracy

Correlation of the estimated transmitting abilities (ETA) with the true breeding values

Trait	Reliability (%) for parental average	Reliability for genomic parental average (%)
Milk Yield	39	77
Herd Life	38	72
Daughter Fertility	34	66
Conformation	38	72

Source: CDN, 2019

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Accuracy Of Parentage Average vs. Genomics

- Dataset large farm with >400 genomic tested cows that have finished their 1st lactation
- Ranked all the animals in three groups either on parental average or genomics and compared it with actual performance

Parental average

Group	Average PA Milk (KG)	Average 305ME
Low	184	13060
Medium	656	12802
High	1102	13744
Correlation PA / 305ME	0.21	

Genomics

Group	Average GPA Milk (KG)	Average 305ME
Low	18	12127
Medium	725	12869
High	1334	14323
Correlation GPA / 305ME	0.53	

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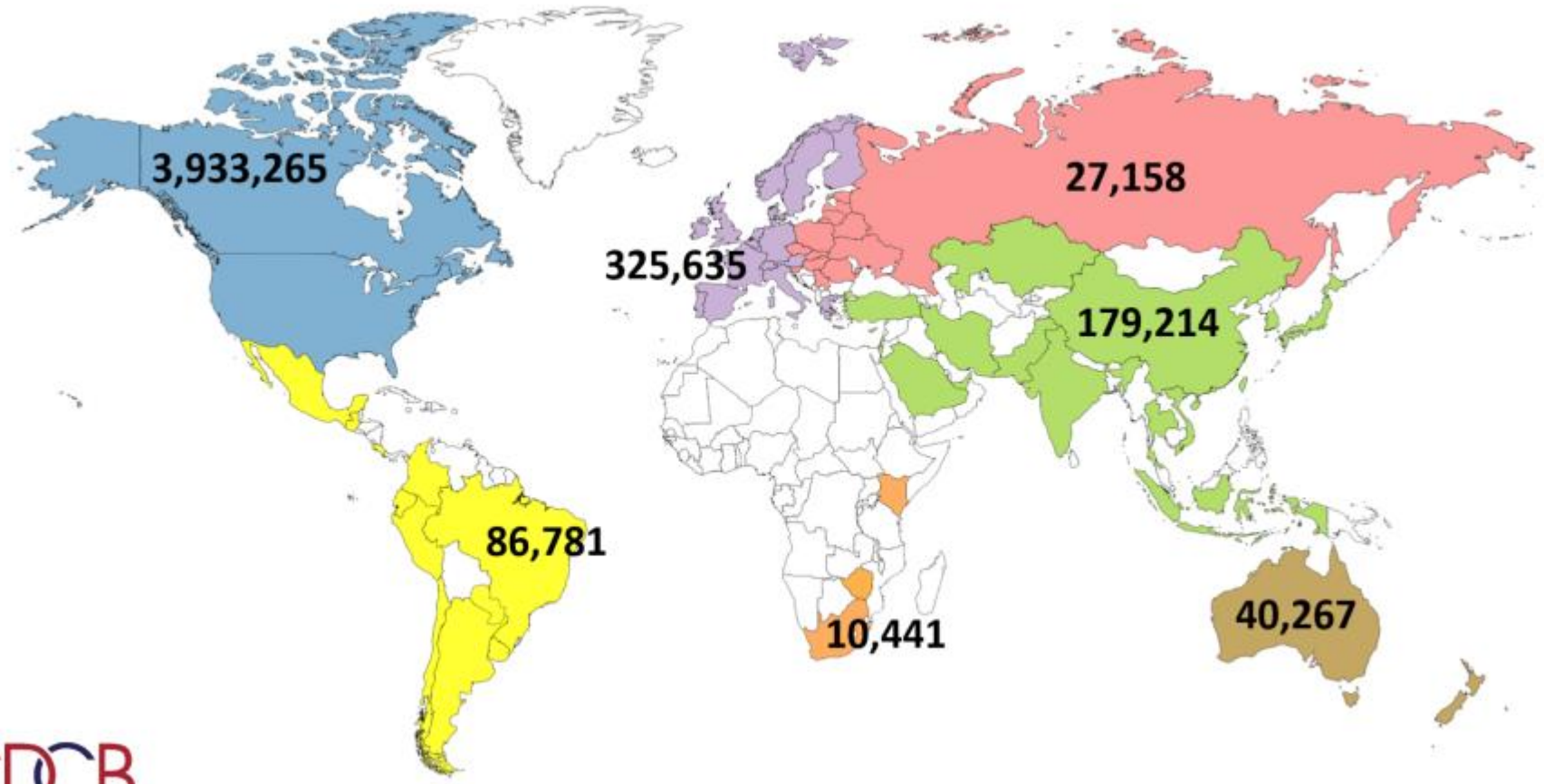
Genotyped Animals In Database By Region (2020)



CDCB
COUNCIL ON DAIRY CATTLE BREEDING

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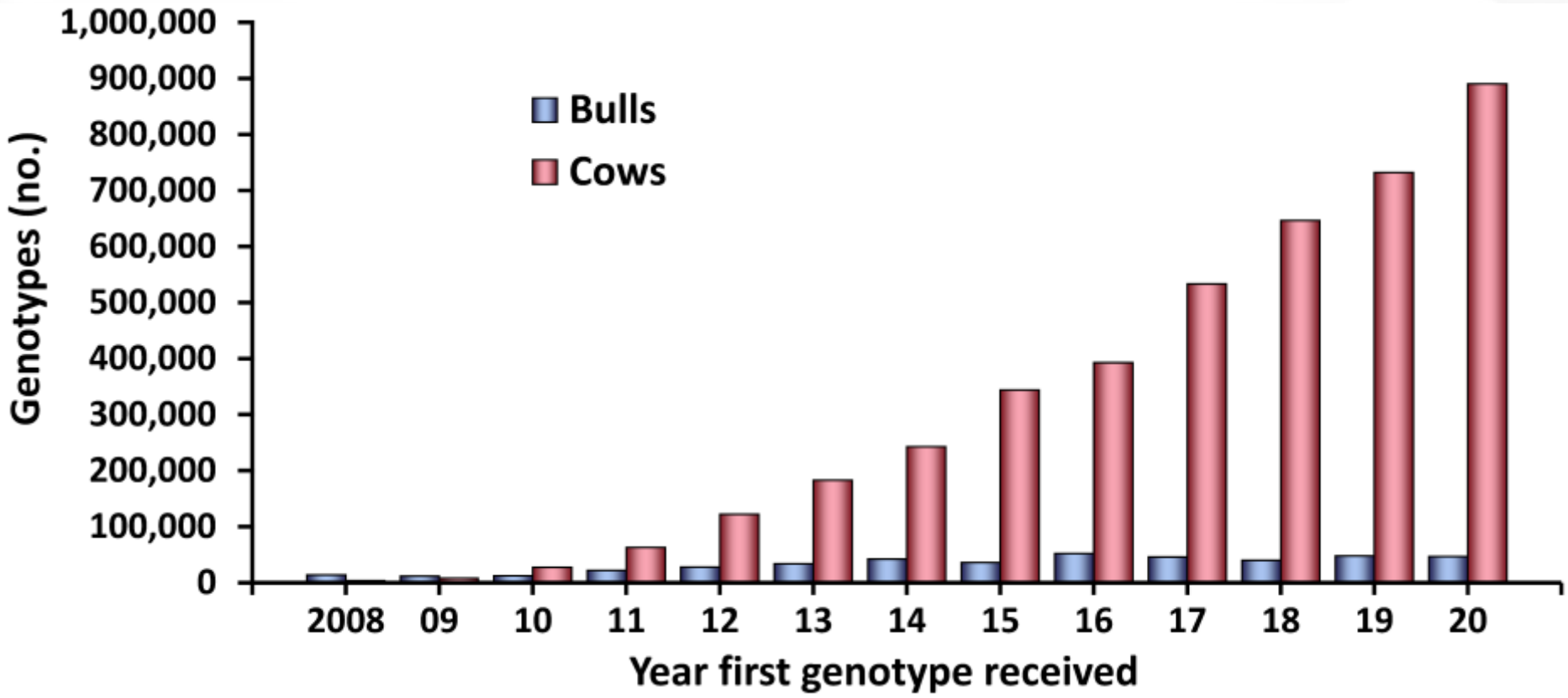
CDCB Usable Genotype Counts/Year By Animal Sex



Selection Intensity

- The difference between the average of animals selected to breed the next generation compared to whole herd average
- Culling: Culling the bottom 20% of a herd can increase the average economic value of the selected group by nearly € 100.
- Beef: Using beef on the bottom end can do the same
- Sexed: Sexed semen on the top end ensures heifers and cows from the best genetics – means increased selection intensity

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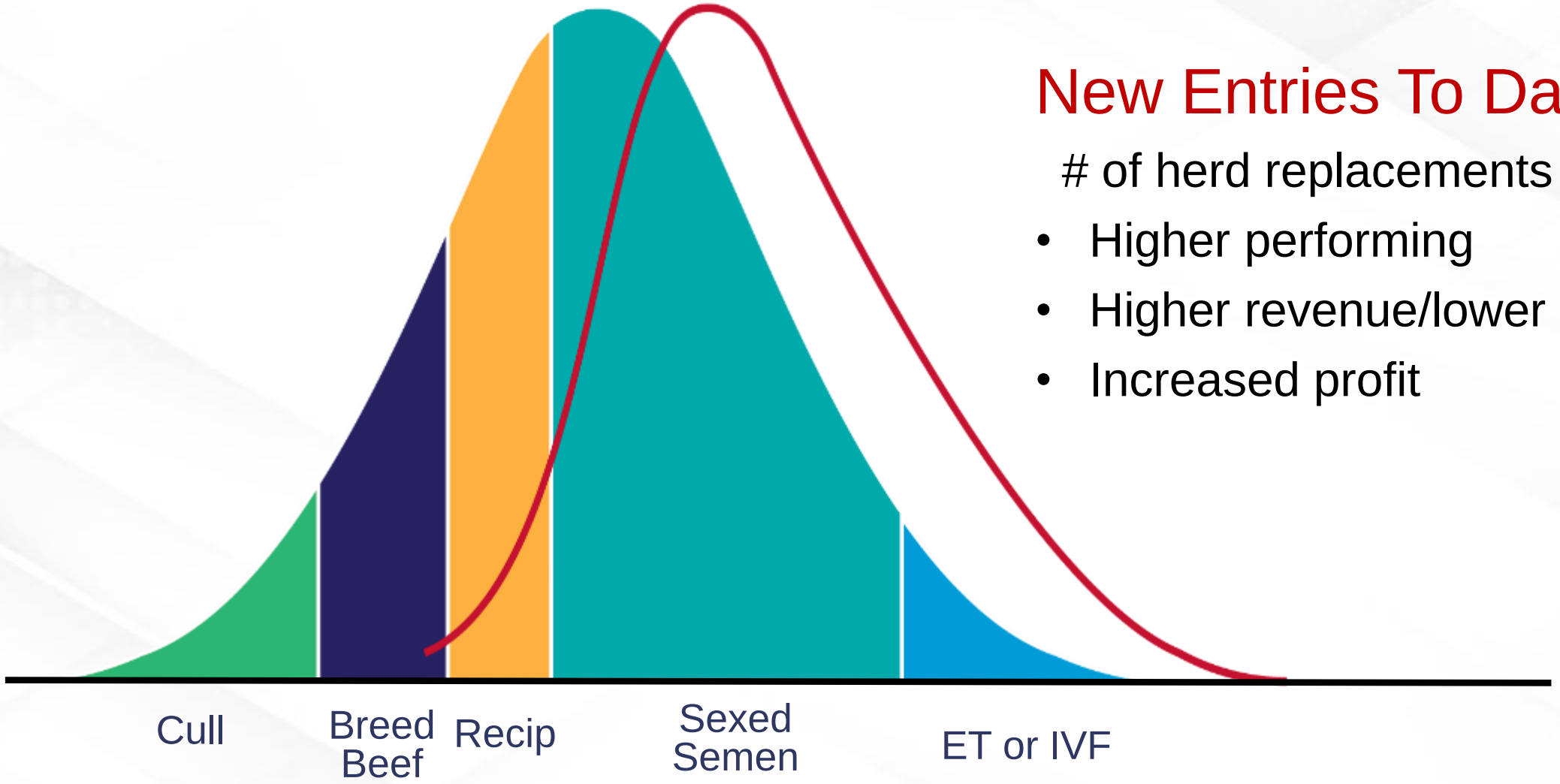

New Entries To Dairy

of herd replacements

- Higher performing
- Higher revenue/lower cost
- Increased profit

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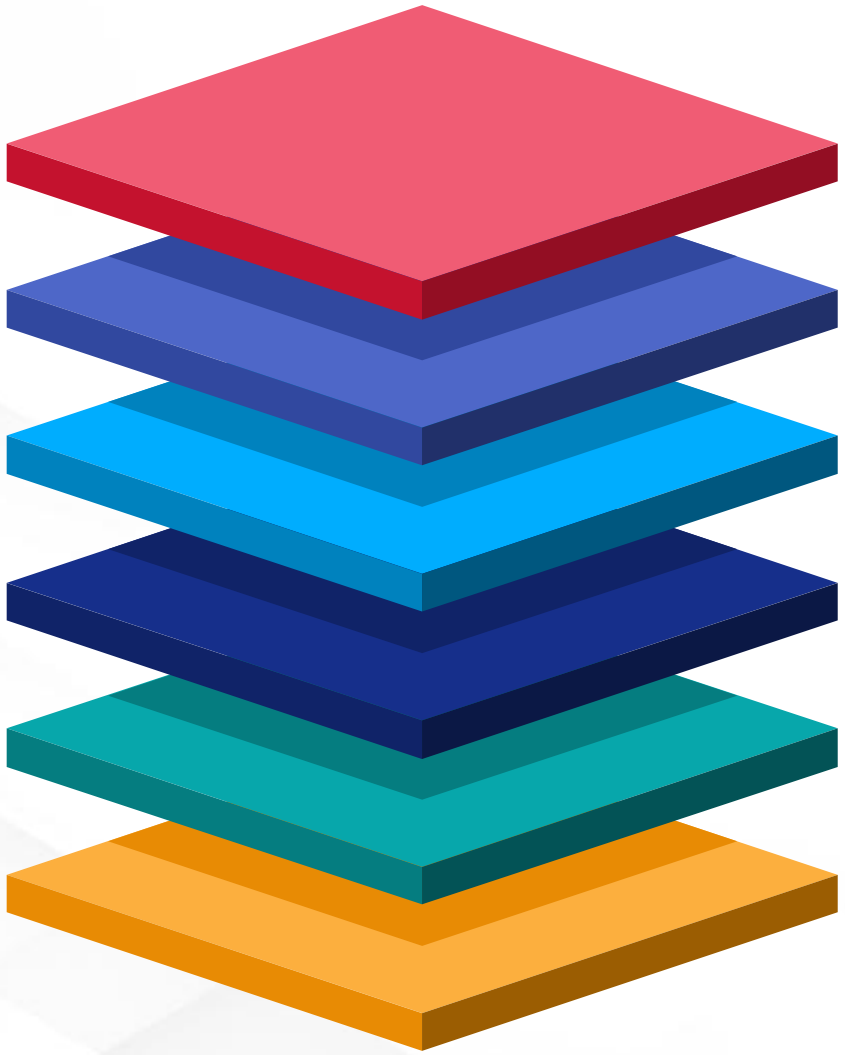
Determining The Selection Strategy That's Best For Each Client



6 Put it into action

5 Does genomics pay? All?

4 Which strategies fit clients' goals

3 Optimal combo of strategic options that produces the highest economic return

2 Using economic parameters on the farm, expansion plans & animal data

1 Consider all possible strategic options for a client


Elevate®
THE INDUSTRY'S ONLY AUTOMATED
GENETIC SELECTION TOOL
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Elevate®

Our female genomic test, Elevate®, gives fast, easy access to vital female genomic information that increases genetic gain, corrects parentage errors, manages inbreeding and helps clients make confident mating decisions.

- Elevate® offers more than just a genomic test. The Elevate strategy optimization is a tool like no other
- Using real farm data, it helps us to manage costs, right size inventory and maximize genetic gains
- Determines best ratios of IVF/ET, sexed semen, conventional semen, beef semen, culling and gives the flexibility to adjust ratios based on what is practical and fits the dairy
- Recommend genotyping only the animals that make sense (not all!)
- To be effective though we must be sure we are getting accurate data, establishing the right goals, and regularly re-evaluating with the client.

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ELEVATE YOUR HERD

- Advanced strategic tool to maximum economic return
- No paperwork – No data entry
- Easy, seamless sample collection
- Genomics automatically applied in your decisions & mating
- Genomic results & follow-up actions via the phone
- Competitive pricing
- Immunity genomics

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Key Take-Aways

- There is no such thing as a one-size fits all breeding goal; work with your genetic supplier at a tailored-custom genetic strategy
- Depending on the goals; the options are to go for a herd-specific economic index or desired gains index for traits which matters most your dairy
- Utilizing the tools from today (sexed, beef-on-dairy, genomics and potential embryo technology) can expedite genetic progress on the female side as well
- Make sure the chosen options and strategies are financially beneficial in the end

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Questions?
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SemexWorks™
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