



The Italian Holstein holistic breeding approach



Raffaella Finocchiaro & Martino Cassandro
ANAFIBJ



your COW
our FUTURE



ANAFIBJ Cremona, Lombardia region



your COW
our FUTURE



HOLISTIC Meaning

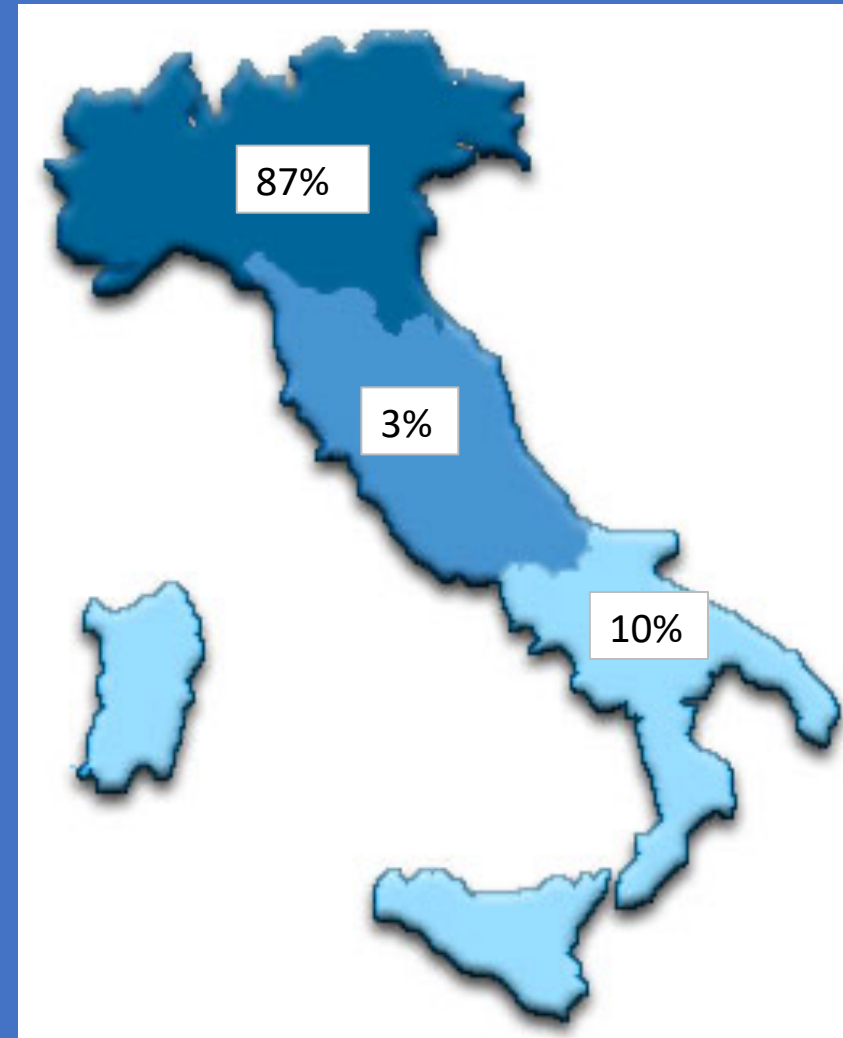
It refers to the approach of dealing with or treating the whole of something and not just a part



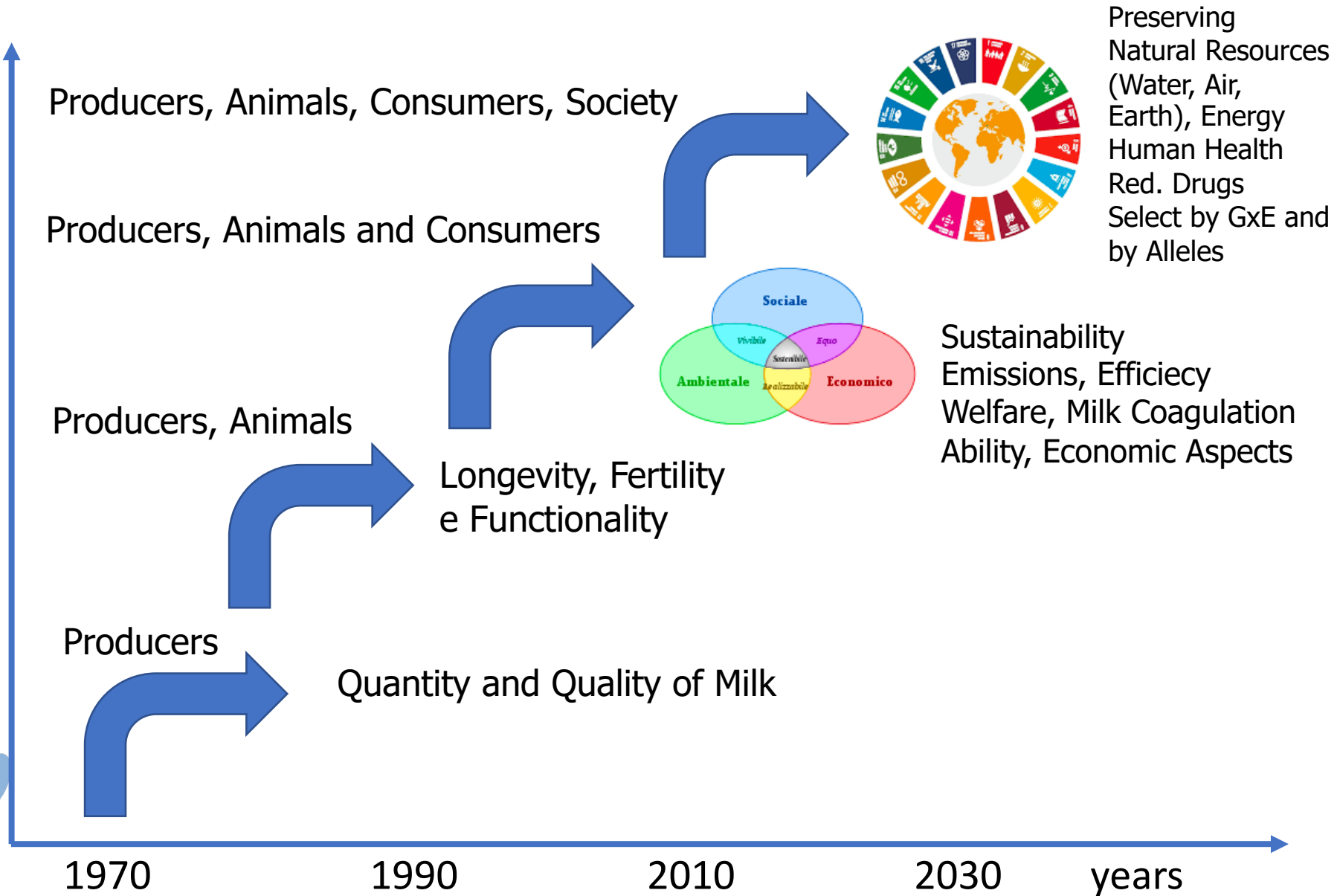
Italy: ANAFIBJ has applied an holistic breeding approach

ANAFIBJ has 2 herdbooks with about **10.000** members with **1.100.000 registered cows** and **800.000** young stock

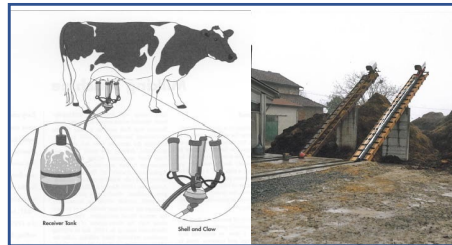
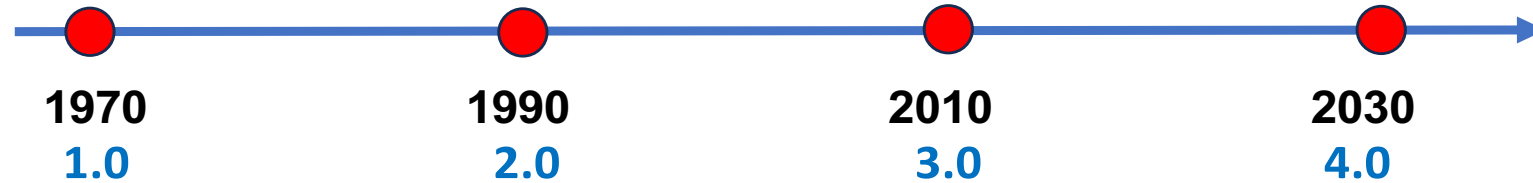
70 – 80 % of the produced milk goes to cheese production in Italy!



Breeding Goal Evolution in dairy cattle



Evolution of the livestock system



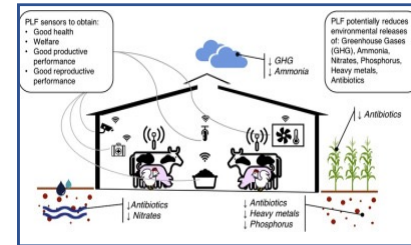
Livestock Mechanization Farming

- Mechanization
- Milking machine
- Less manual labor



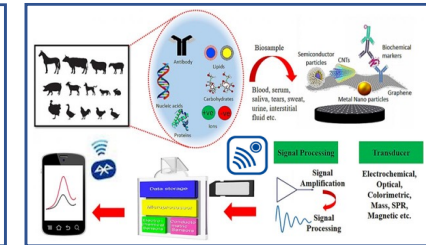
Livestock Intensive Farming

- Infrastructure (LMF)
- Nutrition
- Quantitative Genetics
- Recording data



Livestock Precision Farming

- Livest. Intensive (LIF)
- Automation/Robot
- Genomic analysis
- Management data
- Big-data



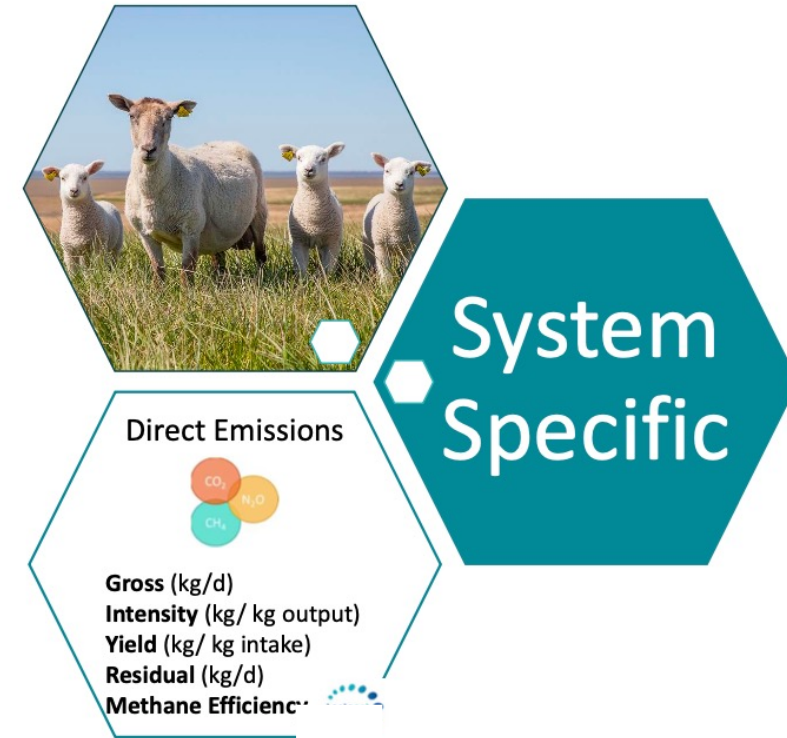
Livestock Olistic Farming

- Precision livestock farming (PLF)
- High-performance phenotyping
- Traits ontologies
- In-/Cross-Breeding
- Genome editing
- Microbiome
- Deep/Machine learning
- Artificial Intelligence

Phenotype Collection



Trait definition



Holistic Sustainable traits

Environment



Methane
Nitrogen
Water usage

Animal Health & Welfare



Disease resistance
Heat tolerance
Resilience
Behavioural traits

Production & Efficiency



Feed Efficiency
RFI
Age at slaughter

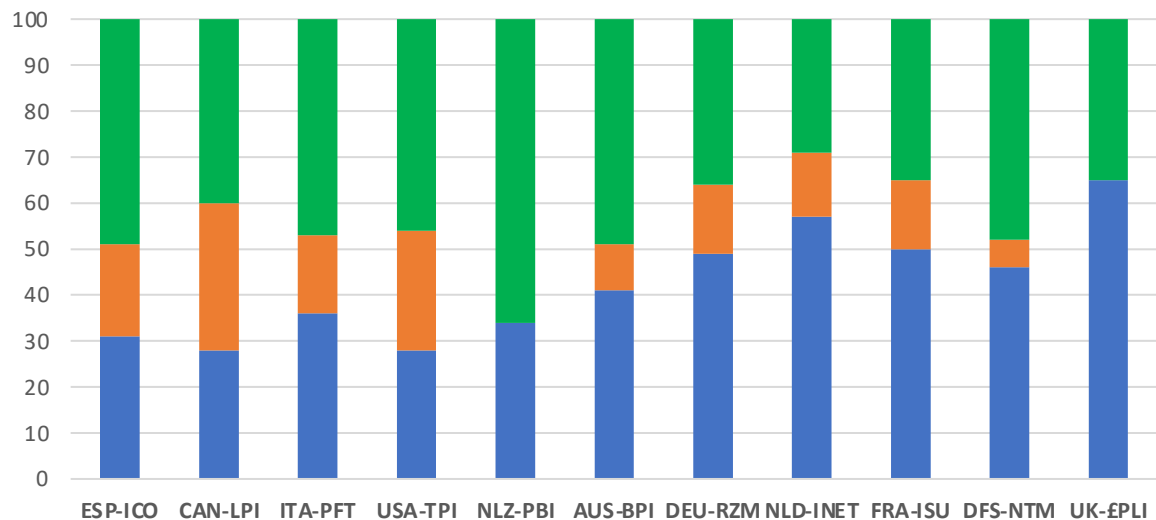
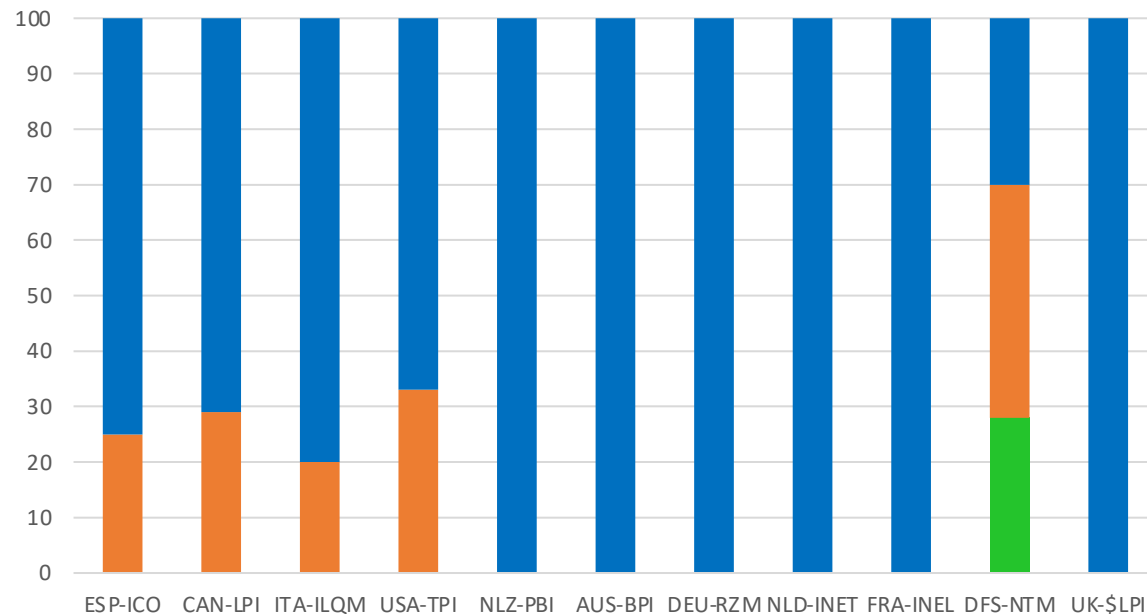
Reproduction & Fertility



Age at first calving
Days-to-calving
Oestrus expression

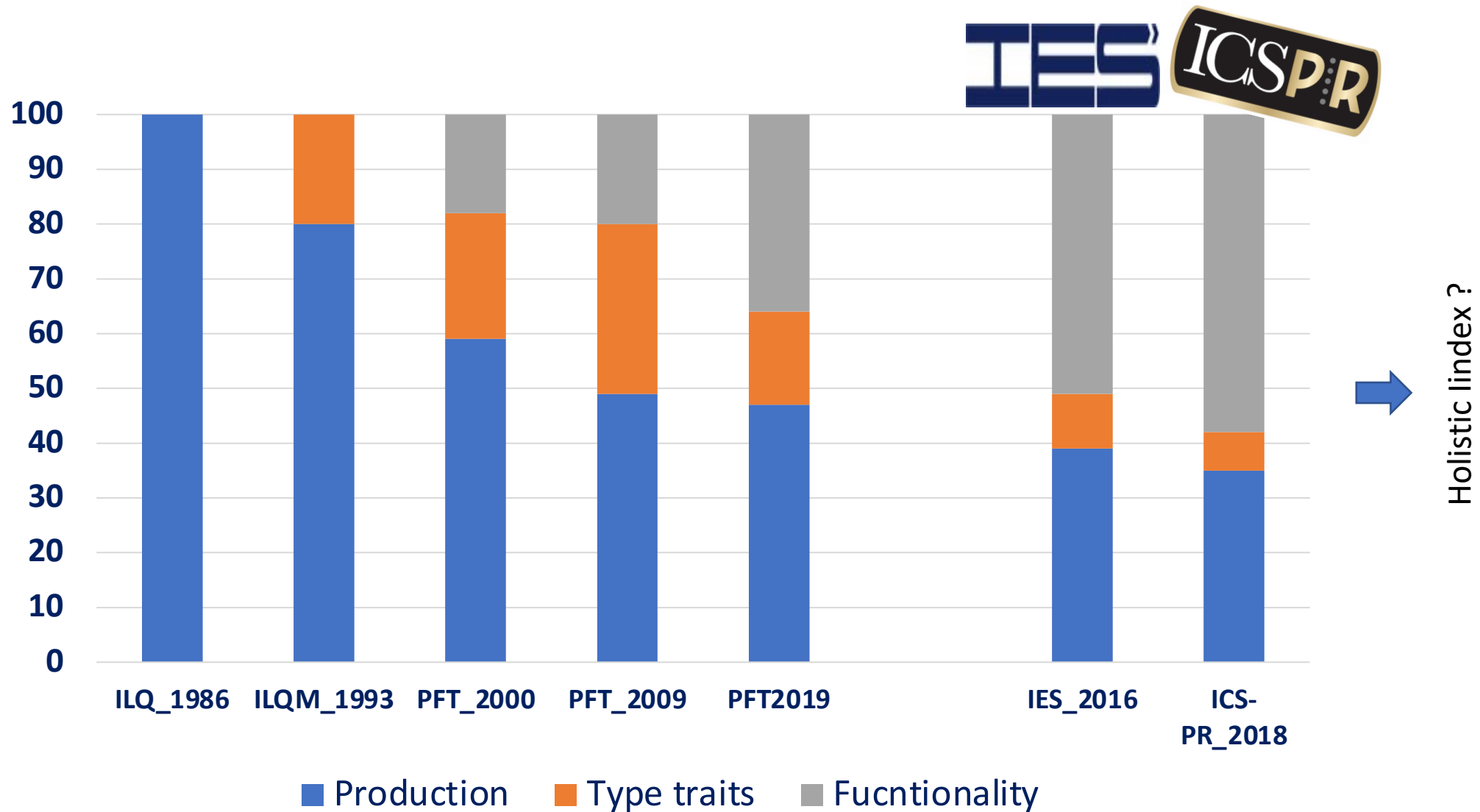
Evolution world selection aims

1994



2023

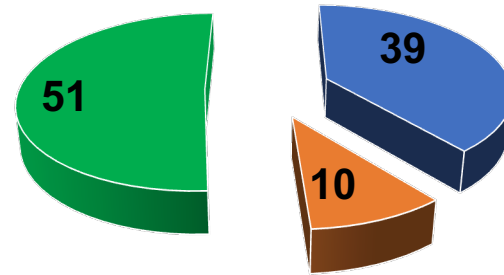
Evolution italian breeding objectives



Economic and Sustainable Indexes

■ Production
 ■ Type conformation
 ■ Functionality

Economic Health Index (2016)



Functionality

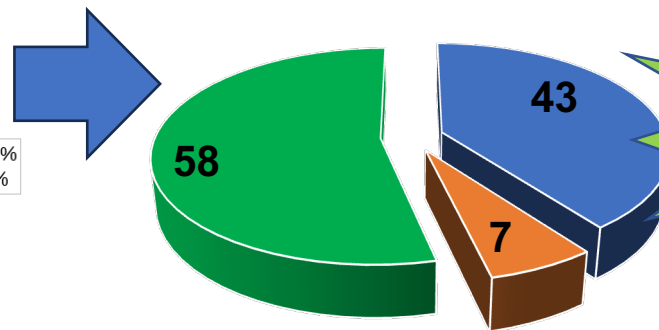
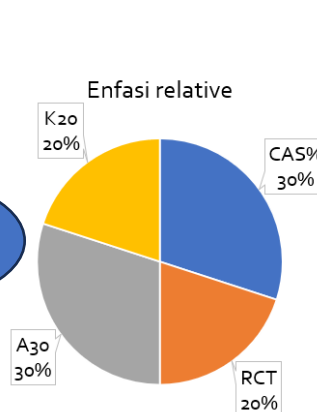
- Longevity **21%**
- Fertility **18%**
- Somatic cells **6%**
- Calving easy **3%**
- BCS **3%**



Sustainability and cheese-making capacities Index– Parmigiano Reggiano (2018) vs 3.0



IQC 6% index



Award K-Cas B

Penalty K-Cas E

- Fertility **15%**
- Somatic sells **14%**
- Longevity **11%**
- Calving easy **5%**
- Mastitis **5%**

BB +0,10 euro/d of milk lifetime
 B +0,05 euro/d of milk lifetime

EE -0,050 euro/d of milk lifetime
 E -0,025 euro/d of milk lifetime

Dairy milk production in Italy?

- **70% cheese production**

- Hard cheeses

- Parmigiano Reggiano
- Grana Padano
- Asiago
- Montasio

- Fresh cheeses

- Mozzarella
- Ricotta
- Crescenza

- 30% drink milk products



Increase number of cheese wheels over time (40 kg/wheel)

**2005: 14
wheels/cow/year**

**2021: 18,5
wheels/cow/year**



since 2018
Introduced
ICS-PR index





Latteco project ---ANAFIBJ approach



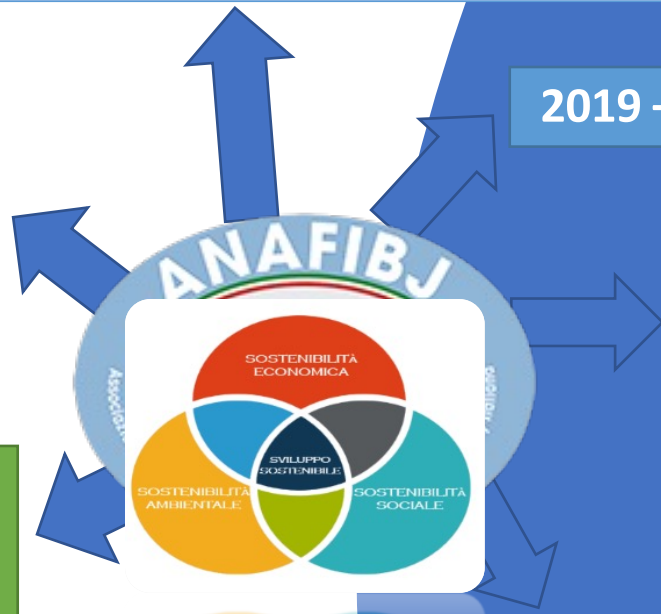
2018 Female fertility (cow + heifers) - 1° revision

2017 - MST- Udder Health index



2023 –

- Methane Intensity index
- Heat tolerance index (M/F/P)
- Female fertility index - 2° revision
- Cheeseability index (IQC) → ICS-PR
- BHB index



2019 – Feed Efficiency (pFE)

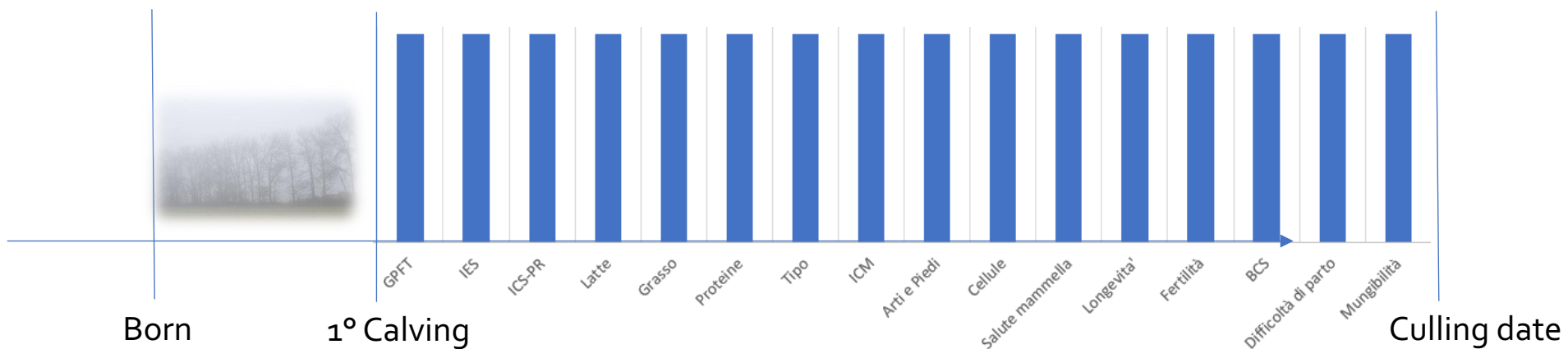
2021

- Heat tolerance index (IHT)
- Workability index – revision (MLK)
- Automated milking index (IMA)
- Overall Udder Score index (ICM)

2022

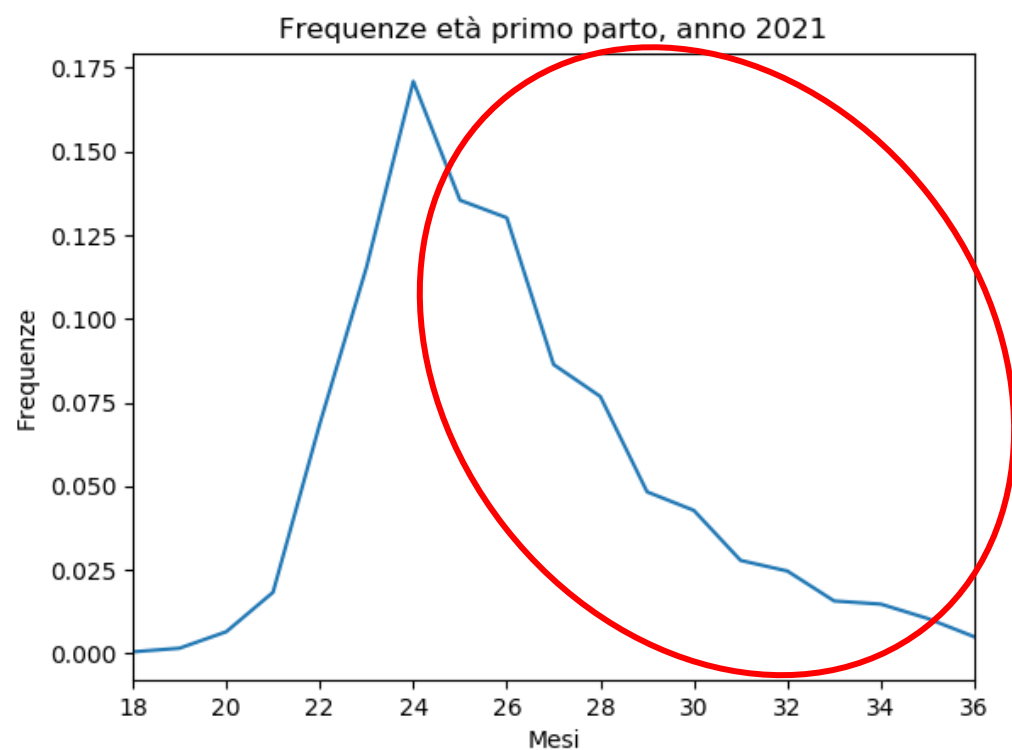
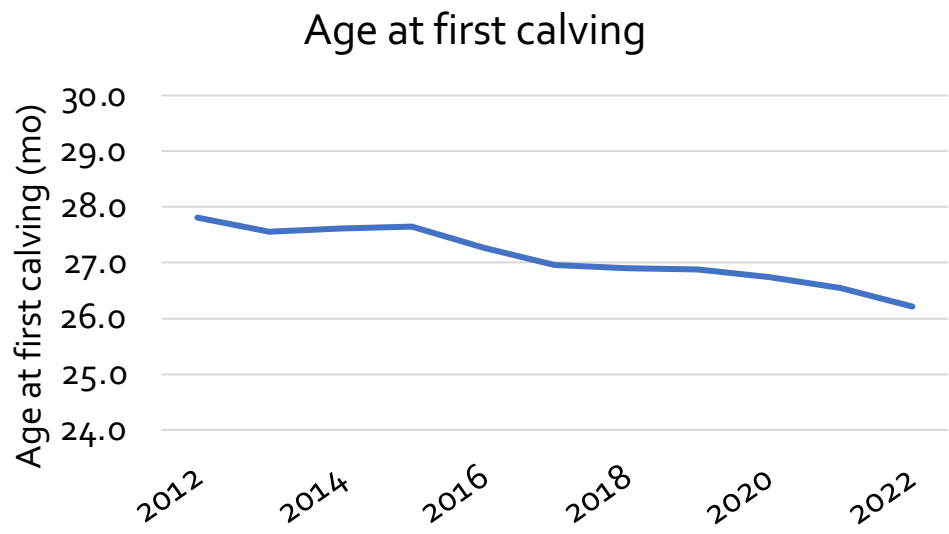
- Well-Being index
- Nitrogen Index
- Age at first calving index
- Gestation length index
- Calving ease and Still-birth index

Genetic evaluation until 2019...



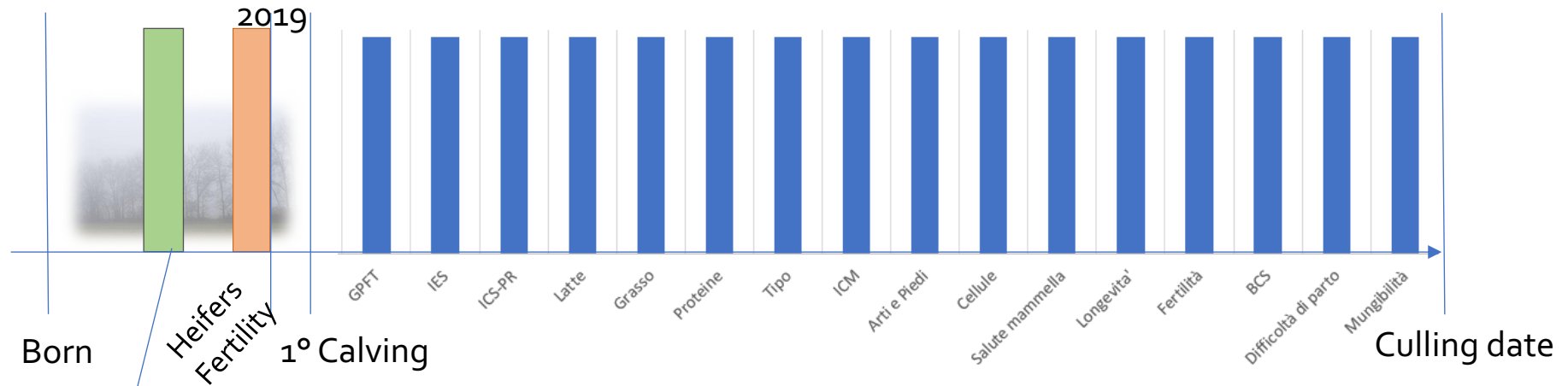
50+ traits evaluated (almost all evaluated on cows)

Young stock: which is the actual situation in Italy?



Distribution of age at first calving

Genetic evaluation after 2019...



Index age at first calving
 Index calving easy
 Index Stillbirth
 Index Gestation Length



Official indexes since december 2022

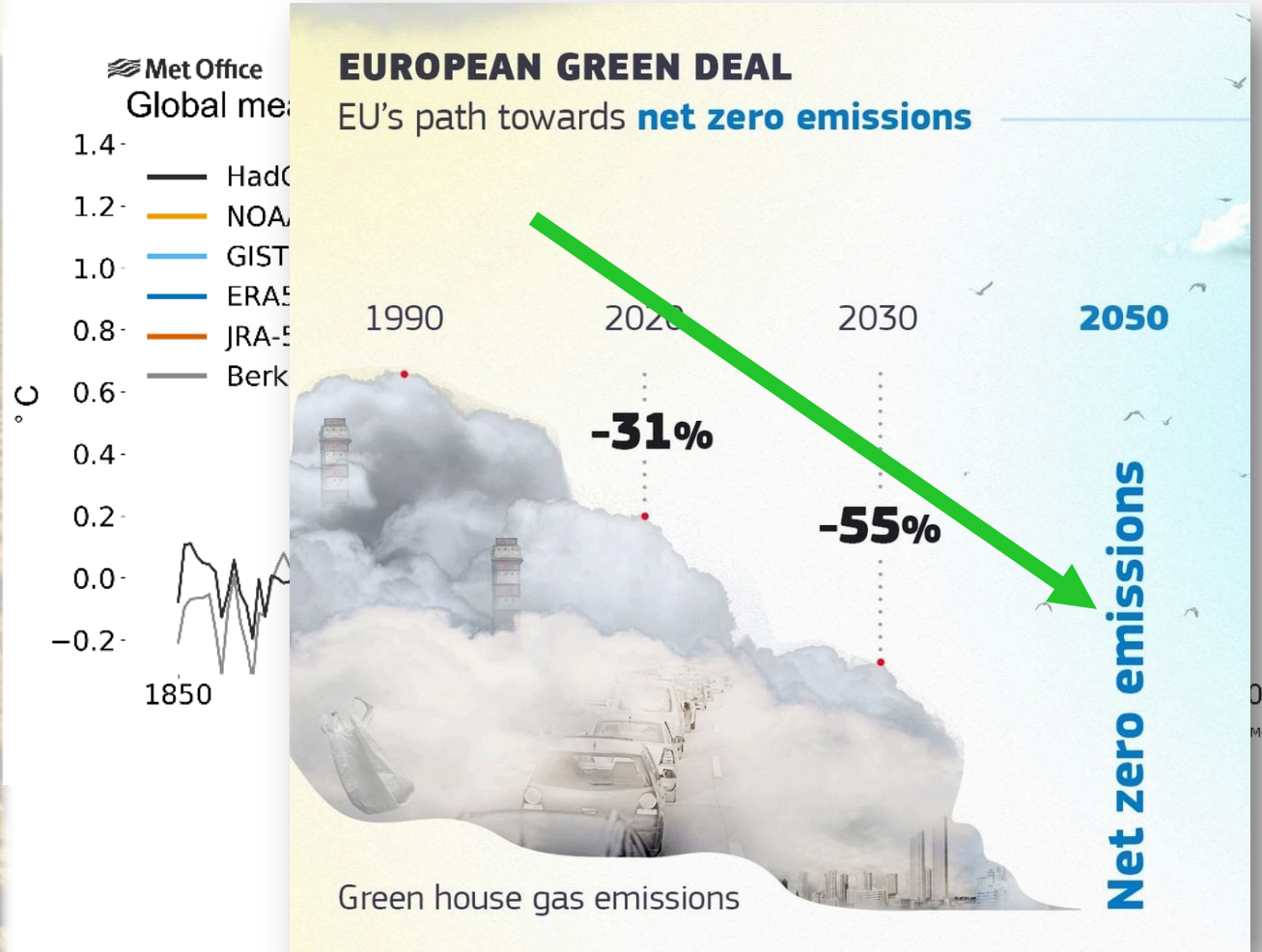
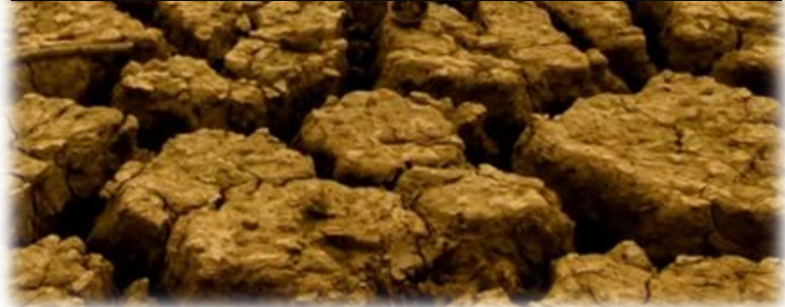
Index calves survival



End 2023/24

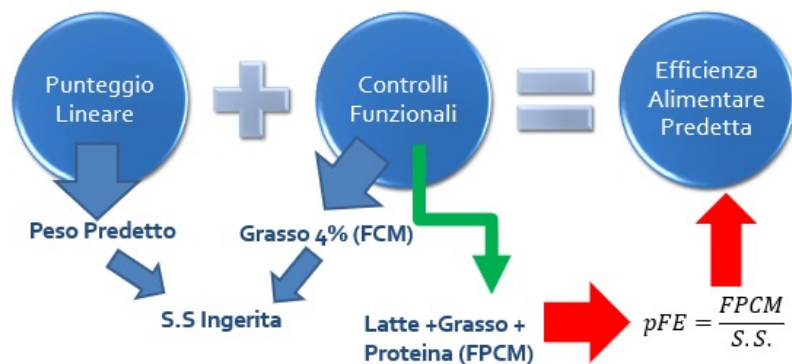


It was the hottest September in history +2.51 C° above average

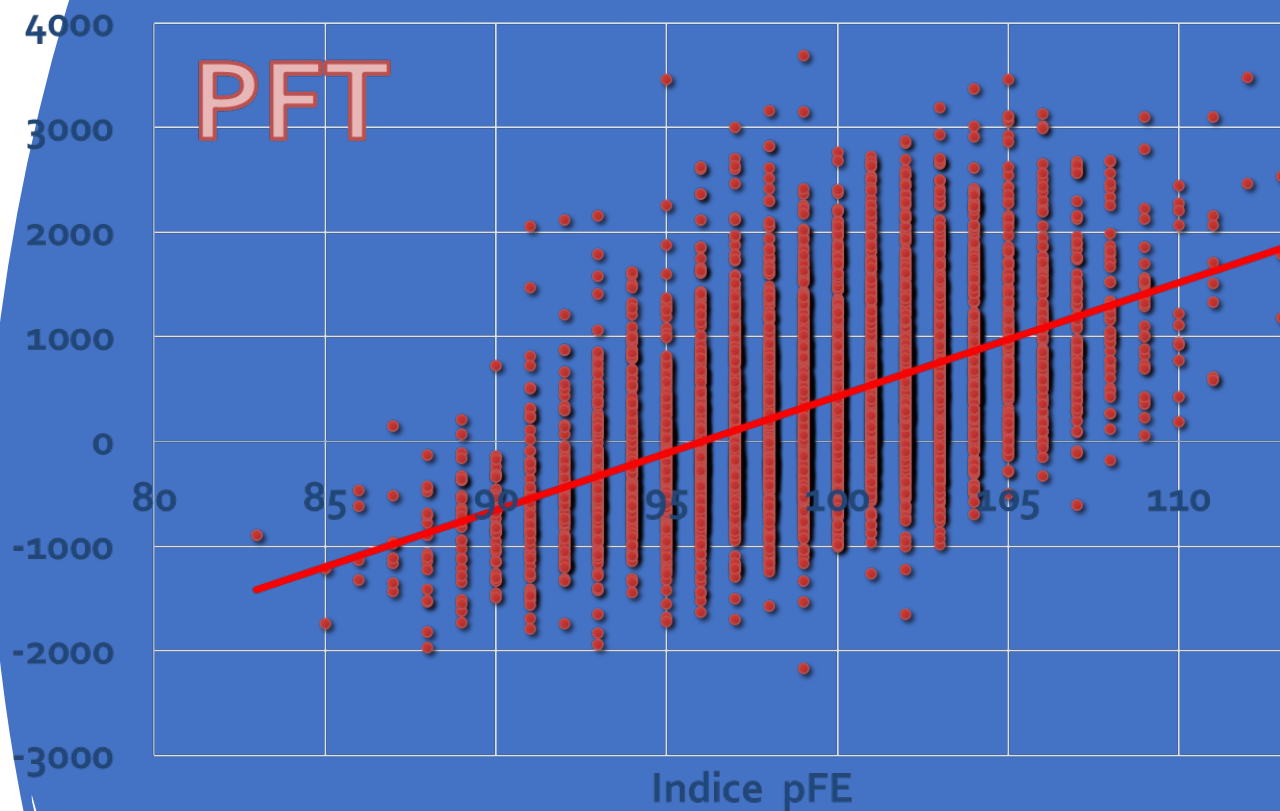


Feed Efficiency Index (pFE)

EFFICIENZA ALIMENTARE → Fenotipo predetto



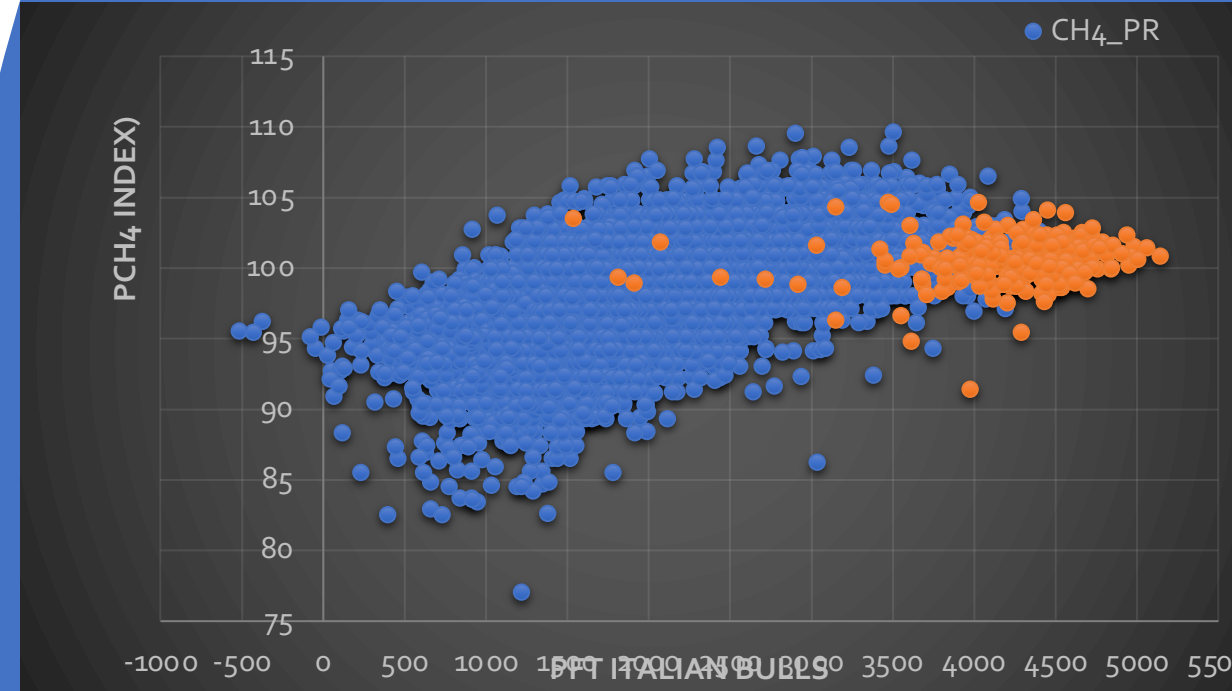
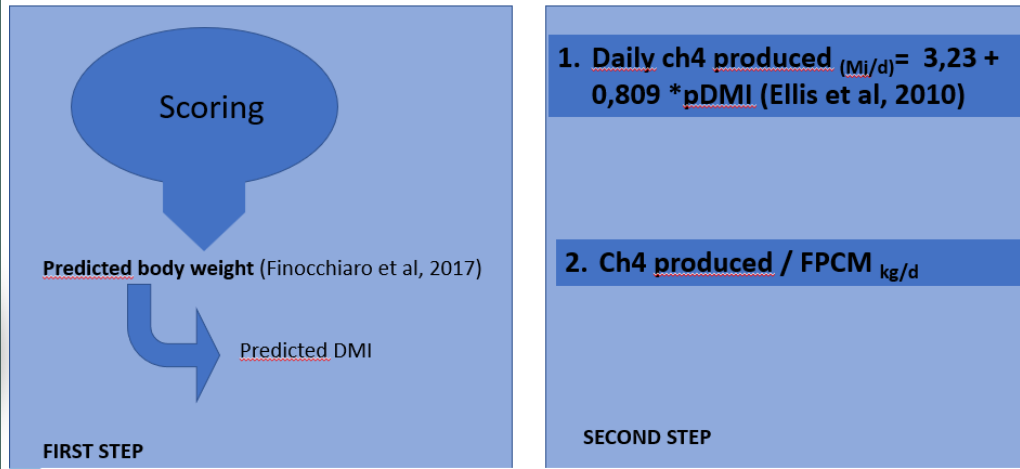
- ✓ pFE is the “trait” selection object for the Italian Friesian.
- ✓ The breeding objective (PFT) has identified efficient subjects. The introduction of a new, more direct “tool” in this direction will improve results.



Phenotypic trend for pFE and pCH4 in Italian Holstein cows



Methane Emission Index(pCH4)

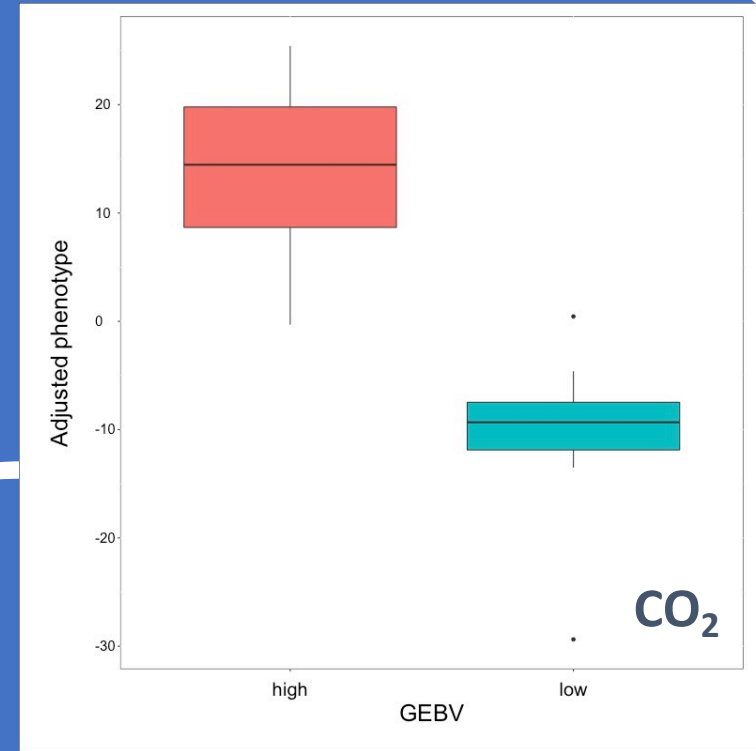
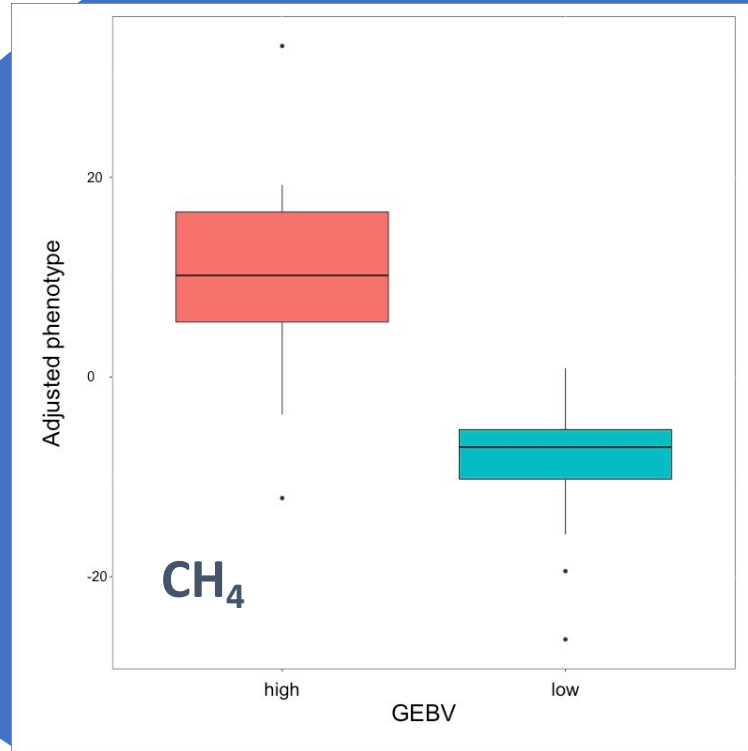


1) pCH4 heretitable 21%

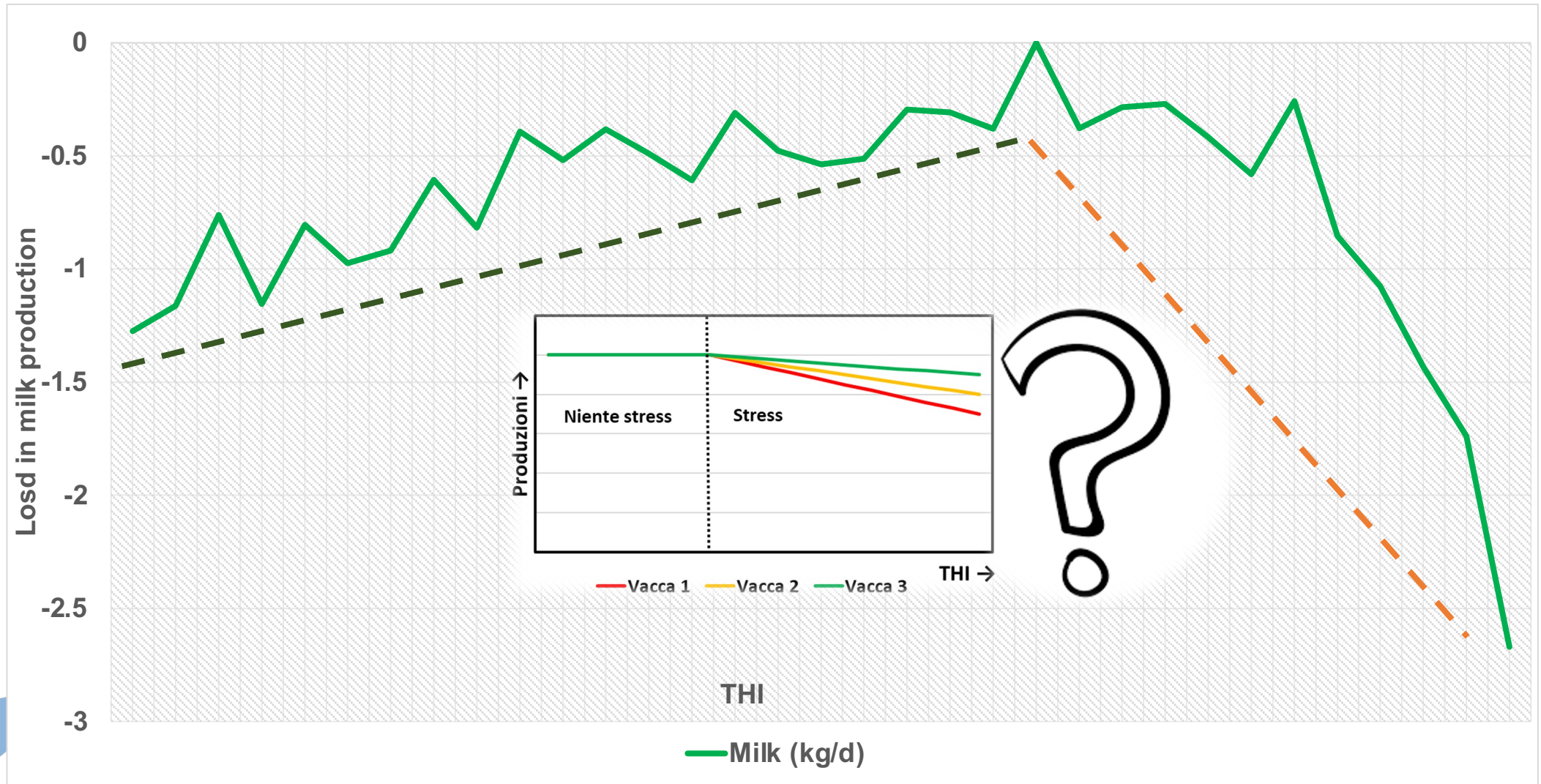
2) Genetic evaluation set-up

3) A new tool to be used for farmers..

BULLS @ ANAFIBJ Center – Good Perspective!



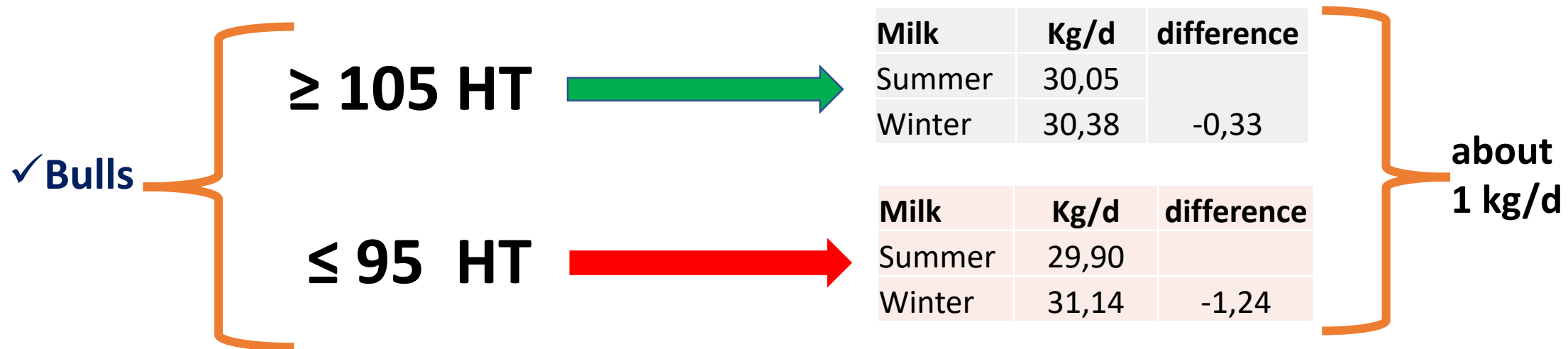
HEAT TOLERANCE – GENETIC EFFECT ?



Genetic Parameters heat tolerance

Trait	Genetic effect anim*THI	Permanent effect anim*THI	Genetic variability
Milk (kg/d)	-0,51	-0,40	0,16
Protein (kg/d)	-0,48	-0,47	0,13
FAT (Kg/d)	-0,42	-0,54	0,12
Protein (%/d)	-0,43	-0,51	0,37
FAT (%/d)	-0,50	-0,54	0,26

Resilient production for Heat tolerance: Bulls with > 1000 daughters





Conclusions

ANAFIBJ is working with this holistic approach
with the aim to offer to our members
selection tools updated to nowadays «world»
request

How to select all these traits?

Traditional selection indexes

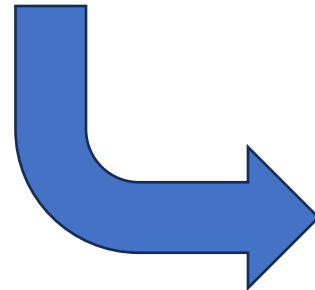


Economic Selection Index

$$I = b_1 EBV_1 + b_2 EBV_2 + \dots + b_n EBV_n$$

b = economic weight

EBV = genetic merit



Sustainability Index

A breeding tool for a greener future

Including new breeding goals



Selection Index

$$I = b_1 e_1 EBV_1 + b_2 s_2 EBV_2 + \dots + b_n EBV_n$$

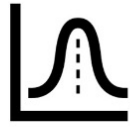
b = economic weight

EBV = genetic merit

e = environmental weight

s = social weight

Improve selection index efficiency



Different farmer typologies
favour different traits



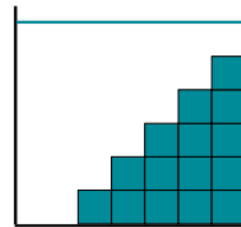
$$I = b_1 w_1 EBV_1 + \dots + b_n EBV_n$$

Non-linear functions

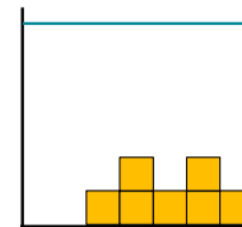


Combining tools

Genetic
Improvement



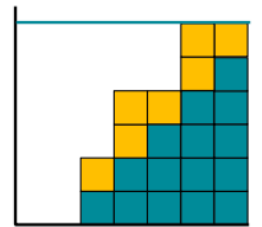
Management
Practices



+

=


Achieve
target



FAO Strategic Framework 2022-2031

“ ... supporting the transformation to **more efficient, inclusive, resilient and sustainable agri-food systems** for better production, better nutrition, a better environment, and a better life”

MORE HOLISTIC
Livestock System





Service for AI's



Herd-Book Office



R&D Office

raffaellafinocchiaro@anafibj.it
www.anafibj.it
+39 3356156186

your COW
our FUTURE

