

# IMPLEMENTATION OF EVALUATION FOR NOVEL TRAITS IN ITALIAN HOLSTEIN

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Consorzio Parmigiano-Reggiano – Dr. Nocetti

**Breeding for Efficiency 2018 EDGP Symposium – December 10, 2018**



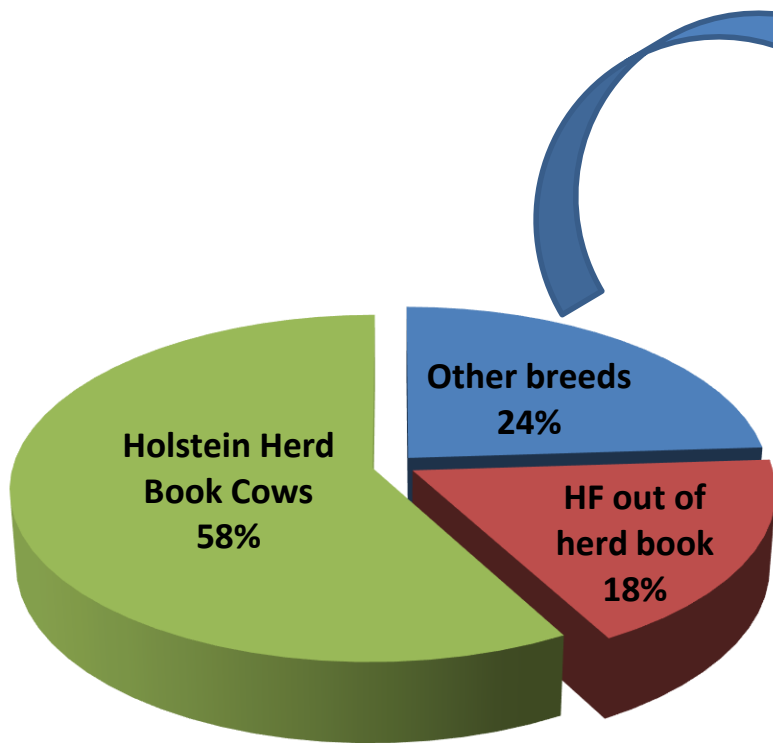
# Italian dairy «industry»

- Italy is warmer than most dairy countries
- Not good for grass
  - ... so no grazing
  - ... good for maize
- No grazing
  - ... Indoor
  - ... Concrete floor (no straw) ... tough conditions
    - ... natural selection on health!
- >70% Cheese production

# Dairy cows in Italy..



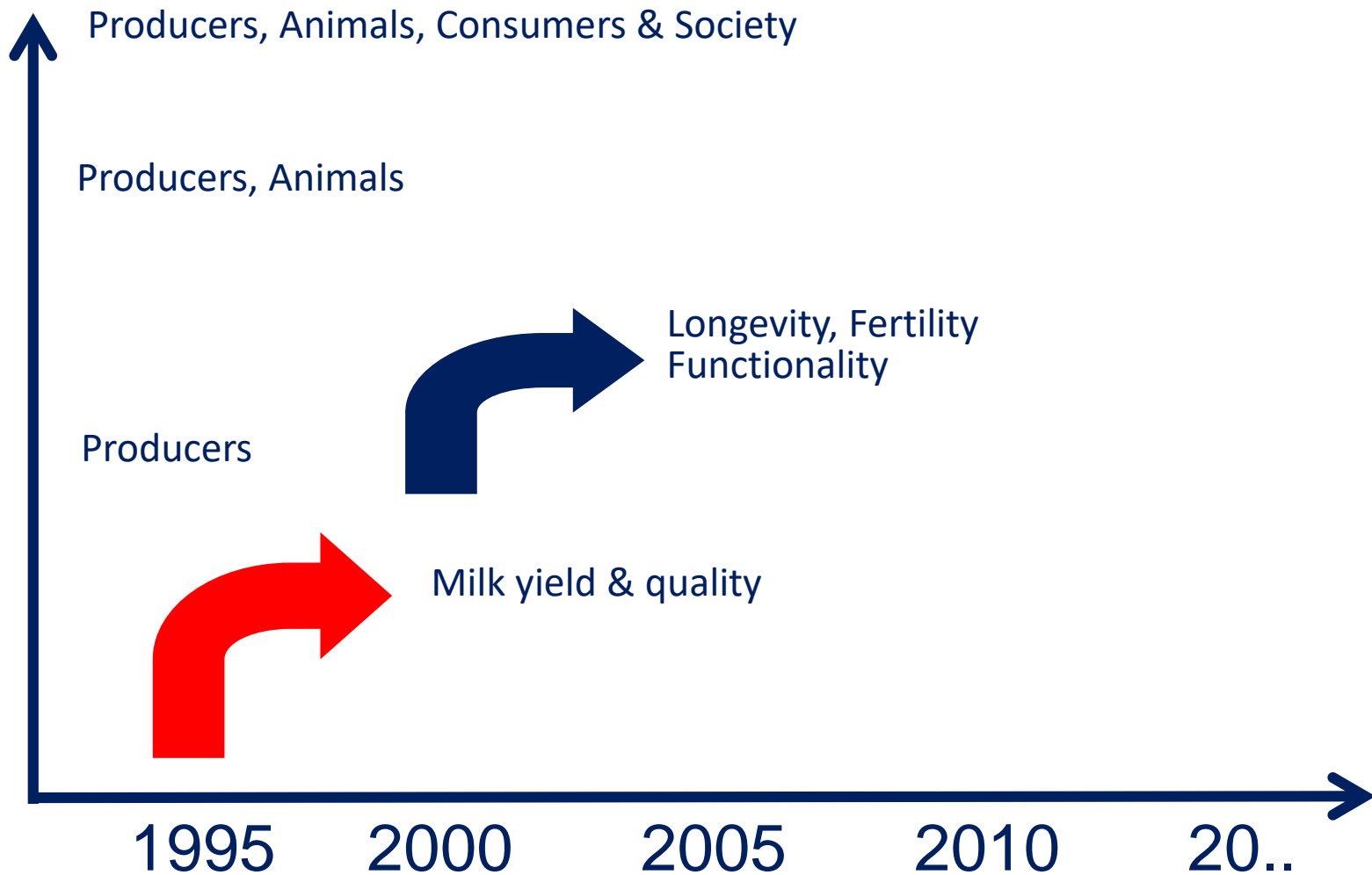
≈ 1,900,000 cows in Italy



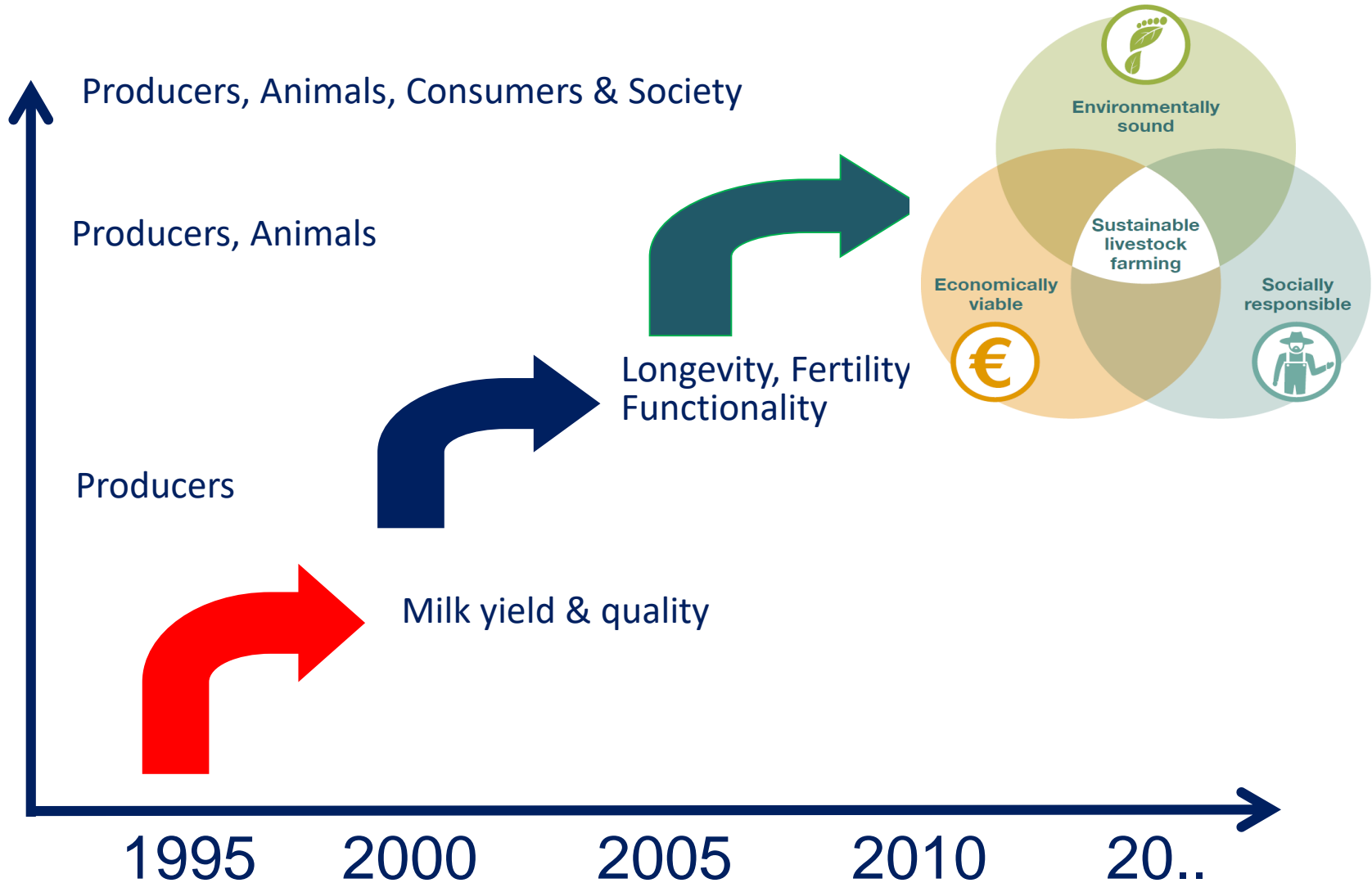
Breed	Cows
Brown Swiss	86,376
Simmenthal	62,755
Grigio Alpina	9,560
Jersey	7,275
Other breeds	34,139



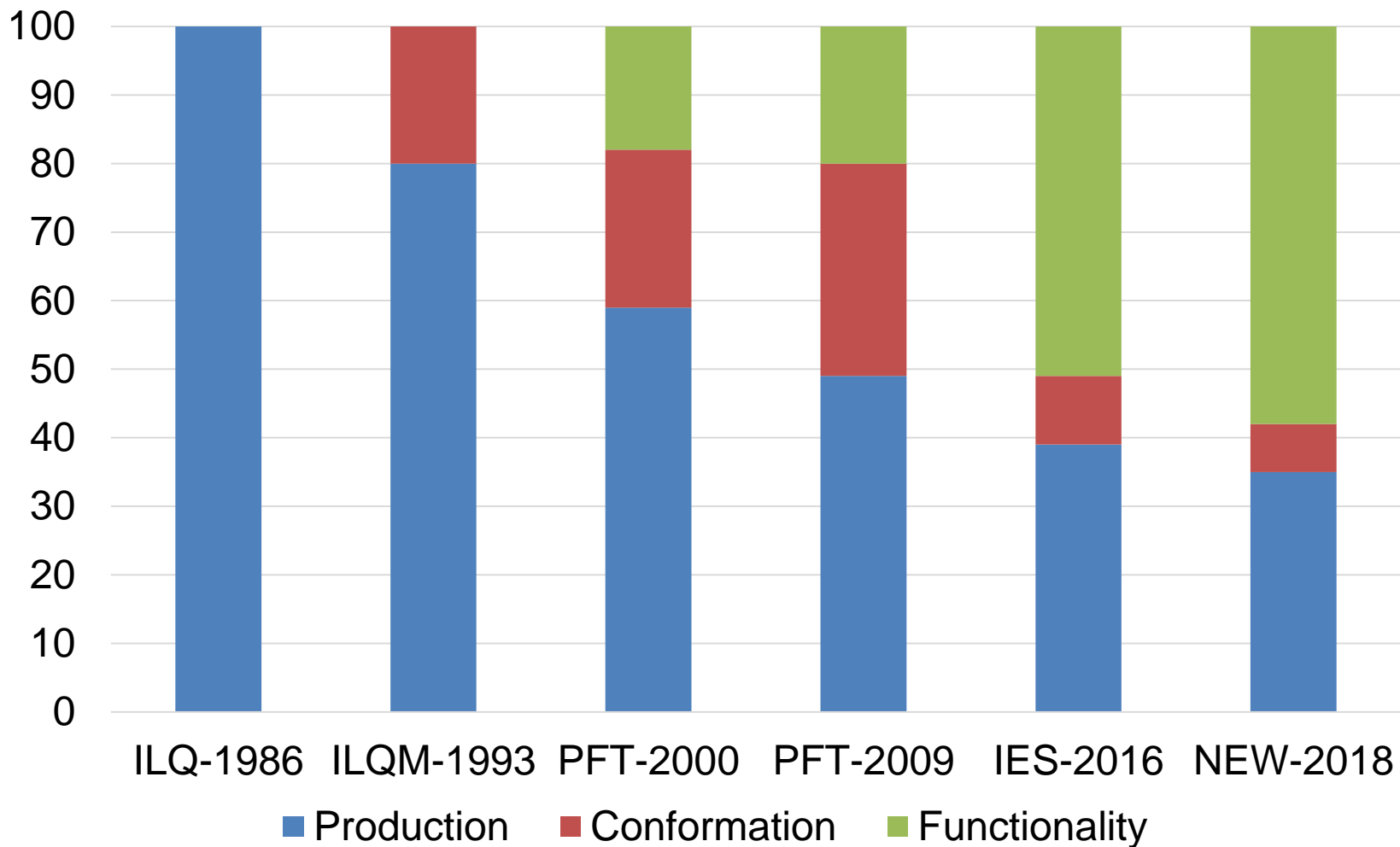
# Evolution of Selection Objectives for Dairy Cattle



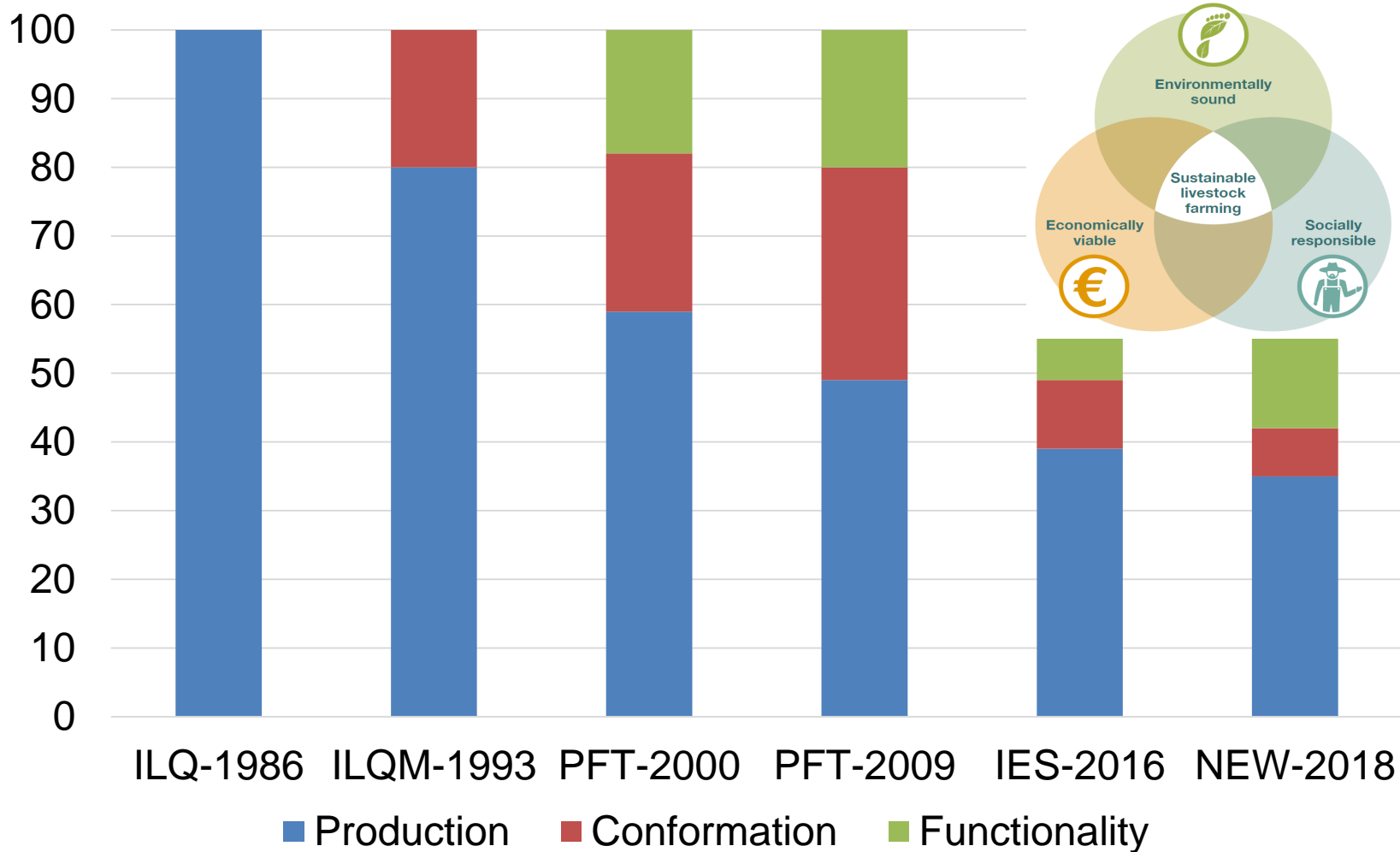
# Evolution of Selection Objectives for Dairy Cattle



# Italian Breeding System Evolution



# Italian Breeding System Evolution



# Sustainable selection models for dairy cows



**BIODIVERSITY** → Sustainable use of genetics diversity



Creation of bio-bank; Monitoring inbreeding & Study for genetic diversity

**HEALTH & WELL-BEING** → Ensure high standards in food chains



Mastitis, revision female fertility and ketosis Index

**ENVIRONMENTAL IMPACT** → more Ethical Breeding and with respect to the environment



Feed efficiency and GHG reduction index; Sustainable Cheese Index

RESULTS FOR  
producers

Accurate matings  
plans

New Index →  
more healthy and  
resistant animals

Sustainable  
livestock industry  
& improved farm  
profitability



# Genotypes & Phenotypes

- Increasead genotyping of females

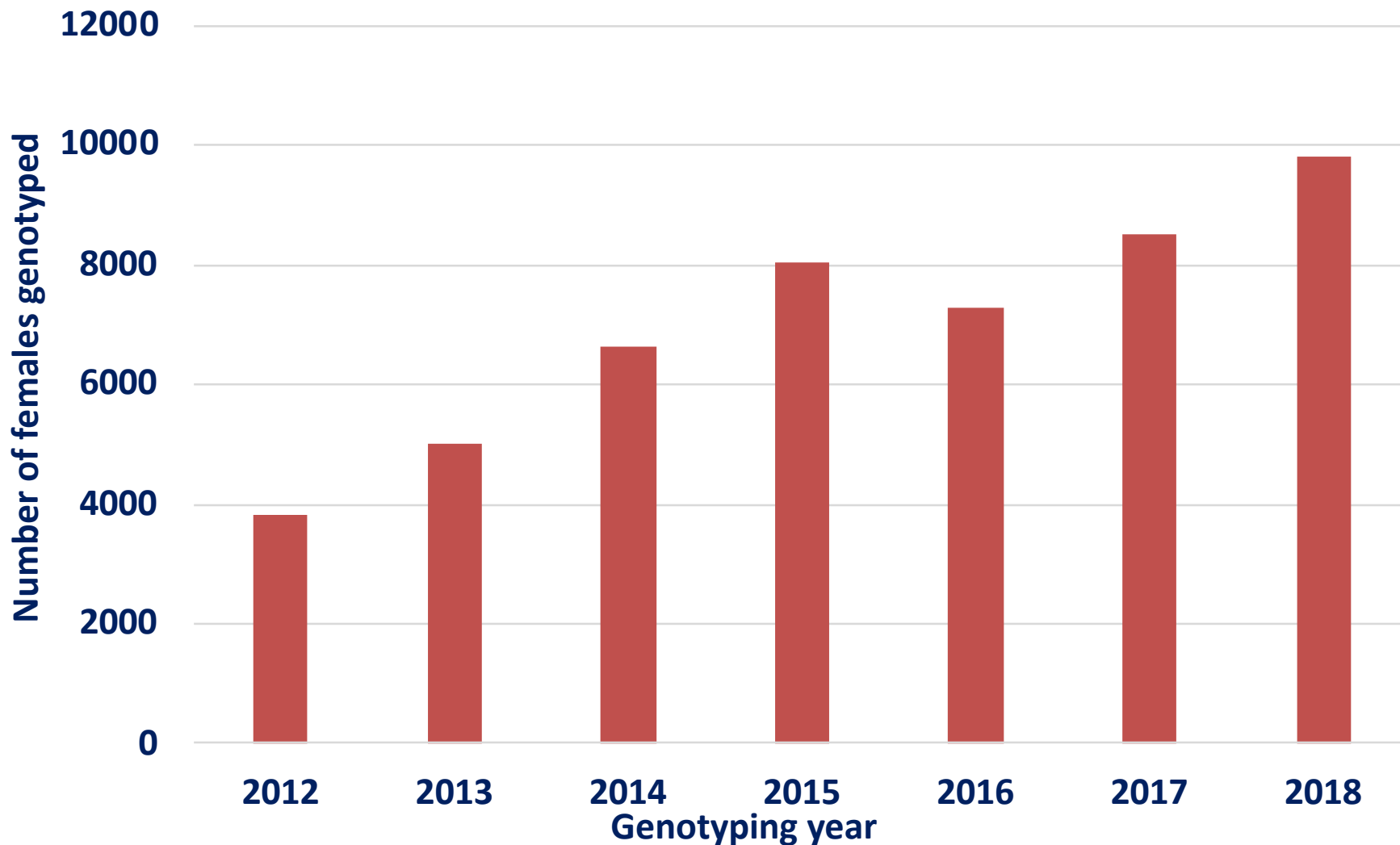
Year	Holstein	Jersey
2017	8000	400
2018	11000	400
2019	11000	400

- 360 males with HD panel
- In addition all the genotypes done by AI centers and by producers

Targetting farms that collect new sets of phenotypes

- **New Phenotypes:**
  - Pathologies (mastitis, metritis, laminitis...)
  - Lab data (BHB ...)
  - Experimental farms with individual recording systems (Feed intake & gas emission)
- **Farms within the national breeding system**
- **Max 150 heads per farm**
  - Heifers (1 year of age)
  - Cows

# Female Genotype trend

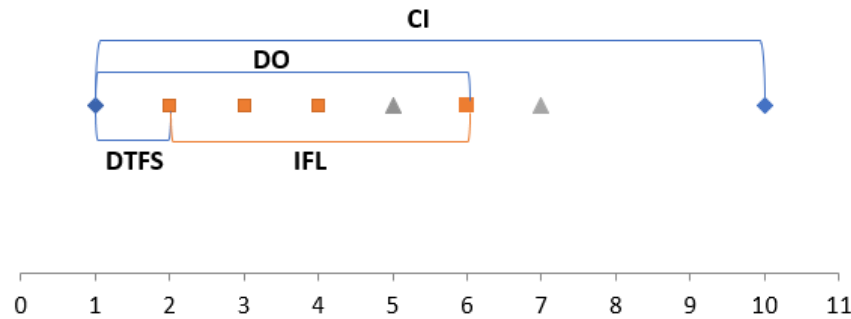




# Where are we now?

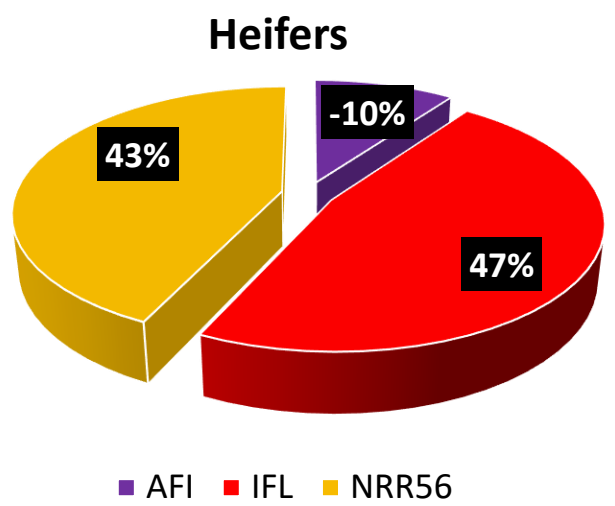
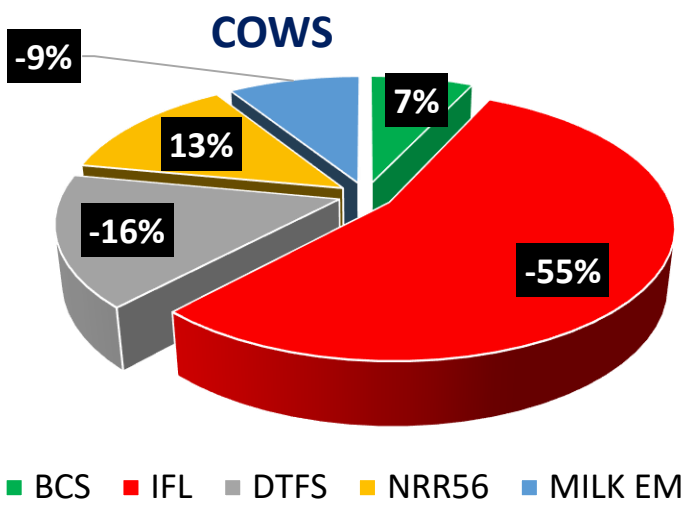
- 1. Udder Health Index – MST (December 2017)**
  - Index for Mastitis Resistance using indicators derived from test-day SCC
  - Higher genetic correlations between the breeding goal and the novel traits
- 2. Revision of Female Fertility Index (December 2018)**
  - Maximize the conception rate (CR) at the first service of the cows: first insemination = pregnancy!
  - Inclusion of new traits and use pregnancy diagnosis
- 3. Sustainable Cheese Index (December 2018)**
  - To select bull's daughters which maximize farm profit for those farms aimed at hard cheese production (Parmigiano Reggiano area mainly)
  - It shows how many €, estimated in the entire productive lifetime, will gain the use of a bull in comparison with the average population
- 4. Feed Efficiency and Methane Emission Reduction project in progress (December 2019 – first release)**
  - Phenotype collection (equipment installation and experiments set-up)
  - Setting up of a predicted breeding value

# Female Fertility index: new info



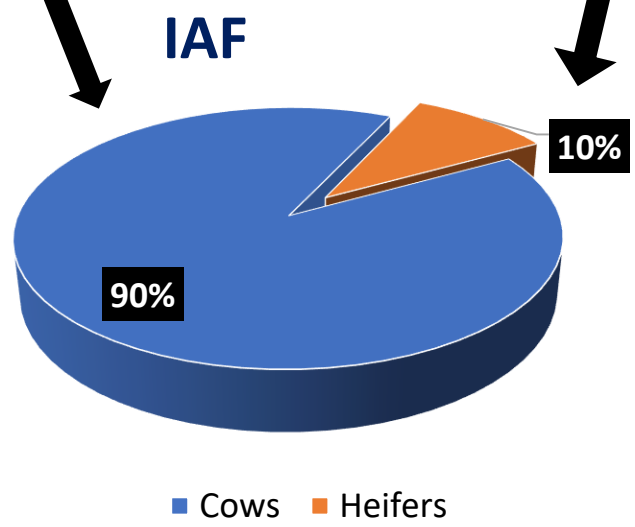
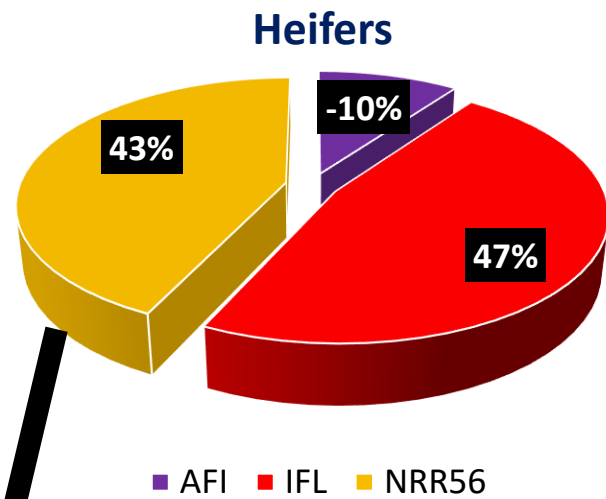
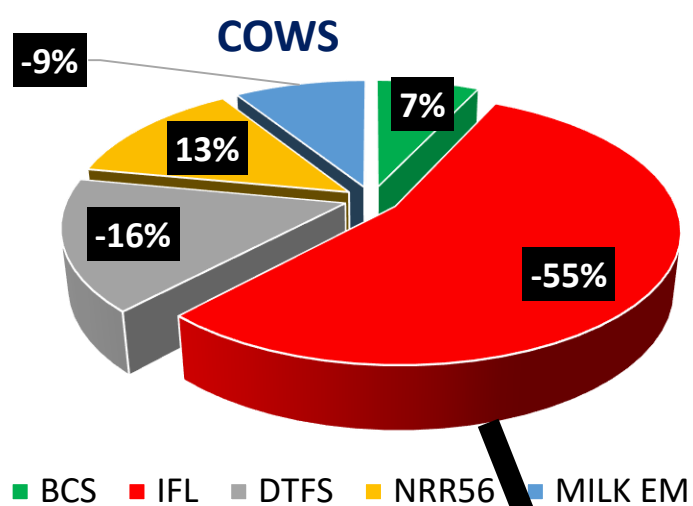
Traits	Mean±SD	h <sup>2</sup>	r <sub>x;CR</sub>
IFL (d) –days to first-last insemination	71±86	4,2%	-89%
DTFS (d) –days to first service	88±42	7,6%	-30%
NRR56 (%) – no return rate	59±49	1,3%	77%
BCS	2,99±0,47	18%	28%
Milk EVM (kg)	10,49±2169	29%	-29%

# Female Fertility Index included Heifers info



**Other countries:** Switzerland, Czech Republic, France, The Netherland, USA, Canada, Austria, DFS, Poland

# Female Fertility Index has also Heifers info





# Sustainable Cheese Index

- Selection to maximize farm profit for those farms participating to hard cheese production (Parmigiano Reggiano area mainly)
- Being sustainable and therefore fully integrated into the ethical, socio-economic and environmental context
- Consider the new regulatory guidelines in breeding (ex: animal health and welfare, antibiotic reduction, etc.) and profitable for the breeder
- Important to identify **COSTS** and **REVENUES**



# Revenues & Costs for entire animal lifetime

## Revenues

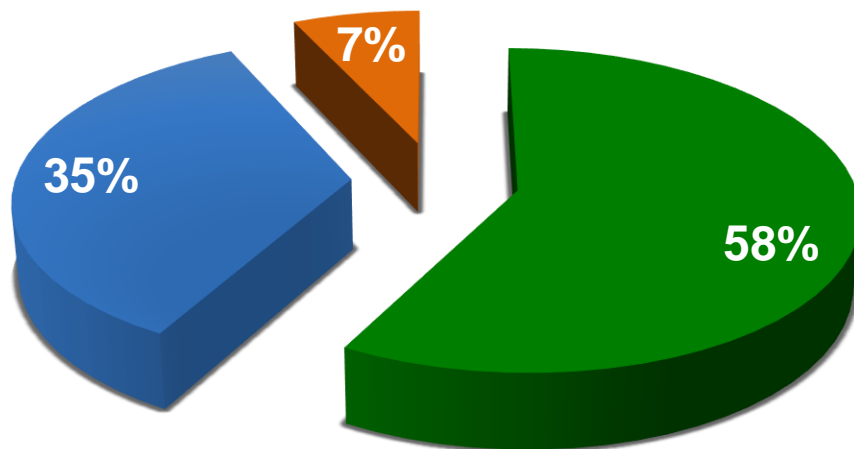
- €/kg Cheese
- €/kg Cream
- €/kg Serum
- Animal Value at end career
- Contents to consider in cheese yield: (fat, prot, SCC) ... protein polymorphism (κ-casein)

## Costs

- Heifer costs production
- Cow costs - Maintenance
- Cow costs -Production
- Feed costs DMI derived
- Somatic Cells (penalty)
- Mastitis
- Fertility
- Fertility Female calving
- Milk transport costs
- Labour cost
- Heifer costs – First insemination
- Cheese production costs

€ produced - € spent = PROFIT career

# Sustainable Cheese Index



- Functionality
- Production
- Conformation

Production	
Kg Fat	5
Kg Protein	30

Conformation	
Stature	-2
Locomotion	3
Udder Depth	2

Functionality	
SCC	14
Calving ease	9
Longevity	10
Mastitis	5
Fertility	20

# The Italian Holstein in 10 years time

Length of productive career (d)	Cheese produced in career (kg)	Index
987 (3,2 Lactations)	2861,51	PFT
1034 (3,4 Lactations)	2890,89	IES
<b>1024 (3,4 Lactations)</b>	<b>2945,20</b>	<b>New Index</b>

- Select towards **functional animals**
- Identify **EFFICIENT** animals and therefore with **less environmental impact**
- Select towards animals **more profitable for the breeder**
- Importance of weight for cells and MST for **antibiotic reduction**

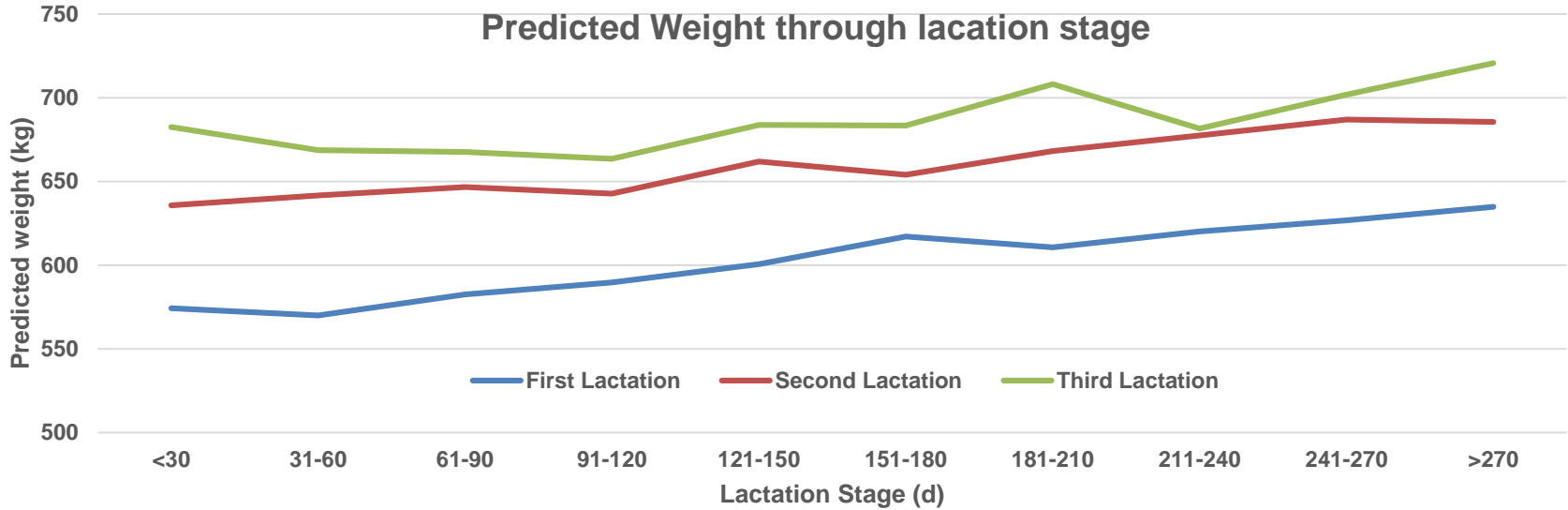


# Italian Holstein → Efficiency

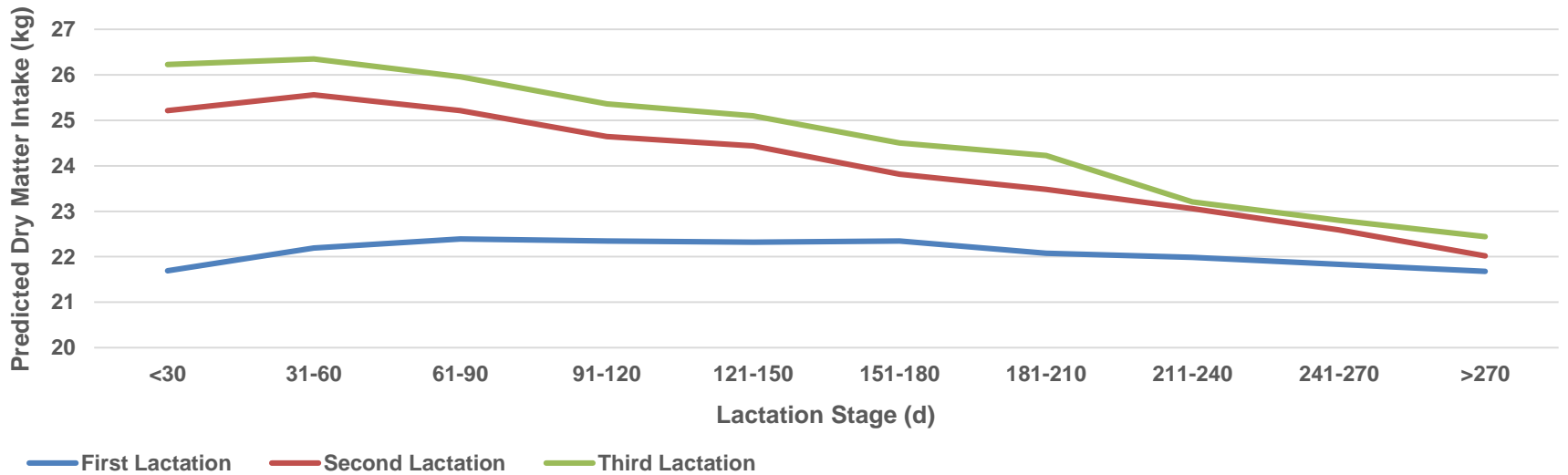


- Prediction equation for Live Weight, developed algorithm to predict live weight (based on real weight and type traits)
- Currently setting up breeding value estimation for Feed Efficiency by means of indirect traits
- Ongoing experiments for Individual Feed Intake and Methane emission
  - Data for individual **cows and heifers** feed intake (RIC system) and CH<sub>4</sub> (LMD)
  - Individual **young bulls** feed intake (RIC system) and Gas Emissions (GF + LMD)

### Predicted Weight through lactation stage



### Predicted DMI through lactation stage





# Expensive Phenotype ..

- National Associations need to contract experimental farms ...and maximize the use of the young bull ...

# Expensive Phenotypes...Genetic Center ANAFI

Green Feed



- For each bull passing the GC for a period of 20 days the following phenotypes are collected:

- All Bulls are genotyped 800 K

- Biometric data 3 times (live weight, BCS, height at withers and girth)

- Feces are collected 3 times

- Chemical analysis through the use of NIRS FOSS DS-2500 technology (SS%; NDF%; ADF%; ADL%; Ceneri%; uNDF (% SS); uNDF; (% NDF); ADLom)

- Unifeed analyzed every month for dry matter

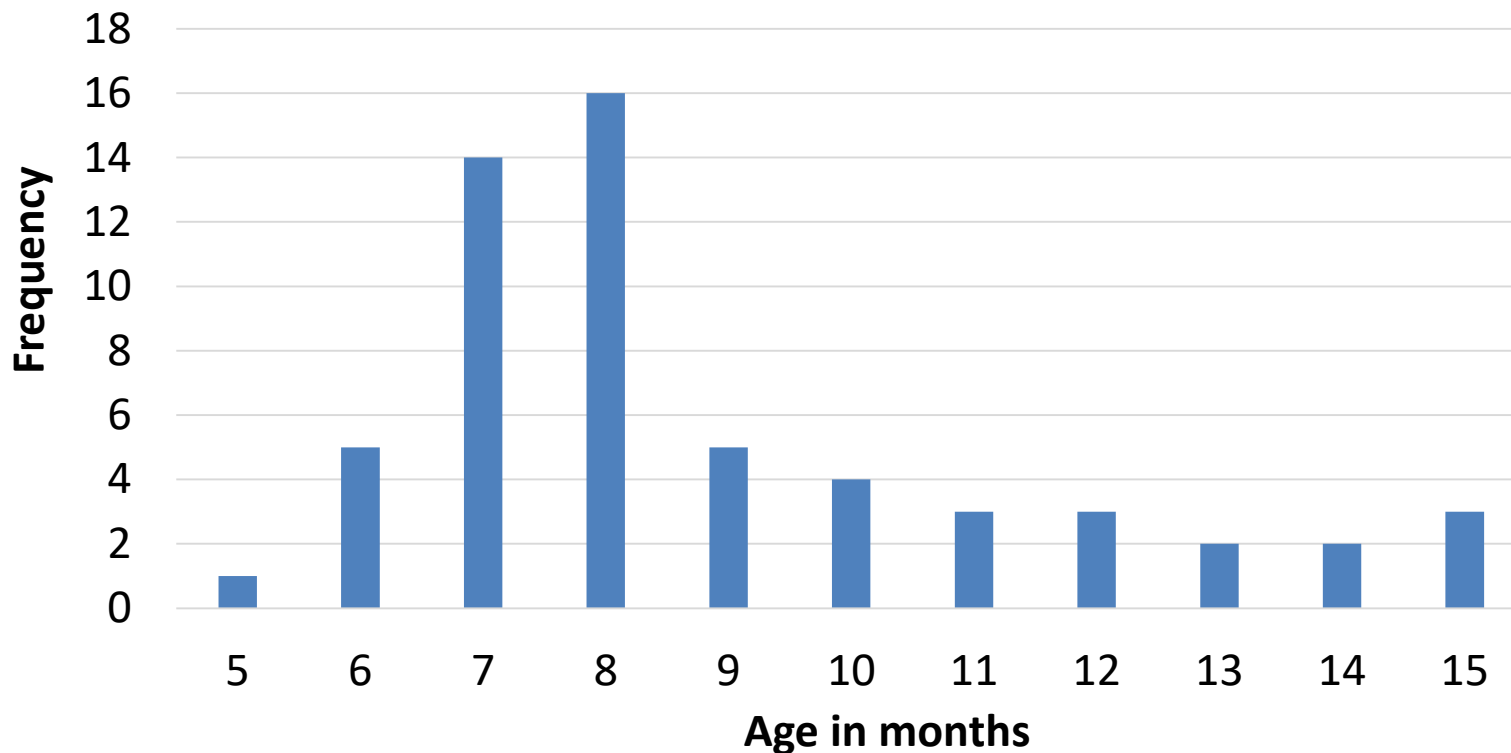
RIC system



# Individual Phenotypes... CG



- Since April 2018 we measured almost 70 bulls





# Expensive Phenotypes ...UNIMI

Cows and Heifers (60 heads)

- Individual feed intake (RIC system) and CH<sub>4</sub> emission (LMD)
- Genotypes: 33k or 50k panel including royalty for beta-casein
- Biometric data every week (live weight, BCS, height at withers and girth)
- Milk yield and contents (fat, protein, lactose, SCC, BHB)
- Feces are collected 3 times
  - Chemical analysis through the use of NIRS FOSS DS-2500 technology (SS%; NDF%; ADF%; ADL%; Ceneri%; uNDF (% SS); uNDF; (% NDF); ADLom)
- Rumen Samples → rumen flora scoop
- Unifeed analyzed every month for dry matter



# Aknowledgments

- Thanks to EDGP for the kind invitation
- ANAFI group and all the collaboration groups:
  - University of Milan
  - University of Bologna
  - University of Padova
  - University of Parma
  - Consorzio del Parmigiano Reggiano
  - All the farmers!!