



# A HOLISTIC APPROACH FOR MONITORING THE ENVIRONMENTAL SUSTAINABILITY OF THE ITALIAN HOLSTEIN POPULATION



75th EAAP Annual Meeting  
**Florence – Italy**

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A. Bracchi, G. Bonacina, M. Zucali, G. Gislou, M. Cassandro*

# INTRODUCTION

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- Methane from enteric emissions contribute to ~50% (0.58 kg CH<sub>4</sub> per kg FPCM) of total greenhouse gas emissions from milk production (*FAO, 2018; Vidican, 2023*)
- Methane (**CH<sub>4</sub>**) and carbon dioxide (**CO<sub>2</sub>**) emissions are **heritable**, enabling genetic selection for reduction (*Cassandro et al., 2010; Breukelen, 2023*)
- National **breeding programs** can significantly **reduce GHG** emissions
- Phenotypes currently collected by universities, research centers, associations, and private companies worldwide

# ANAFIB OBJECTIVES

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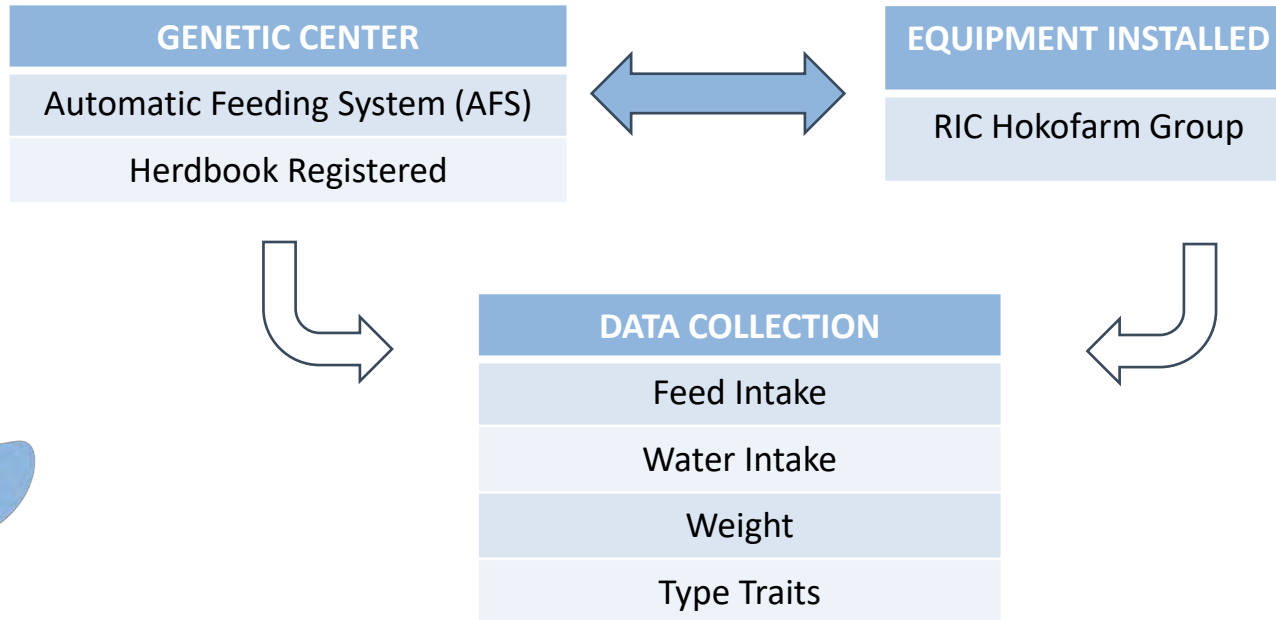
- **Collect GHG Emissions Data:**
  - Greenfeed®
  - Moologger®
- **Collect Novel Data** for Innovative Traits:
  - Milk Spectra Records (MIR)
  - Data Validation of Proxies
- **Develop Tools and Services:**
  - Reports for Farmer
- Establish **Genomic Evaluations:**
  - Incorporate Innovative Traits



# BEEF/BEEF ON DAIRY

## MATERIALS AND METHODS

A partnership of Italian breeding companies, universities, and research centers to **evaluate** and **understand** the methods and **applications**



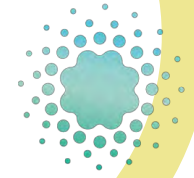
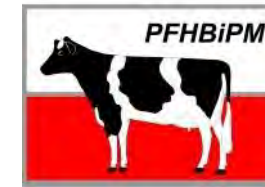
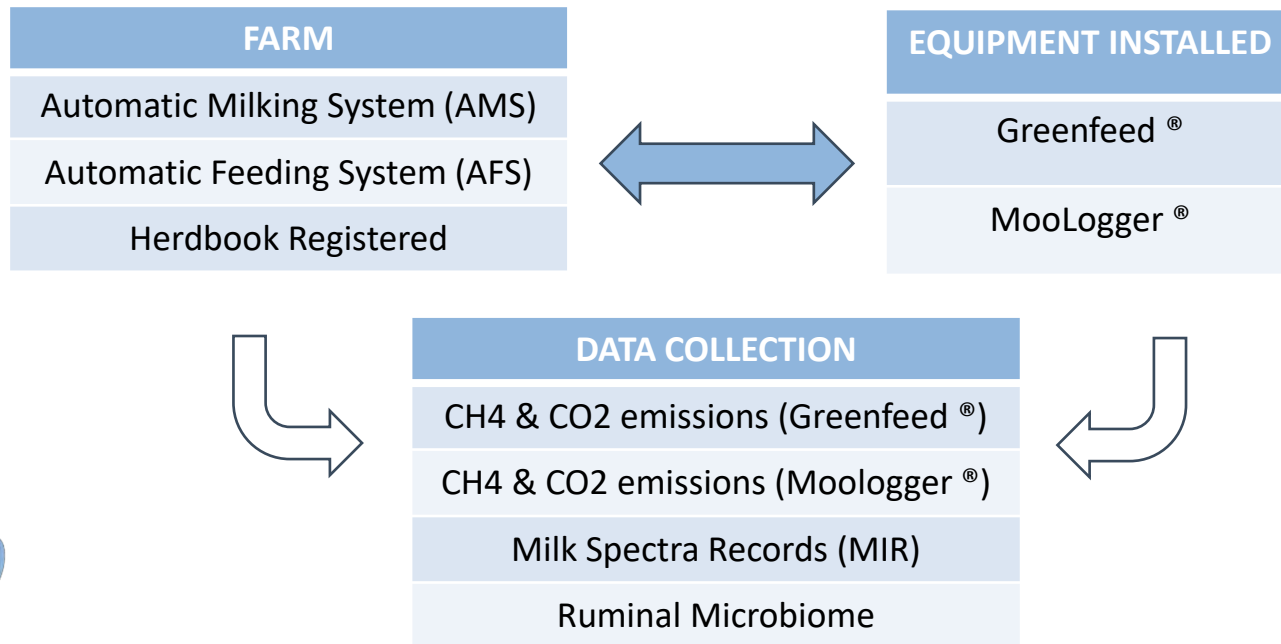
your COW  
our FUTURE



# GREENHOUSE GAS PROJECTS

## MATERIALS AND METHODS

A partnership of Italian breeding companies, universities, experimental farms, research centers, and private companies focused on **phenotype** collection, **research**, and **standardization**



Global Methane Hub



### ISC



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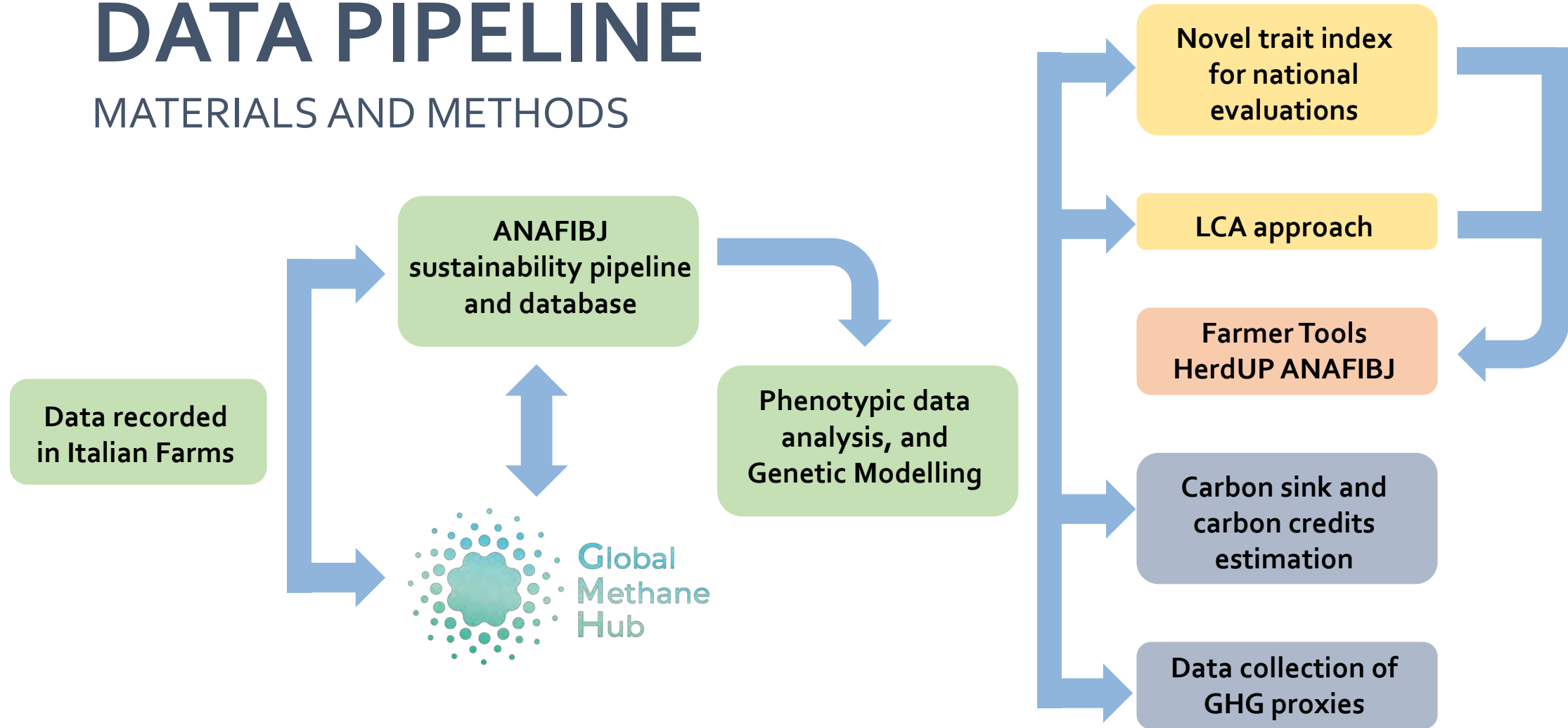
ALMA MATER STUDIORUM UNIVERSITÀ DI BOLOGNA





# DATA PIPELINE

## MATERIALS AND METHODS

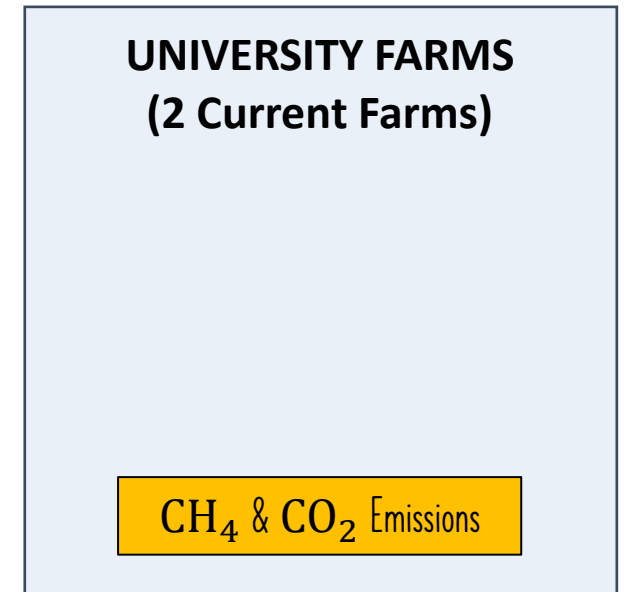
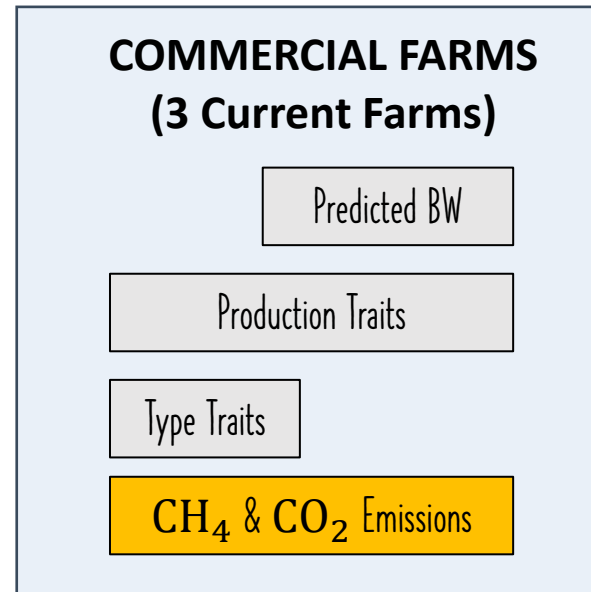
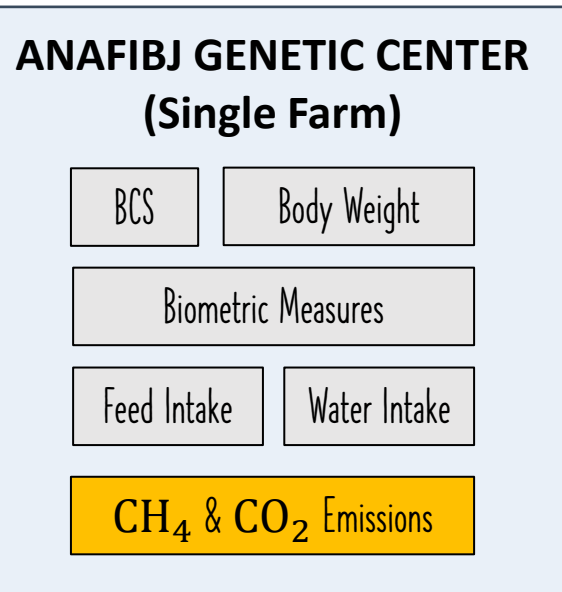


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# PHENOTYPE COLLECTION

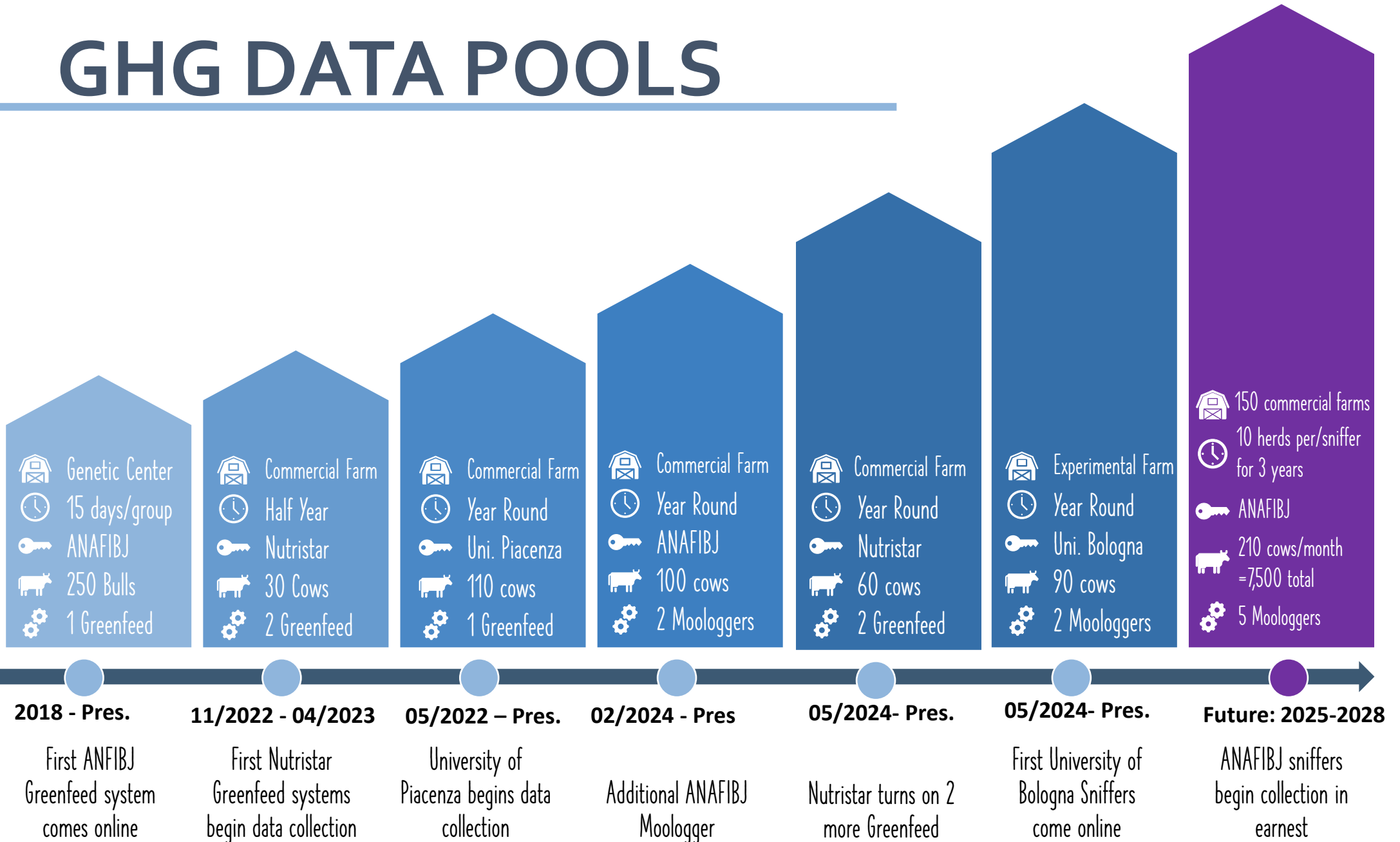
## MATERIALS AND METHODS

Collection of **methane, carbon dioxide** emissions, **feed intake, MIR,** and **water intake** data on **Italian Holstein young bulls and commercial cows** in Italy.





# GHG DATA POOLS



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our **FUTURE**





# GEBV of Novel Traits



## FUTURE RESULTS

Genetic correlations between feed intake and GHG emissions measured on young bulls with production and reproduction traits measured in Italian Holstein cows  
*F. Tiezzi, R. Finocchiaro, L. Benzoni, J. T. Van Kaam, M. Marusi, R. Bozzi, M. Cassandro*

- ~ 250 bulls
- Currently 3 new traits:
  - Feed Efficiency
  - CH<sub>4</sub> Emissions
  - CO<sub>2</sub> Emissions
- Current Single Trait ssGBLUP Model:
  - $y = \text{DOB} + \text{AGE} + \text{CG} + \text{ag} + \text{pe} + \text{date} + e$
- Future evaluations will correlate production traits with all new sustainability traits.

# HerdUP Farmer Tool

## RESULTS

Development of a Simplified Tool for Assessing Climate Change Impact in Dairy Cattle Farms

G. Gislon, M. Zucali, V. Ferrari, M. Marusi, A. Sandrucci, A. Tamburini, S. Mondini, R. Finocchiaro, M. Cassandro

		Parametri	Default	Simulazione
Total UAA (Utilised agricultural area)	<input type="text" value="0"/>			
Biogas	<input type="radio"/> Si <input checked="" type="radio"/> No	Reference year	2024	
Organic Farm	<input type="radio"/> Si <input checked="" type="radio"/> No	Daily milk yield of current cows (kg/d)	35,62	<input type="text" value="40,00"/>
Amount of hay in the ration (kg/d)	<input type="text" value="12,3"/>	Estimated annual herd milk production (q/year)	78007,80	87600,00
Amount of soybean meal in the ration (kg/d)	<input type="text" value="3"/>	Fat (%)	3,72	
Total feed quantity (kg/d)	<input type="text"/>	Protein (%)	3,40	
Amount of protein concentrate in the ration (kg/d)	<input type="text"/>	Cows (lactation + dry) (n)	600	<input type="text"/>
Total dry matter intake per day	<input type="text" value="27"/>	Heifers > 12 mo (n)	246	<input type="text" value="300"/>
<input type="button" value="Elabora"/> <input type="button" value="Chiudi"/>		Heifers between 12 and 6 mo (n)	184	<input type="text" value="200"/>
		Female calves < 6 mo (n)	110	<input type="text" value="150"/>
		Age at first calving (mo)	23,49	<input type="text"/>
		Average IES (Economic Sustainability Index) (Average of last 5 years)	325	
		Average Predicted Methane Emission Index	101	
		Herd milk yield sold/LU (livestock units)	8200,99	8588,24
		Pregnant cows at 120 d (%)	65	<input type="text" value="70"/>
		Herd environmental impact (CO2/milk kg)	1,76	1,70



# ITALIAN HOLSTEIN YOUNG BULLS: GREEN PASSPORT

## FUTURE RESULTS

ANAFIBJ Associazione Nazionale Allevatori della Razza Frisona, Bruna e Jersey Italiana

### Bull Functionality and Environmental Impact Report

- **REPORT DATE:** 09/05/2024
- **MATRICOLA:** DE000364299796
- **DATE OF BIRTH:** 20/01/2022
- **GENETIC CENTER NUMBER:** 1681
- **CFA:** 9900834

#### • Methane Emissions:

- Mean Daily Production: 232.46 (g/day)
- Average daily for the population: 237.45 (g/day)

#### • Feed Intake:

- Mean Daily Production: 6.79 (kg/day)
- Average daily for the population: 8.81 (kg/day)

#### • Water Intake:

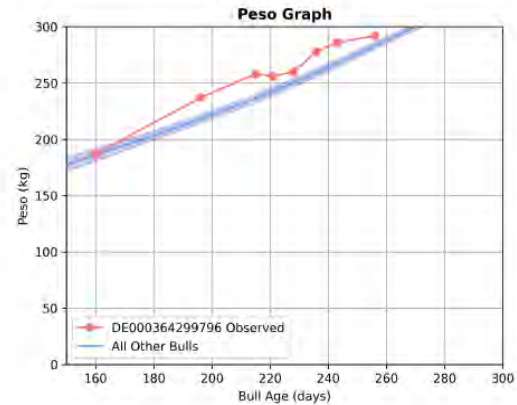
- Mean Daily Production: 16.05 (kg/day)
- Average daily for the population: 20.44 (kg/day)

ANAFIBJ Associazione Nazionale Allevatori della Razza Frisona, Bruna e Jersey Italiana

### Growth Report- Weight

Matricola: DE000364299796, Genetic Center Number: 1681

Data pesata	Eta toro (giorni)	Peso (kg)	Peso stimato (kg)	ADG (kg/giorno)
03-10-2022	256	292.0	237.65	0.46
20-09-2022	243	286.0	228.12	1.14
13-09-2022	236	278.0	222.99	2.25
05-09-2022	228	260.0	217.12	0.57
23-08-2022	215	258.0	207.6	1.11
04-08-2022	196	237.0	193.67	1.39
29-06-2022	160	187.0	167.28	-

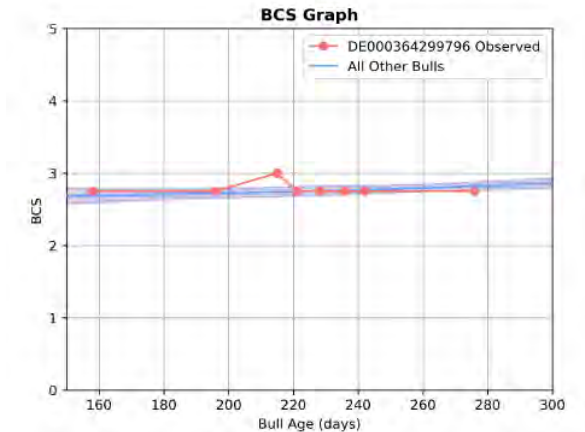


ANAFIBJ Associazione Nazionale Allevatori della Razza Frisona, Bruna e Jersey Italiana

### Growth Report- BCS

Matricola: DE000364299796, Genetic Center Number: 1681

Entry Date	Eta toro (giorni)	BCS
23-10-2022	276	2.75
19-09-2022	242	2.75
13-09-2022	236	2.75
05-09-2022	228	2.75
29-08-2022	221	2.75
23-08-2022	215	3.0
04-08-2022	196	2.75
27-06-2022	158	2.75



# CONCLUSIONS

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- **Crucial Data Collection Pipeline**
  - **Enhanced data collection** in **commercial farms**
  - Large database of sustainability traits crucial for developing national inventory of (direct and proxy) phenotypes
  - **Vital** for establishing **genetic evaluations**
- **LCA** is a key-tool to perform high-quality **technical assistance** using an holistic approach (nutritional, genetic, agronomic...).

# Thanks!



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