



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



75th EAAP Annual Meeting
Florence – Italy

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INTRODUCTION

- Methane from enteric emissions contribute to ~50% (0.58 kg CH₄ per kg FPCM) of total greenhouse gas emissions from milk production (*FAO, 2018; Vidican, 2023*)
- Methane (**CH₄**) and carbon dioxide (**CO₂**) 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

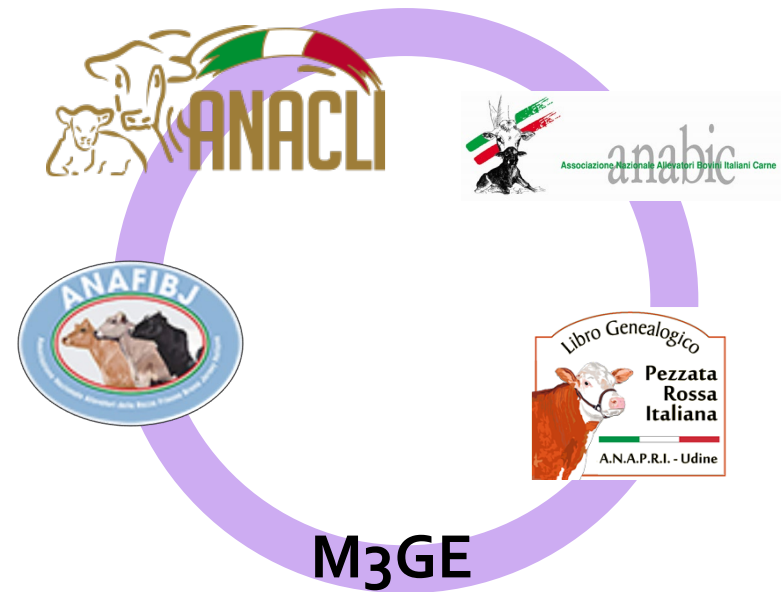
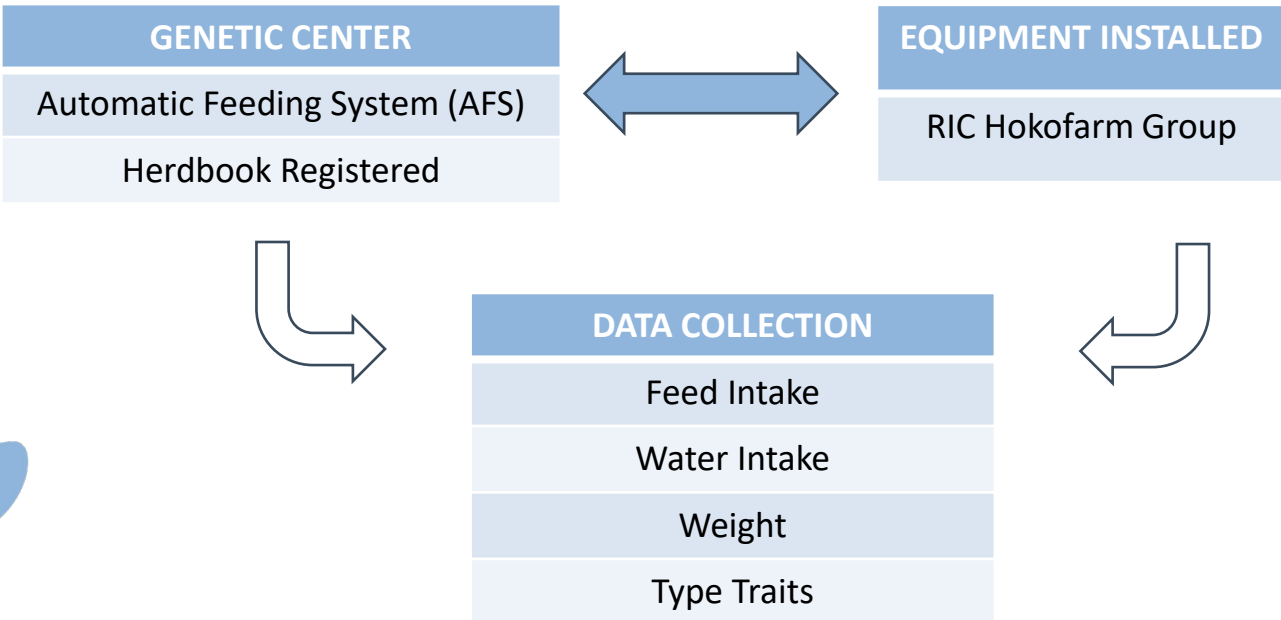
ANAFIBJ OBJECTIVES

- **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**

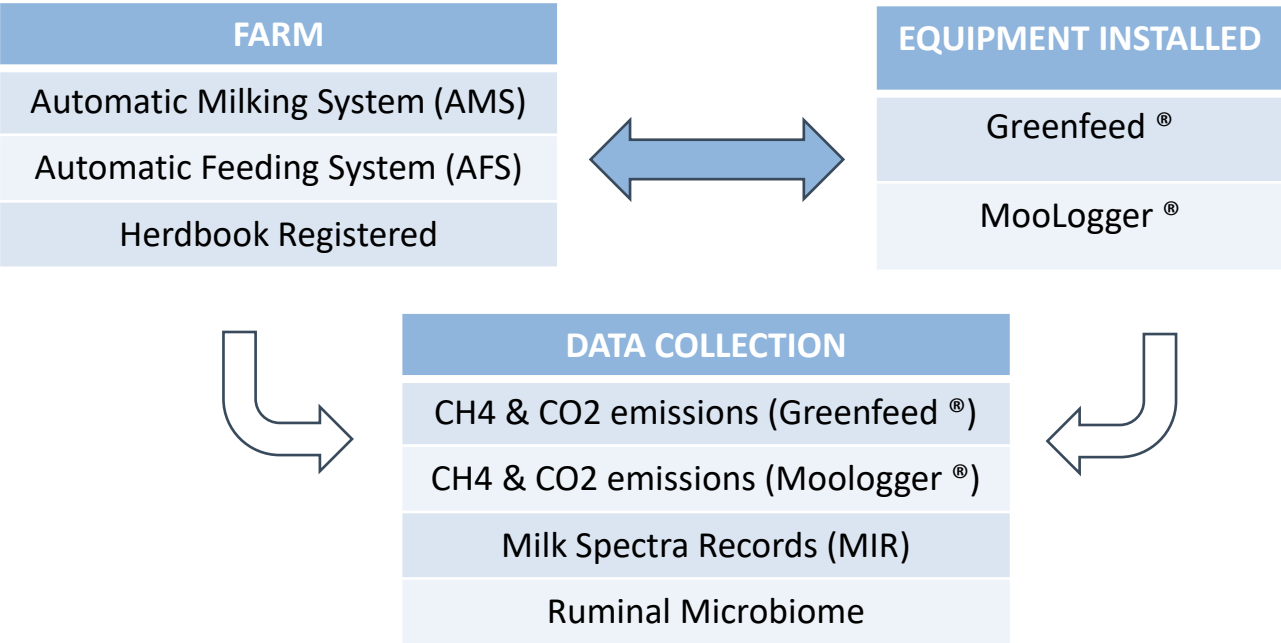




GREENHOUSE GAS PROJECTS

MATERIALS AND METHODS

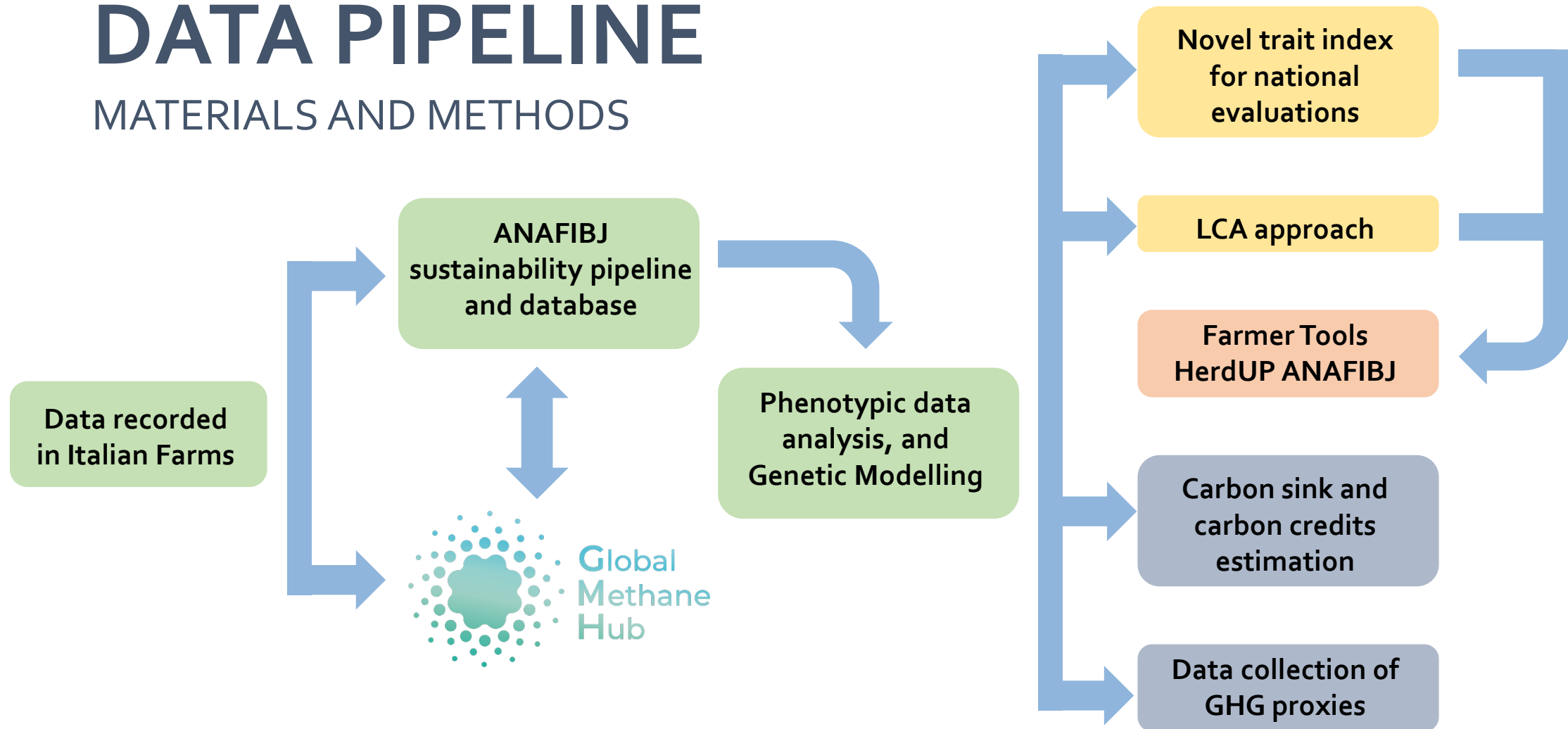
A partnership of Italian breeding companies, universities, experimental farms, research centers, and private companies focused on **phenotype** collection, **research**, and **standardization**



your **COW**
our **FUTURE**

DATA PIPELINE

MATERIALS AND METHODS



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.

ANAFIBJ GENETIC CENTER (Single Farm)

BCS

Body Weight

Biometric Measures

Feed Intake

Water Intake

CH₄ & CO₂ Emissions

COMMERCIAL FARMS (3 Current Farms)

Predicted BW

Production Traits

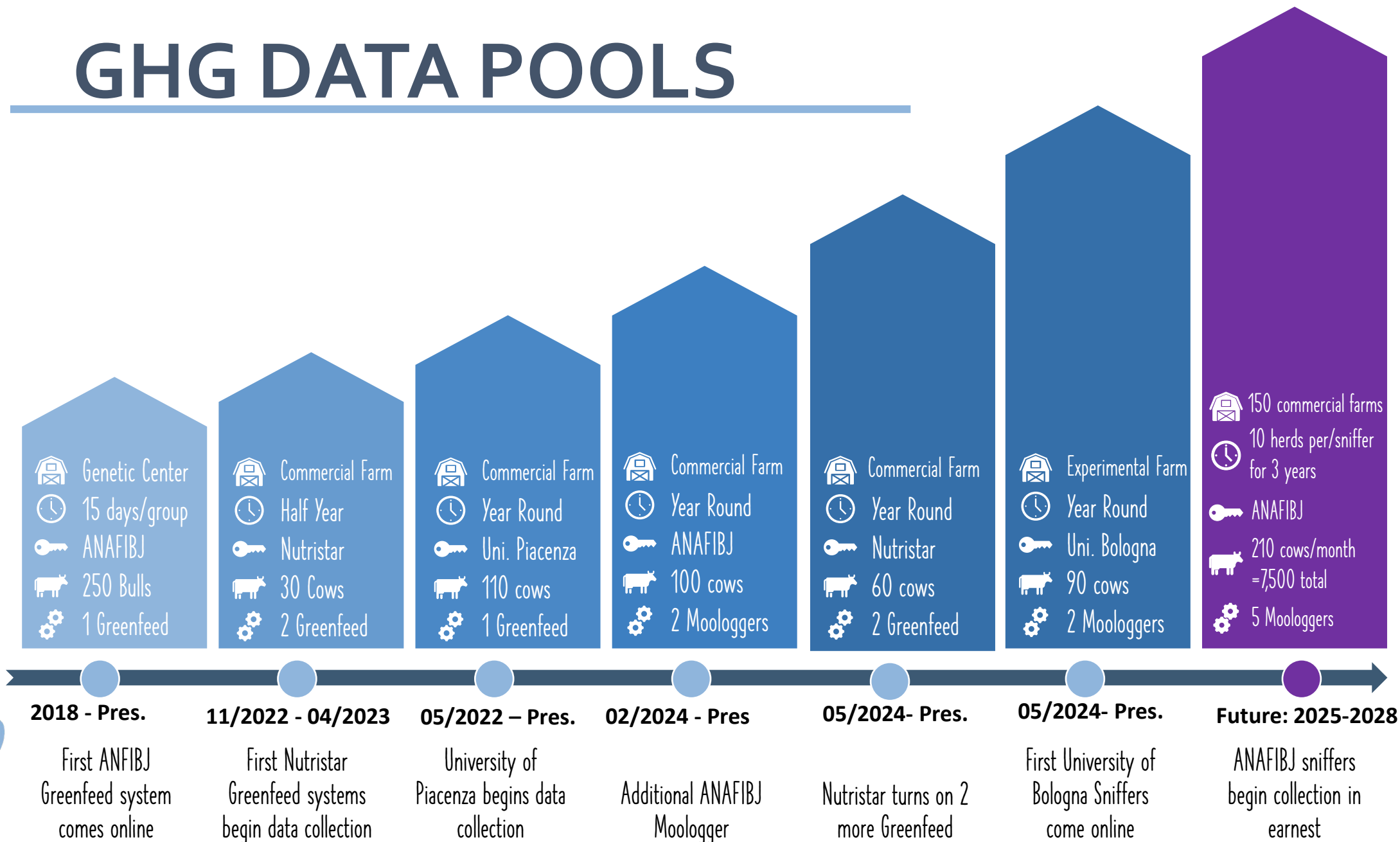
Type Traits

CH₄ & CO₂ Emissions

UNIVERSITY FARMS (2 Current Farms)

CH₄ & CO₂ Emissions

GHG DATA POOLS



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
 - CH₄ Emissions
 - CO₂ 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. Gislou, M. Zucali, V. Ferrari, M. Marusi, A. Sandrucci, A. Tamburini, S. Mondini, R. Finocchiaro, M. Cassandro

Total UAA (Utilised agricultural area)	0	Parametri	Default	Simulazione
Biogas	☐ Si ☒ No	Reference year	2024	
Organic Farm	☐ Si ☒ No	Daily milk yield of current cows (kg/d)	35,62	40,00
Amount of hay in the ration (kg/d)	12,3	Estimated annual herd milk production (q/year)	78007,80	87600,00
Amount of soybean meal in the ration (kg/d)	3	Fat (%)	3,72	
Total feed quantity (kg/d)		Protein (%)	3,40	
Amount of protein concentrate in the ration (kg/d)		Cows (lactation + dry) (n)	600	
Total dry matter intake per day	27	Heifers > 12 mo (n)	246	300
Elabora Chiudi		Heifers between 12 and 6 mo (n)	184	200
		Female calves < 6 mo (n)	110	150
		Age at first calving (mo)	23,49	
		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	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 Frisone, 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:

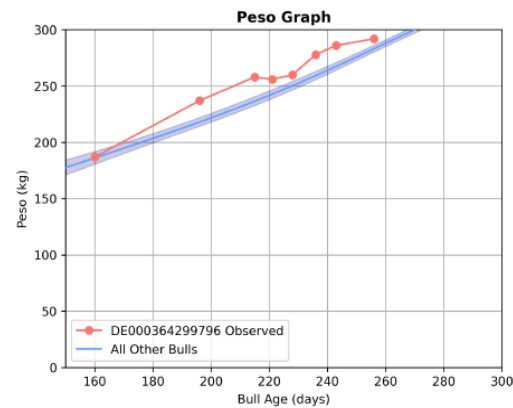
- **Mean Daily Production:** 16.05 (kg/day)
- **Average daily for the population:** 20.44 (kg/day)

ANAFIBJ Associazione Nazionale Allevatori della Razza Frisone, 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	-

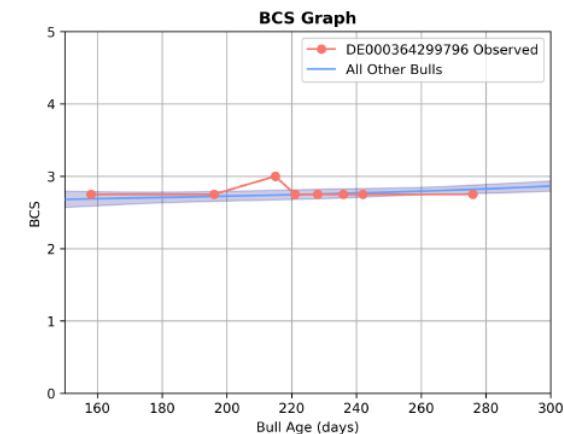


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Growth Report- BCS

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

- 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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