

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

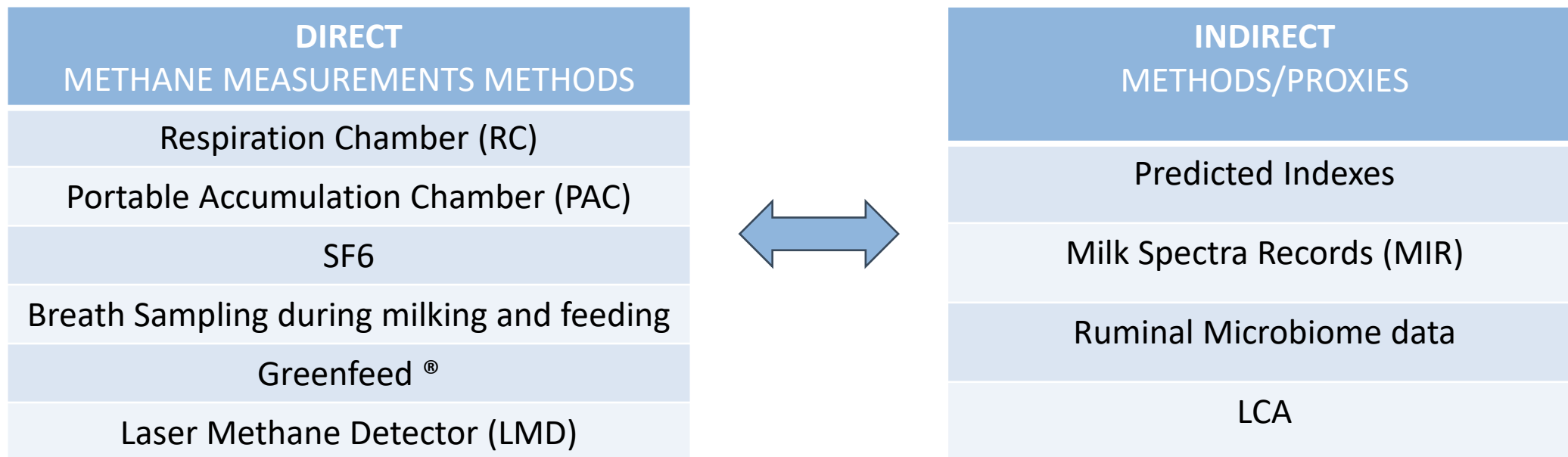


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# INTRODUCTION

- Dairy cattle is known to be impactful on greenhouse gases (GHG) emissions for **over 10%** of livestock sector emission globally (*Gerber et. Al., 2013*);
- Methane (CH<sub>4</sub>) and carbon dioxide (CO<sub>2</sub>) emissions have been shown to be **heritable**, providing the basis for applying genetic selection for their reduction (*Cassandro et al., 2010*);
- **National breeding programs** and the genetic improvement can provide relevant contribution to reduce GHG emissions;
- Many Universities, Research Centers, Associations and Private Companies have started **collecting phenotypes**.

# INTRODUCTION



# OBJECTIVES

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- **Collect GHG emissions data using different methods:**
  - Greenfeed ®
  - Moologger ®
- **Collect innovative traits data:**
  - Milk Spectra Records (MIR)
  - Ruminant Microbiome data
- **Validate proxies;**
- **Develop tools, certifications and services** that meet community and farmers need of mitigation climate change;
- Set-up a **genetic evaluation** also including innovative traits.

# MATERIALS AND METHODS

## STEP 1 (2019)

Collection of methane, carbon dioxide emissions, feed intake and water intake data in ANAFIBJ Genetic Center on **Italian Holstein young bulls** candidates to AI in Italy.

### ANAFIBJ GENETIC CENTER

BCS



Body Weight

Biometric Measures

Feed Intake



Water Intake

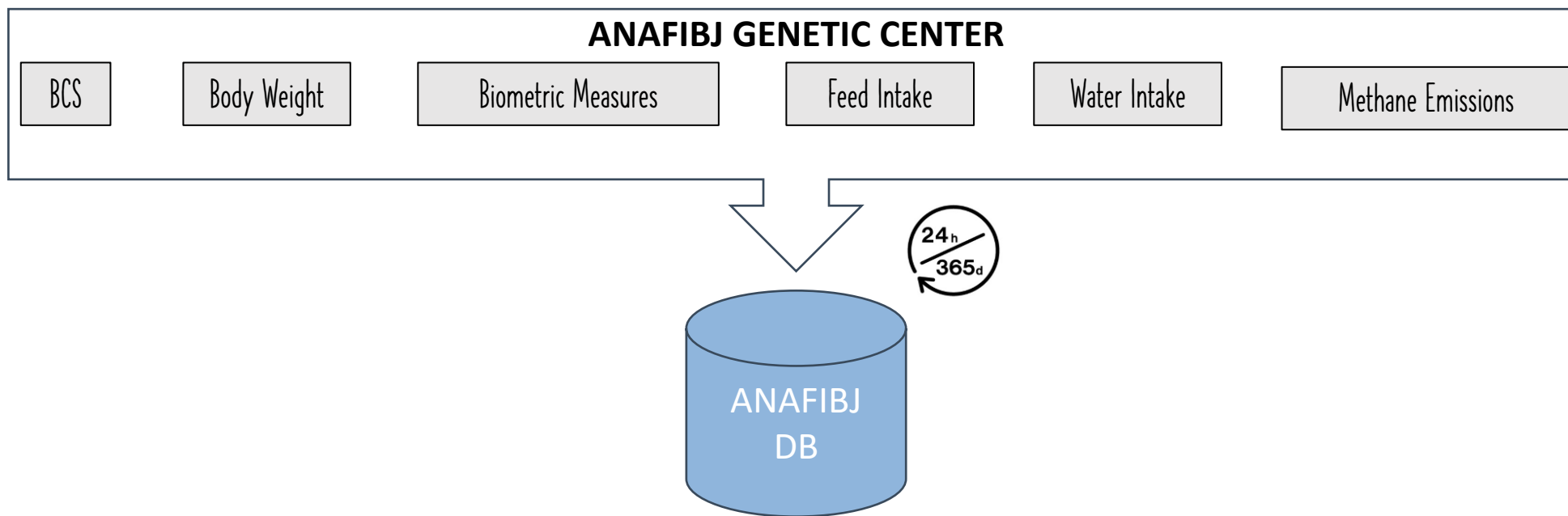
Methane Emissions



# MATERIALS AND METHODS

## STEP 2 (2021)

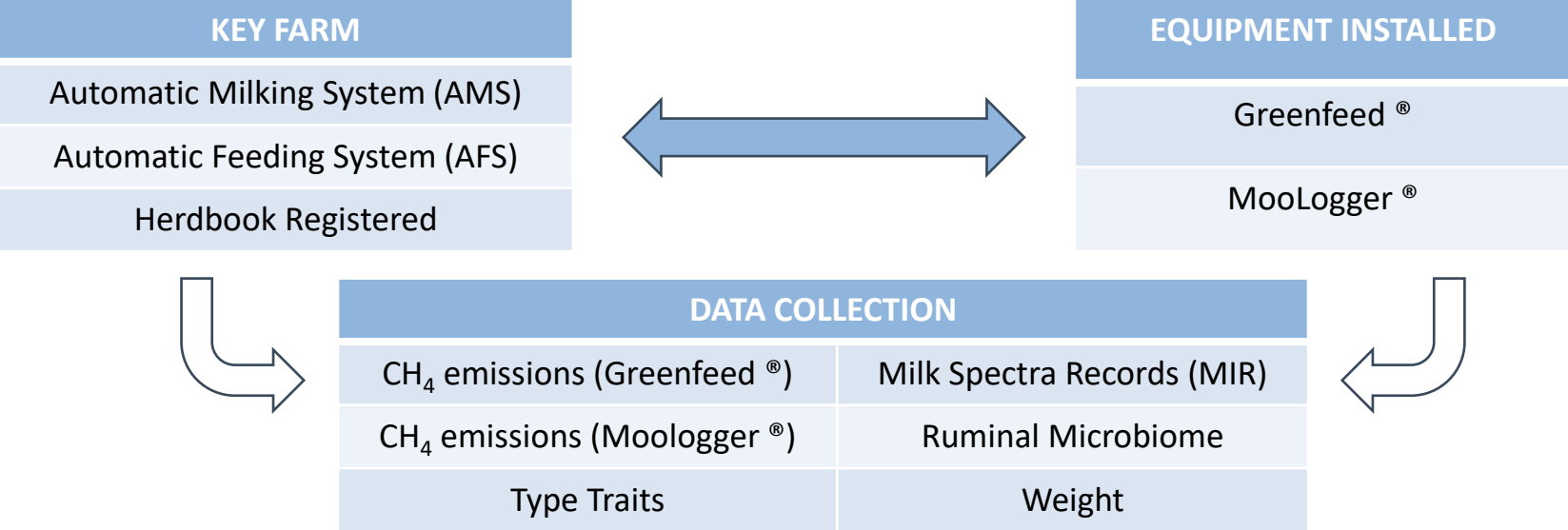
Creation of a **daily automatic data pipeline** to incorporate these new traits into the routine database maintained by ANAFIBJ.



# MATERIALS AND METHODS

## STEP 3 (2023)

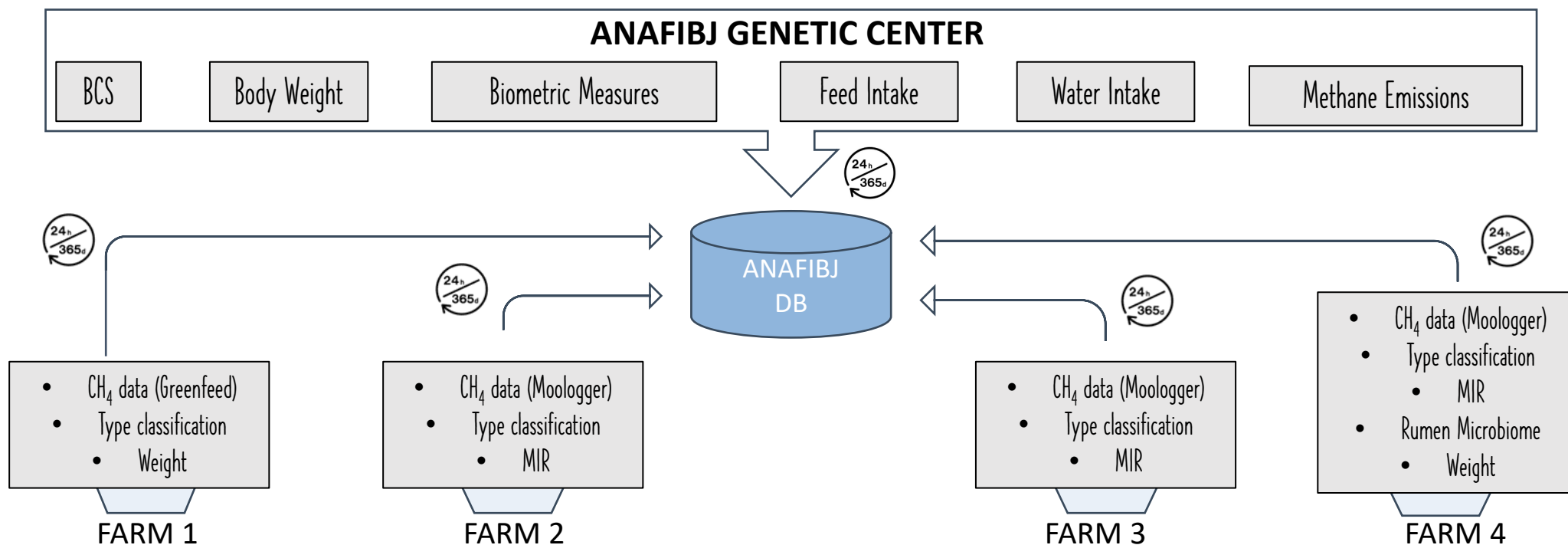
Creation of a **ISC (Italian Sustainability Consortium)** including University, Experimental Farms, Research Centers and Private Companies.



# MATERIALS AND METHODS

## STEP 4 (2024)

Creation of **ISC (Italian Sustainability Consortium)** data pipeline to incorporate Consortium traits into the routine database maintained by ANAFIBJ.





# RESULTS

## ITALIAN HOLSTEIN YOUNG BULLS

- 35,653 CH<sub>4</sub> records (Greenfeed ®)
- 559,800 feed intake records
- 6,491 water intake records
- 2,181 BCS records
- 6,543 biometric measures records
- 2,315 weight records

272 Italian  
Holstein  
young bulls

# RESULTS

## ITALIAN HOLSTEIN YOUNG BULLS GREEN PASSPORT

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

### Bull Functionality and Environmental Impact Report

- **REPORT DATE:** 09/05/2024
- **MATRICOLA:**
- **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:

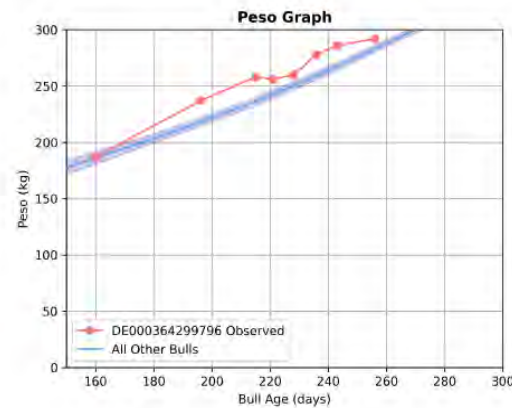
- **Mean Daily Production:** 16.05 (kg/day)
- **Average daily for the population:** 20.44 (kg/day)

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

### Growth Report- Weight

Matricola: C 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	-

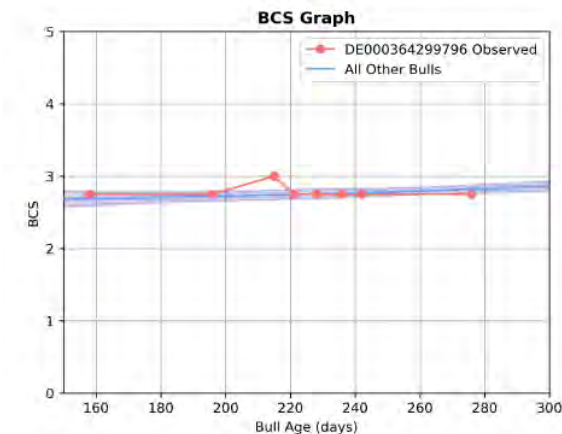


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### Growth Report- BCS

Matricola: I 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



# RESULTS

## ITALIAN HOLSTEIN COWS

- 25,400 CH<sub>4</sub> records (Moologger<sup>®</sup>)
  - ~ 250 CH<sub>4</sub> records/day

In addition, from University Farms:

- Weight
- Rumen Microbiome

For each cow enrolled:

- BCS data (1<sup>st</sup> lactation)
- Type classification
- Milk Spectra data (MIR)


120 Italian Holstein  
cows continuously  
recorded.

# RESULTS

## Environmental Sustainability Evaluation using LCA approach

- Average **Predicted** Methane Emission Index → **Direct** data

Total UAA (Utilised agricultural area)	<input type="text" value="0"/>	<b>Parametri</b>	<b>Default</b>	<b>Simulazione</b>
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"/>
		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



# CONCLUSIONS

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- **Data collection** on key-farms is crucial to create a **national inventory** about sustainability traits (direct and proxies) and to **set up a genetic evaluation**;
- **Data collection** in commercial farms is going to be **enhanced**;
- **LCA** is a key-tool to perform high-quality **technical assistance** using an holistic approach (nutritional, genetic, agronomic...).

# Thanks!



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