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# ITALIAN HOLSTEIN ASSOCIATION & THE «ECOLOGICAL FOOTPRINT» PROSPECT

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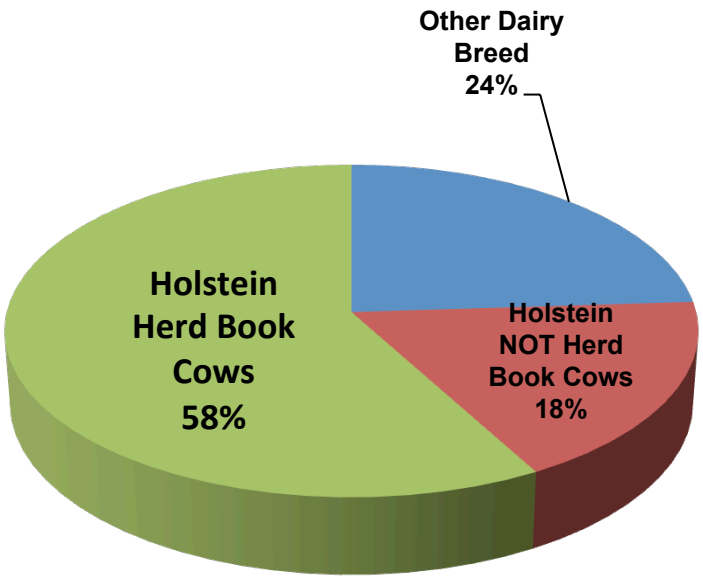
METHAGENE

METHAGENE – Final meeting – October 11-13, 2017

# 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 |

# Outline

1. What is your ultimate dream with regard to being able to reduce the ecological footprint of cattle in Italy.

2. Where is ANAFI now.

3. What do you need to get from 2 (where is ANAFI now) to 1 (ultimate dream).

# Ultimate dream … →reduce EF of dairy cattle in Italy

- **Convince & work together with farmers** → set up breeding values in order to select for more efficient animals → better environmental impact

- **Contribute to progress** → create critical mass. To work togheter (inter)national in order to reach a common result.

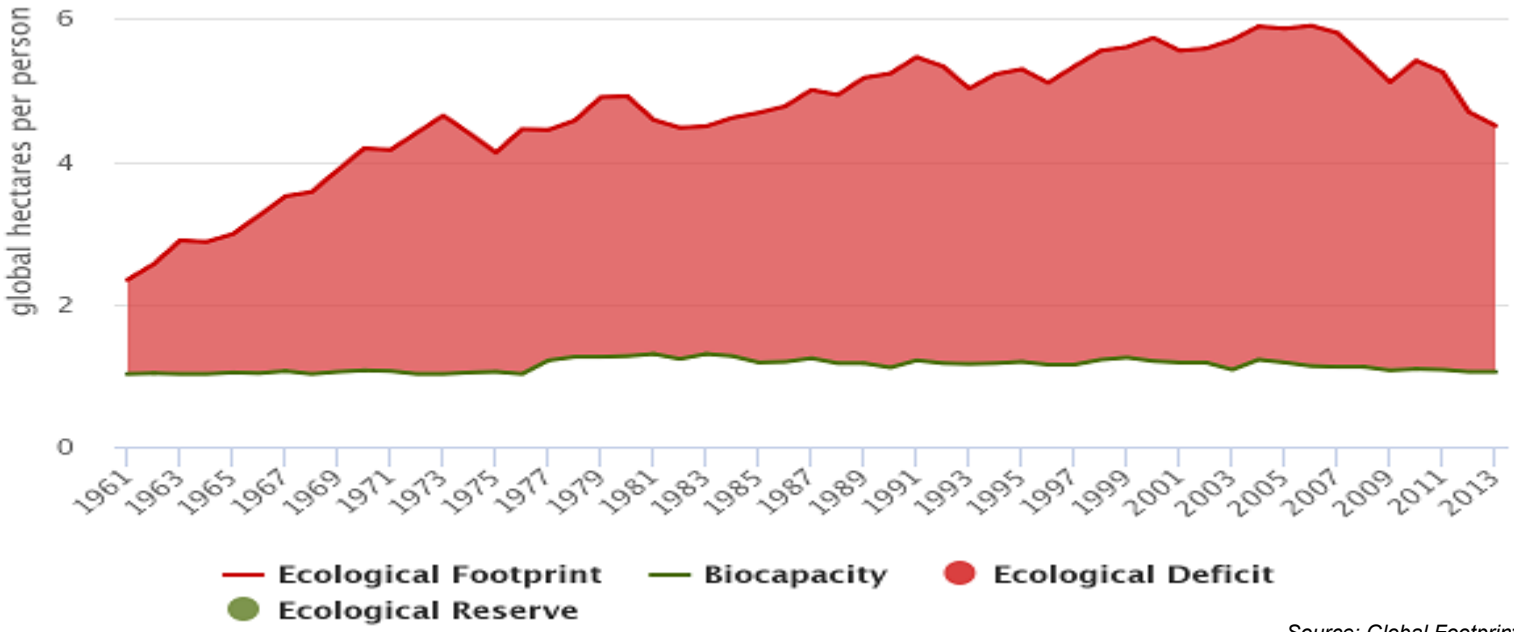
# Ultimate dream … →reduce EF of dairy cattle in Italy

- **Convince & work together with farmers**

- **Different viewpoints, common interest:**
  - **Farmer interest: Efficiency**
  - **Consumer interest: Environmental impact**

- Most farmers would not care about gas emission:
  - Invisible so not noticed
  - No 'visible' cost (i.e. no bills)
  - However make them aware that they **paid** the feed that was converted into gas
- Most consumers would not care about efficiency:
  - However efficiency impacts on consumer **price**

# The Ecological Footprint in Italy (where is now Italy)




*Source: Global Footprint Network, 2017 National Footprint Accounts*

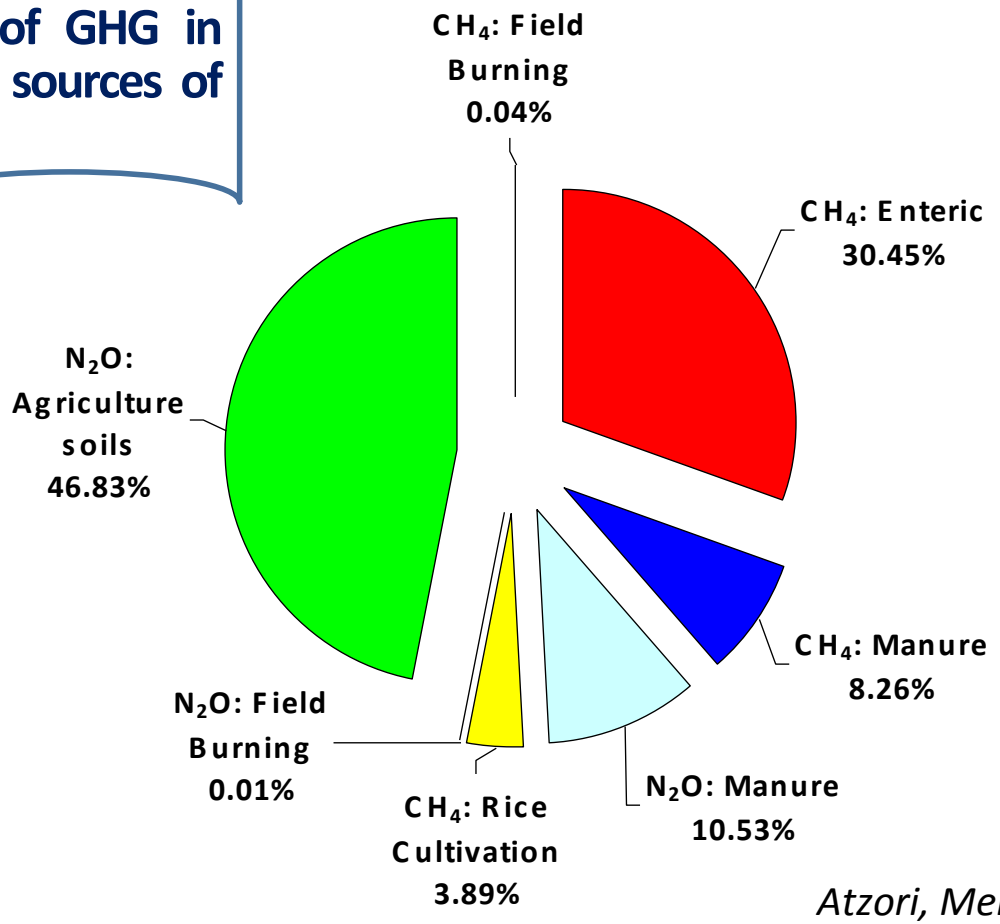
- 4 Italy would be needed to satisfy in a sustainable way Italian needs. (*Ruggiero, 2017)*
- *So we are in Ecological deficit → Ecological Footprint **exceeds** biocapacity (productivity of its ecological assets )*

# Greenhouse gas (GHG) footprint

- It is a component of the ecological footprint
- It refers to the amount of GHG that are emitted during the creation of products or services
  - The GHG footprint is expressed in GHG global warming potential and is generated by products or services
- Where is Italy and … ANAFI?

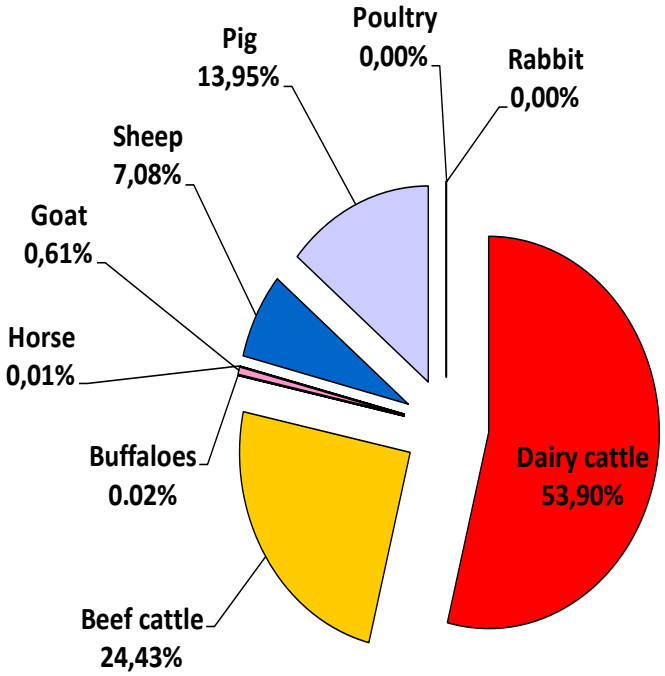
# ..what about gas emission in Italy?

**Italian contribution of GHG in agriculture by single sources of GHG**




*Atzori, Mele, Pulina, 2010*

# ..what about gas emission in Italy?




Italian contribution of total emissions of GHG in livestock sector by single species and categories

*Atzori, Mele, Pulina, 2010*

# Meanwhile what are ANAFI aims and future developments?

LATeco

1. **Feed efficiency**
   - Predicted feed efficiency (short term)
   - Individual measurements on feed intake (experimental farms) → genomics → breeding value estimation (long term)

2. **Greenhouse gas/Methane emission**
   - Predicted $CH_4$ emission (short term)
   - Individual measurements on $CH_4$ emission (experimental farms) → genomics → breeding value estimation (long term)

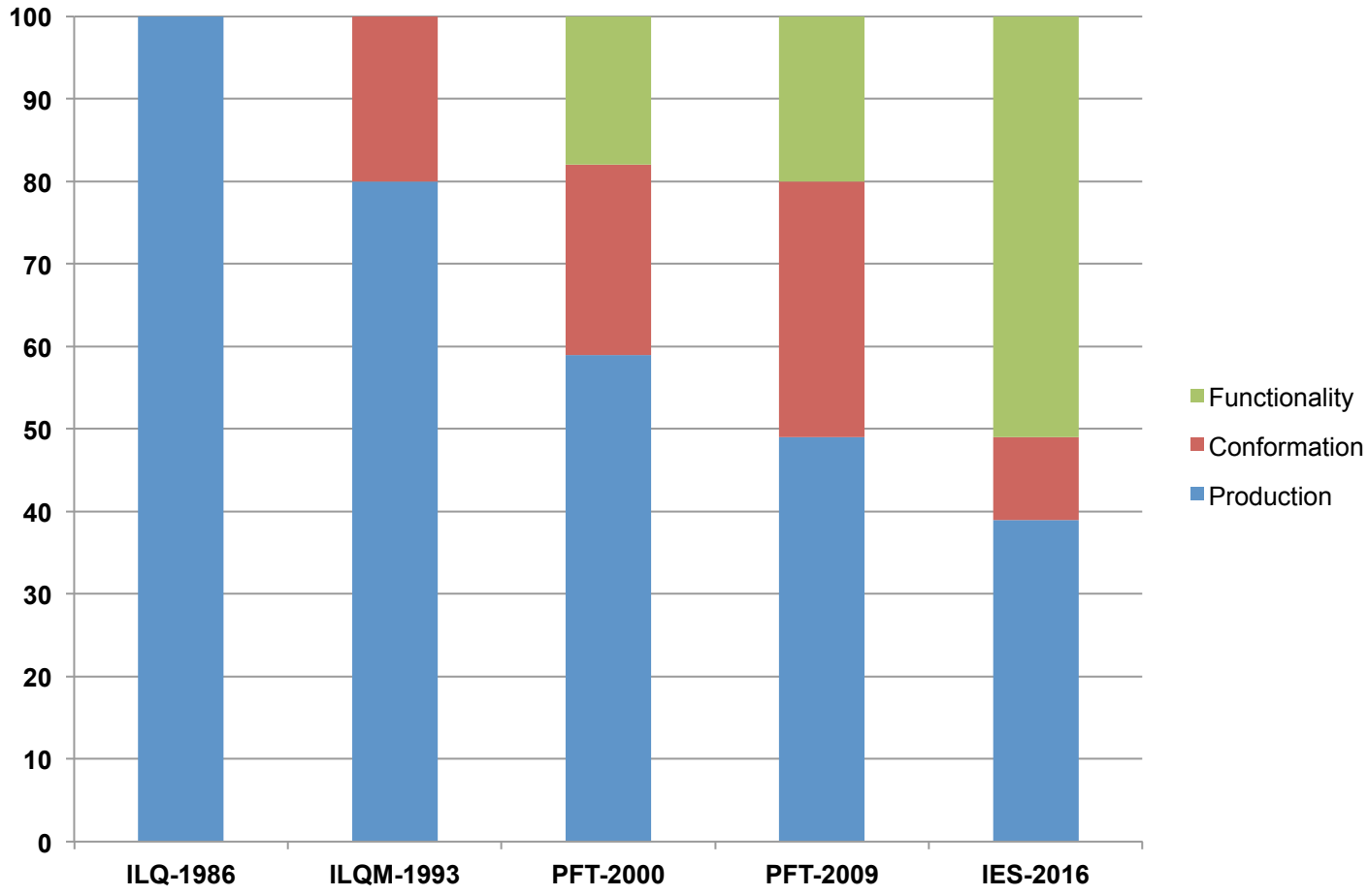
- Experimental farms (cows &heifers)
- Bull genetic center

**International cooperation!**

# Genetic Center experiment

- 300 young bulls in three years
- Genotyped with 54k panel and pre-selected with DGV
- Young bulls: age 4-12 months arrive, last 105 days; body weight and BCS
- New phenotypes:
  - Individual Methane emission (GreenFeed system)
  - Individual dry matter intake (ric system)

# Evolution of the breeding system in the Italian Holstein



# Combining Farmers view and need for future

**More income for the farmer** → need efficient cow
→ improve environment?

**Less cost** → need healthy cow (no problem)


**Efficient system!!!**

# Tested predicted method

- Predictions for feed efficiency and Methane emissions in Italian Holstein Friesian population
- **DATA**
  - 17,031 bulls official genetic evaluation
    - Production EBVs (Milk, fat and protein)
    - Type EBVs (Stature, chest width, body depth, rump width, BCS )
    - All data have been rescaled on 2009-2011 base

- Predicted CH4 → Ellis et al., 2010
- Predicted Dry Matter Intake → Chase and Sniffen (1985)

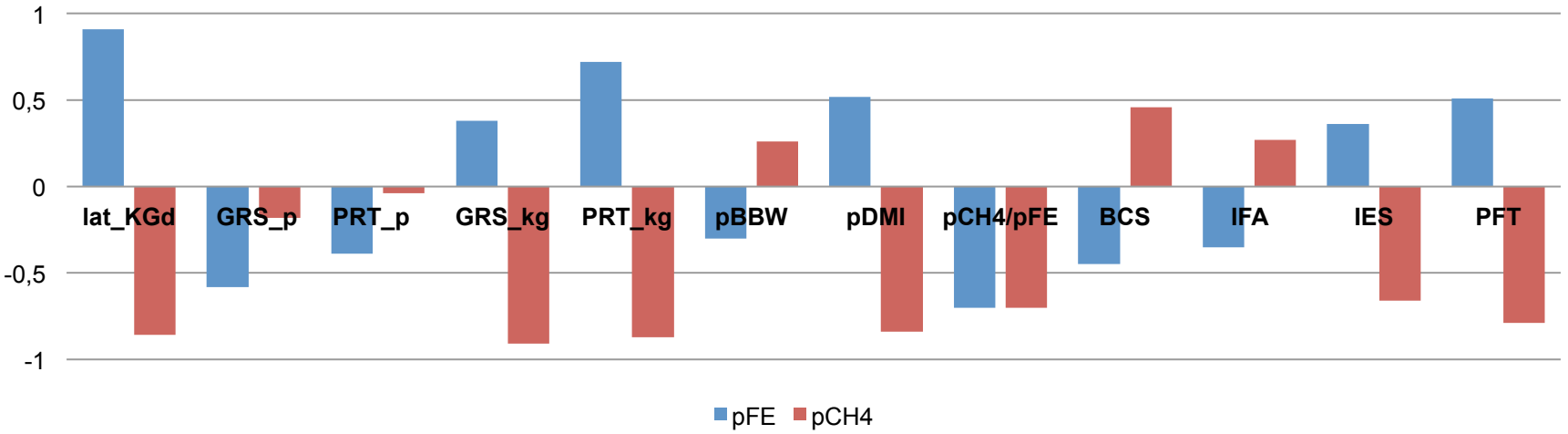
$$pFE = milk / pDMI$$

$$pCH\downarrow 4 = 3.23 + (0.809 * pDMI)$$

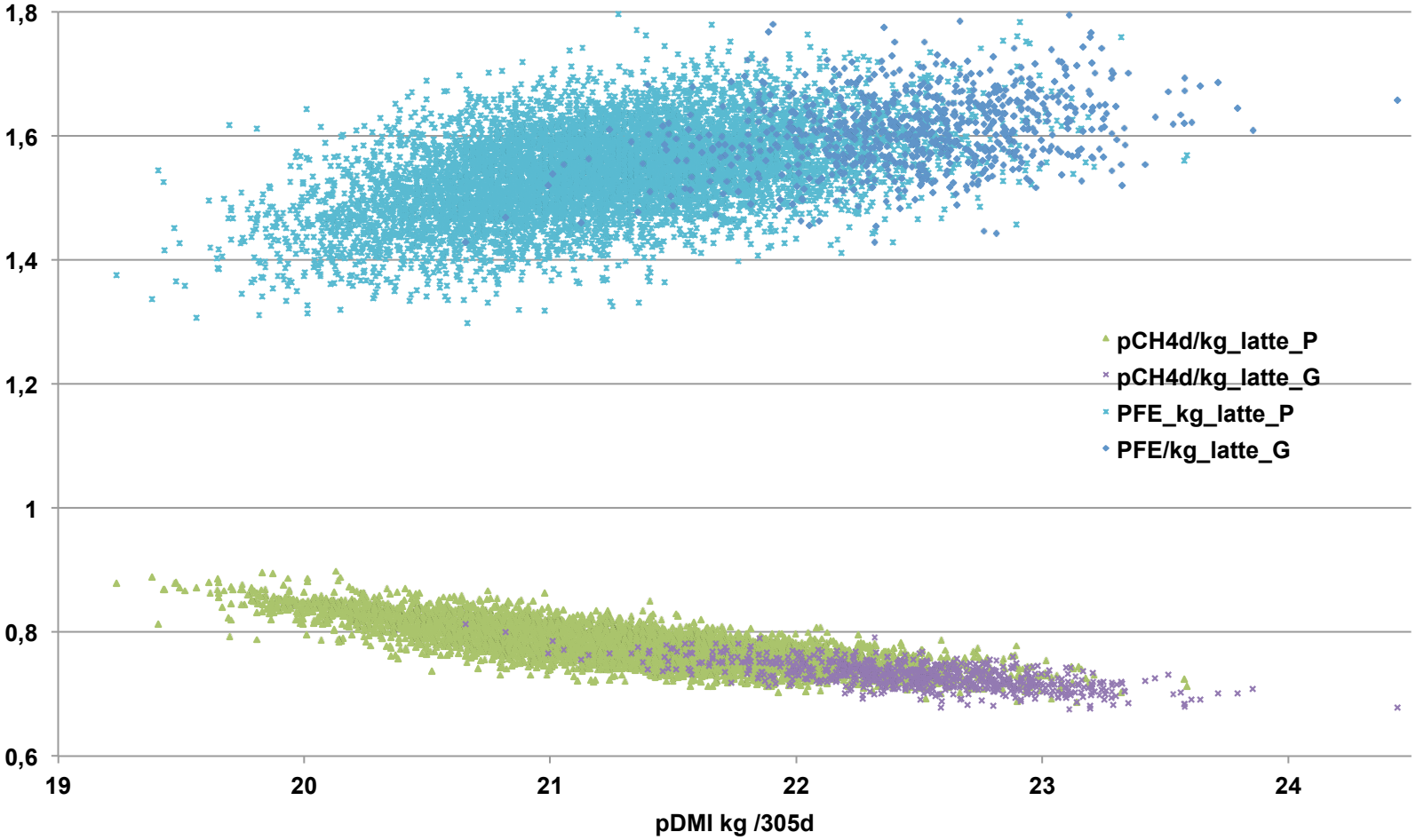
# Descriptive statistics

| Trait | Mean ± SD | Range |
|---|---|---|
| MY, kg/305 d | 27,64 ±1,91 | 21,34-38,86 |
| pDMI kg/305 d | 21,34 ±0,70 | 19,24-24,44 |
| pFE d | 1,55±0,07 | 1,30-1,80 |
| pCH4 (MJ/MY, kg) | 0,78±0,03 | 0,67-0,90 |

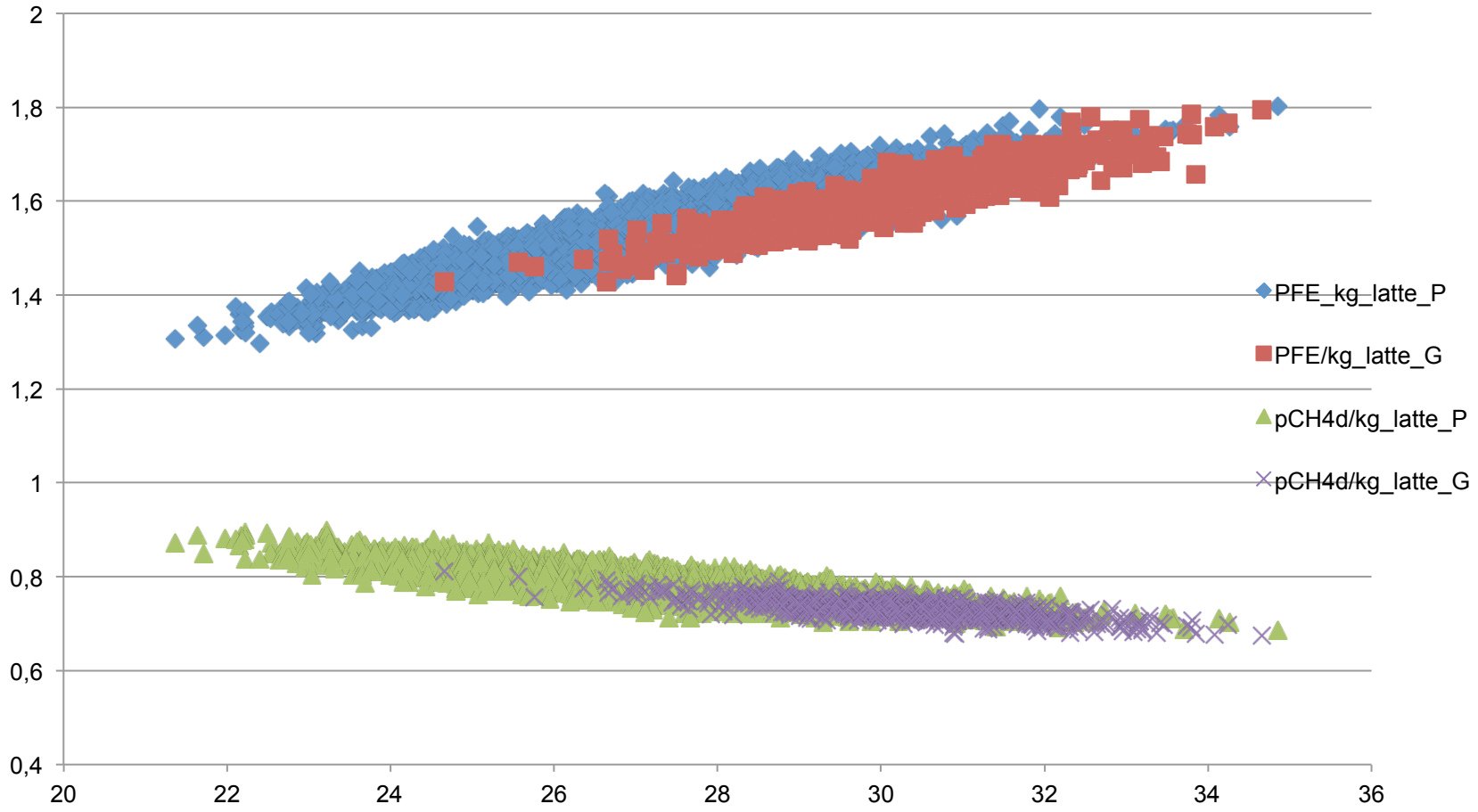
## Pearson Correlations for pFE and pCH4 with some key traits



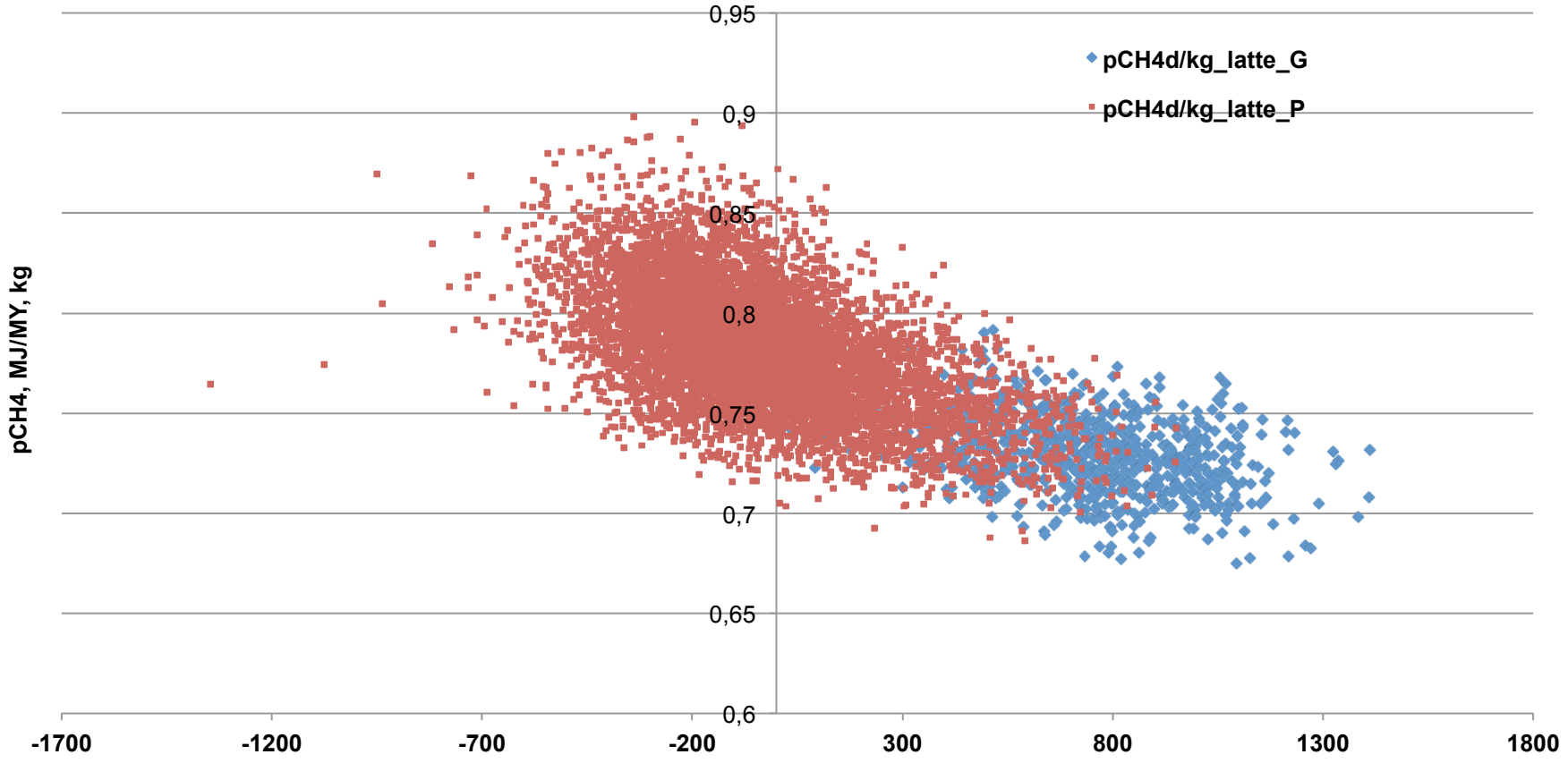
# pFE and pCH4 *vs* pDMI



# pFE and pCH4 vs Daily milk yield



# EBV $pCH_4$ emission and IES of Italian HF bulls



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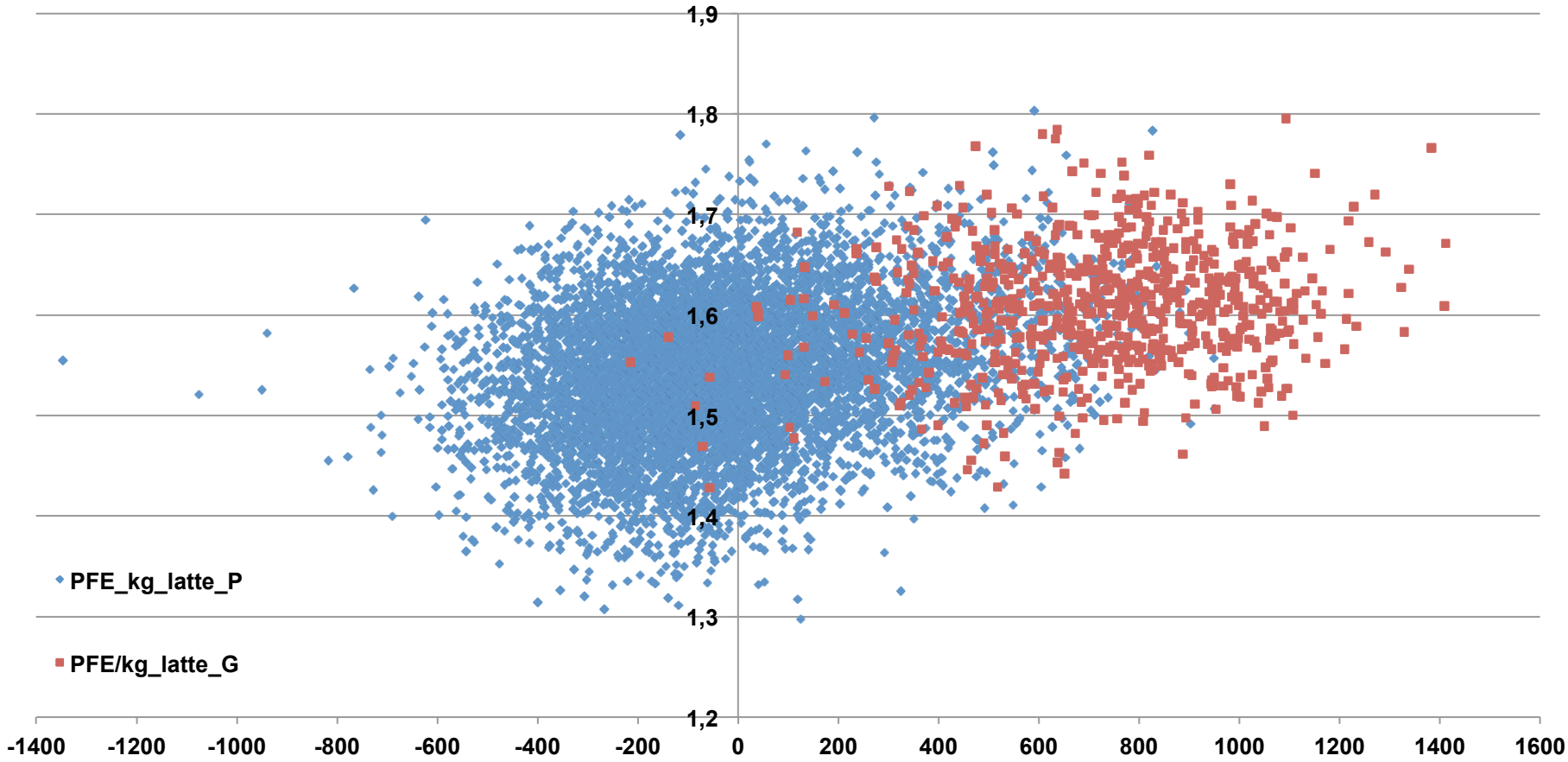

# ANAFI goal…

- We’re on our way to establish routine evaluation for:
  - Feed efficiency
  - Gas emission
- We aim at EBV & gEBV

- Current selection goal already improves feed efficiency and gas emission, but extra attention can increase genetic gain

- Indices will be included in total merit index

# What do you need to get from 2 (where is ANAFI now) to 1 (ultimate dream).

- Lot's of work!!
- Results of this explorative study suggest that predicted $CH_4$ per unit of output is heritable and can be selected for reducing gas emissions without depleting production, functionality and fertility traits.
- The livestock sector, in particular genetic area, has enormous potential to contribute to climate change mitigation.
- Reducing GHG concentrations in the atmosphere is a public good and should be recognized as such, much like other traditional responsibilities of government.
- Direct individual measurements together with a genomic approach, of $CH_4$ are very helpful for more efficient selection strategies and for a better genetic control on daily $CH_4$ emission.