



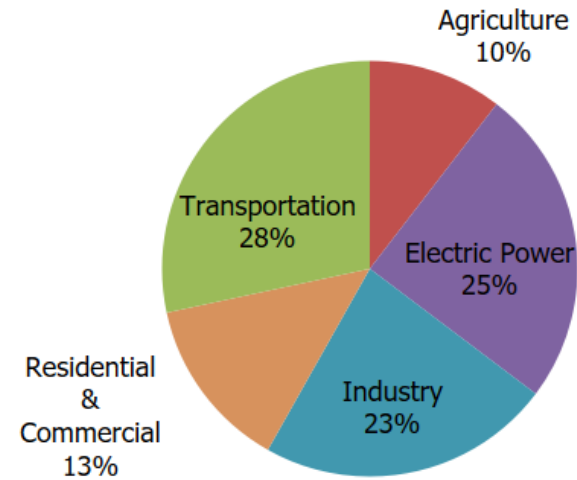
Correlation between mid-infrared-based predicted methane production and milk urea in Walloon Holstein dairy cows

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Background

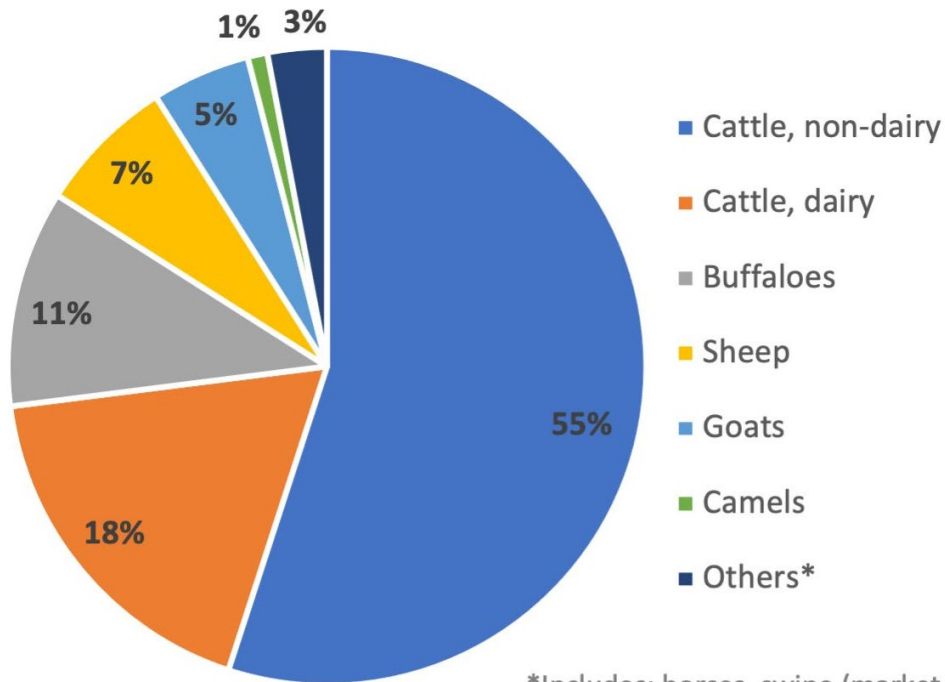
- ✓ Emissions of GHG have a high global warming and climate change potential, an important global challenge of our time.



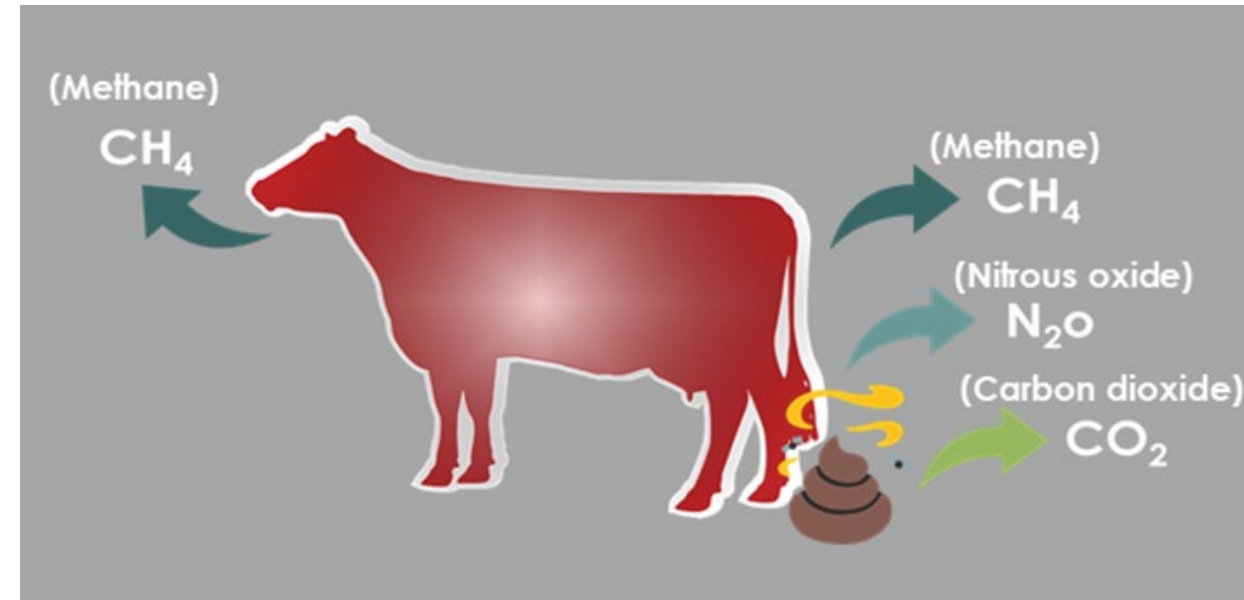


Background

- ✓ Dairy cows contribute around 20% to livestock GHG emissions (methane, nitrous oxide and carbon dioxide)



*Includes: horses, swine (market and breeding), asses, llamas, mules.



Methane: most important GHG emitted from dairy cows



Average daily methane emissions is approximately 400 g/d per cow

Accurate measurements of methane production require complex and expensive techniques (respiration chamber, greenfeed system, ...)

Milk mid-infrared (MIR) data have been proved as a fast and cheap method for predicting methane produced by individual cows

Reporting methane output:

- ✓ Daily methane production (g/day)
- ✓ Methane yield (g/ kg of DMI)
- ✓ Methane intensity (g/ kg of milk)

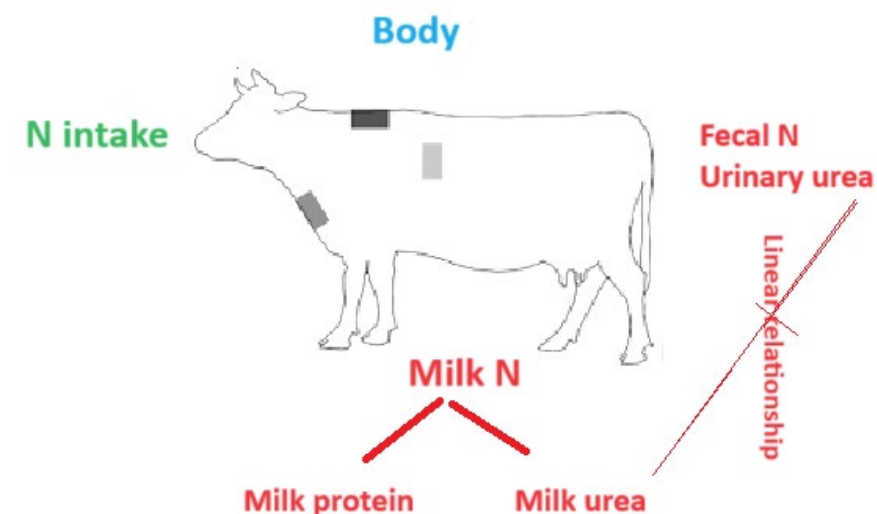


Nitrous oxide: an important GHG emitted from dairy cows



- ✓ Average daily nitrous oxide emissions is 970 mg/d per cow
- ✓ Dairy cows use on average 25% of their dietary N for growth and production, the remaining is excreted into the environment through feces (undigested N) and urine (UU, the end products of N metabolism)
==> **nitrous oxide (N_2O)**

- ✓ 40% to 50% intake N is excreted as UU
- ✓ UU is difficult to record BUT is related to MU



Nitrous oxide, the second important GHG emitted from dairy cows



MU {
a normal non-protein N component in milk
easy to record (e.g., milk MIR data)
included as a standard part in most milk recording systems
} ==> MU can be used as a tool for
evaluation the N losses

Background



- ✓ Minimizing N losses and methane production from dairy cows is crucial at two major levels:

Environmental concerns (climate change)

Economical perspective (more CH₄ production and N losses ==> more losses of gross energy and N)

How much methane do you produce?

Me? About 400 – 600 liters per day!



Reduce emissions! stop global warming

Objectives



The main suggested ways for reducing methane emissions and N losses are herd management, feeding strategies, and **genetic selection**

For genetic selection, traits need

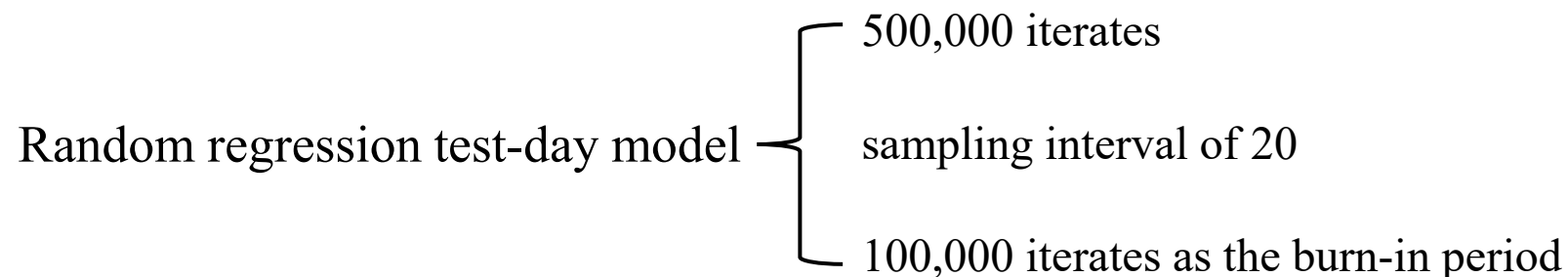
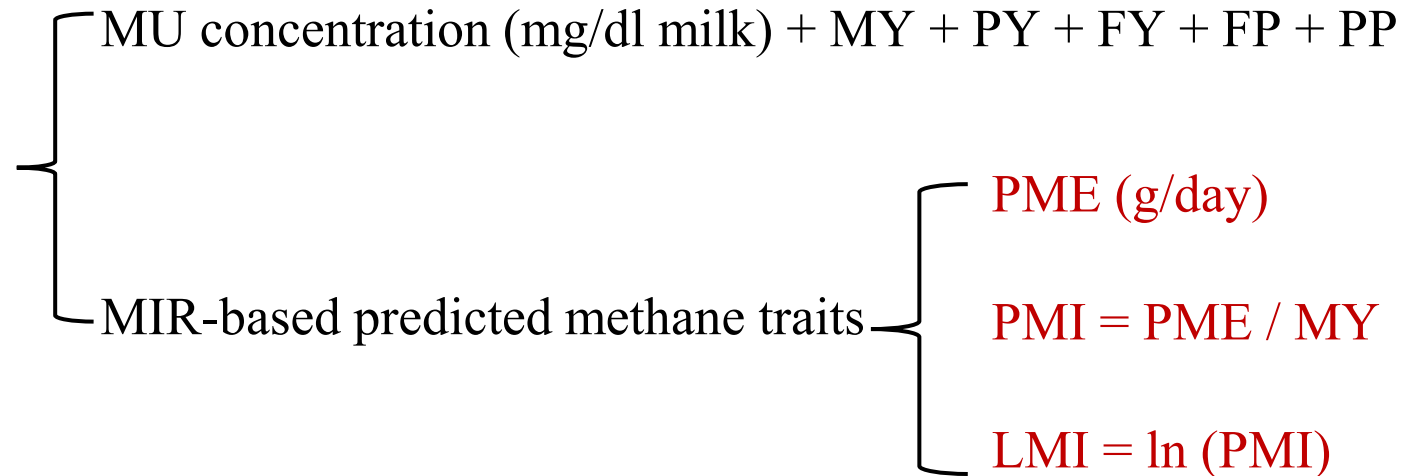
- to be well defined
- to be recordable in a cheap and fast way
- to be genetically variable and heritable

This study aimed to estimate genetic parameters for MU and MIR-based predicted methane production in Walloon Holstein cows



Materials and methods

- ✓ 1,529,282 methane and MU test-day records on 229,465 1st parity Holstein cows distributed in 1,530 herds (2006 to 2022)

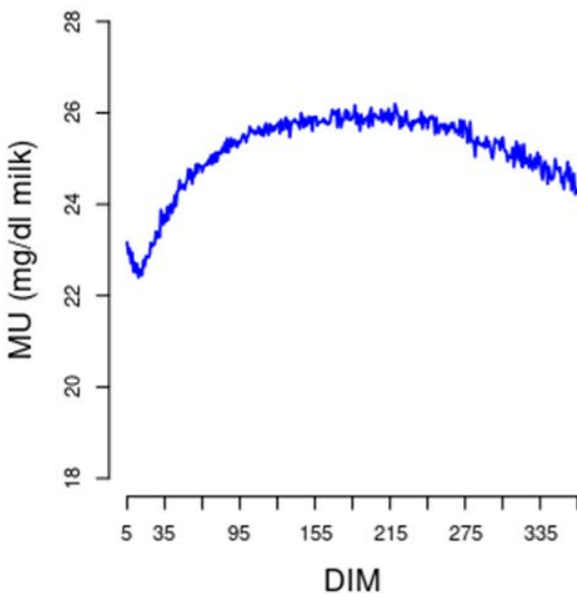
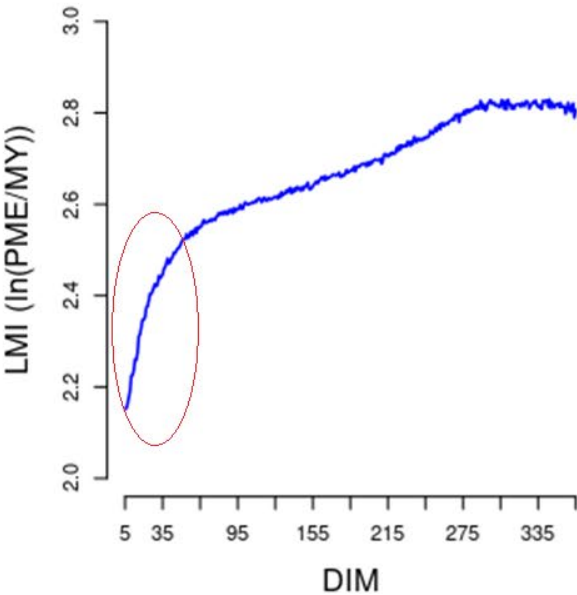
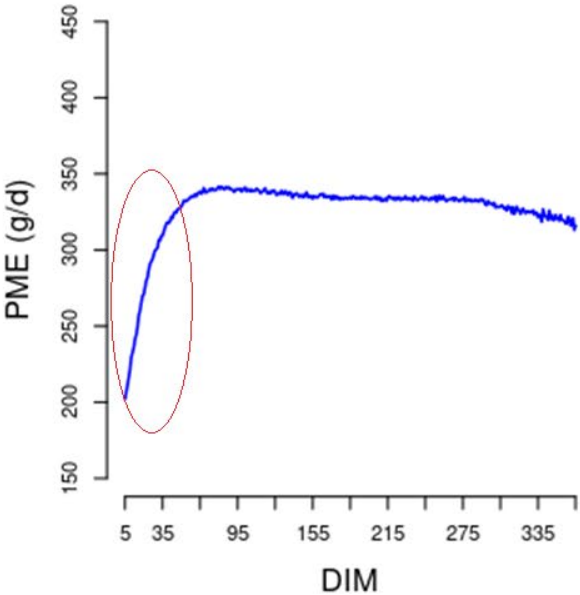




Results

Descriptive statistics for the defined methane traits, milk urea, and milk yield traits

MY (kg)	FY(kg)	PY(kg)	FP(%)	PP(%)	MU (mg/dl milk)	PME (g/day)	LMI
23.56 (6.13)	0.93 (0.24)	0.79 (0.20)	3.99 (0.67)	3.36 (0.35)	25.23 (8.28)	325.5 (66.88)	2.64 (0.36)

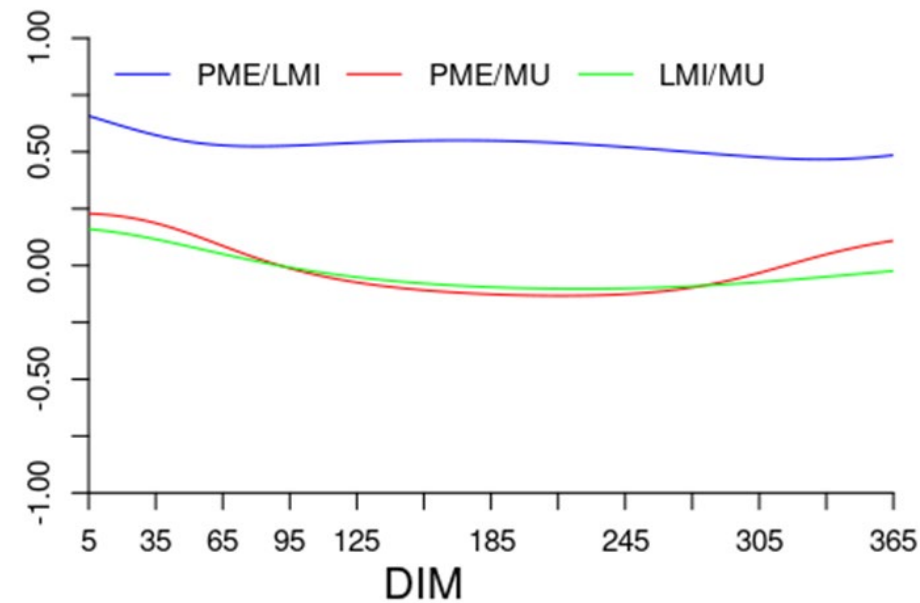
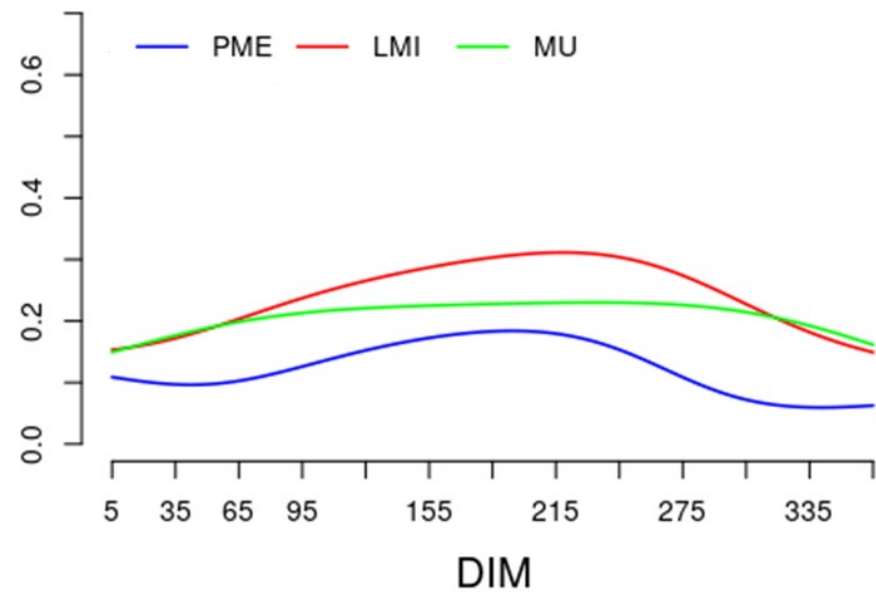


Results



Mean (range) genetic correlation among PME, LMI and MU

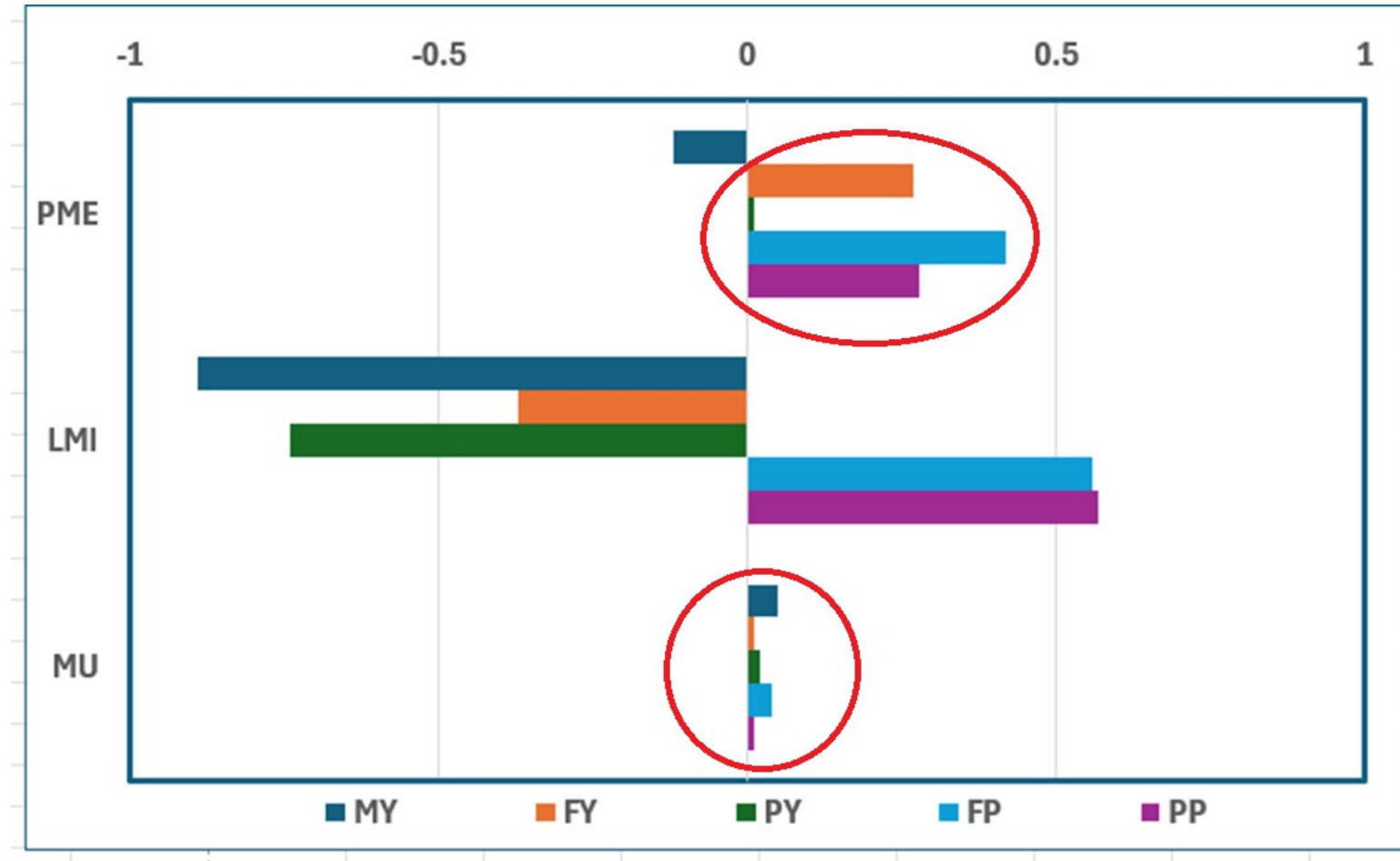
	PME	LMI	MU
PME	0.13 (0.06 to 0.18)	0.53 (0.43 to 0.53)	-0.02 (-0.13 to 0.23)
LMI		0.25 (0.15 to 0.31)	-0.03 (-0.10 to 0.16)
MU			0.21 (0.15 to 0.23)



Results



Genetic correlations of PME, LMI and MU with milk traits



Conclusion



The results demonstrated large variations for PME, LMI, and MU encourage the implementation of selection for environmentally friendly cows

MU is weakly correlated with milk yield, and milk composition, therefore, selection for lower MU would not influence the production performance

The mean genetic correlations estimated between MU and methane traits (PME and LMI) were close to zero indicating no association between these traits



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Co-funded by
the European Union



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Thank you for your attention