



# Dairy Bull Methane Emission Performance test: the ANAFIBJ experience

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ANAFIBJ





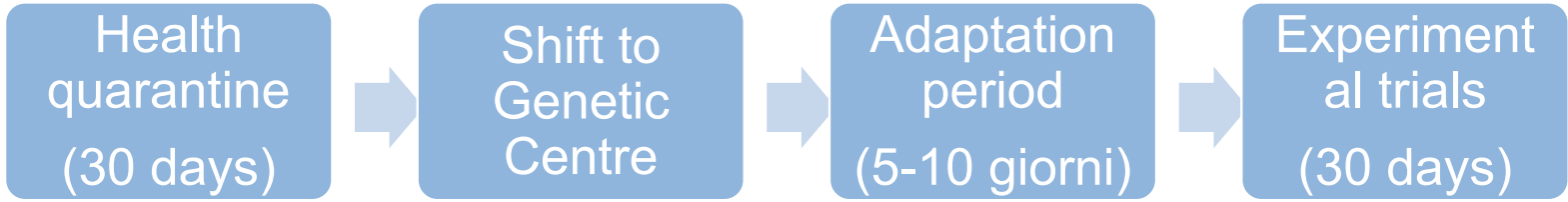
# ANAFIBJ Genetic Center



**TARGET: collection of phenotypes useful for selection**

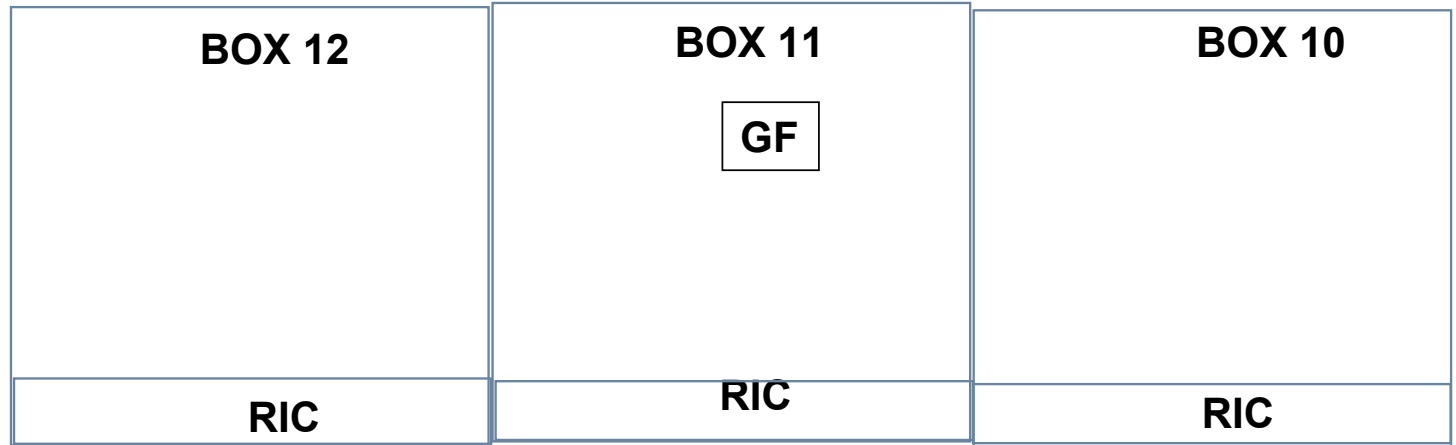
- ✓ Young Italian Holstein bulls (4-12 months)
- ✓ Homogeneous groups by origin, weight and age
- ✓ Feeding *ad libitum*
- ✓ Free access to instruments





**GREENFEE  
D SYSTEM**

**MooLogger  
(Sniffer)**





your COW  
our FUTURE



# Bull's Phenotypic information

Since March 2018 → 221 Young Bulls

- Morpho data file
  - 928 records on 221 bulls
- Insetec-data file
  - 464'977 records on 212 bulls
- GreenFeed-data file
  - 11'202 records on 161 bulls



Roughage Intake Control system  
(Hokofarm Group, The Netherlands)



GreenFeed system (C-Lock Inc., Rapid City,  
SD, USA)

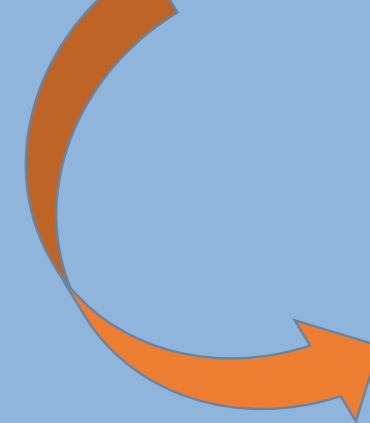
Data Flow automatization: daily routine update (8 o'clock) for all sets of data





# Bull's Genomic information

- 221 individuals genotyped
- 69,127 SNPs over 30 chromosomes
- SNP editing performed using preGSf90 software (Misztal, UGA)
- 61,591 SNPs after editing
- Genomic relationship matrix built using default options





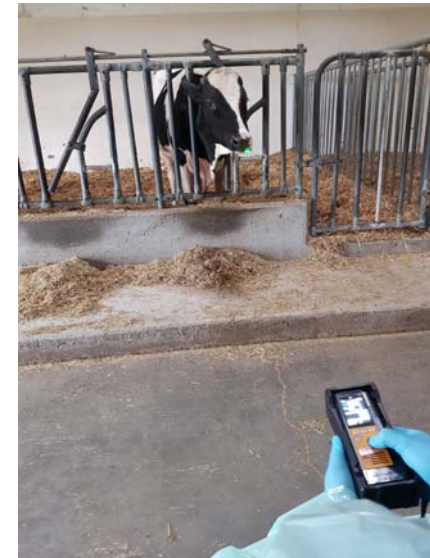
# METHANE EMISSIONS



## ❖ Laser Methane Mini Detector



LMD FEATURES	
Purchase Cost	Low
Running Costs	Low
Repeatability	Low
Behaviour Alteration	Low
Throughput	Very High





# Data Processing and Editing

- Existing Variables

- CO<sub>2</sub> (g/d)
- CH<sub>4</sub> (g/d)
- AirFlow (L/s)
- Duration of Visit



- Traits included, GreenFeed:

- Number of Visits
- CO<sub>2</sub> (Average)
- CH<sub>4</sub> (Average)
- AirFlow (Average)
- Duration of Visit (Average, Sum)

- Each dataset was prepared as showing 1 record per bull-date combination.





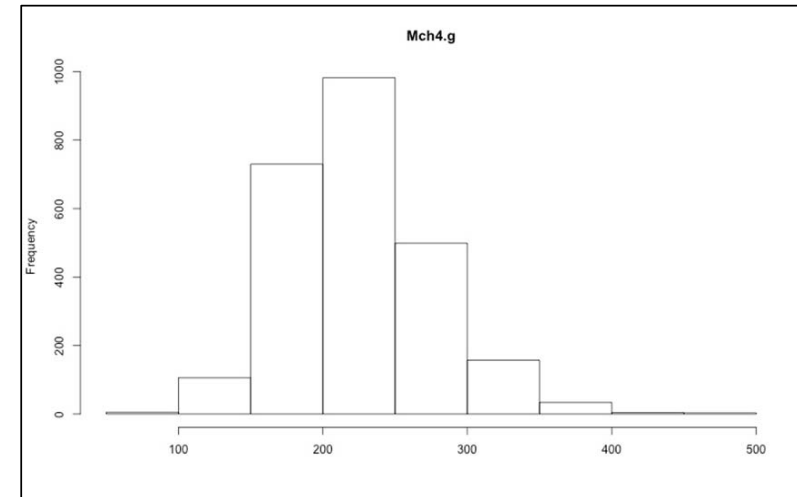
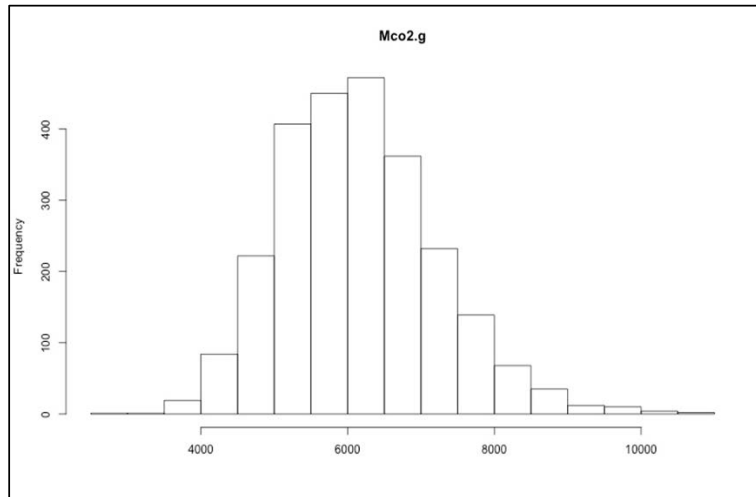
Trait	Definition	Editing
Weight	.	.
BCS	.	Maximum set at 5
Heart.gi	.	Maximum set at 600
Height	.	.
Nvisits.r	Count of the number of visits	Maximum set al 150
Sintake.r	Sum of the daily intake	Maximum set at 25
Stime.r	Sum of the daily time spent at the feeder	Maximum set at 20,000
Mintake.r	Average daily intake	Maximum set at 1
Mtime.r	Average daily time spent at the feeder	Maximum set at 1,500
Nvisits.g	Number of visits to the GreenFeed per day	.
Stime.g	Sum of daily time spent at the GreenFeed	Maximum set at 5,000
Mco2.g	Average daily CO <sub>2</sub>	.
Mch4.g	Average daily CH <sub>4</sub>	.
Mairf.g	Average daily Airflow	.
Mtime.g	Average daily time spent at the GreenFeed	Maximum set at 800



<b>Trait</b>	<b>N, records</b>	<b>N, bulls</b>	<b>N, days</b>	<b>Mean</b>	<b>SD</b>	<b>Min</b>	<b>Max</b>
Weight	885	212	109	309.3	77.48	126	524
BCS	849	204	105	3.0	0.33	2	5
Heart.gi	715	162	93	157.3	14.15	117	194
Height	714	160	93	125.5	7.71	107	154
Nvisits.r	7150	203	935	26.0	11.59	1	117
Sintake.r	7150	203	935	8.9	4.13	0	28
Stime.r	7150	203	935	7727.1	3237.80	23	17645
Mintake.r	7150	203	935	0.3	0.09	0	1
Mtime.r	7150	203	935	317.0	117.07	23	1120
Nmeals.r	7150	203	935	6.13	2.25	2	16
MintakeMeal.r	7110	203	935	0.6	0.24	0.2	4.3
MtimeMeal.r	7110	203	935	556.4	271.70	23	4358
Nvisits.g	2817	160	853	3.9	1.71	1	17
Stime.g	2817	160	853	1285.9	701.03	122	8161
Mco2.g	2817	160	853	6198.2	1103.88	2952	11063
Mch4.g	2817	160	853	223.6	51.83	70	572
Mairf.g	2817	160	853	29.2	4.02	18	41
Mtime.g	2817	160	853	329.3	87.49	122	1060



# Data emission distribution





# Model

$$y = \text{DOB} + \text{AGE} + \text{CG} + \text{ag} + \text{pe} + \text{date} + e$$

y: phenotype

DOB: date of birth (covariate)

AGE: age at phenotyping (covariate)

CG: contemporary group (covariate)

ag: additive genetic (GBLUP)

pe: permanent environmental (bull)

date: date of phenotyping

e: residual

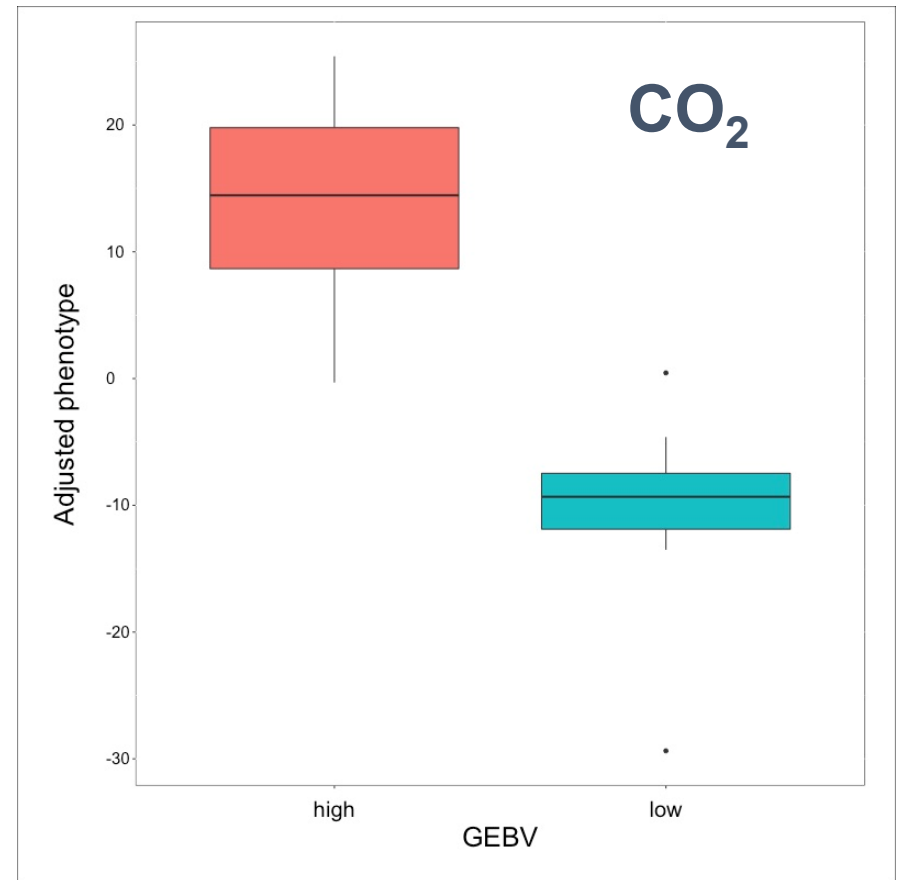
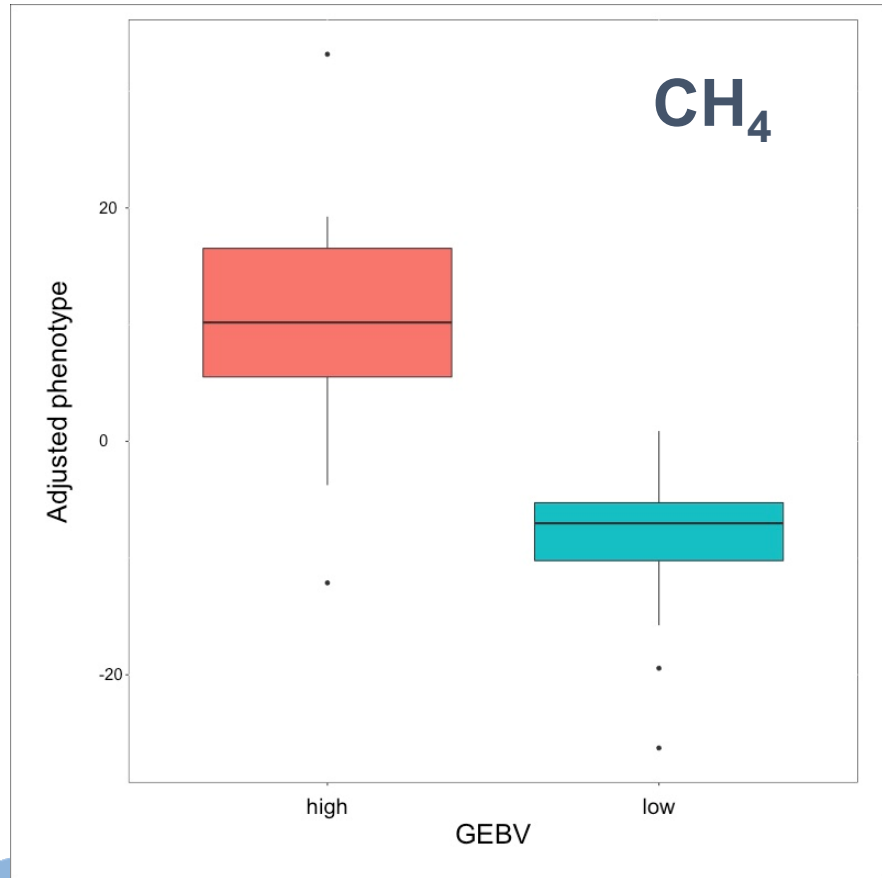


Trait	$h^2$	Perm Env	Date
Weight	0.501 (0.235)	0.378 (0.213)	0.037 (0.016)
BCS	0.590 (0.186)	0.203 (0.153)	0.018 (0.009)
Heart girth	0.467 (0.232)	0.411 (0.211)	0.043 (0.017)
Height	0.391 (0.214)	0.440 (0.188)	0.005 (0.004)
Nvisits.r	0.282 (0.124)	0.125 (0.075)	0.309 (0.031)
Sintake.r	0.293 (0.139)	0.158 (0.088)	0.302 (0.034)
Stime.r	0.181 (0.124)	0.206 (0.077)	0.316 (0.031)
Mintake.r	0.187 (0.135)	0.344 (0.096)	0.065 (0.009)
Mtime.r	0.329 (0.172)	0.323 (0.132)	0.048 (0.008)
SintakeAdj.r	0.146 (0.110)	0.347 (0.077)	0.066 (0.008)
StimeAdj.r	0.390 (0.188)	0.253 (0.141)	0.054 (0.009)
MintakeAdj.r	0.187 (0.134)	0.330 (0.094)	0.063 (0.009)
MtimeAdj.r	0.337 (0.172)	0.313 (0.132)	0.047 (0.008)
Nmeals.r	0.850 (0.086)	0.139 (0.085)	0.006 (0.001)
MintakeMeal.r	0.137 (0.098)	0.171 (0.058)	0.045 (0.007)
MtimeMeal.r	0.204 (0.126)	0.239 (0.083)	0.037 (0.006)
MintakeAdjMeal.r	0.178 (0.127)	0.294 (0.086)	0.060 (0.008)
MtimeAdjMeal.r	0.300 (0.160)	0.303 (0.119)	0.045 (0.007)
Nvisits.g	0.314 (0.101)	0.065 (0.059)	0.098 (0.015)
Stime.g	0.374 (0.107)	0.068 (0.064)	0.115 (0.017)
Mco2.g	0.475 (0.189)	0.198 (0.144)	0.101 (0.019)
Mch4.g	0.276 (0.156)	0.182 (0.102)	0.095 (0.017)
Mairf.g	0.005 (0.008)	0.007 (0.009)	0.958 (0.013)
Mtime.g	0.119 (0.087)	0.101 (0.047)	0.131 (0.021)
Mco2Adj.g	0.480 (0.190)	0.195 (0.145)	0.102 (0.019)
Mch4Adj.g	0.271 (0.156)	0.186 (0.102)	0.095 (0.017)
MairfAdj.g	0.004 (0.005)	0.005 (0.005)	0.956 (0.007)
MtimeAdj.g	0.018 (0.015)	0.012 (0.008)	0.013 (0.010)





Age → 171 – 541 days





# Thanks!



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[www.anafibj.it](http://www.anafibj.it)



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