breed4green

breed4green - Establishing a comprehensive dataset on methane emissions, proxies and other traits in commercial farms

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Duration: 1.5.2023 - 31.10.2027

supported by the BML and dafne.at
Federal Ministry
Republic of Austria
Agriculture, Forestry, Regions
and Water Management

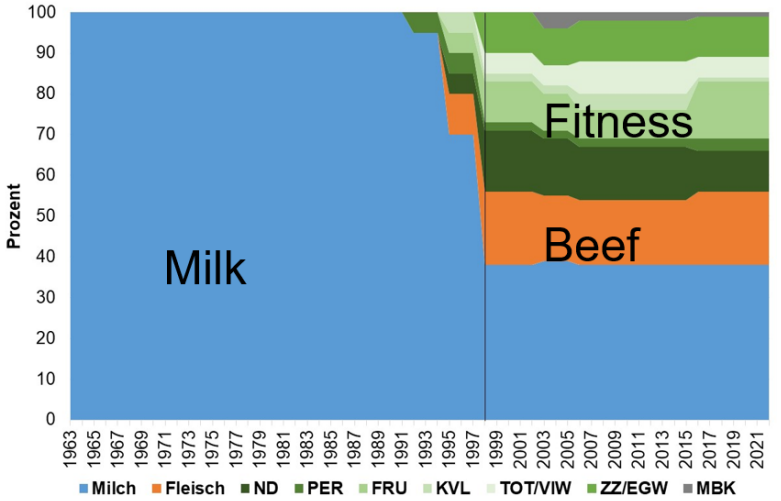
Project partners

Cooperation and supporting partners

Starting point

- **Austria: main cattle breed dual purpose Fleckvieh** (77%), Brown Swiss, Holstein
- **International collaboration** in data processing and genetic evaluation
- **Total Merit Index with dairy, beef and functional traits in place**
- **Feed efficiency and methane** of interest
- **Genomics: many phenotypes still needed** – challenge for expensive traits and smaller cattle populations – **proxies of interest**!

Source: AREC Raumberg-Gumpenstein

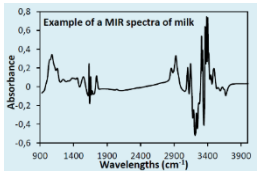


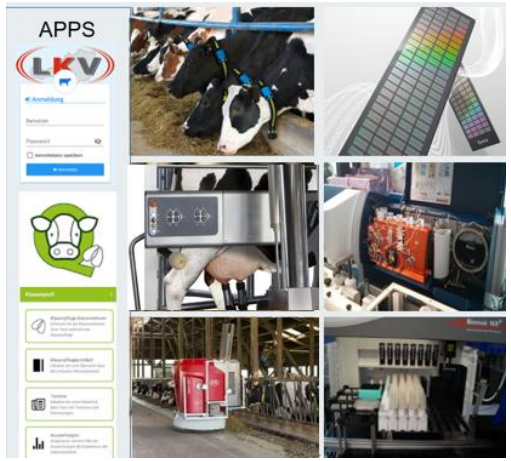
Historic development of TMI-Traits Fleckvieh

Aims: feed efficiency ↑ methane ↓

Data (station and farms)

Veerkamp et al. 2015





Source: SenseHub, Lely, Delaval, Grandl 2022, Kalcher/RZA

Potential

most ‚efficient' cows have lower CH_4

Hörtenhuber (Efficient Cow, 2017)

Q: C-Lock

GreenFeed-system

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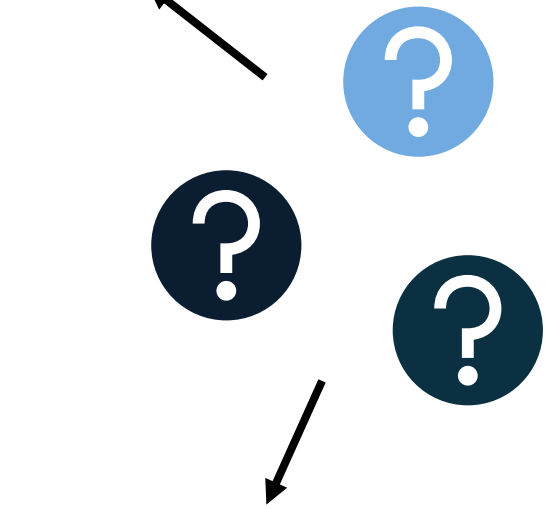
CH_4



Efficiency / Health

Trait definition (direct/indirect traits), genetics (heritability, correlations with other traits in TMI)

Station data

Raumberg-Gumpenstein and Moarhof

Feed intake and information on ration,
methane and CO_2 measurements, DHI and MIR-spectra every 2 days,
AMS (daily milk yield, milking interval), sensor, body weight, BCS,
health information, claw trimming data,
feed information, environmental factors

Farms

25 Fleckvieh and 5 Brown Swiss dairy farms

Methane and CO_2 measurements, DHI and MIR spectra monthly + weekly during GreenFeed period, rations and feed analysis, AMS or MMG (daily milk yield, milking interval), sensor, body weights during GreenFeed period, over 15 months (BCS, health information, claw trimming data, feeding), environmental factors, FoKUHs genotyping

DATA

for research in breed4green

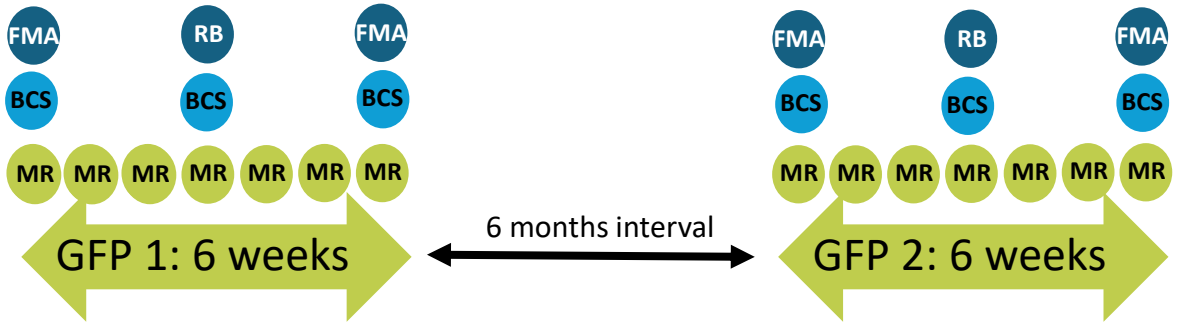
Additional data from RDV (central cattle database) and projects Rinderzucht AUSTRIA

Data from external cooperations

Overview data recording in breed4green

ZUCHT DATA

GreenFeed periods (GFP) 1&2 (6 weeks each):
Methane and CO_2 measurements (GreenFeed)
body weights several times daily (automatic scales)



GreenFeed period (GFP) 1&2:
DHI und MIR spectra weekly
BCS 6x
feed analysis (FMA) 4x
farm data, husbandry
ration analysis (RB) 2x

breed4green data recording 15 months on each farm (30 farms: 12/23 - 10/27)

MR MR MR MR MR MR MR MR MR MR MR MR

At each DHI visit (MR):
Milk yield&contents
MIR spectra
Body condition score
Locomotion score
Ration

Recording for 15 months on each farm:

Day 7 and 14 after calving: ketosis tests and recording of feeding behavior, prophylaxis, health information, claw trimming data, daily milk yield, milking interval (AMS / MMG data)
genotyping of all animals, ration composition,
if available concentrate feeding station data and sensor data

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Data and Origin

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ZUCHT DATA

Data collection/data provision

- DHI (LKV)
- Farmer
- Technology provider
- RDV
- Feed laboratory
- ……

Partners

- Farmers
- LKVs
- Breeding associations
- Different milking technology companies
- Different sensor companies
- c-lock
- Datamars...

Data transmission

- Data interface
- Data export
- csv per email
- APEX breed4green
- APEX RDV…

Agreements

- data protection
- data usage

Data quality

- 30 farms - ensuring high data quality crucial!
- Monitoring routine
- Regularly check data quality

Cooperation between many parties, many systems, every farm different!

Challenges

- **Recruitment of suitable farms**
  - building structure and space in the barn – enough space for scales and GreenFeed
  - motivation of farmer, workload
- **Technical challenges**
  - Animal recognition – multiple EIDs on same animal challenge for GreenFeed and scales
  - Internet failures
- **Wide variety of technical equipment**
  - data exchange, format, quality

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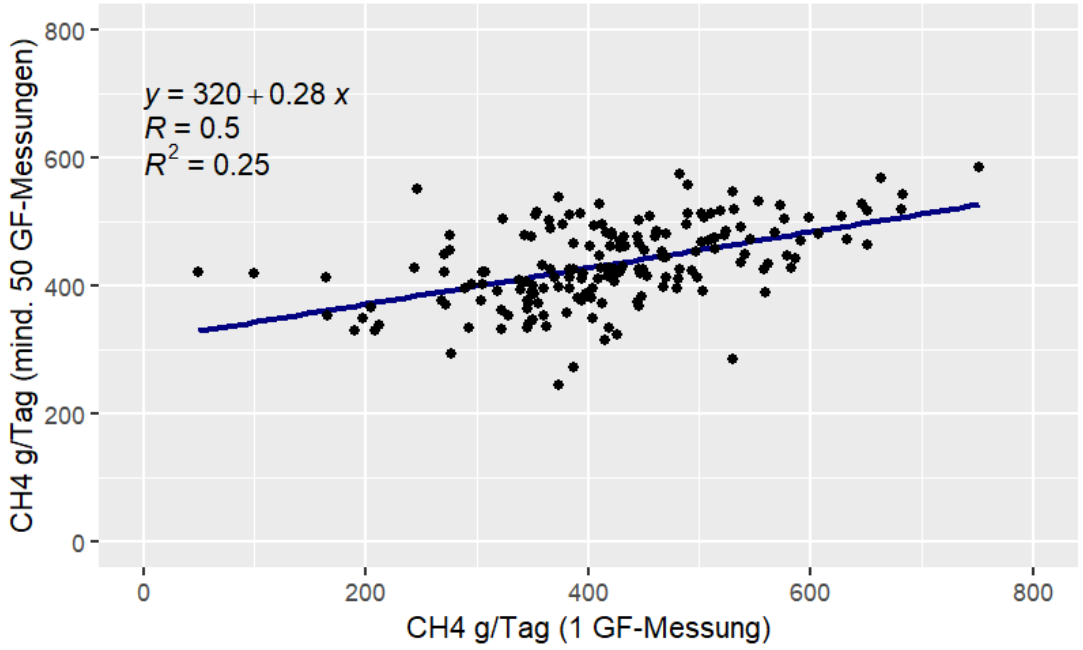
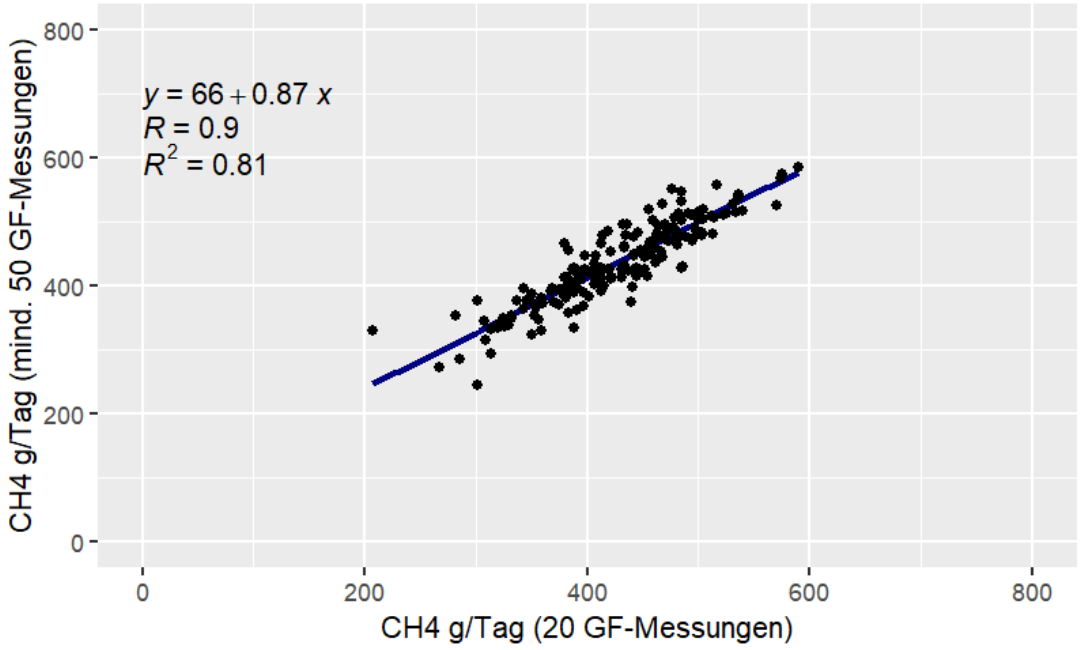
ZUCHT DATA

Source: Linke, Schmid

How many GreenFeed-measurements per animal?

- >2 minutes: 175 animals with more than 50 measurements





Methane measurements with GreenFeed

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ZUCHT DATA

- High variability
- Daily fluctuations
- 20 measurements required to determine methane emissions for one animal
- If the animals remain in the GreenFeed box for a longer period, fewer measurements are required to obtain meaningful results

Phenotypic correlations – Fleckvieh

6 farms, 201 cows (at least 20 GreenFeed-measurements in period)

Trait	Methane/kg milk	Residual methane	Body weight	Milk
Methane	0.44	0.95	**0.30**	**0.15**
Methane/kg milk		0.55	0.10	-0.70
Residual methane			**0.00**	**-0.02**
Body weight				0.03

Heritability – Fleckvieh

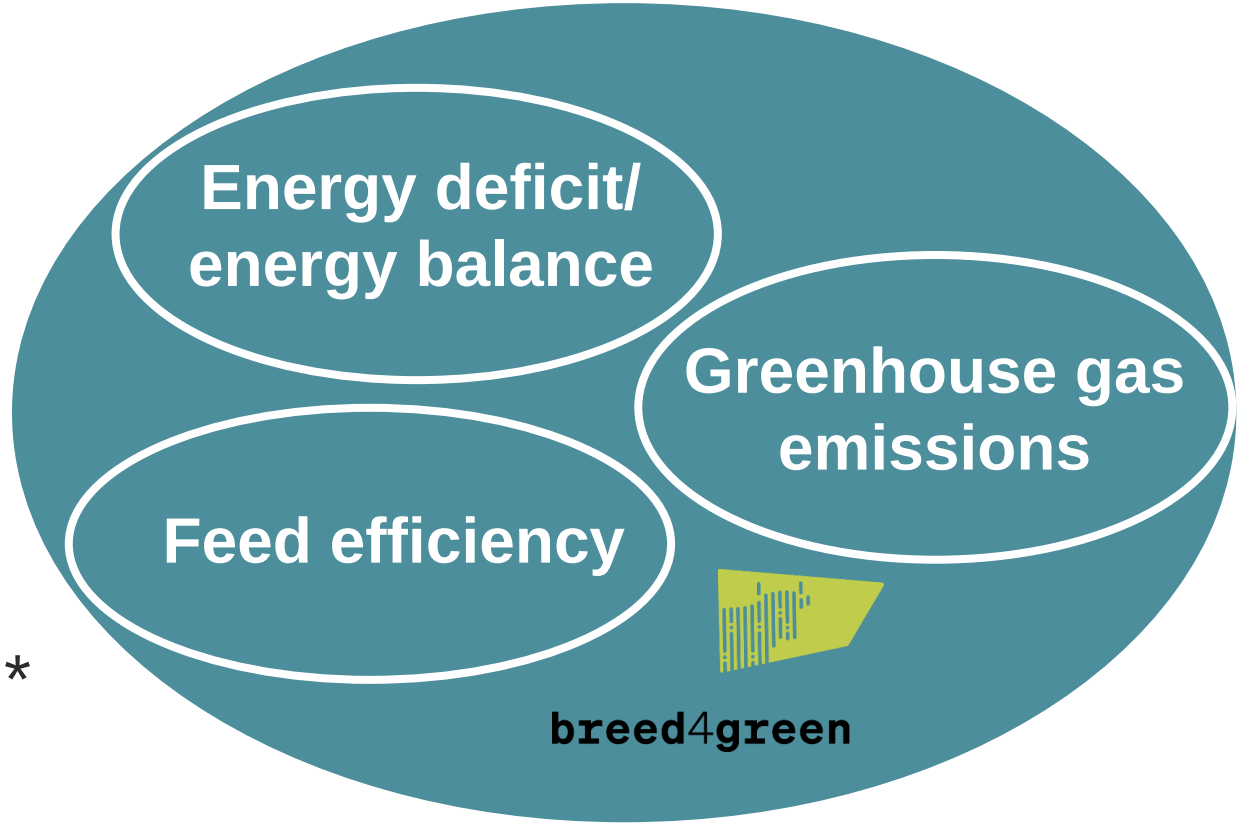
6 farms, 201 cows (at least 20 GreenFeed-measurements in period)

Trait	Number of datasets	Number of cows	Heritability
Methane	1,189	201	0.206 (±0.141)
Methane/kg milk	1,004	200	0.029 (±0.127)
Residual methane	828	179	0.296 (±0.159)
Body weight	1,179	217	0.198 (±0.190)
Milk	1,362	249	0.233 (±0.163)

Outlook

- Research into the **genetic potential for improving feed efficiency and reducing methane emissions** in Fleckvieh and Brown Swiss cattle
  - Direct and indirect traits (e.g. mid-infra-red estimator)
  - Station and practice farms
  - Relationships to other traits in the overall breeding value
- Consideration of these traits in the breeding goal and breeding program*

*(*after breed4green)*



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RINDERZUCHT AUSTRIA

HBLFA
Raumberg-Gumpenstein
Landwirtschaft

BOKU UNIVERSITY

ZUCHT DATA

LKV AUSTRIA

FLECKVIEH AUSTRIA

BROWN SWISS
MORE THAN MILK

Cooperation and supporting partners

LfL
Bayerische Landesanstalt für Landwirtschaft

LGL

uniform agri

ASR
Arbeitsgemeinschaft Süddeutscher Rinderzucht- und Besamungsorganisationen e.V.

SMARTBOW
a part of zoetis

FBF

LELY

GEA

DeLaval