Re-Livestock
RESILIENT FARMING SYSTEMS

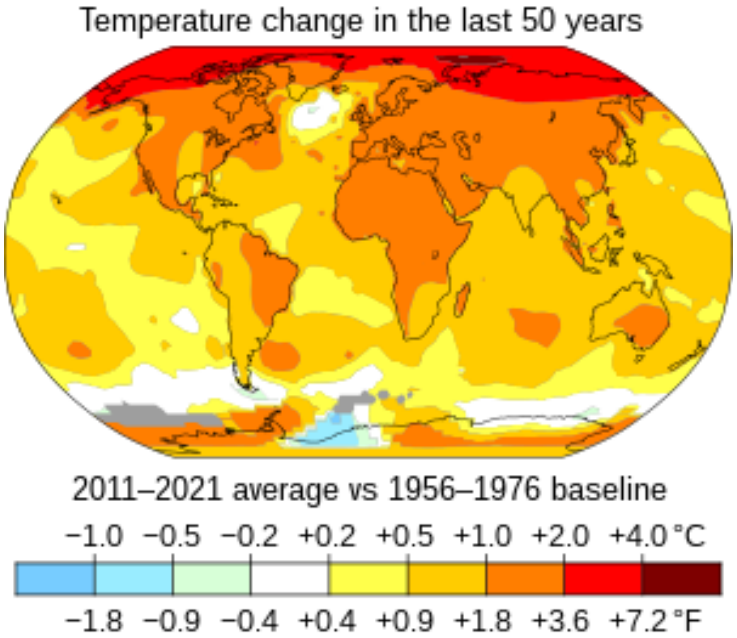
Re-Livestock - Facilitating innovations for resilient livestock farming systems

Birgit Gredler-Grandl
on behalf of EB members

ICAR meeting, Toledo 23rd-25th May 2023

WAGENINGEN
UNIVERSITY & RESEARCH

- Global warming
- Long-term shifts in temperature and weather patterns
- Human activities
- Resilience to harsher environments



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This article is more than 4 months old

New Zealand farmers may pay for green first p

By 2025, fa
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by Jacinda

Newsletters Live

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Learn more

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- Horizon Europe (HORIZON-CL6-2021-CLIMATE-01-06)
- September 1, 2022 - August 31, 2027
- Budget: €13 Million (9.5 EU, 3.5 CH and UK)

Overall objective

To evaluate and mobilize the adoption of innovative practices applied cross- scale (animal, herd, farm, sector and region) ...

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to reduce GHG emissions from livestock farming systems and increase their capacity to dealing with potential climate change impacts

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to reduce GHG emissions from livestock farming systems and increase their capacity to dealing with potential climate change impacts.

37 partners // 13 countries

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AT	Austria
AU	Australia
CH	Switzerland
DE	Germany
DK	Denmark
ES	Spain
IE	Ireland
IT	Italy
NL	The Netherlands
PL	Poland
PT	Portugal
SE	Sweden
GB	United Kingdom

37 Partners

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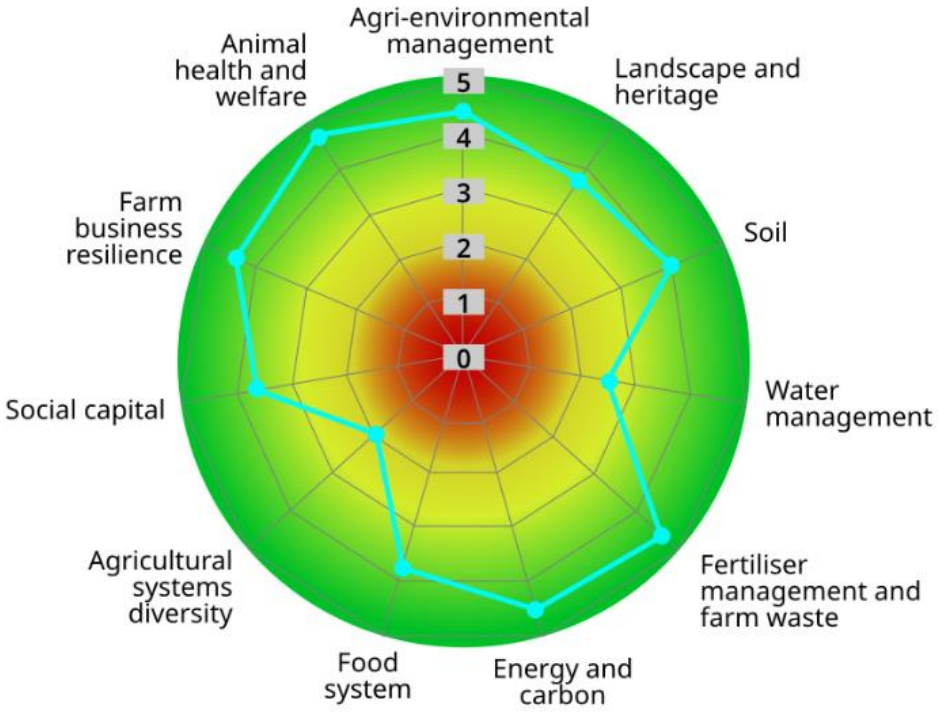
#	Role	Short Name	Legal Name	Country
1	COO	CSIC	Agencia Estatal Consejo Superior de Investigaciones Científicas	ES
2	BEN	WR	Stichting Wageningen Research	NL
3	BEN	UNIBO	Alma Mater Studiorum - Universita di Bologna	IT
4	BEN	UPV	Universitat Politecnica De Valencia	ES
5	BEN	WU	Wageningen University	NL
6	BEN	SLU	Sveriges Lantbruksuniversitet	SE
7	BEN	AU	Aarhus Universitet	DK
8	BEN	IAMZ-CIHEAM	Mediterranean Agronomic Institute of Zaragoza (ES). International Centre for Advanced Mediterranean Agronomic Studies	ES
9	BEN	UCD	University College Dublin, National University of Ireland, Dublin	IE
10	BEN	UNIPI	Universita di Pisa	IT
11	BEN	CONSULAI	Consulai, Consultoria Agroindustrial Lda	PT
12	BEN	MVARC	MVARC	PT
13	BEN	PIK	Potsdam-institut fur Klimafolgenforschung Ev	DE
14	BEN	AERES	Stichting Aeres Groep	NL
15	BEN	CRV BV	CRV BV	NL
16	BEN	ICOEL	Innovationscenter for Økologisk Landbrug P/S	DK
17	BEN	UEX	Universidad de Extremadura	ES
18	BEN	PULS	Uniwersytet Przyrodniczy W Poznaniu	PL
19	BEN	PCH	Pig Champ Pro Europa SL	ES
20	BEN	BOKU	Universitaet Fuer Bodenkultur Wien	AT
21	BEN	ANAS	Associazione Nazionale Allevatori It Suini	IT
22	BEN	PIC	Pig Improvement Company España, SA	ES
23	BEN	PROVACUNO	Organización Interprofesional Agroalimentaria De Carne De Vacuno- Provacuno	ES
24	BEN	AEANI	Asociación Española de Criadores de Ganado Vacuno Selecto de Raza Avilena Negra Ibérica	ES
25	BEN	IRIAF	Instituto Regional de Investigación Y Desarrollo Agroalimentario Y Forestal De Castilla-la Mancha	ES
26	AP	FIBL	Forschungsinstitut Fur Biologischen Landbau Stiftung	CH
27	AP	Agroscope	Eidgenoessisches Departement Fuer Wirtschaft, Bildung Und Forschung	CH
28	AP	AGRIFIRM	Agrifirm Group BV	NL
29	AP	Barenbrug	Barenbrug Holland BV	NL
30	AP	UQ	The University of Queensland	AU
31	AP	ABS	Agribusiness Service B.V.	NL
32	AP	DSM	DSM Nutritional Products Ltd	CH
33	AP	UREAD	The University of Reading	UK
34	AP	SRUC	SRUC	UK
35	AP	QUB	The Queen's University of Belfast	UK
36	AP	ORC	Progressive Farming Trust Ltd Lbg	UK
37	AP	PFLA	Pasture-fed Livestock Associationcic	UK

Re-**understanding**
and mobilising adoption
multi-actor approach



- Public Goods tool-based data collection for answering the following research question:
- **In which innovative farming systems is *"climate-smartness"* evident?**

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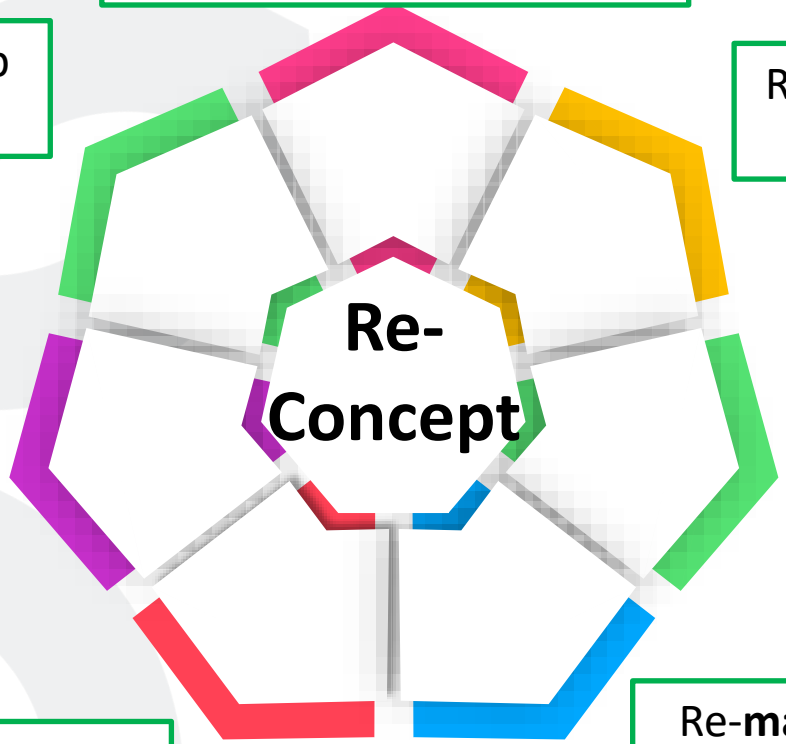
Re-**understanding** and mobilising adoption multi-actor approach

Re-**map** a roadmap for transition

Re-**feeding** livestock for resilience



Re-**design** of circular systems

Re-**breeding** livestock for resilience

Re-**assessment** of livestock farm systems

Re-**managing** farm level for livestock resilience

Re-Feeding livestock for resilience

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To identify and evaluate **low carbon footprint feed materials**

To evaluate **grasslands** in low carbon livestock production

To increase the contribution of **feed supplements** to low carbon livestock production

To **make forage crops and livestock** more resilient to climate change and volatility

Re-Breeding livestock for resilience

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Demonstrate the **potential** of **animal breeding** in climate change **mitigation** and **adaptation**

To improve **accuracy** and **predictive ability** of **EBV** for **mitigation** and **adaptation** traits

To design **breeding strategies** that **reduce** GHG emission and **contribute** to adaptation to climate change

Role of animal breeding in climate change mitigation

- Evaluate the reduction of CH_4 and CO_2 through selective breeding
- Define traits and combine phenotypes for CH_4 and CO_2 of four countries (more countries under discussion)
- Estimation of EBV for CH_4 and CO_2 traits and evaluate accuracy of EBV

Role of animal breeding in climate change mitigation

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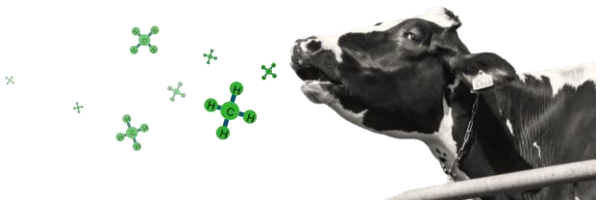
Across country analysis

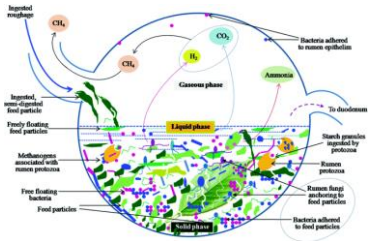
Phenotypes for CH4 & CO2

Host genomic data

Rumen microbiome

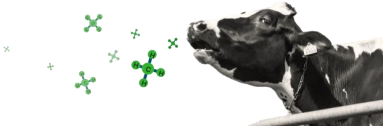
Rumen metagenomic data

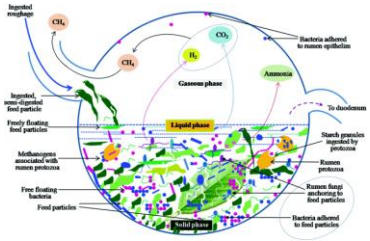




Singh et al. 2019

Data

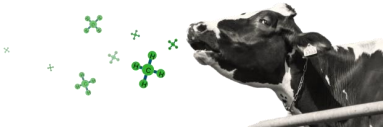


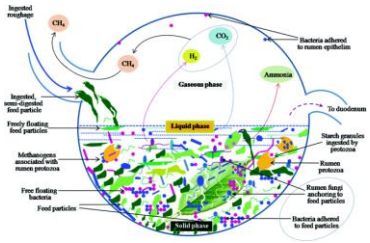


- Australia
- Poland
- Spain
- The Netherlands

Pictures: Anouk van Breukelen, AGRI

Data

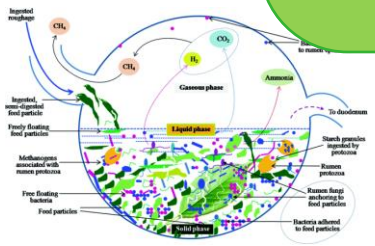




- **Australia**
  400 Brahman and composite cattle (4,250 cattle by 2026)
  Microbiome information available on part of the animals
- **Poland**:
  483 Holstein cows
- **Spain**:
  >3,000 Holstein cows
  Microbiome: 439 cows
- **The Netherlands**:
  7,000 Holstein cows (100 herds: 15,000 cows)
  Microbiome: 1,000 cows

Pictures: Anouk van Breukelen, AGRI

Data



~ 20,000 cattle phenotyped for CH4
~ 2,000 cattle with rumen metagenome data

y 2026)

imals

Microbiome: 439 cows

- **The Netherlands**:
  7,000 Holstein cows (100 herds: 15,000 cows)
  Microbiome: 1,000 cows

Pictures: Anouk van Breukelen, AGRI

Novel phenotypes and genetics of adaptation to climate change

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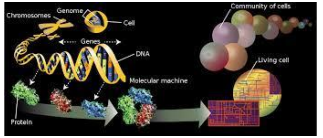
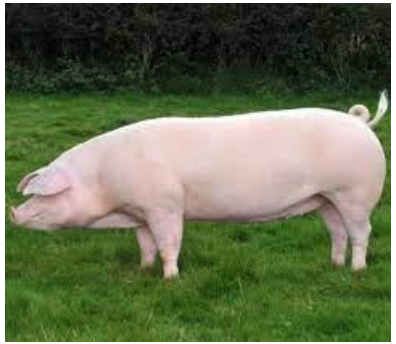
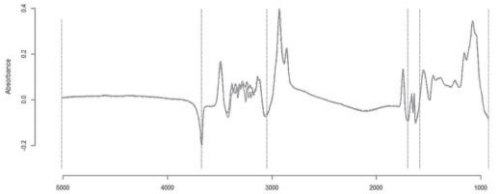
- Define innovative phenotypes
- Collection of climate data across various European regions
- Estimate genetic parameters
- Determine the –omics behind **heat tolerance**
- Local versus mainstream breeds

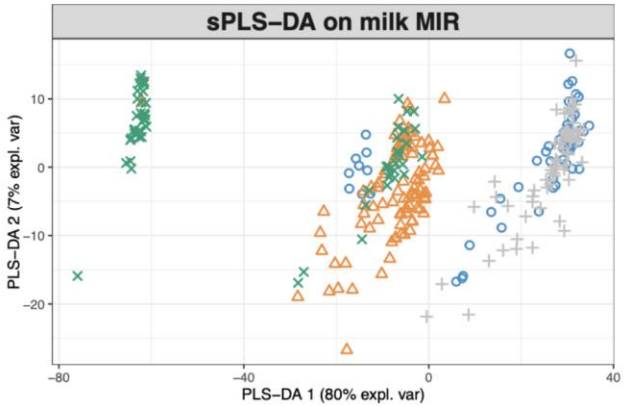




MIR as selection criteria for thermotolerance



Ramon et al., 2023



PLS-DA Loadings

	Comp 1	Comp 2
○ Comfort & primiparous	0.382	0.260
△ Heat & primiparous	-0.193	-0.761
+ Comfort & multiparous	0.540	0.028
× Heat & multiparous	-0.724	0.594

Figure 4. First two components of the PLS-DA analysis from mid-infrared spectra of sheep milk in relation to the physiological status (primiparous vs. multiparous) or the presence or absence of environmental stressors (comfort vs. heat stress).

Genetic evaluation tools and breeding strategies

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Genomic prediction

- Include biological/functional information
- GWAS, selection signatures, biomarkers

Breeding strategies

- lower the environmental impact of livestock production systems without adverse effects
- increase the adaptation of livestock to climate change
- Selection indices for different future climate scenarios

Re-managing farm level for livestock resilience

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Develop **husbandry & housing techniques** for mitigation and adaptation

Enhance **nutrient recycling and C sequestration**

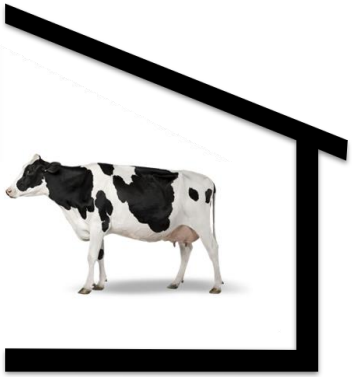
Novel **agroforestry** combinations and **grassland management**

Improve **decision making** based on **PLF**

Re-managing farm level for livestock resilience

Develop **husbandry & housing techniques** for mitigation and adaptation

Husbandry practices for cattle in indoor systems



- Shadow, roof insulation, self-controlled showers
- Calves (social management, ...), feedlot (size groups, densities…)
- PLF devices as non-invasive indicators

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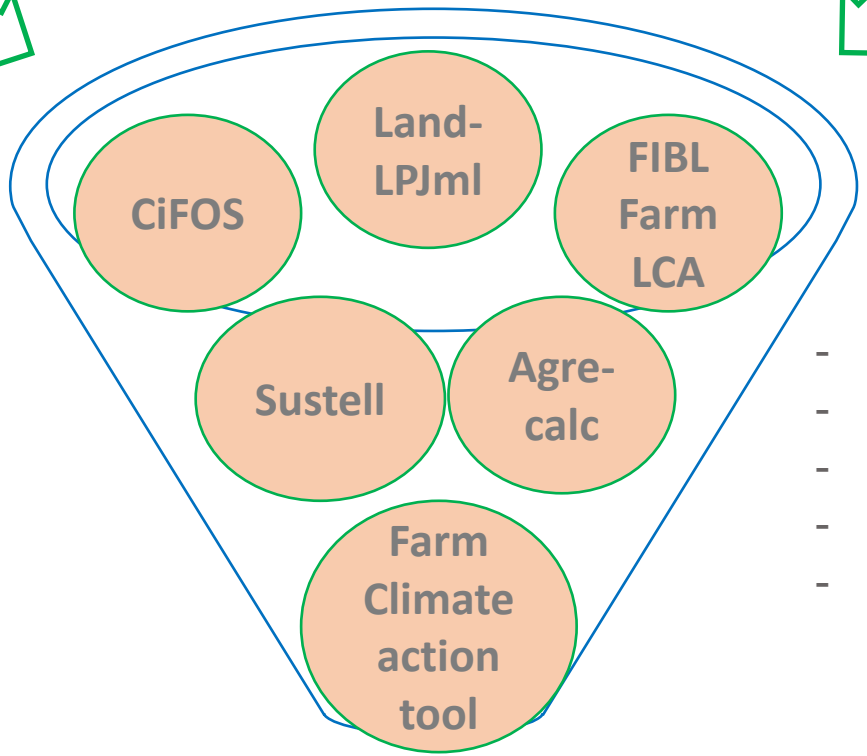
Re-Breeding

Re-Feeding

Re-Managing



Re-Model
Re-Toolbox

- Farm LCA-tools
- Model food systems
- Global vegetation model
- Model global C cycle
- Emissions from housing, grazing, crop rotation, manure ...

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Thank You!

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www.re-livestock.eu

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