

Global Methane Genetics initiative

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GMG webinar: Enabling adoption of methane-reducing breeding programs through GHG accounting and MRV frameworks

GMG project: Framework adoption & incentivization system for genetic selection as methane mitigation tool

**Methane
breeding value
validation
protocol**

Webinar
May 11, 2026

**SWOT analysis
trait definition
Selection index
Breeding objective**

Webinar
April 13, 2026

**Review of
policy levers
and market
mechanisms**

Webinar
May 7, 2026

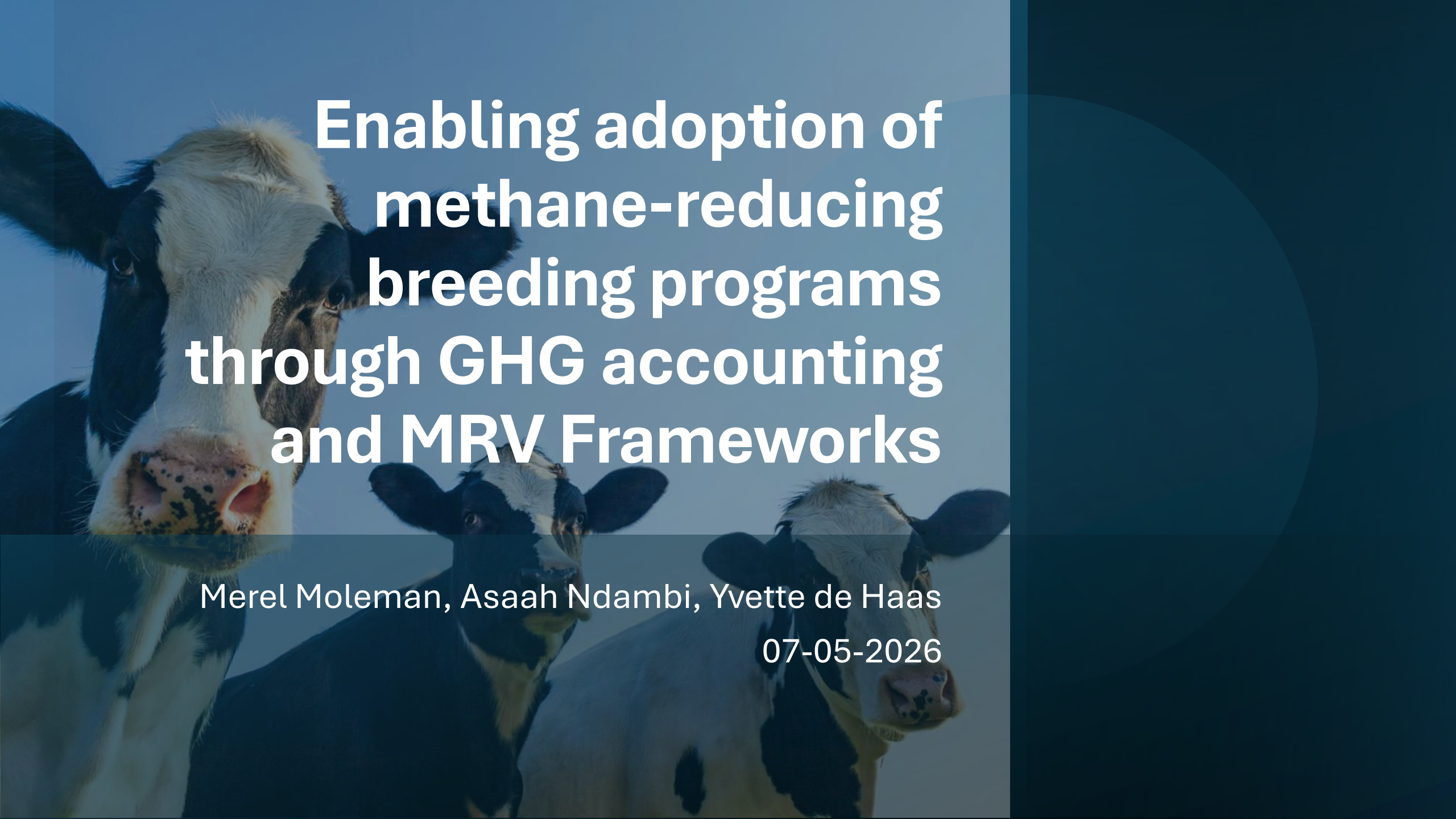
Session at ICAR meeting in Verona: Adoption & Incentives to Breed for Methane Mitigation
<https://icar2026.it/meeting-programme/>

Agenda

- **Asaah Ndambi (WUR):** *GHG accounting tools* (15 min)
- **Merel Moleman (WUR):** *MRV and incentive mechanisms* (25 min)
- **Discussion** (15 min)

Aim

- Present first results
- Get feedback



Enabling adoption of methane-reducing breeding programs through GHG accounting and MRV Frameworks

Merel Moleman, Asaah Ndambi, Yvette de Haas

07-05-2026

The problem

Livestock accounts for **12%** of global GHG emissions and **33%** of methane emissions.

Methane emissions from cows and sheep can be reduced by **25%** via breeding programmes.

Yet, livestock receives less than **1%** of global climate finance.

Solution: Integrate genetics into carbon calculation tools



**Increase awareness
& visibility**

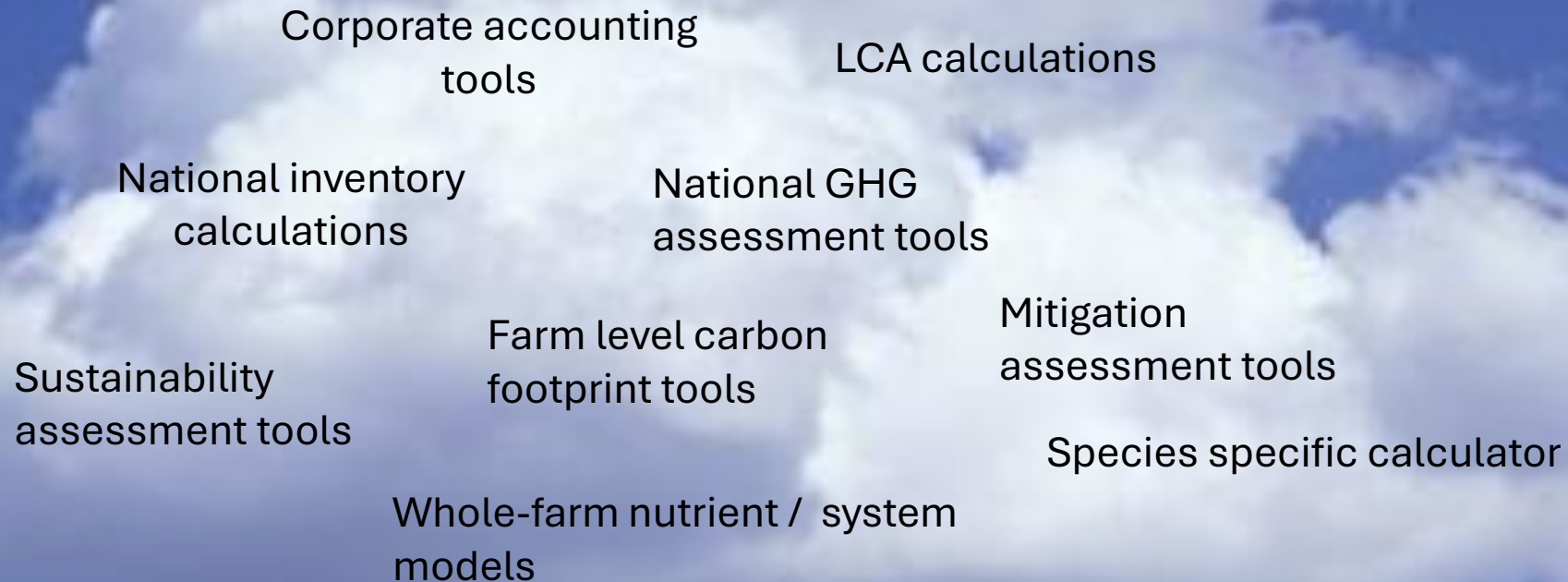


**Unlock incentive
programs**



**Support policy &
corporate alignment**

A cloud of GHG accounting



Corporate accounting
tools

LCA calculations

National inventory
calculations

National GHG
assessment tools

Sustainability
assessment tools

Farm level carbon
footprint tools

Mitigation
assessment tools

Species specific calculator

Whole-farm nutrient / system
models

A cloud of GHG accounting

Corporate accounting
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**National GHG
assessment tools**

Sustainability
assessment tools

**Farm level carbon
footprint tools**

Mitigation
assessment tools

**Whole-farm nutrient /
system models**

Species specific calculator

Mapping the current landscape of tools

Tool / Model	Country of Origin	Ruminant Species Covered	Scale
GLEAM / GLEAM-i	FAO (Global)	Cattle, goats, sheep, buffalo, camels	Global / National / Farm
EX-ACT (Environmental eXternalities ACcounting Tool)	FAO (Global)	Cattle, sheep, goats	Project / Programme / Sector / National
AGNAV	Ireland	Cattle, goats, sheep	Farm level
Agrecalc	UK	Cattle, sheep, goats	Farm level
Agrosfär	Sweden	Cattle	Farm level
Biocode	Finland	Cattle	Farm / Supply chain
BOVID CO ₂	Spain	Cattle	Farm level
CAP'2ER PE	France	Cattle, goats, sheep	Farm level
CONVIS	Luxembourg	Cattle	Farm level
DECiDE	Belgium (Wallonia)	Cattle, sheep	Farm level
ESGreen Tool	Denmark	Cattle	Farm level
EkonMod	Slovakia	Cattle, sheep	Farm level
Farm Carbon Calculator	UK	Cattle, sheep	Farm level
FaST Navigator	EU	Cattle, sheep, goats	Farm level
Klimrek	Belgium (Flanders)	Dairy cattle	Farm level
KLIR	Switzerland	Dairy cattle	Farm level
Kringloopwijzer (ANCA)	Netherlands	Cattle	Farm level
SANDY	UK	Cattle, sheep, goats	Farm level
TEKLa	Germany	Cattle, goats	Farm level
BIOCODE	Finland	Cattle	Farm level
ADER 914	Romania	Cattle, goats, sheep	Farm level
ArdiCarbon	Spain	Sheep	Farm level
Carbon Sheep	Italy	Sheep	Farm level
Teagasc Sheep LCA	Ireland	Sheep	Farm / National
RISE	Switzerland / FAO	Cattle, goats, sheep (if present)	Farm level
FarmDESIGN (WUR)	Netherlands	Cattle, goats	Farm level
MOTIFS	Belgium (ILVO)	Cattle	Farm level

Next steps: select tools and assess how breeding for methane can be incorporated

An overview of selected tools

Tool / Model	Country of Origin	Ruminant Species Covered	Scale	Tool owner	Purpose of tool
GLEAM / GLEAM-i	FAO (Global)	Cattle, goats, sheep, buffalo, camels	Global / National / Farm	FAO (Respondent from WUR)	Estimate, analyse & stimulate GHG emissions and mitigation scenarios in the livestock sector
CAP'2ER	France	Cattle, goats, sheep	Farm level	IDELE (French Livestock Institute)	Assess environmental footprint of agricultural farms & identify actionable levers to improve their sustainability
Cool Farm Tool	UK	Cattle, sheep	Farm level	Cool Farm Allaince (academic and industry)	Farm-level calculator designed to help farmers measure, manage, and reduce greenhouse gas emissions, water usage, and biodiversity impacts.
Farm Carbon Calculator	UK	Cattle, sheep	Farm level	Farm Carbon Toolkit (organisation)	Primarily for farmers to measure, analyse, and manage a farm's total carbon footprint. It assesses emissions and calculates carbon sequestration in soil and trees.
Kringloopwijzer (ANCA)	Netherlands	Cattle	Farm level	WUR (livestock	Quantify and improve the environmental sustainability of dairy farming. It maps nutrient flows, primarily nitrogen, phosphorus, and carbon across the farm.

Other tools consulted: LCA tool – Italy, National Inventory Tool- Australia

Possible challenges



Data availability



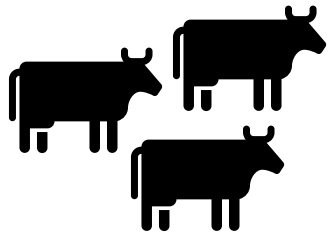
Verification standards



Regional disparities

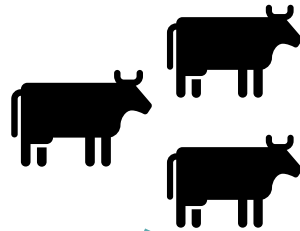
Core data requirements

Tier 1

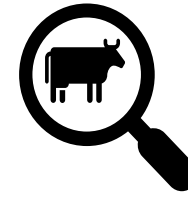


X emissions/animal

Tier 2



X



Herd characteristics

- Animal numbers
- Or modeled animal numbers
 - bull to cow ratio, mortality, age at first calving

Production

- Milk production
- Liveweight
- Number of eggs

Feed

- Quantity
- Quality (digestibility, etc.)

X emission factor

Manure management

- Quantity
- Quality

The basis

Data (x system)

- **Herd characteristics:**
 - Number of animals
 - Age at first calving
 - Bull to cow ratio
 - ...
- **Productivity**
 - Milk production
 - Liveweight
- **Feed ration**
 - % feed in diet
- **Manure management**
 - % manure management

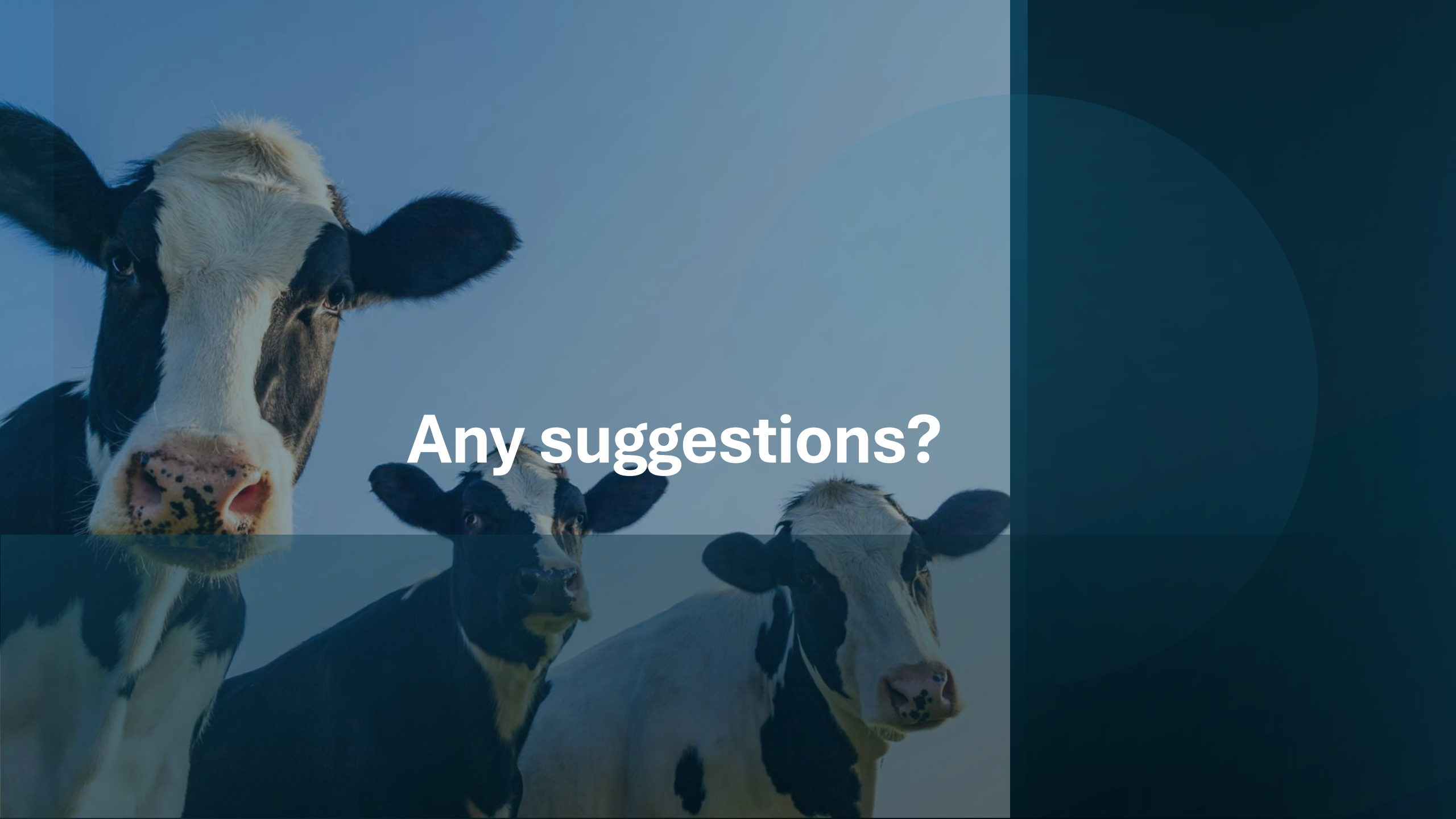
Model

Gleam-I Model



Results

Emission estimates



Any suggestions?



GHG accounting tools & breeding for lower methane emissions

Merel Moleman, Asaah Ndambi, Yvette de Haas

07-05-2026

MRV systems



: Livelihoods Mount Elgon Project



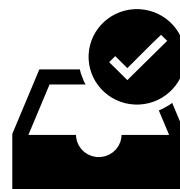
: Cap and Trade program



Monitoring



Reporting



Verification



1 ton of CO₂
equivalent



How would MRV help?

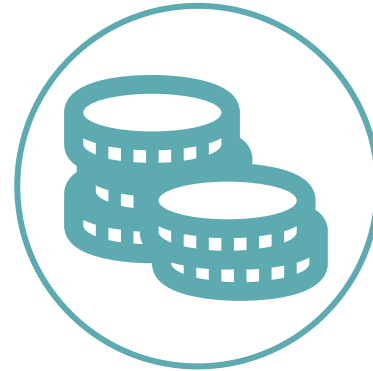
Tracking

Monitors progress toward national targets (e.g., NDCs) and emission reduction goals.



Compliance:

Mandatory reporting under international agreements like the UNFCCC.



Market & certification needs:

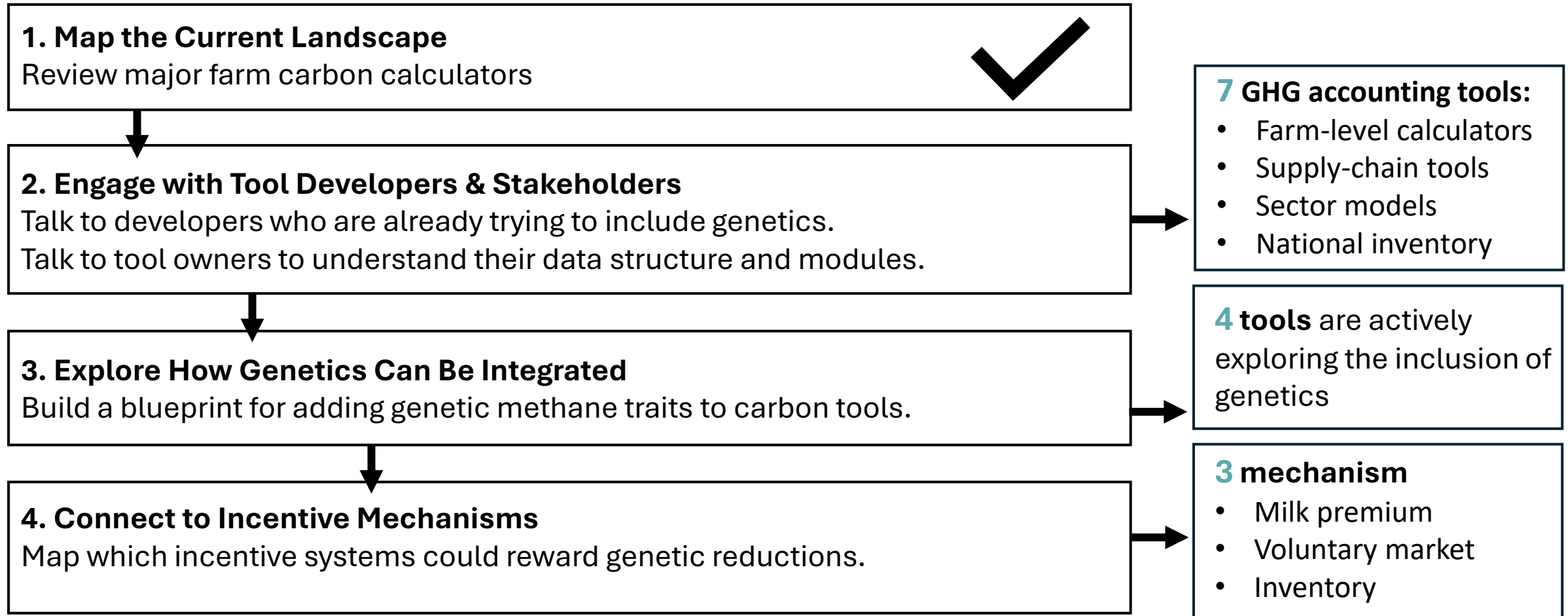
Access to carbon markets & funding



Informed decision-making:

Data-driven decisions for policymakers on mitigation strategies and investments

Objectives



How genetics can be integrated



Breeding-value

Use methane breeding values (MBVs) Aggregate across herd composition.



Measure methane

Measure methane on animal level.
Aggregate across herd composition.



Default assumptions

Assume ~1% annual reduction
Scenario analysis Global & regional models (e.g. GLEAM-i)

Data pipelines

✓ When data pipelines exist

- Centralised databases
- Automated data
- Clear data governance
- Defined institutional roles

✗ When they don't

- No available data
- Manual reporting
- High transaction costs

Governance matters as much as data

- **Ownership & accountability**
- **Risk sensitivity** (political, reputational)
- **Alignment with inventory protocols**
- **Mandate ambiguity** (voluntary vs. compliance-driven)

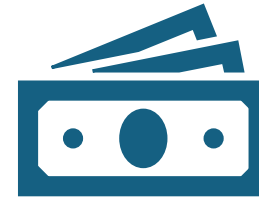
Incentive mechanisms



National inventory



Milk premium



Voluntary carbon
crediting

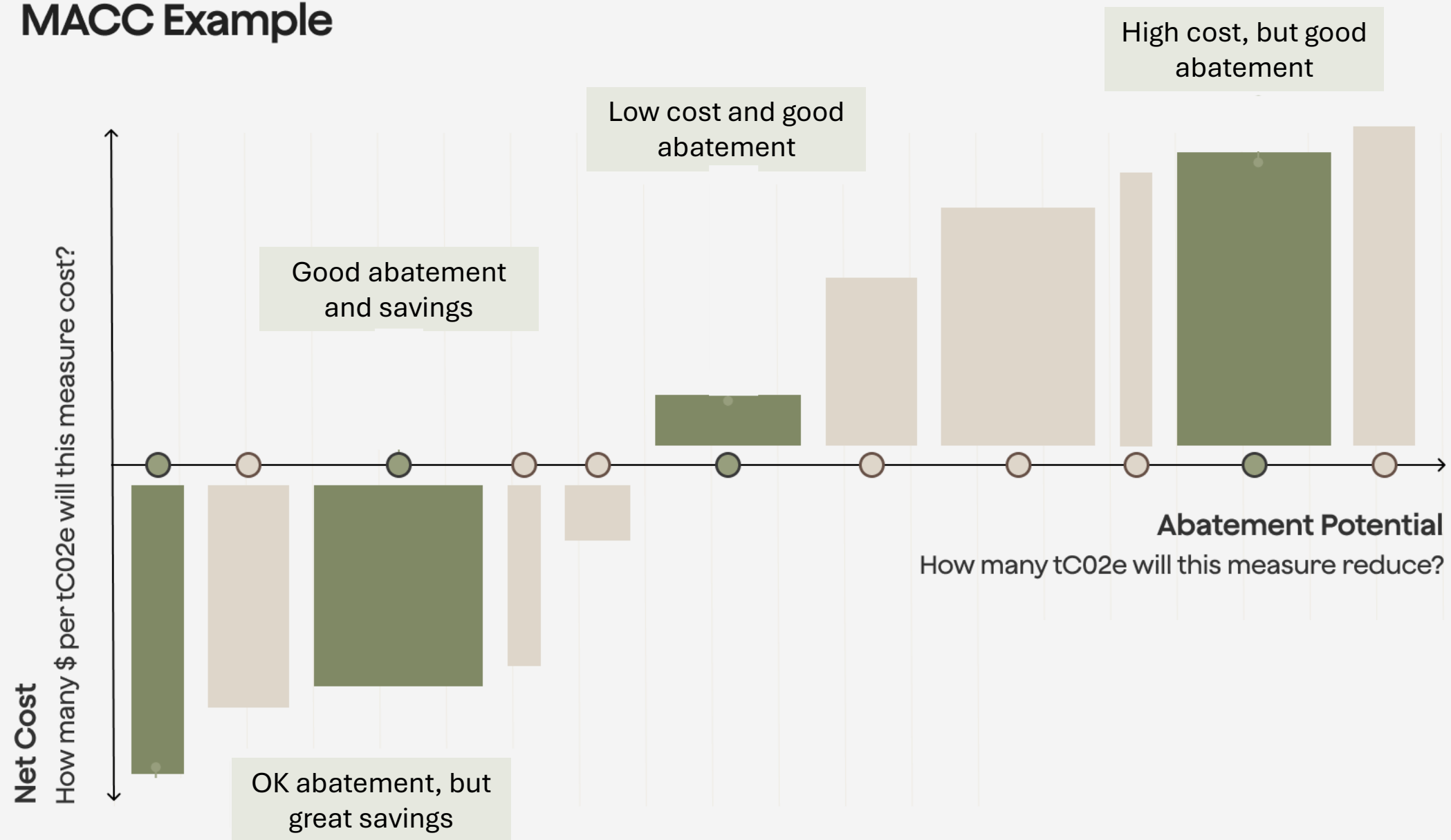
Example: milk premium

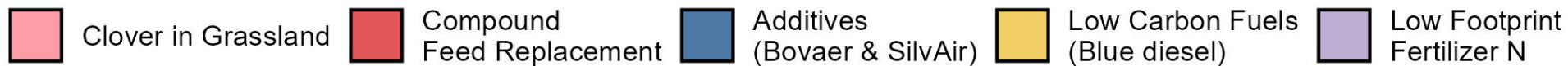
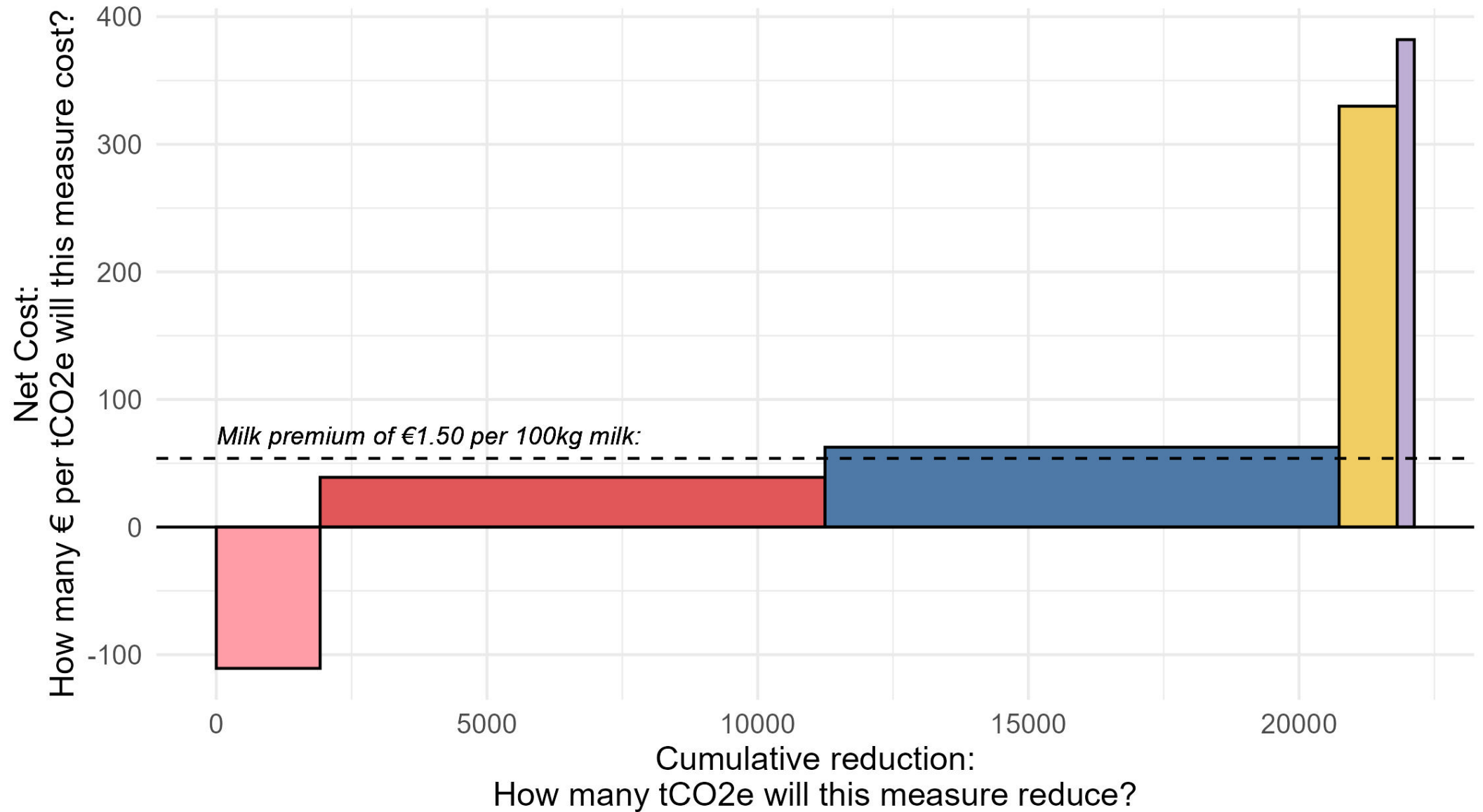
- Data:
 - **Herd & production data:** automatic collected
 - **Feed and manure data:** automatic collected and entered by farmer
 - **Emission factors:** based on national research
- **Dissagregated:** per farm
- Model used:
 - ANCA: Dutch national tool for the dairy industry
- Indicators:
 - Broad range of indicators
 - Including: absolute emissions, emission intensity

linked to a milk premium (1.5 euro per 100 kg milk)



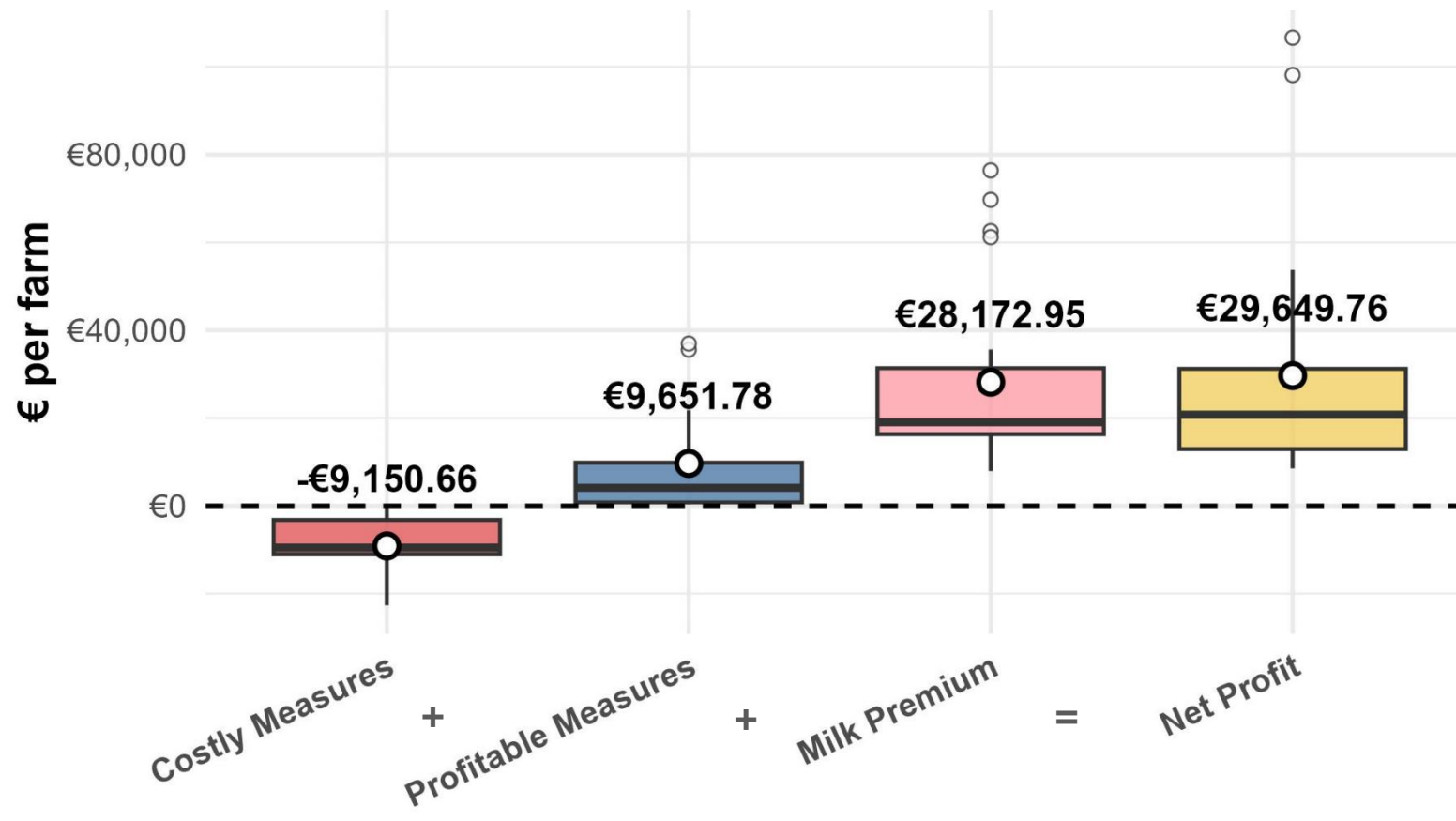
MACC Example





Impact of milk premiums on farm

- $\pm 50\%$ farmers reached 900 gCO₂-eq/kg threshold
- $\pm 20\%$ total reduction potential



Why genetics fits in incentive mechanisms

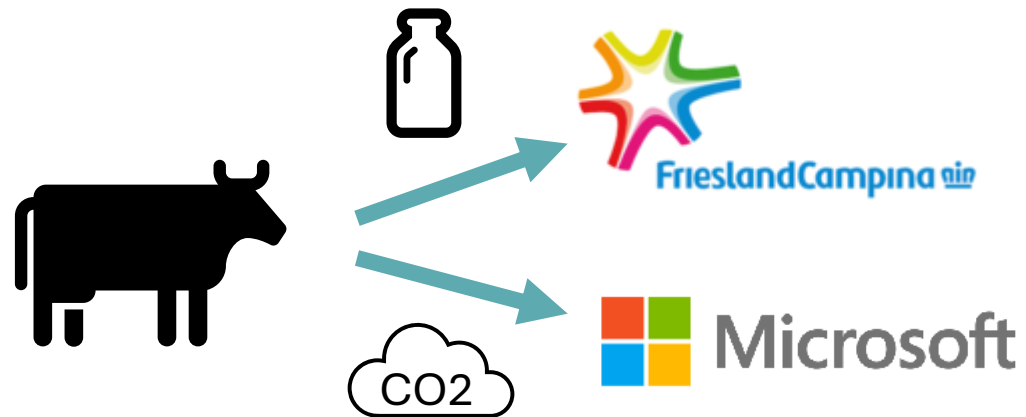
- No reversal risk
- No ongoing input requirements
- Durable and cumulative



Insetting vs offsetting

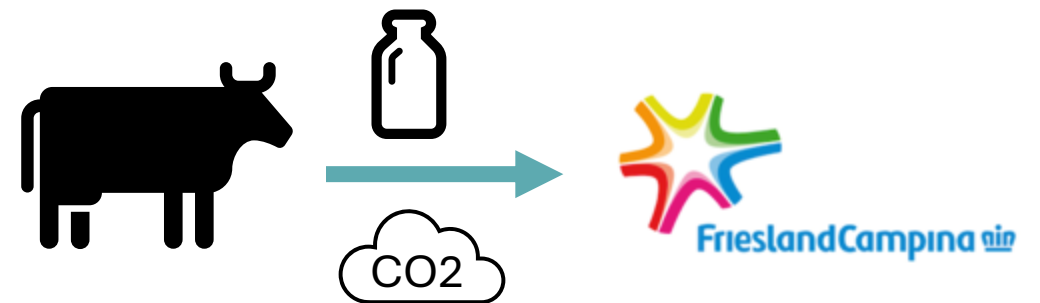
- **Offsetting**

- External credit sales



- **Insetting**

- Reductions stay in value chain
- Supports Scope 3 goals



Farm-level adoption

- **Key constraint:**

- Costly to implement
- Technically complex, reliant on external expertise
- Increases workload
- Requires data sharing



- **Key solutions:**

- Simplify input requirements (focus on highest-impact variables)
- Automate processes within trusted institutions
- Ensure appropriate financial compensation

RESET: Farm adoption is more than economics

Regulation

Education

Social pressure

Economic support

Tools



key knowledge gaps:



Credibility

Transparent link breeding values and emissions

Peer-reviewed coefficients for different contexts/breeds

Valid default assumptions



Negative effects

Avoiding Effects on milk and meat production

Broader rumen function and efficiency



Economics

How much weight methane in selection indices

Alignment between breeding goals and incentives

Main takeaways

- **Genetics is already entering GHG accounting** and is **technically straightforward to include**
- **Scaling is constrained by system readiness:** data availability, infrastructure, and governance
 - **In low-data contexts:** reliance on default assumptions
 - **With better data and investment:** automatization and linkages to incentive mechanisms
- **Private programs are likely to grow faster** than public offset markets
- **Farmer adoption is decisive**, both for: effective MRV systems, and on-farm uptake of mitigation practices
- **Key gaps remain:** credibility, negative side effects, and economics