GHG accounting tools & breeding for lower methane emissions

Global Methane Genetics initiative

Led by WAGENINGEN UNIVERSITY & RESEARCH

In Partnership with BEZOS EARTH FUND, Global Methane Hub

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Integrate genetics into carbon calculation tools

How to solve the problem?

Increase awareness & visibility

Unlock incentive programs

Support policy & corporate alignment

Objectives of the study

1. Engage with tool developers & stakeholders
Talk to developers who are already trying to include genetics.
Talk to tool owners to understand their data structure and modules.

2. Explore how genetics can be integrated
Build a blueprint for adding genetic methane traits to carbon tools.

3. Connect to incentive mechanisms
Map which incentive systems could reward genetic reductions.

7 GHG accounting / frameworks:
- Farm-level calculators
- Supply-chain tools
- Sector models
- National inventory

3 tools are actively exploring the inclusion of genetics

2 mechanism
- Milk premium
- Voluntary market

1. Engage with tool developers & stakeholders

Overview selected livestock tools/frameworks

Tool/ Instrument	Country of origin	Information source	Level	Purpose
GLEAM	- (FAO) [1]	WUR[1]	Multi-scale	Estimate livestock GHG emissions and simulate mitigation scenarios
CAP'2ER[1]	France	IDELE[1]	Farm	Assess environmental performance and identify mitigation options
Cool Farm Tool	United Kingdom	Cool Farm Tool (Written input)	Farm	Farm-level calculator for GHG, water, and biodiversity impacts with scenario analysis
Farm Carbon Tool	United Kingdom	Farm Carbon Toolkit	Farm	Carbon footprint tool and support mitigation
Kringloopwijzer (ANCA)[1]	Netherlands	WUR[1]	Farm	Quantify nutrient flows and emissions
Herd UP	Italy	ANAFIBJ[1]	Farm	Farm management and decision-support tool
National inventory	Australia	Independent	National	Report and account

1: FAO = Food and Agriculture Organization of the United Nation; WUR = Wageningen University & Research; IDELE = French Livestock Institute; ANCA = Annual Nutrient Cycle Assessment; ANAFIBJ = National Association of Italian Holstein, Brown and Jersey Breeders

2. Explore how genetics can be integrated

What data do we need?

Breeding-value

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

Measure methane

Measure methane directly on farm level.

Default assumptions

Assume ~1% annual reduction.

Scenario analysis Global & regional models (e.g. GLEAM-i)

2. Explore how genetics can be integrated

Data infrastructure

Enables progress:

- Centralised data systems
- Automated data flows
- Access to breeding & herd data

Slows progress:

- Limited breeding databases
- Fragmented systems & poor interoperability
- On-farm measurement = costly & not scalable

2. Explore how genetics can be integrated

Governance

Enables progress:

- Clear institutional roles
- Industry-led initiatives
- Motivation -> Alignment with Scope 3 targets

Slows progress:

- Farmer backlash
- Slow public-sector processes
- Need for validation & consensus

3. Connect to incentive mechanisms

Overview of financial incentive mechanisms

Category	Definition	Examples
Carbon Pricing	A set price on emissions (pay per ton of CO_2).	Carbon taxes (e.g. Denmark)
Compliance Carbon Markets	Regulated markets where companies must trade allowances to stay within a cap.	Emissions Trading Systems (ETS)
Voluntary Carbon Markets (VCM)	Companies or individuals voluntarily buy carbon credits to offset their emissions.	Projects certified by Verra or Gold Standard
Results-Based Finance	Payments are made after verified emission reductions.	REDD+ forest protection payments; Green Climate Fund
Other non-market and hybrid climate finance	A wide range of financial instruments, often mixing approaches	Includes private incentives (e.g. “milk premium”)

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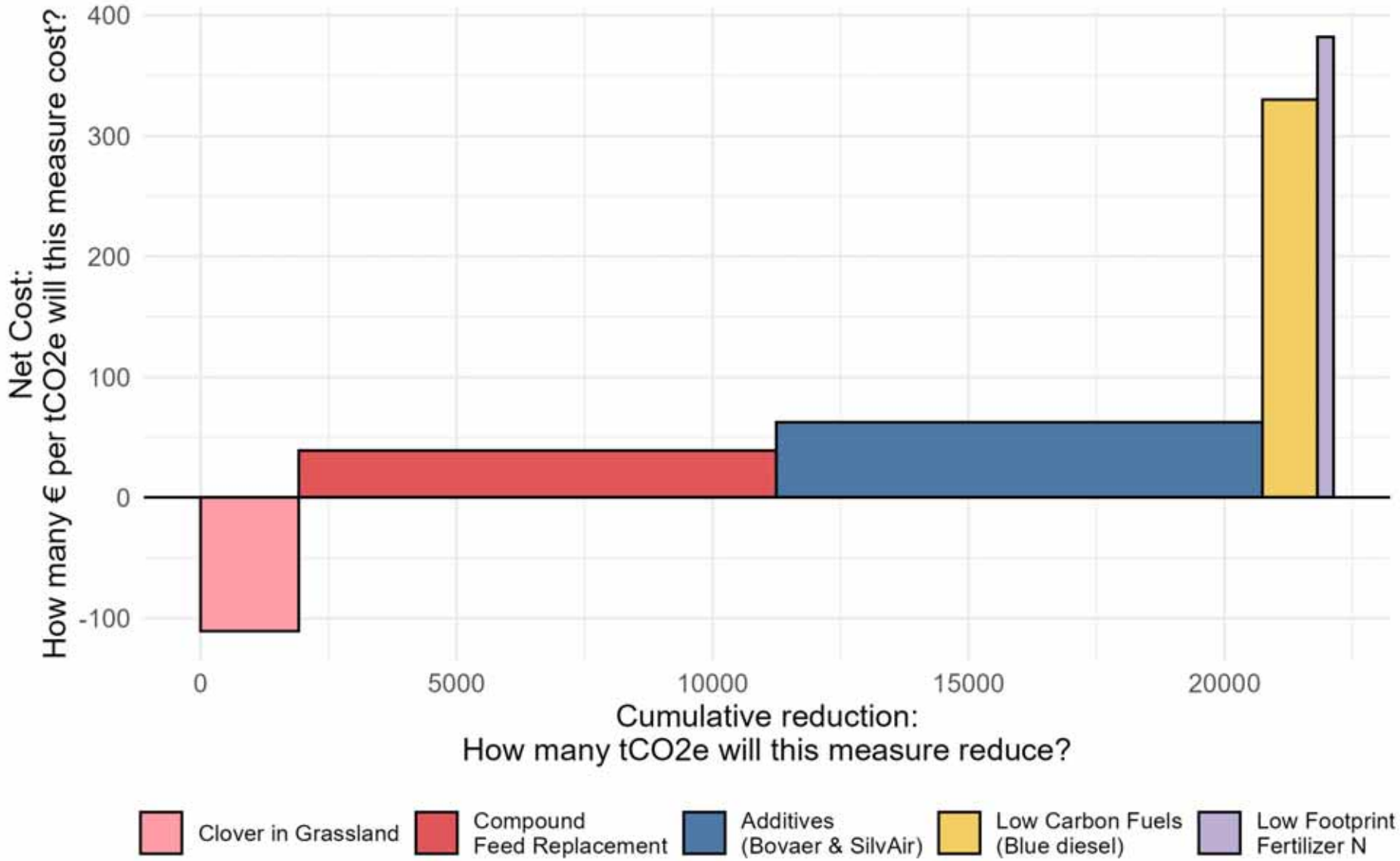
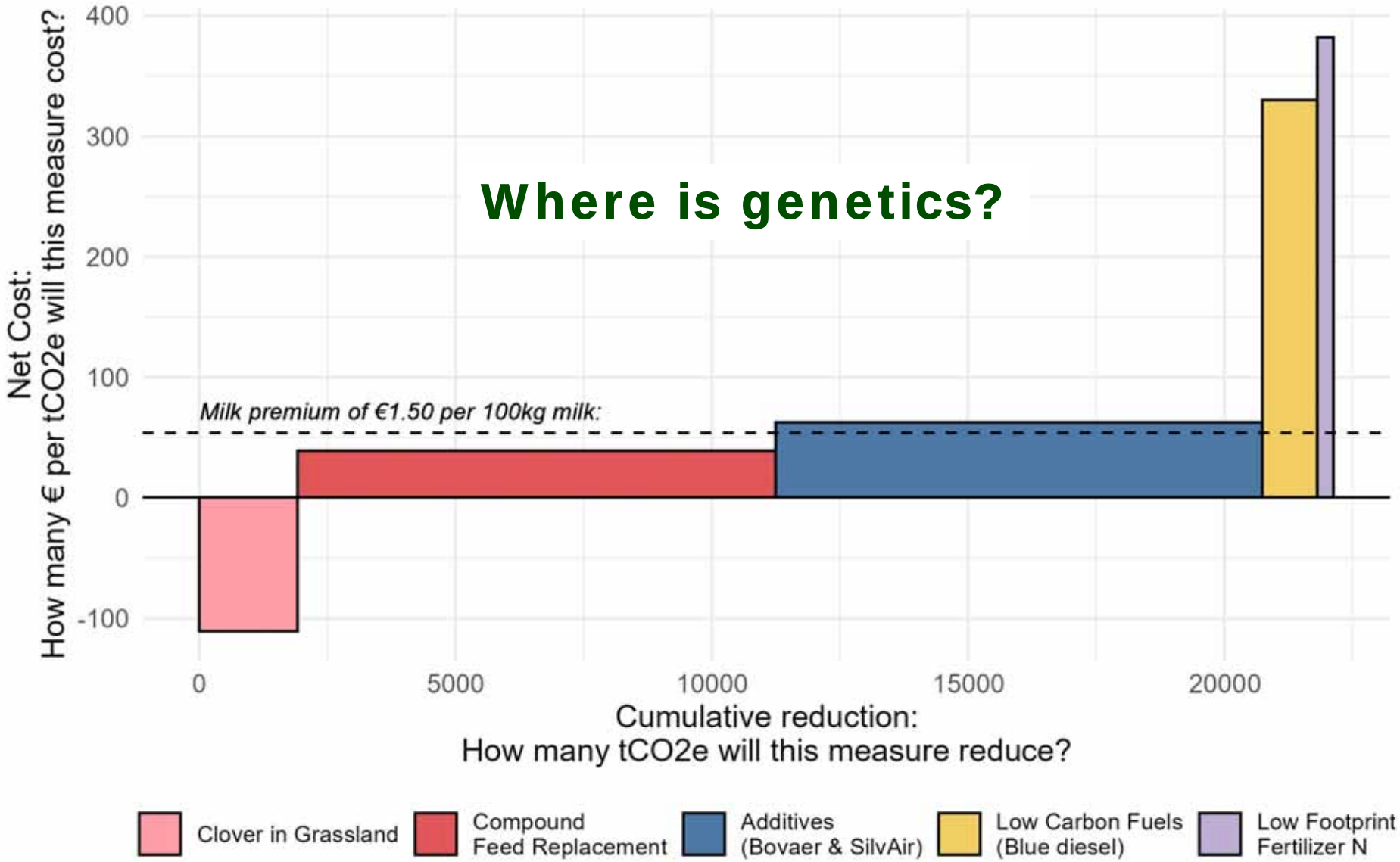
Deep dive:

- **Friesland Campina milk premium**
- **emission intensity threshold**


Net Cost:
How many € per tCO2e will this measure cost?
400
300
200
100
0
-100
0
5000
10000
15000
20000
Cumulative reduction:
How many tCO2e will this measure reduce?
Clover in Grassland
Compound
Feed Replacement
Additives
(Bovaer & SilvAir)
Low Carbon Fuels
(Blue diesel)
Low Footprint
Fertilizer N


Where is genetics?
Net Cost:
How many € per tCO2e will this measure cost?
400
300
200
100
0
-100
Milk premium of €1.50 per 100kg milk:
0
5000
10000
15000
20000
Cumulative reduction:
How many tCO2e will this measure reduce?
Clover in Grassland
Compound
Feed Replacement
Additives
(Bovaer & SilvAir)
Low Carbon Fuels
(Blue diesel)
Low Footprint
Fertilizer N

But… farm adoption is more than economics

The RESET model

- **R**egulation
- **E**ducation
- **S**ocial pressure
- **E**conomic support
- **T**ools

What can the genetic research community do?

Interviewees stressed the following knowledge gaps:

Credibility

- Transparent link breeding values and emissions
- Peer-reviewed coefficients for different contexts/breeds

Negative effects

- Avoiding effect on milk and meat production
- Broader rumen function and efficiency

Economics

- Weight of methane in selection indices
- Alignment between breeding goals and incentives

Main takeaways

- Genetics is already entering GHG accounting and is **technically straightforward**
- Scaling is **constrained by system readiness**: data availability, infrastructure, and governance
- Genetic mitigation is **well suited for financial incentive mechanisms** and is already beginning to connect to carbon markets and pricing schemes.
- **Farmer adoption is decisive**, both for: effective data systems, and on-farm uptake of mitigation practices
- Key **gaps remain**: credibility, negative side effects, and economics

Thank you for your attention

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The problem

A major source of emissions, a minor share of funding

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.

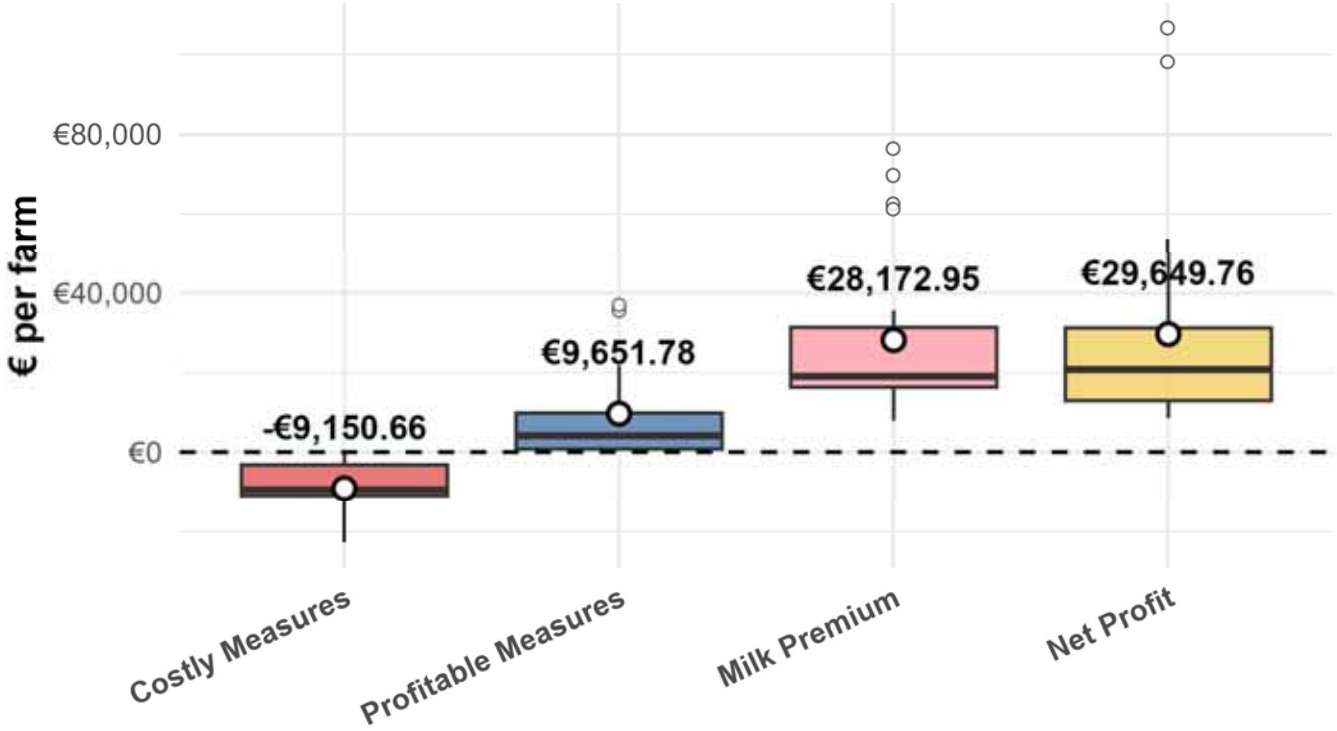
Yet, the Ag sector receives less than **4.5%** of global climate finance.

3. Connect to incentive mechanisms

Financial impact

± 50% farmers reached 900 gCO_2-eq/kg threshold

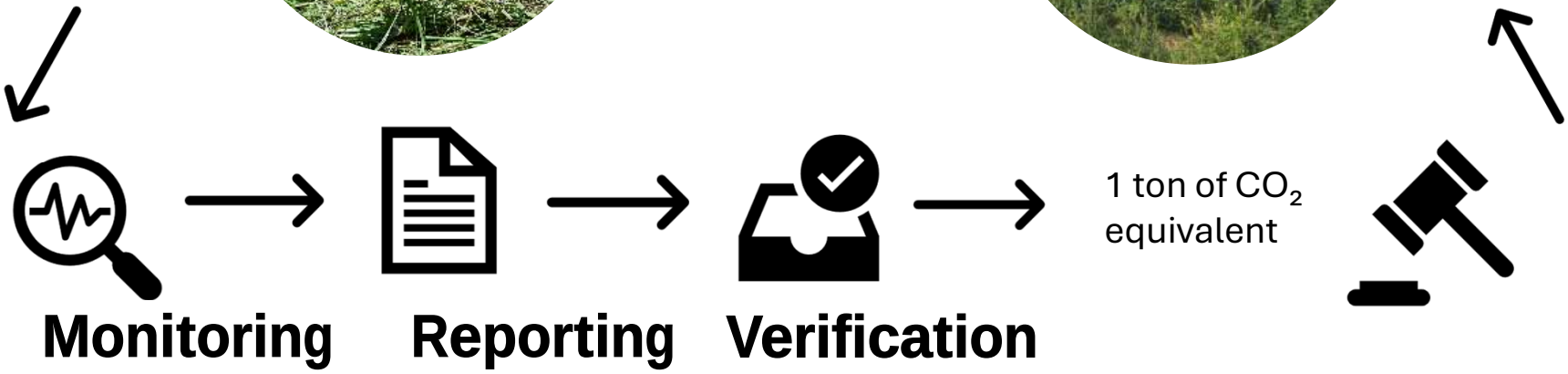
± 20 % total reduction potential



MRV systems are central

KENYA : Livelihoods Mount Elgon Project

California : Cap and Trade program



Sources: State of California, Gerard Tordjman

3. Connect to incentive mechanisms

Genetic mitigation is well suited for financial incentive mechanisms

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