



Latvia University
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Economic aspects of mitigation practices on pilot dairy farms in Europe

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«From grass to glass»

«Decarbonising agriculture and reducing its impact on the environment, ensuring healthy food, is not only a legitimate societal expectation, but a moral duty.»

Dacian Cioloș is a Romanian MEP for Renew Europe.

◆ **Amount and price of product**

and

- ◆ Carbon footprint
- ◆ Ammonia footprint
- ◆ Dairy wellnes



Drivers of green change in farming

- EU Common Agricultural Policy
- National policy
- Cooperatives
- Buyers
- Carbon market
- Green taxonomy
- Investors

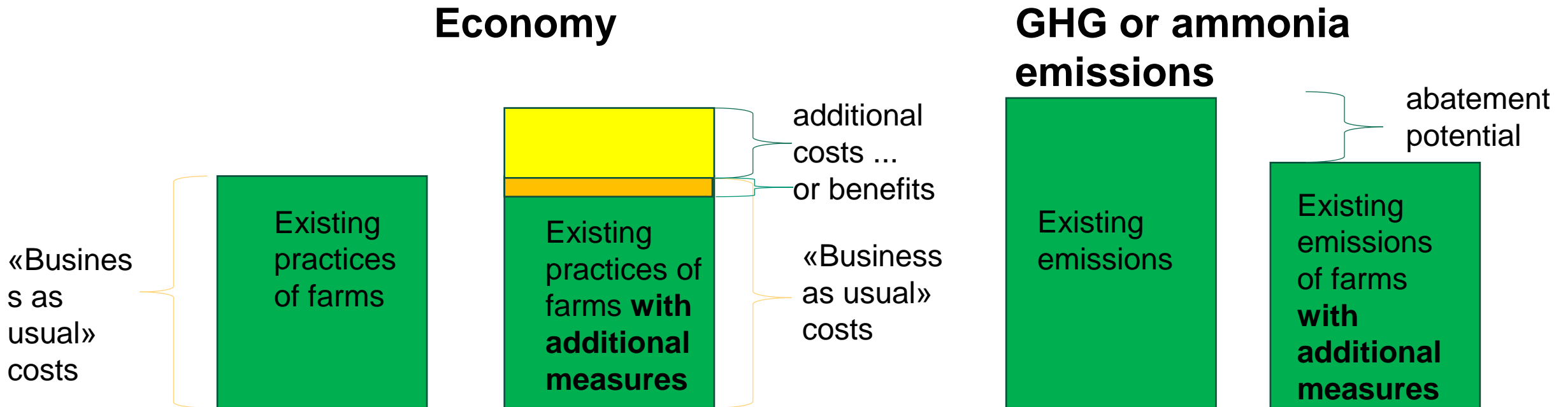
Aim of Project Work Package

The aim of this research, therefore, was to choose mitigation measures with farmers and simulate effects of measures on GHG emissions based on actual farm situations.

Approach

Marginal cost is an economic concept that measures the cost of an additional unit.

The marginal abatement cost, in general, measures the cost/benefit of reducing one more unit of pollution.



Alternatives for interpreting the measure

Measure: Increase feed efficiency

Alternative 1

improve the feed conversion rate (reduce required DM per kg FPCM)



Mitigation practices include:

improvement of feed quality (suitable composition of grasses, grass mowed in time, etc.)

- a) changes in grass management;
- b) feeding plan preparation;
- c) precision feed distribution.

Alternative 2

improving cow genetics



Mitigation practices include:

gradual or immediate replacement of the cow herd by improving the genetics of the cows

- a) replacement of the cow herd;
- b) feeding plan preparation;
- c) precision feed distribution.

Alternative 3

change the composition of the feed



Mitigation practices include:

include concentrates in the feed

- a) feed ration calculation;;
- b) feeding plan preparation;
- c) precision feed distribution.

Constructing a GHG Marginal Abatement Cost Curve

Measure: Increase feed efficiency

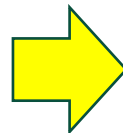
Alternative 1

improve the feed conversion rate (reduce required DM per kg FPCM)



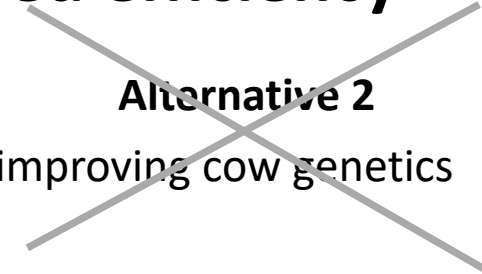
Mitigation practices include:

improvement of feed quality (suitable composition of grasses, grass mowed in time, etc.)
 a) changes in grass management;
 b) feeding plan preparation;
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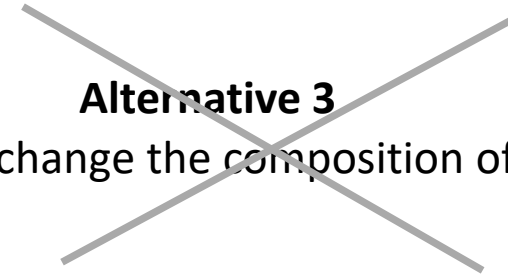
Alternative 2

improving cow genetics



Alternative 3

change the composition of the feed



Mitigation effect:

to the climate

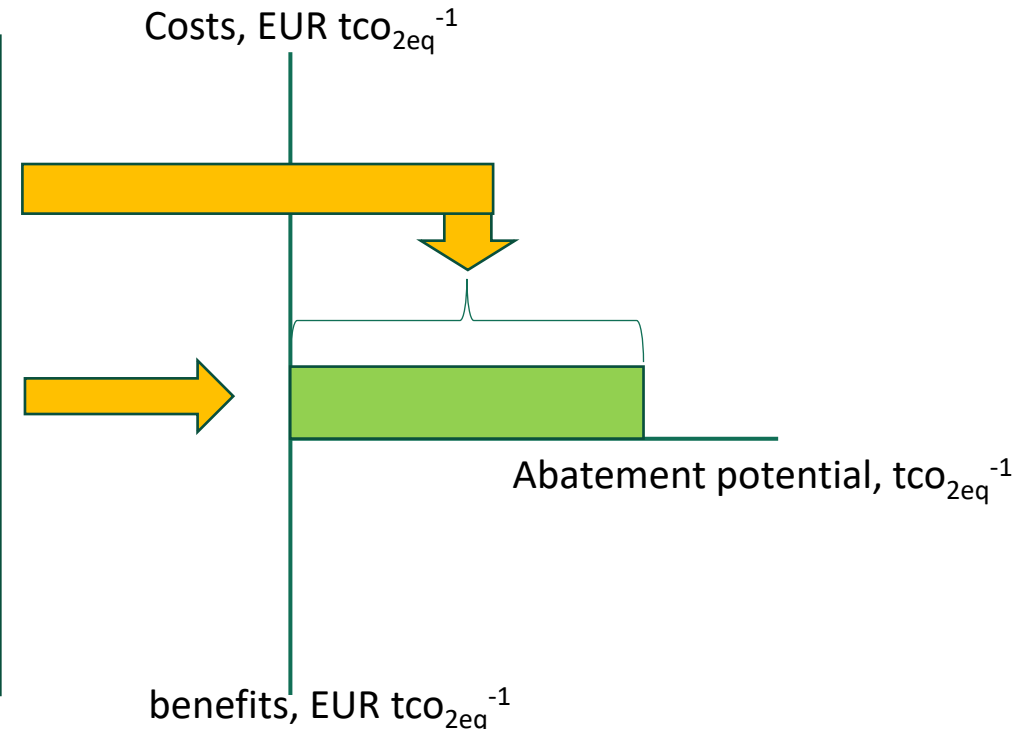
reduced GHG emissions;
 (less net energy)

to the economy

a) less feed intake; b) precision feed distribution.

questionable effect

a) Increased milk production
 b) Improvement of animal health



CCCF Farm plan formation process

GHG and NH3 results

Economic impact of measures

- MACC measure nr.1
- MACC measure nr.2
- MACC measure nr.3
- MACC measure nr.

Farm plan reduction of emissions Dairy farmer: LV_1

1. Description of farmers' future strategy on development of farm and reduction of emissions

Farm LV_1 has made changes in farm practices and strategies to reduce greenhouse gas emissions and increase carbon sequestration. These practices and strategies are: Extending pastures and improving animal welfare.

For the reduction of emissions, farmers consider important would be to change the following farming activities: animal health; Livestock sheds and manure storage; Fertilizer and manure use and soil management; Machinery and Fuel Use and Technology and Automation.

For the economic development of the farm farmers consider important the following farming activities: increase milk production per cow; increase longevity of stock; Use grass clover mix in pastures; increase fertilisation efficiency; increase roughage production per ha; Add feed additives to ration and increase soil organic matter.

To reduce an ammonia emissions farmers made changes on the following farming practices: fast application of manure and retain nitrogen. In the future, the farm does not plan to implement additional measures to reduce ammonia emissions.

2. Which mitigation measures are already implemented?

- Extending pastures
- Improving animal health
- Fast application of manure
- Retain nitrogen

3. Which mitigation measures will be implemented?

- Increase feed efficiency
- Renewable energy farm

7. Quotes

"while increasing milk production is important to maintain the farm's economic viability, reducing emissions is also important to maintain the farm's reputation and ensure long-term sustainability."

Calculations results Dairy farmer: LV_1

8. Table: Farm LV_1 emissions results calculations results with Agrecalc tool

Category	With measures	Present
Emissions per hectare, KgCO ₂ e/ha	3300	3350
Emissions per hectare, KgCO ₂ e/ha (Target)	3400	
Emissions per LU, KgCO ₂ e/LU	7250	7300
Emissions per LU, KgCO ₂ e/LU (Target)	7350	7400
Whole farm CO ₂ e emissions, KgCO ₂ e/kg output	0,00	0,50
Whole farm CO ₂ e emissions, KgCO ₂ e/kg output (Target)	1,00	1,50
Total CO ₂ e emissions from farming, KgCO ₂ e	401000	403000
Total CO ₂ e emissions from farming, KgCO ₂ e (Target)	405000	407000

9. Economics: MACC curve LV_1 with all simulated measures

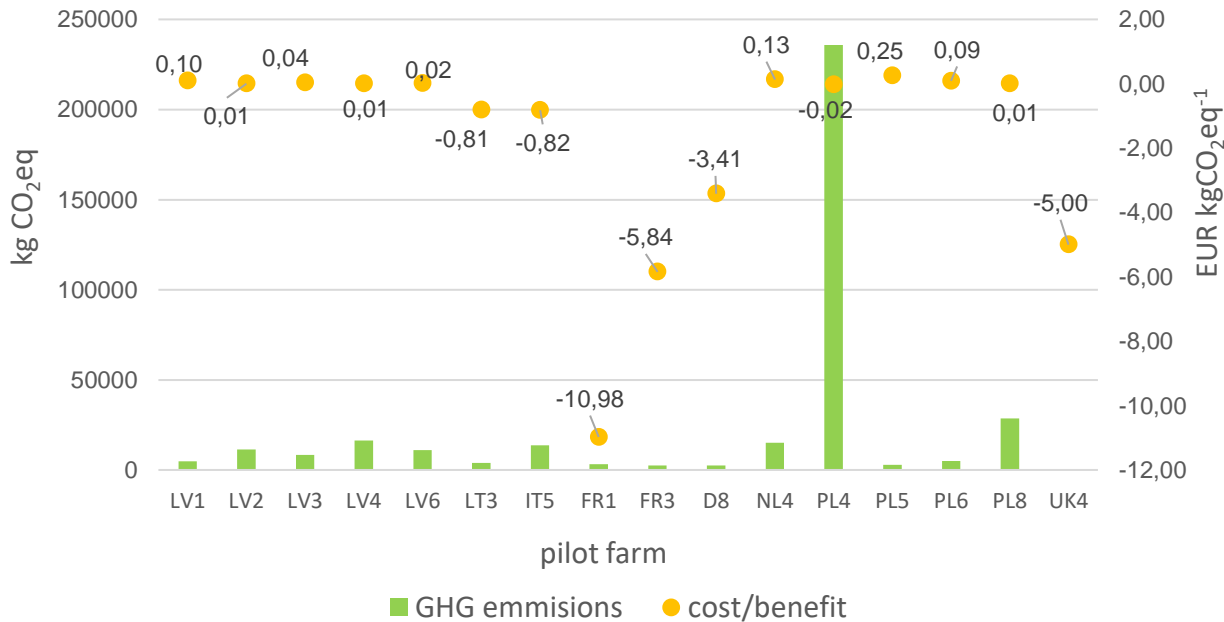
Picture of mitigation practice: <https://cometrenewables.ie/solar-pv-for-dairy-farms/>

Picture of farm strategy:

Selection of information and data

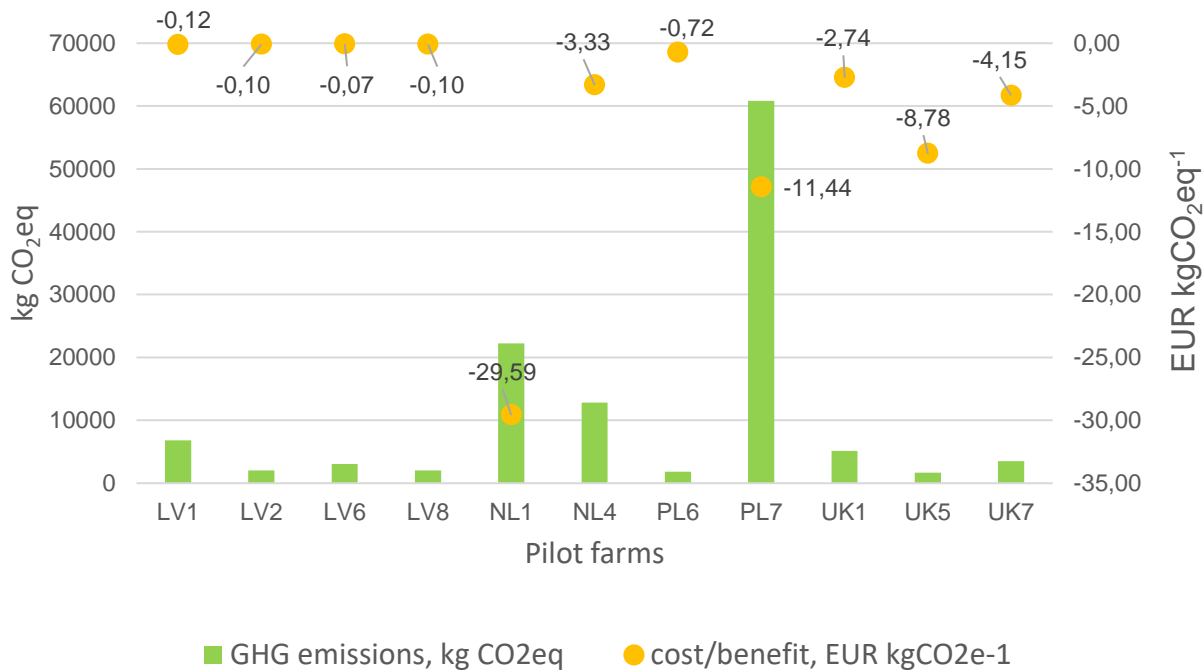
- Farmers' wishes, data, assumptions;
- National experts data, assumptions;
- Agrecalc calculations results;
- Statistics, producers information

Increase feed efficiency



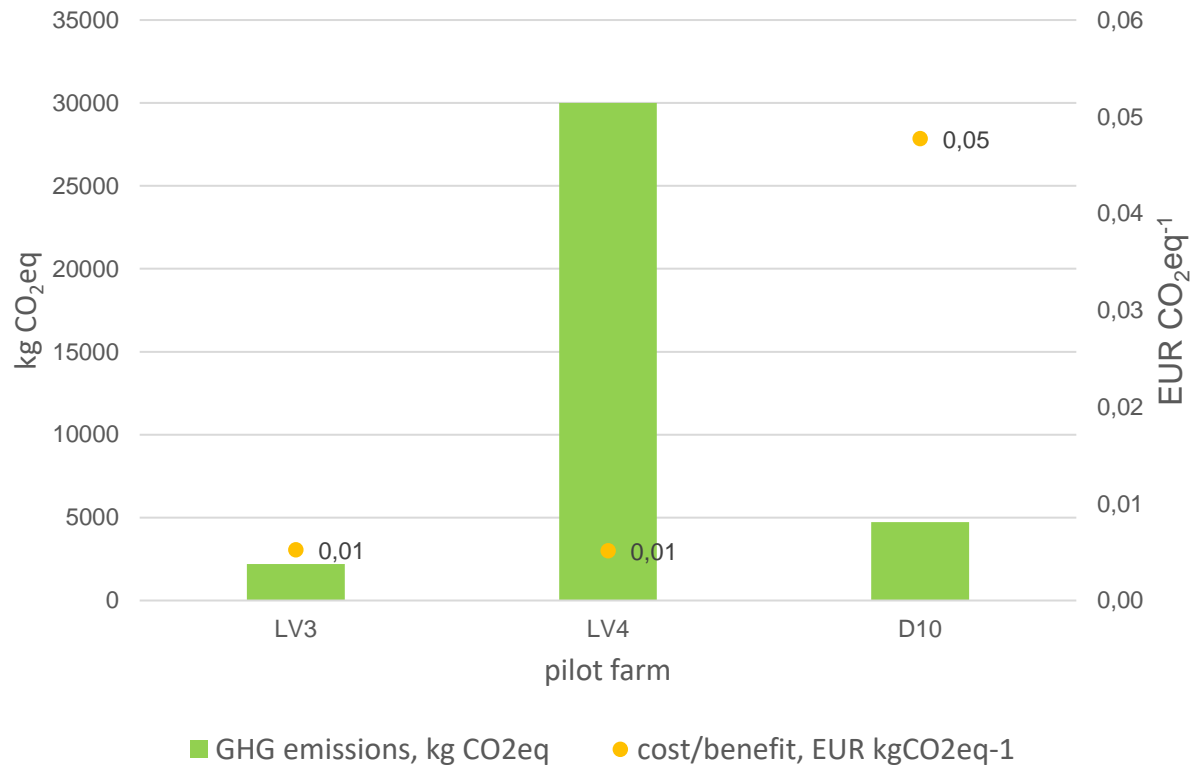
- this measure was chosen by 16 farms
- 9.5% of the GHG emission reduction potential of all measures
- A very carefully formulated ration and recipe can make a big difference in economics by reducing costs

Renewable energy production



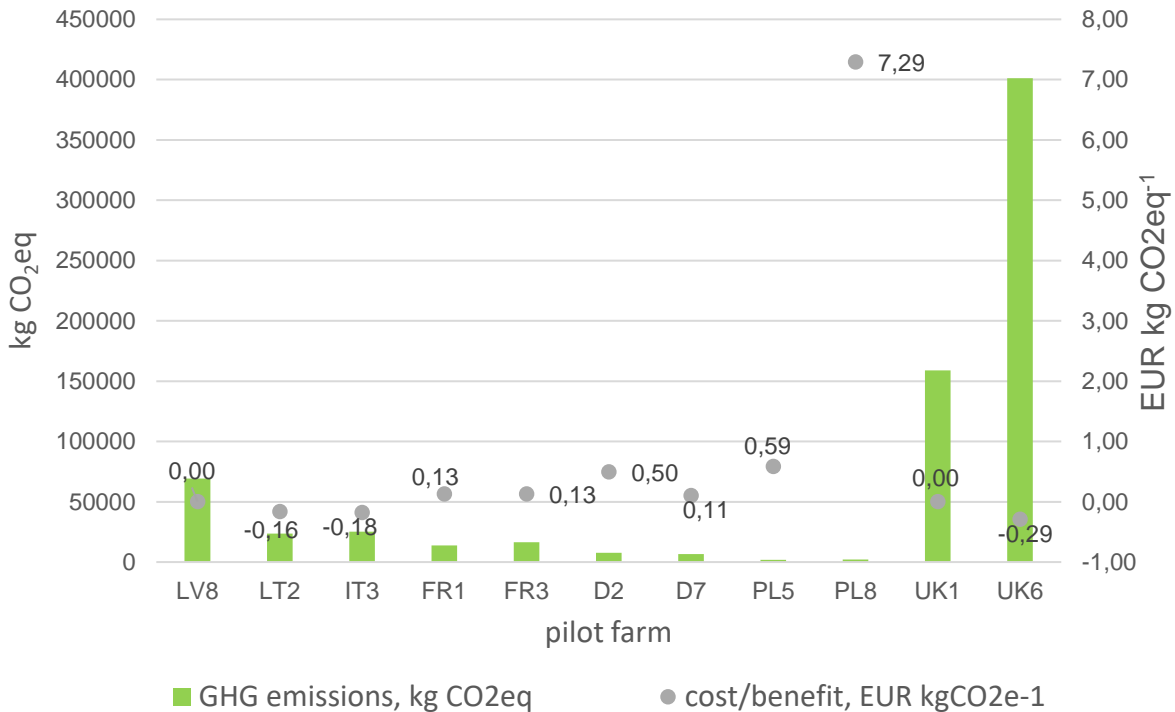
- this measure was chosen by 11 farms
- mostly farms chose solar energy, however, three farms chose solar and wind energy production and one biogas and electricity production;
- 3,2% of the GHG emission reduction potential of all measures
- this measure is mostly profitable and generates additional income, especially in the production of biogas, at the same time the result is very significantly affected by the electricity sales price

Nitrification inhibitors



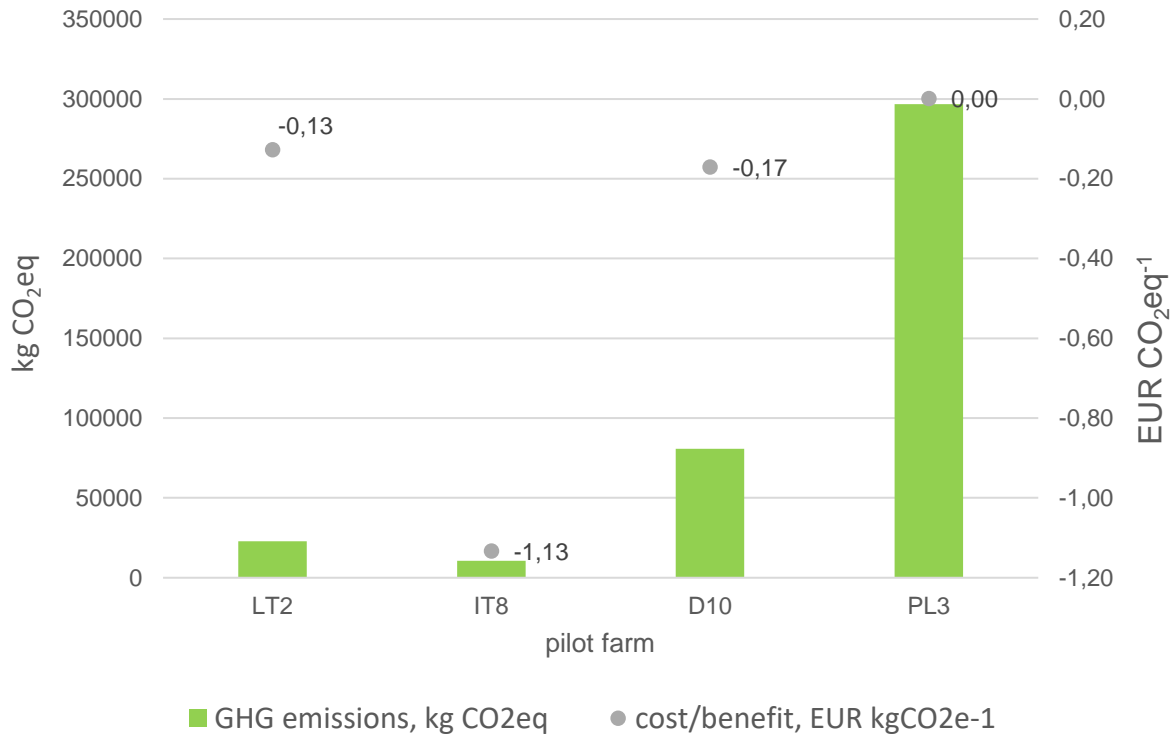
- this measure was chosen by 3 farms
- 1,5% of the GHG emission reduction potential of all measures
- the measure is cost-effective, while the price of N is essential

Covering slurry storage



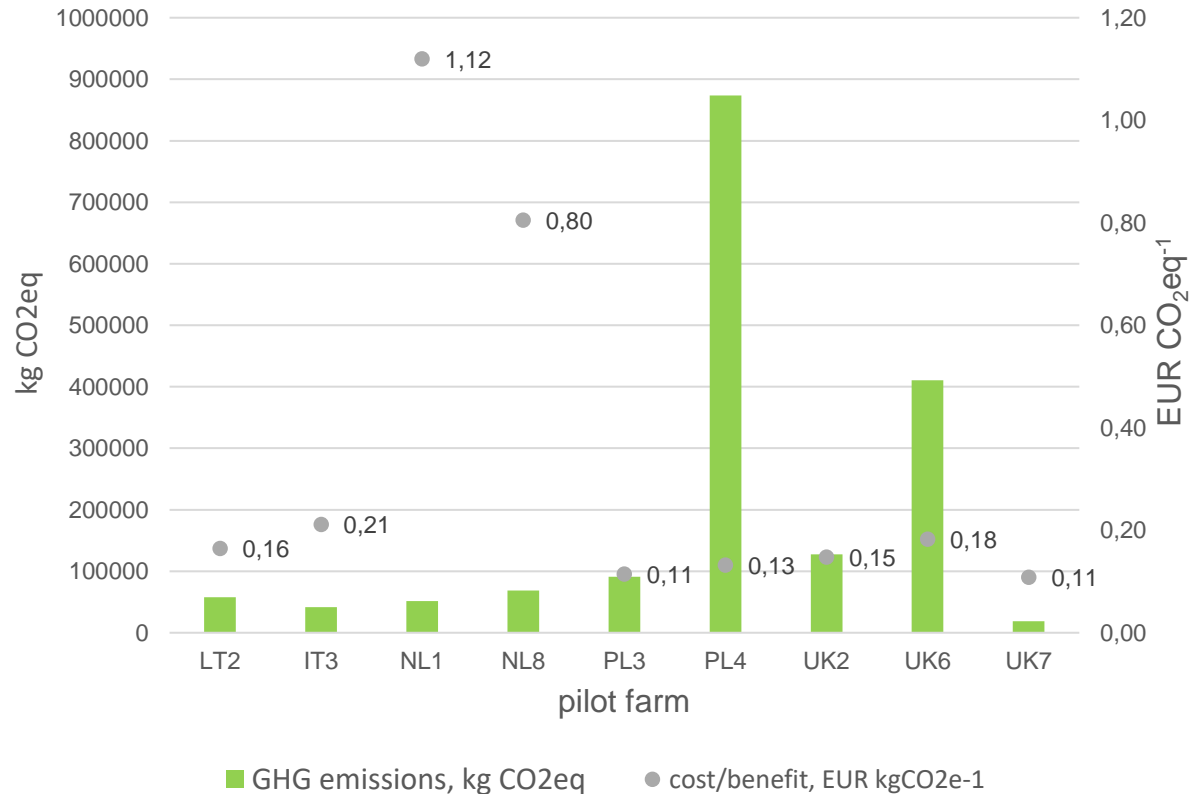
- this measure was chosen by 11 farms
- 19,0% of the GHG emission reduction potential of all measures
- In 4 cases, the measure generates additional income, in other cases, relatively small expenses
- the cost of one farm measure is very high, which is related to the very high construction costs reported by the farmers.

Manure Acidification



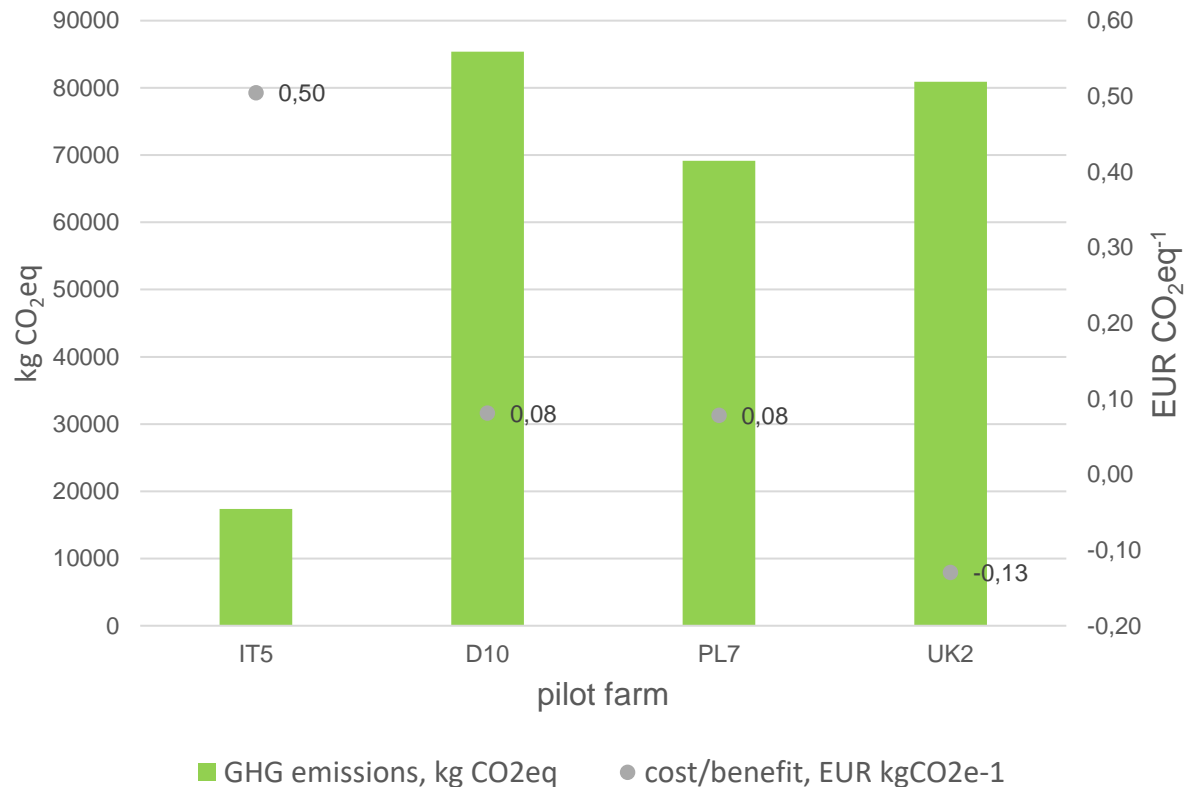
- this measure was chosen by 4 farms
- 10,4% of the GHG emission reduction potential of all measures
- the measure generates additional income for the farm, which is formed from the saved N

Methane blocker



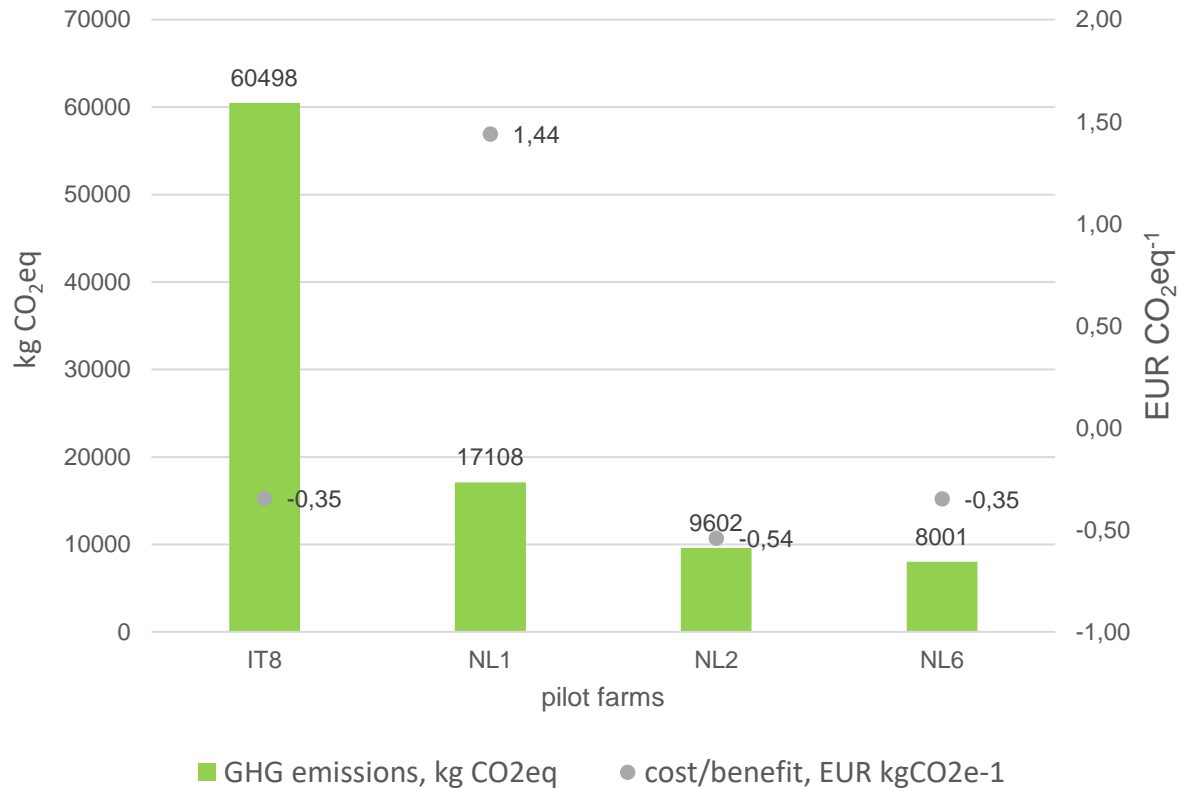
- this measure was chosen by 9 farms
- 45,5% of the GHG emission reduction potential of all measures
- The measure is easy to implement and the costs are relatively similar for almost all farms.
- two farms stand out significantly because the Agrecalc tool records a relatively small reduction in GHG emissions. This is probably related to the already high efficiency of methane use, which reduces the effect of the measures.

Probiotics in the barn



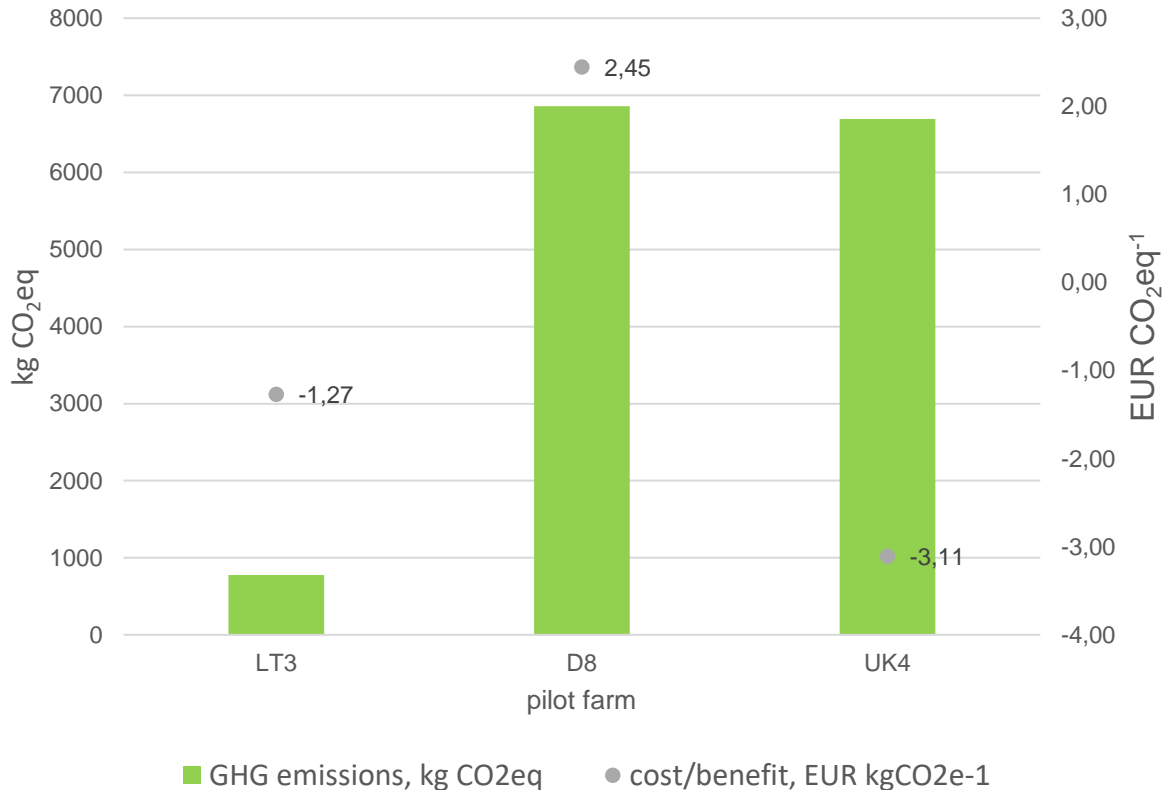
- this measure was chosen by 4 farms
- 6,6% of the GHG emission reduction potential of all measures
- in one case, this measure results in increased income because the farm has shown a relatively significant reduction in feed costs
- in one case, the cost is higher because the owner believes that the use of probiotics does not affect the amount of feed

Low protein diet



- this measure was chosen by 4 farms
- 2,5% of the GHG emission reduction potential of all measures
- Reducing the amount of protein results in a cost reduction, except in one case where a cheaper feed is substituted for a more expensive feed.

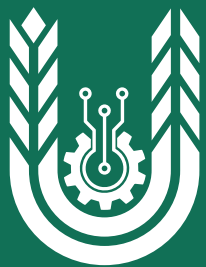
Energy saving equipment



- This measure was chosen by 3 farms
- 0,4% of the GHG emission reduction potential of all measures
- Farms have chosen different strategies. Calculations are significantly affected by the price of energy.

Some conclusions and hypotheses

- The perception of the meaning of measures differs between countries, between farmers, consultants, politicians.
- Each subsequent GHG mitigation measure implemented may lose its effectiveness due to previously implemented measures
- Personalized application of measures to farms can ensure a more effective result.
- Measures with high cost sensitivity (fertilizer or fuel price) can significantly change the economic efficiency of the measure.
- The choice of measures is determined by national support policy or regulatory framework.
- Measures costs vary between countries. At the same time, they are often not lower in Eastern Europe.



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Thank you!

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