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Effect of mitigation measures on GHG and ammonia emissions of pilot farms in European countries

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Climate care dairy farming: follow up

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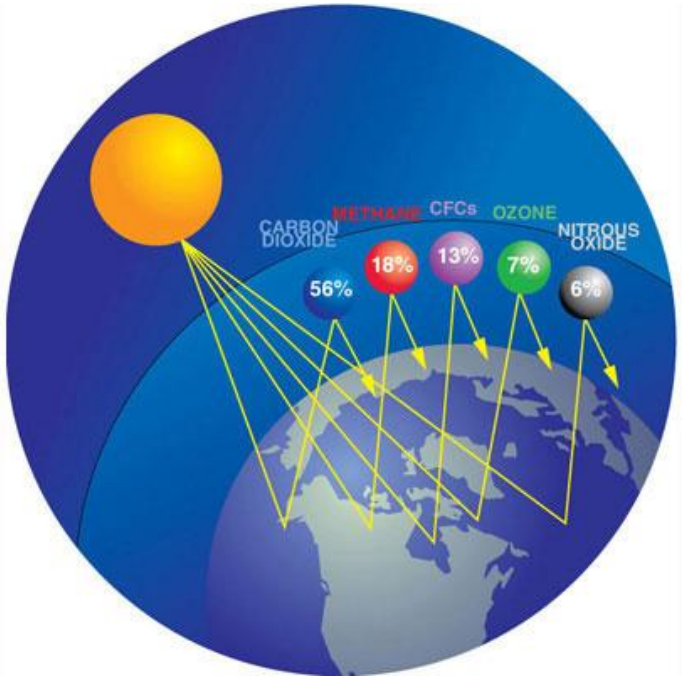
Climate and policy



https://www.labxchange.org/library/pathway/lx-pathway:793d74a7-f393-4fe1-9943-4662d8a0d651/items/lx-pb:793d74a7-f393-4fe1-9943-4662d8a0d651:html:e7c26031

- Many GHGs, including water vapor (the most important), ozone, carbon dioxide, methane, and nitrous oxide, are naturally present in the atmosphere.
- Other GHGs are synthetic chemicals that are emitted only as a result of human activity. Anthropogenic (human) activities are significantly increasing atmospheric concentrations of many GHGs.

The first climate-neutral continent
by 2050

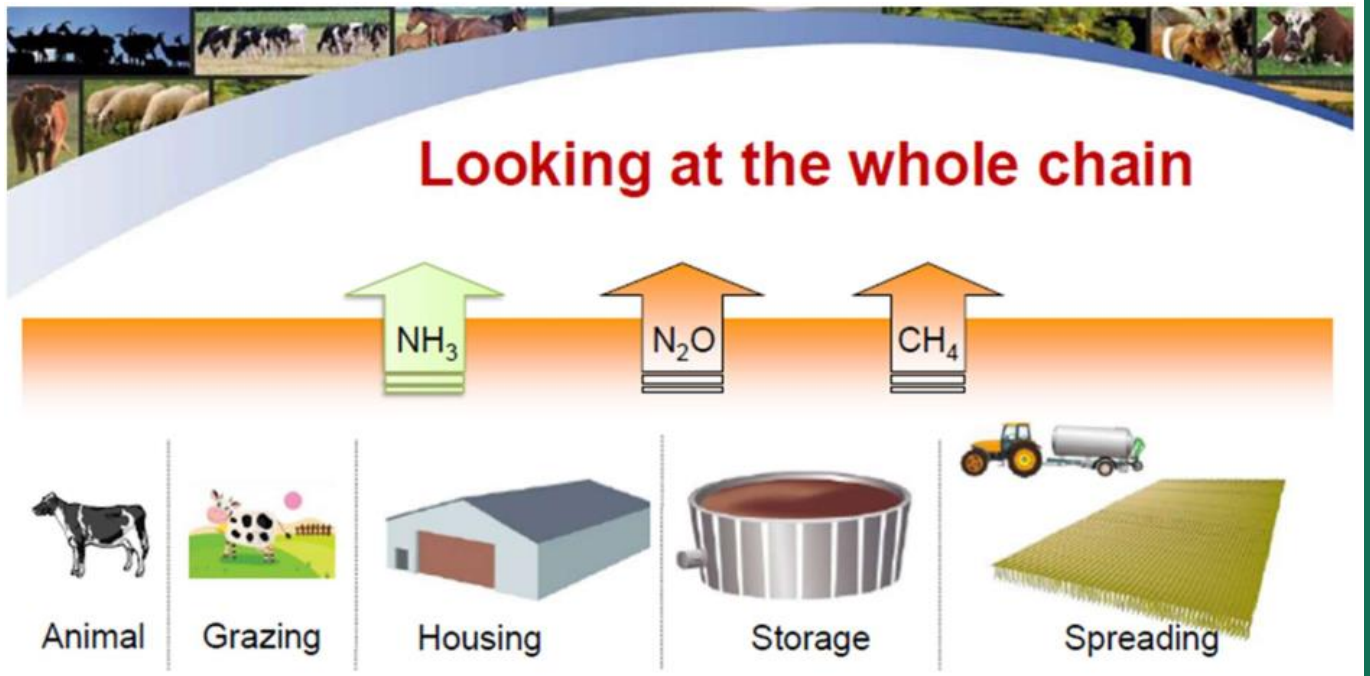
At least 55% less
net greenhouse gas emissions by 2030, compared to 1990 levels

3 billion
additional trees to be planted in the EU by 2030

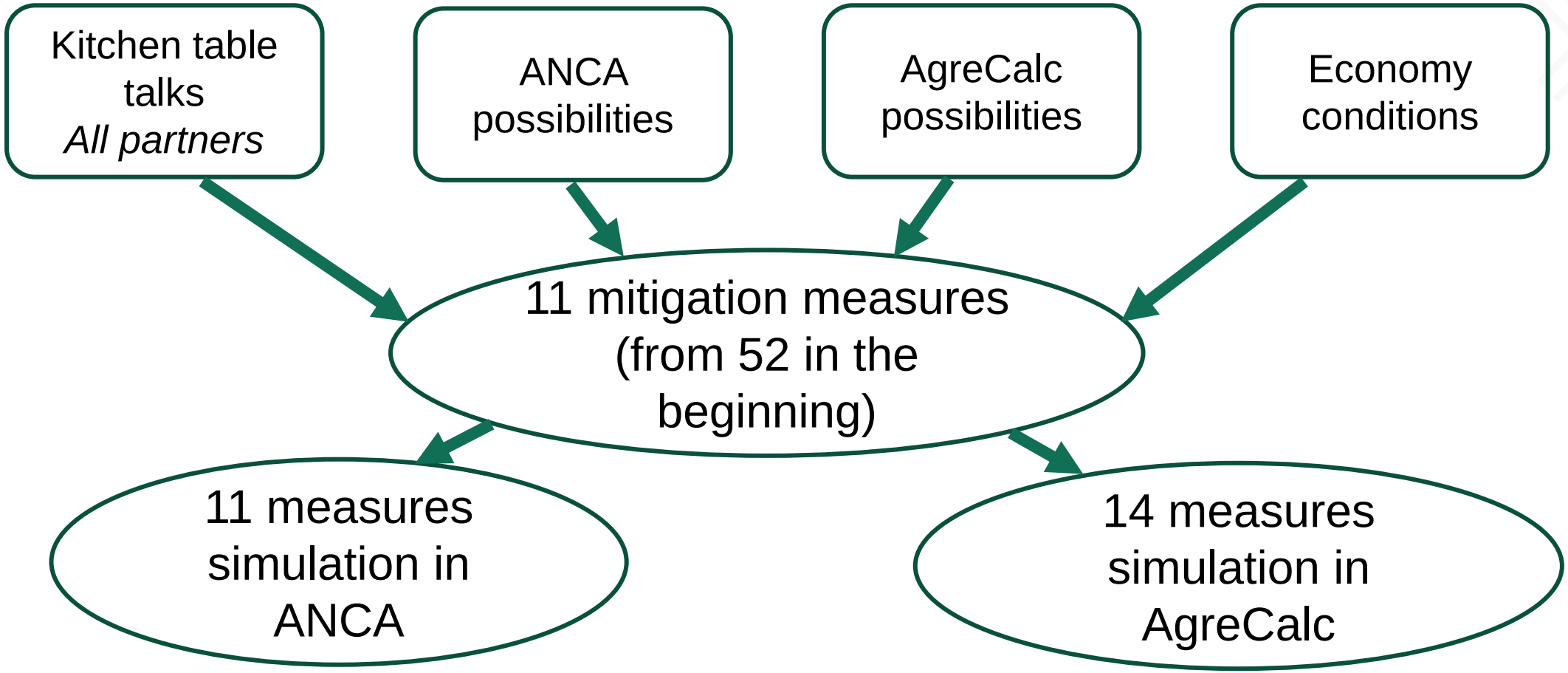
https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

Mitigation measures of GHG and ammonia emissions

- Genetics and breeding
- Herd management and housing system
- Feed production, grassland and land management
- Manure management and spreading
- Energy management



Selection process for emission reduction measures



Mitigation measures for dairy farms were chosen

- Animal - feeding
  - Increase feed efficiency
  - Low protein diets
  - High digestible diet and change in crops
  - Feeding enteric methane inhibitor
  - Use of probiotics
- Housing
  - Low emission floors
- Fertilizing
  - Use of nitrification inhibitor for crops
  - Low emission slurry spreading techniques
  - High digestible diet and change in crops
- Manure management
  - Mechanical manure separation
  - Covering manure storage
  - Adding straw to slurry for covering the manure storage
  - Manure acidification
- Energy management
  - Renewable energy sources on farm (RES)
  - Energy saving equipment

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farming

Mitigation practices simulation for farm

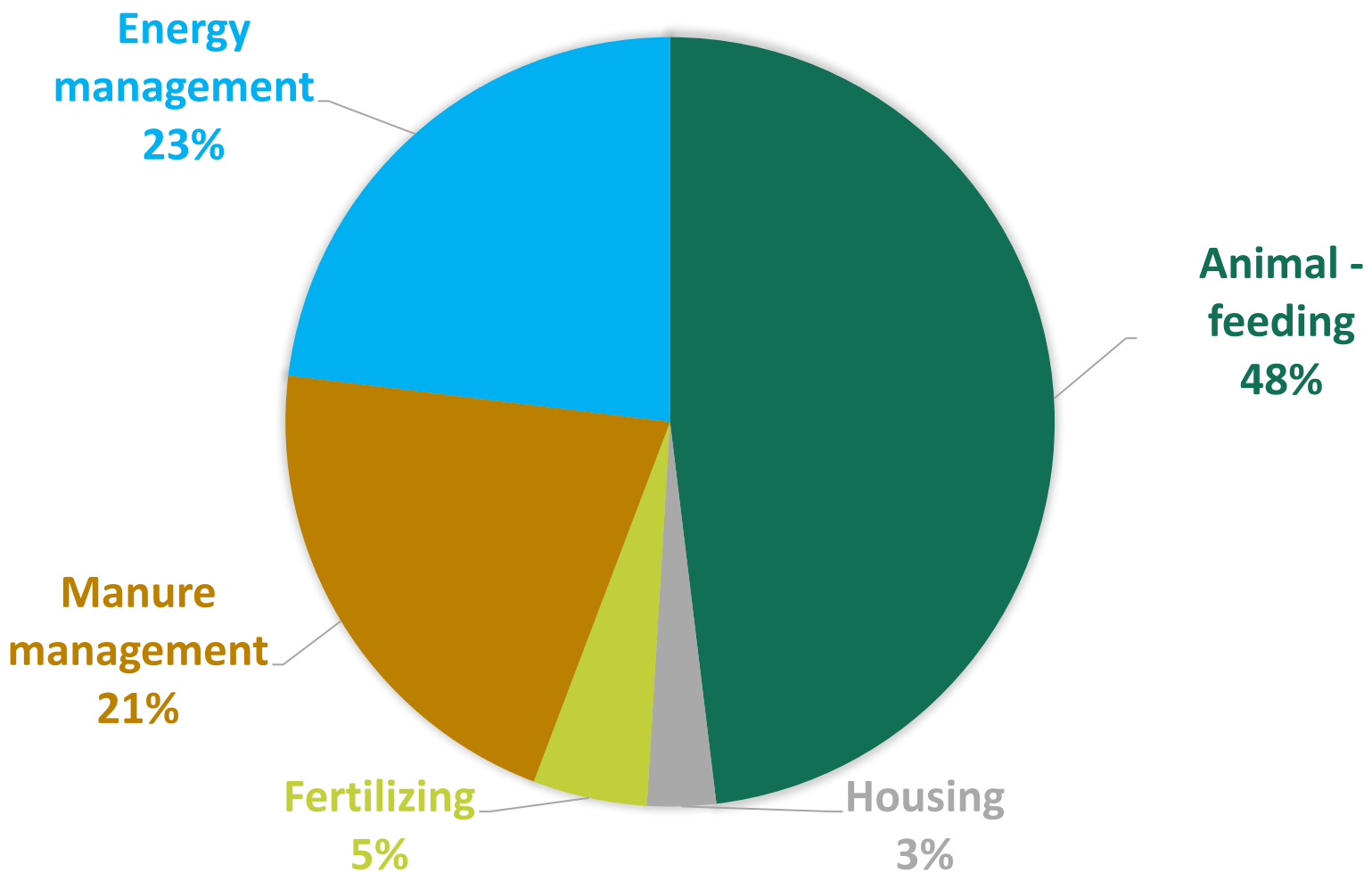
Farm code_____

To achieve the GHG and ammonia reduction objectives potential mitigation practices and techniques and their promising combinations will be simulated based on farm data.
Please choose at least **two mitigation** measures mostly related to **NH3 emission**.

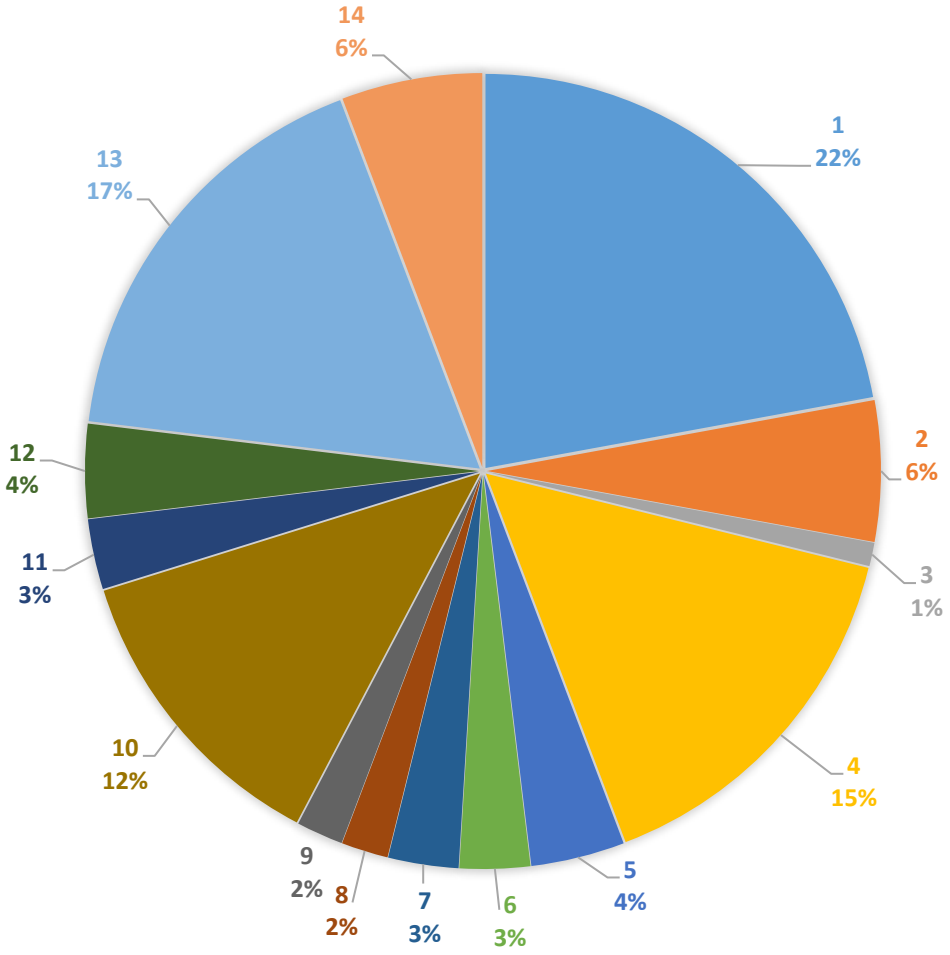
Please choose mitigation practice from list below, and choose the statement which best describes your situation, based on:

Measures		NH3	GHG	Explanation	Mark your choice	
					Yes/No	Not applicable/ Already used
I	II	III	IV	V	VI	VII
1	Increase feed efficiency	x	x	Change the rations of feed. Feed efficiency is improved through improved animal management (incl. health). The feed ration is not changed and milk yield remains the same. **Mitigation practice include:** feed ration calculation; feeding plan preparation and control; precision feed distribution. **Benefits**: lower feed consumption. **Weakness**: increased additional work for farmers.	Yes	
2	Low protein diets	x	x	Change the rations of feed. The N content of feed ration ingredients is reduced, e.g. by reducing N content of concentrates. Milk yield and milk composition remains the same, assumed that the feed ration composition is not changed, and there are no changes in grass or crop management. **Mitigation practice include**: purchase/production of low		x

Farmers and/or experts chose



Farmers and/or experts chose



1 Increase feed efficiency
2 Low protein diets
3 High digestible diet and change in crops
4 Enteric methane inhibitor
5 Use of probiotics in the barn
6 Low emission floors
7 Use of nitrification inhibitor for crops
8 Low emission slurry spreading techniques
9 Mechanical manure separation
10 Covering manure storage
11 Adding straw to slurry for covering the manure storage
12 Manure acidification
13 Renewable energy sources on farm (RES)
14 Energy saving equipment

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Farm plan for simulation of mitigation measures

Description of mitigation measures

GHG and NH_3 results

- Measure no.1
- Measure no. 2
- Measure no. 3
- Measure no. .....

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 farmer 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 an amonia emissions.

2. Which mitigation measures / practices were already taken?

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

4. Expected effects on emissions (based on tool calculations)

Increase feed efficiency.
Reduce the energy per cow by 5 to 10%. The assumption is made that less feed is needed for the same amount of milk produced

Renewable energy production (RES) at farm.
The measure envisages placing 12.8 kW solar panels on the farm, which will produce 10,432 kWh of electricity.

3. Which mitigation measures are planned to be implemented and how?

Increase feed efficiency.
Feed efficiency is improved through improved animal management (incl. health).

Renewable energy production (RES) at farm.
The purpose of the measure is the production of renewable energy on the farm by installing solar panels.

5. Equipment involved, investment and economic

Increase feed efficiency.
Significant changes in farming, which provide for the preparation of feed plans (377 EUR per year), additional work for the distribution of feed to workers (105 EUR per year).

Renewable energy production (RES) at farm.
The investment for the purchase and assembly of the panels is EUR 17,920 and the service life is 20 years. The value of the produced electricity (price 0.11 EUR kWh-1) is 1,148 EUR per year.

7. Quote of farmer:

"while increasing milk production per cow, it is important to maintain the longevity of the herd"

6. Attention points when implementing measures

Increase feed efficiency.
It is difficult to express the expected effect financially

Renewable energy production (RES) at farm.
The solar panels service life.

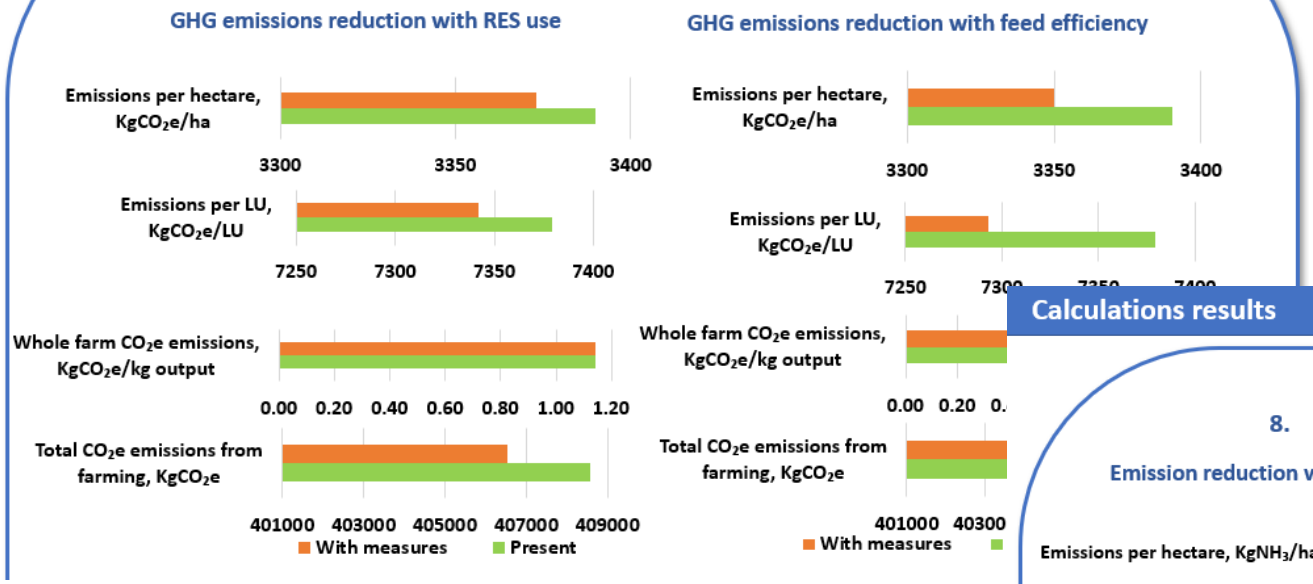
farming

Joint call 2018 on novel technologies, solutions and systems to reduce GHG - ID 39274

Farm plan for simulation of mitigation measures

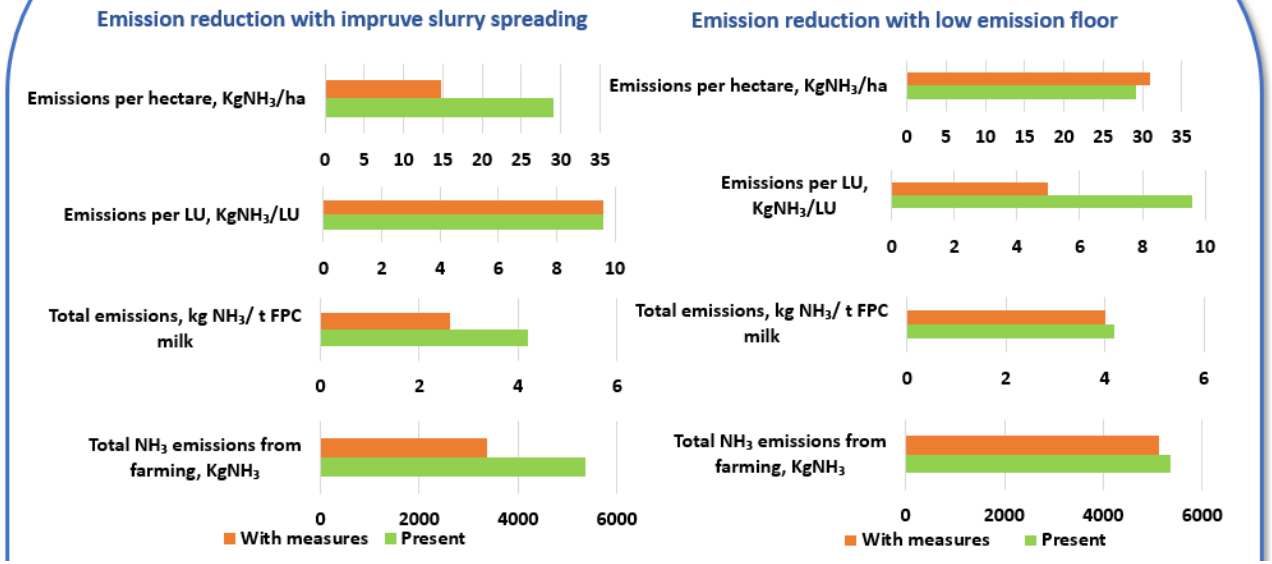
Calculations results — **Dairy farmer: LV_1**

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

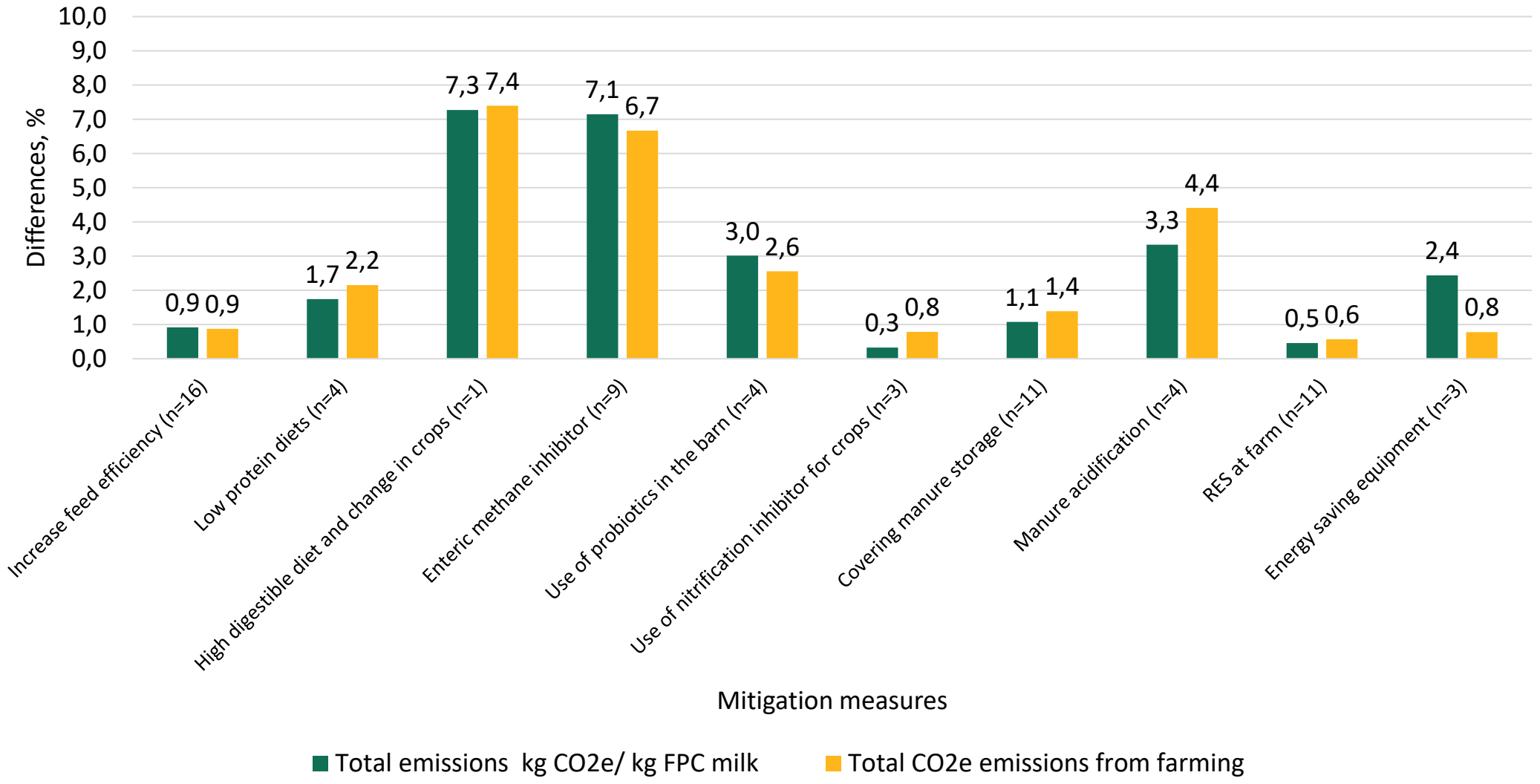


Calculations results — **Dairy farmer: LV_7**

8. Table: Farm LV_7 emissions calculations results with ANCA tool



Simulation results Agrecalc



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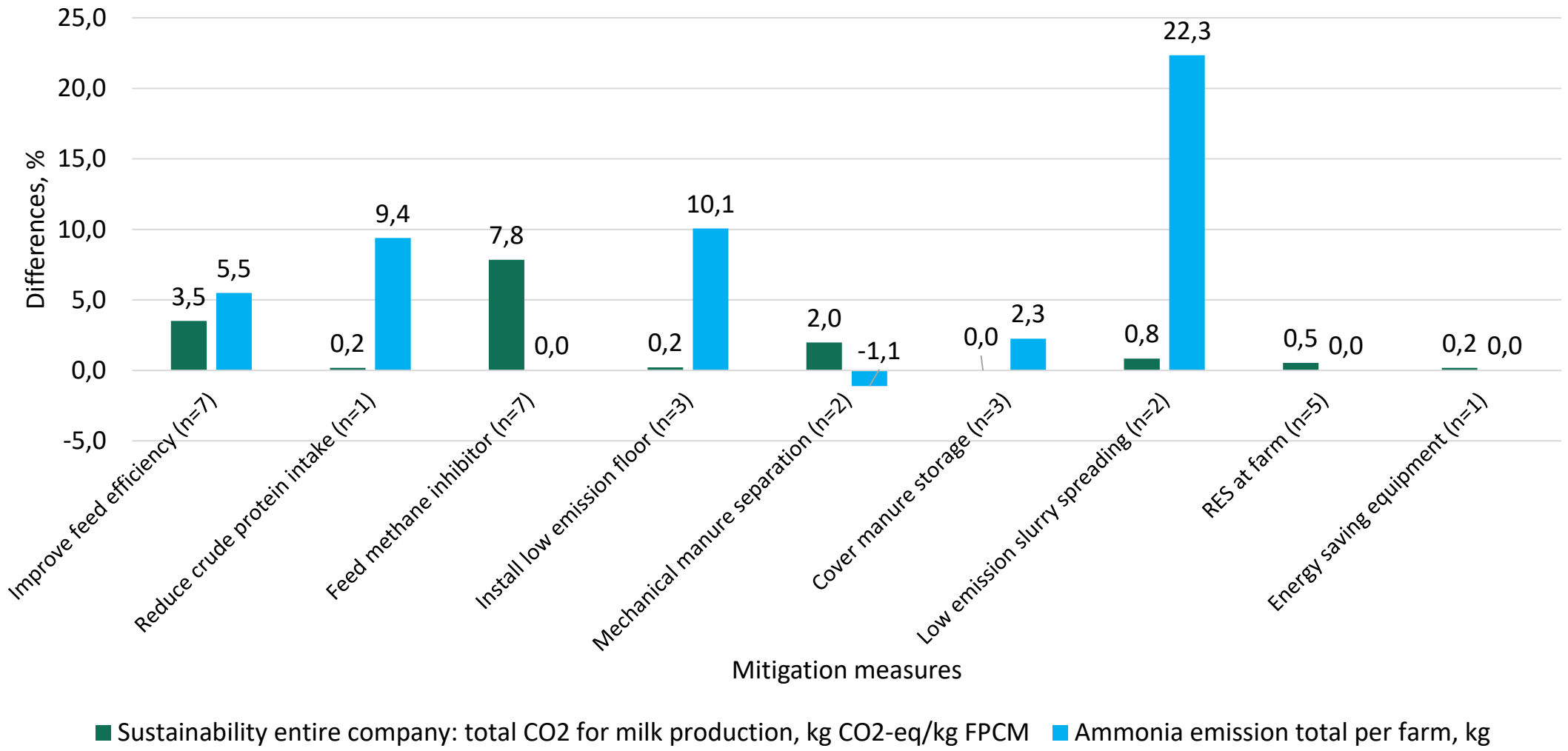
Simulation results ANCA



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Conclusions

- Farmers prefer to choose mitigation measures with possibly quick emissions decreasing results and low investments
- Mitigation effect of measures depend on farm condition before simulation
- Mitigation results depend on tools used for simulation (Agrecalc and ANCA)
- Measures related to renewable energy source (RES) and energy saving equipment did not show preferable results, because estimated part was only for self use at the farm
- Future research needs to show full possible reduction of mitigation measures by analysing implementation in the farm condition

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THANK YOU FOR YOUR ATTENTION!

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For more information: www.CCCfarming.eu