Economic assessment of greenhouse gas mitigation on livestock farms

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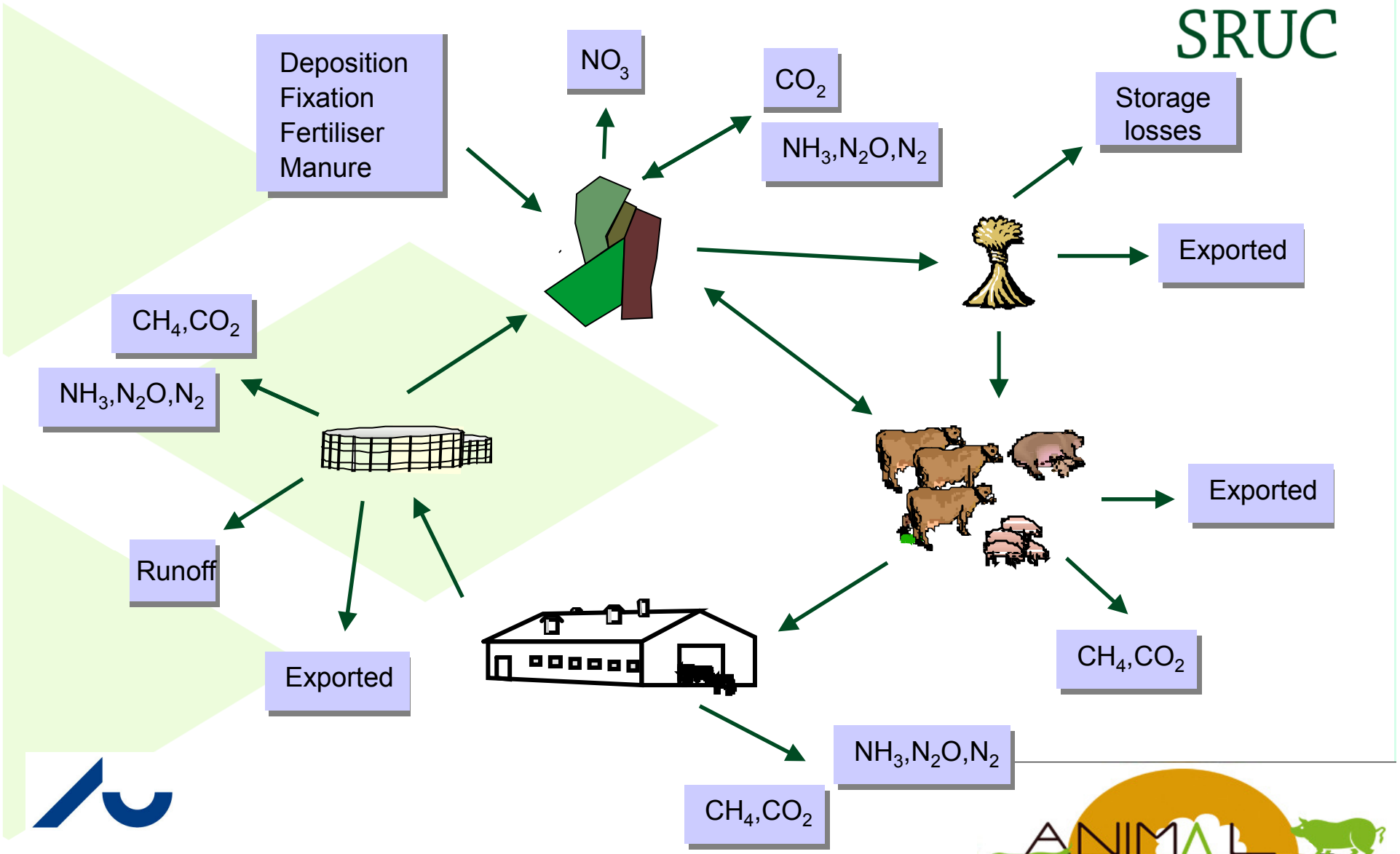
Farm level assessment

- GHG, N: biophysical model (FarmAC)
- Finances: partial budgeting
- Farms:
  - Maritime grass-based dairy
  - Maritime grass-based beef
- Mitigation measures:
  - Reduced N fertilisation, grass-clover mix, improved pasture quality, longer grazing, nitrification inhibitors, improved genetics of dairy, earlier finishing of beef

FarmAC



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ANIMAL CHANGE

Farms' description summary

	Maritime dairy	Maritime beef
Farm size [ha]	35.2	47.2
Grazed pasture [ha]	21.8	24.5
Grass silage [ha]	13.4	22.7
Number of cows [head]	66	35
Urea used [kg N/yr/farm]	2,532	0
CAN used [kg N/yr/farm]	2,686	3,211
Concentrate imported [kg DM/y/farm]	49,126	27,978
Grass silage imported [kg DM/y/farm]	1,851	-7,087

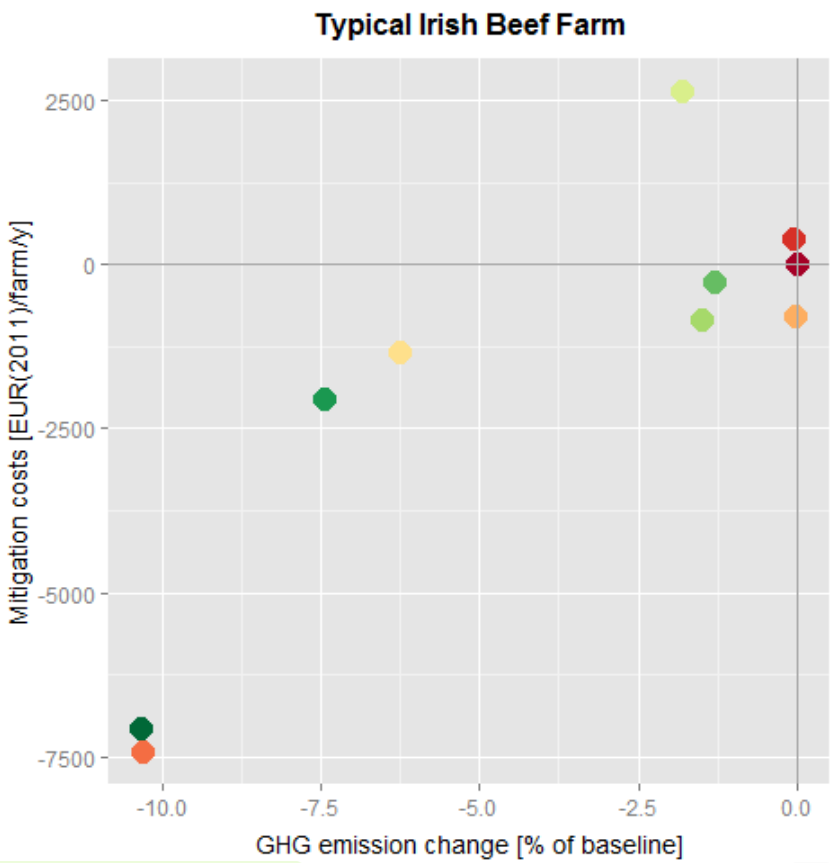
Financial data summary

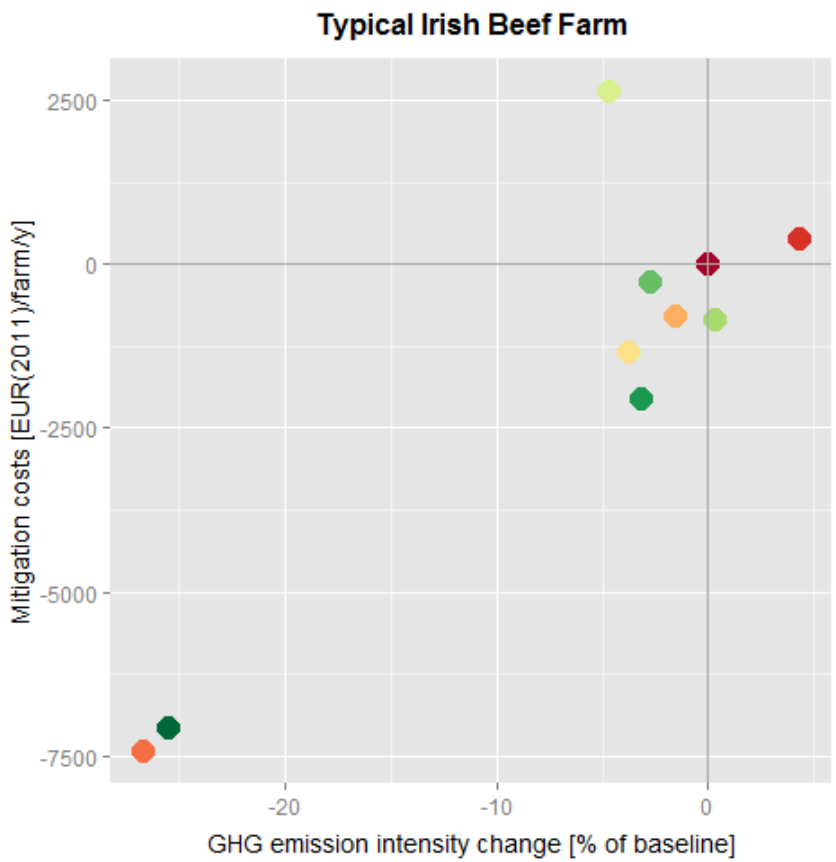
Urea price [EUR(2011)/t N]	878
CAN price [EUR(2011)/t N]	1,185
Concentrate price [EUR(2011)/t fresh matter]	284
Grass silage price [EUR(2011)/t fresh matter]	30
Reseeding cost [EUR(2011)/ha]	250
Clover seed price [EUR(2011)/kg]	8
DCD price [EUR(2011)/kg]	7
Milk price [EUR/kg]	0.345
Average heifer/steer price [EUR/kg LW]	1.9

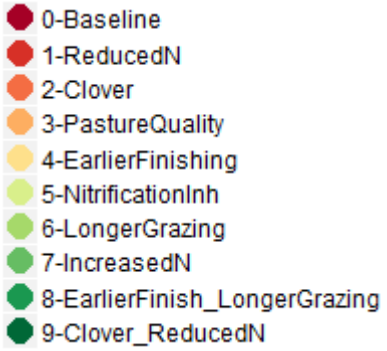
Mitigation option assumptions

- Reduced N fertilisation
  - -5% synthetic N, -4-6% grass yield, +3-4% forage utilisation
  - No technical cost
- Grass – clover mixture (7-10% clover)
  - -16% synthetic N, same grass yield, +4% milk yield/growth rate
  - Seeding cost €8/ha/y, no change in reseeding frequency
- Improving pasture quality trough better management
  - Increased digestibility (assuming rotational grazing), +2% milk yield /growth rate
  - Reseeding frequency increased
- Improved genetics (dairy farm only)
  - +5% milk yield/growth rate
  - No technical cost (assumption: artificial insemination in the baseline)
- Earlier finishing (beef farm only)
  - -8% synthetic N,
  - No technical cost
- Nitrification inhibitors
  - -9% synthetic N, 10kg/ha/y DCD, +2% milk yield/growth rate
  - DCD cost €17/ha/y
- Longer grazing (+5 days)
  - -0.5% synthetic N, +1% milk yield/growth rate
  - No technical cost

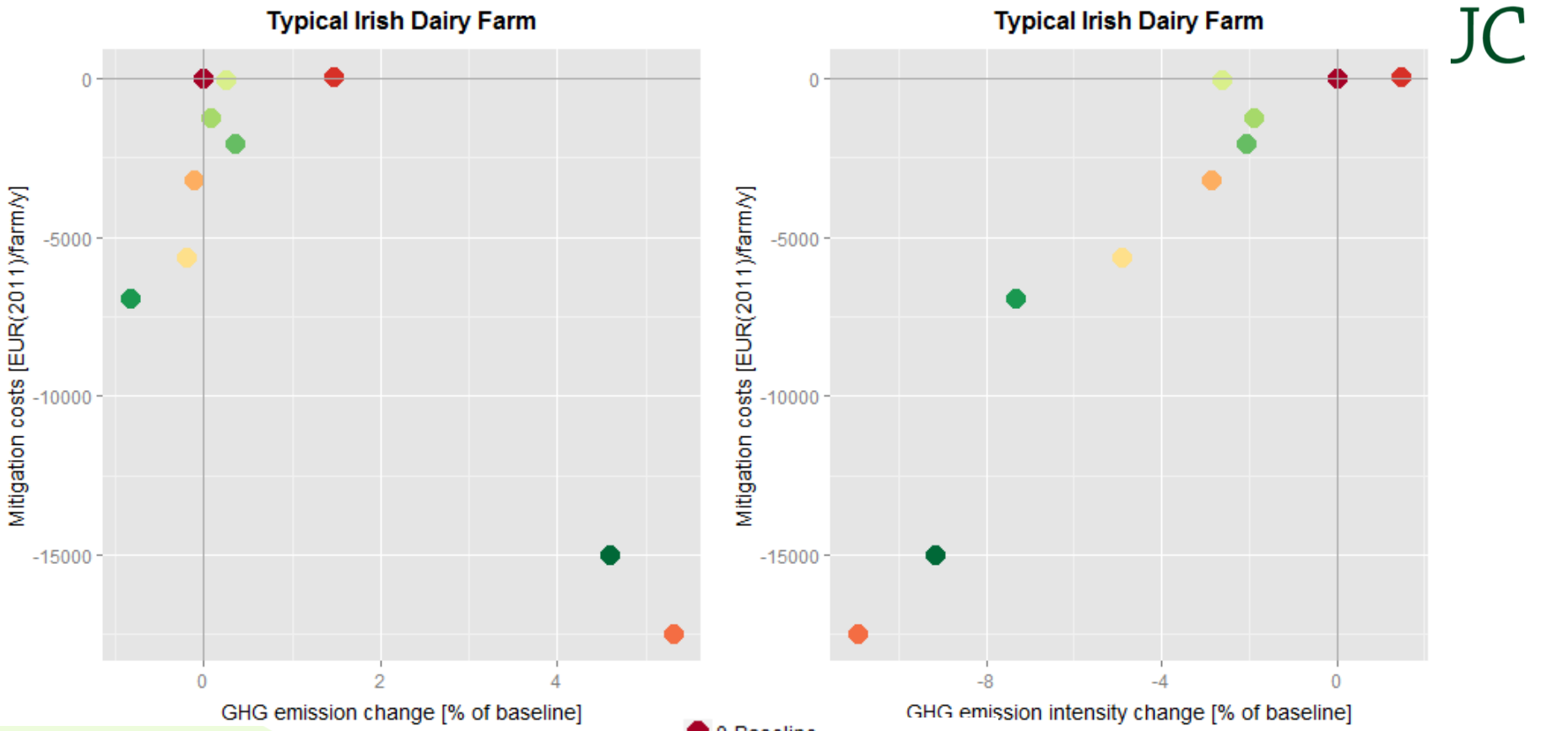
Beef farm


Typical Irish Beef Farm
Mitigation costs [EUR(2011)/farm/y]
2500
0
-2500
-5000
-7500
-10.0
-7.5
-5.0
-2.5
0.0
GHG emission change [% of baseline]

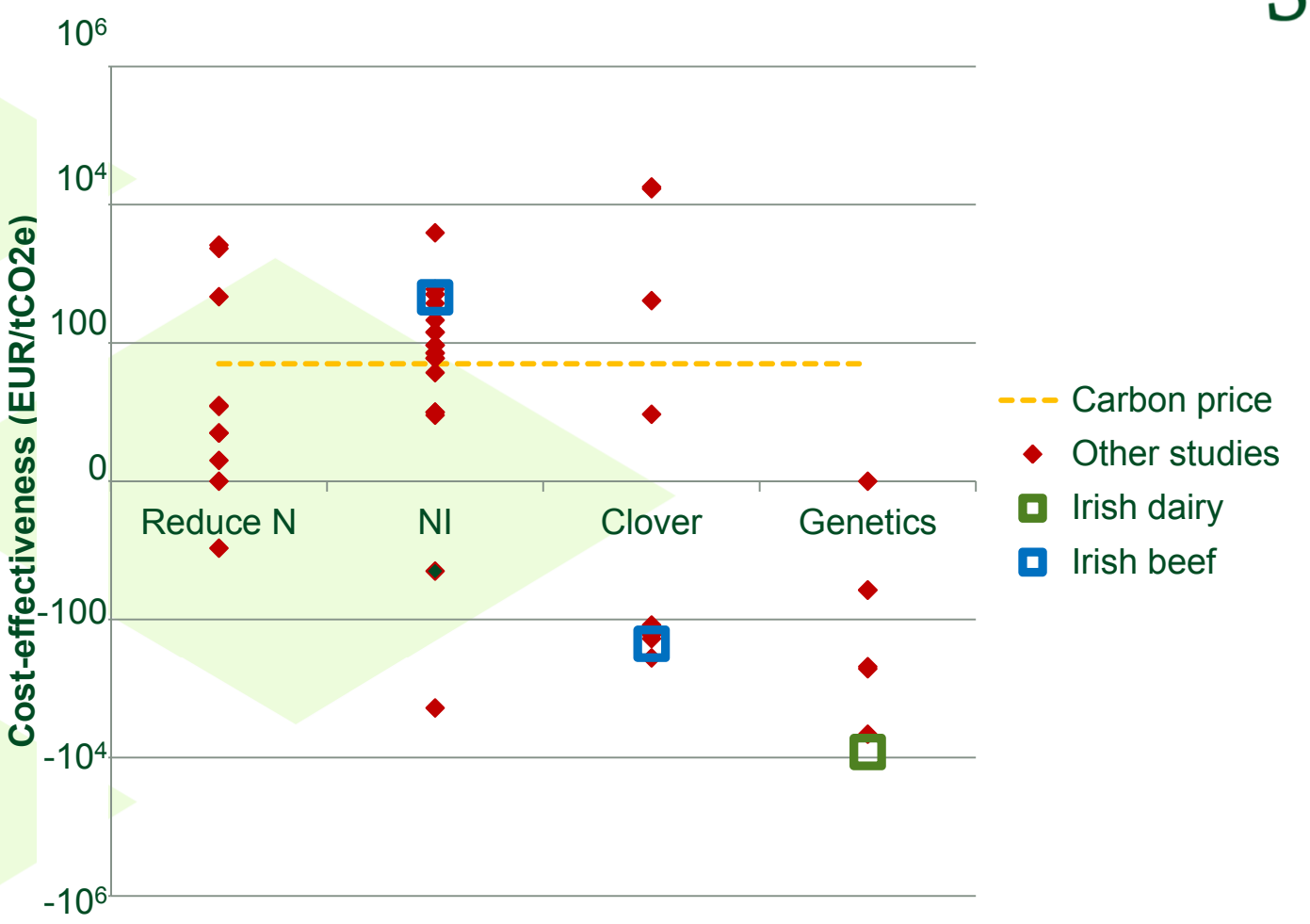

Typical Irish Beef Farm
Mitigation costs [EUR(2011)/farm/y]
2500
0
-2500
-5000
-7500
-20
-10
0
GHG emission intensity change [% of baseline]


0-Baseline
1-ReducedN
2-Clover
3-PastureQuality
4-EarlierFinishing
5-NitrificationInh
6-LongerGrazing
7-IncreasedN
8-EarlierFinish_LongerGrazing
9-Clover_ReducedN

Dairy farm


Typical Irish Dairy Farm
Mitigation costs [EUR(2011)/farm/y]
0
-5000
-10000
-15000
0
2
4
GHG emission change [% of baseline]
Typical Irish Dairy Farm
Mitigation costs [EUR(2011)/farm/y]
0
-5000
-10000
-15000
-8
-4
0
GHG emission intensity change [% of baseline]
0-Baseline
1-ReducedN
2-Clover
3-PastureQuality
4-GeneticImp
5-NitrificationInh
6-LongerGrazing
7-IncreasedN
8-GeneticImp_LongerGrazing
9-Clover_ReducedN

Comparison with other studies



Graus *et al.* 2004, Weiske *et al.* 2007, Amann *et al.* 2008, ICF 2008, Moran *et al.* 2008, Bates *et al.* 2009, Hasegawa *et al.* 2010, Hoglund-Isaksson *et al.* 2010a, Schulte *et al.* 2012, ICF 2013

Conclusions

- Emission intensity or absolute reduction?
  - Currently mixed policy messages
- Mitigation by individual options are low
  - Need for “packages”
- Most of the selected measures have negative costs (technical costs only!), though many implies improved management practice
  - Barriers (time/effort of implementation, perceived risk of reduced yield, lack of information/trust)
  - Framing the message: focus on efficiency and profitability
- Both implementation and effects are different on different farms
  - Information/advice should be farm-specific as much as possible

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Thank you!

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