Actions to mitigate greenhouse gas emissions from milk production

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Agenda for today's presentation

- Greenhouse gas (GHG) emissions from milk production
- Some critical aspects to consider
- Reduction of GHG emissions
- Conclusion

Arla Foods: facts & figures

Arla Foods is a cooperative owned by about 8000 Swedish, Danish and German milk producers.

Seventh largest dairy company.
Turnover about 7.3 billion Euro in 2011.
Number of employees 17 400.

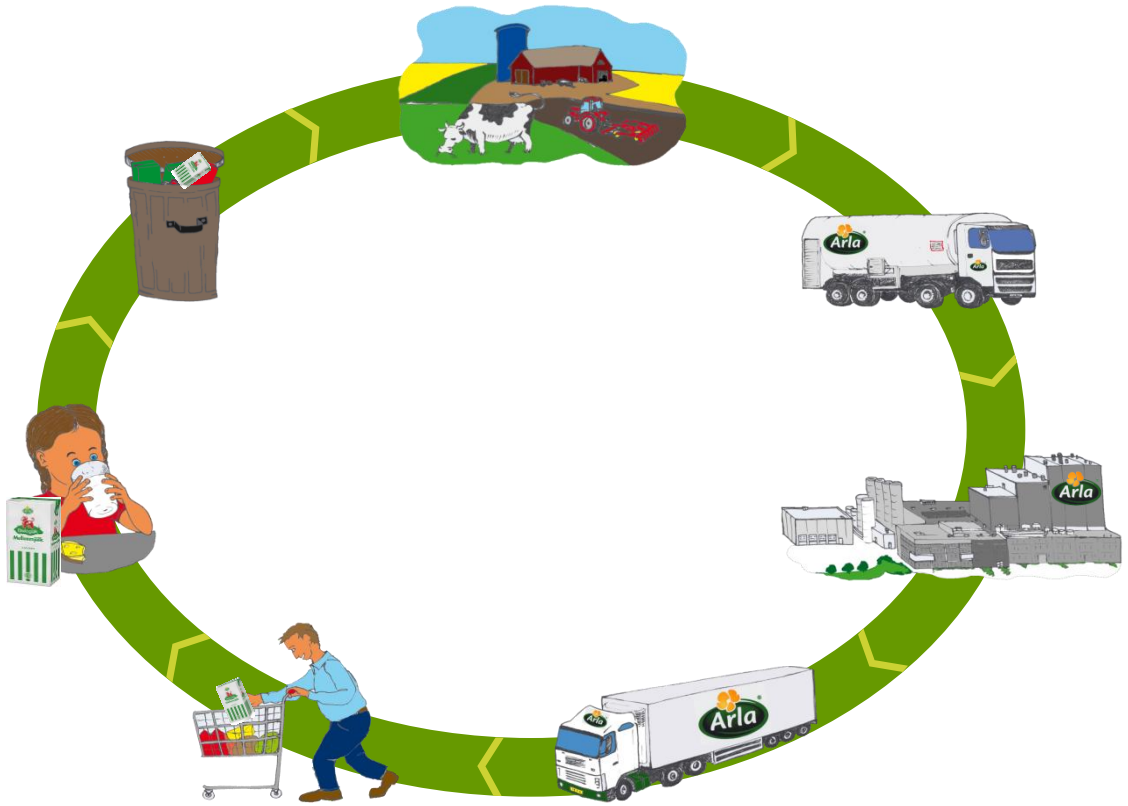
Over 9 million tonnes milk intake in 2011.
Largest producer of organic dairy products.

Production in 12 countries, and
sales offices in further 22 countries.

Method: Carbon Footprint (CF) / Life Cycle Assessment (LCA)

Assess the greenhouse gas emissions for the whole lifecycle of a product 'from cradle to grave'.

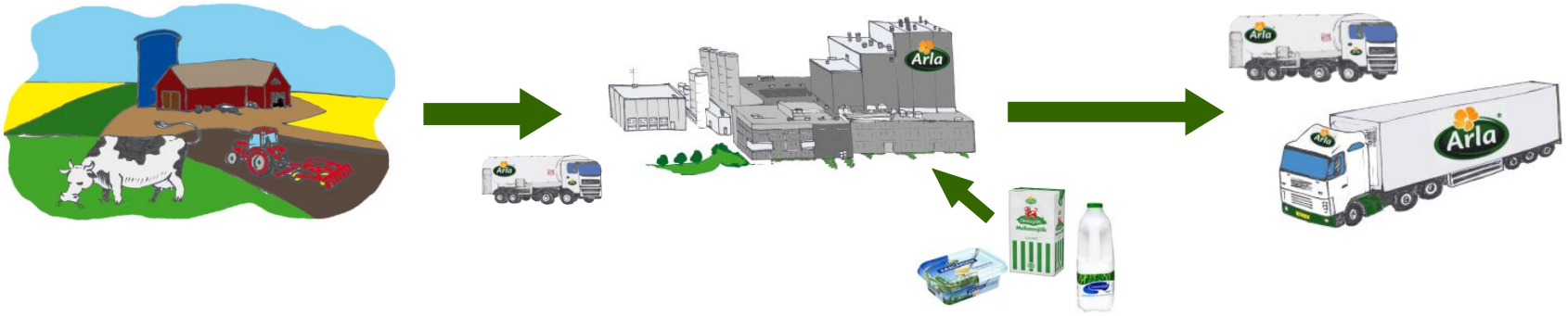
INPUTS:
Energy
Materials
Chemicals
Others



OUTPUTS:
Emissions
- to air.
- water.
- soil

Waste
Waste water

Calculating the carbon footprint of Arla Foods ('cradle to gate')



Primary production

CO_2e
- CO_2 x 1
- CH_4 x 25
- N_2O x 298

Processing

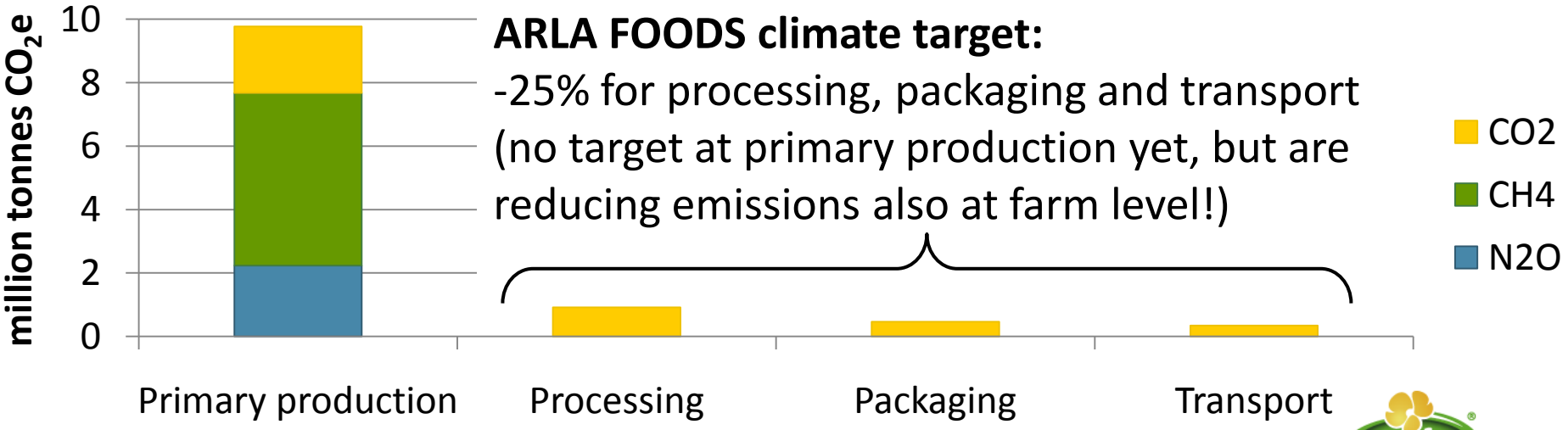
CO_2 x 1

Packaging

CO_2 x 1

Transport

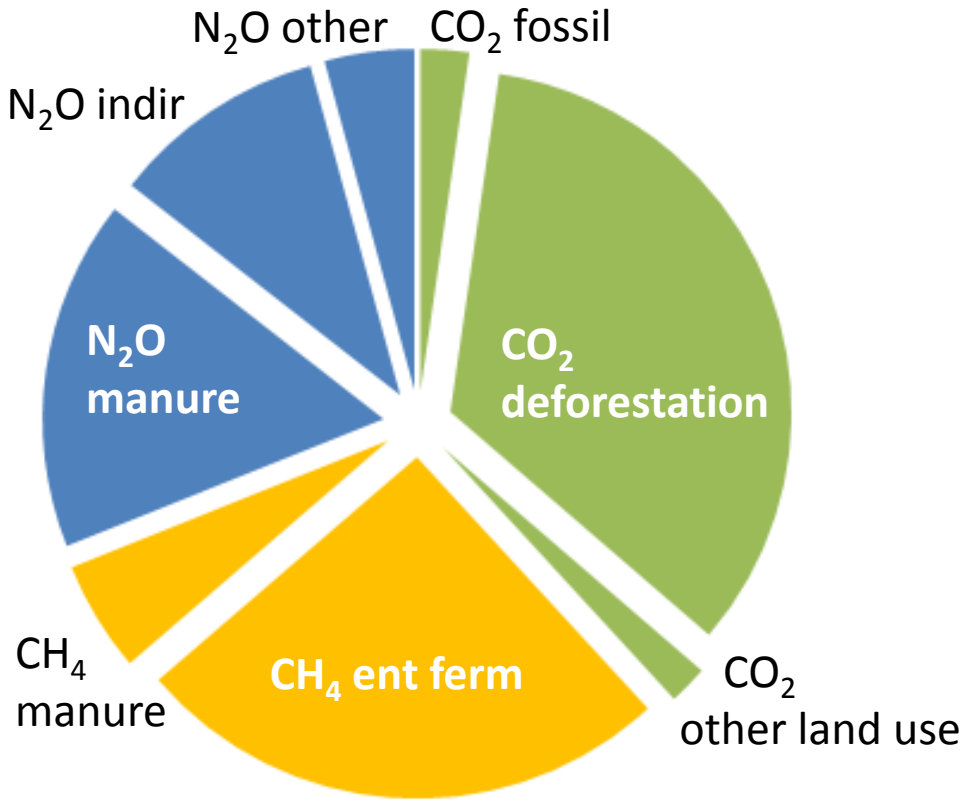
CO_2 x 1



ARLA FOODS climate target:

-25% for processing, packaging and transport (no target at primary production yet, but are reducing emissions also at farm level!)

Livestock's contribution to climate change



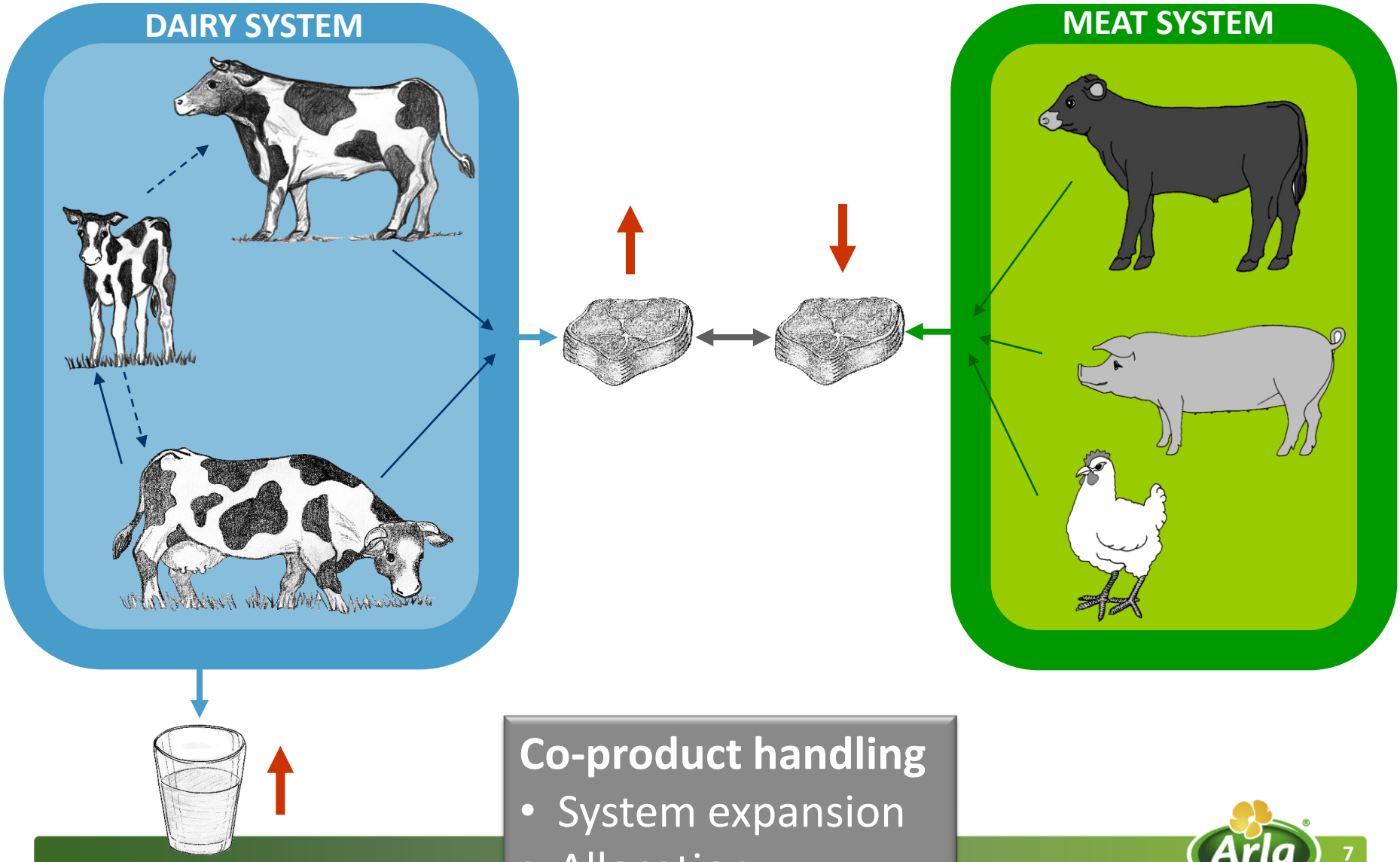
"The livestock sector is a major player, responsible for 18 percent of greenhouse gas emissions..."

(FAO: Steinfeld et al., 2006)

Dairy (incl. 57% of global beef) represents 4% of GHG emissions

(Gerber et al., 2010)

The interaction between milk and meat system

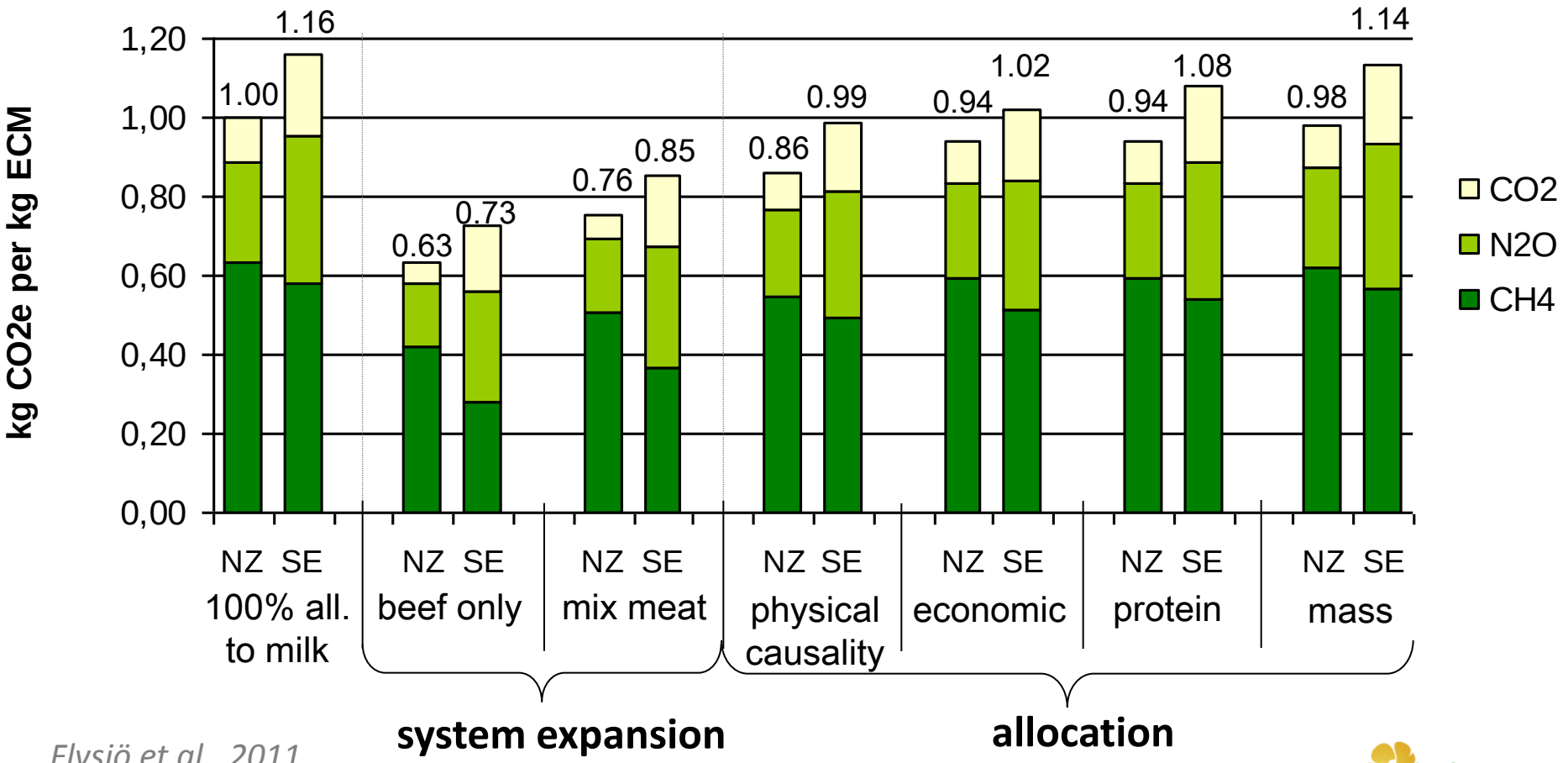


Co-product handling

- System expansion
- Allocation

Co-product handling – system expansion vs allocation

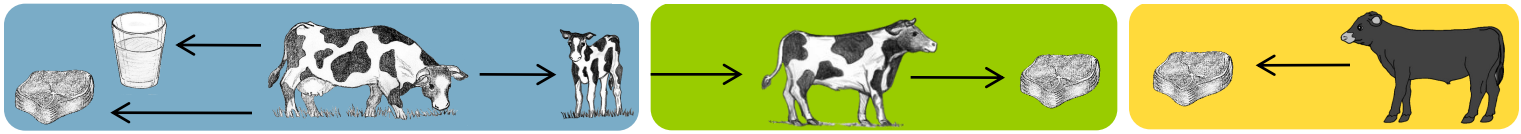
Carbon footprint of 1 kg energy corrected milk (ECM)
at farm gate in New Zealand (NZ) and Sweden (SE) (excl LUC).

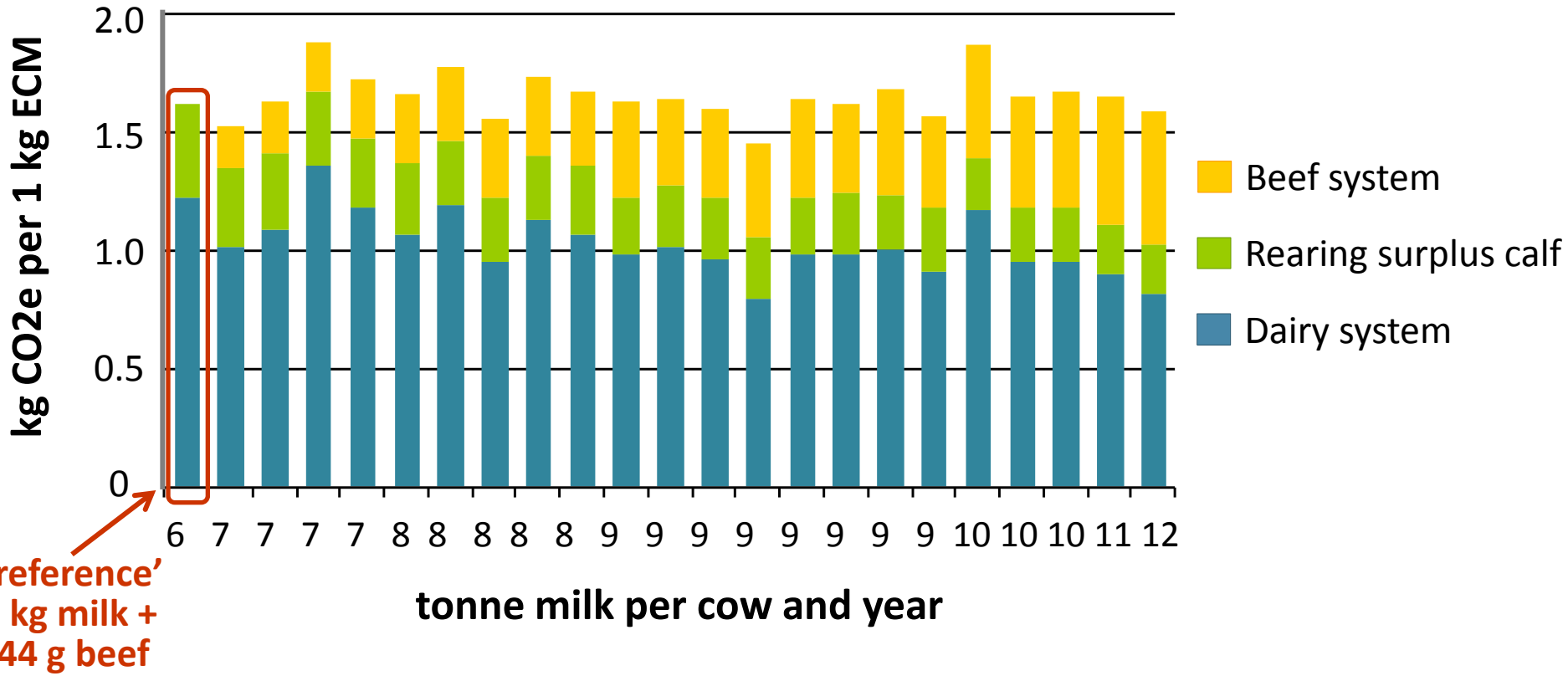


Flysjö et al., 2011

Accounting for affected systems – analysing different farms in SE (excl. LUC)

Carbon Footprint of 1 kg milk **and 44 grams of beef**





Cederberg and Flysjö, 2004; Flysjö et al., 2011

It is not evident that a higher milk yield per cow results in a lower CF!

How to account for land use change (LUC)

- Only production on deforested area is responsible for the deforestation?

or

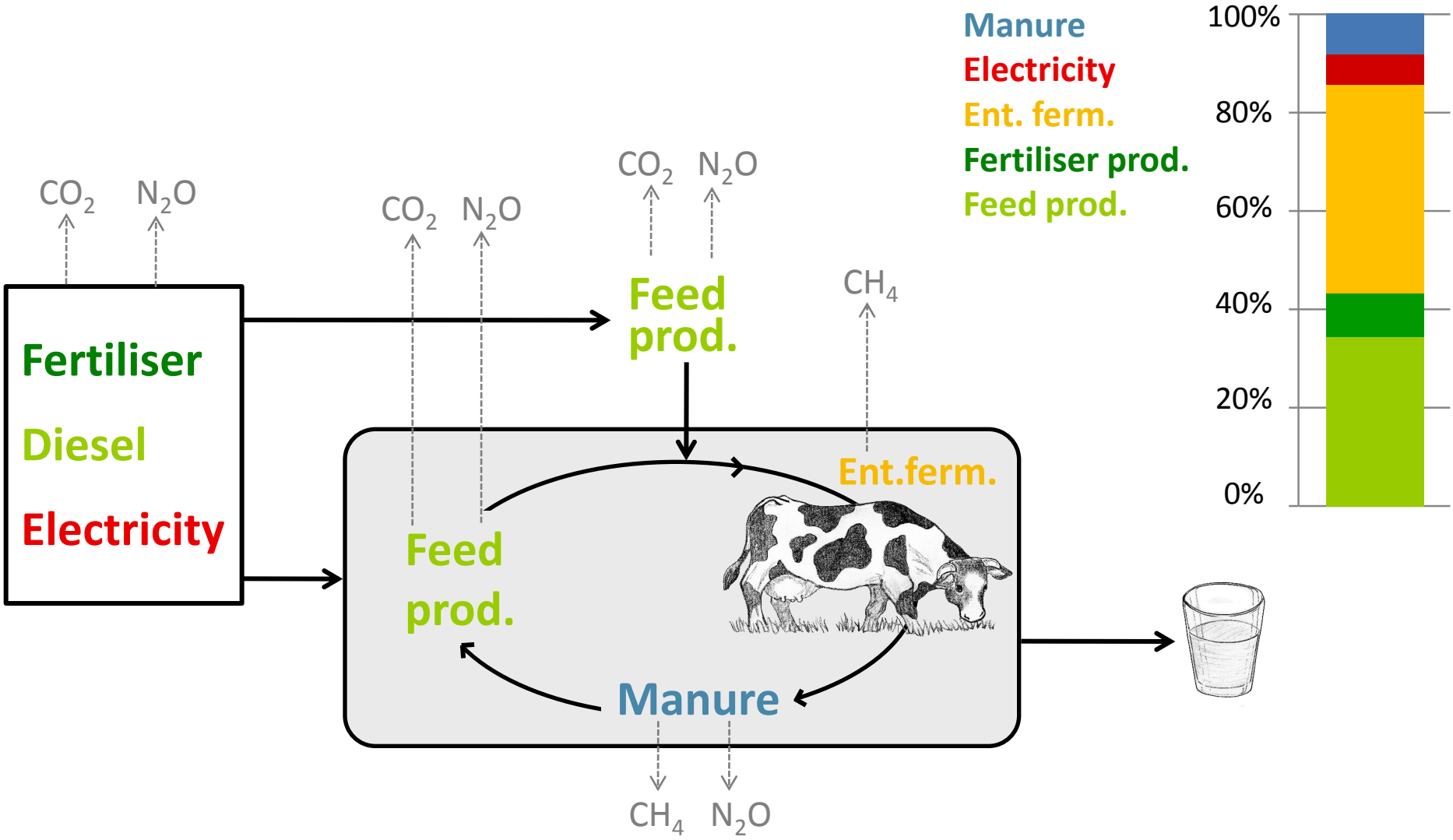
- All land occupation drives deforestation? (i.e. ‘less land is better’)

CF for milk at farm gate using different methods to account for LUC

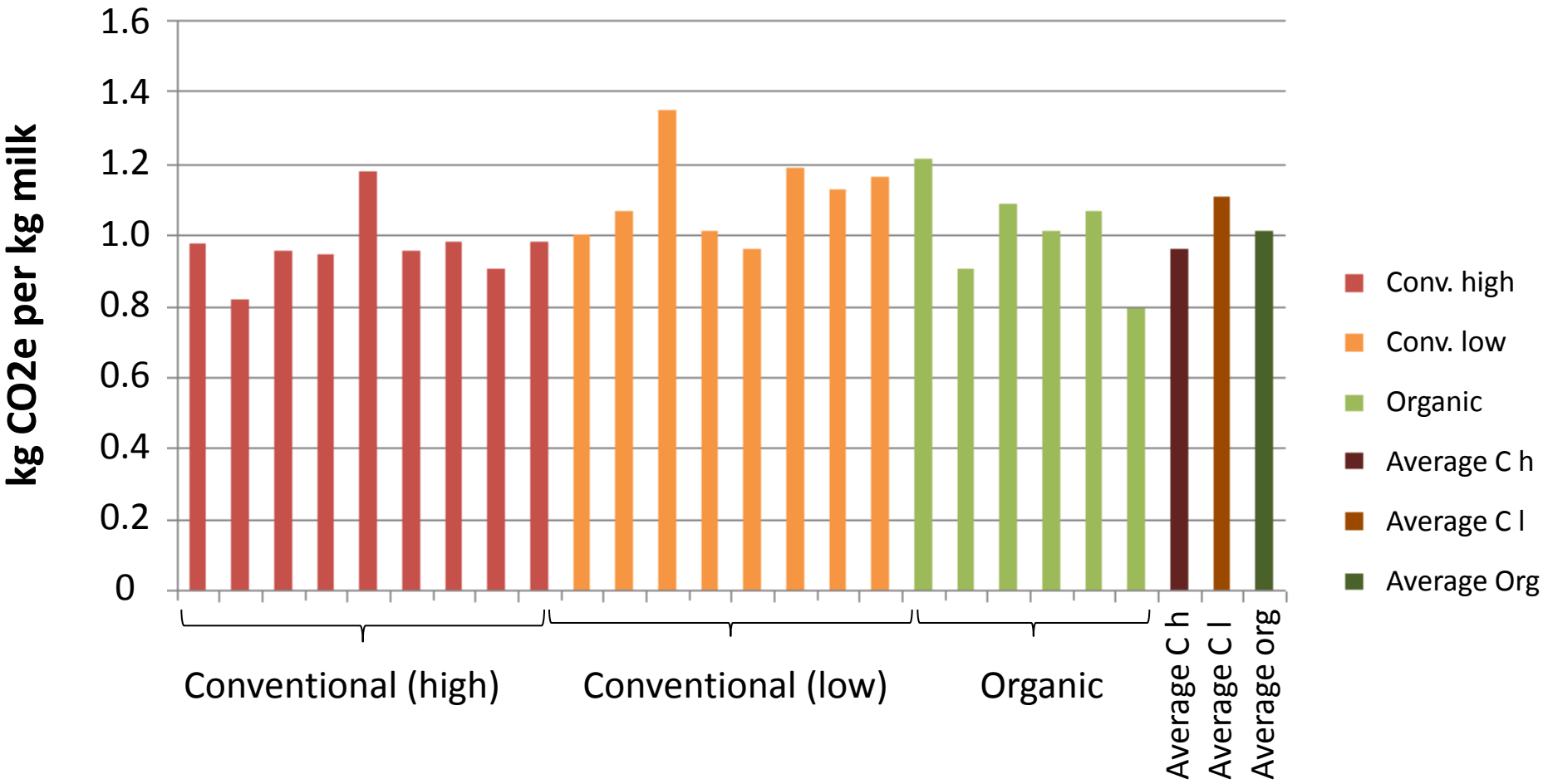
Milk production in Sweden	Organic	Conventional
(kg CO2e per kg ECM)	Syst. exp.	Syst. exp.
No LUC incl.	0.49	0.52
LUC incl. for soy *(Gerber et al.. 2010)*	0.56	0.85
LUC incl. for soy *(Leip et al.. 2010) 'medium case'*	0.52	0.65
LUC incl. for general LU *(Audsley et al.. 2009)*	0.83	0.66
LUC incl. for general LU *(Schmidt et al.. 2011)*	2.11	1.38

Flysjö et al., 2012

System overview on greenhouse gas emissions on farm level (excl. LUC)



Variation in carbon footprint between farms (excl. LUC)



Cederberg and Flysjö, 2004

Mitigation measures at farm level

Efficiency
- Feed
- Nitrogen
- Energy
- Yield

'Green' investments
- Biogas
- Microbial fuel cells

Environmental potential
Technical feasible
Economical viable
…uncertainty!?

'Green' purchasing
- Feed with low CF
- Fertiliser (BAT)
- Renewable electricity

Other
- Feed additives (reduce CH_4)
- Carbon sequestration

Estimated reduction potential for different mitigation actions

Based on average Swedish milk production in 2005 (electricity mix changed to European average).

Actions	’Scenario’	Estimated reduction in CF		
	low / medium / high	'low'	'medium'	'high'
Increased milk delivery	1/2/3	1.0%	2.0%	2.9%
Enteric CH_4	5/10/15	2.1%	4.3%	6.4%
Electricity	25/50/100	1.5%	3.0%	6.0%
Diesel use	5/12.5/20	0.3%	0.7%	1.1%
N efficiency	5/12.5/20	0.6%	1.5%	2.4%
BAT N fertiliser	25/50/100	1.2%	2.5%	5.0%
Purchased feed	5/12.5/20	0.6%	1.6%	2.6%
Feed management	1/2.5/5	0.3%	0.8%	1.6%

How does the ‘low carbon farm’ look?

1. Healthy and ‘happy’ animals.
2. High feed efficiency (milk/feed) – high milk yield and good quality of roughage.
3. Efficient use of manure, optimal N-application and BAT of synthetic fertiliser.
4. Effective feed production and high share of own produced feed.
5. Low age of first calf and longevity of cows.
6. Manure to biogas, energy efficiency.
7. Sexed semen, beef cattle in excess of replacement needs.

Conclusion

- A system thinking is required – LCA is a good method.
- There is no ‘silver bullet’ to mitigate emissions.
- The individual farm needs to be considered.
- Co-product handling is critical.
  - Accounting for affected systems are necessary!
  - It is not evident that increased milk yield results in lower CF…
- Land use and land use change needs to be addressed.


Thank you for your attention!
Questions?
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