Large variation in emission intensities from dual-purpose sheep production system

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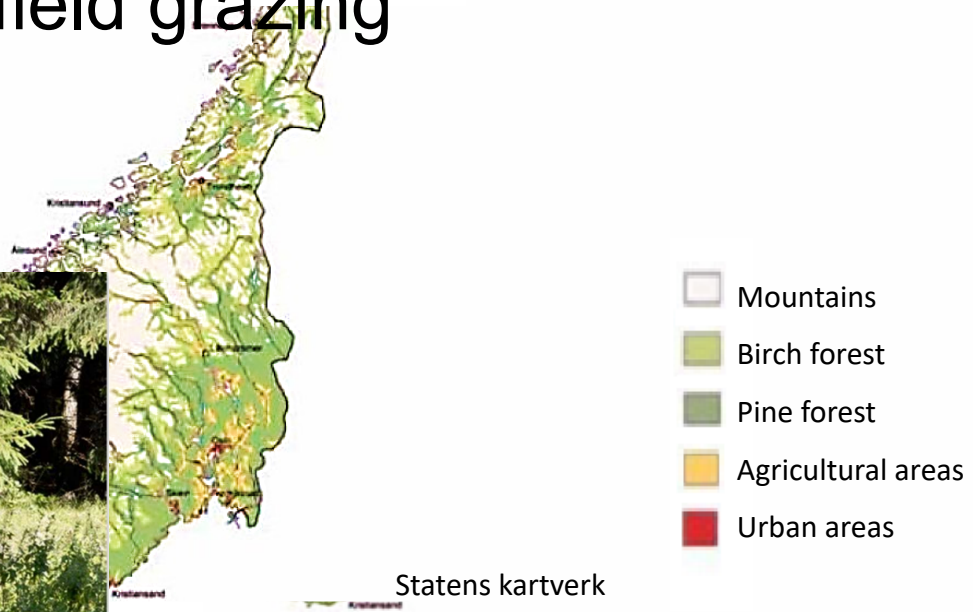
Norwegian natural resources

Limitations:
- climate
- topography

- 3% arable land
  - 1/3 cereals
  - 2/3 grass

- In addition: 50% of area suitable for outfield grazing

→ use of ruminants



Norwegian sheep production

- Population size:
  - 1 million winterfed ewes
  - 1.3 million lambs slaughtered

- One dominant breed:
  - Norwegian White Sheep: 70%

Bhatti et al., 2019;

Norwegian sheep production system

Indoor feeding

NOV – MAR
Breeding season (Nov–Dec)
(Male and Females)

Spring grazing

APR – MAY
Lambing season (Mar–May)
(Sheep and lambs)

Range grazing

JUN – SEP
Summer season
(Sheep and lambs)

Autumn feeding

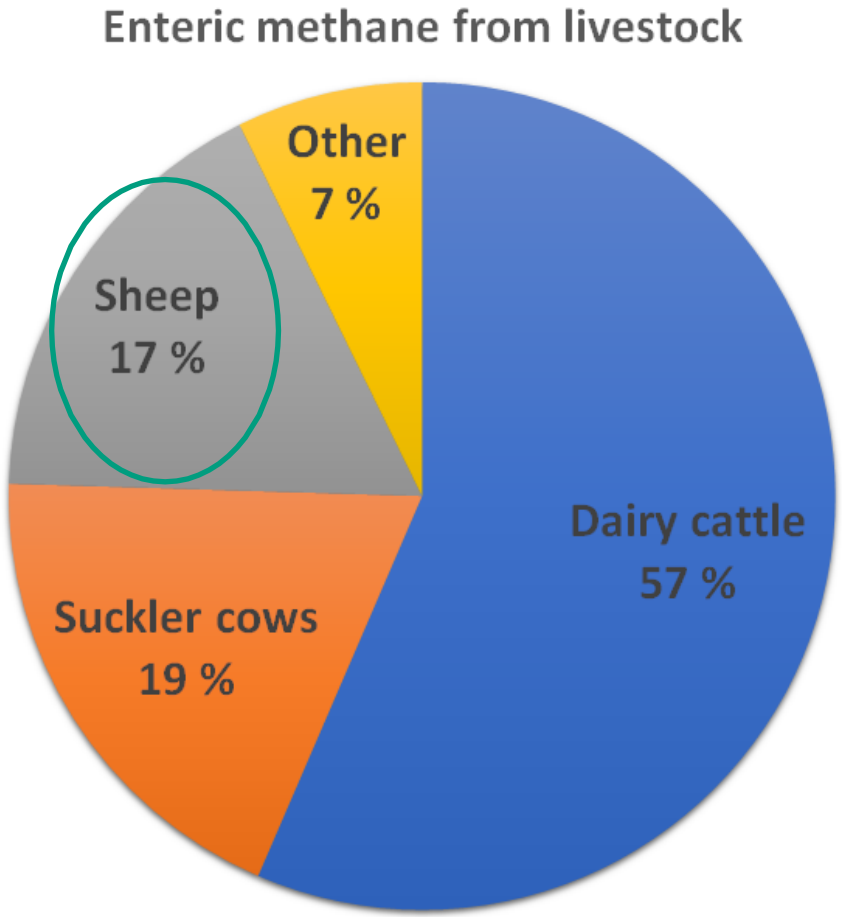
SEP – NOV
Slaughtering season
(Sheep and lambs)

Slaughterhouse

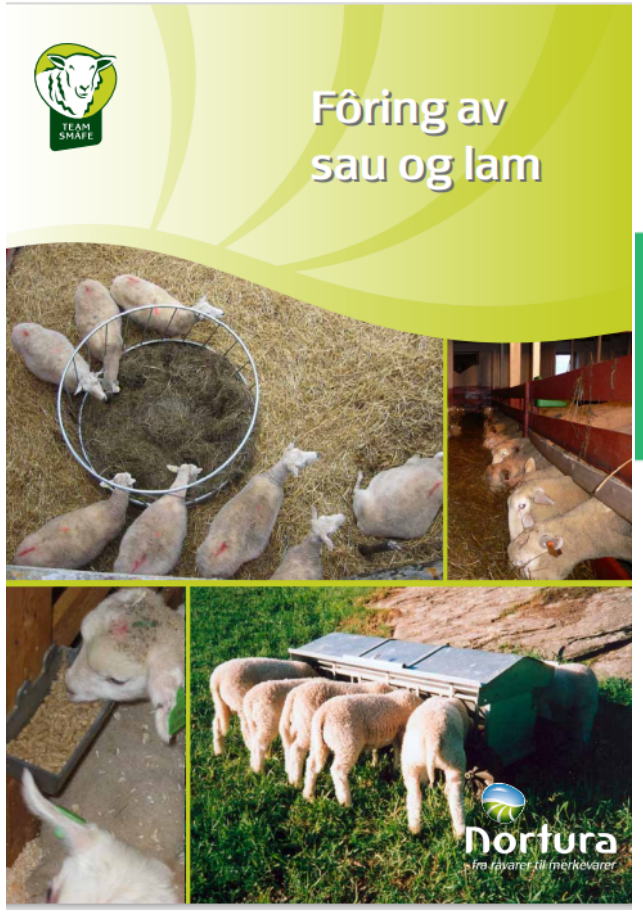
Bhatti et al., 2019

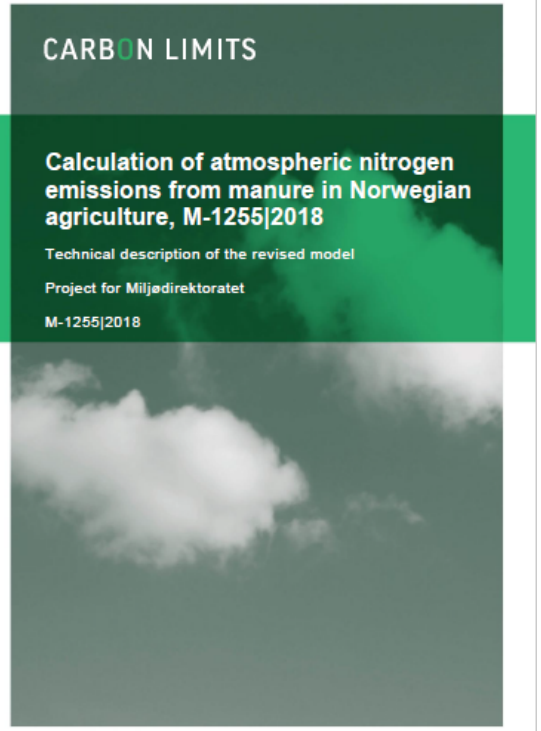
Greenhouse gas emissions

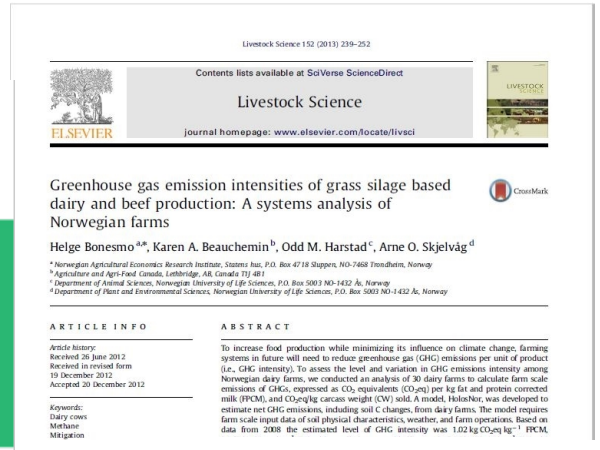
- Greenhouse gas emissions (GHG) from agriculture (ruminants) is focused in the public debate
- Agriculture: 9.4% of total GHGs
- Enteric methane is the most important emission source
  - ~50% of GHG from agriculture
- Need mitigation options

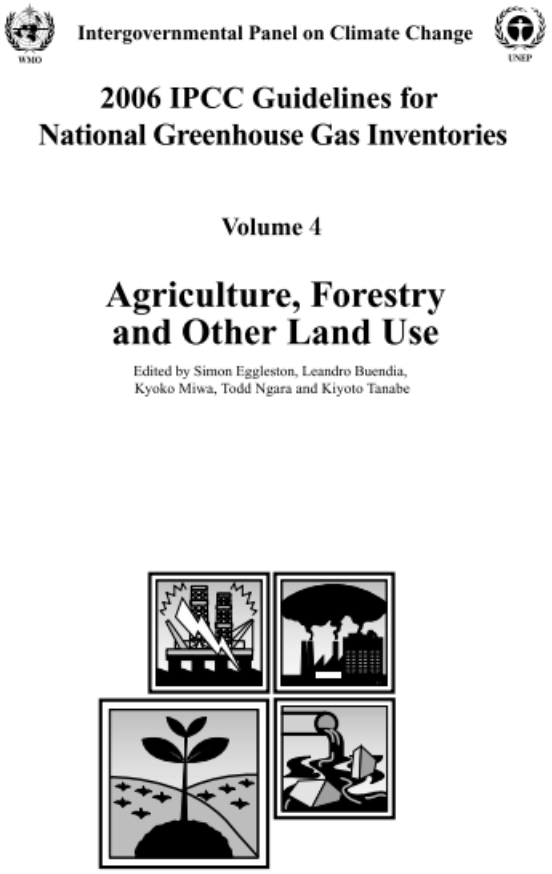


HolosNorSheep



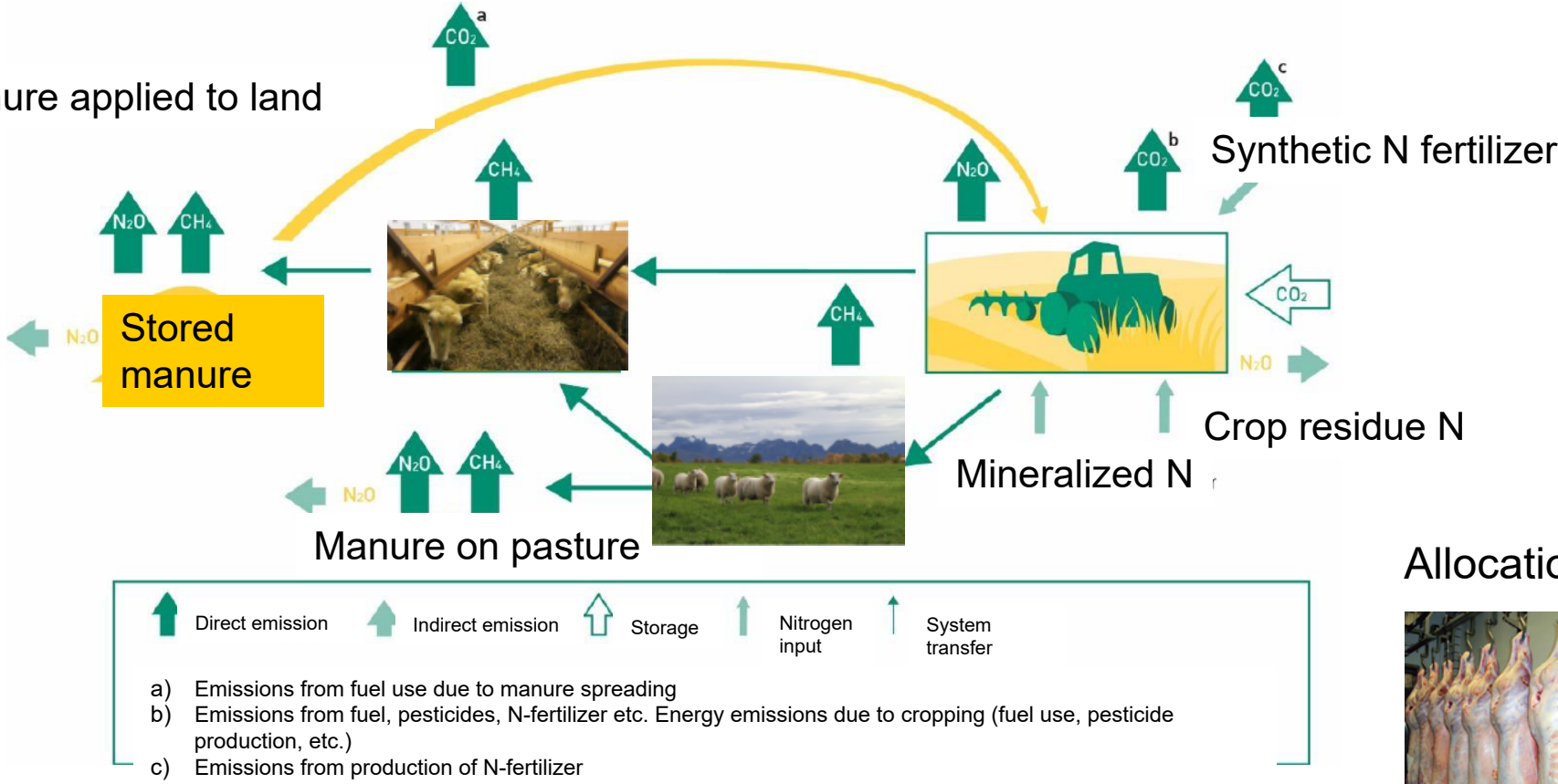






HolosNorSheep

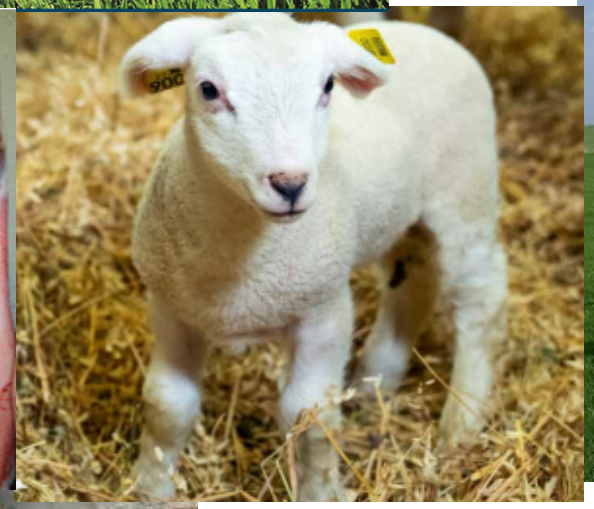
N-fertilizer
Diesel fuel
Electricity
Pesticides
Perservatives

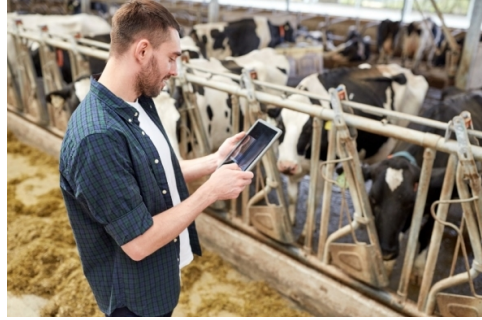


Allocation of GHGs:

Soil carbon balance set to zero

Input data HolosNorSheep





Data

NIBIO – Norsk institutt for bioøkonomi

Skifteplan

Landbruksdirektoratet

Felleskjøpet Rogaland Agder

Felleskjøpet

Strand Unikorn

Fiskå Mølle

Nortura

Fatland

Furuseth

Duett – smarte løsninger

Visma

Agro Økonomi

Animalia

NMBU

NIBIO – Norsk institutt for bioøkonomi

Farm model «HolosNorSheep»

GHG Calculator

GHG database

LD Landbrukets Dataflyt

Advisory tool

Farmer and adviser

Norsk Landbruksrådgiving

Animalia

TINE

Felleskjøpet

Pilot study

- 38 farms distributed across Norway with varying climate, natural resource base, feeding and management practices

- Data from 2019 to 2021 (n=68)

- Average:
  - herd size: 83 ewes (±49)
  - ley area: 24 hectares (±17)

Animal performances

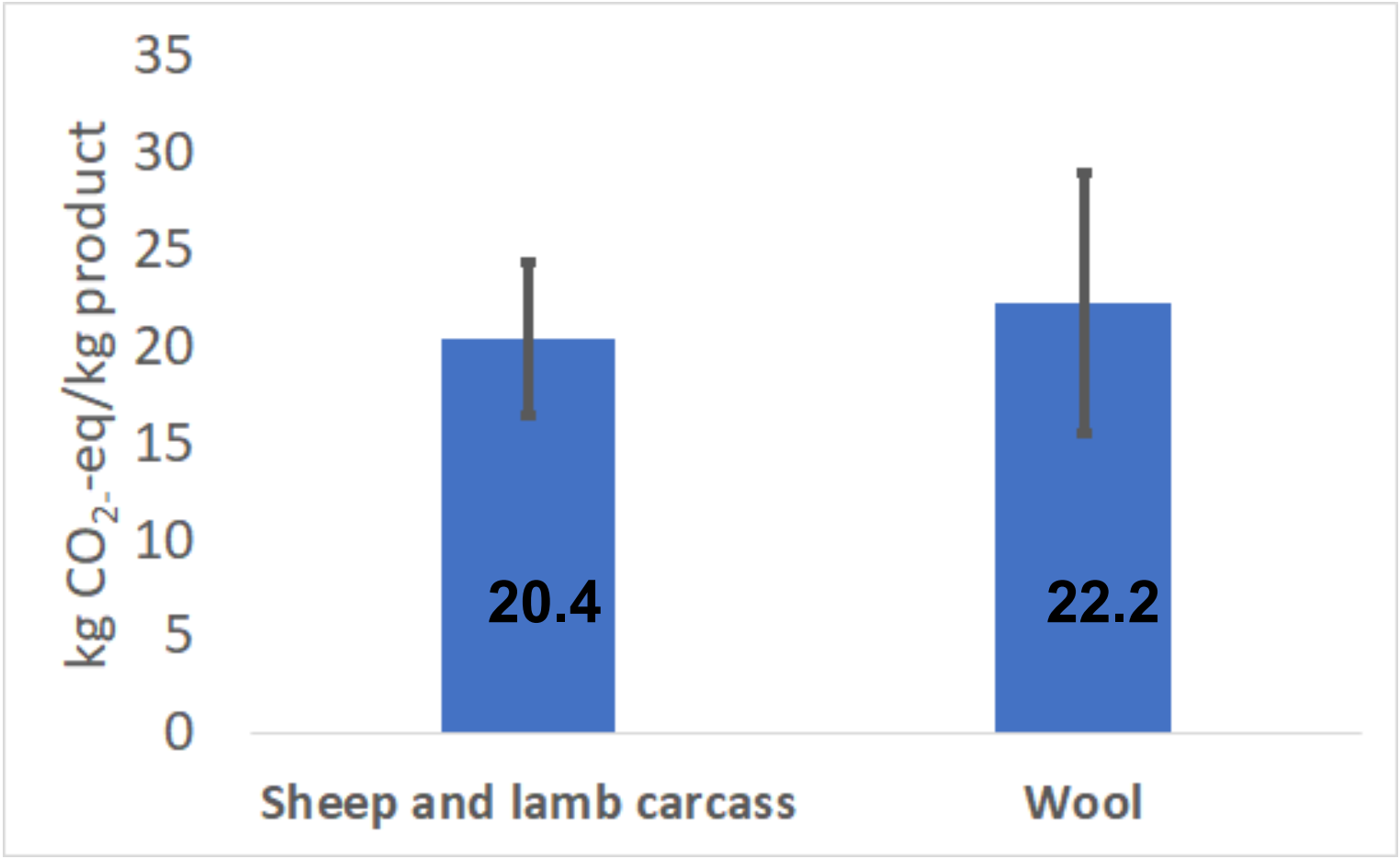
	Average (std)	Min	Max
Ewes			
Live weight, kg	78 (±6.5)	56	81
Number of weaned lambs	2 (0.3)	1.4	3.0
Lambs			
Autumn weight, kg	45 (±4.8)	33	54
Carcass weight, kg	20.6 (±2.4)	15	27
Growth rate birth-autumn, gram	310 (±40)	230	400
Autumn fattening, no. of days	20 (±12)	4	78

Input factors

Input factor	Average (std)	Min	Max
Electricity, kwh	13,207 (±16,623)	0	95,532
Concentrates, kg/kg carcass	2.2 (±1.7)	0	7.8
Fuels, liters	-	0	349

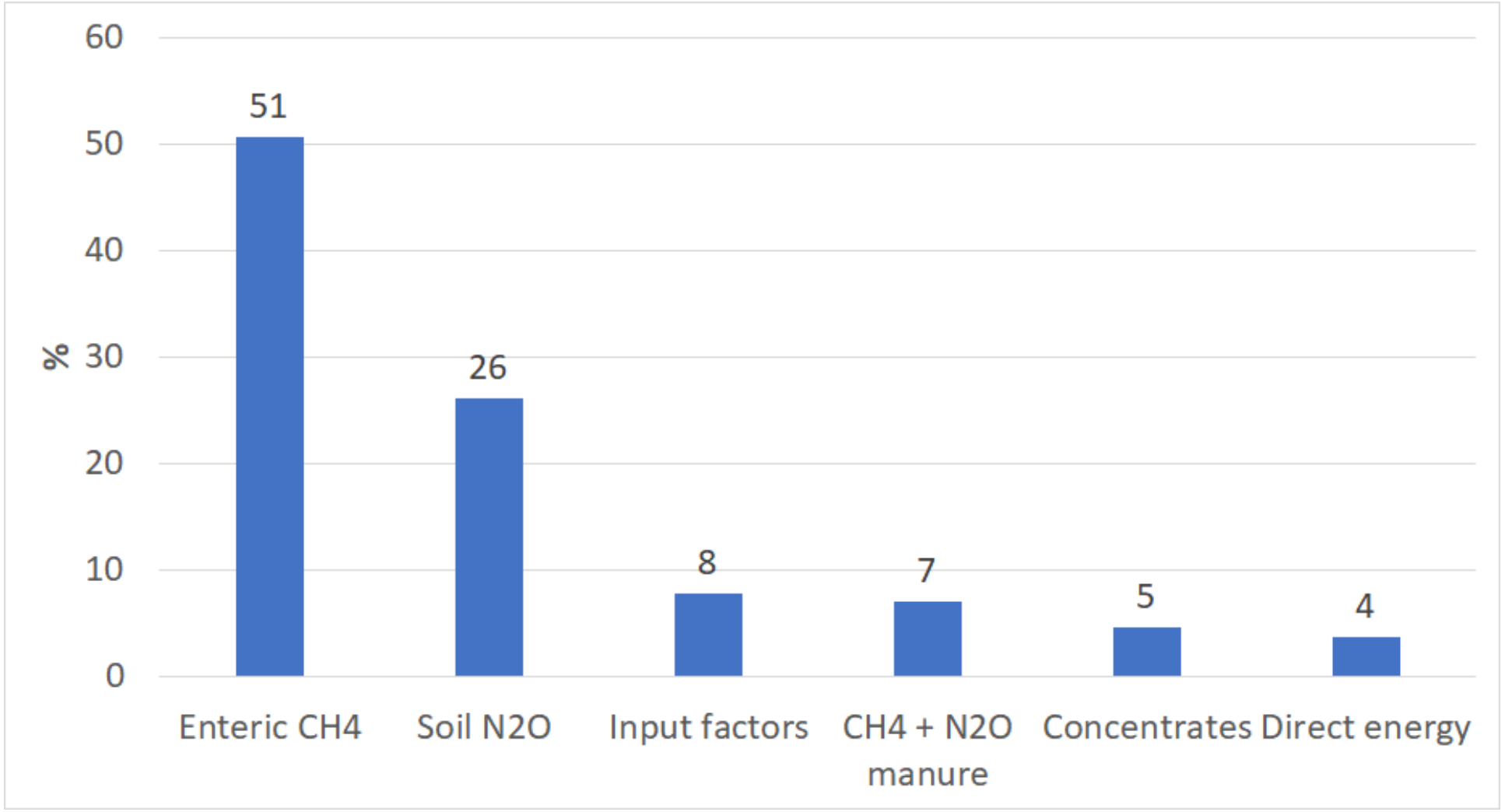
Preliminary results

Emission intensities



	Min	Max
Carcass	11.3	30.4
Wool	10.7	51.0

Emission sources



Summary

- The GHG calculator is available to all sheep farmers in Norway
  - need to share data from many sources

- Pilot study:
  - large variation in animal performances and use of input factors
  - → large variations in emission intensities (11-30 kg CO_2-eq/kg carcass)
  - → potential to reduce emission intensities from Norwegian dual-purpose sheep production

Thank you for your attention!