



# Carbon footprints of dairy farms along the Atlantic coast of Europe



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INSTITIÚID TEICNEOLAÍOCHTA PHORT LAIRGE



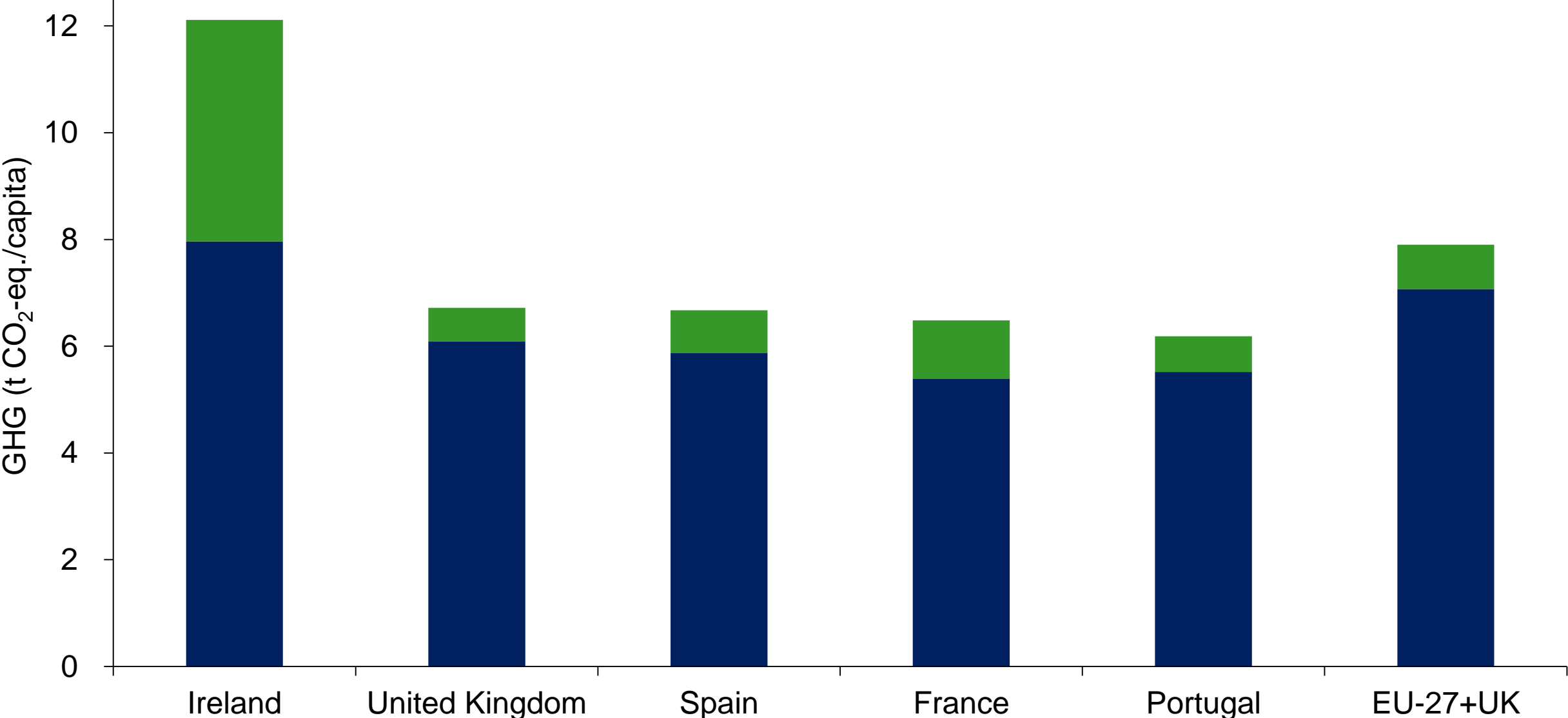
# Dairy-4-Future project

- 100 commercial dairy farms
- 10 experimental dairy farms
- Funded by the Interreg Atlantic Area Program



# Per capita greenhouse gas emissions in countries in the Atlantic Area

■ Other emissions ■ Agriculture

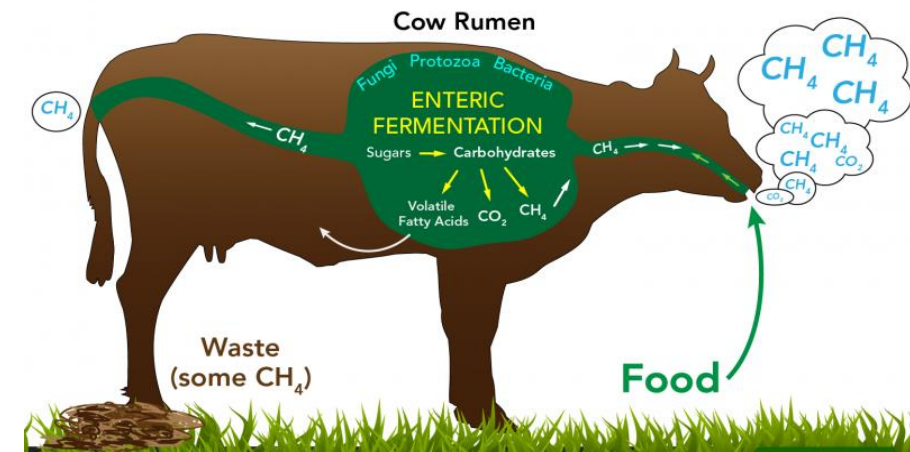


# Policies for greenhouse gas mitigation in countries of the Atlantic Area

Country	Target reduction (%)	Baseline year	Targeted measures
Ireland	22-30	2018	Fertiliser N, manure management, genetic merit
UK	17-30	2019	Fertiliser N, manure management, agro-forestry
Spain	18	2005	Fertiliser N, manure management, more legumes
France	18	2015	Fertiliser N, manure management, bio-energy, agro-forestry
Portugal	11	2005	Fertiliser N, manure management, genetic merit, bio-energy

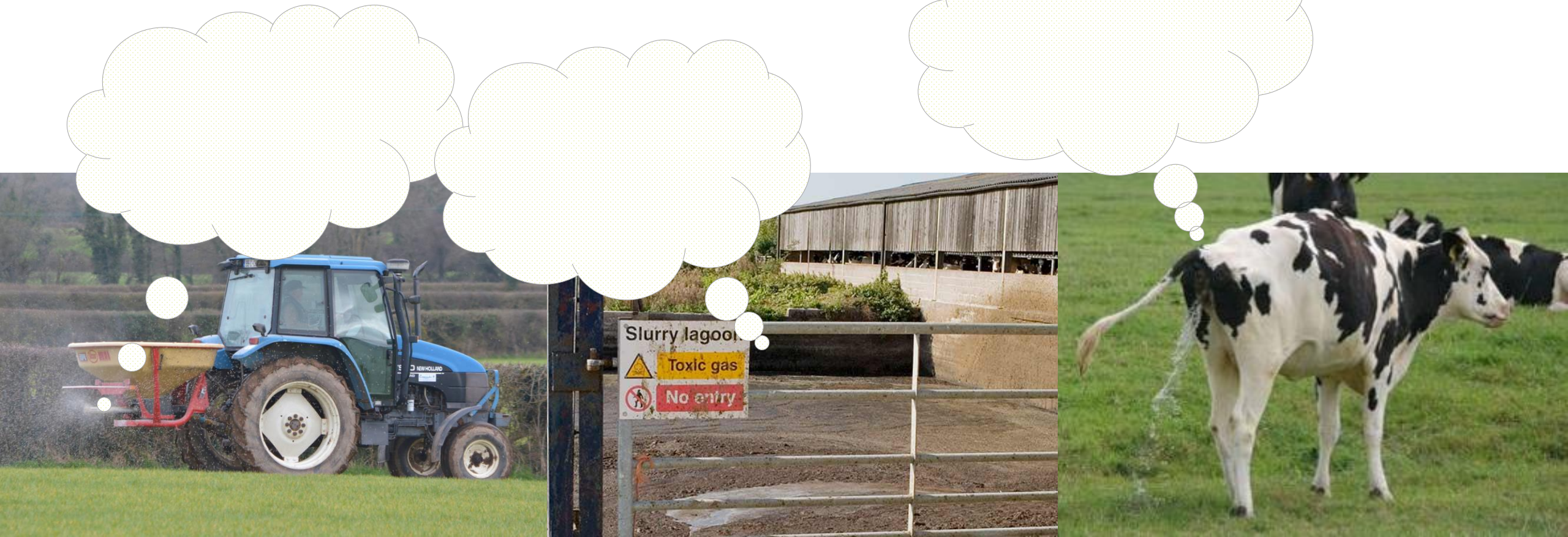
# Aims & objectives

- Study of carbon footprints of milk from dairy farms
- Lower greenhouse gas emissions from dairy farms
- Study practices on dairy farms to identify best practices
- Need a range of diverse practices
- Specific solutions to farming system (pasture-based, indoor etc.)
- Also studying economic & social implications

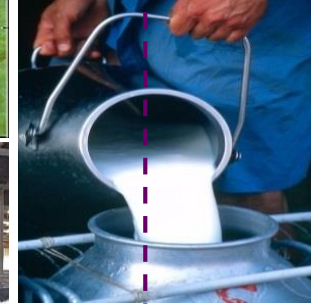


# Calculating a Carbon footprint

- Carbon footprint metric – e.g. per kg milk or per ha of land
- FPCM = Fat and Protein Corrected Milk

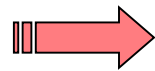


# Accounting for greenhouse gas emissions



## Primary resources

Raw materials  
Energy use  
Transport



## Inputs

Fertilizers  
Electricity  
Fuel  
Feeds



# Number of farms per region

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	<b>Ireland</b>	10
	<b>N. Ireland</b>	10
	<b>Great Britain</b>	9
	<b>France</b>	6
	<b>Galicia</b>	10
	<b>Basque</b>	9
	<b>Portugal</b>	20
	<b>Total</b>	74

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- More progressive farms
- Diversity of systems
- Wide range of practices
- Not necessarily representative of dairy farms in each region



# Farm Characteristics

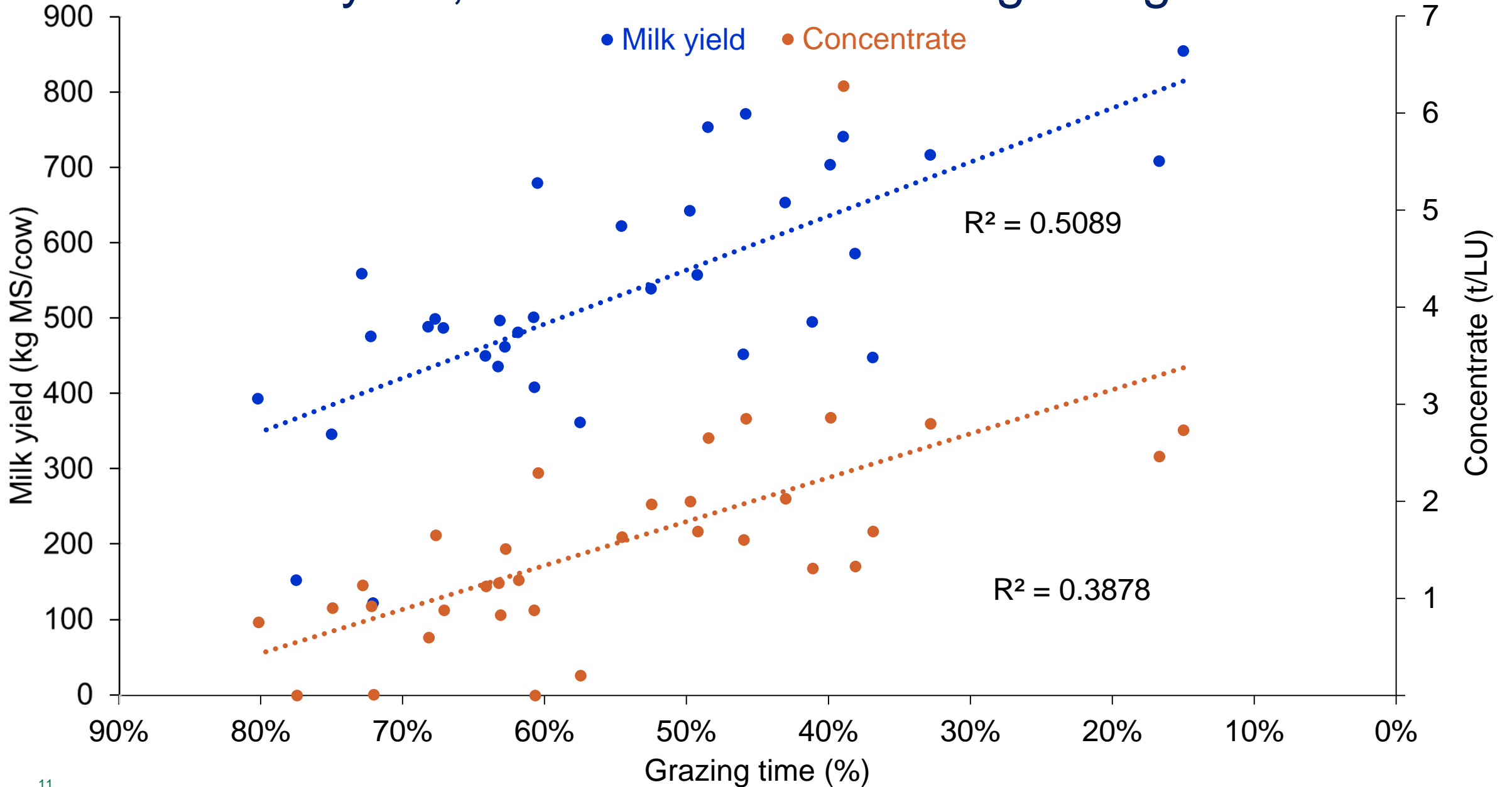
	<b>Stocking rate</b>	<b>Milk solids production</b>	<b>Age at first calving</b>	<b>Youngstock</b>	<b>Replacement rate</b>
	(LU/ha)	(kg/cow)	(months)	(%)	(%)
<b>Ireland</b>	2.36	488	24	25	22
<b>N. Ireland</b>	2.22	714	27	33	30
<b>Great Britain</b>	2.13	530	26	31	28
<b>France</b>	1.51	476	28	27	24
<b>Galicia</b>	2.25	677	29	26	23
<b>Basque</b>	3.52	759	26	41	37
<b>Portugal</b>	7.84	685	28	33	30

# Farm Characteristics

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	<b>Stocking rate</b>	<b>Grazing time</b>	<b>Concentrate</b>	<b>Purchased Forages</b>	<b>Fertilizer N</b>
	(LU/ha)	(%)	(kg DM/LU)	(kg DM/LU)	(kg/ha)
<b>Ireland</b>	2.36	66	966	421	270
<b>N. Ireland</b>	2.22	25	2,425	159	189
<b>Great Britain</b>	2.13	55	1,825	150	175
<b>France</b>	1.51	39	632	771	35
<b>Galicia</b>	2.25	17	2,466	466	80
<b>Basque</b>	3.52	5	3,561	1,150	45
<b>Portugal</b>	7.84	0	2,757	2,042	163

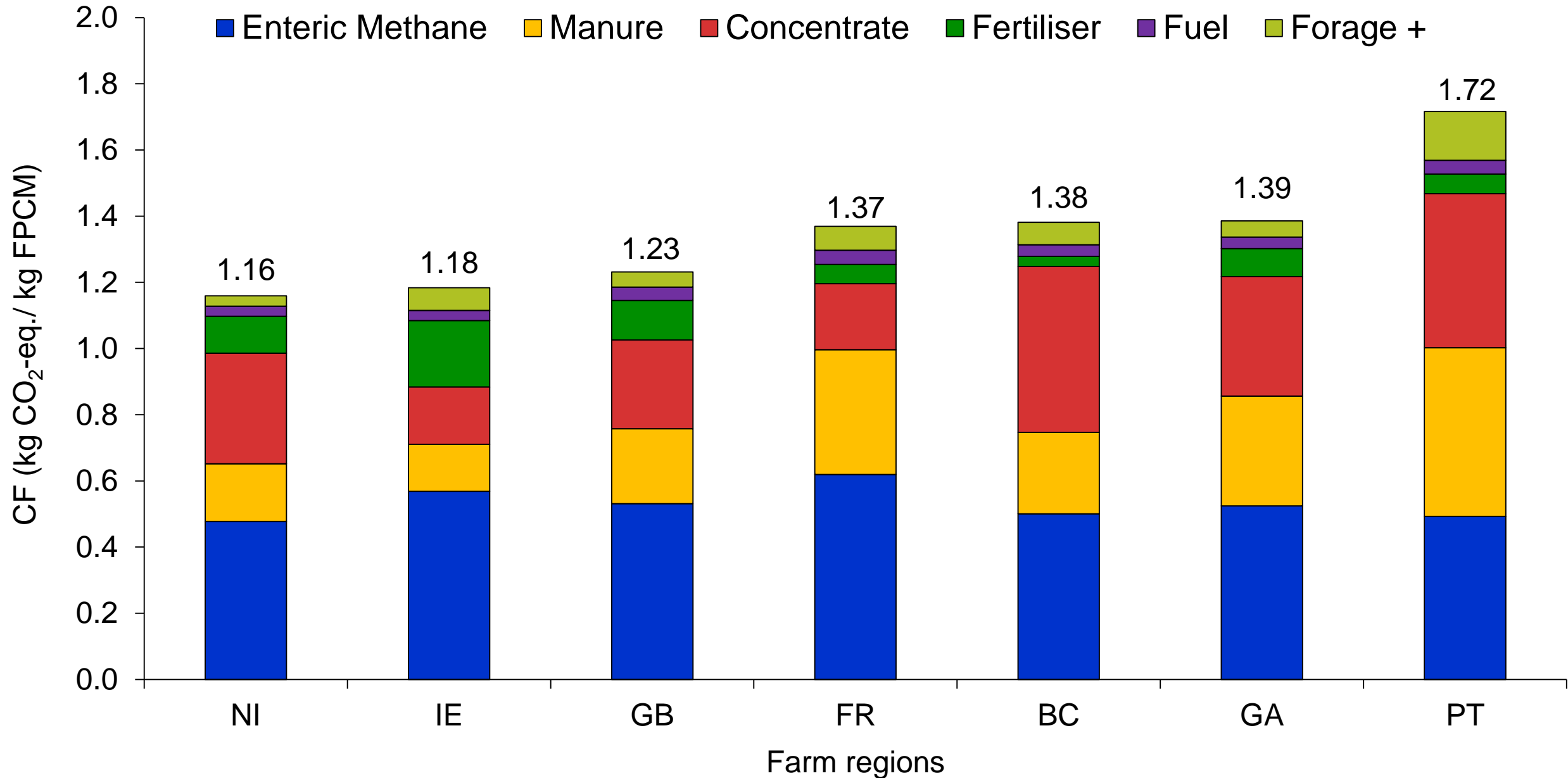
# Milk yield, concentrates fed and grazing time



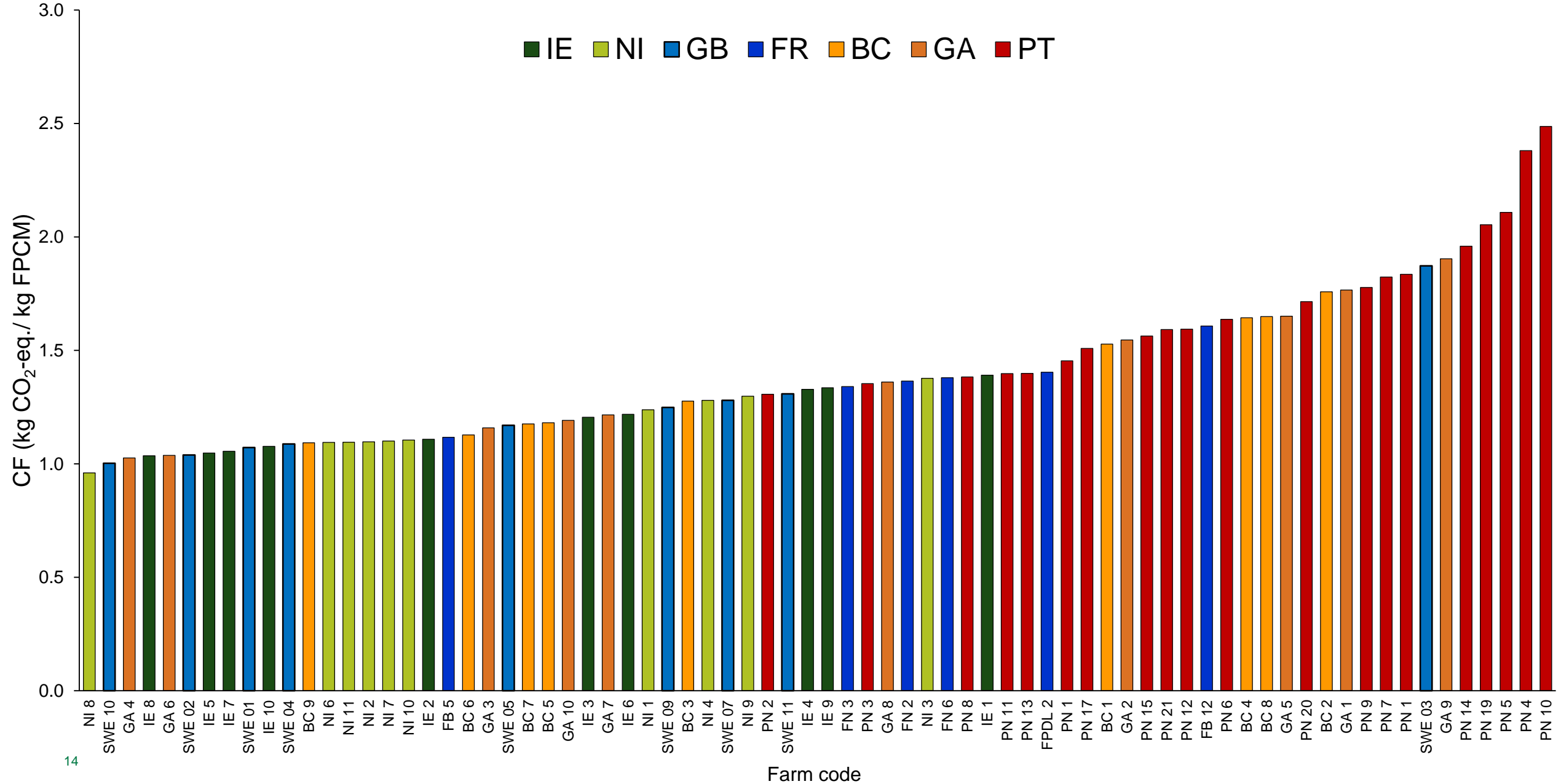
# Farm Characteristics

	<b>Grazing time</b>	<b>Milk production</b>	<b>Concentrate</b>	<b>Purchased Forages</b>	<b>Fertilizer N</b>
	(%)	(kg/cow)	(kg DM/LU)	(kg DM/LU)	(kg/ha)
<b>Ireland</b>	66	488	966	421	270
<b>N. Ireland</b>	25	714	2,425	159	189
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# Carbon footprint per kg milk in the different regions



# Carbon footprint per kg milk on the pilot dairy farms



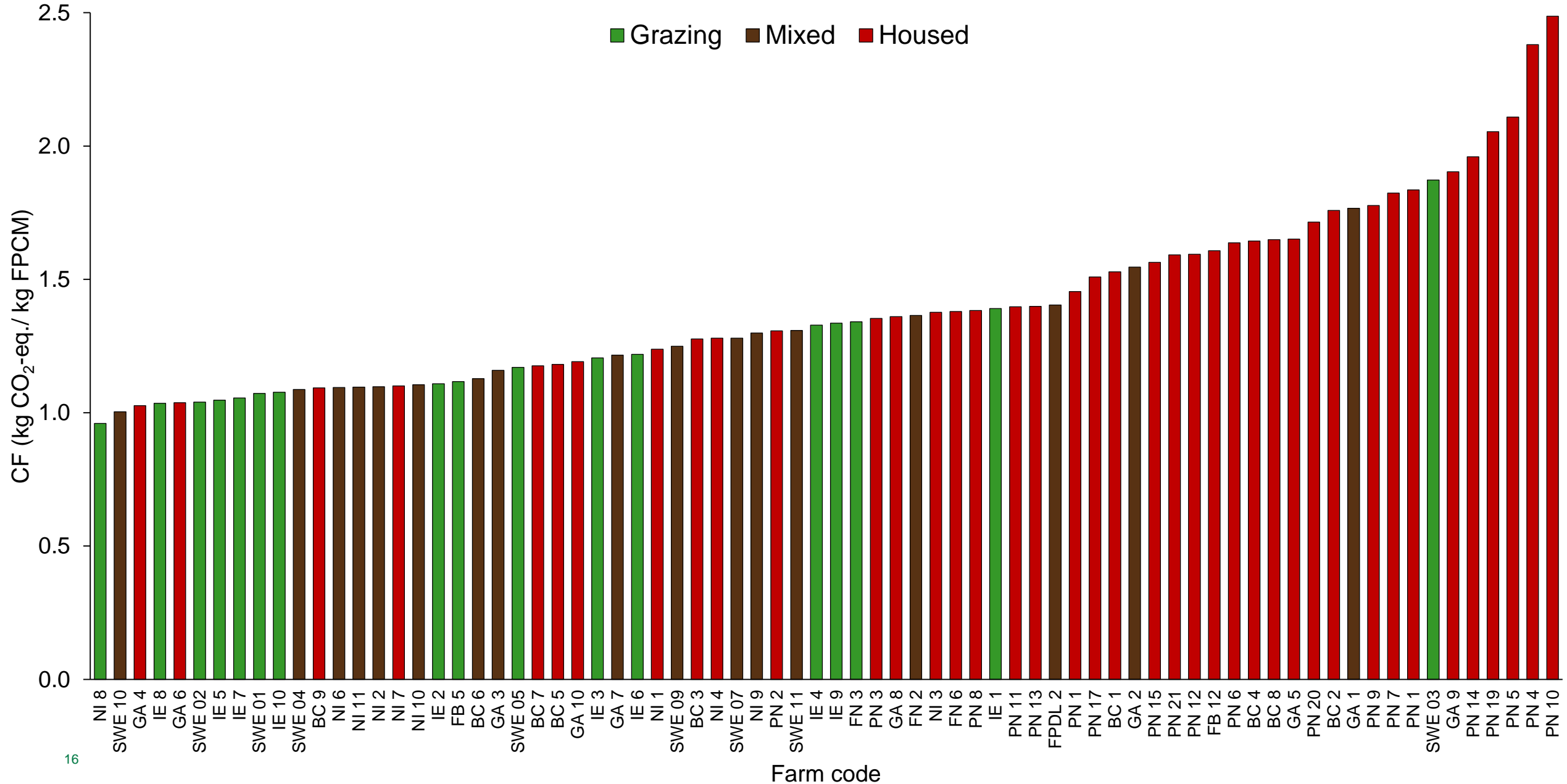
# Farm systems

- **Grazing:** >60% grazing throughout the year
- **Housed:** 100% housed
- **Mixed:** <60% grazing & <100% housed



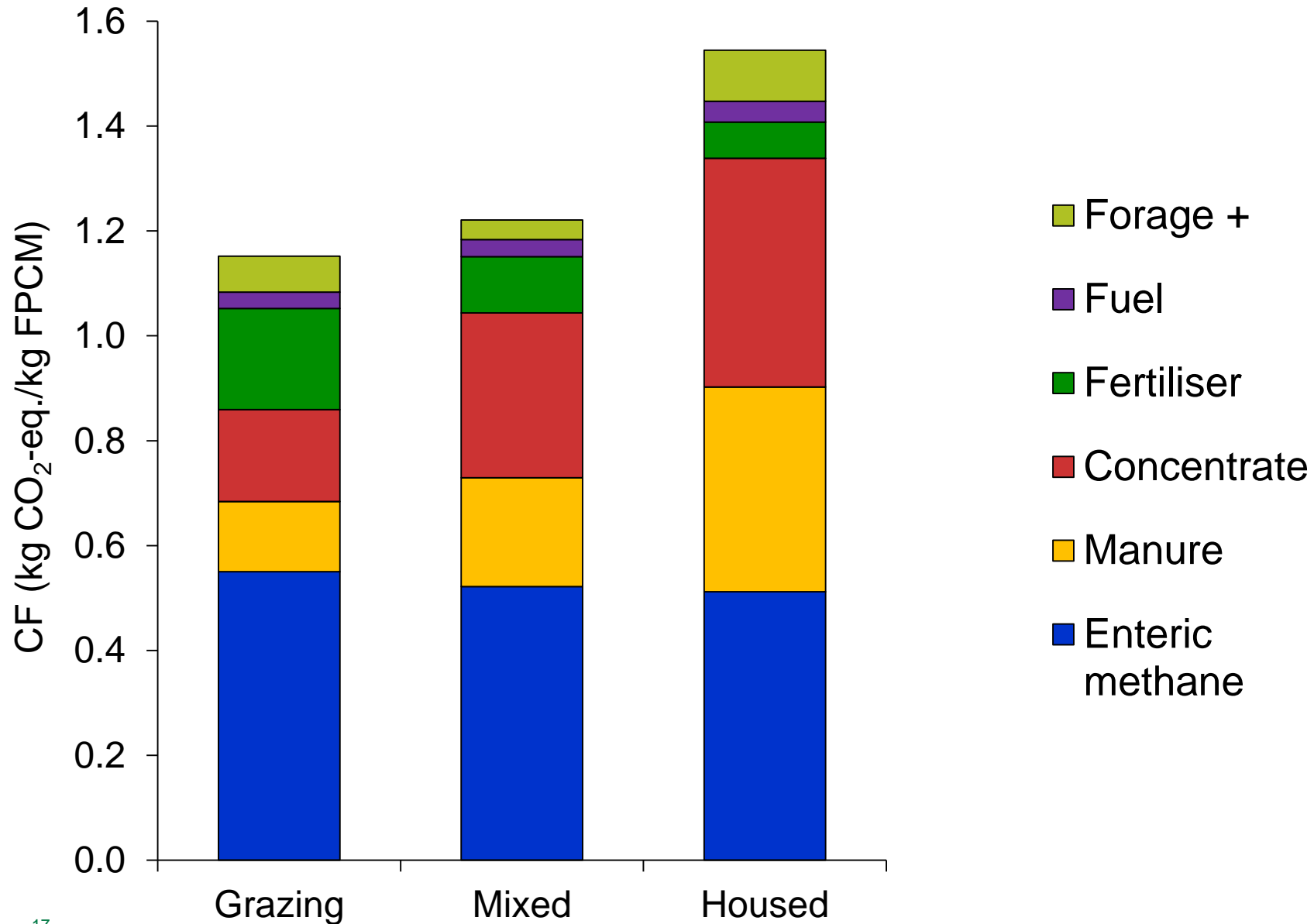
	Grazing	Mixed	Housed
Number of farms	17	17	40
Grazing time %	68	42	0

# Carbon footprint per kg milk on the pilot dairy farms

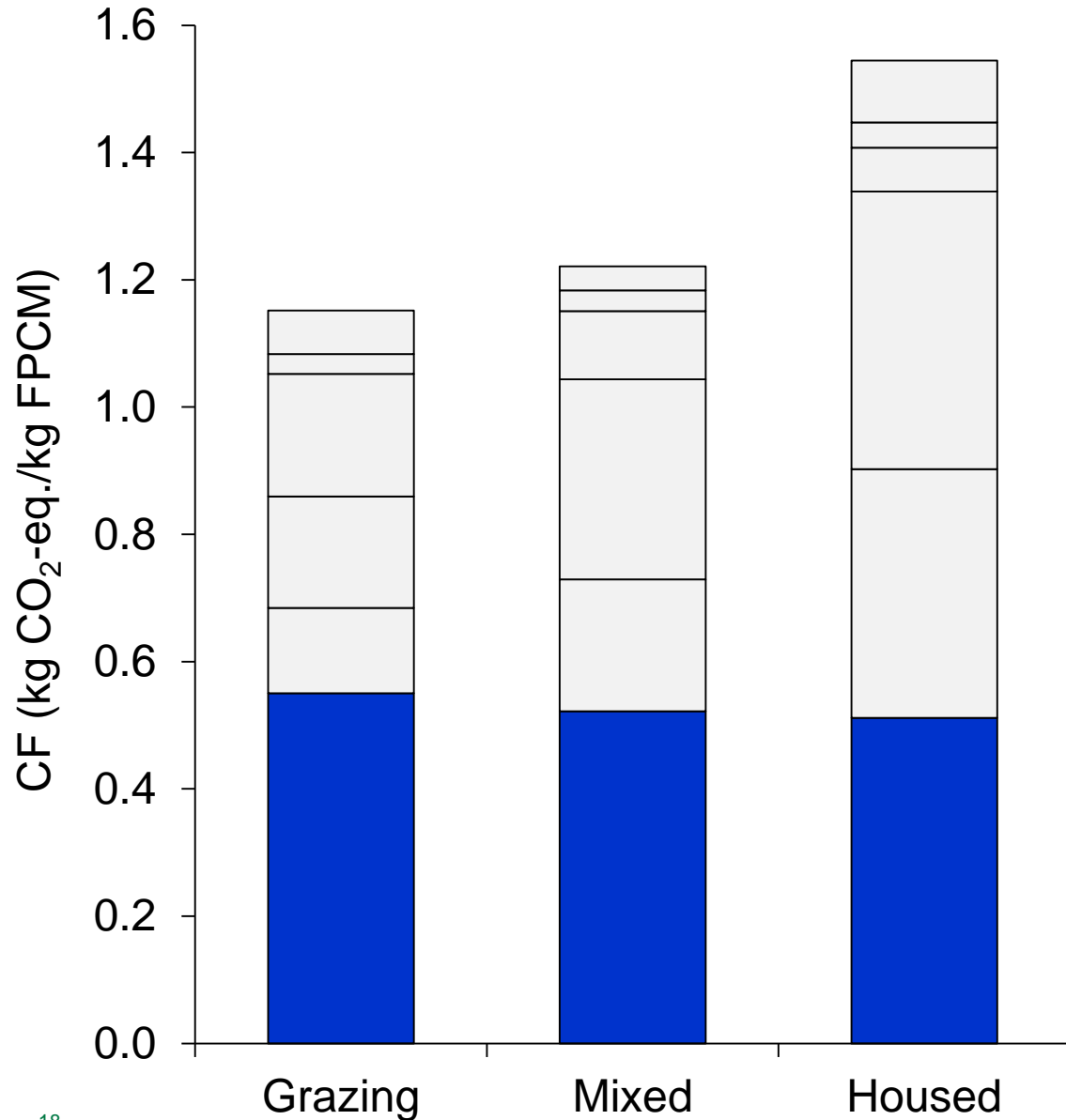




# Components of the carbon footprint of milk in different systems

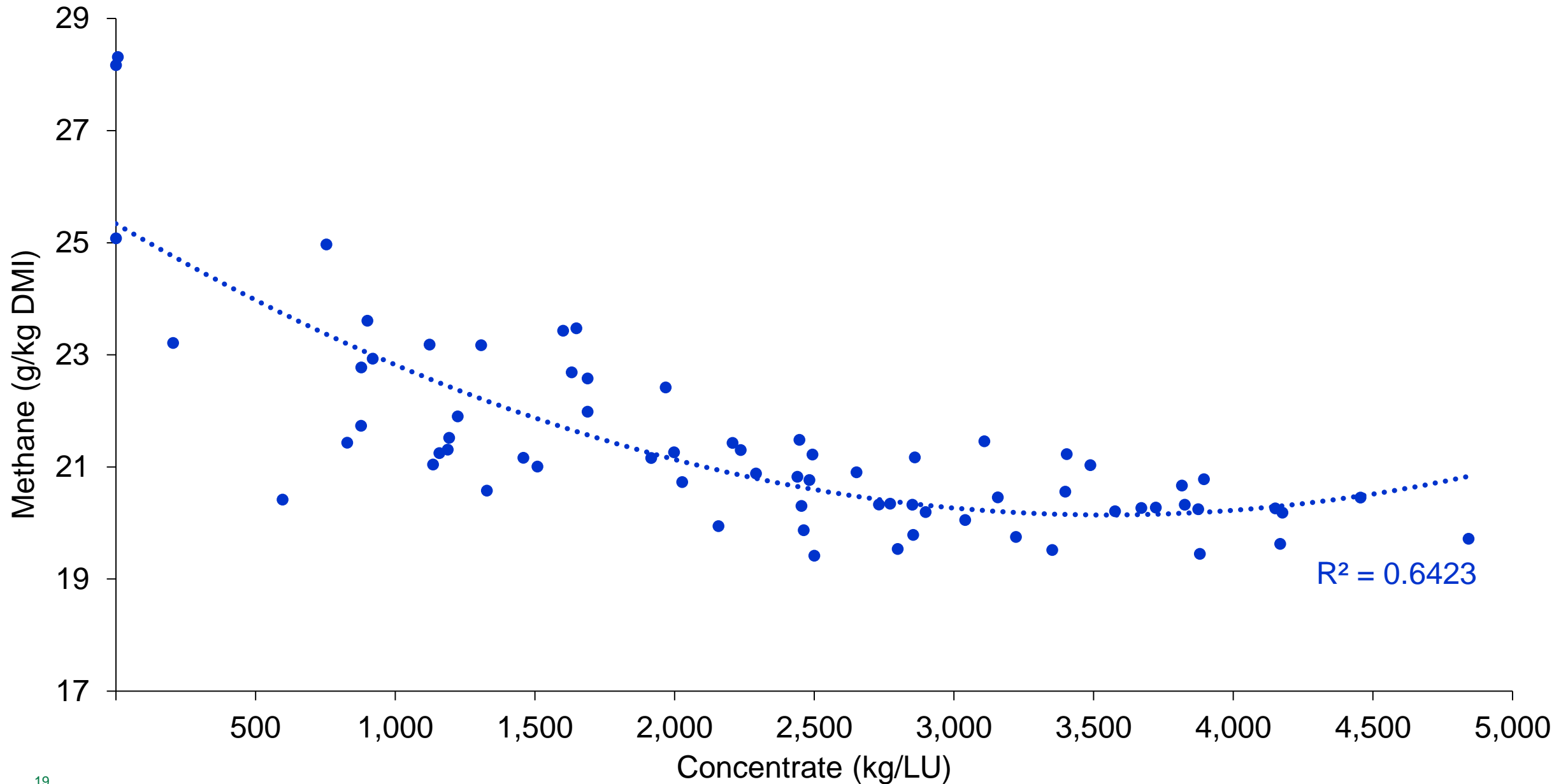


# Methane emissions from different production systems

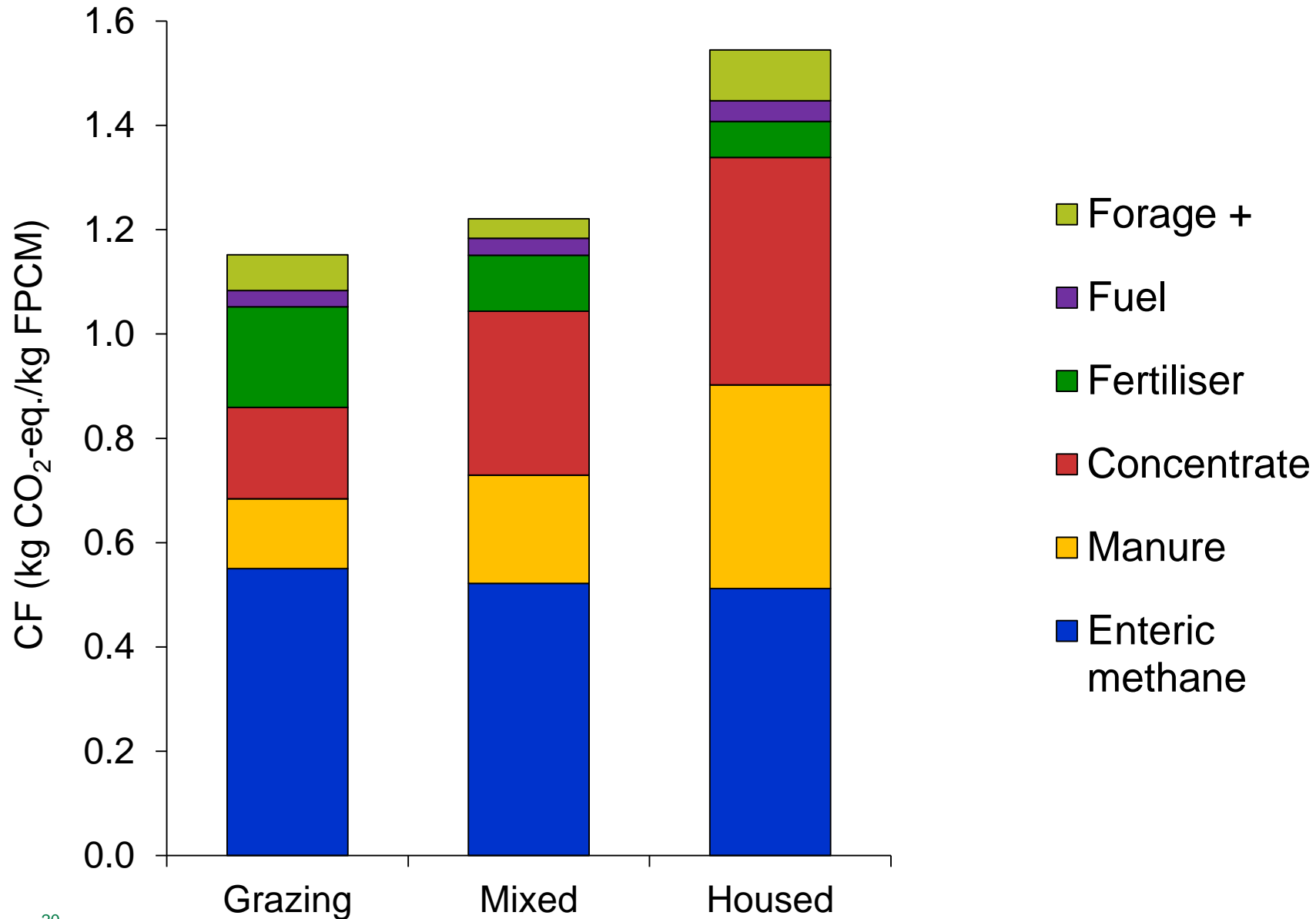


		Grazing	Mixed	Housed
Concentrate	kg/LU	837	2,016	2,937
Milk solids	kg/cow	437	623	723
Age at first calving	months	26	28	27
Replacement rate	%	23	28	30

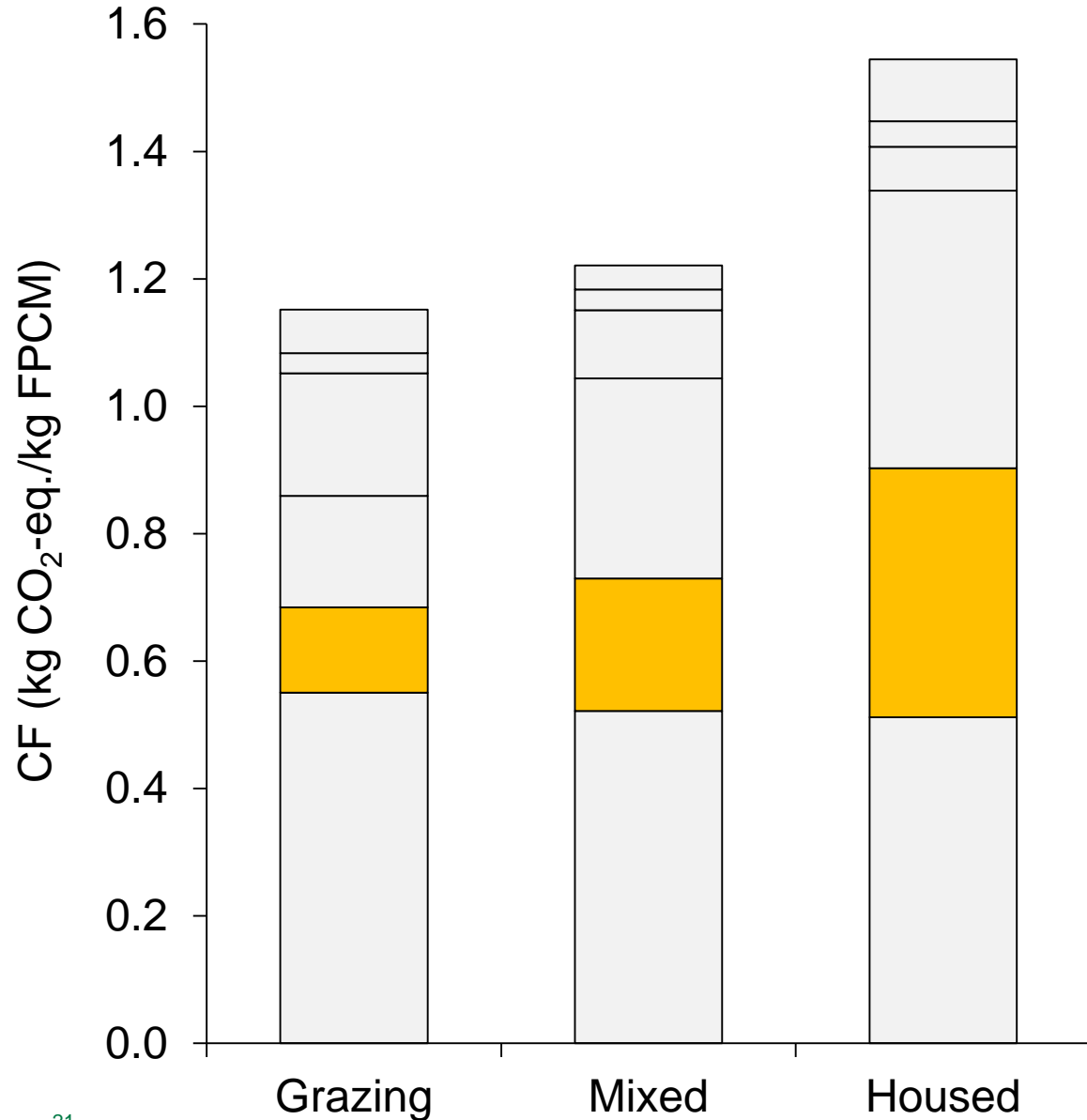
# The effect of concentrate on methane emissions per kg DM



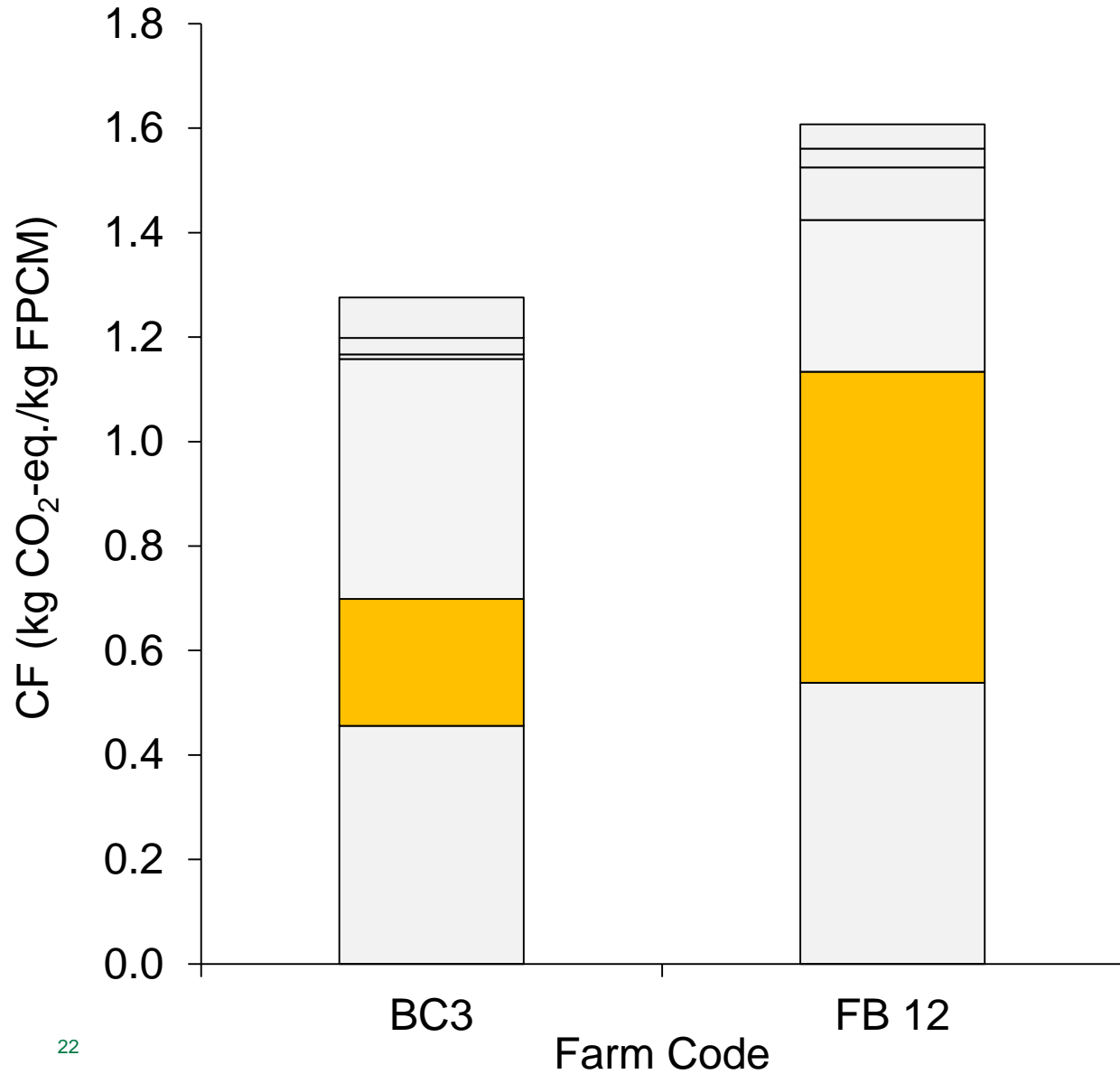
# Carbon footprint of milk in different systems



# Emissions from manure management in the different systems



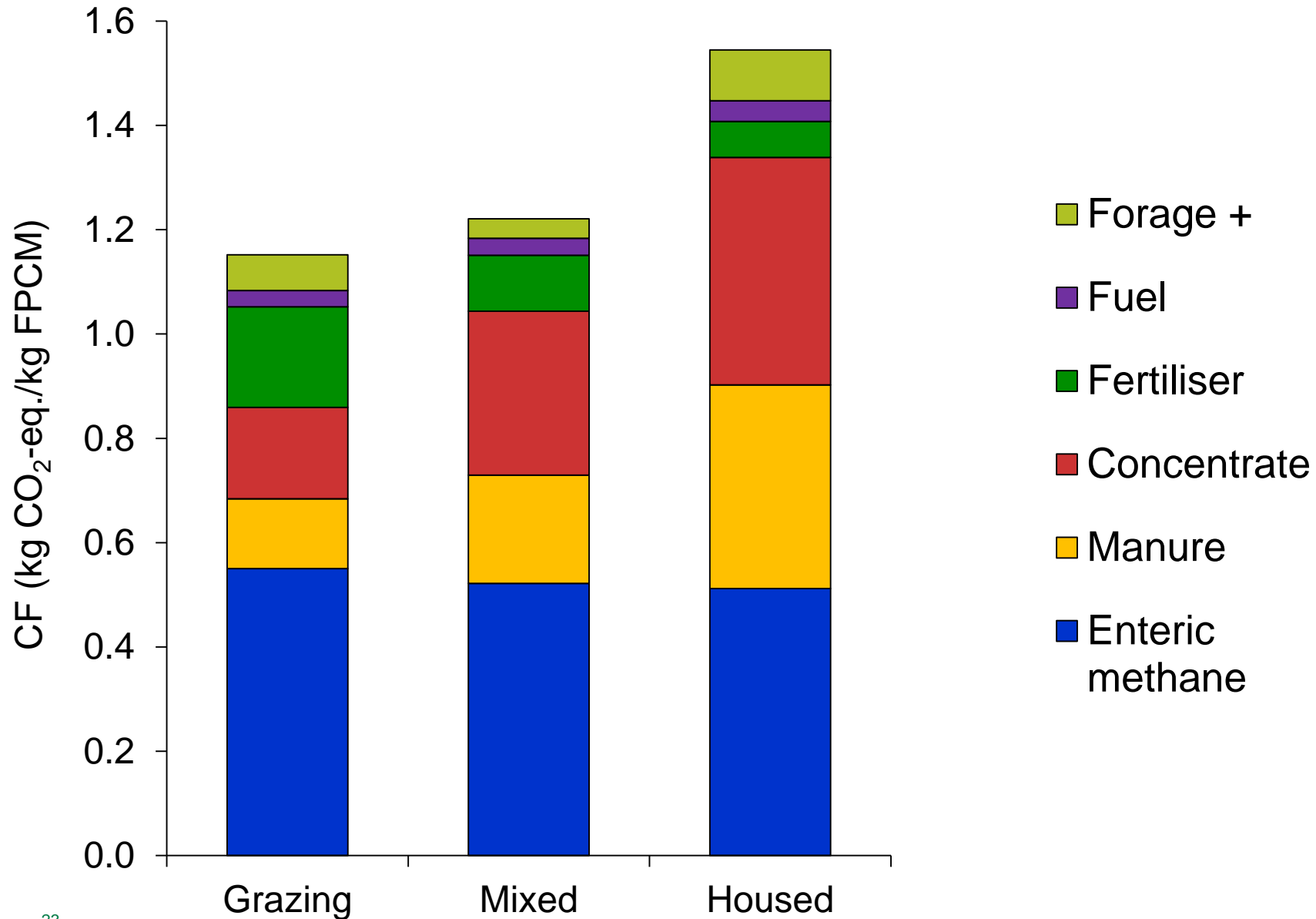
# Emissions from covered vs uncovered slurry storage



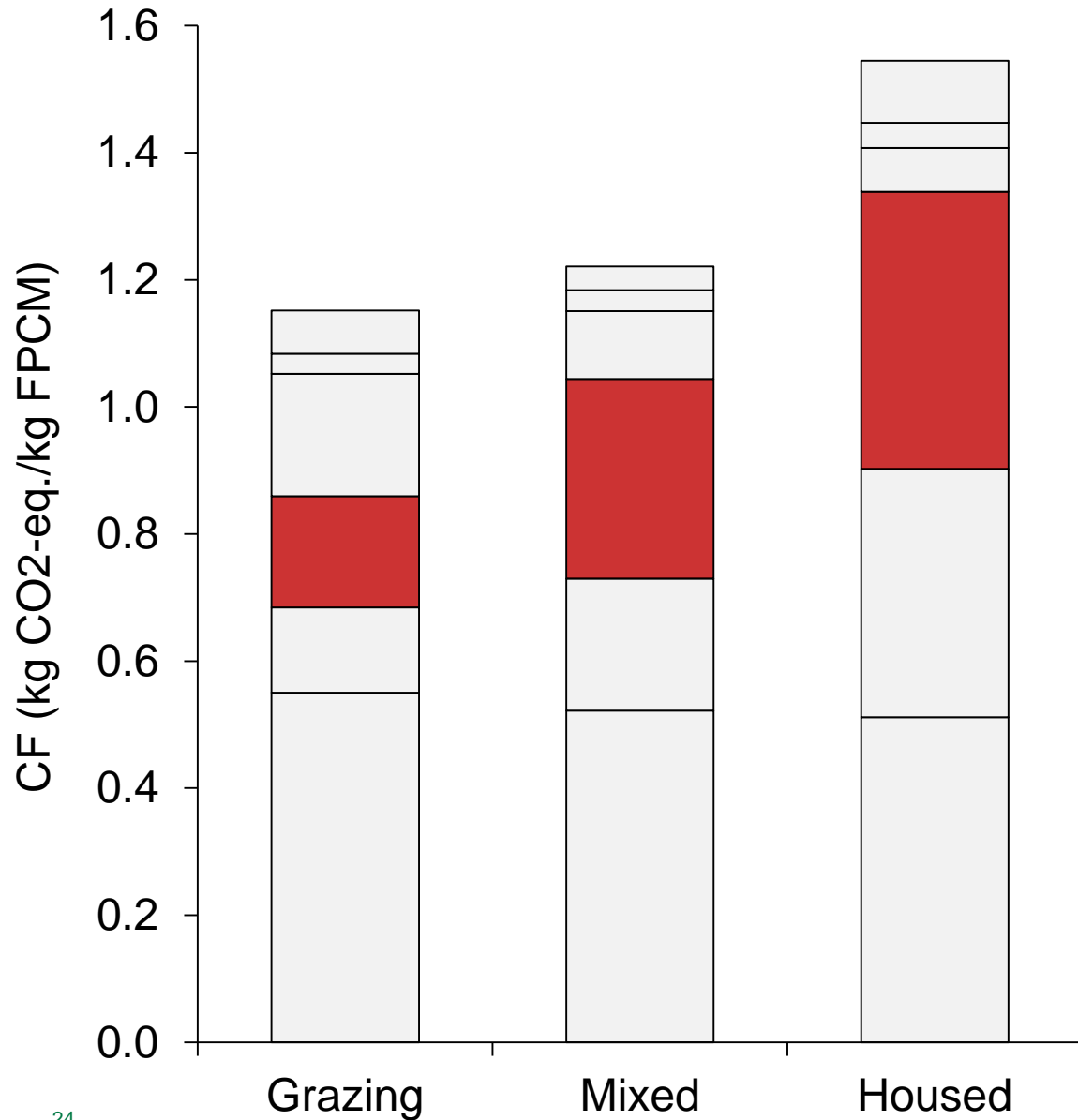
	BC 3	FB 12
Manure storage	Covered	Uncovered



# Carbon footprint of milk in different systems



# Emissions from concentrate fed

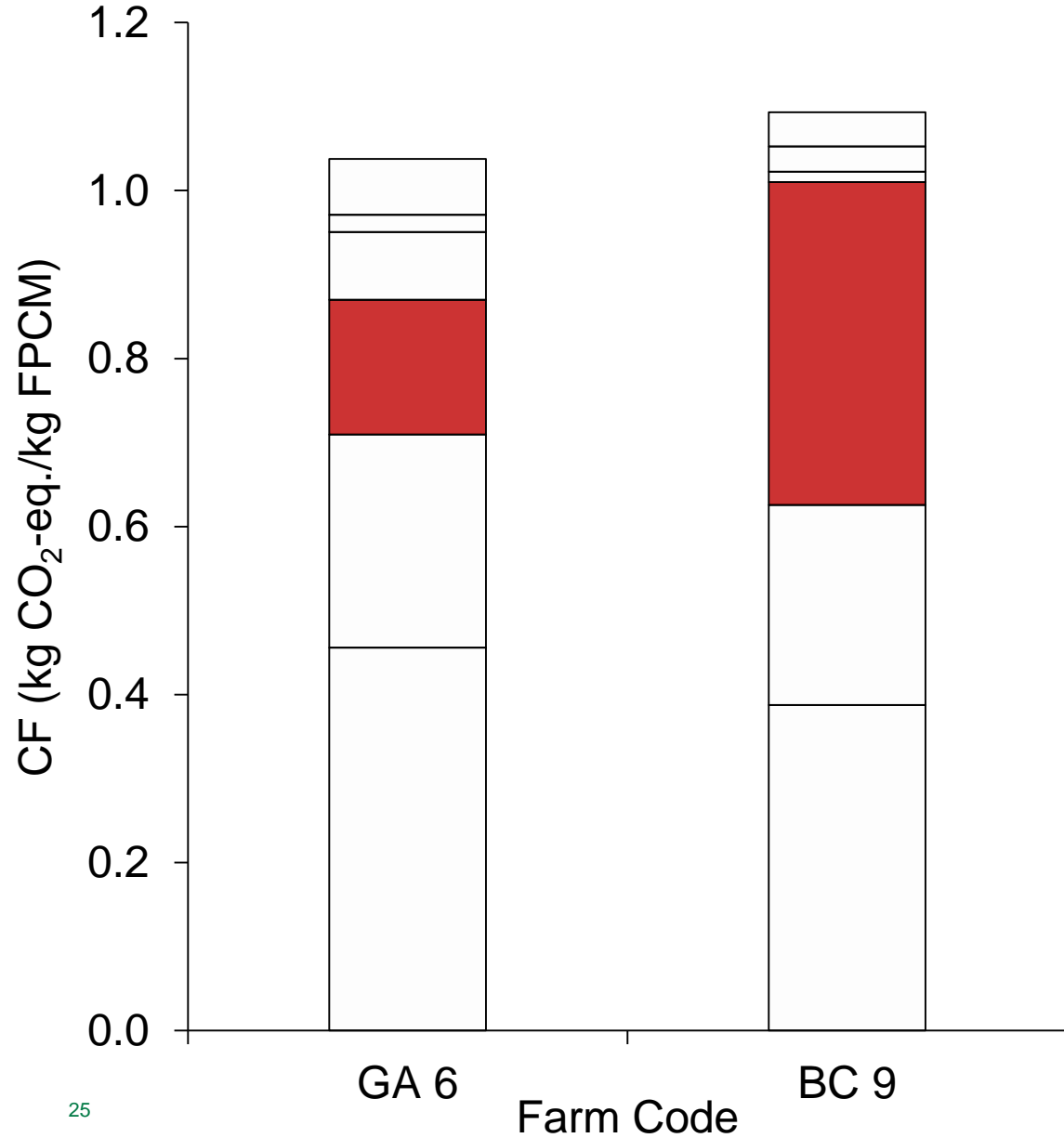


		Grazing	Mixed	Housed
Concentrate	kg/LU	837	2,016	2,937





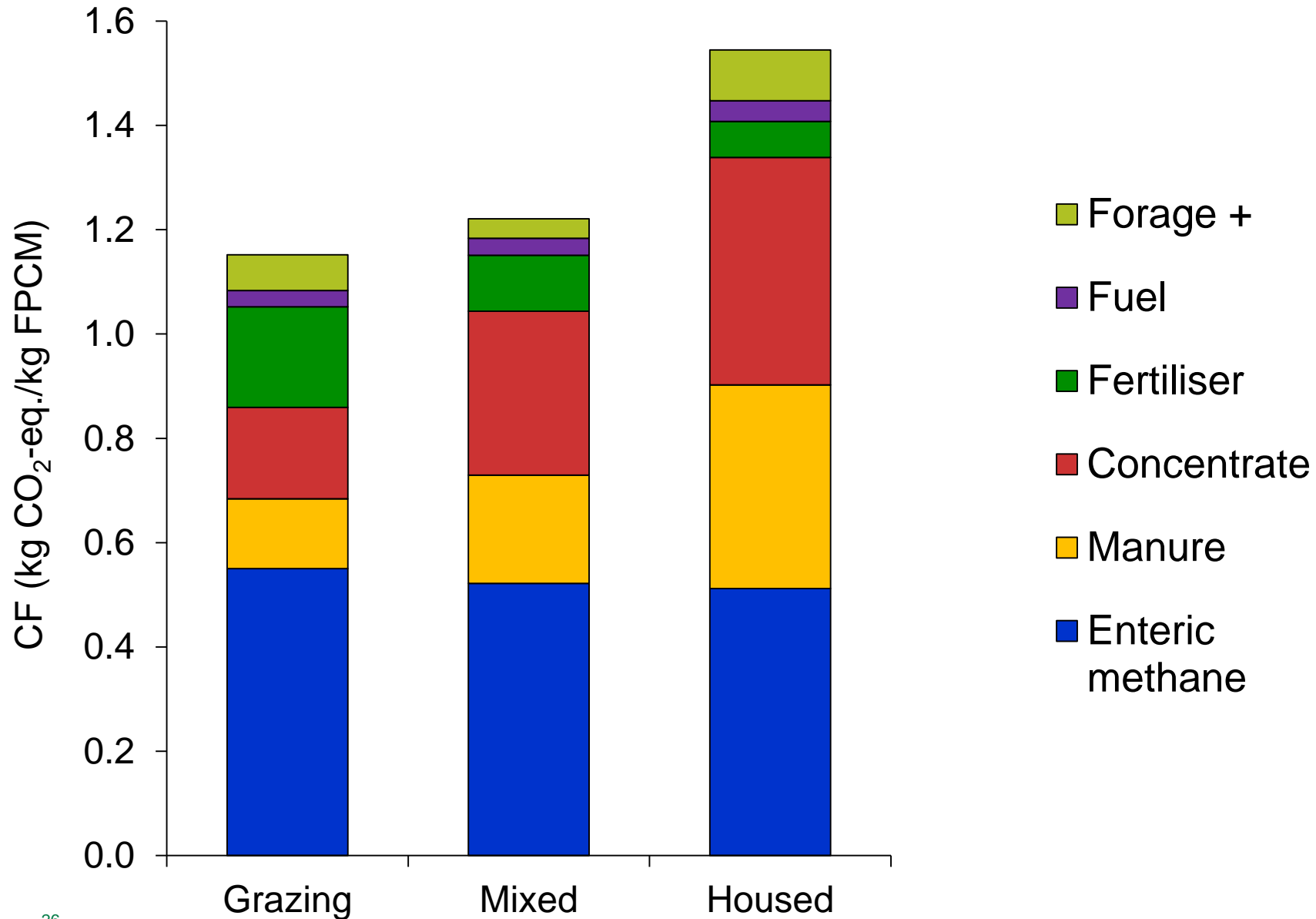
# Emissions from different concentrate types



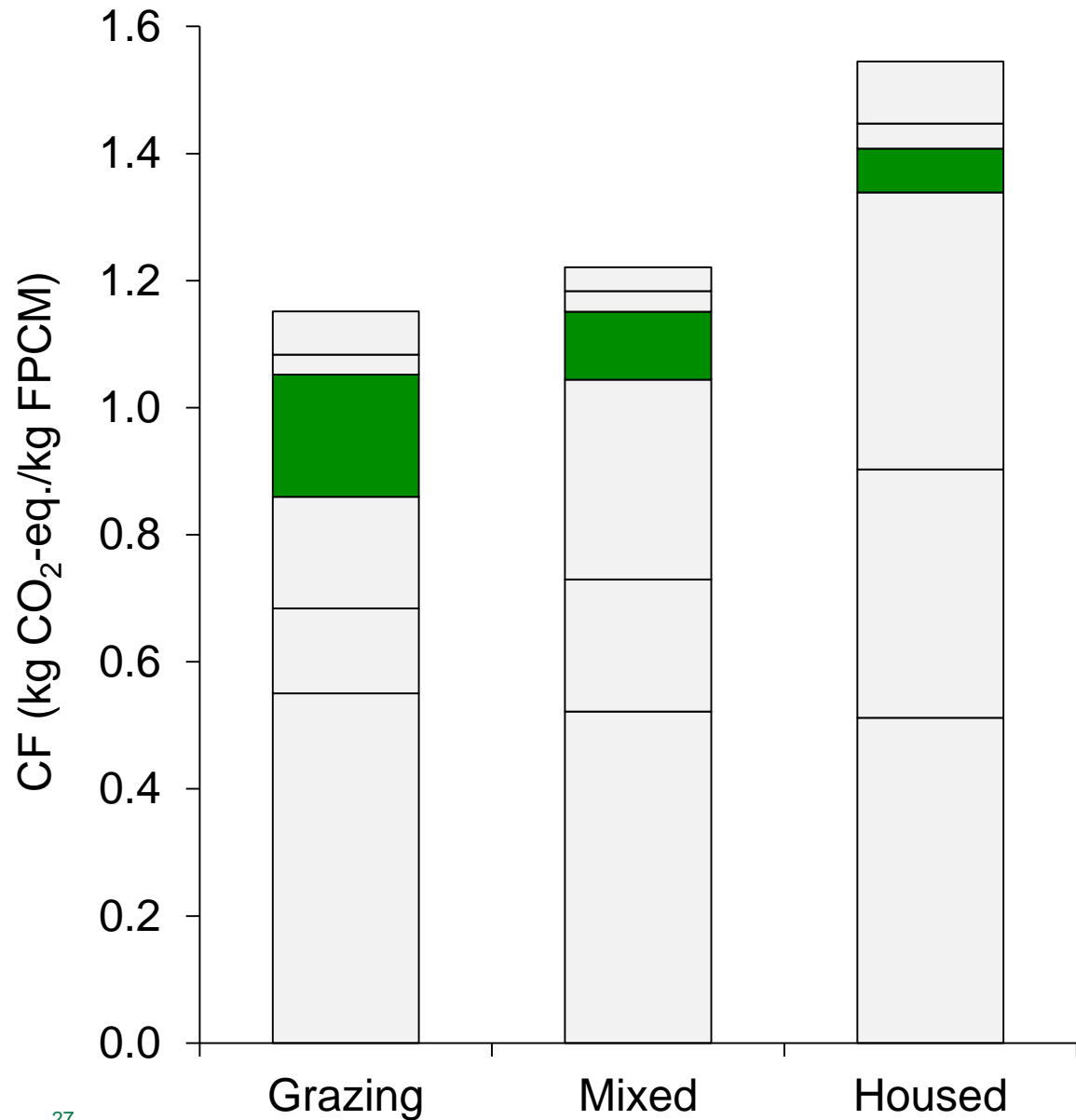
	GA 6	BC 9
Concentrate (t/LU)	5.4	3.8
Type	Locally produced low crude protein	Imported Soya



# Carbon footprint of milk in different systems



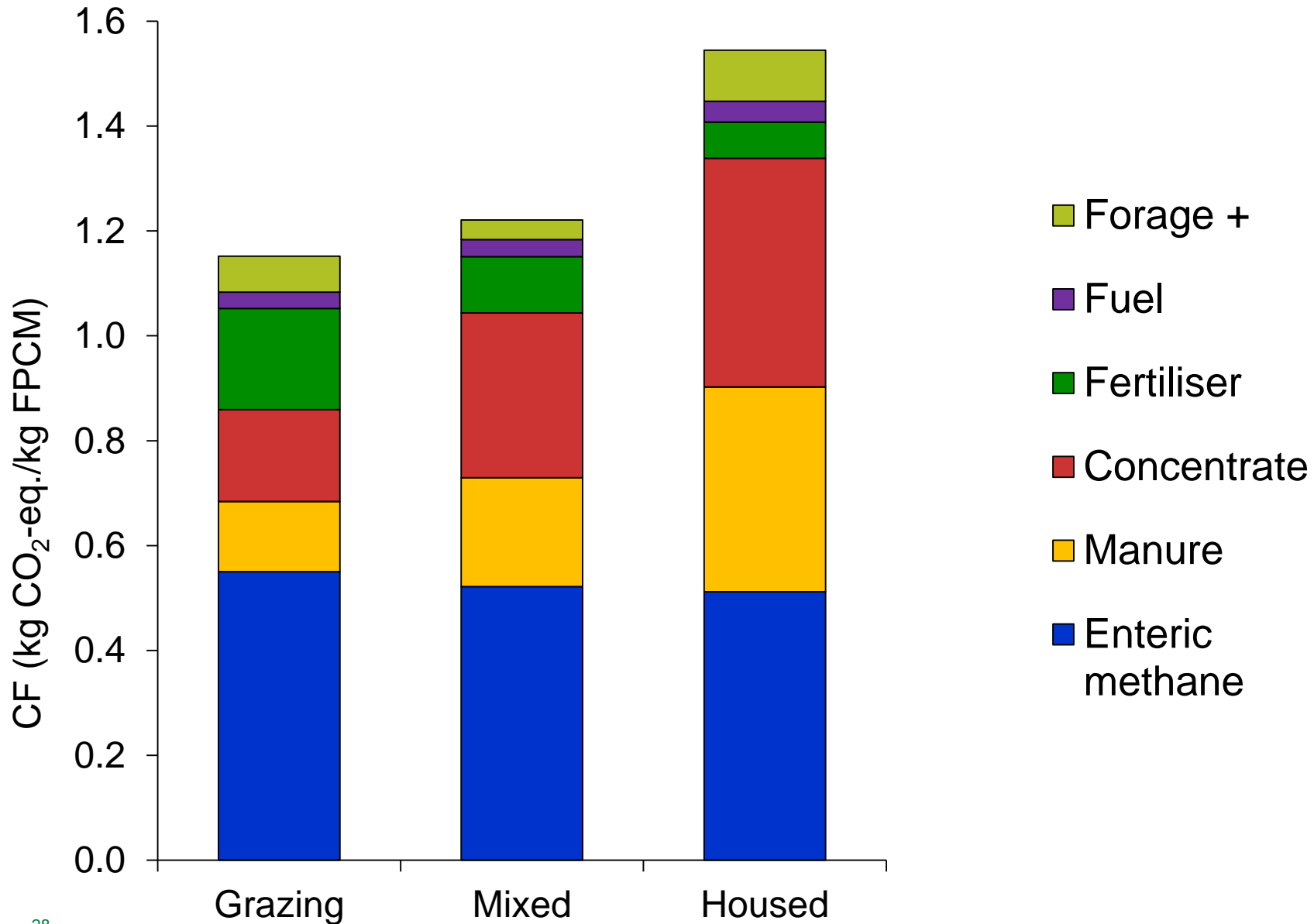
# Emissions from fertiliser N



	Grazing	Mixed	Housed
Fertiliser N kg/ha	247	161	130



# Carbon footprint of milk in different systems



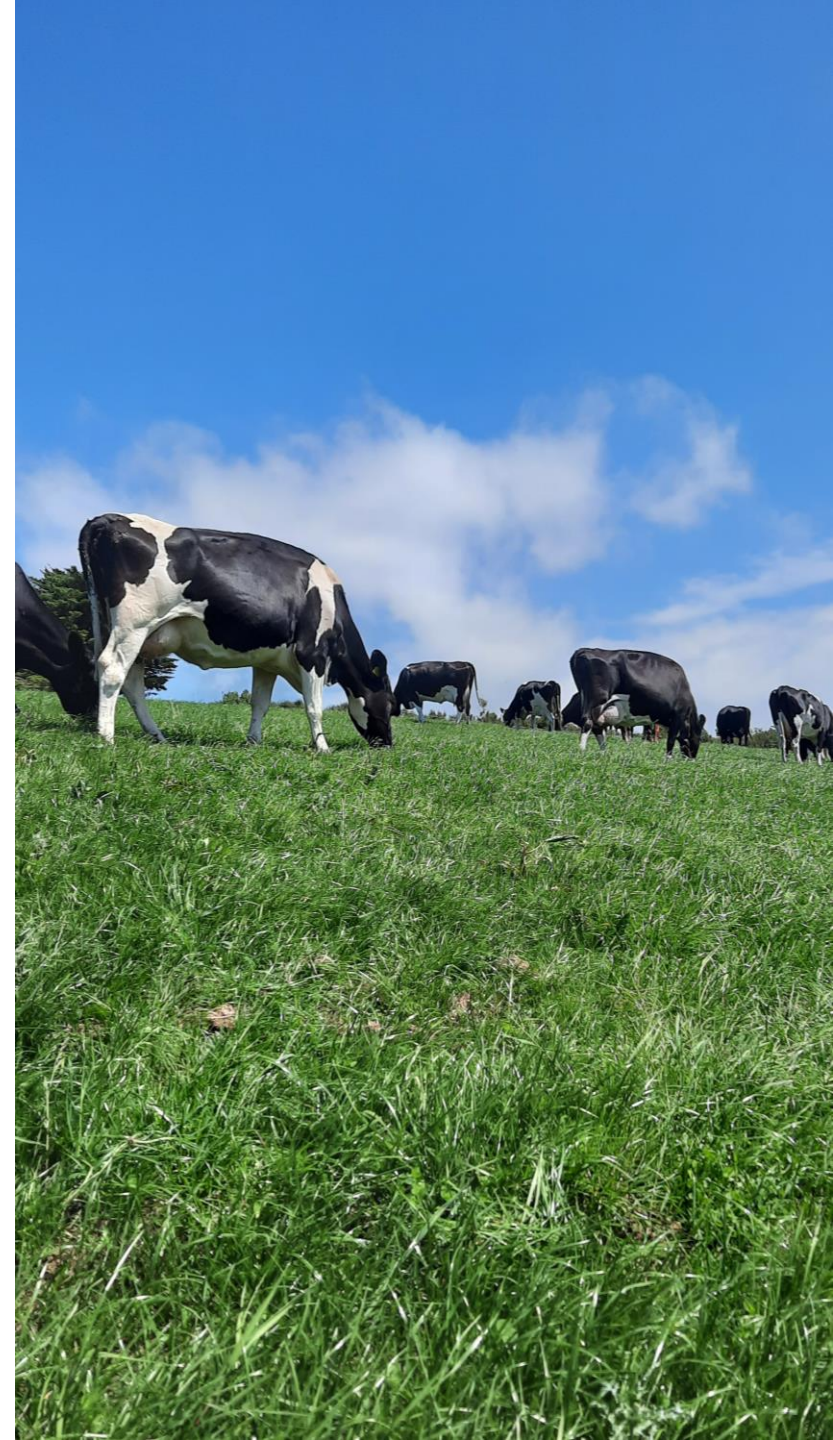
# Summary

- Ambitious reduction targets set for Agriculture
- Big range of carbon footprints → Considerable potential for lowering emissions
- Fertiliser N use, manure management, concentrate use, enteric fermentation
- Pasture-based systems tend to have lower carbon footprints



# Other aspects of the study

- Acidification
- Eutrophication
- Fossil fuel use
- Global land use
- Human edible feed conversion efficiency (heFCE)
- Economic impact
- Social impact



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