LIFE CYCLE ASSESSMENT: RESOURCE USE EFFICIENCY AND ENVIRONMENTAL MANAGEMENT IN ANIMAL PRODUCTION SYSTEMS

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INIA

PLAN AGROPECUARIO

MINISTERIO DE GANADERÍA
AGRICULTURA Y PESCA

Outline of talk

1. What is LCA ?
2. Market drivers for LCA
3. Resource/environmental indicators & hot-spots
4. Environmental emissions & on-farm efficiency

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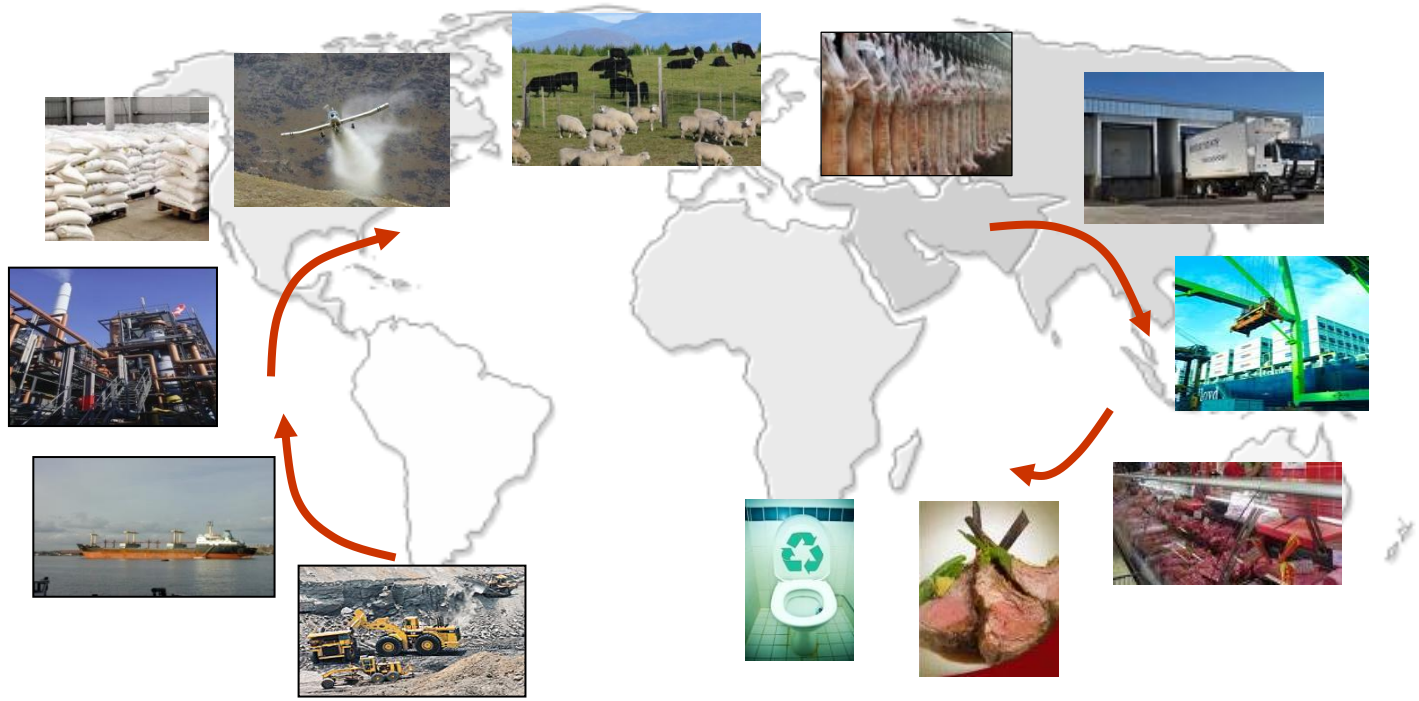
1. What is Life Cycle Assessment?

Total resource use or environmental emissions of a product from "cradle-to-grave"



Based on international standards (e.g. ISO 14040, 14044)

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2. MARKET DRIVERS FOR ENVIRONMENTAL FOOTPRINTING

Demand for information:

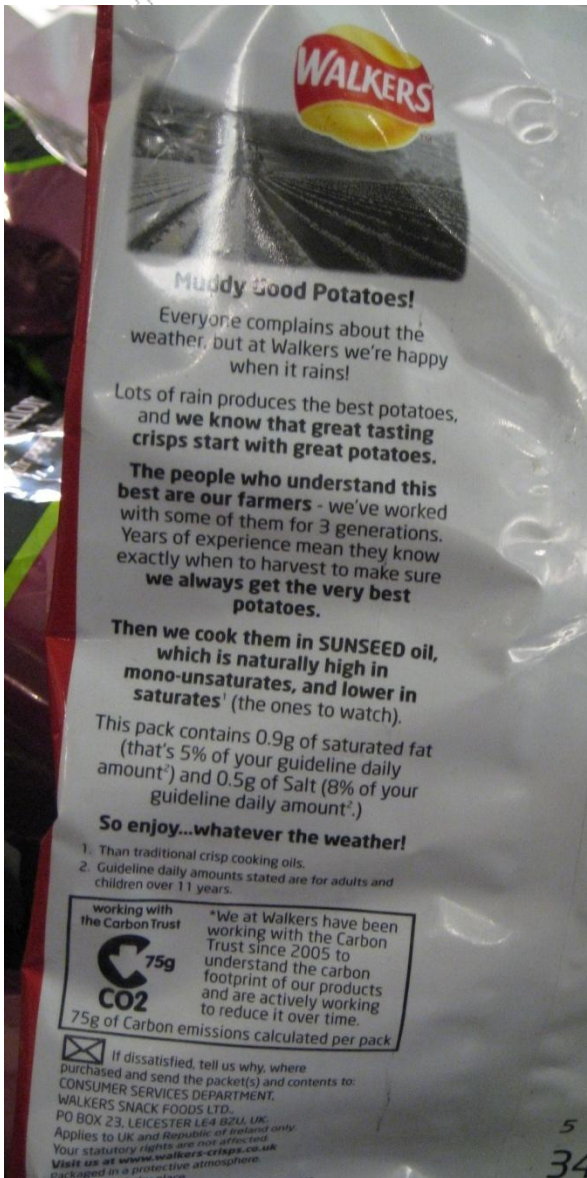
- UK supermarkets
- France, South Korea…

  - *Eco-labelling*

- Becoming a supply requirement

  - with an environmental reduction plan

- **EU Product Environmental Footprinting**



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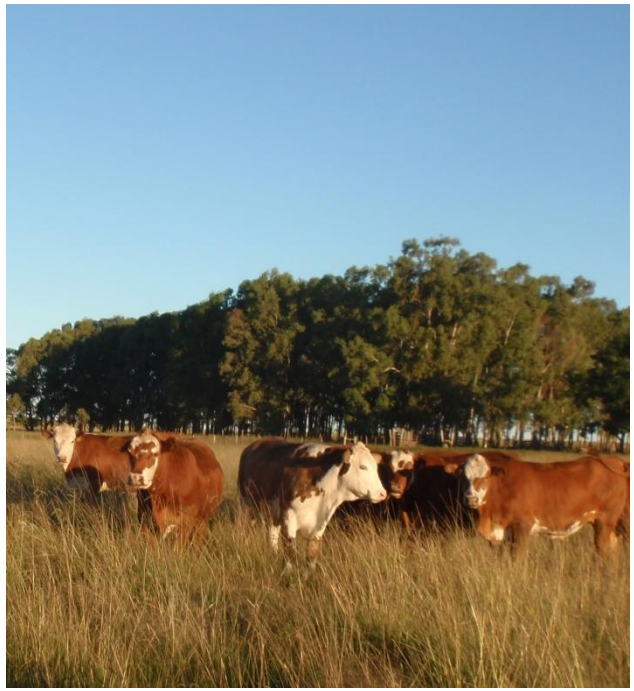
NZ LAMB IN FRENCH SUPERMARKET

	Gigot d'agneau ... (14608)		
	RECHAUFFEMENT CLIMATIQUE	POLLUTION AQUATIQUE	BIODIVERSITE
Note	kg éq. CO2	kg éq. P (E-06)*	m²année
A	<0,16	<26	<0,15
B	entre 0,16 et 0,33	entre 26 et 51	entre 0,15 et 0,29
C	entre 0,33 et 0,49	entre 51 et 77	entre 0,29 et 0,44
D	entre 0,49 et 0,65	entre 77 et 102	entre 0,44 et 0,59
E	entre 0,65 et 0,82	entre 102 et 128	entre 0,59 et 0,74
F	entre 0,82 et 0,98	entre 128 et 153	entre 0,74 et 0,88
G	1,33	235	1,63

Impact croissant

Appropriate methodology

e.g. Biodiversity indicator = land area !



DRAFT FOR PUBLIC REVIEW

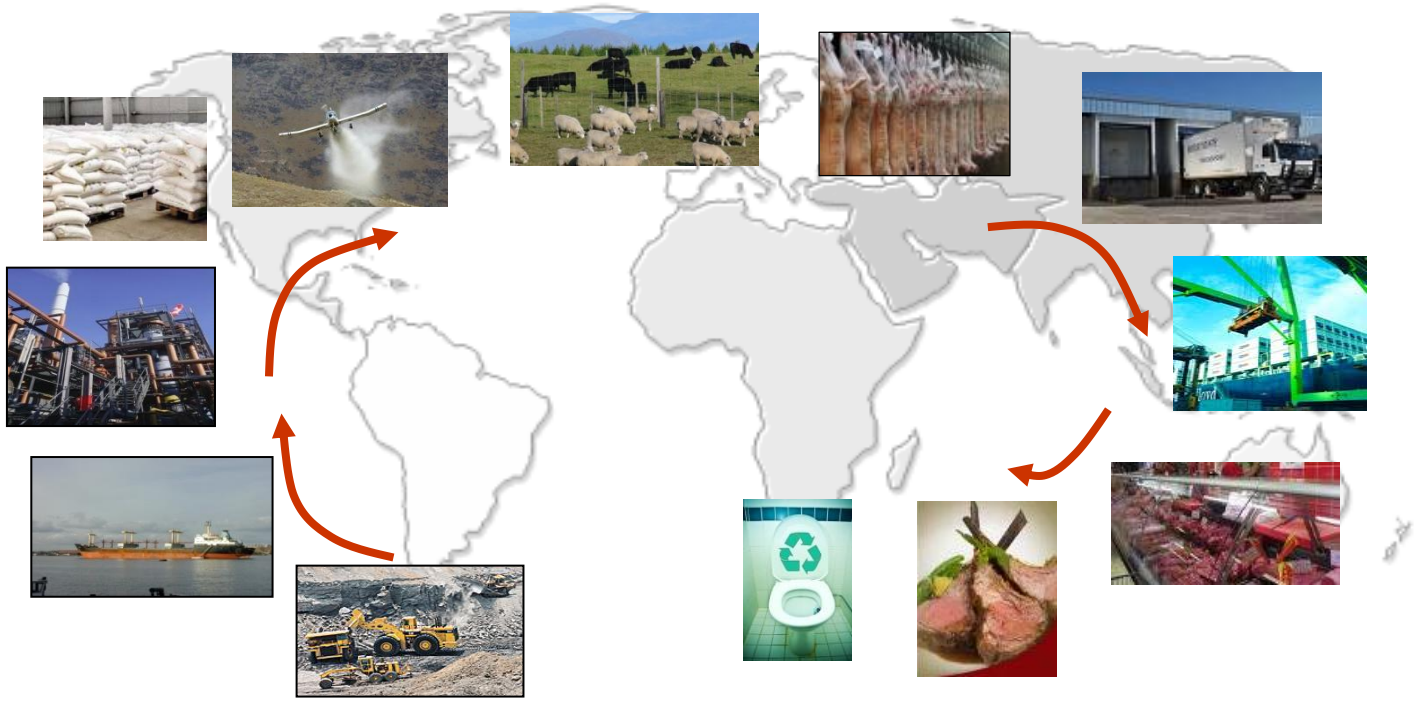
Greenhouse gas emissions and fossil energy demand from small ruminant supply chains

Guidelines for quantification

leap

LIVESTOCK ENVIRONMENTAL ASSESSMENT AND PERFORMANCE PARTNERSHIP

3. Resource/environmental indicators and "hot-spots"



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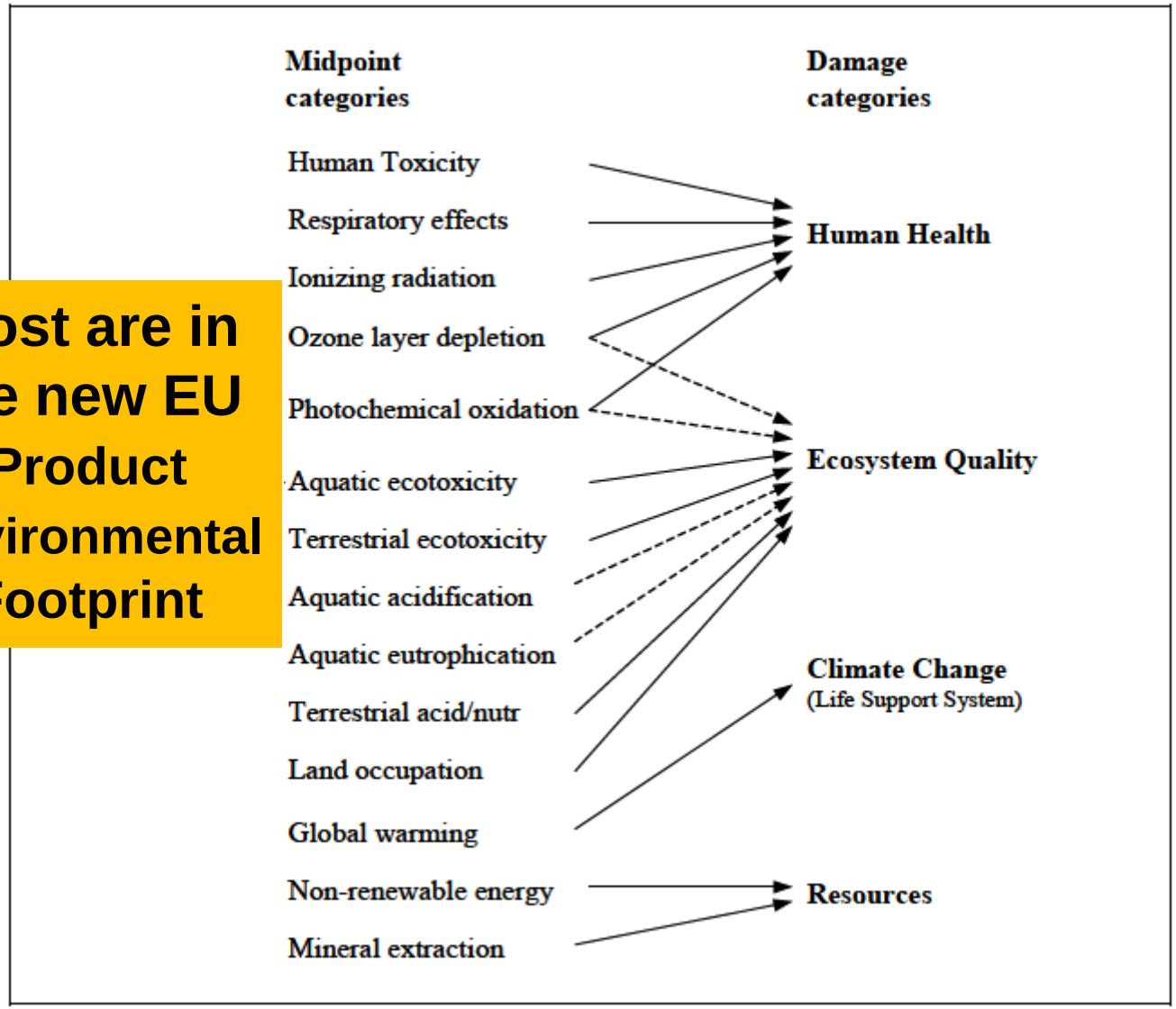
Multiple resource & environmental impact categories



Most are in the new EU Product Environmental Footprint

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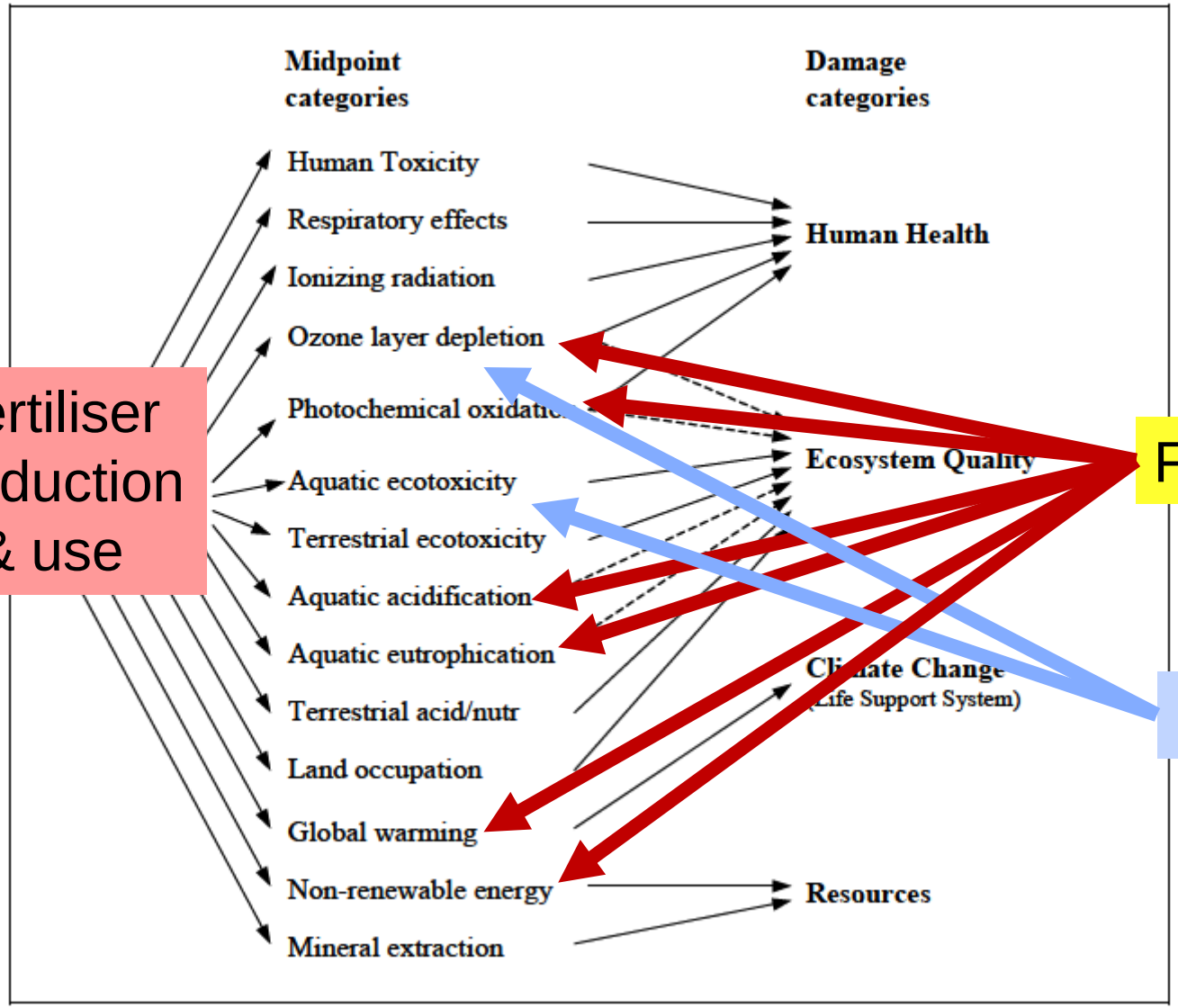

Fertiliser production & use

Fossil energy use

Pesticides

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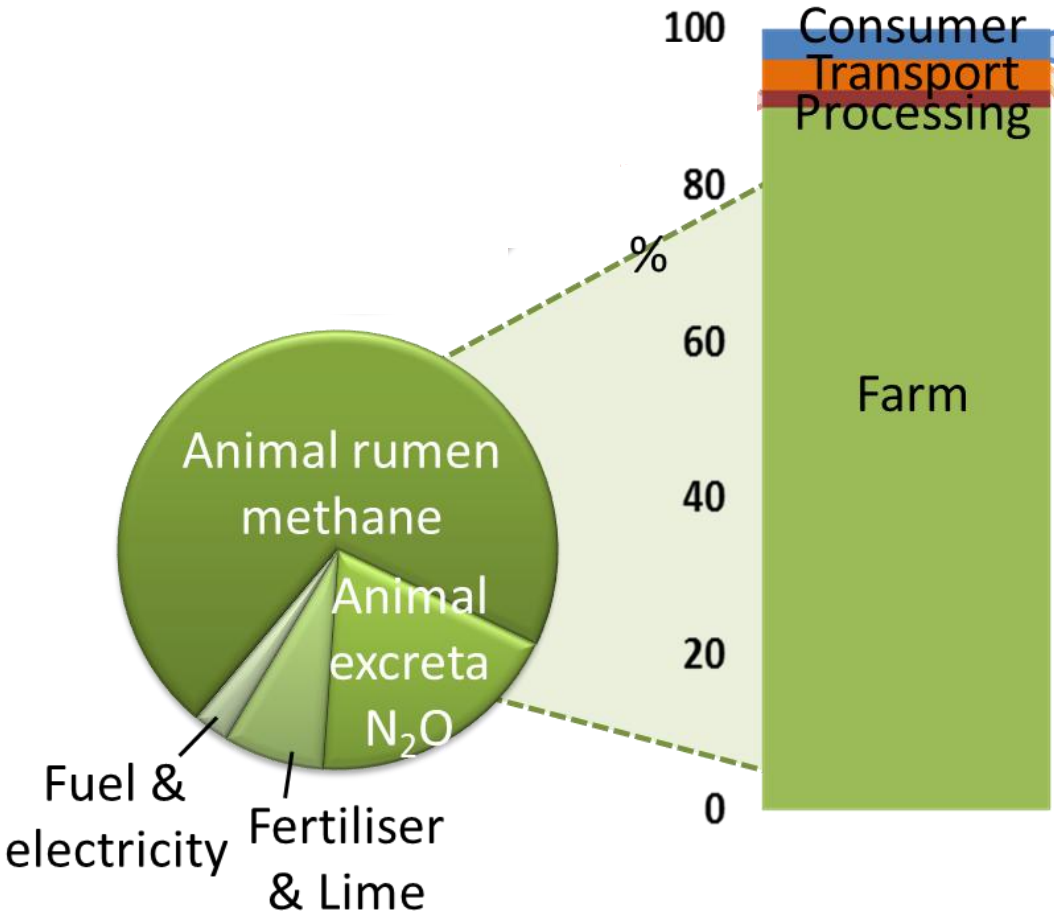
Current NZ dairy study on multiple indicators

Low versus high intensity farms (based on cows/ha, N fertiliser use & brought-in feeds)

In 9 out of 12 indicators, environmental emissions/kg milk increased significantly with increased farm intensity

e.g.	*Low*		*High*
Climate Change	*0.72*	→	*0.84 kg CO_2-e/kg milk*
Eutrophication	*0.92*	→	*1.08 kg PO_4-e/kg milk*
Ecotoxicity	*1.13*	→	*1.52 kg CTU-e/kg milk*

Carbon footprint of NZ beef consumed in USA



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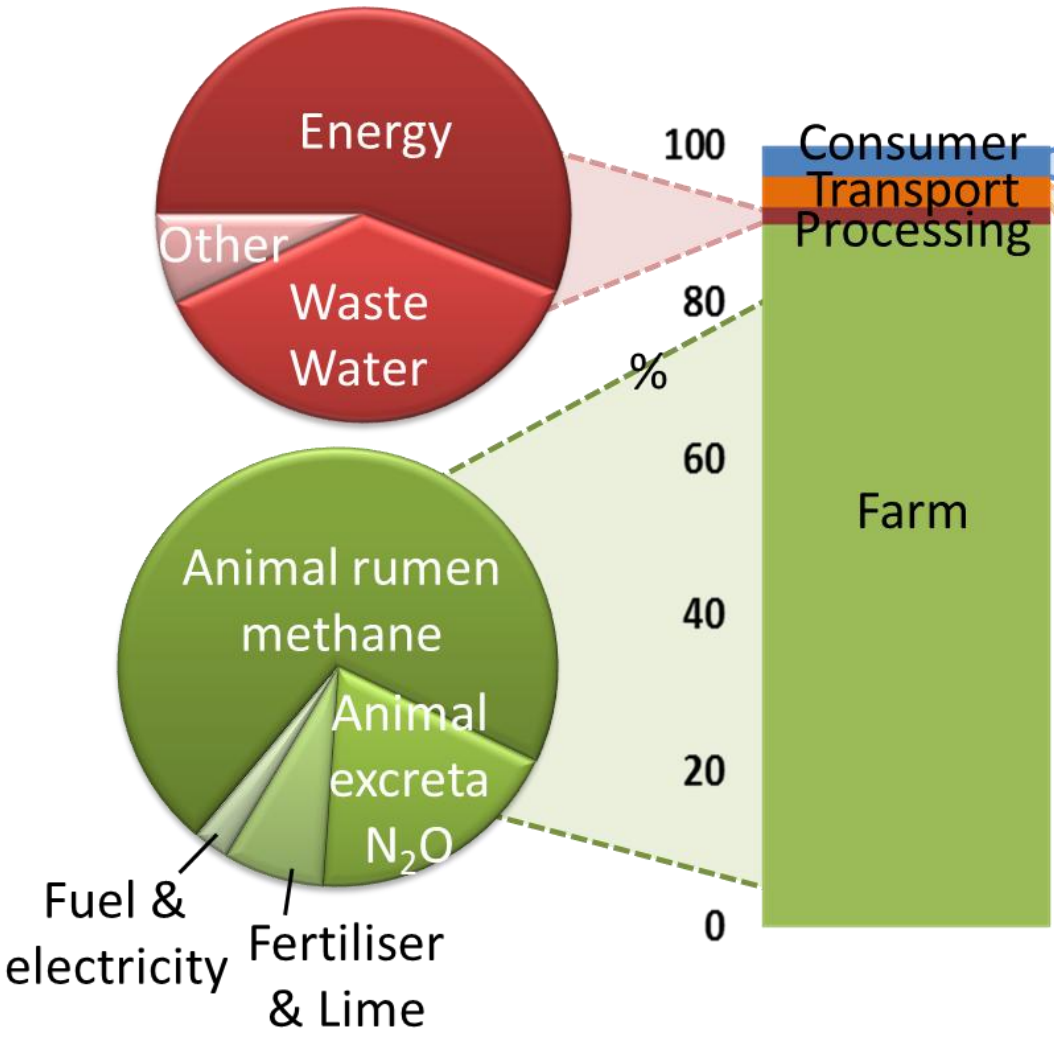

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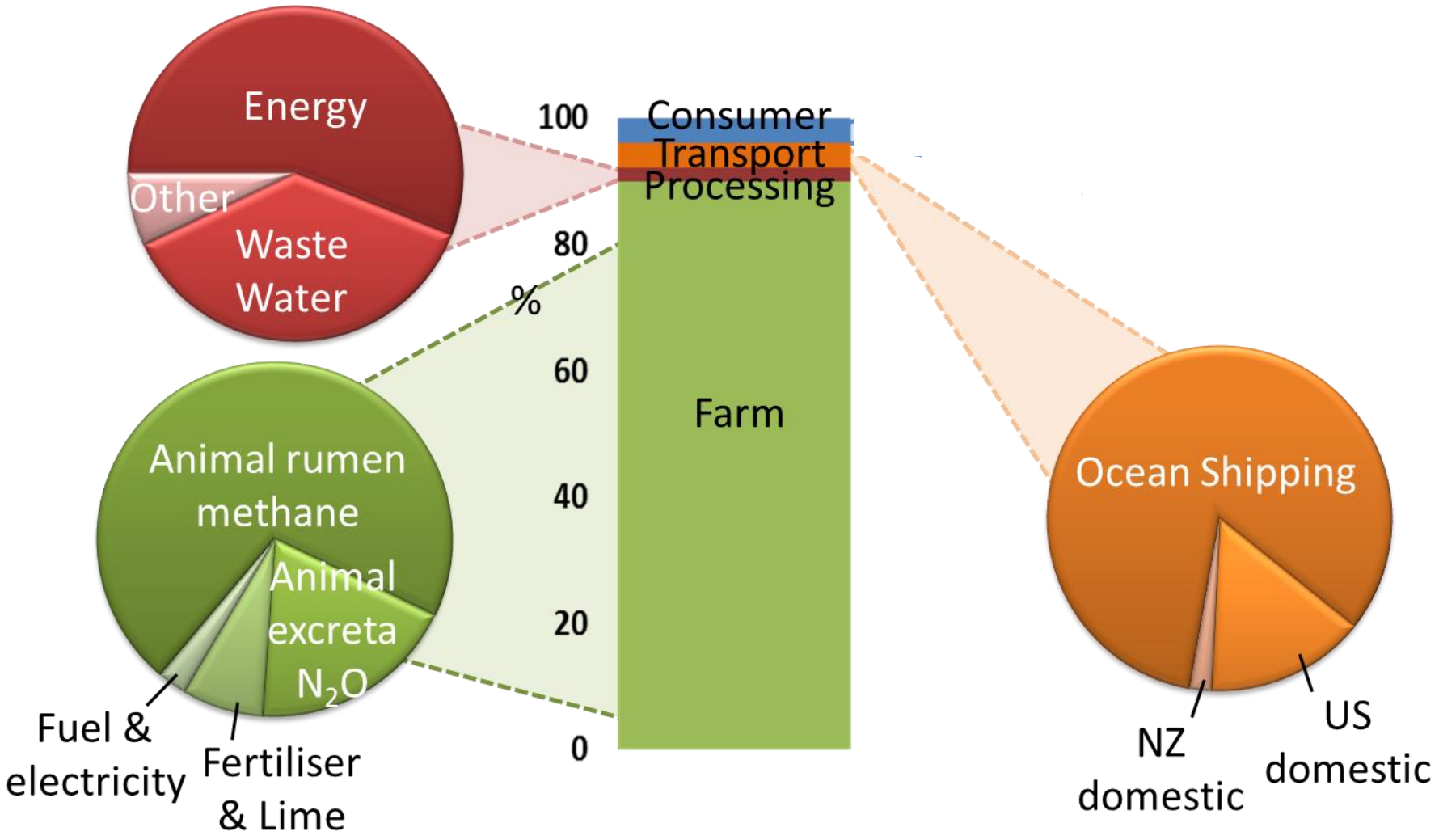

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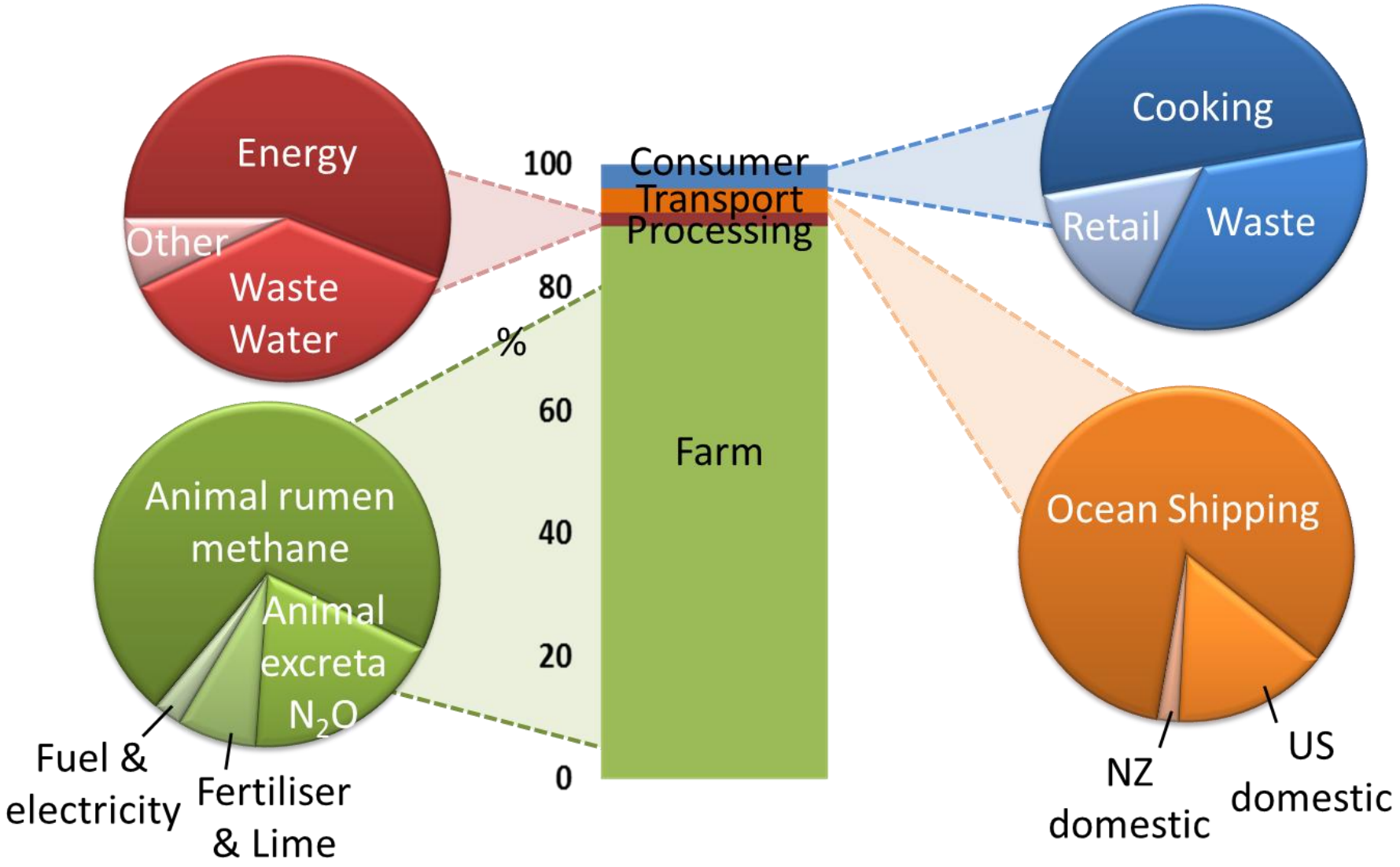
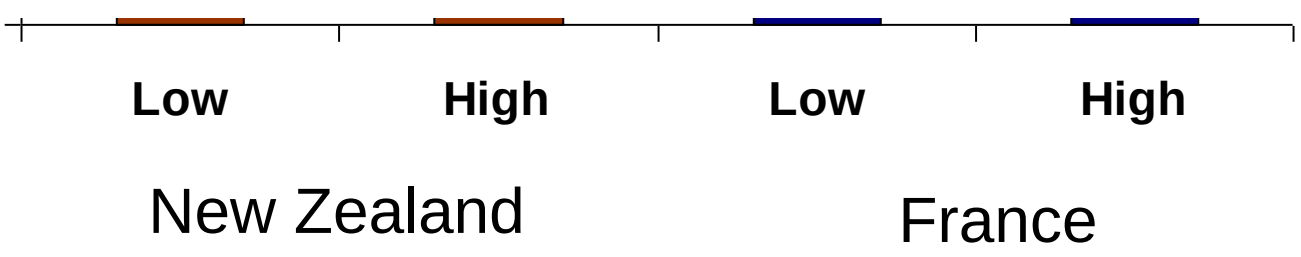


4. Environmental emissions and on-farm efficiency

Effects of dairy intensification in NZ and France

kg milksolids/ha→ 915 1184 420 603



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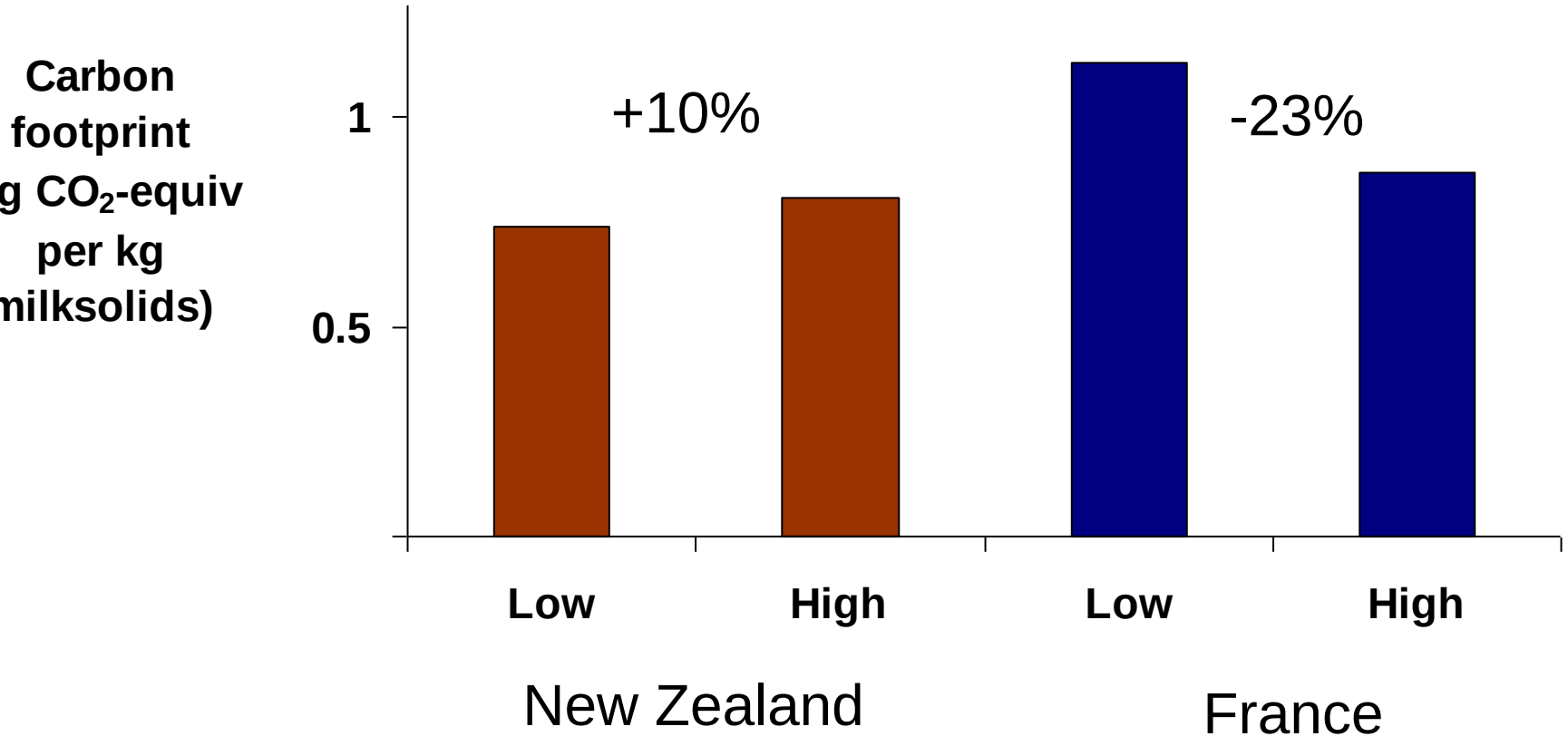

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Effects of dairy intensification in NZ and France

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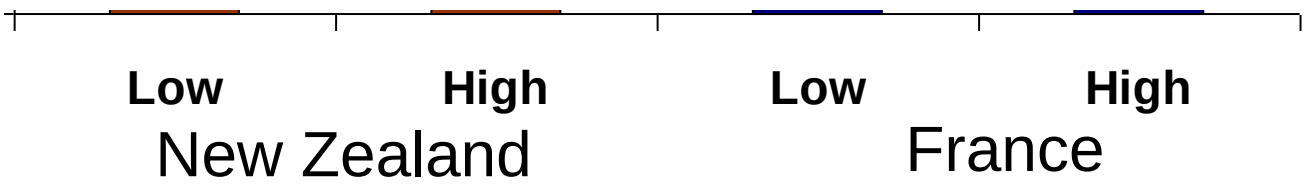

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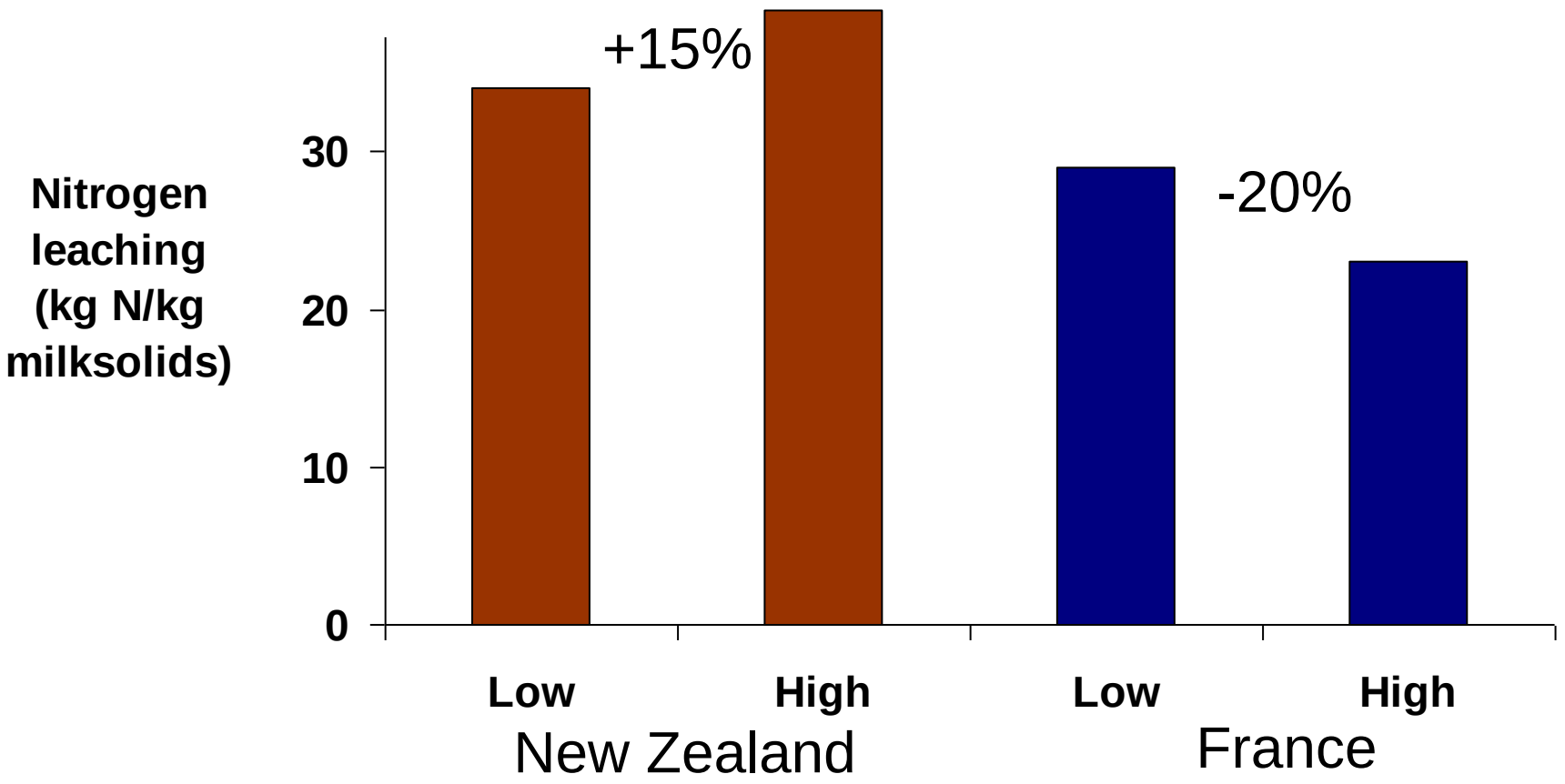

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Effects of dairy intensification in NZ and France

Q. Why did French farm environmental efficiency increase with intensification?

A. Greater farm system efficiency gains

	NZ	France
Milksolids/cow	+32%	+49%
Feed conversion efficiency (kg milk/kg feed intake)	+5%	+33%

Gains in environmental efficiency with intensification can require large gains in production efficiency

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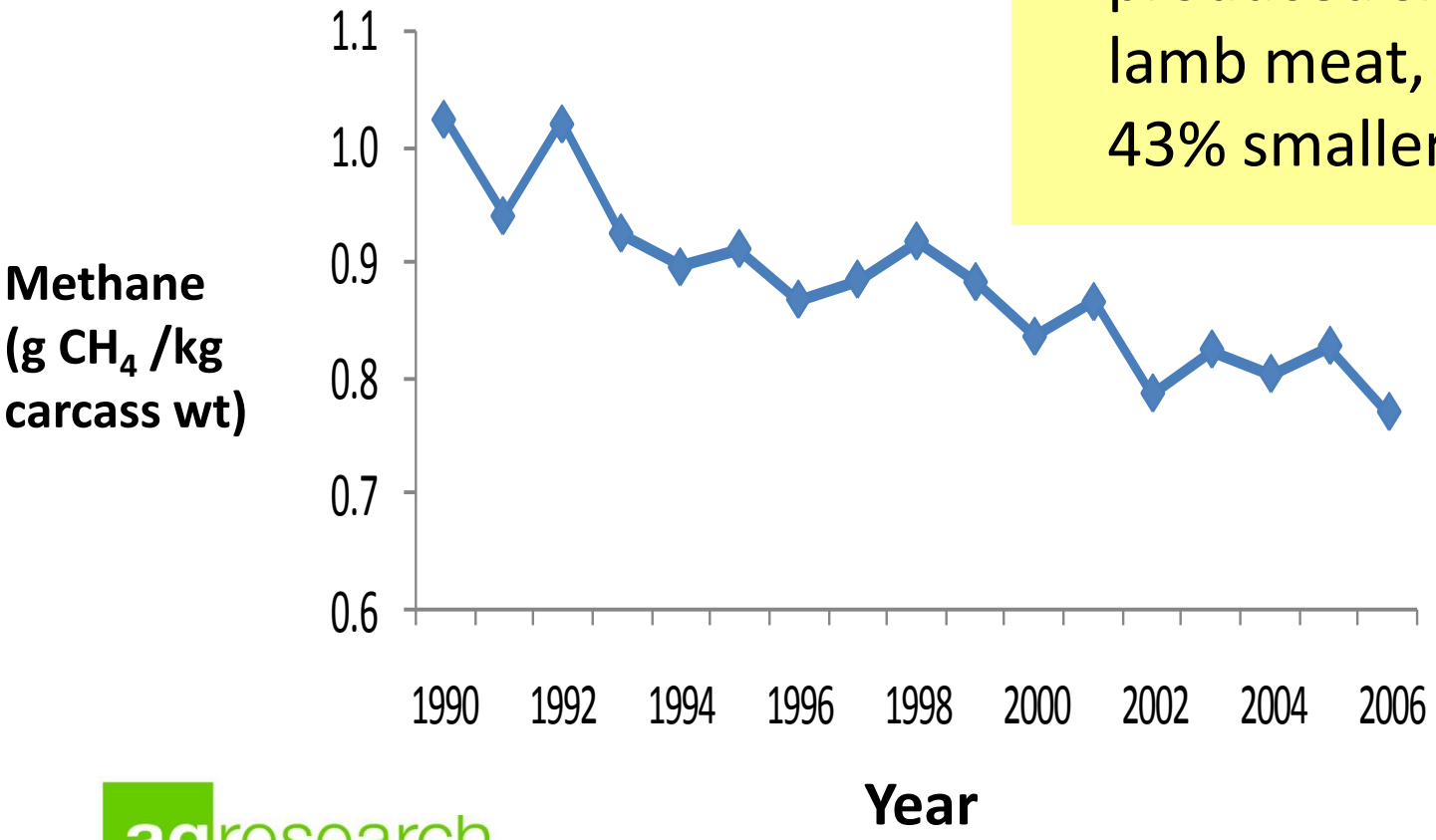
Efficiency has increased over time for sheep

NZ sheep meat average:



Compared to 1990, NZ sheep farms in 2009 produced slightly more lamb meat, but from a 43% smaller flock

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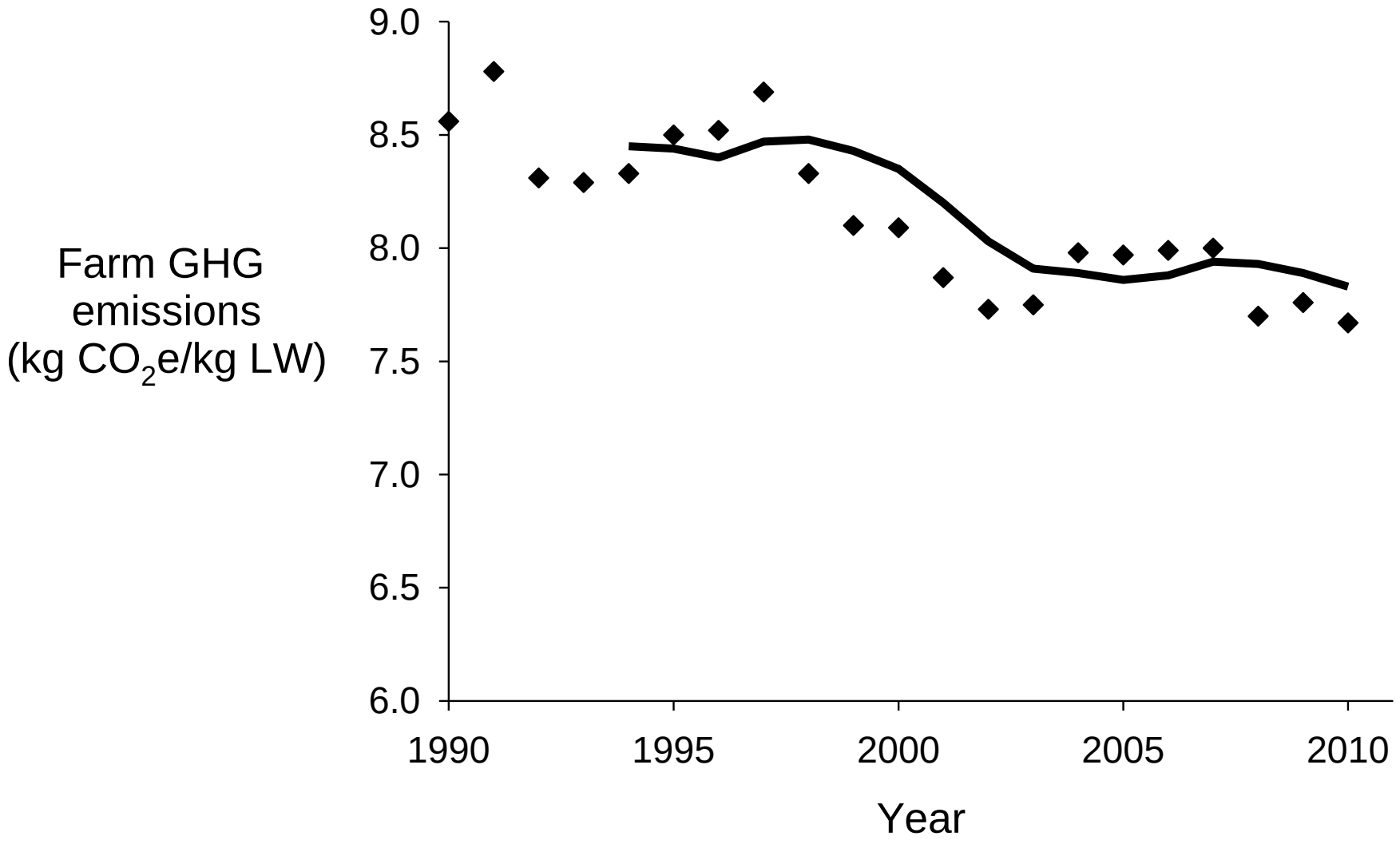
Changes in the carbon footprint of NZ beef over time



Farm-stage GHG emissions for NZ average beef:

Traditional beef		**10.5 kg CO_2-equiv./kg LW**
Dairy cull cows/heifers		**1.5 kg CO_2-equiv./kg LW**
NZ weighted average	**=**	**8.4 kg CO_2-equiv./kg LW**

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Australian beef carbon footprint study:

	GHG kg CO_2-e/kg meat	Fossil fuel use MJ/kg meat
Grass-fed beef	25.5	18.2
Grain-finished beef	21.6	24.0

80% of variation between farms was due to:

Weaning rate, and

Average daily live-weight gain

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Wiedemann et al. 2015

Effect of intensifying using a winter crop on cattle production and GHGs on North Island hill country

	No crop	+Winter crop (8ha)	
Live-weight sold (kg/ha)	75	83	*+11%*
Gross margin ($/ha)	470	478	*+2%*
GHGs (kg CO_2e/ha)	3930	4070	*+4%*
C footprint (kg CO_2e/kg LW)	13.3	13.5	+1%

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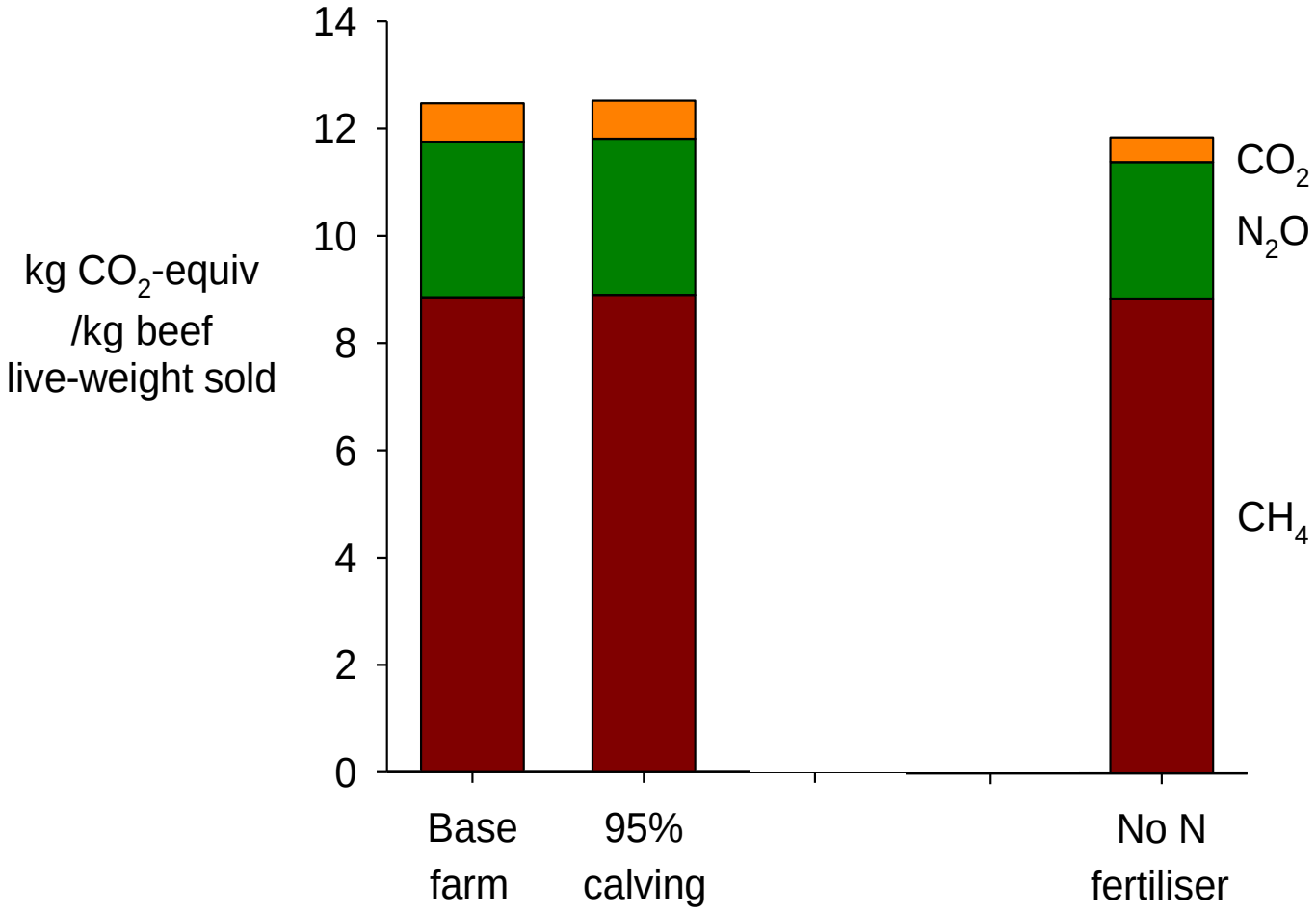
Beef case farm study on the carbon footprint of beef and effects of system changes



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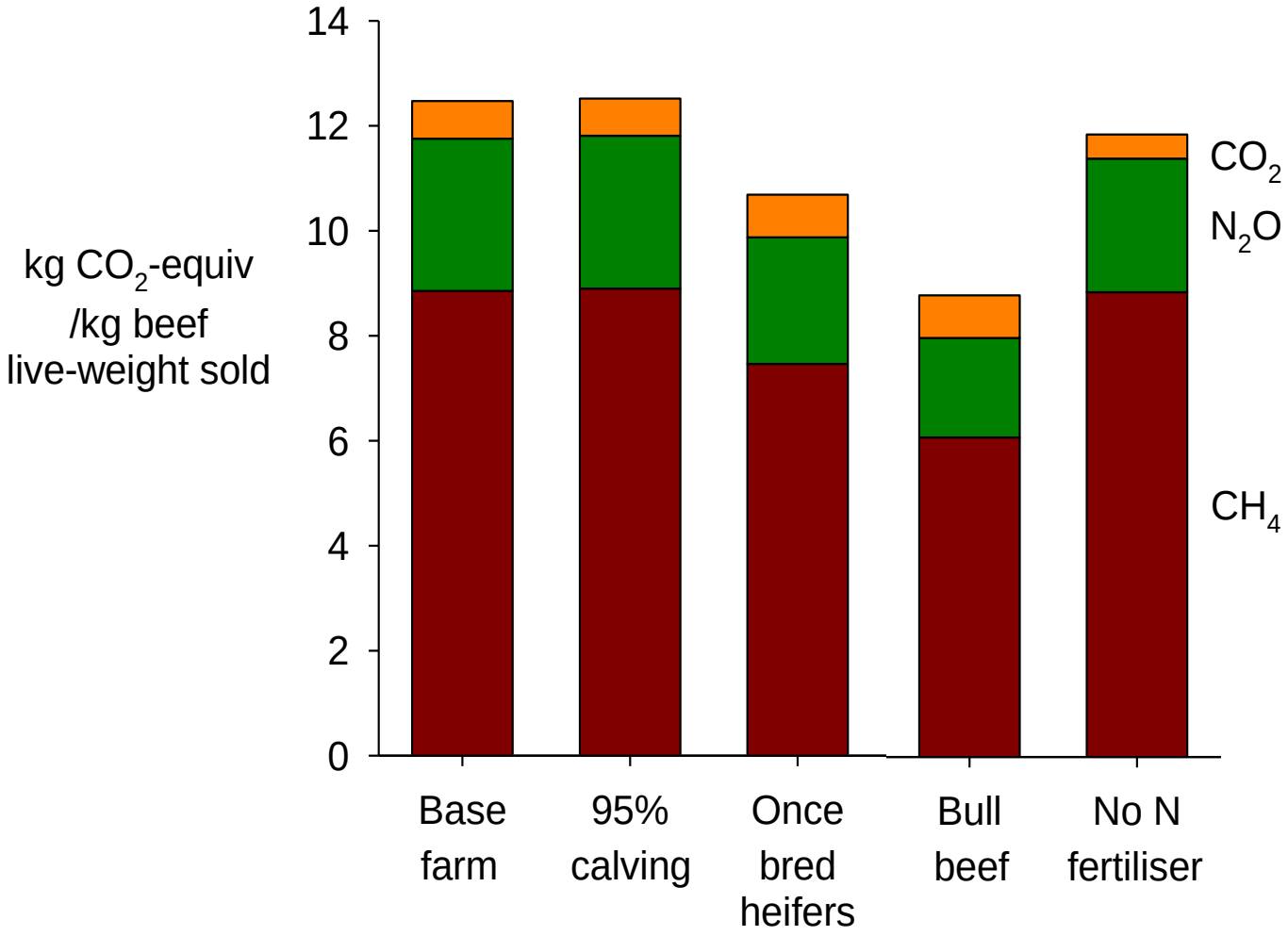

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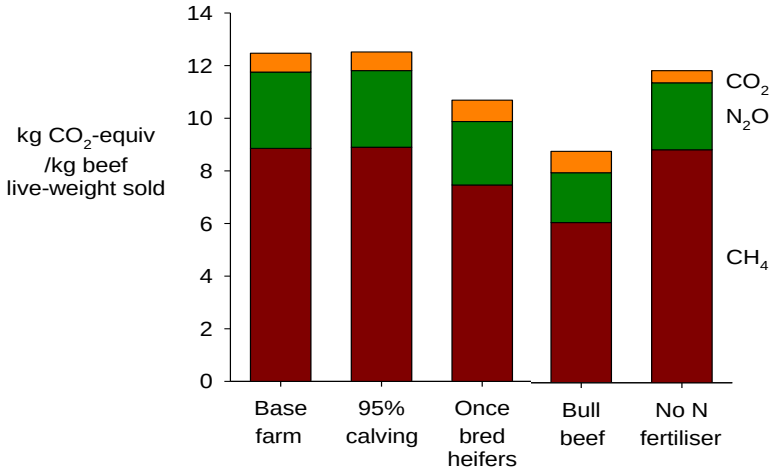
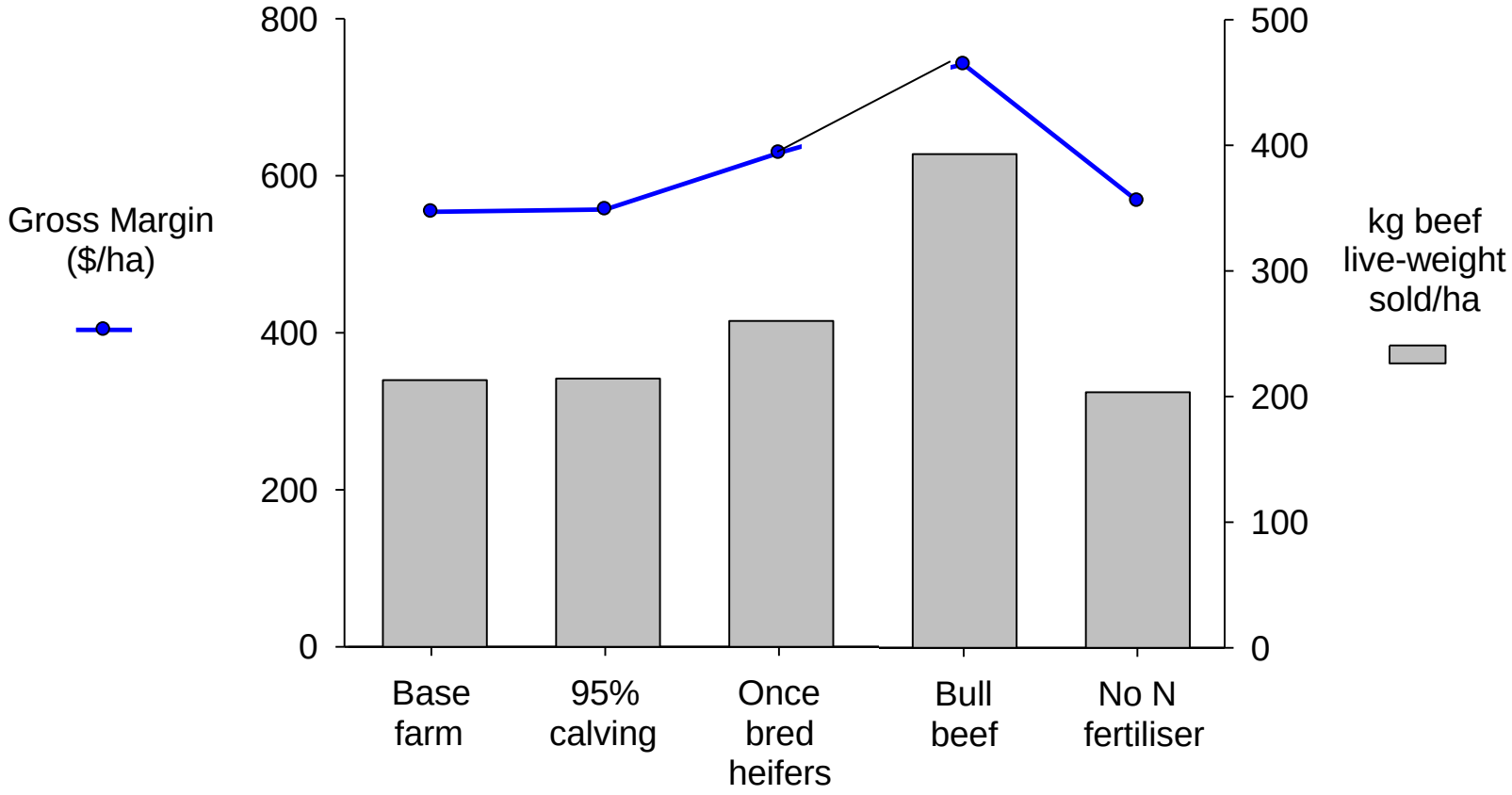
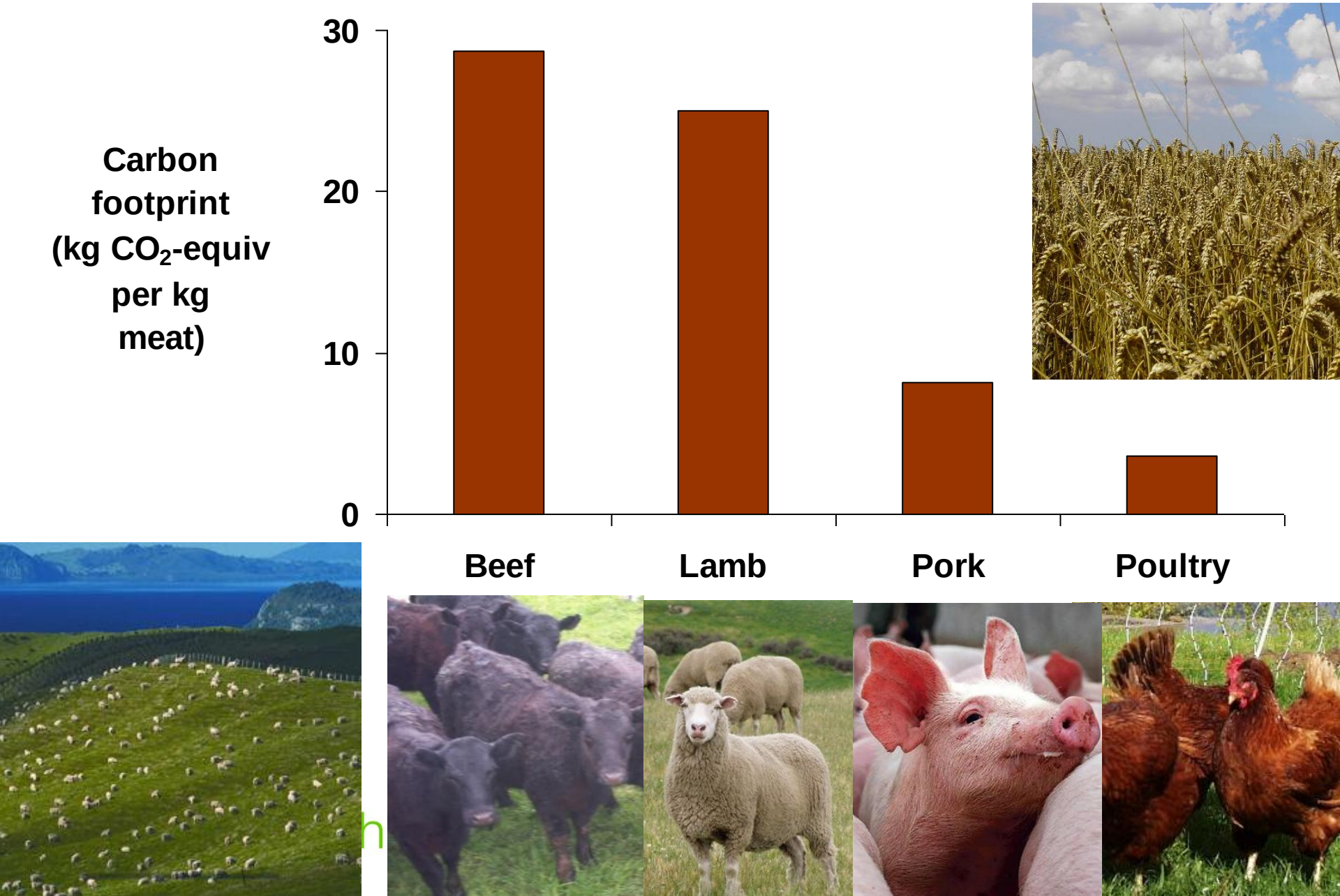




Should we change what meat we produce and eat?




GHG = global issue → emissions/kg product
Water quality = local issue → emissions/hectare

Summary

Life Cycle Assessment can be used for:

- Providing key resource & environmental information on products, as requested by our customers
- Defining hot-spots along the life cycle
- Examining multiple indicators and avoiding trade-offs

Intensification often increases emissions per ha and per kg product

To minimise this, we need to simultaneously integrate management practices for greater environmental efficiency

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