Carbon footprinting of New Zealand lamb from an exporting nation's perspective

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Outline of talk

1. Drivers?
2. NZ sheep farm system
3. Methods
4. Results
   - sensitivity analyses
   - NZ and French case study systems
   - potential effects of mitigations

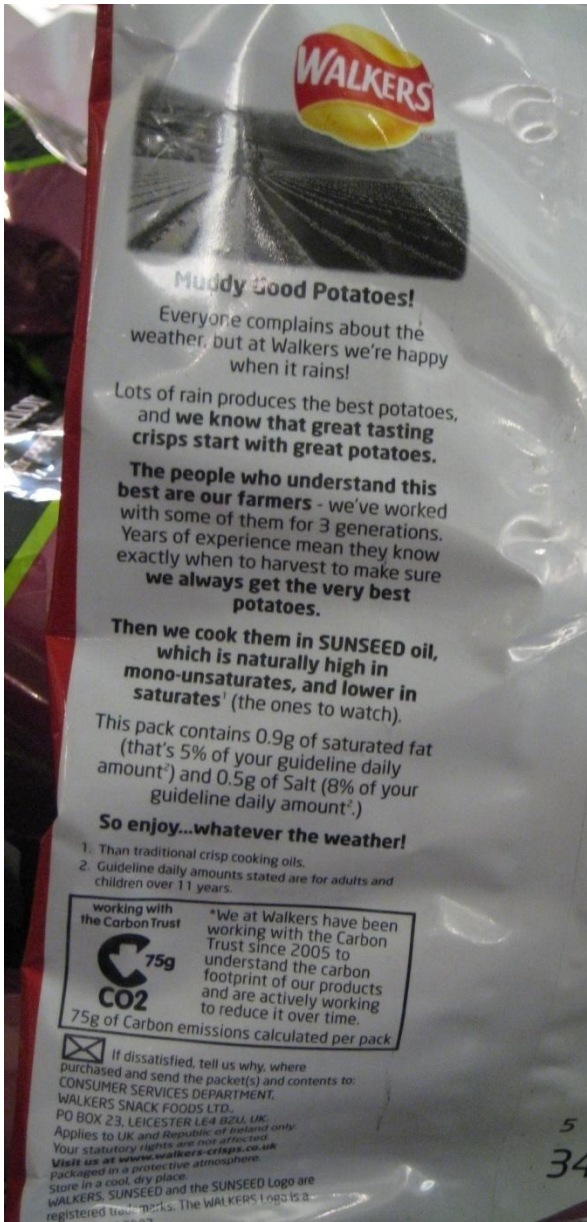
Drivers ?

International:

- Food-miles → Carbon footprinting
- Supermarkets - *Eco-labelling*
- Becoming a supply requirement

NZ is world's largest exporter of lamb

(c. 40% of total)



Drivers ?

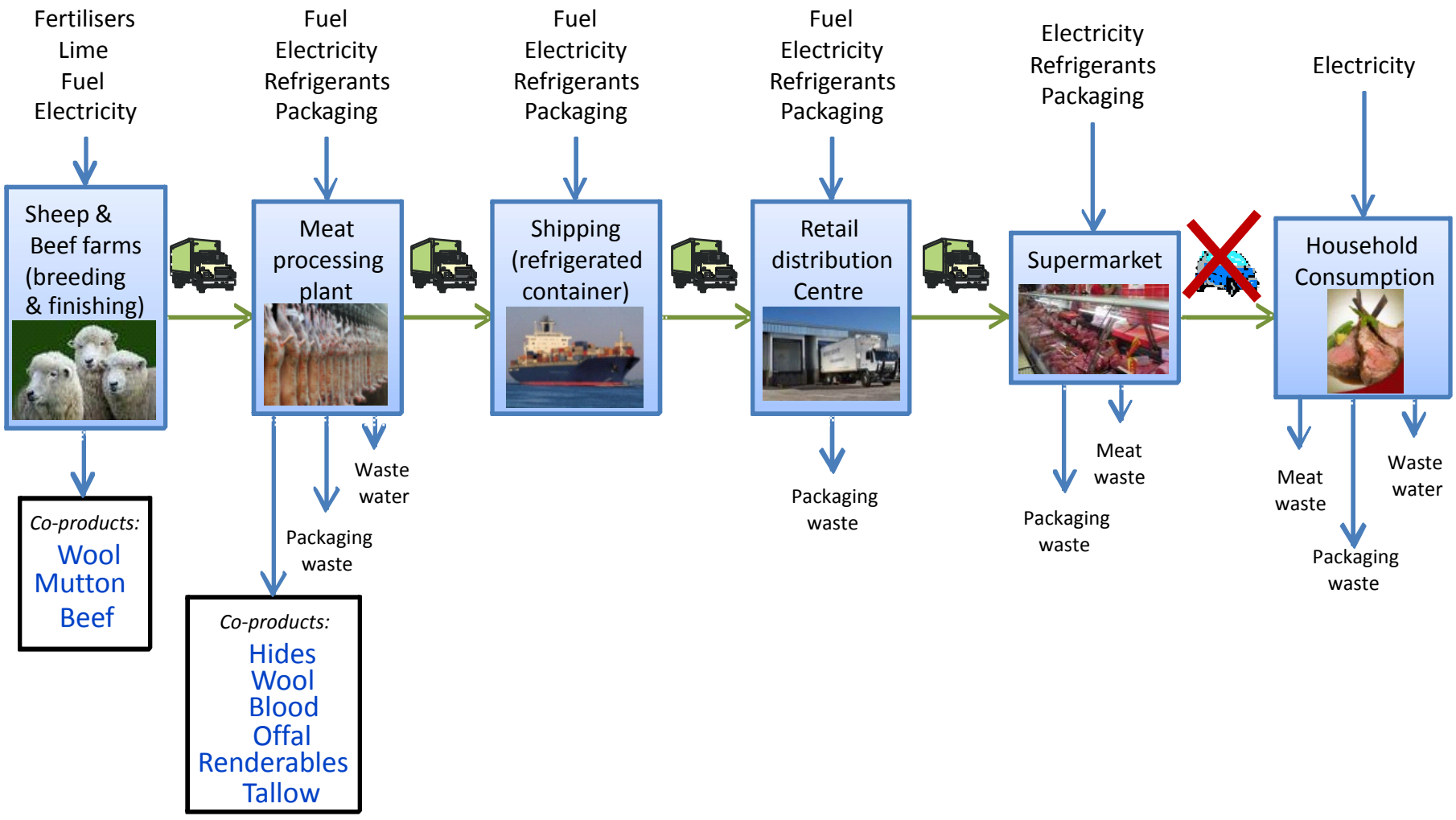
Within NZ:

- Emissions Trading Scheme
  - Carbon payment for tree planting
  - Carbon tax on fuel & electricity (c. 4-5%)
  - Animal CH_4 & N_2O tax in 2013 or 2015

Features of NZ sheep farming

- simple farm systems (mixed sheep & beef)
  - average > 4000 sheep equivalents
- permanent perennial grass/clover pastures
- reliance on clover-N with little fertiliser-N
- all outdoors; no brought-in feed
- dual-purpose meat & wool sheep
- Seasonal production
  - spring lambing to match pasture growth pattern
  - opposite season to the Northern Hemisphere

Life cycle of lamb to the U.K.



Based on international standards (e.g. ISO 14040s norms; PAS 2050)

METHODS: data



Farms:

- survey farm data (>460 farms over 7 farm classes)
- tier-2 method to estimate feed energy intake
- some NZ-specific E.F.s e.g. 20.9 g CH_4/kg DM intake

Meat processing plants:

- survey data from 11 plants (>40% all lambs)
- covered energy use, waste-water processing, refrigerants, consumables etc.

Transport/retail/consumer/waste:

- mainly 2^o data modified for country-specific emissions

METHODS: co-products

Farms:

- biological allocation between animal types on-farm

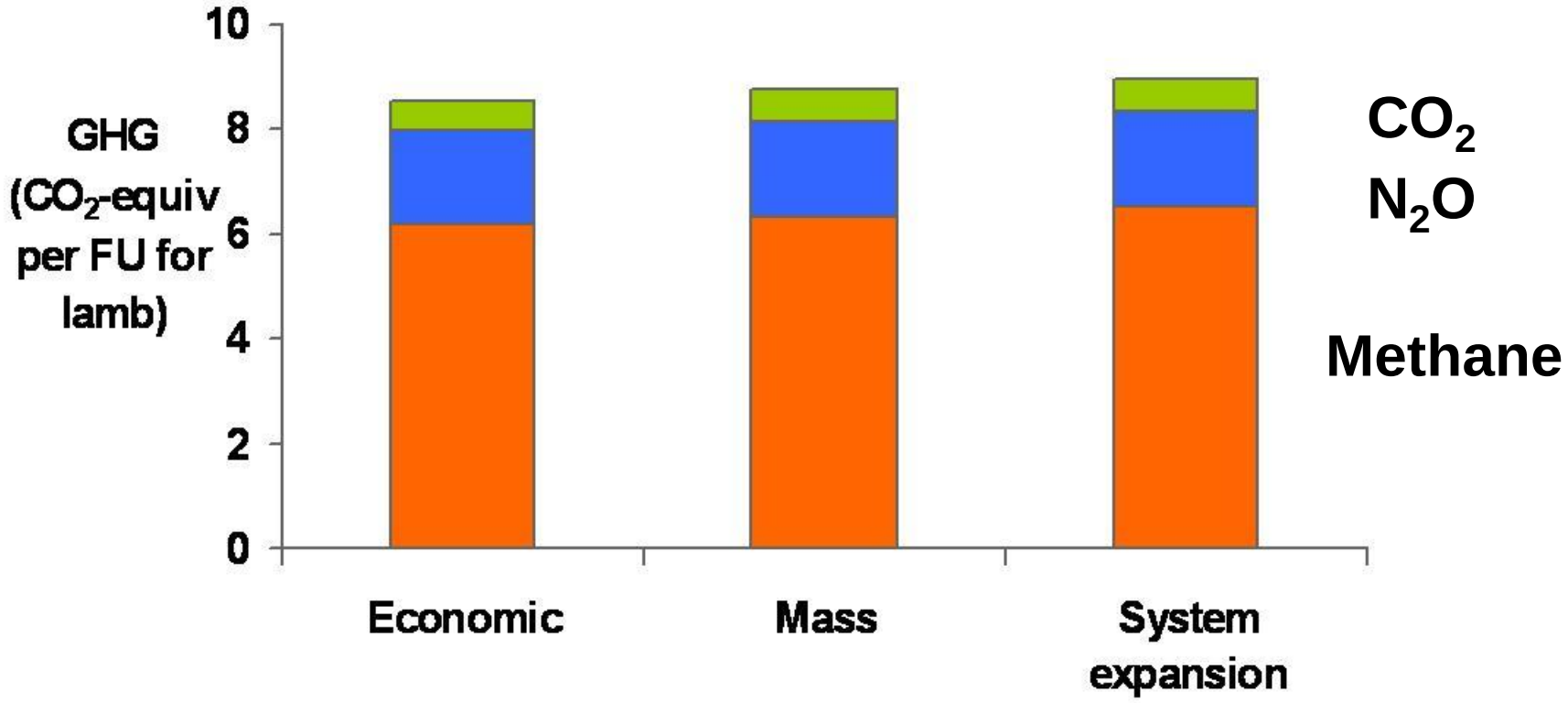
- economic allocation within sheep for meat and wool

Meat processing plants:

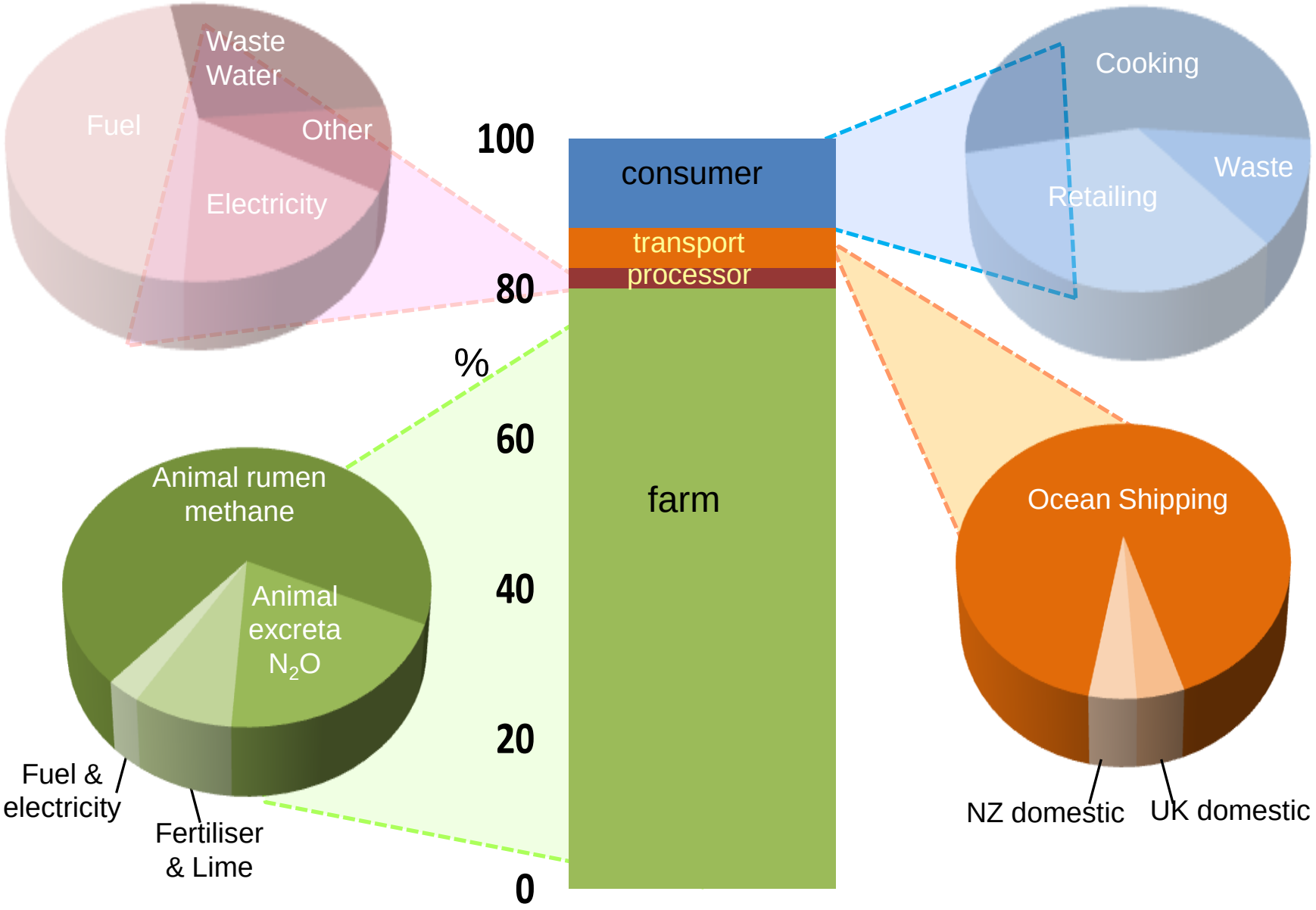
- economic allocation between meat and co-products
  - skins, blood, renderables, tallow

RESULTS:

Effects of method of allocation between meat and wool




Lamb carbon footprint = 19 kg CO_2-equiv./kg meat


Waste
Water
Fuel
Other
Electricity
100
consumer
transport
processor
80
%
60
farm
40
20
0
Cooking
Waste
Retailing
Animal rumen
methane
Animal
excreta
N_2O
Fuel &
electricity
Fertiliser
& Lime
Ocean Shipping
NZ domestic
UK domestic

SENSITIVITY ANALYSES: meat processor

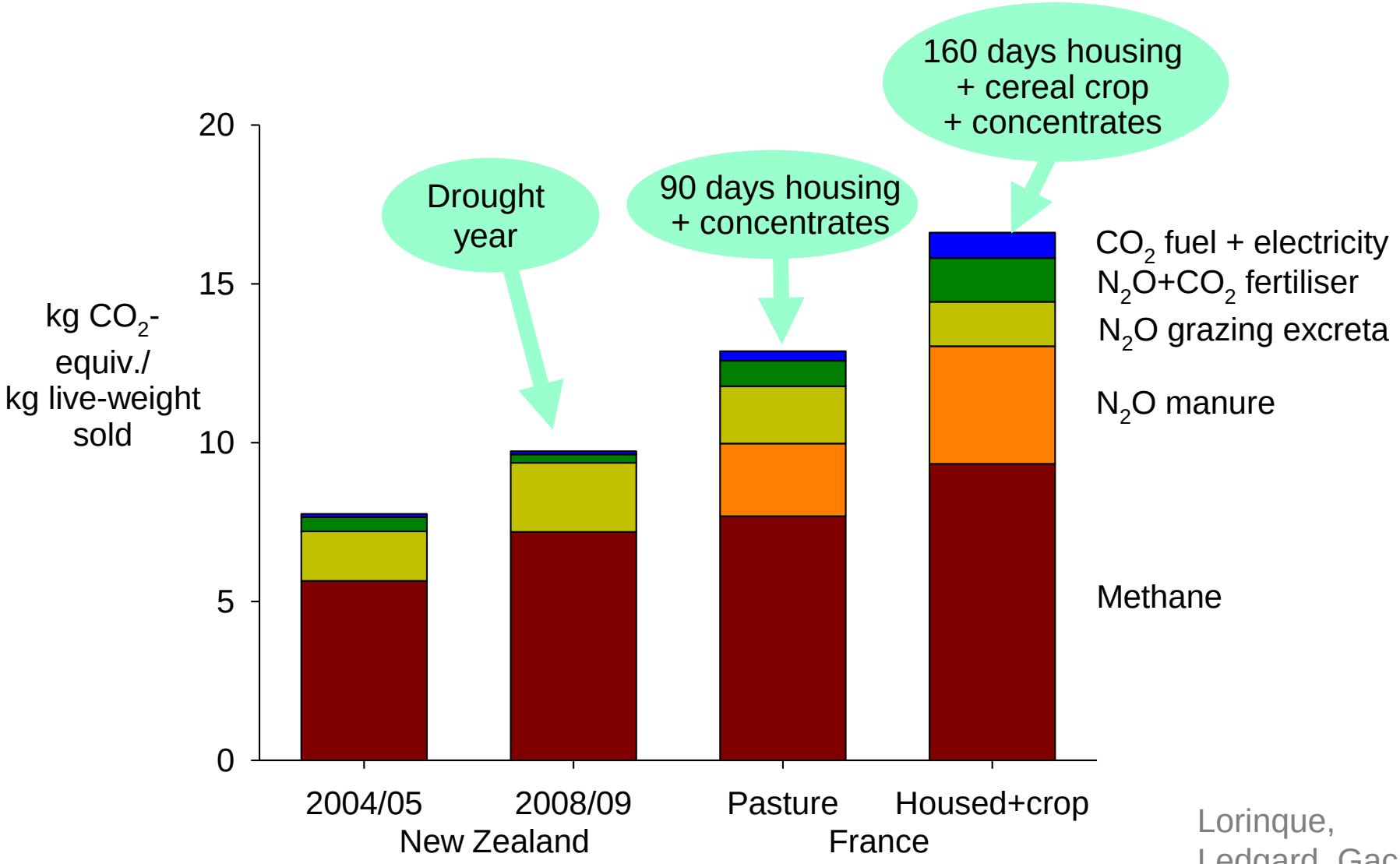
Waste-water treatment:
Changing from anaerobic processing to either aerobic processing or methane capture could reduce processing emissions by 22-38%, although this is only c. 1% of the total carbon footprint

SENSITIVITY ANALYSES: consumer

Cooking method:
roasting had 11% higher consumer/retail emissions than frying, or a 1% increase in total carbon footprint

Inclusion of **consumer travel** gave an increase of up to 7% in the total carbon footprint
(> all other transport stages combined)

Case study of NZ and French sheep farm systems



22% allocation to wool

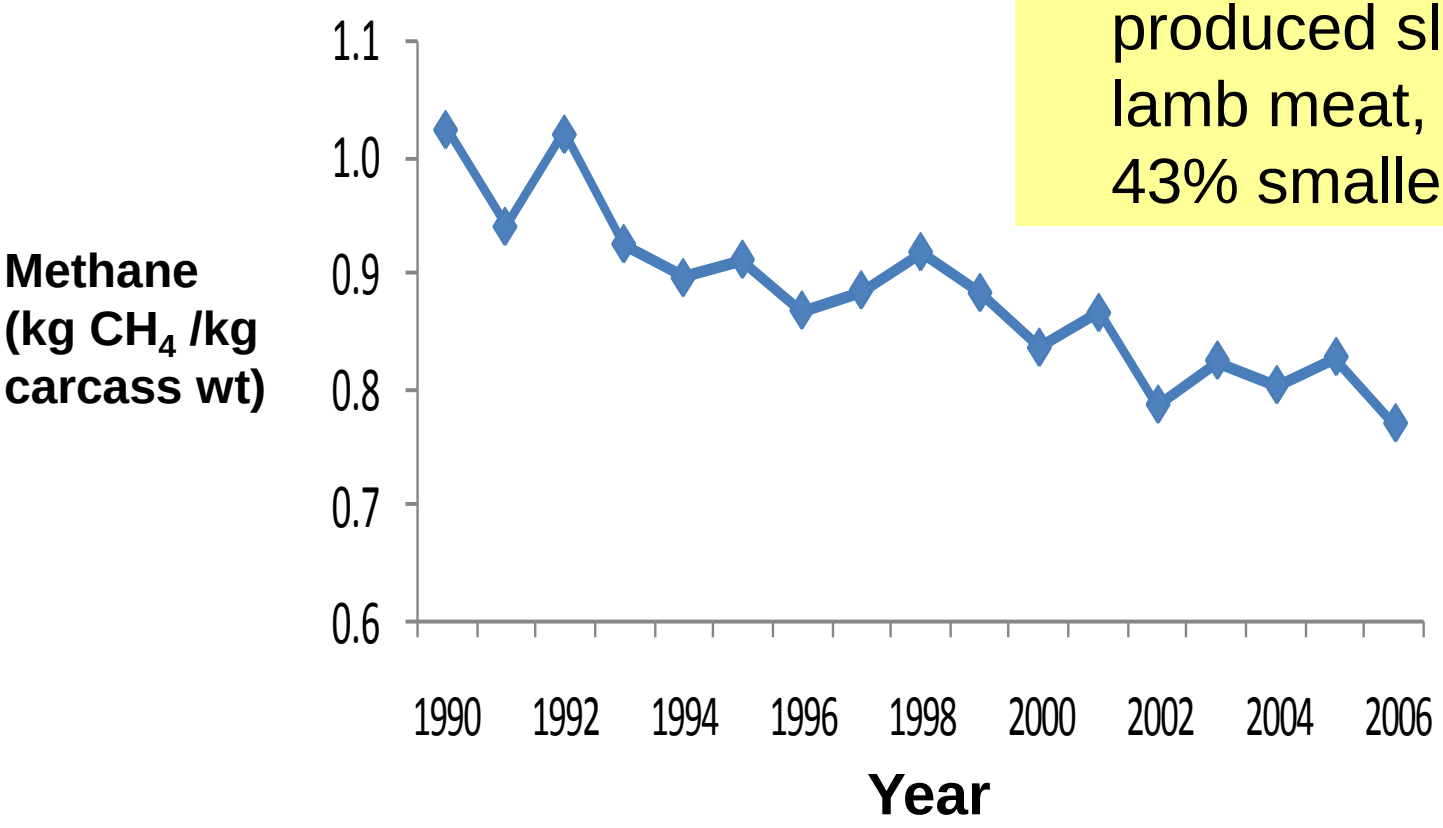
0.3% allocation to wool

Lorinque, Ledgard, Gac, Boyes & Le Gall, unpubl.

How can we reduce emissions?

i. increase animal production efficiency

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



Hypothetical mitigation scenarios on case study farms

	% reduction in farm GHG emissions/kg lamb	Effect on profit
↑ **lamb growth :** *finish 1 month earlier*	**4-12**	**++**
↓ **replacement rate:** *ewes last 1 yr longer*	**5-7**	**+**
↑ **lambing%** **:** *by ~ 20%*	**3-5**	**++**
ewe hogget lambing **:** *80%*	**2-5**	**+**
no N fertiliser use on pasture	**1-3**	**-**
nitrification inhibitor use (DCD)	**~ 9**	**- -**

Summary:

Carbon footprint of NZ lamb of 19 kg CO_2-equiv./kg meat:

- covers whole life cycle, but dominated by farm stage
- depends on methodology choices
- lower from low-input grazing systems
- decreased over time with increased feed conversion efficiency
- potential reduction with some mitigations

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