

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**



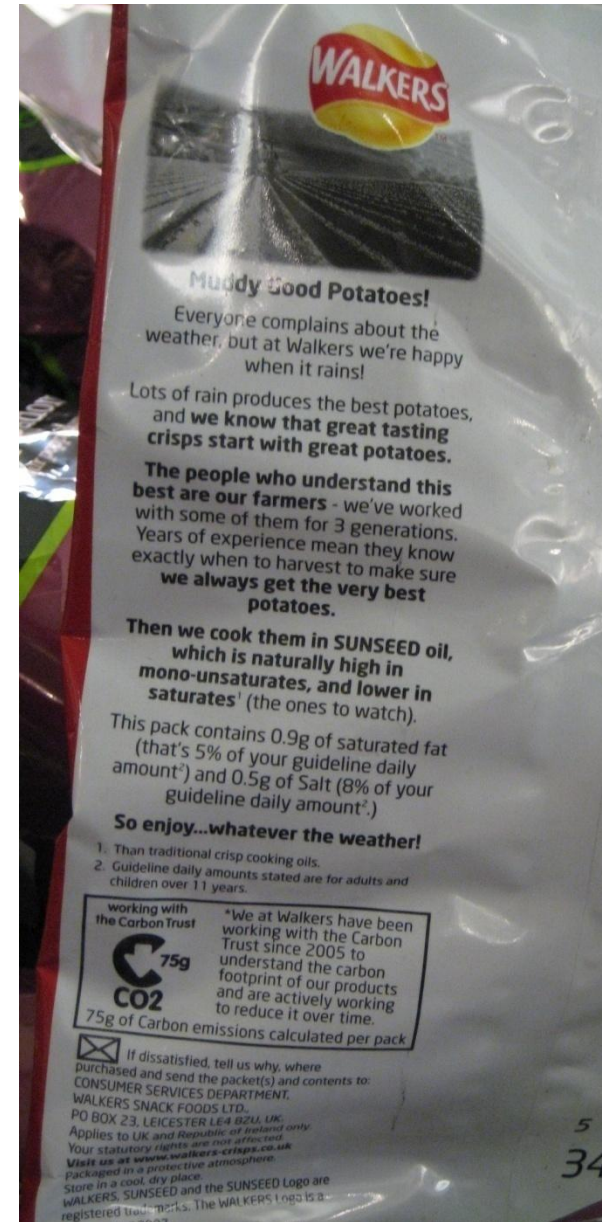
Drivers ?



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 CH₄ & N₂O tax in 2013 or 2015

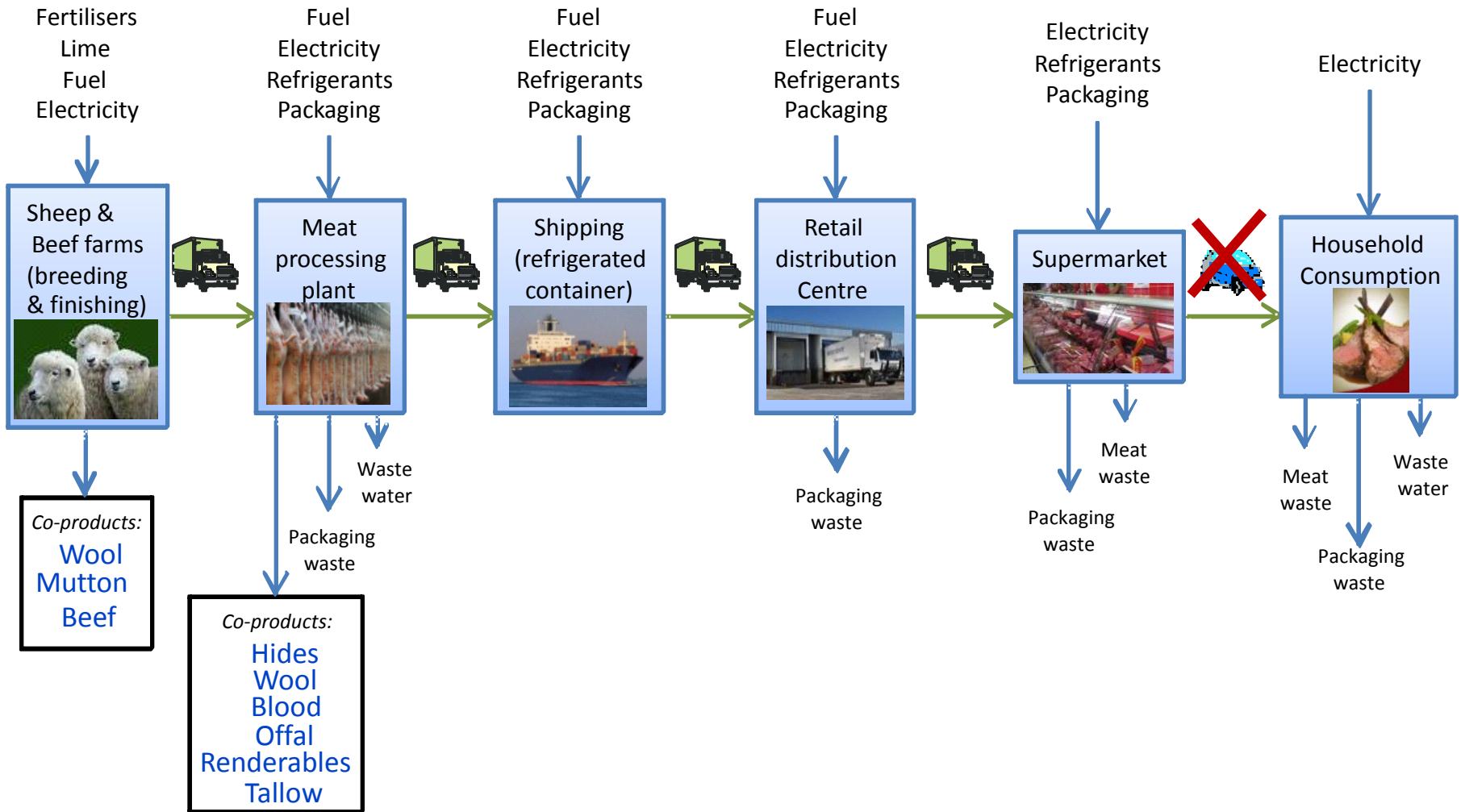


Features of NZ sheep farming

- **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 CH₄/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:

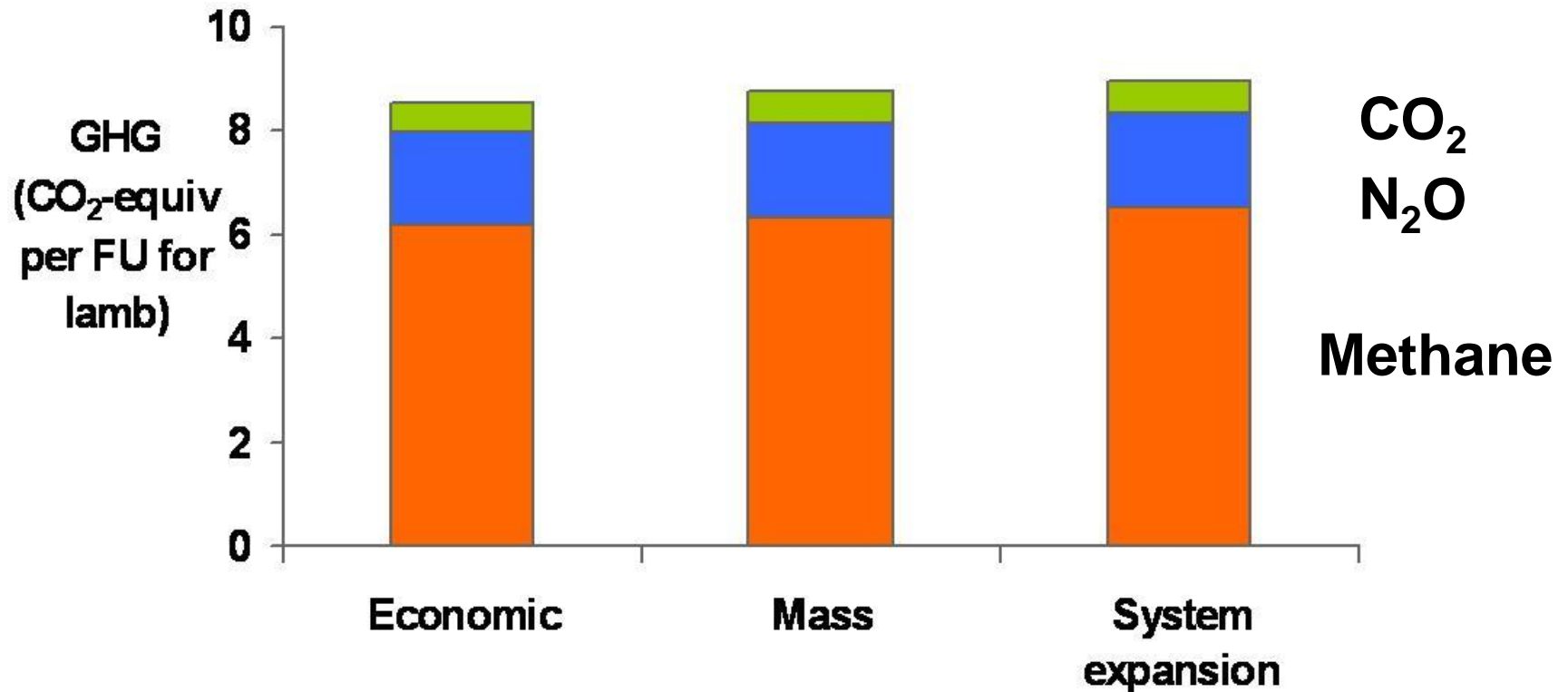
- economic allocation between meat and co-products
 - skins, blood, renderables, tallow



RESULTS:

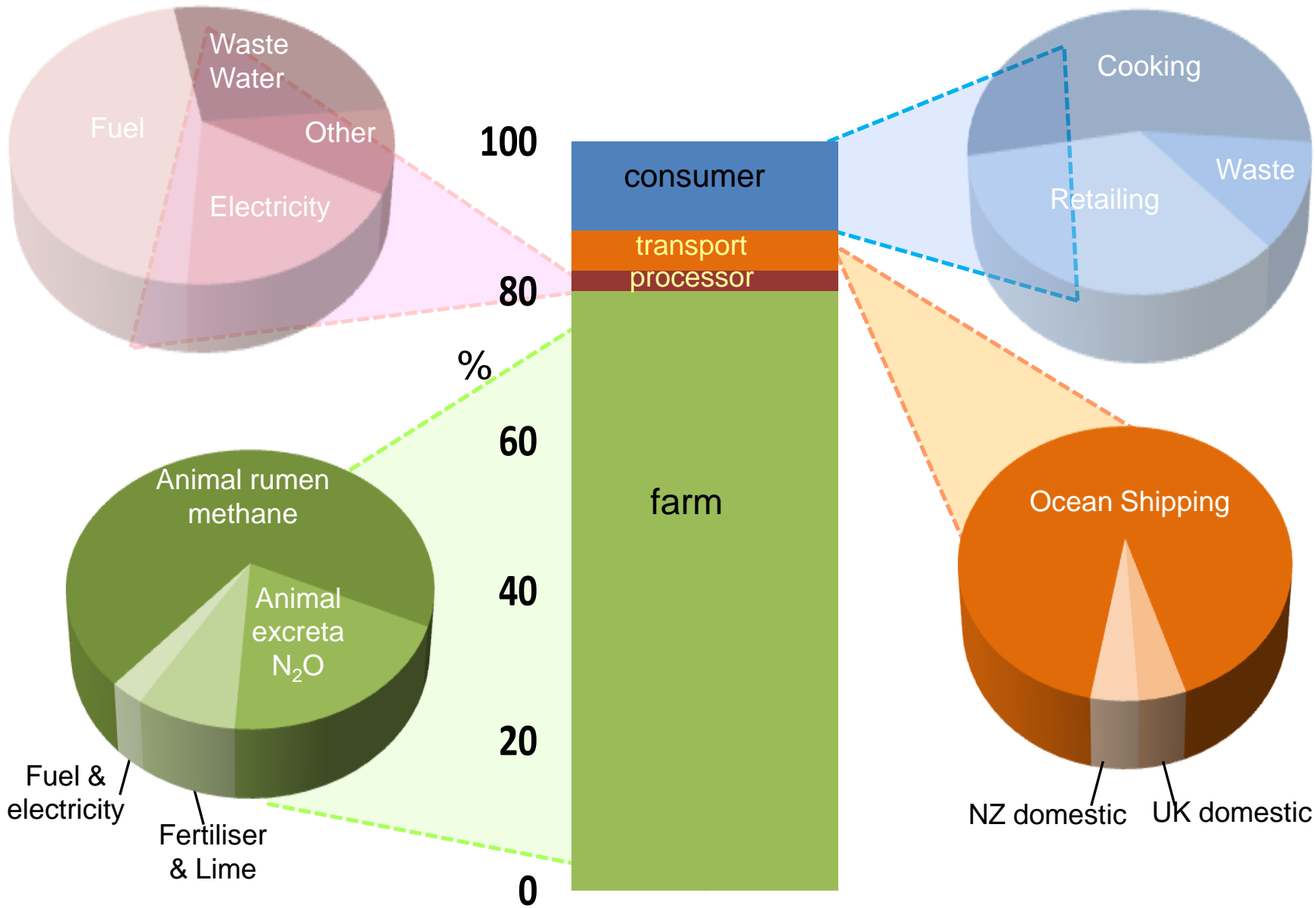


Effects of method of allocation between meat and wool



Lamb carbon footprint = 19 kg CO₂-equiv./kg meat





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



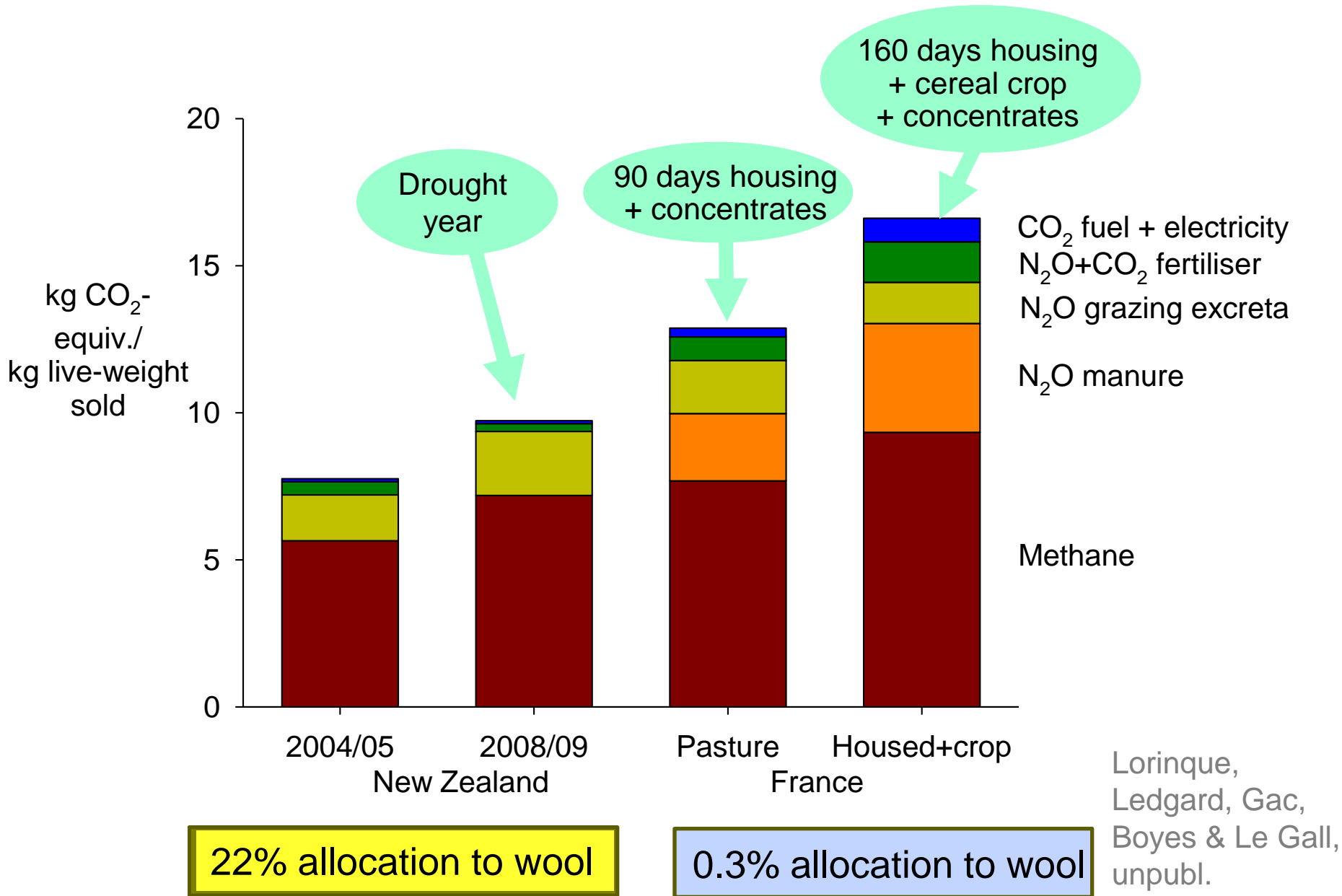
Cooking method:

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)

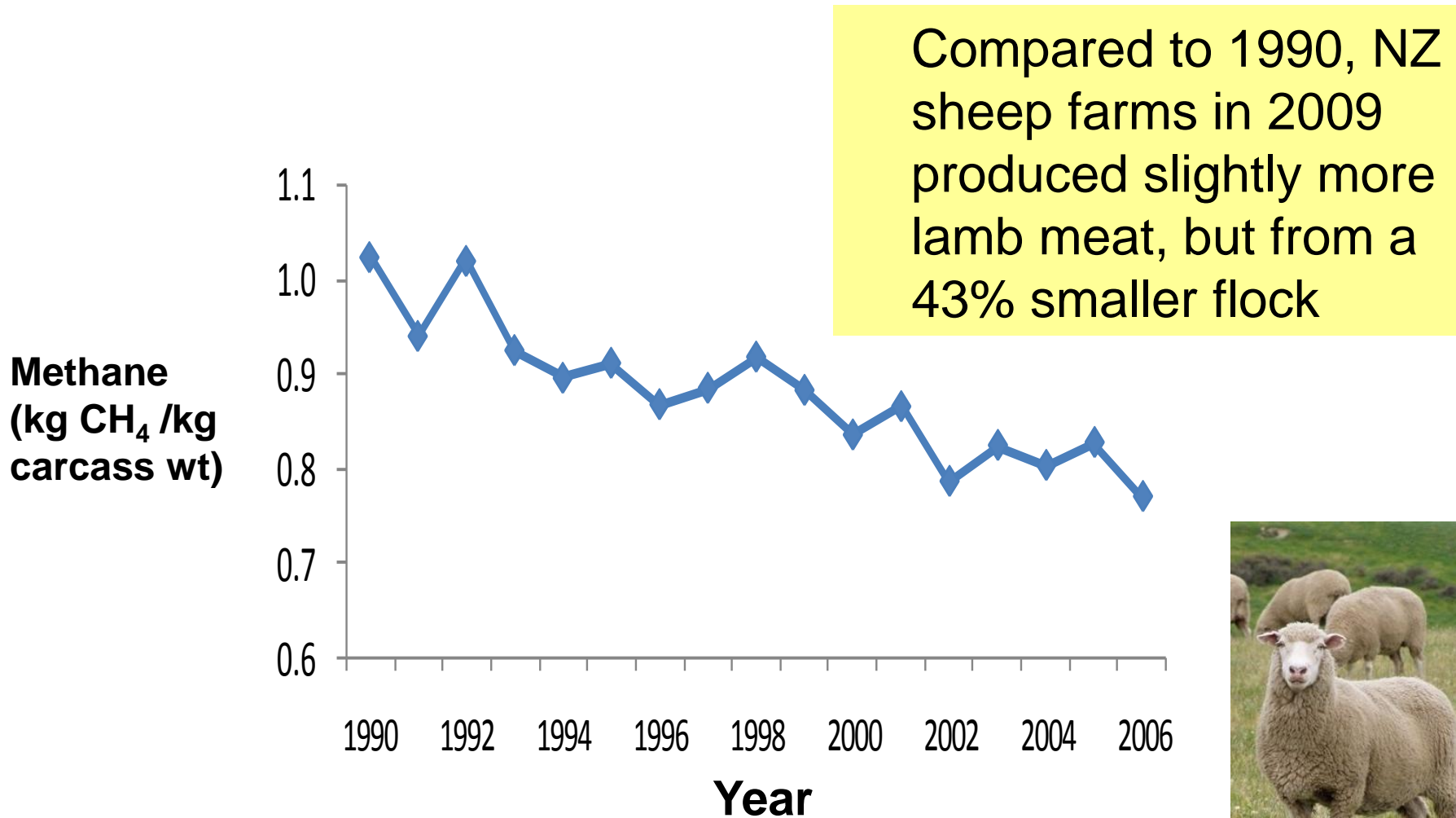


Case study of NZ and French sheep farm systems



How can we reduce emissions?

i. increase animal production efficiency



Hypothetical mitigation scenarios on case study farms

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

Summary:

Carbon footprint of NZ lamb of 19 kg CO₂-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