



# Food and Climate Change

The role of fruit and vegetables in  
contributing to GHG emissions

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*Food Climate Research Network*

# This presentation

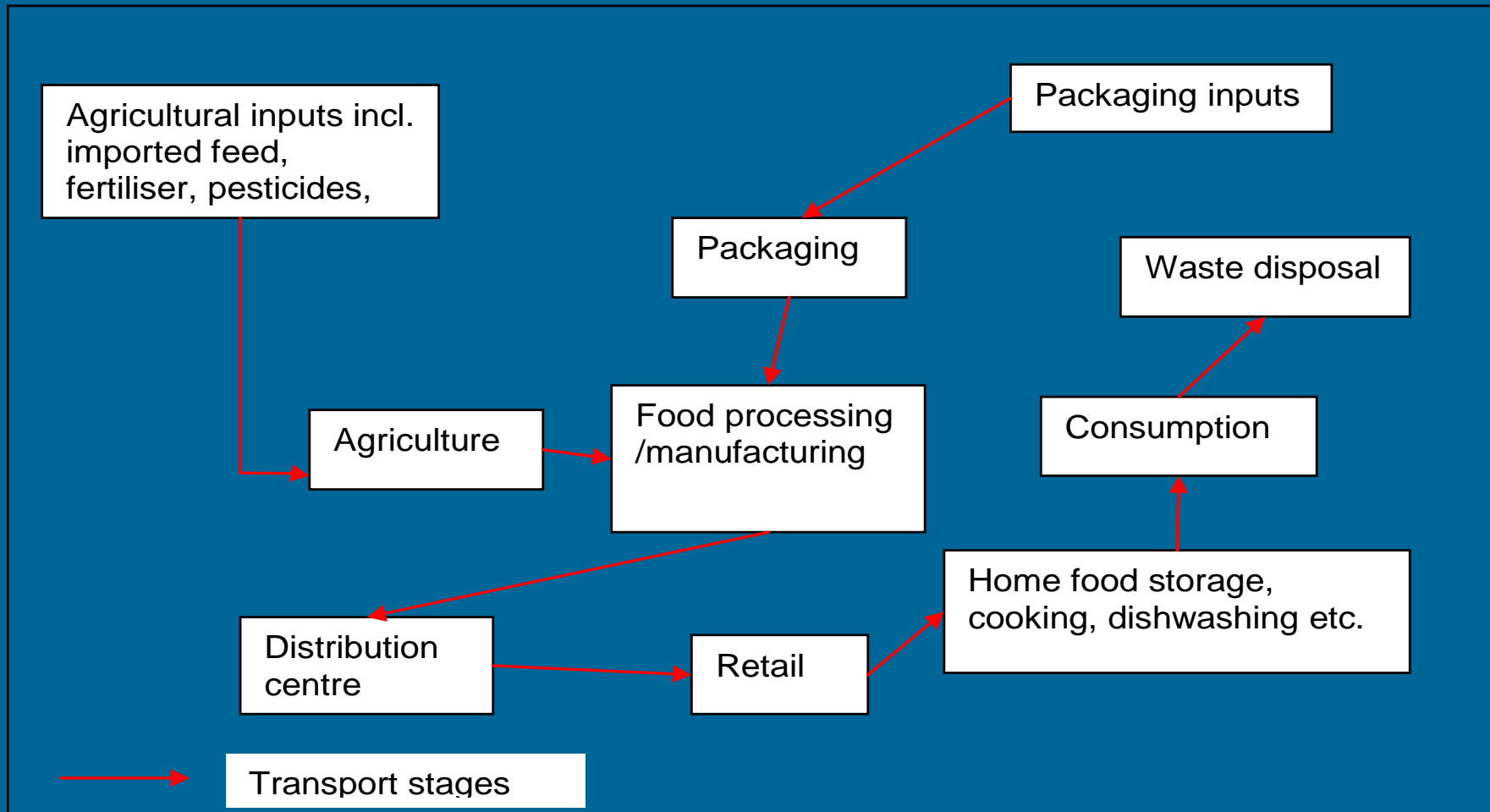
1. Food & its GHG emissions – by life cycle stage
2. Food and its GHG emissions – by food type
3. Focus on fruit & veg
4. The health / climate change relationship
5. Observations / conclusions
6. A bit about the FCRN

# Defining terms

- GHGs = greenhouse gas emissions
- CO<sub>2</sub> the main GHG but...
- ...others also important especially for food
  - Methane: 23x more potent than CO<sub>2</sub>
  - Nitrous oxide: 296x more potent than CO<sub>2</sub>
  - Refrigerant gases: thousands of times more potent...

# 1. Food GHG emissions – by life cycle stage

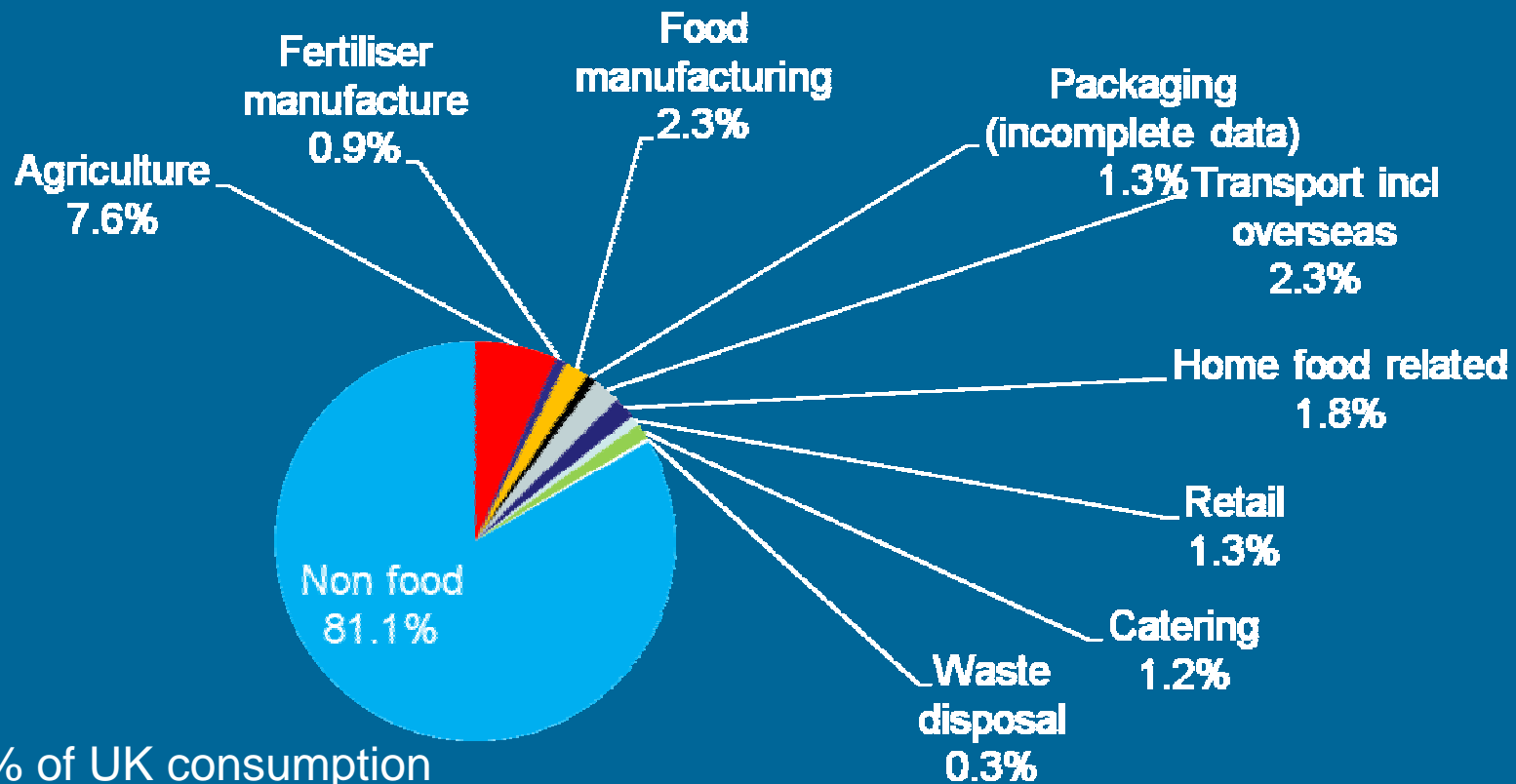
# The LCA perspective



# Overall food-related contribution to GHG emissions

- EU EIPRO report: **31%** all EU consumption related GHGs
- FCRN UK estimates: around **19%** (probably an underestimate) - Defra estimates similar
- World agriculture contribution – **17 - 32%** total global emissions
- Huge uncertainty / variability between countries / differences in what's included and what's not – intensity of other industry sectors

# Food GHG impacts – by life cycle stage - UK



As % of UK consumption related GHG emissions est at 234 MTCe

## 2. Food GHG emissions – by food type

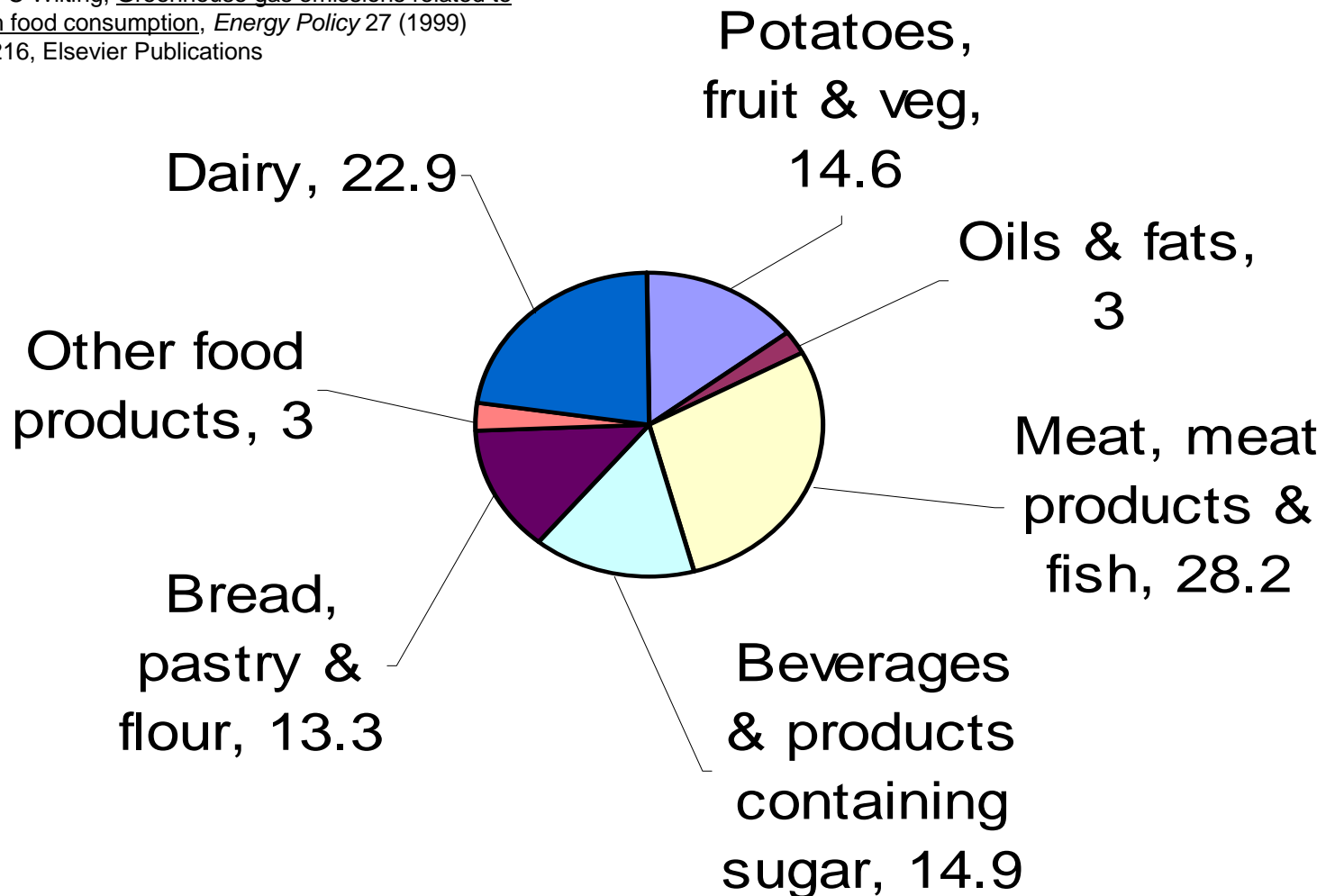


# FCRN work so far

- Meat and dairy – about 8.5%
- Fruit and veg - about 2.5%
- Alcoholic drinks – about 1.5%
- This is of the UK's TOTAL GHG emissions
- Similar to this Dutch study...

# Contribution of food groups to Dutch GHG emissions KG/CO<sub>2</sub>e

Klaas Jan Kramer, Henri C Moll, Sanderine Nonhebel,  
Harry C Wilting, Greenhouse gas emissions related to  
Dutch food consumption, *Energy Policy* 27 (1999)  
203-216, Elsevier Publications



# Livestock: the main concern

- Global – **18%** global emissions (FAO 2006)
- EU: **15%** EU GHGs or 50% of all food impacts (EIPRO 2006)
- Kramer et al (1999): **50%** of all food impacts
- UK (from FCRN study): about **8.5%**
- Variation depends on what's included (eg. **LU change**) & baseline consumption GHGs

### 3. Focus on fruit & veg

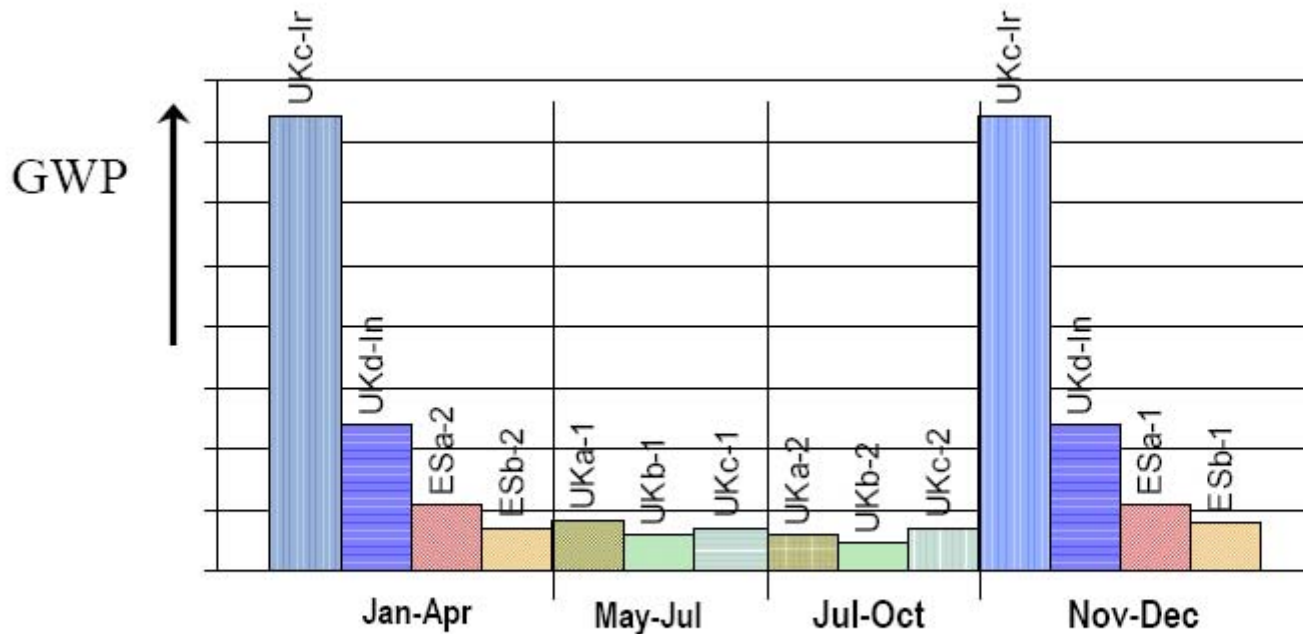
# Fruit and veg – 2.5% UK GHG total

- HIGH GHG produce are those that are:
  - Air freighted (eg. berries and beans)
  - Unseasonal protected (ratatouille veg)
  - Pre-prepared (salad bags, chopped salads)
  - Fragile / spoilable (berries and salads)
- LOW GHG produce are those that are:
  - Seasonal and field grown: no heating; fewer 'tradeoffs'
  - Robust (less need for rapid transport, less prone to waste, less temp critical?) - brassicas, root veg etc...
- Consumption trends moving in more GHG intensive directions

## Key impact areas – this varies

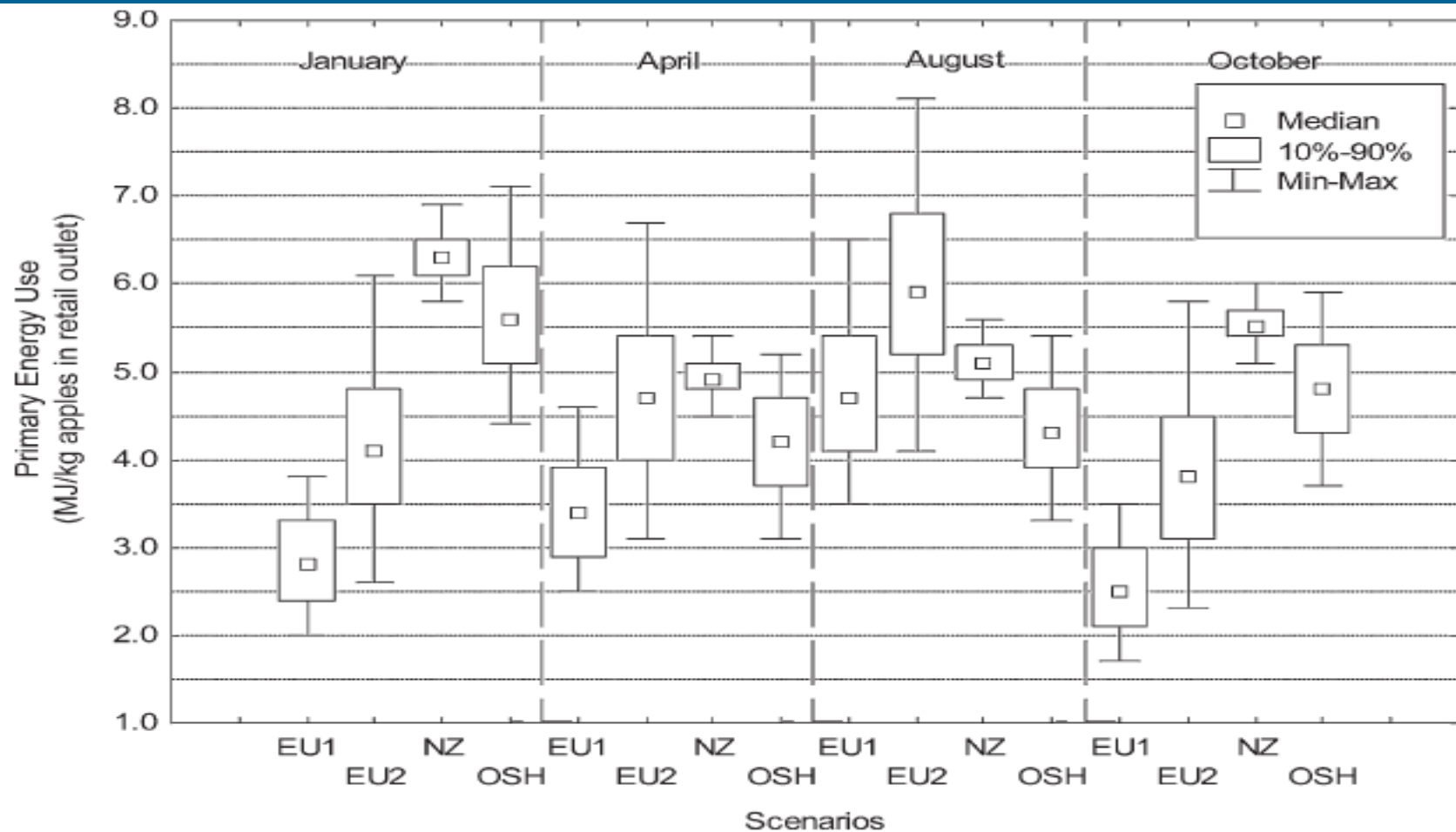
- Production (for glasshouse grown fruit and veg)
- Transport (for air freighted produce)
- Storage (for produce stored beyond growing season)
- Cooking
- Waste

# Production – lettuce



The vulnerability of exporting nations to the development of a carbon label in the UK Gareth Edwards-Jones  
Barry Hounsome, Llorenç Mila i Canals 1, Liz York, Katharina Plassmann and Davey Jones, Presentation given  
at Food Security and Environmental Change Conference, Oxford, 2-4 April 2008,  
<http://www.gecafs.org/FoodConferencePresentations.htm>

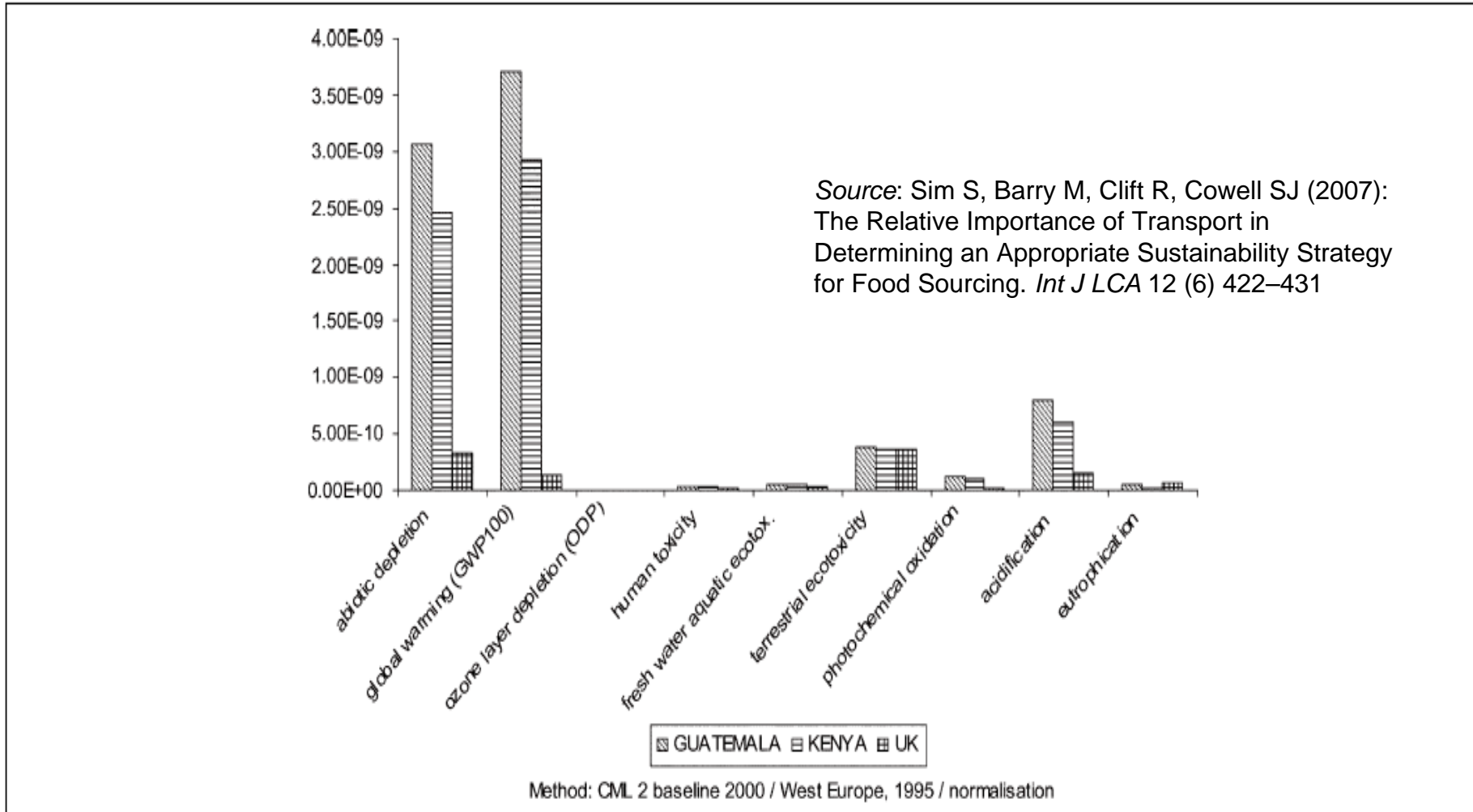
# Storage – Apples



Milà i Canals L, Cowell SJ, Sim S, Basson L (2007): Comparing Domestic versus Imported Apples: A Focus on Energy Use. *Env Sci Pollut Res* 14 (5) 338–344



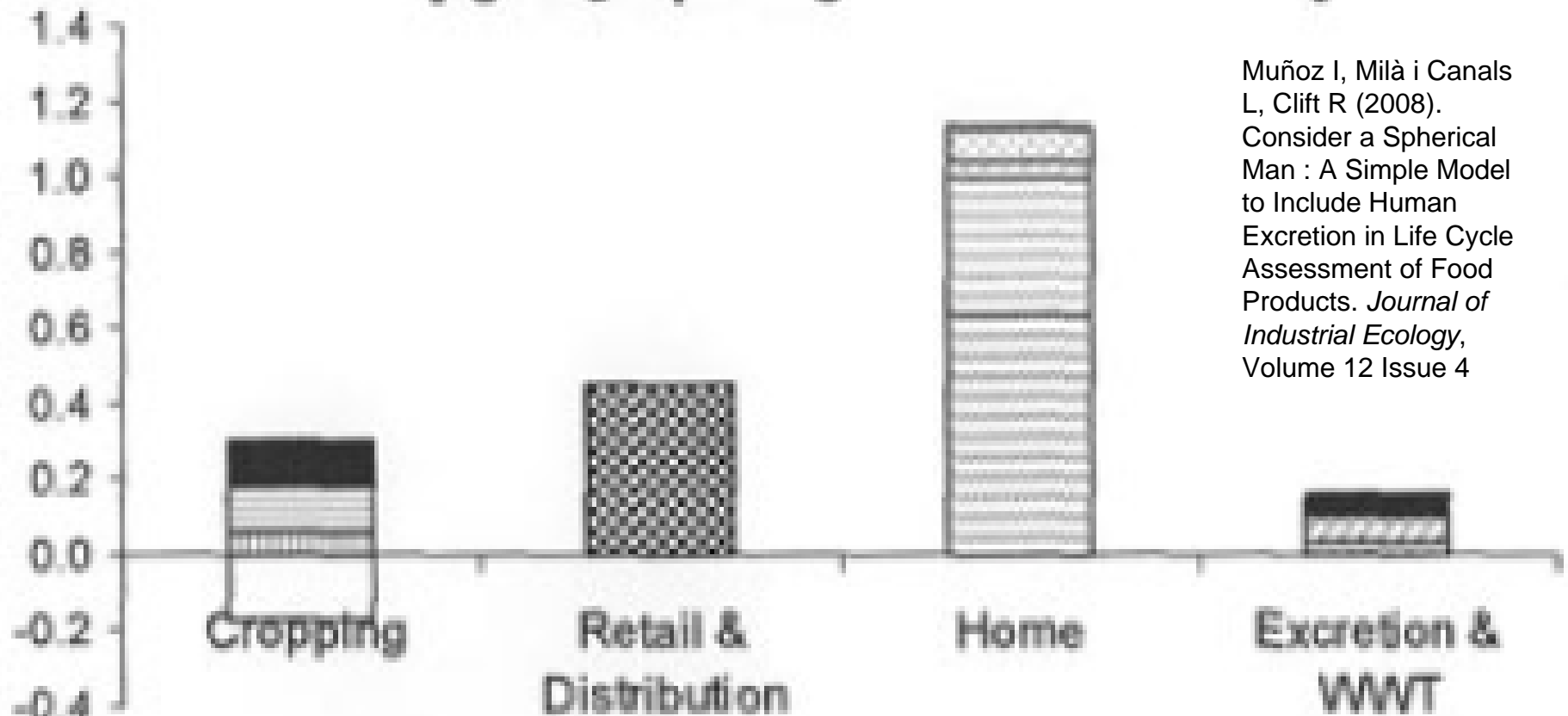
# Transport - green beans



**Fig.2:** Normalised impact assessment for runner beans sources from Kenya, Guatemala and the UK – accounting for radiative forcing of aircraft emissions for the Kenyan and Guatemalan supply chains

# Cooking - Broccoli

b) CML2001, Global Warming Potential (GWP 100 years)  
[kg CO<sub>2</sub>-Equiv./kg broccoli consumed]



Muñoz I, Milà i Canals L, Clift R (2008). Consider a Spherical Man : A Simple Model to Include Human Excretion in Life Cycle Assessment of Food Products. *Journal of Industrial Ecology*, Volume 12 Issue 4

# Waste – all fruit and veg

- We throw away a third of the food we buy. Over 60% of this could have been eaten (*source WRAP 2008*).
- Fruit and veg account for nearly half of this
- Wasted food is a waste of embedded GHG emissions

# It's not just about GHG emissions

- We need to think about:
- Water use (eg. Mediterranean horticulture)
- Pesticides
- Biological diversity

## 4. The nutrition / CC relationship

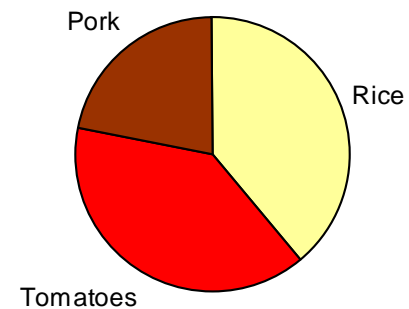
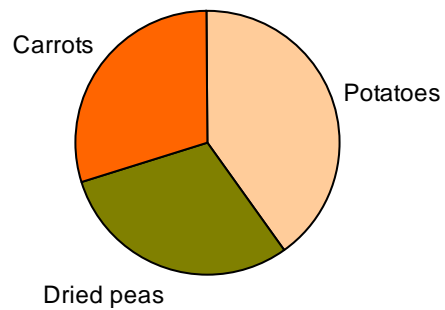
Is healthy food less GHG intensive?

# The eatwell plate

Use the eatwell plate to help you get the balance right. It shows how much of what you eat should come from each food group.



# Two balanced meals... A ninefold GHG difference



Health AND environment policy approach or health VERSUS environment?

# The nutrition challenge – different for rich and poor

- **The rich:** Less meat, less fat, less sugar; more grains & veg – *win-win for health & environment*
- **The poor:** Develop food production systems that *maximise nutrition at minimum GHG cost*
  - Some livestock products nutritionally useful for vulnerable groups
- **Need to integrate nutrition/CC policy**



# 5. Reducing food's GHG contribution

Need for technological improvements AND behaviour change

# What might a low GHG diet look like?

- Not overeating
- Much less meat and dairy
- Seasonal field grown foods
- Not eating certain foods
- Reducing dependence on cold chain
- But wasting less
- Efficient cooking
- Redefining quality

## 6. Observations and conclusions

# Food's impacts

- Food contributes to a significant proportion of the UK's GHG emissions
- All stages in the supply chain contribute to emissions
- Agriculture most significant stage
- **Meat and dairy most GHG intensive food**
- Fruit and veg not so GHG intensive – but demand for the more GHG intensive fruit and veg is growing

- There can be synergies between healthy eating and climate change mitigation ...
- **But this isn't inevitable**
- Govt needs to develop healthy eating guidelines that seek to achieve maximum nutrition at minimum GHG 'cost'.

## 6. About the FCRN

# The FCRN

Funded by UK research council & Defra

Based at Surrey University

Focuses on:

- Researching food chain contribution to GHG emissions and options for emissions reduction – technology, behaviour, policy
- Sharing and communicating information on food & climate change with member network

# FCRN outputs

1. Five comprehensive studies so far:
  1. Fruit & vegetables
  2. Alcoholic drinks
  3. Food refrigeration
  4. Meat & dairy
  5. Synthesis paper
6. All at [www.fcrn.org.uk](http://www.fcrn.org.uk)





# Cooking up a storm

Food, greenhouse gas emissions  
and our changing climate

Tara Garnett

Food Climate Research Network  
Centre for Environmental Strategy  
University of Surrey | September 2008

- **Comprehensive website** –see [www.fcrn.org.uk](http://www.fcrn.org.uk)
- **Working seminars:** To inform research
- **Networking:** To catalyse further research
- **E-news:** on food/GHGs to over a thousand members
  
- Please join...

Thank you

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[www.fcrn.org.uk](http://www.fcrn.org.uk)

Food Climate Research Network