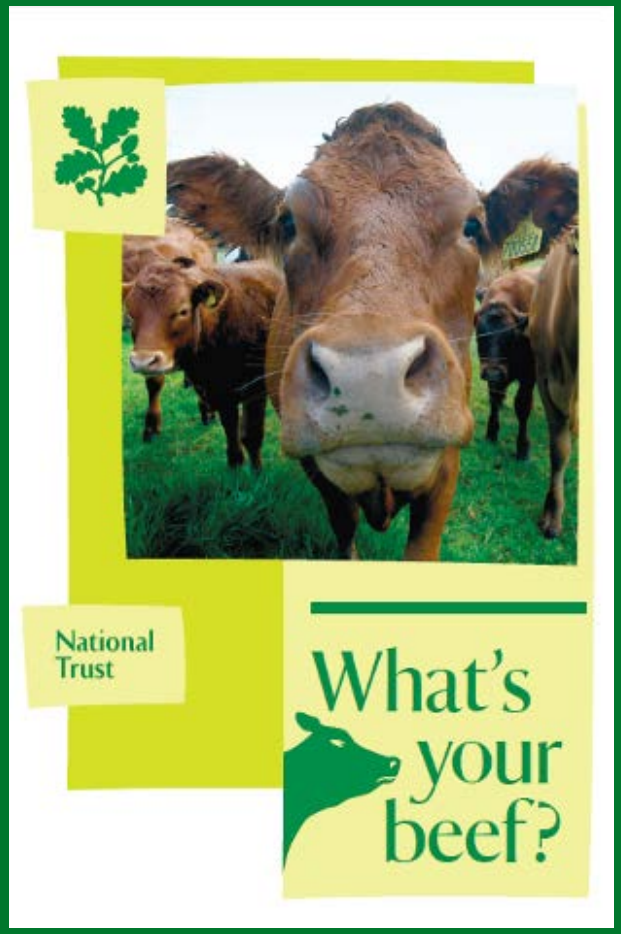
Comparing the carbon footprint of different beef systems



Rob Macklin, Head of Food and Farming

John Kay, Farm Wastes Adviser

ORC 21st January 2013

National Trust interest?

- 160,000 ha of grazing land
- 1,300 beef and sheep farms
- High proportion of extensive livestock systems

Study objectives

1. Footprint beef production on National Trust farms
   - Ten NT beef farms – selection of systems
   - $kgCO_2e$ per kg liveweight at farm gate

2. Explore mitigating effects of carbon sequestration
   - Reliant on published data

3. Make comparisons with other life cycle studies
   - US feedlot
   - Brazilian ‘Cerrado’

BESTFOOTFORWARD
The Sustainability Consultants

Laurence GOULD PARTNERSHIP LTD

Method

- Farms visited in Oct/Nov 2010 – data collection
- NT farm analyses done in ECO2 Project tool
  - Carbon Trust accredited
  - EBLEX roadmap
  - Field staff fully trained
- Interpretation by consultants *Best Foot Forward*
  - Aggregation of NT farm results
  - Carbon sequestration scenarios
  - Comparisons with published life cycle studies

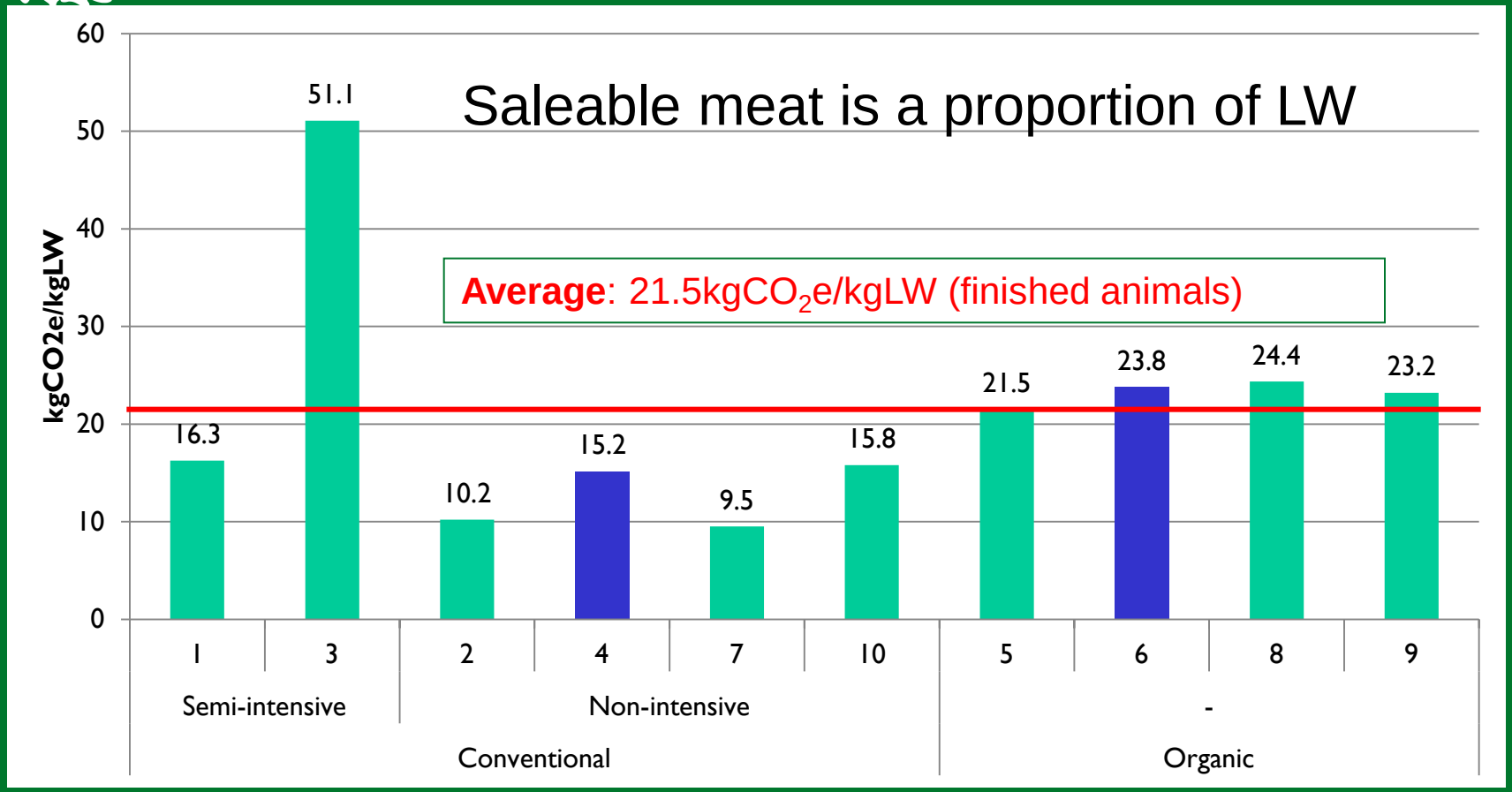
The Farms

Ten farms – non-random sample

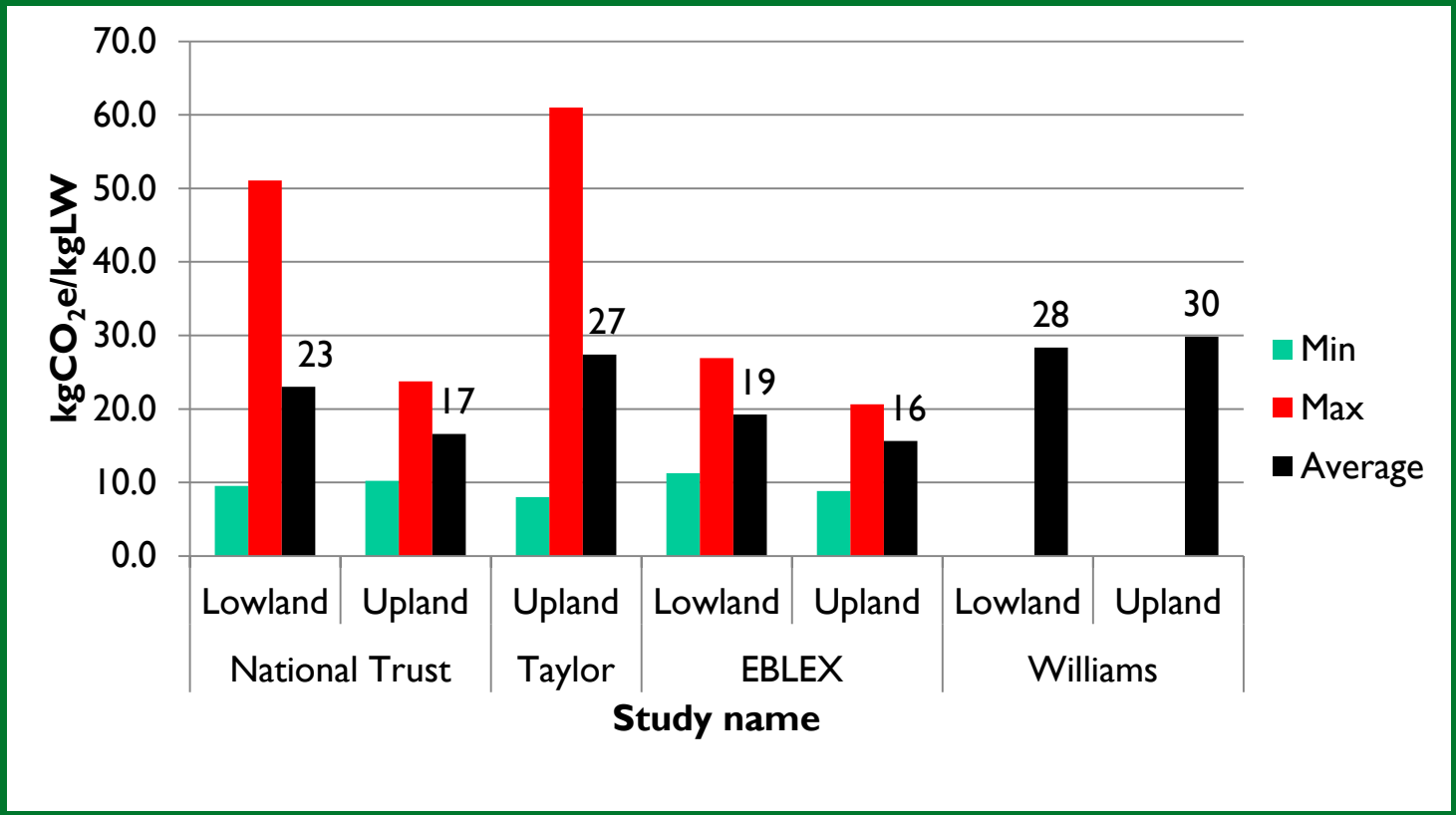
- 7 lowland, 3 upland
- 4 organic, 2 semi-intensive*, 4 non-intensive
- Mix of breeds: tradition, continental
- 50-300 hectare beef enterprises
- Some had sheep, arable

*higher levels of concentrates used

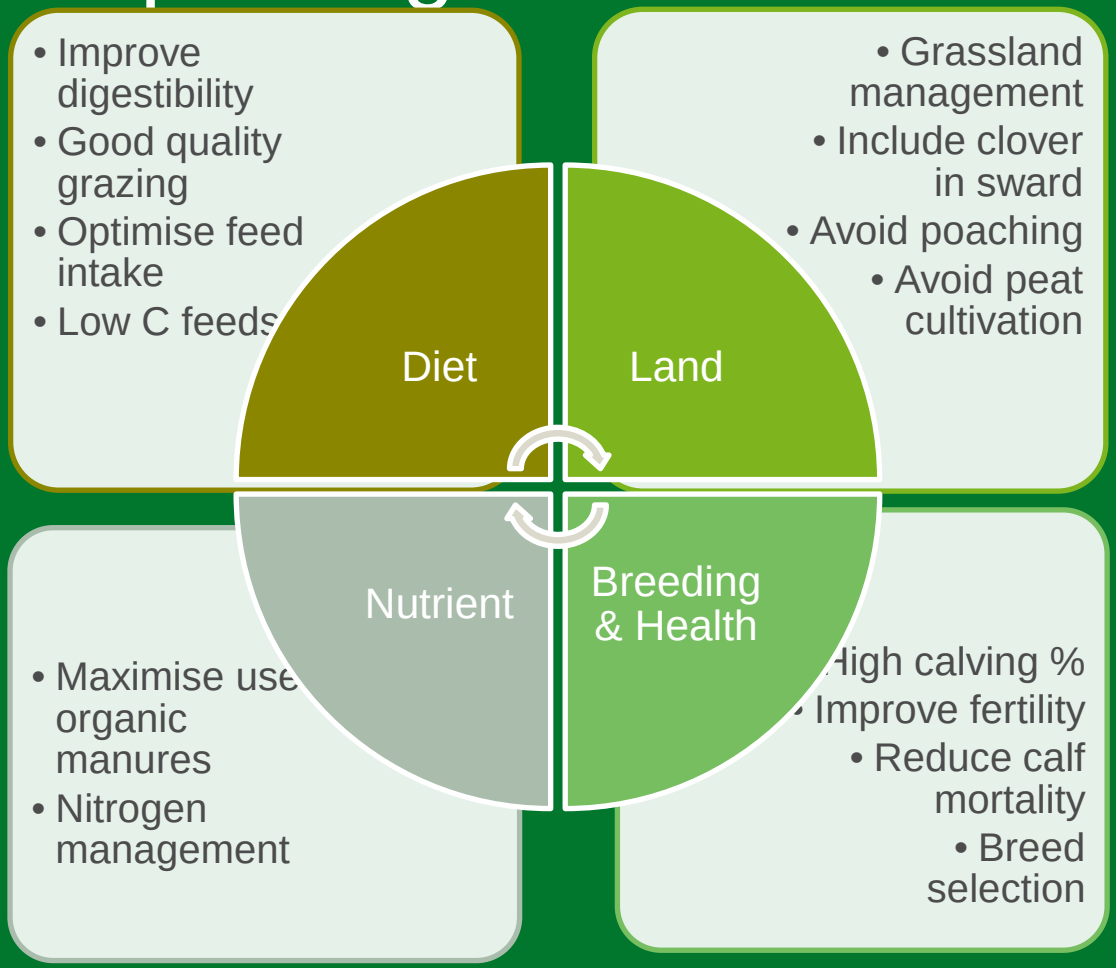
Results: CO_2e / kg liveweight



UK comparisons



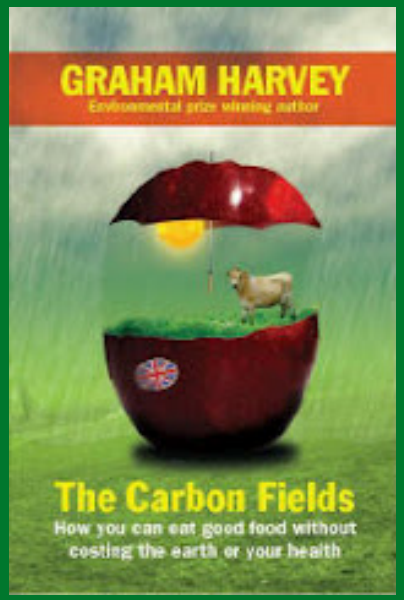
Improving emissions efficiency

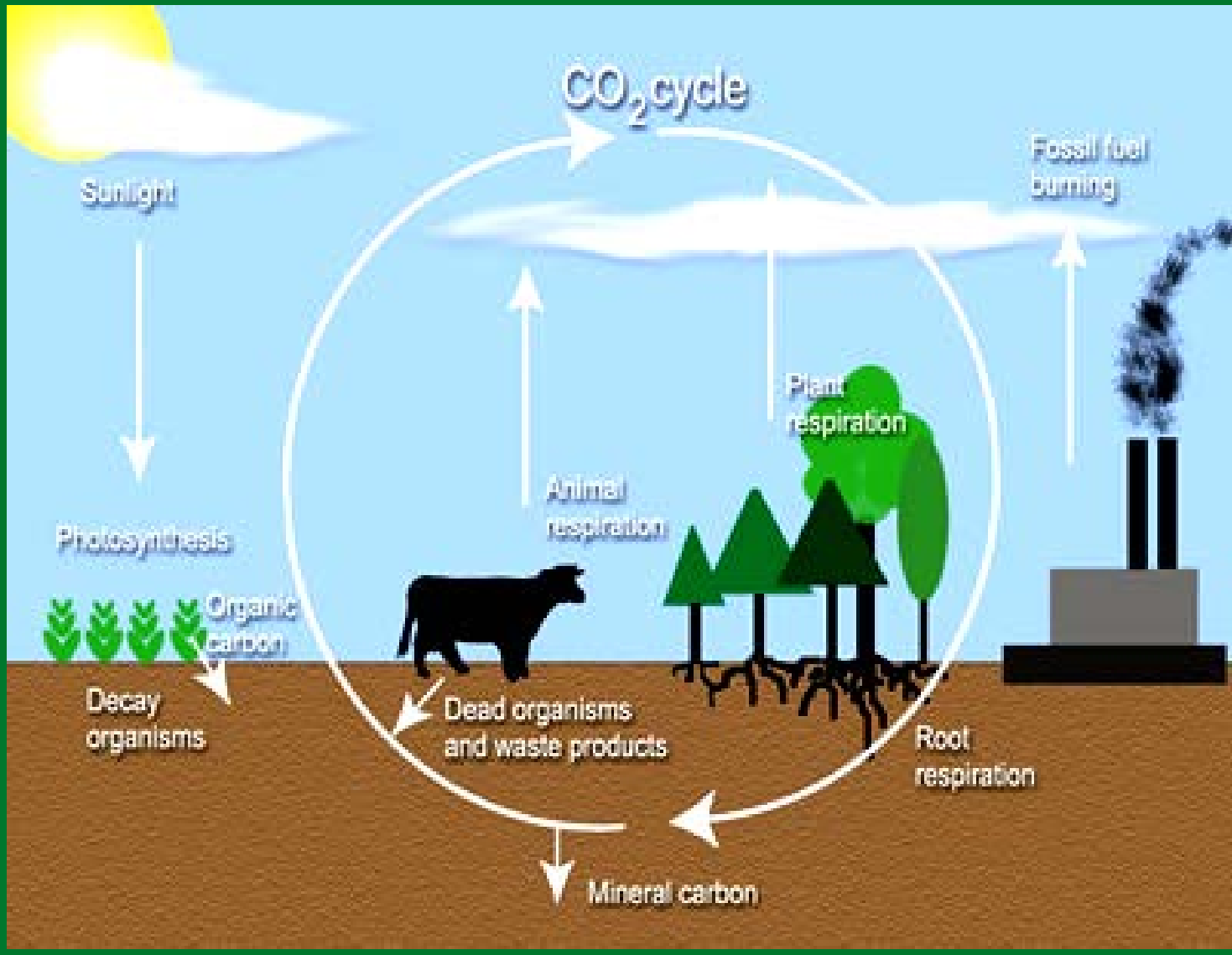


kg CO_2e/kg LW?

v

Sequestration



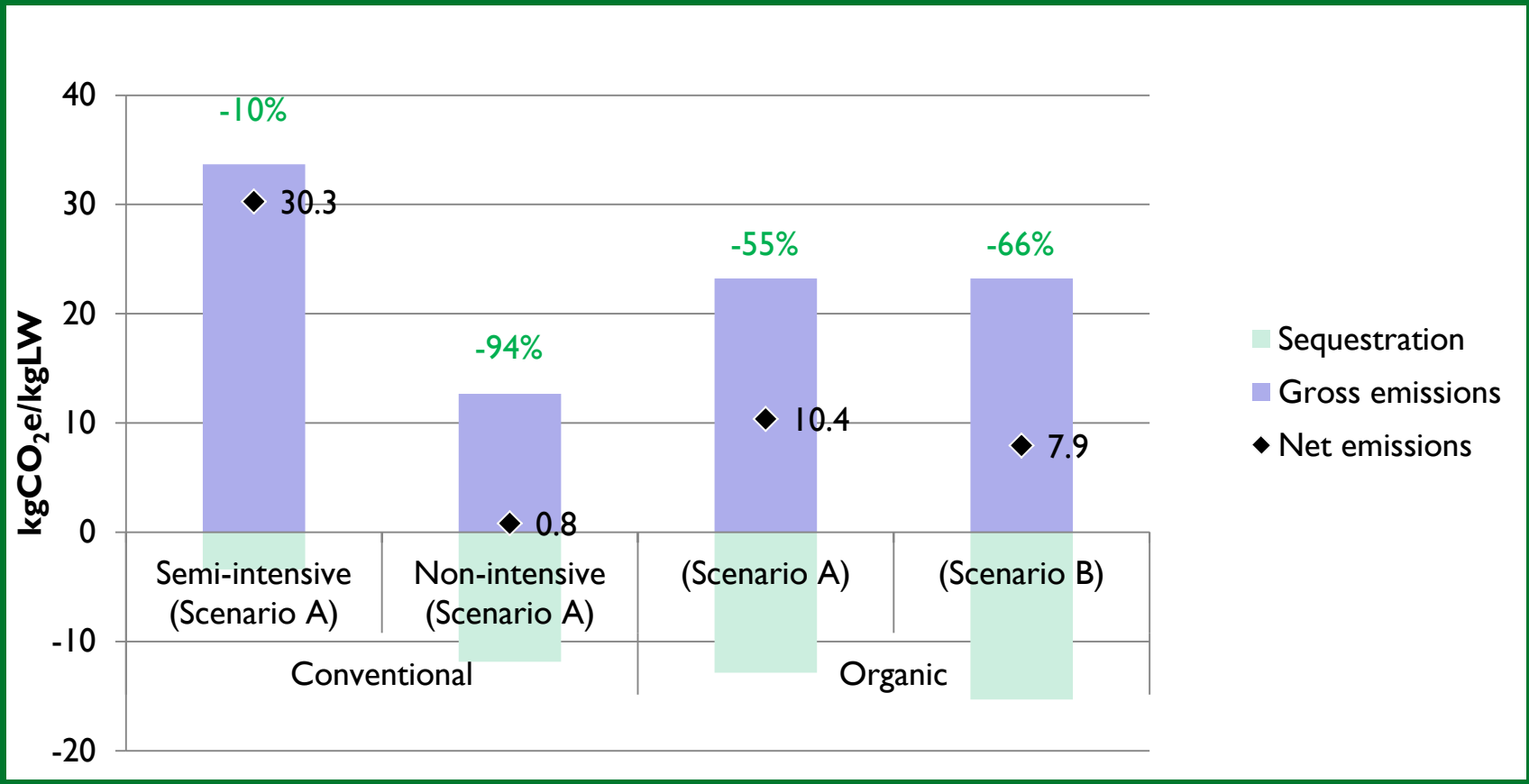


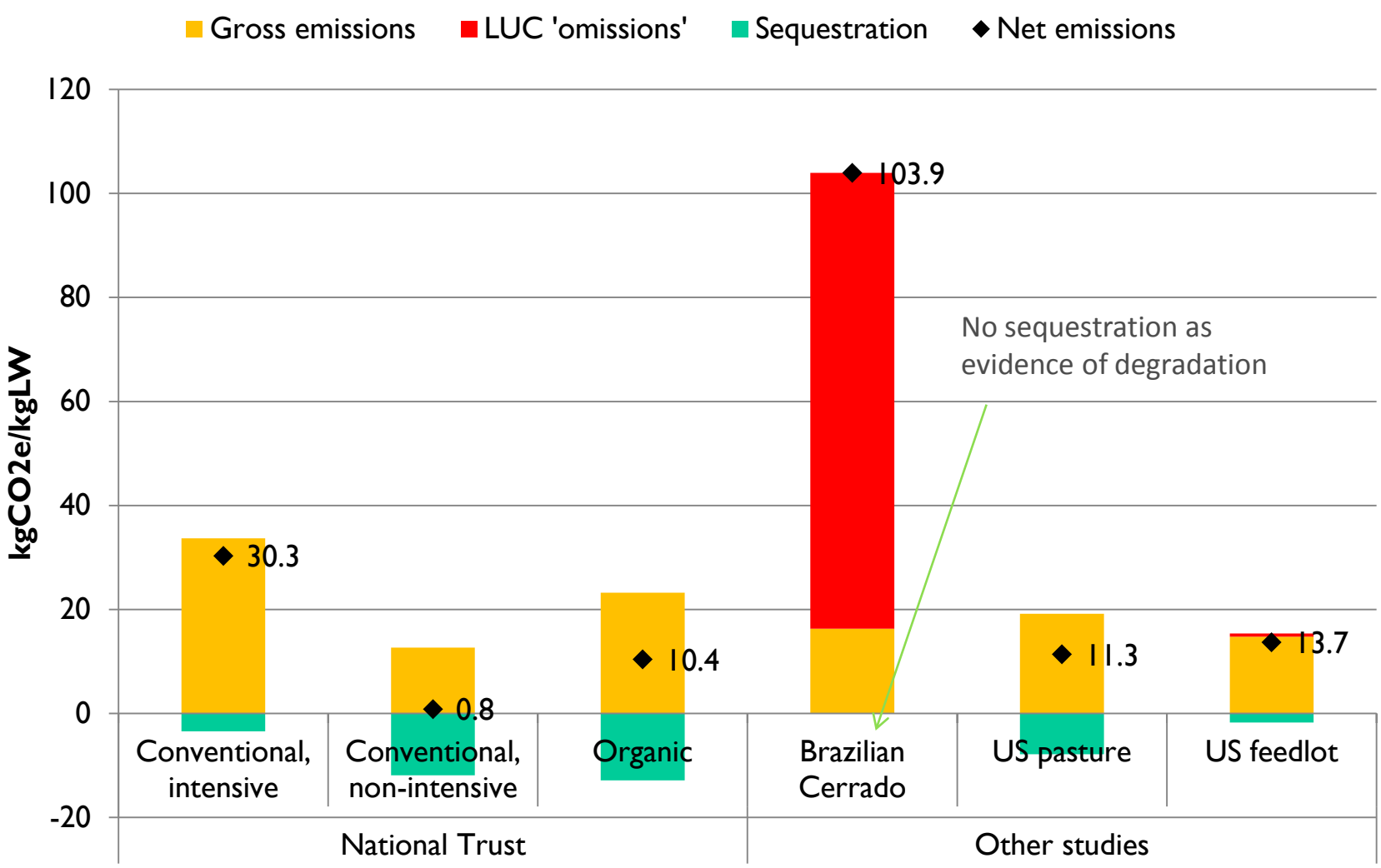
Soil carbon sequestration scenarios

- **Scenario A: Grass sequestration on all farms**
  - Permanent grassland sequesters carbon at a rate of 0.24tC/ha/year (Janssens, et al., 2005)
  - This approach was used by Taylor, et al., 2010 for The Countryside Council for Wales

- **Scenario B: Grass & crop sequestration post organic conversion**
  - Soil carbon levels improve at the following rates over 20 years
    - Grassland: 0.42tC/ha/year
    - Cropland: 0.55tC/ha/year
  - Derived from review of 10 Northern European Studies – including two from England, which demonstrated a 28% higher soil carbon level in organic soils. (Azeez, G. 2009.)

Farm models


40
30
20
10
0
-10
-20
kgCO2e/kgLW
-10%
30.3
-94%
0.8
-55%
10.4
-66%
7.9
Semi-intensive (Scenario A)
Non-intensive (Scenario A)
(Scenario A)
(Scenario B)
Conventional
Organic
Sequestration
Gross emissions
Net emissions


Gross emissions
LUC 'omissions'
Sequestration
Net emissions
kgCO2e/kgLW
120
100
80
60
40
20
0
-20
30.3
0.8
10.4
103.9
11.3
13.7
No sequestration as evidence of degradation
Conventional, intensive
Conventional, non-intensive
Organic
Brazilian Cerrado
US pasture
US feedlot
National Trust
Other studies

Sequestration summary

What happens if C sequestration is included in model

- Marked reduction in C-footprint
  - Potentially 10-94% reduction in the study farms
- Non-intensive conventional best
- However still much uncertainty
  - On-farm measurement needed
  - Saturation: Sequestration indefinite?
  - Permanence: What if carbon is released?

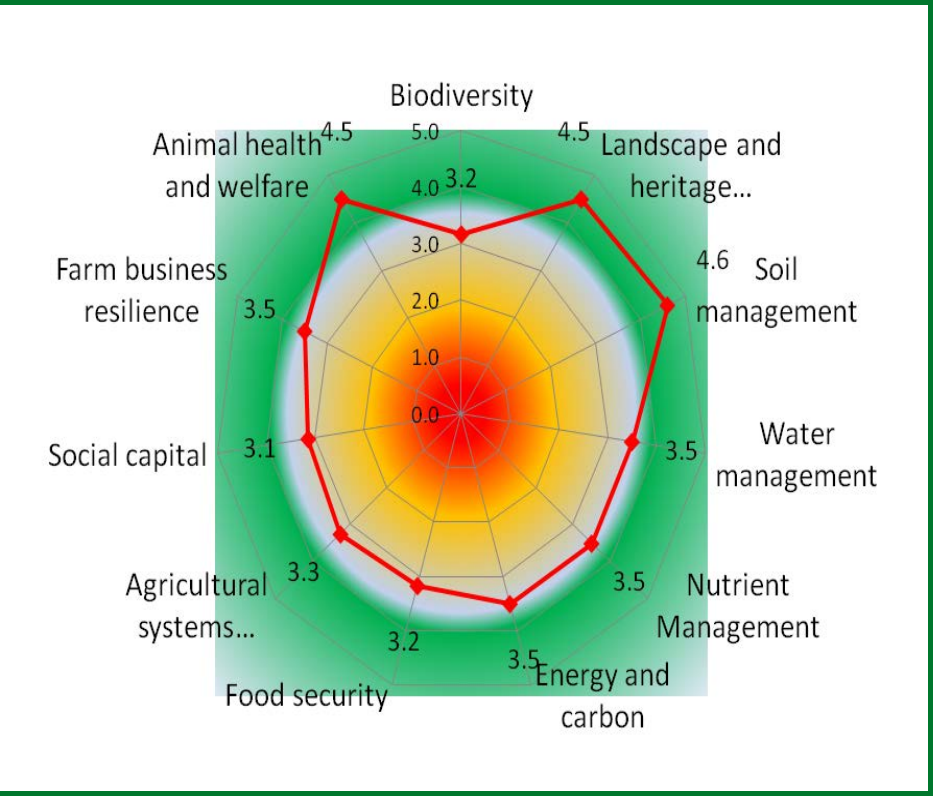
Where next – comparing *net* footprinting?

Improved sequestration modelling based on actual field and laboratory analyses.

Linking land capability to *optimal* food production

Focus on more sustainable feeds

Wider sustainability criteria?



System analyses should address;

- environmental impacts
- land use change
- meat quality

Thank you for listening