

Organic livestock production – implications for health and the environment

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Ruminants in mixed farming benefits:

- Allow commercial utilisation of forage legumes during fertility-building phase of rotations
 - increases profitability and productivity
 - clover and lucerne fix most nitrogen
 - provides on-farm FYM
- Allow land to remain in grass (and clover) for longer, which:
 - builds greater fertility
 - reduces cultivations and seeds costs
 - provides a longer break to reduce crop diseases

Mixed farming and ruminants problems:

- Ruminants produce methane, a potent GHG:
 - adult beef cattle 200 l/day, 50.7kg/yr
 - -dairy cows up to 550 l/day, 139.43kg/yr
 - atmospheric methane now over 1700ppb (before 1850, under 700ppb)
 - GWP of methane approx 25 times CO2

- reducing methane levels could slow climate change quickly because atmospheric methane breaks down in just 12-15 yrs

Livestock also responsible for some nitrous oxide emissions

Grazing animals going out of fashion amongst policy-makers

- Very high-yielding dairy cows produce more milk per litre of methane emitted, but need to be zerograzed to consume enough high-energy feed
- Grass-fed beef animals emit more methane than grain-fed beef animals
- Chickens emit almost no methane
- Chickens prolific and grow very quickly
- Cattle and sheep 1-2 offspring per year and grow relatively slowly = higher GHG emissions
- Carbon footprint of extensive beef and lamb said to be 3-4 times higher than intensive chicken

Red v. white meat

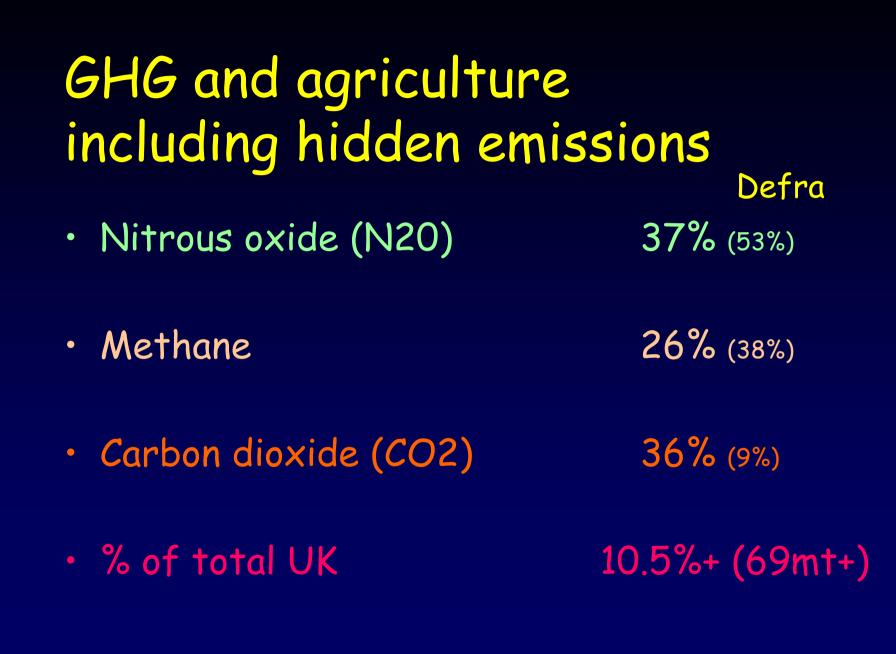
- Beef and lamb high in saturated fats
- Chicken low in saturated fats
- Red meat low in omega-3 fatty acids
- Chicken high in omega-3 fatty acids
- Red meat high in heme iron
- Chicken low in heme iron

GHG and agriculture (% of UK total) Defra statistics	
 Nitrous oxide (N20) 	53% (4%)
• Methane	38% (3%)
• Carbon dioxide (CO2)	9% (<1%)
 Agriculture % of total UK 	8% (48mt)

Hidden CO2 (million tonnes CO2e)

- Fuel and electricity 2.4
- N fertiliser production
- Recent grassland conversion
- Ongoing losses from Fens
- Losses from other cropland
- Imported feed soil C losses
 Total

2.4 8.5 9 1 ? ? 20.9+



Soil carbon

- Ploughing grassland = C & N losses
- Varies with soil C content
 In UK 23-90t/ha C (84-330t CO2/ha)
- No UK figures for soil N losses
- Dutch study = additional one-third
- Total 250t CO2e over 100 years
- = ave. 2.5 tonnes CO2/ha/yr for 100 yrs

Soil carbon and organic farming

- Soil carbon higher on organic farms but by how much?
- UN 11 studies averaged 200-400kg
 C/ha/yr
- Soil Association 39 studies averaged +28% in EU = 560kg/ha/yr (2053kg/ha/yr)

Theoretical organic farm

- 50:50 grass/crops
- 0.5LU/ha across whole farm
- GWP of ruminants =
- 0.5 x 52.74 x 90* = 2.37t CO2e/ha/yr
- Carbon sequestration could = 2.05t
 CO2e/ha/yr

* Generously allows for ongoing nature of ruminant emissions and recent research showing that GWP of CH4 higher than previously estimated

N fertiliser and GHGs

- In EU factories each tonne of Nfertiliser produces N20 and CO2 = to
 6.7t CO2e
- However approx. half of N-fertiliser imported from factories up to 4 times less efficient
- Ave. arable use = 147kg/ha/yr = 985+
 Kg CO2e/ha/yr)

Mixed organic v. all arable

Mixed organic 2.37-2.05 = 0.32tonnes CO2e/ha/yr All arable +0.985kg CO2e/ha/yr Mixed organic advantage 985- 320 = 665+ kg CO2e ha/yr

Grass v. grain-fed beef

- Grazing animals
- More stearic SFA (benign)
- More oleic MUFA (olive oil)
- Less Palmitic SFA (possibly harmful)
- UP to 11 times more Omega-3 PUFA
- More CLA

Red meat v. chicken

- Less omega-3 overall but
- Chicken Omega-6 to Omega-3 ratio
- Approx 10:1
- Beef Omega-6 to Omega 3 ratio
- Average of 7 studies 1.53:1