# Organic livestock production – implications for health and the environment

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Organic Producers' Conference – January 2011

Soil Association

# 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 zero-grazed 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 | 8.5 |
| • Recent grassland conversion | 9 |
| • Ongoing losses from Fens | 1 |
| • Losses from other cropland | ? |
| • Imported feed soil C losses | ? |
| Total | 20.9+ |

# GHG and agriculture including hidden emissions

| | Defra |
|---|---|
| • Nitrous oxide (N20) | 37% (53%) |
| • Methane | 26% (38%) |
| • Carbon dioxide (CO2) | 36% (9%) |
| • % of total UK | 10.5%+ (69mt+) |

# 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 N-fertiliser 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