

Impact of Agriculture & Food Distribution on Climate Change

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Agriculture & food industry- contribution to climate change

- Historically, alongside the burning of fossil fuels, agriculture has **caused** the production of about half the world's greenhouse gas emissions to date.
- Today, industrial agriculture and the food distribution system continues to be a major cause, producing about **18%** of the UK's greenhouse gas emissions.
- Agriculture also determines how severe many of the **impacts** of climate change will be on society

**What is “climate-friendly”
food”?**

Greenhouse gas emissions of UK food & agriculture

| | GHGs of UK production | | GHGs of UK consumption | |
|----------------------------|-----------------------|-------|------------------------|--------|
| | % | MTCe | % | MTCe |
| Agriculture | 8.0 | 14.32 | 8.78 | 17.90 |
| Food manufacturing | 1.8 | 3.22 | 2.63 | 5.37 |
| Food transport (UK) | 1.5 | 2.70 | 2.54 | 5.18 |
| Food retailing | 1.00 | 1.79 | 0.88 | 1.79 |
| Food catering | 1.66 | 2.97 | 1.46 | 2.97 |
| Home food related | 2.25 | 4.03 | 1.98 | 4.03 |
| TOTAL FOOD | 16.21 | 29.03 | 18.26 | 37.24 |
| TOTAL UK GHGs | 100 | 179 | 100 | 203.90 |

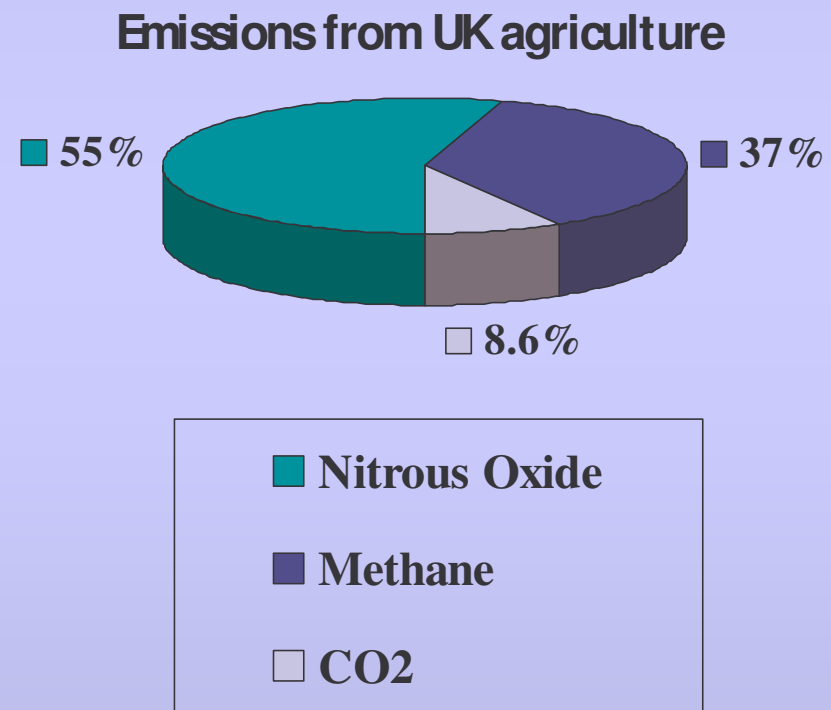
Agriculture today

UK agriculture sectors

| Sector | Global warming impact (kg CO _{2e} per tonne) | Main factor in energy use |
|------------------------|--|--------------------------------|
| Potatoes | 235 | Storage, drying, cooling – 36% |
| Feed maize | 577 | Fertiliser manufacture – 61% |
| Feed wheat | 731 | Fertiliser manufacture – 51% |
| Breadwheat | 804 | Fertiliser manufacture – 53 |
| Oilseed rape | 1,710 | Fertiliser manufacture – 52% |
| Milk (per 1000 litres) | 1,600 | |
| Poultry meat | 4,570 | Concentrate feed |
| Eggs (per 20,000) | 5,530 | Concentrate feed |
| Pigmeat | 6,360 | Concentrate feed |
| Sheep | 7,500 | Intensive grass production |
| Beef | 15,800 | Concentrate feed – 50% |

How agriculture contributes to climate change in the UK

- Officially, agriculture accounts for 8% of the UK's emissions (178 million t Ce).
- But, this excludes large CO₂ & N₂O emissions from farm inputs and soil carbon losses
- Nitrous oxide is the main greenhouse gas, then methane; CO₂ is



Nitrous oxide & crop nutrition

- 310 times as powerful as CO₂ (over 100 years)
- atmospheric levels have increased 16%
- from conversion of atmospheric nitrogen (N₂) into N₂O
- 61% of England's N₂O emissions are produced by farms from the use of nitrogen as a crop nutrient; 9% is emitted during nitric acid production (for fertiliser)
- **solution:** avoid fertilisers and reduce use of nitrogen in farming, ie. organic farming & less meat consumption

Methane & meat consumption

- 23 times as powerful as CO₂ (over 100 years)
- since 1750, levels have risen two & a half fold
- from biological processes in anaerobic conditions
- agricultural emissions: 84% from cattle & sheep (ruminant digestion) & 16% from manure management
- global rise in meat consumption threatens progress
- **solution:** less but better quality meat consumption, ie. more extensive, outdoor production (all organic is)

Carbon dioxide

- the main greenhouse gas
- agriculture accounts for c.3% of UK total
- agriculture produces CO₂ through (i) the use of energy and (ii) soil carbon losses
- *direct* use of energy on the farm accounts for 28% of agriculture's energy (fuel for farm machinery, electricity for milking, drying grain crops, storing potatoes and ...)

The hidden side of industrial agriculture - indoor production

- Glasshouse production:
 - out-of-season vegetables, eg. nearly all UK tomatoes
 - heating and ventilation of glasshouses
 - very energy intensive
- Indoor pig and poultry production:
 - intensively produced animal feed grain
 - heating and lighting of houses
 - high levels of (intensively produced) feed are imported

**The hidden side of
industrial agriculture -
agrochemicals**

Nitrogen fertiliser

- most energy (72%) is the manufacture of farm inputs: fertilisers, pesticides, animal feed & veterinary drugs
- nitrogen fertiliser, the basis of industrial agriculture: **37%** of total energy & produces **6.7t CO₂e per t N**
- raw material is fossil fuel (natural gas)
- 3 million t of N fertiliser, half of which is imported
- application causes N₂O emissions & reduces soil C bank
- exacerbates the consequences of climate change
- our food prices are vulnerable to rising energy prices

Soil Carbon

- soil contains twice as much C as the atmosphere
- but soil now has a lower C state than natural level
- 25 year survey found “enormous” soil C losses in UK, not yet included in the UK greenhouse gas inventory
- causes: rising temperatures, land drainage, reliance on inorganic fertiliser & intensive grazing
- **solution:** move away from inorganic fertilisers to organic matter-based farming ie. organic farming

Agricultural & food transport

- industrial agriculture is a transport based system, because it is based on agrochemical & feed inputs
- after the farmgate, food products now travel far:
 - trade changes: rise in global trade of agricultural products
 - food industry: large abattoirs & centralised distribution
 - rise in 'processed' foods, over fresh wholefood
 - change in dietary preferences: exotic foods & more meat
- **solution:** local, unprocessed, organic food, less meat

Climate change impacts & adaptation

Climate change impacts & adaptation

Agriculture is a key factor in the severity of the main consequences of climate change:

- **flooding** risk depends on soil run-off rates: soil organic matter improves soil structure and can double percolation rates
- **drought** may affect food supplies and prices: inorganic fertiliser reduces water retention capacity and crop root size
- **water scarcity** will be exacerbated by agricultural water demand for fertiliser production (37 m³ per t) and irrigation

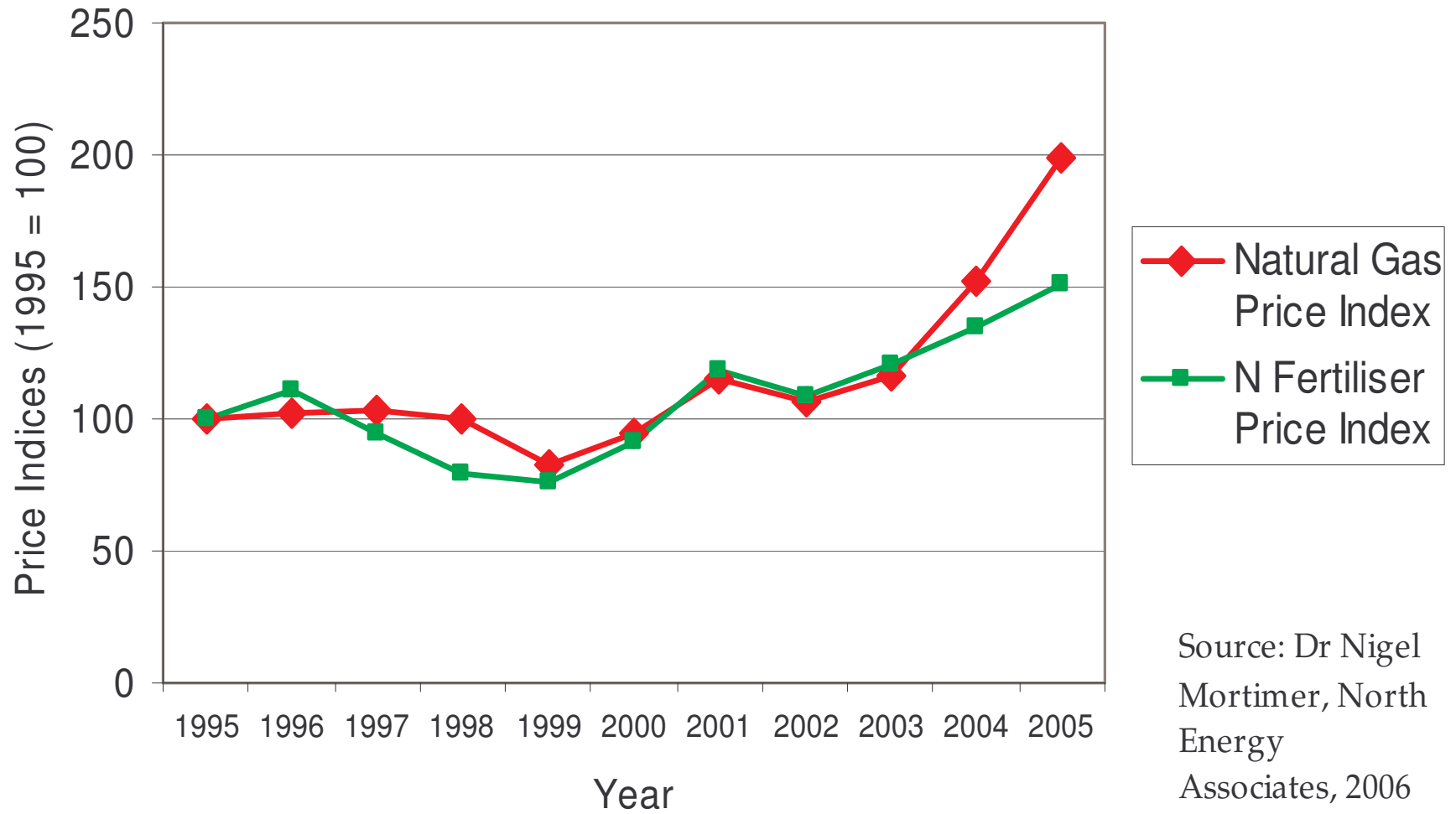
Solution: move from inorganic fertiliser to organic matter

‘Peak Oil’ & rising energy prices

Impacts of rising energy prices

- farm input prices will increase, especially N fertiliser, so industrial farming will become more expensive
 - electricity costs for indoor production will increase, increasingly favouring seasonal outdoor production
 - the cost of importing food imports will increase
 - costs of food processing & packaging will increase
- > industrial food prices will increase and economics will favour organic, local, seasonal, unprocessed food?

Natural Gas and Nitrogen Fertiliser Price Indices



Organic Farming

- based on *natural* processes *in situ* , eg. clover to fix N and composting to build soil organic matter levels
- avoids emissions from the manufacture of farm inputs
- reduces energy use: 29%/t for wheat & 33%/t for milk
- builds soil carbon levels by 0.3-1t per hectare per year
- reduces flooding risk and agricultural water use
- reduces vulnerability to drought & rising energy prices
- reduces food transport (3 times as likely to sell locally)

Organic farming energy efficiency

| Sector | Main factor in non-organic energy use | Organic energy use/t vs. non-organic |
|---------------|--|---|
| Breadwheat | Fertiliser manufacture – 53% | 29% less |
| Oilseed rape | Fertiliser manufacture – 52% | 25% less |
| Potatoes | Storage, drying, cooling – 36% | 1.6% more |
| Beef | (non-organic) concentrate feed – 50% | 35% less |
| Sheep | (non-organic) grass production | 20% less |
| Milk | | 38% less |
| Pigmeat | (non-organic) animal feed | 13% less |
| Poultry meat | (non-organic) animal feed | 32% more |
| Eggs | (non-organic) animal feed | 14% more |
| Tomatoes | Heating & electricity use for glasshouse | 30% more |



“Food for Life” ... tasting, enjoying,
engaging, improving environmental & health performance!

The Soil Association’s “Food for Life” campaign aims to improve the quality of school meals by encouraging the use of fresh, local and organic ingredients as well as improving food education.

Ingredients targets: 75% unprocessed

50% local

30% organic

and food education

The Soil Association is now working with over 700 schools across the UK.

Climate friendly food catering

- Review contracts - opportunity for improvements
 - review food served to staff, visitors and office events
 - start with an organic or local food trial, eg. in staff canteen or Christmas lunch
 - control **budget**: seasonality, negotiation & shortening supply chain, cut wastage
- Work with caterers and identify suppliers of local, organic food
 - encourage caterers to find and negotiate new sources, introduce gradually
 - ensure supplies are **really** organic (certified) and local (not just local wholesaler!)
- Review menus for healthy focus and budget control
 - staples: often organic dried produce (rice, pasta) and dairy are quick wins
 - fruit & veg: **seasonal** is more competitive and produces even less emissions
- Communicate what and why to staff and clients
 - inform and enthuse staff: information in canteen, visit and adopt an organic farm
 - use to give good impression to clients and assist business relations

Business catering - how to do it

1. **Wessex Water, Britvic and Merck, Sharp, Dohme**
 - Avance Catering serving staff local and seasonal organic food, very popular
 - suppliers: Bath Organic Farms (Weston), Ashlyns Organic Farm (Essex), and local meat
2. **Defra - “Food Procurement Toolkit”**
 - toolkit to increase the use of small and local food suppliers for public sector (www.defra.gov.uk)
 - BaxterStorey Catering is now trialling, serving local, organic & Fairtrade food in Defra offices
3. **Soil Association - organic sourcing information**
 - online resource for supplier & caterers: www.soilassociation.org/sourcemarketplace
 - Soil Association Certification can provide lists of organic licensees

Conclusions

- Agriculture is a major cause of climate change (50%/18%) & has a major role to play in reducing the impacts of climate change on society
- Organisations and businesses should move to routinely supplying or requesting climate-friendly food
- **“Climate-friendly” food is: seasonal, organic, unprocessed whole food, local, and less but better meat**