The comparative energy efficiency of organic farming

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Introduction

- Agricultural fossil energy use is important due to decline in oil and gas supplies
- Rise in energy price impacts food costs
- Also significant for its contribution to climate change
- Only global warming factor to be fully measured for several farming sectors in one country

‘On-farm’ use of energy

Energy is used as on-farm for:

- fuel for field machinery
- electricity for farm operations (drying grain, milking and refrigerating milk, drying and storing potatoes)
- indoor crops: fuel for heating glasshouses for ‘out-of-season’ vegetables (tomatoes, courgettes & peppers)
- indoor livestock: electricity for heating and lighting ‘factory’ farms (pigs & poultry)

The hidden side of industrial agriculture

The manufacture of industrial farm inputs

- Only 28% of energy is used on the farm
- most energy, 72%, is used to manufacture, package and transport the industrial farm inputs
- fertilisers (37%),
- animal feed (16%),
- tractors (10%)
- pesticides (8%)
- plus vet drugs, glasshouse frames, plastic silo wrap...

Methodological issues

- Important to include energy used to produce all inputs
- Issue of human labour
  - very different policy implications
- Studies of agricultural energy use do not provide assessment of global warming impact
- Fossil energy use is only one source of greenhouse gases in farming

Data sources

- Data taken from 2 studies funded by UK government
- 15 sectors in total

Analysis:

- Energy use by sector
- Energy efficiency of organic vs non-organic
- Difference in annual national energy use if organic, at current UK production levels

How do the sectors compare?

Traditional British field vegetables	< 1.5 GJ / t
Milk & potatoes	1.5 - 2.5 GJ / t
Cereals	2 - 5 GJ / t
Chicken & eggs	14 - 16 GJ/t
Beef, sheep, pigs	22 - 27 GJ/t
Out-of-season glasshouse vegetables (tomatoes, courgettes, peppers)	c.120 GJ / t

Organic farming energy efficiency

Sector	Non-organic energy use, GJ/t	Organic energy use
Carrots	0.6	25% less
Cabbage	0.9	72% less
Leeks	1.0	58% less
Onion	1.3	16% less
Potatoes	1.5	14% more
Bread wheat	2.4	16% less
Milk	2.6	28% less
Oilseed rape	4.9	3% more
Eggs	13.7	10% more
Poultry meat	15.2	11% more
Pigmeat	22.0	35% less
Sheep	25.0	57% less
Beef	26.5	41% less
AVERAGE		**26% less**

UK national production

- Each sector weighted according to current UK production levels
- Low energy-intensive foods can have significant energy demands if produced and consumed in large quantities
- Organic production would save UK agriculture 20% on its energy bill
- Greatest national savings in milk and beef (almost 10,000,000 GJ/year in each)
- Significant savings in sheep, pigs and wheat

Strengths of organic farming

- Harnesses natural ecological and biological processes in place of manufactured inputs
- nitrogen fertiliser is made from is fossil fuel (natural gas) and is 37% of UK agriculture's total energy use
- Use of solar energy to fix atmospheric N in conjunction with bacteria and leguminous crops
- Mixed farming – use of animal manure

Weaknesses of organic farming

- Lower yields in North West Europe
- Issues with methodology of studies
- Poultry meat and eggs
- Outdoor, free range systems less energy efficient than factory farms
- Animal welfare and reliance on antibiotic drugs unacceptable – eat less

Conclusions

- Organic farming is on average 26% more energy efficient
- Offers substantial national savings on fossil fuel
- Food choices are important
- An energy-efficient and climate-friendly diet is: organic, seasonal, local and unprocessed, with less meat

Thank you