

P_{olicy}

I_{ncentives}

for

C_{limate}

C_{hange}

M_{itigation}

A_{gricultural}

T_{echniques}

Addressing the climate challenge What can agriculture do?

An example from Denmark

PICCMAT Final symposium

Brussels, Borschette Centre, 28 October 2008

Jørgen E. Olesen, Aarhus University

P_{olicy}

I_{ncentives}
for

C_{limate}

C_{hange}

M_{itigation}

A_{gricultural}

T_{echniques}

Contents

1. Current structure of Danish agriculture
2. Current trends in greenhouse gas emissions from Danish agriculture
3. Which measures can be implemented on different farm types?
4. Which incentives could be used to reduce emissions?

P_{olicy}

I_{ncentives}
for

C_{limate}

C_{hange}

M_{itigation}

A_{gricultural}

T_{echniques}

Characteristics of DK agriculture

- Agriculture occupies 62% of land area
- 55 % of agricultural area is in cereals
- 20 % of cereal grains are exported
- 80 % of butter and cheese are exported
- >80 % of meat is exported
- Detailed and strict regulation on N fertiliser and manure use has been implemented

P_{olicy}

I_{ncentives}

for

C_{limate}

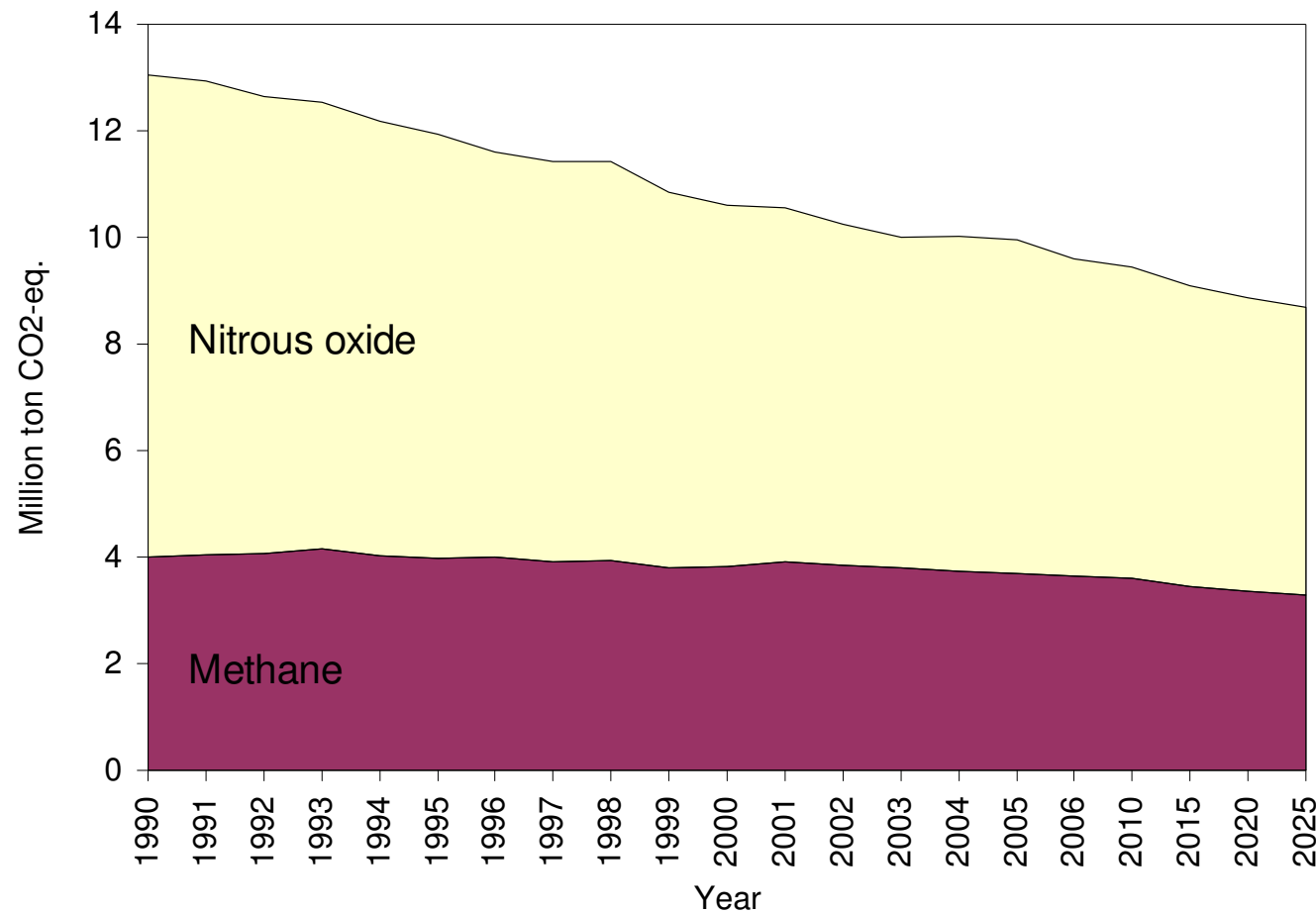
C_{hange}

M_{itigation}

A_{gricultural}

T_{echniques}

Development in CH₄ and N₂O from agriculture in Denmark



Brussels,
28 October 2008

Addressing the climate challenge – what can agriculture do?
Ideas from Europe and beyond

P_{olicy}

I_{ncentives}

for

C_{limate}

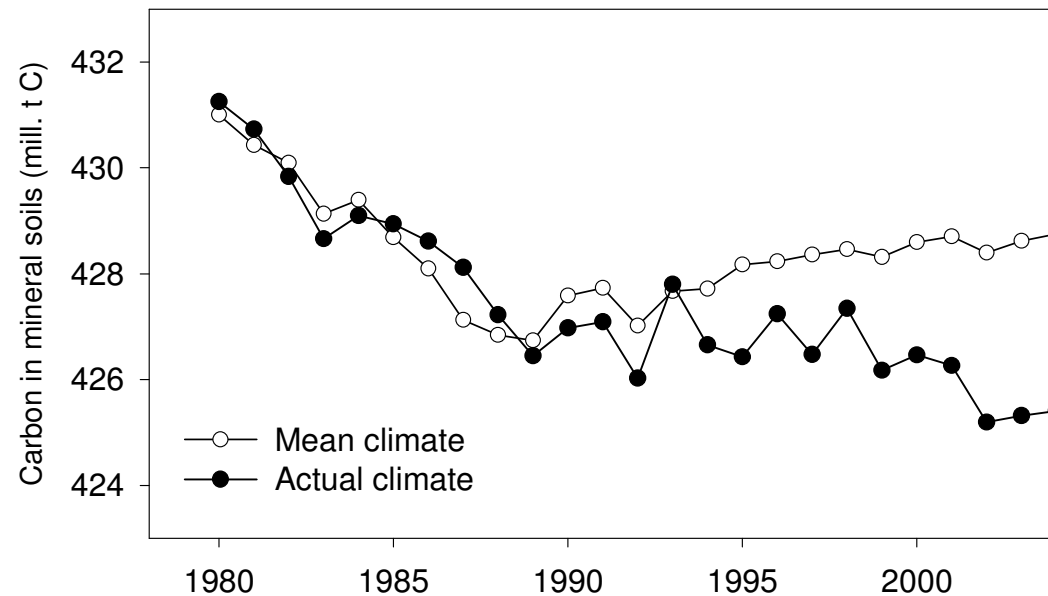
C_{hange}

M_{itigation}

A_{gricultural}

T_{echniques}

Development of carbon in mineral agricultural soils in Denmark



The changes around 1990 are caused by a ban on field burning of straw. There was a political will to ban straw burning, because of smoke pollution.

P_{olicy}

I_{ncentives}

for

C_{limate}

C_{hange}

M_{itigation}

A_{gricultural}

T_{echniques}

Projected GHG reductions from Danish agriculture 1990-2012

Source	mill. ton CO ₂
Methane	0.3
Nitrous oxide	2.9
Carbon in mineral soils	1.5
Carbon in organic soils	0.1
Less use of lime	0.3
Total	5.1

In total Danish agriculture is expected to cover 35% of Denmark's reduction commitment under the Kyoto Protocol

P_{olicy}

I_{ncentives}

for

C_{limate}

C_{hange}

M_{itigation}

A_{gricultural}

T_{echniques}

Contribution of GHG reduction measures (% of total emission) on farm types

Farm type	Cattle, per cow	Pigs, per sow with slaughter pigs	Arable farms, per ha
Typical emissions (kg CO ₂)	14,000	7,500	3,500
Staw incorporation		8.9	24.0
Biogas	3.8	6.7	
Burning of solid manures		4.5	
Cooling of slurry, pigs		0.4	
Covering of slurry stores	0.8	1.3	
Covering of solid manures	5.4		
Feeding cattle with more fat	6.0		
Improved N-utilisation, pigs		2.3	
Catch crops	1.4	3.8	7.5
Reduced tillage		1.5	3.2
Nitrification inhibitors			5.1
Total	10-18	15-29	20-40

P_{olicy}

I_{ncentives}

for

C_{limate}

C_{hange}

M_{itigation}

A_{gricultural}

T_{echniques}

Contribution of GHG reduction measures (% of total emission) on farm types

Measure	Extent	CH ₄ + N ₂ O	Soil C	Bioenergy	Total
<i>Bioenergy</i>					
Manure for biogas	45 %	452	-70	252	634
Incineration of degassed gylle	30 %	73	-53	59	79
<i>Improved manure handling</i>					
Cooling of slurry in houses	20 %	4	0	0	4
Frequent removal of slurry	20 %	-12	13	0	2
Cover on slurry stores	40 %	41	0	0	41
Cover on solid manures	80 %	1	0	0	1
<i>Animals</i>					
Increased fat in feed	50 %	248	0	0	248
<i>Improved N utilisation</i>					
Reduced N for grasslands	200.000 ha	93	0	0	93
Nitrification inhibitors	100 %	272	0	0	272
<i>Change in land use</i>					
Catch crops	400.000 ha	-14	293	0	280
Reduced tillage	200.000 ha	0	66	-8	58
Organic soils out of production	27.000 ha	20	274	0	295
Total		1178	523	303	2007

P_{olicy}

I_{ncentives}
for

C_{limate}

C_{hange}

M_{itigation}

A_{gricultural}

T_{echniques}

Incentives to reduce emissions currently being considered

- Regulate (prescribe or prohibit) certain practices
- Tax on methane and nitrous oxide emissions from individual farms
- Financial support for climate friendly agriculture based on either:
 - A list of approved measures
 - A farm scale accounting of greenhouse gas emissions (reduction relative to a standard)