



Cropland and Grassland Management

Accounting for agr. land in Denmark

LULUCF meeting

28. February – 1 March 2013, ISPRA, Italy

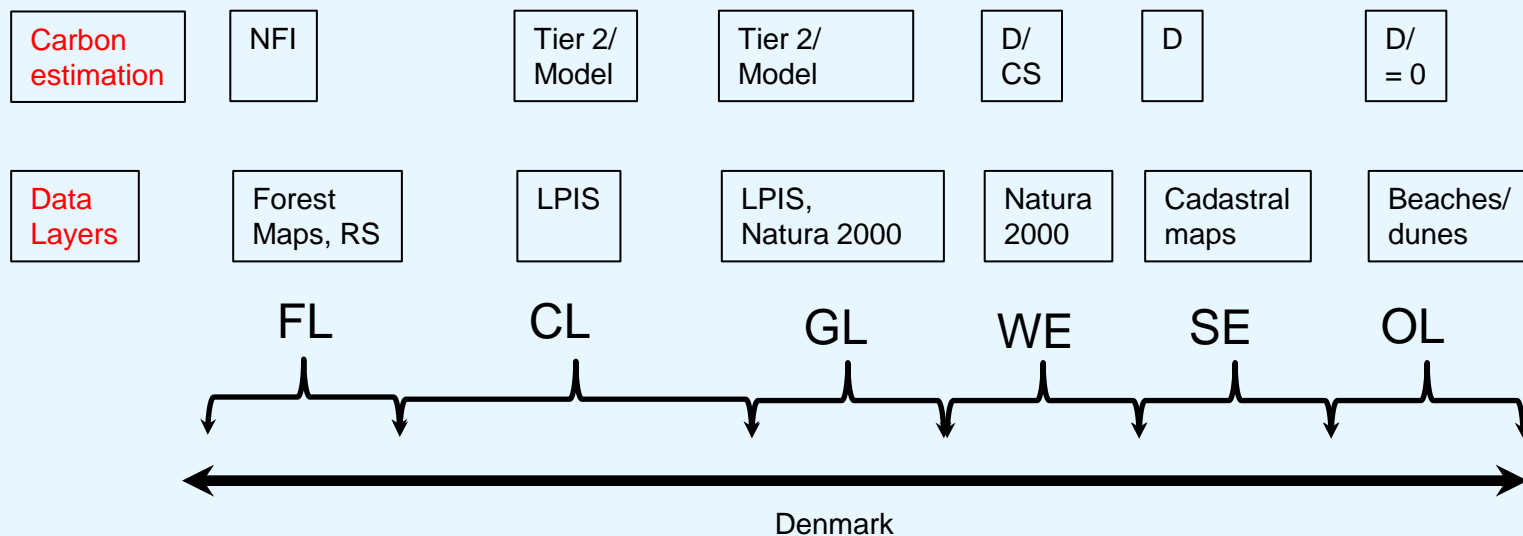
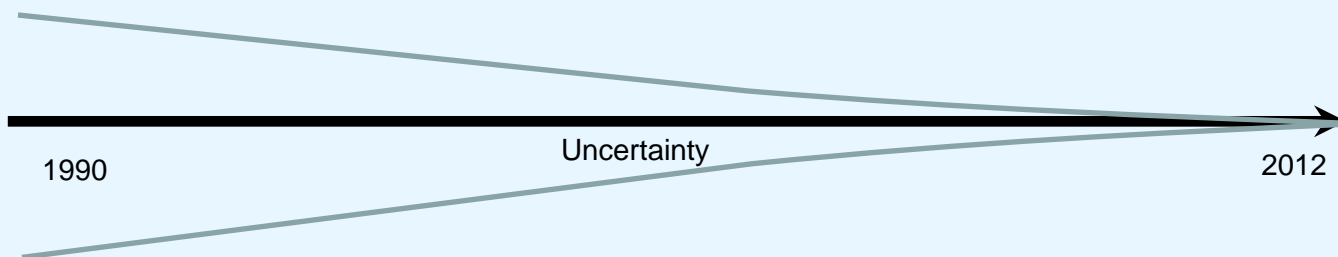
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	1990	2011
5. Land Use, Land-Use Change and Forestry	-5386	2317
A. Forest Land	-49	6479
1. Forest Land remaining Forest Land	-50	6326
2. Land converted to Forest Land	1	153
B. Cropland	-5046	-3778
1. Cropland remaining Cropland	-5052	-3803
2. Land converted to Cropland	6	25
C. Grassland	-183	-248
1. Grassland remaining Grassland	-165	-172
2. Land converted to Grassland	-18	-76
D. Wetlands	-91	-79
1. Wetlands remaining Wetlands (3)	-86	-45
2. Land converted to Wetlands	-5	-35
E. Settlements	-16	-56
1. Settlements remaining Settlements (3)	NO	NO
2. Land converted to Settlements	-16	-56
F. Other Land	0	0
1. Other Land remaining Other Land (4)	NO	NO
2. Land converted to Other Land	NO	NO
G. Other (please specify)(5)	0	0

What did we do?

- › **Priority – What do we know for sure?**
- › **Gap filling**
 - › **Field maps, 2011 (LPIS 1998-2011) EU Cross Compliance**
 - › **Cadastral maps, date**
 - › **Lakes**
 - › **Nature 2000 habitats**
 - › **Forest, maps –**
 - › RS, 1990, 2005, 2011
 - › **3% left**
 - › **0.3% left**



Land Use Matrix 1990-2011

1990\2011	Forest	Cropland	Grassland	Wetlands	Lakes	Settlements	Other	Sum
Forest	539022	0	1093	2174	346	614	0	543249
Cropland	46518	2557665	86090	6148	3971	15529	0	2715921
Grassland	38596	37619	335933	3251	1421	9326	0	426146
Wetlands	6	0	0	69531	6	35	0	69578
Lakes	0	0	0	0	58666	3	0	58669
Settlements	0	0	0	0	0	465779	0	465779
Other	0	0	0	0	0	0	26239	26239
Sum	624142	2595284	423115	81104	64410	491286	26239	4305581
Percentage	14%	60%	10%	2%	1%	11%	1%	100%



Outline

- › **Denmark's election of Cropland and Grassland Management**
- › **Problems faced**
- › **Results**
- › **General remarks on Convention and KP reporting**
 - › **The scientific level**
 - › **The reporting level**

The Danish election of 3.4

› Data used

- › Satellite/Landsat
- › LPIS from 1998 –
- › Ortophotos of hedges in 1990 and 2005
- › Digital soil surface model (LIDAR, 2*2 m²)
- › Soil sampling >10,000 soil cores in organic soil
- › 464 soil samples in mineral soils (resampling)
- › 300 soil samples in forest soils (base line)

Denmark – available data

› Forest area

- › 1990, 2000 census data for area, no C-stock data
- › 2002 – 5 years rotation
 - › Sample based National Forest Inventory

› Cropland

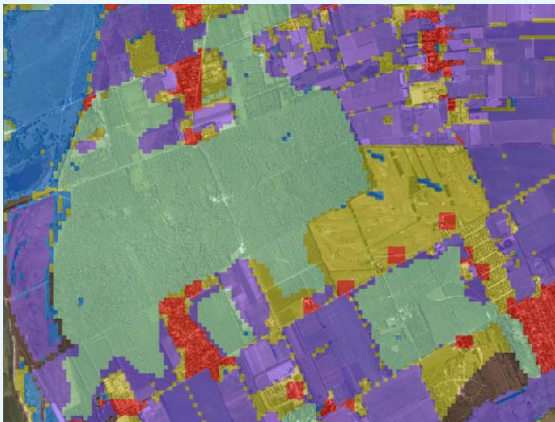
- › Census from statistics Denmark
- › 1998 to 2012 annual data from the EU-subsidiary system – single payment scheme

› Grassland

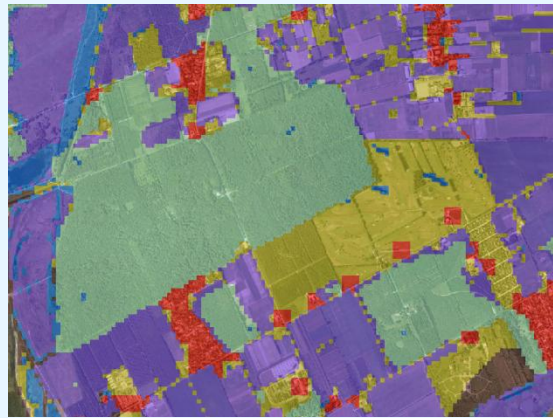
- › Census from statistics Denmark
- › 1998 to 2012 annual data from the EU-subsidiary system – single payment scheme:
 - › but permanent grassland in this regime is not grassland in IPCC regime.

Land use matrix

- › **Changes in land use categories is a night mare**
 - › **High resolution gives large changes**
 - › **Low resolution gives few changes**



1990



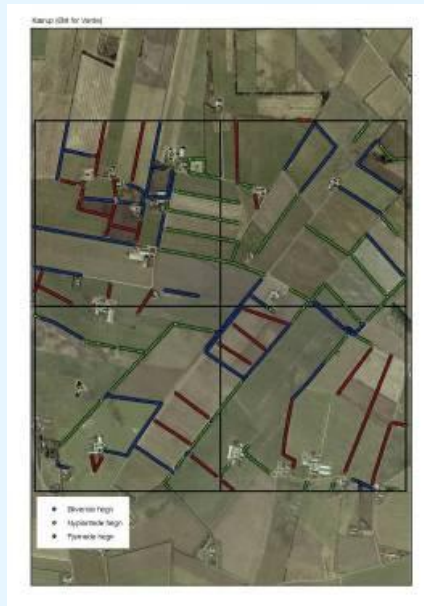
2005



2010

Living biomass in Cropland

- Hedgerows
- Orchards and fruit plantations



Jutland

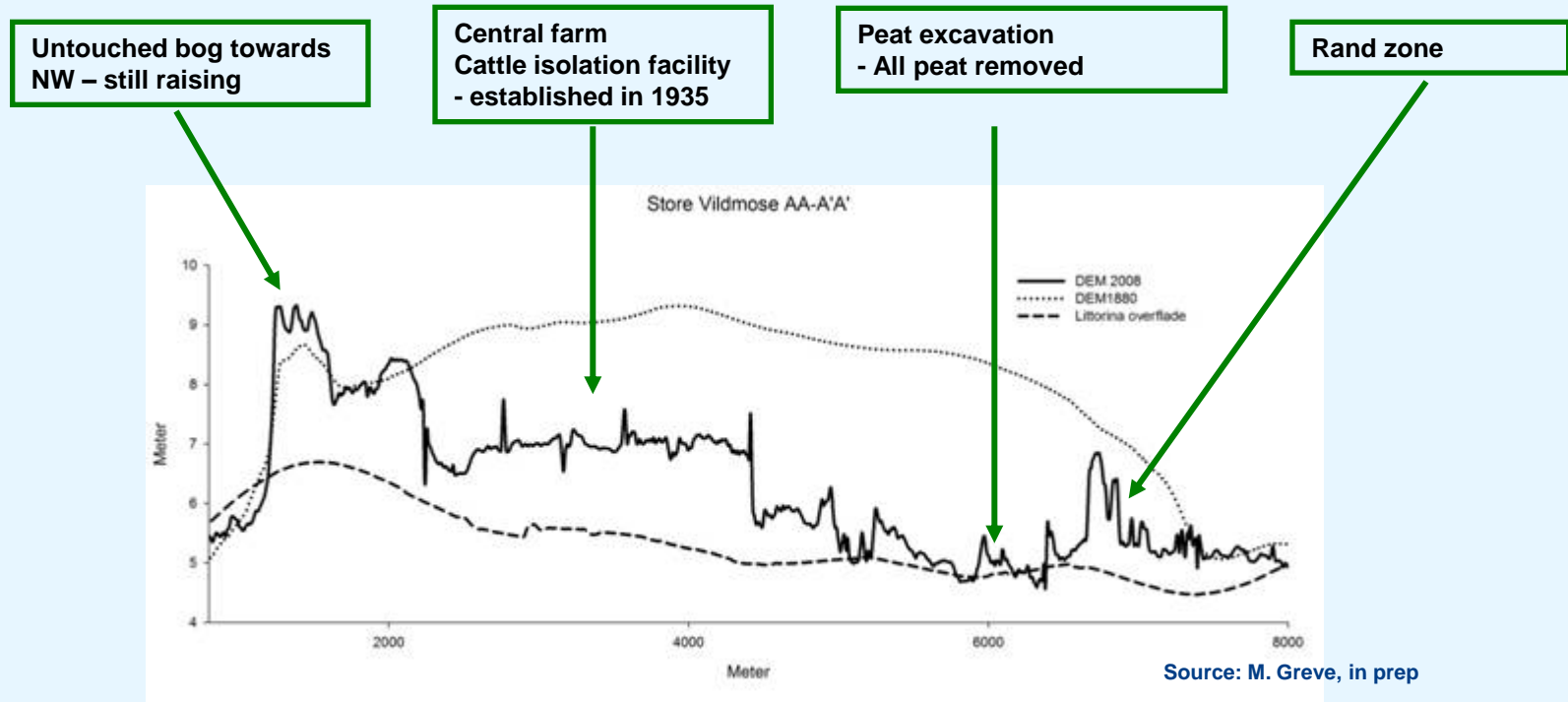


Fyn

Very large dynamic in hedgerows in Denmark, large changes are expected in intensive cropland areas

St. Vildmose, 1880 – 2010,

- The largest raised bog in Northern Europe
- relatively untouched until 1935

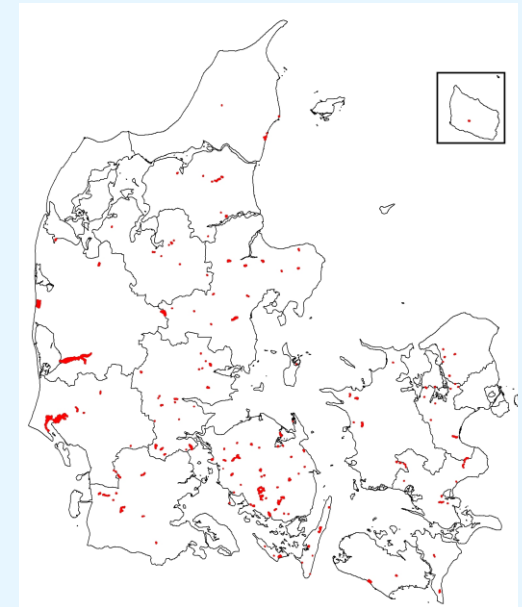


- › Based on LIDAR digital surface model (1.6*1.6 m²)
- › Settlements are caused both by C-loss and drainage
- › Peat used for energy purposes are included in the reduction commitments, peat for horticultural purposes are not included (0.06 % of the total Danish emission)

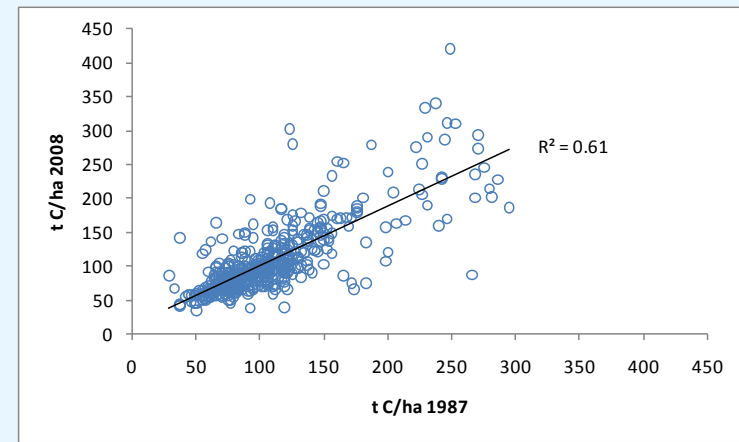
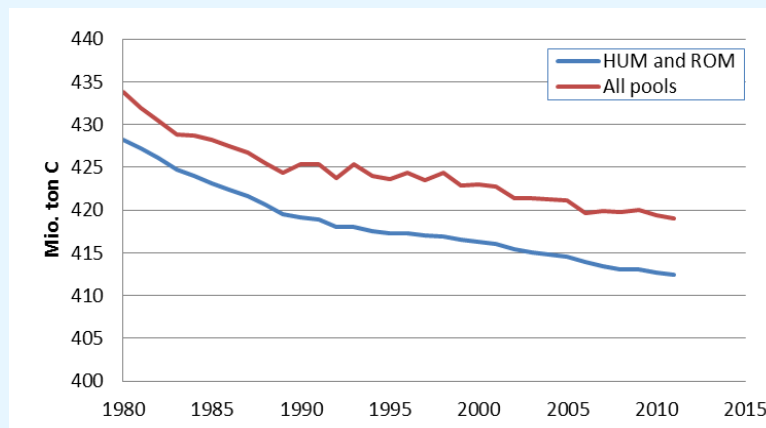
Wetlands – voluntary in the future?

› What is wetland?

- › Very difficult to estimate the area
- › Not all of the area is turned into partly water covered or fully water covered
- › Large emissions of CH₄ can occur



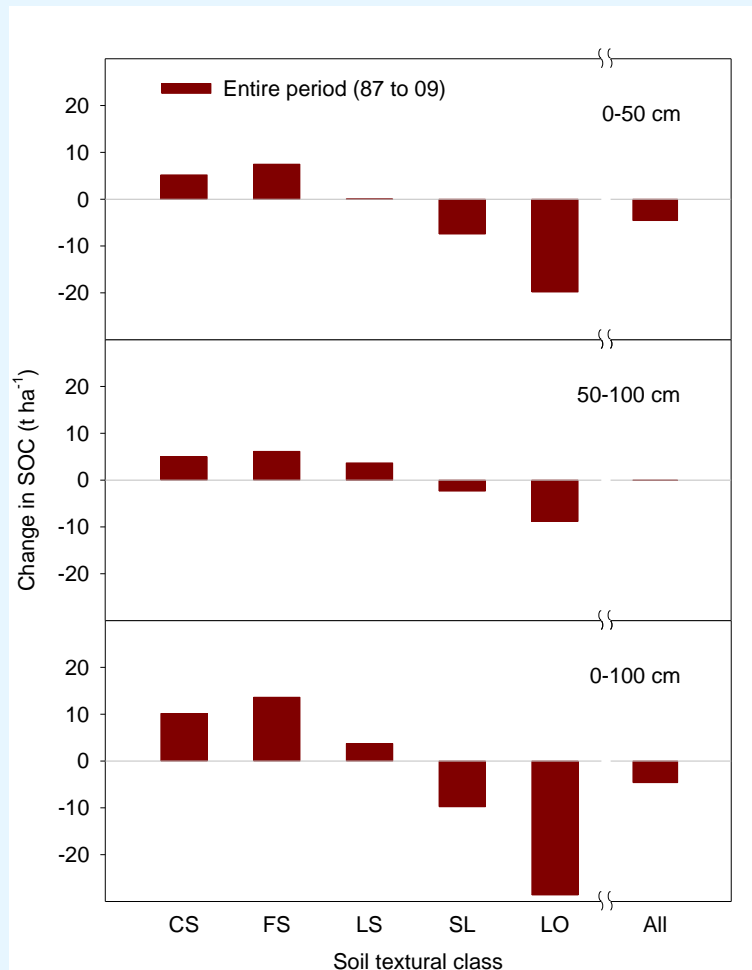
Changes in C stock in mineral soils



› Large variability

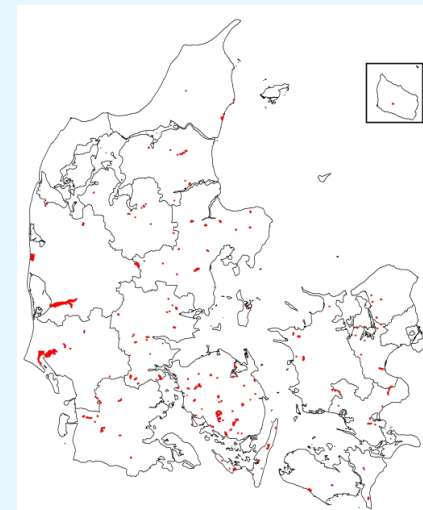
- › Caution should be taken and a good understanding and interpretation of the out come from the model is essential
- › We cannot detect changes within a short timespan
- › The current soil models is based on long term field trials (>150 years) and probably not suitable for short term emission inventories
- › Soil sampling is good for evaluation of the models but costly with a high variability

Changes in mineral soils



Estimated loss by C-TOOL
1990-2011 \approx 7-10 mio. ton C

Measured loss in soil sampling
1987-2009 \approx 10 mio. ton C



Organic soils

- › **Much less area than we expected**
 - › Average C stock 250-300 ton C/ha (0-100 cm)
 - › C stock in mineral soils \approx 150 ton C/ha (0-100 cm)
 - › Annual C loss from organic soils 8 ton C/ha

- › **When will an organic soil be mineral?**
- ›
$$\frac{(300 \text{ ton} - 150 \text{ ton})}{8 \text{ ton/yr}} = 19 \text{ years}$$

- › **We need more information on the emission from "low" organic soils**

Results from the scientific program

- › **Much less organic agricultural soils than we expected**
- › **Mineral agricultural soils still loose carbon**
- › **The area in the LPIS system varies with years and political decisions (7 % increase from 2005 to 2006 due to single payment scheme) and does not include field margins etc.**
- › **It is difficult to split between Cropland and Grassland based on LPIS and the farmers reporting**
- › **Grassland and wetlands are very difficult to define**

Three major issues are essential

- › **The scientific level**
 - › **Good science \ Bad science**
 - › **Scientist are always trying to make it very complicated**
 - › **Primarily as they have very little feeling with the reporting and the political level**
 - › **Try to simplify to the most important issues!**
- › **The Political level**
 - › **What are the demands from the politicians:**
 - › **Tier 1/Tier 2/Tier 3 (modeling)**
 - › **If the politicians want that every political decision should be included - you need modeling**
- › **The reporting level**
 - › **How detailed should it be?**
 - › **Don't be too ambitious**
 - › **If the scientific level is low: Not too many subdivision as it cannot be justified**



Thanks for your attention