

### Organic farming in a landscape perspective



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### Why organic farming and landscape?

- 6% of the rural landscape organic
  - The concept of holism also includes the landscape
  - Organic farming is different from the conventional farming
- ↓
- Potential difference in influence on the landscape
- ↓
- Organic farming could be an instrument against homogenisation and loss of habitats in the rural landscape

### Expectations to organic farming (1):

#### Principles for OF (IFOAM 2002):

*"to maintain the genetic diversity of the production system and its surroundings, including the protection of plant and wildlife habitats"*

#### Danish Action Plan II for OF (1999):

*"nature content and value should to a much higher degree become an element of organic farming. This concerns the whole landscape, including cultivated land as well as semi-natural areas and small biotopes"*

#### Wihjelm committee (2001):

*"organic farming helps to form a basis for the consideration of nature resources on fields in rotation, as well as on the surrounding land"*

### Expectations (2):



### But:

- (Danish) production standards for OF do not comprise any specific rules concerning creation or management of uncultivated land
- OF practices lead to a richer animal and plant life on the cultivated land and in edge biotopes - but its effect on quantity and pattern of uncultivated landscape elements is not well studied

### Potential effects of OF (direct):

1) Ban on fertiliser forces OF to maintain nutrient balances within the farming system through crop rotation



Assumed to lead to a higher diversity of crops, more and smaller fields with longer field margins, which are potential habitats for wild flora and fauna

2) Ban on chemical herbicides and pesticides



Assumed to promote creation and maintenance of small biotopes as habitats for natural predators

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Potential effects of OF (indirect):

1) As organic farmers have a more ideological attitude to nature, their landscape management differs from conventional farmers' landscape management



Leads to a richer nature content on organic farms

2) Organic farms differ from their conventional counterpart with respect to farm-types, -sizes, production types, location etc.



These differences can be related to landscapes' nature content and therefore lead to differences in the landscape between organic and conventional farms

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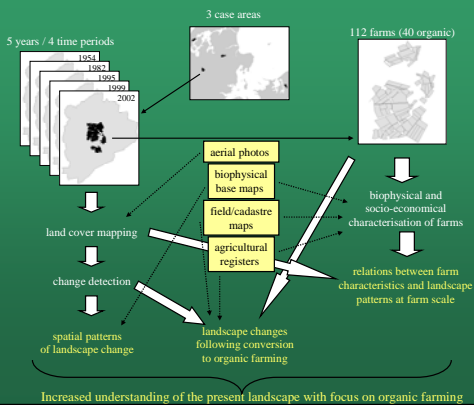
Research questions

1) Is it possible to find a difference in the landscape between organic and conventional farms (In 2002)

2) Is it possible to find a relation between landscape changes/dynamics and the date of conversion?

3) Are current variations in the landscape a result of recent changes or former changes?

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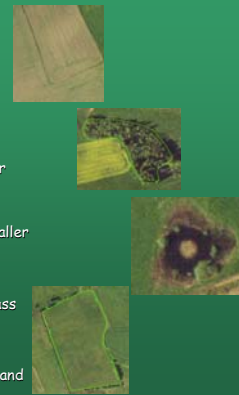
Landscape parameters, definitions:

Field divide:  
- any line dividing two different plots of cultivated land. Including hedgerows and ditches

Uncultivated land  
- Any plot of uncultivated/natural land cover

Small biotopes (patch)  
- Plot of uncultivated/natural land cover smaller than 2 hectares

Natural grassland  
- Area larger than 100m<sup>2</sup>, dominated by grass  
- < 25% woody vegetation (crown cover)  
- No signs of recent cultivation (no tractor tracks)  
- Appears heterogeneous in spatial texture and colour



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Landscape parameters, definitions:

Field size:

- Size of field plots with cultivated land



Farm parameters, definitions

Farm area

- Total area of farm, incl. property and rented land, excl. land rented to other farms

Organic / conventional

Converted before / after 1995

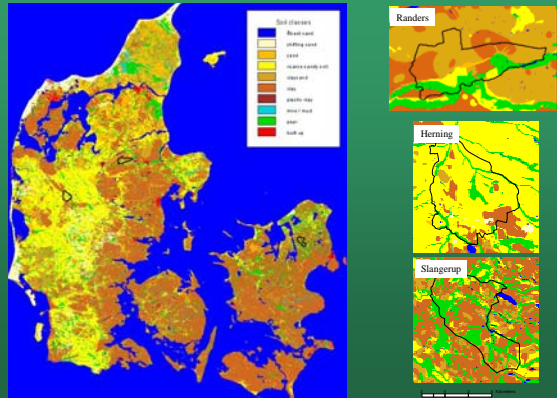
Peat soil as % of the farm area

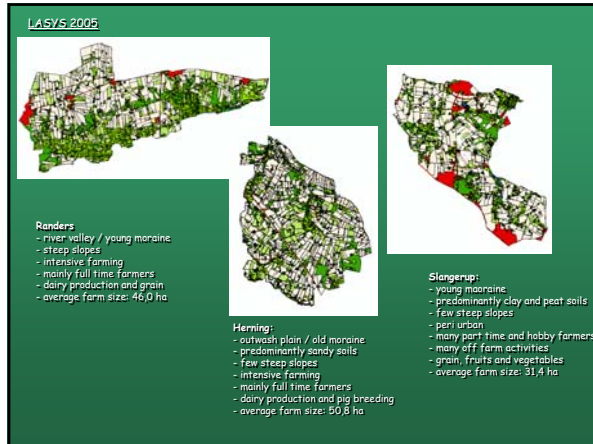
Slopes >5% as % of the farm area

Farm type

- cattle, pig/chicken, mixed/stockless (based on economic significance of production)

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Relationships between the landscape and organic / conventional farming (averages)

	N	uncultivated land, % of farm	natural grass, % of farm	small biotopes, % of farm	field divides, m/ha	average field size, ha
conventional	72	0,24	0,14	0,17	43,90	3,02
organic	40	0,34	0,23	0,17	44,30	2,88
whole area	-	0,29	0,17	0,14	48,22	2,36

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Relationships between the landscape and farm parameters (Anova)

farm parameters	uncultivated land, % of farm	natural grass, % of farm	small biotopes, % of farm	field divides, m/ha	average field size, ha
organic/conventional	**	**	ns	ns	ns
farm size (lg)	**	ns	**	**	**
peat soil, % of farm	**	ns	**	ns	ns
slope >5%, % of farm	**	**	**	**	ns
case area	ns	**	ns	**	ns
farm type*	ns	**	ns	ns	ns

(significance levels: p<0,05=\*\*, p<0,001=\*\*\*)  
 (\* cattle, pig/chicken, mixed/stockless)

farm size highly related to small biotopes, field divides and average field sizes

% slope >5% highly related to all except average field size

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Relationships between the landscape and interactions between farm parameters (nested Anova)

farm parameters	uncultivated land, % of farm	natural grass, % of farm	small biotopes, % of farm	field divides, m/ha	average field size, ha
organic/conventional*farm size (lg)	**	**	**	***	***
organic/conventional*case area	**	***	ns	***	ns
organic/conventional*farm type	**	**	ns	ns	ns
organic/conventional*peat	**	ns	ns	ns	ns
organic/conventional*farm size (lg)*case area	**	**	**	***	***
organic/conventional*peat*case area	***	**	**	***	ns
organic/conventional*farm type*case area	ns	**	ns	***	ns

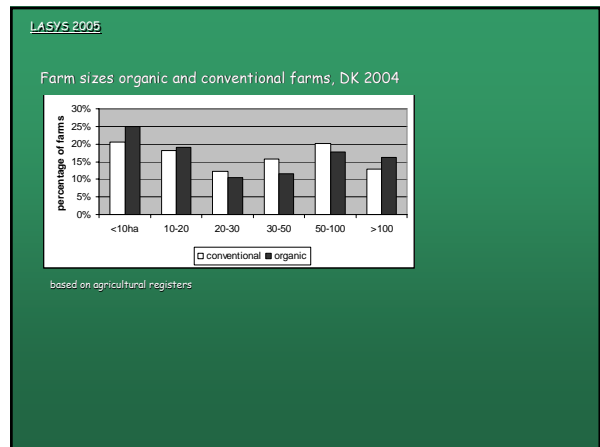
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 (\* cattle, pig/chicken, mixed/stockless)

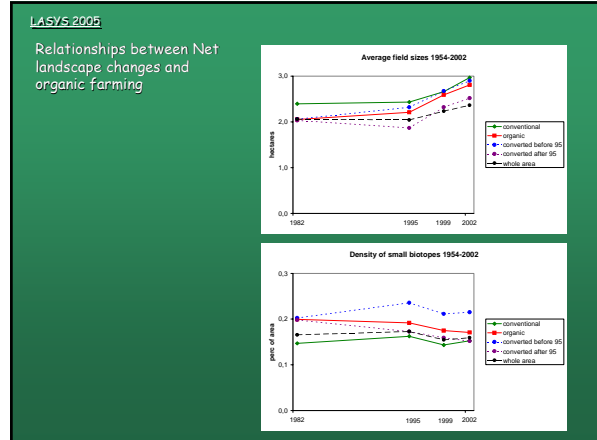
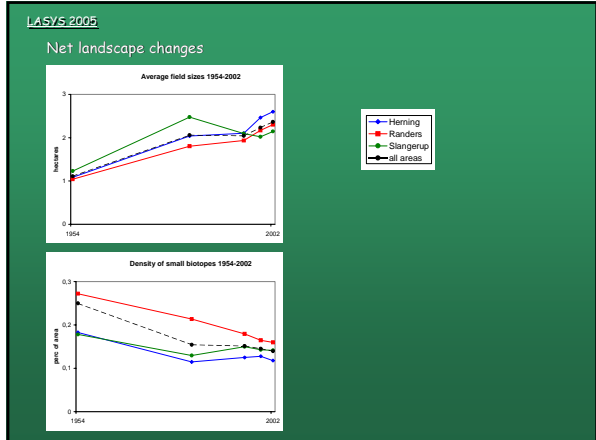
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Relationships between the landscape and interactions between farm parameters

*organic/conventional \* farm size \* case area*  
 All landscape parameters are particularly positively related to small organic farms in Slangerup

*organic/conventional \* peat \* case area*  
 Uncultivated land, natural grass and small biotopes are positively related to organic farms with a high density of peat soil in Herning and Randers





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Relationships between Net landscape changes and interactions between farm parameters (nested Anova)

	Changes in densities of small biotopes, % of area			Changes in average field sizes, hectares		
	1982-1995	1995-1999	1999-2002	1982-1995	1995-1999	1999-2002
conventional/organic	ns	ns	ns	ns	ns	ns
converted before/after 1995*farm type	ns	**	ns	ns	ns	ns
converted before/after 1995*case area	ns	ns	ns	ns	ns	ns
converted before/after 1995*farm size (kg)*case area	ns	ns	ns	ns	ns	ns
converted before/after 1995*farm type*case area	ns	ns	ns	ns	ns	ns

(significance levels: p<0.05=\*\*, p<0.001=\*\*\*)  
(\* cattle; pig/chicken; mixed/stockless)

decreasing field sizes on organic farms in Slangerup, converted after 1995

increasing field sizes on conventional pig/chicken farms in Herning and Randers

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Relationships between Net landscape changes and farm parameters organic farming (Anova)

	Changes in densities of small biotopes, % of area			Changes in average field sizes, hectares		
	1982-1995	1995-1999	1999-2002	1982-1995	1995-1999	1999-2002
conventional/organic	ns	ns	ns	ns	ns	ns
converted before/after 1995	ns	ns	ns	ns	ns	ns
farm size (kg)	**	ns	ns	ns	ns	**
peat soil, % of farm	ns	ns	ns	ns	ns	ns
slope >5%, % of farm	ns	ns	ns	ns	ns	ns
case area	**	ns	ns	ns	ns	ns
farm type*	ns	ns	ns	ns	ns	ns

(significance levels: p<0.05=\*\*, p<0.001=\*\*\*)  
(\* cattle; pig/chicken; mixed/stockless)

increasing field sizes on "sloping" farms

increasing field sizes on pig/chicken farms

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Relationships between relative landscape changes and farm parameters (Anova)

	% changed small biotopes of all biotopes			% changed field divides of all field divides		
	1982-1995	1995-1999	1999-2002	1982-1995	1995-1999	1999-2002
conventional/organic	ns	ns	ns	ns	ns	ns
converted before/after 1995	ns	ns	ns	ns	ns	ns
farm size (kg)	**	ns	ns	ns	ns	ns
peat soil, % of farm	ns	ns	ns	ns	ns	ns
slope >5%, % of farm	ns	ns	ns	ns	ns	ns
case area	ns	**	ns	ns	ns	ns
farm type*	ns	ns	ns	ns	ns	ns

(significance levels: p<0.05=\*\*, p<0.001=\*\*\*)  
(\* cattle; pig/chicken; mixed/stockless)

larger field size dynamics on "flat" farms

larger field size dynamics on pig/chicken farms

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Relationships between relative landscape changes and interactions between farm parameters (nested Anova)

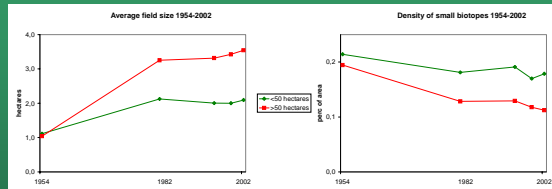
	% changed small biotopes of all biotopes			% changed field divides of all field divides		
	1982-1995	1995-1999	1999-2002	1982-1995	1995-1999	1999-2002
conventional/organic	ns	ns	ns	ns	ns	ns
converted before/after 1995*farm size (kg)	ns	ns	ns	ns	ns	ns
converted before/after 1995*farm type	ns	ns	ns	ns	ns	ns
converted before/after 1995*case area	ns	ns	ns	ns	**	ns
converted before/after 1995*farm size (kg)*case area	ns	ns	ns	ns	ns	ns
converted before/after 1995*farm type*case area	ns	ns	ns	ns	ns	ns

(significance levels: p<0.05=\*\*, p<0.001=\*\*\*)  
(\* cattle; pig/chicken; mixed/stockless)

larger field size dynamics on conventional pig/chicken farms in Herning and Randers

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Relations between farm size (2002) and landscape changes 1954-2002



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Relations between farm size (2002) and landscape changes 1954-2002 (Anova)

	Changes in densities of small biotopes, % of area		Changes in average field sizes, hectares	
	1954-1982	1982-2002	1954-1982	1982-2002
farm size (lg)	***	ns	***	ns
clay soil, % of farm	**	ns	***	ns
slope >5%, % of farm	***	ns	**	ns
case area	**	ns	ns	ns

(significance levels: p<0,05=\*\*, p<0,001=\*\*\*)  
(\* cattle; pig/chicken; mixed/stockless)

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Conclusions and perspectives:

Positive relation between all landscape parameters and organic farming in Slangerup (because of many small hobby and part time farms?)

No clear relation between date of conversion and landscape changes

Positive relation between farm size and landscape parameters in 2002 seem to be a result of former landscape changes rather than recent changes (do small part time and hobby farmers choose areas where landscape changes have been less strong?)

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Conclusions and perspectives:

Land cover mapping an appropriate method to register landscape changes in relations to farm parameters?

Need for other farm parameters and data sources to distinguish farm types/lifestyle types?