

Overcoming discrepancies in scale between landscape monitoring and CORINE land cover registration

Gregor Levin, Jesper Brandt, Martin Olsen

**Department of Environmental, Social and Spatial Change (ENSPAC)
Roskilde University**

Monitoring agricultural landscapes is important :

- **Effects of different pressures:**
 - **Agriculture**
 - **Policy**
 - **Society**

- **Resilience / adaptation to pressures (e.g. climate change)**

Landscape monitoring gives detailed information on land cover, land use and spatial patterns

- but is generally restricted to sample areas (difficult to generalize)

CORINE land cover registration covers the whole EU

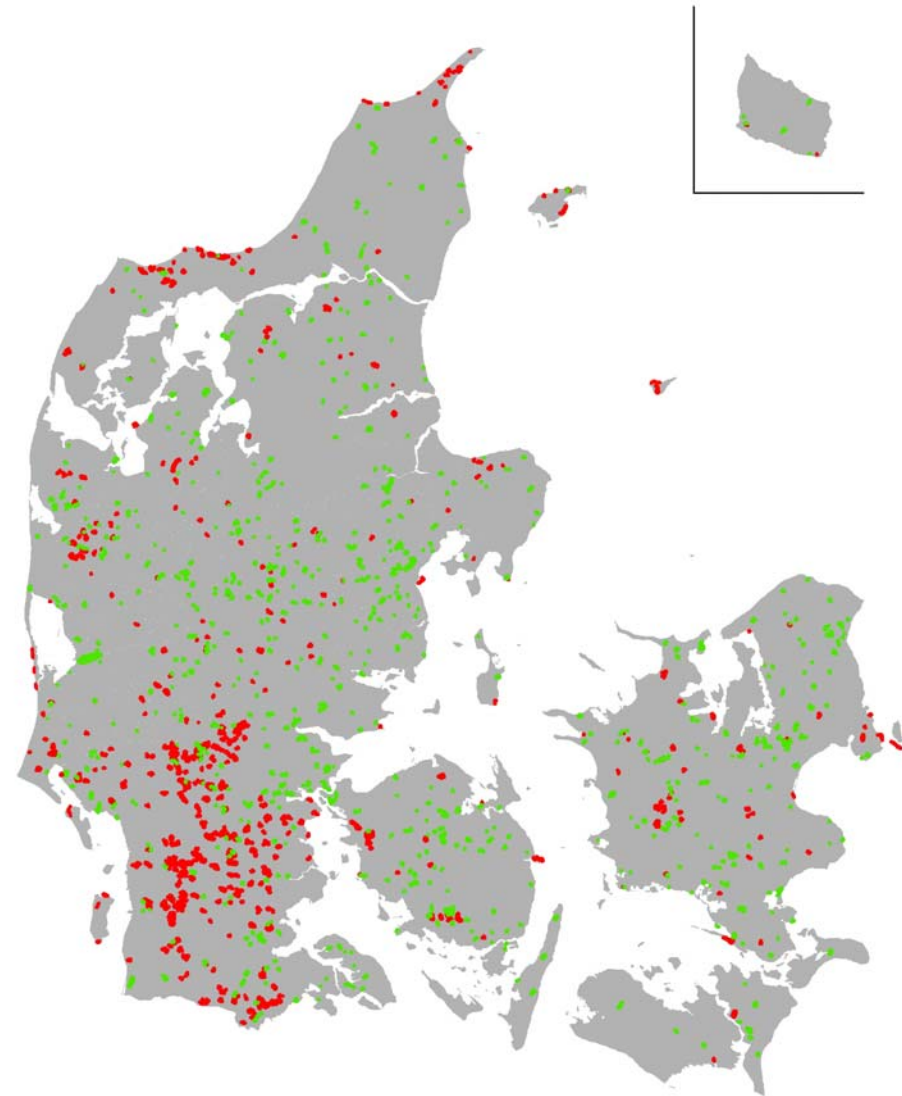
-but resolution is too broad to capture most changes in (Danish) agricultural landscapes

CORINE land cover (CLC):

- 31 land cover classes (5 agricultural)
- Complex land cover classes
- Resolution 25 ha
- Total coverage

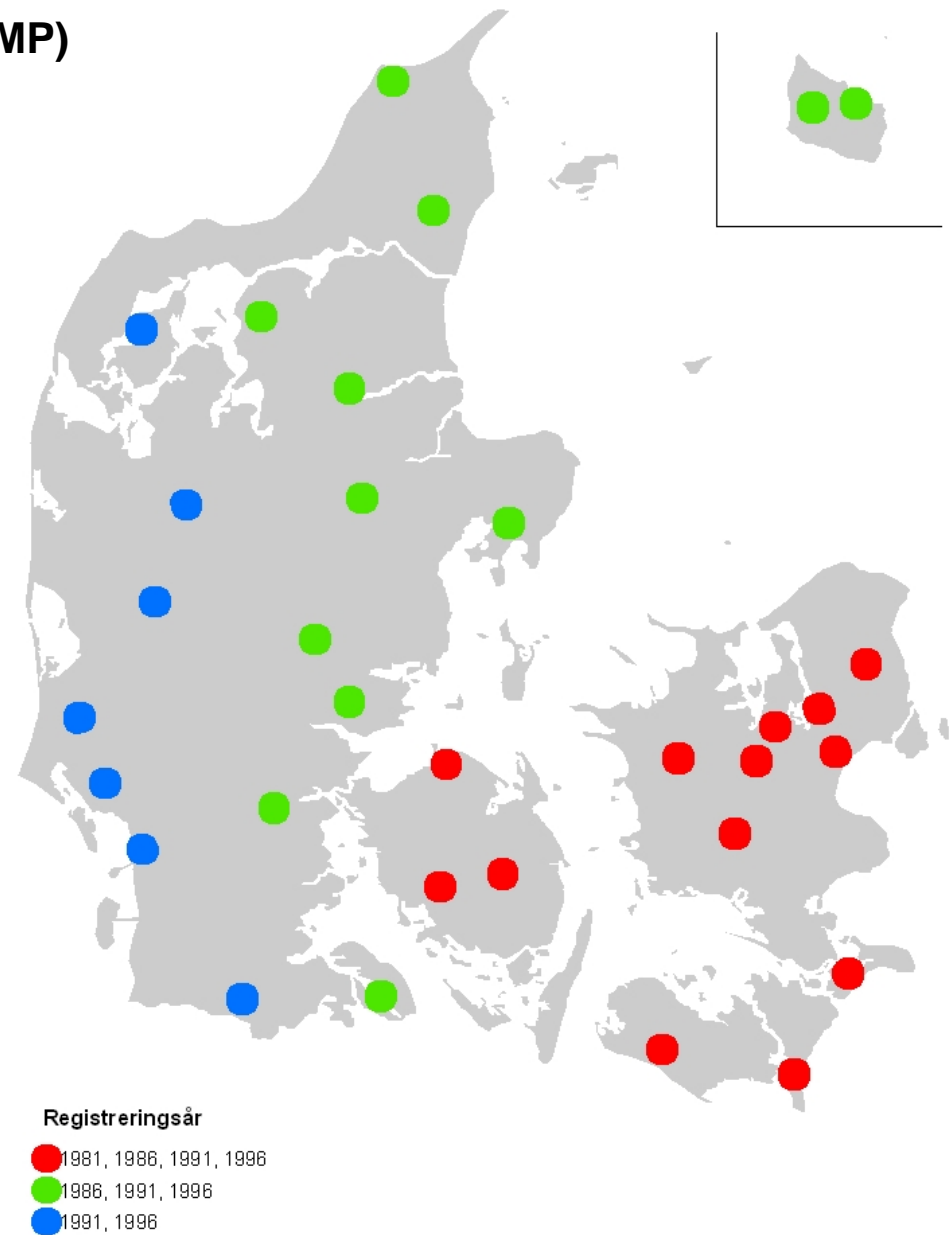
1990 - 2001

- 1.32 % of Danish land area has changed
- 0.75 % of agricultural land has changed
- 0.10 % are changes between agricultural classes



Small biotope monitoring programme (SBMP)

- 32 sample areas, each area 2x2 km.
- Covers app. 0.4% of the Danish agricultural landscape
- Registered landscape elements
 - areas $\geq 10\text{m}^2$
 - lines $\geq 10\text{m}$ length 0.1-10 m width
- 66 land cover classes
- Field survey and air photos



Landscape changes 1991 - 2001 (13 sample areas in on Zealand and islands)

Within the 13 sample areas there were no changes in CLC from 1990 - 2000

But there were considerable changes in SBMP from 1991 - 2001

		1991	2001	1991-2001
heterogeneity	(HIX)	0.84	0.75	-10.7%
mean field size	(ha)	3.7	3.9	6.5%
land in rotation	(area %)	86.78%	76.8%	-11.6%
land outside rotation	(area %)	2.86%	10.9%	279.8%
tree cover	(area %)	1.83%	2.9%	59.1%
lakes / ponds	(area %)	0.45%	0.6%	31.5%
hedgerows	(m/ha)	14.5	15.6	7.6%
field divides	(m/ha)	18.4	20.5	11.6%
water courses	(m/ha)	3.7	3.7	1.9%

Research questions:

- **Can CLC classes be separated using data from SBMP?**
- **Can CLC classes be separated into sub-groups, which are able to capture a larger landscape variation keeping a resolution of 25 ha?**
- **Are CLC subgroups able to capture landscape changes from 1990 (1991) - 2000 (2001)?**

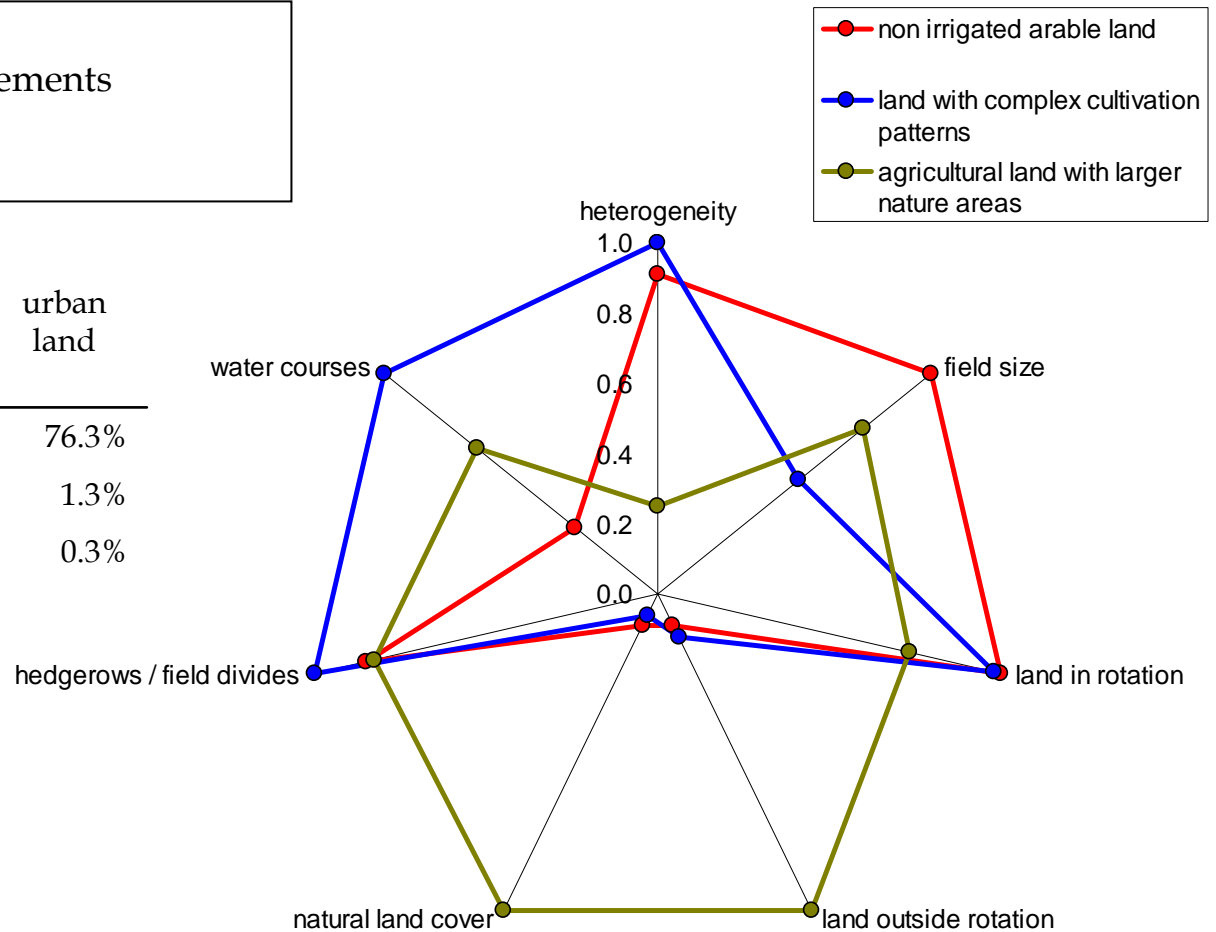
Separating CLC classes with SBMP data (all sample areas in 1991)

division of sample areas into grids of 25 ha

↓
spatial overlay
↓

Calculation of:
densities of landscape elements
heterogeneity
mean field sizes

	land in rotation	natural land cover	urban land
urban land	21.6%	0.3%	76.3%
agricultural land	90.7%	2.6%	1.3%
forest	14.3%	29.1%	0.3%



Separating subgroups of CLC classes with SBMP data (all sample areas in 1991)

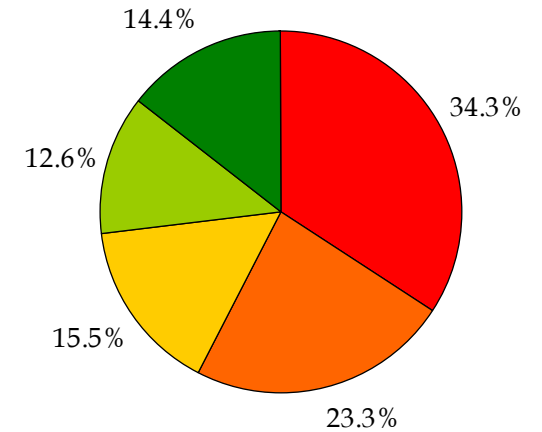
	Heterogeneity	Mean field size	Land in rotation	Natural land cover	Hedgerows and field divides
1	-	+	+	-	+/-
2	+/-	+/-	+	-	+/-
3	+	-	+	+/-	+
4	-	+/-	+/-	+	-
5	+	+/-	-	+	+/-

- 1** Intensive land use with low heterogeneity
- 2** Intensive land use with medium heterogeneity
- 3** Intensive land use with high heterogeneity
- 4** Medium land use intensity with high density of natural land cover
- 5** Extensive land use with high heterogeneity and high density of natural land cover

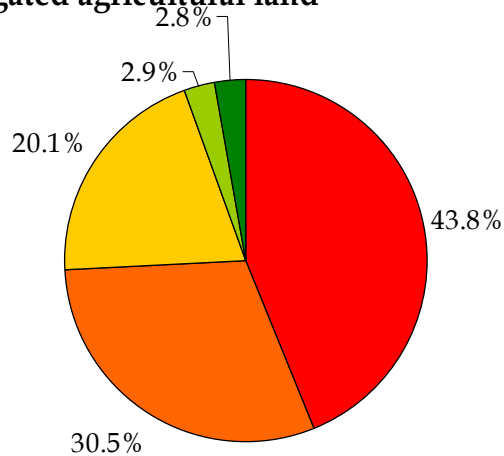
Subgroups of CLC classes with SBMP data (all sample areas in 1991)

- 1** Intensive land use with low heterogeneity
- 2** Intensive land use with medium heterogeneity
- 3** Intensive land use with high heterogeneity
- 4** Medium land use intensity with high density of natural land cover
- 5** Extensive land use with high heterogeneity and high density of natural land cover

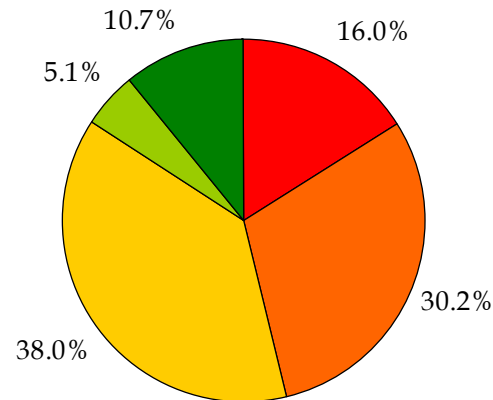
all classes



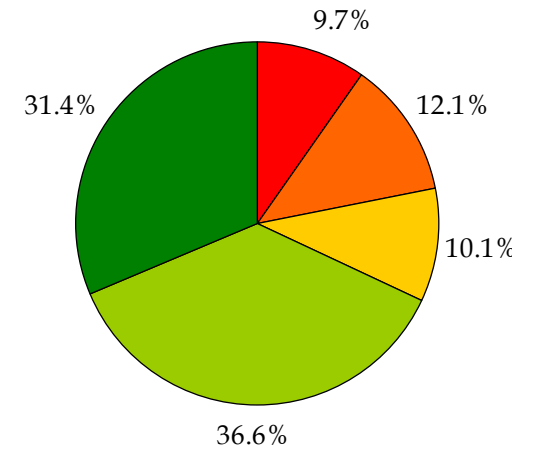
non irrigated agricultural land



complex cultivation patterns

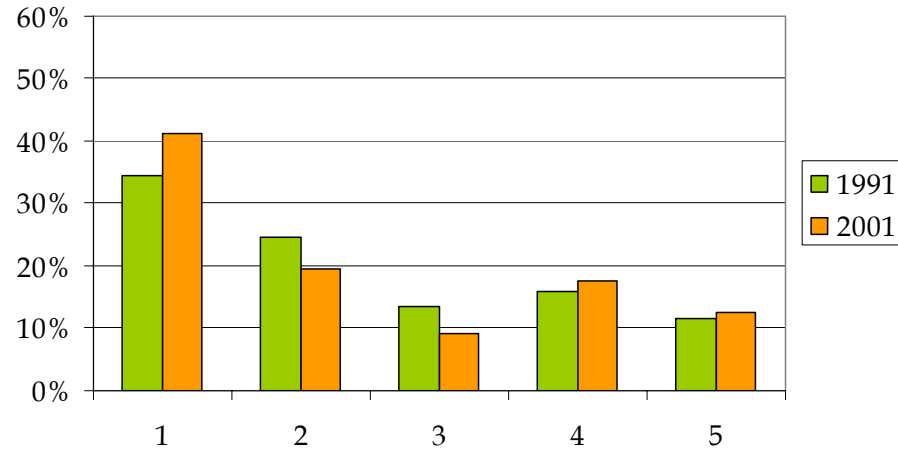


agricultural land with larger nature areas

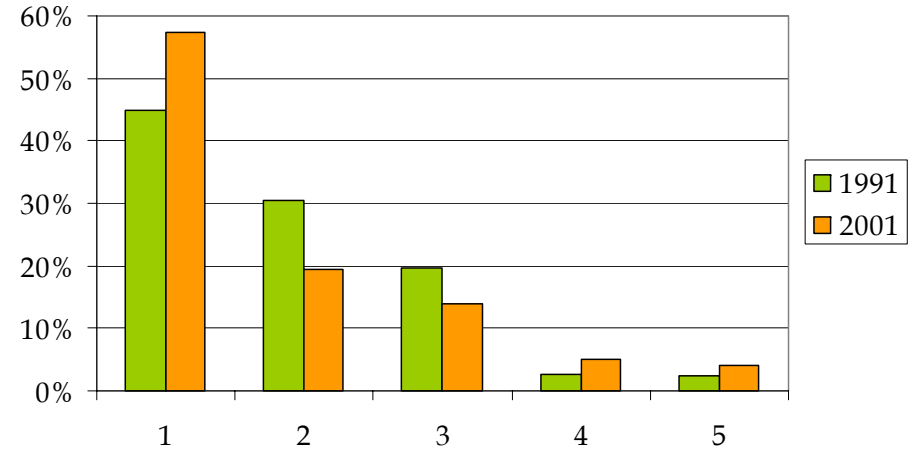


Changes in subgroups 1991 - 2001 (13 sample areas)

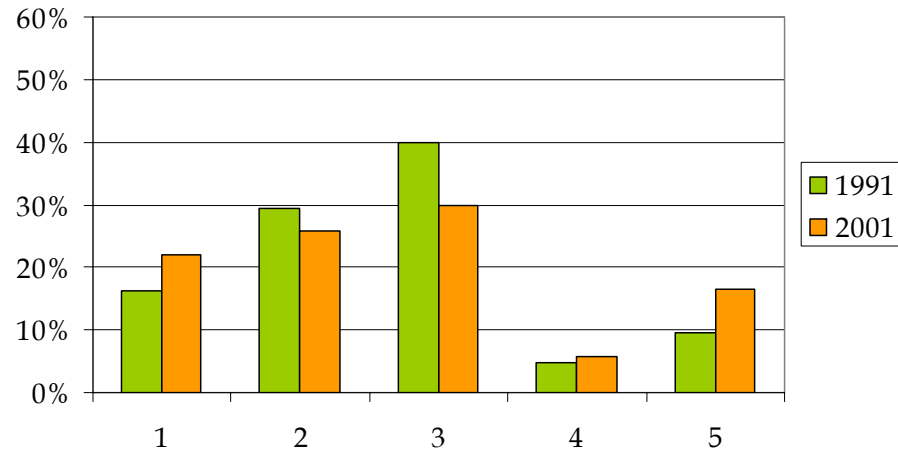
all classes



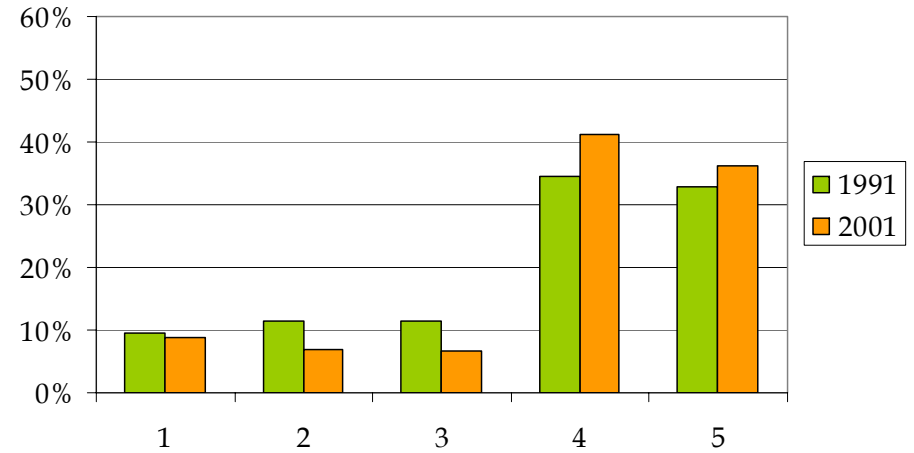
non irrigated agricultural land



complex cultivation patterns



agricultural land with larger nature areas



Conclusions

- CLC - classification can be related to data from more detailed landscape monitoring
- CLC - classification can be enhanced with the use of data from landscape monitoring without increasing the spatial resolution of 25 ha
- But coverage is not enhances

Perspectives

- Other, more covering data might be used to enhance CLC, e.g:
 - agricultural registers
 - Other land cover registrations
- Extension to the EU level

Thank you for your attention

