Environmental and economic effects of regulating phosphorus use and losses from the agricultural sector – an empiric study

Conference Aarhus, 5-6 October 2011

Line Block Hansen, AU

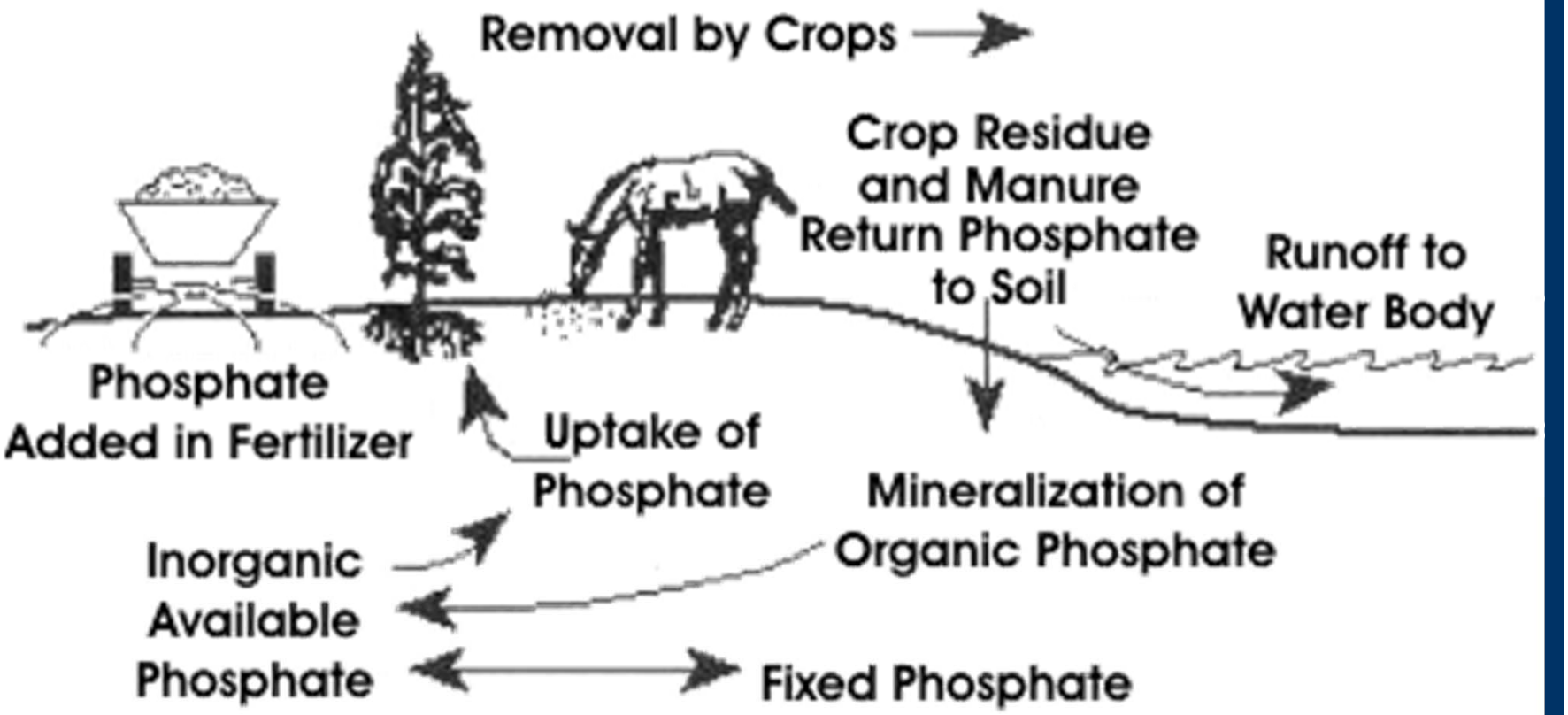
Berit Hasler, AU and Lars Gårn Hansen, KU

Eutrophication

Agriculture

... animal manure

The Phosphorus Cycle



Source: Busman et al., 1997.

Tax on phosphorus surplus

Plant producers	Animal husbandry	Animal husbandry
		Phosphorus stock
Phosphorus stock	Phosphorus stock	

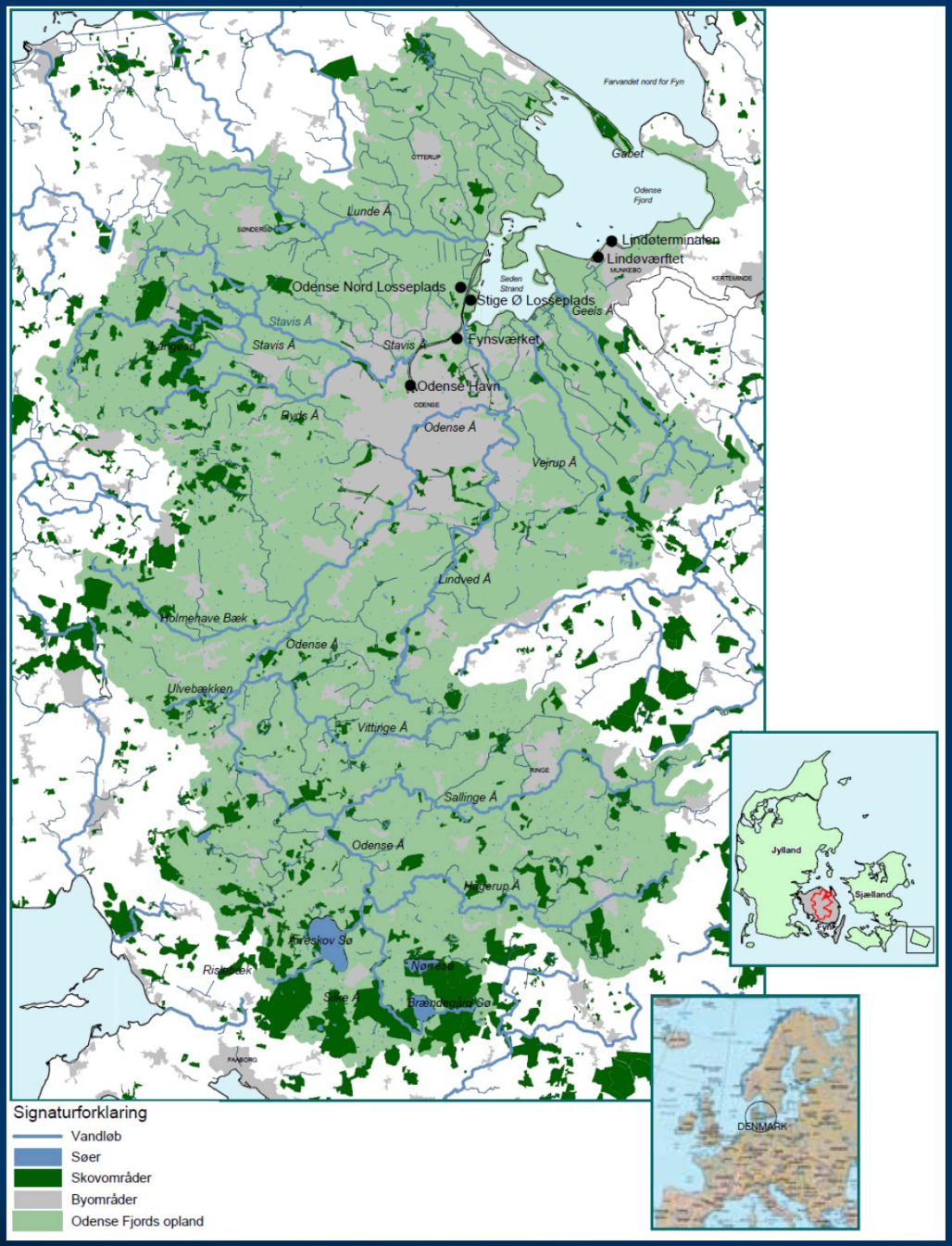
Loss from the stock

Dynamic modelling

- Profit maximization of farmer profit
- Dynamic variables:
  - Type and amount of P fertilizer (manure and/or chemical)
  - Nitrogen fertilizer (chemical)
  - Crop choice
  - Implement area measures to reduce P-losses
  - Different choice in his production to reduce P losses
  - All other variables are presumed constant (e.g. pesticide use)
- Simple model describing stock changes over time (change in P-application and crop removal)
- Model calculating the phosphorus index and different effects from e.g. implementing buffer zones, wetland areas.

Case area: Odense Fjord catchment

- 16.448 fields
- 63.287 hectares
- 1.425 farms



Reference: Miljøcenter Odense 2007

Odense Fjord catchment

Farm types	No. of farms	No. of fields	Hectares
Plant producers	701	6.606	24.943
Pig producers	328	4.709	21.063
Cattle producers	359	4.448	14.708
Other	37	685	2.572
Total	1.425	16.448	63.287

Odense Fjord catchment

Phosphorus numbers	Denmark	Odense Fjord catchment
0,0-0,9	1	0
1,0-1,9	9	13
2,0-2,9	24	28
3,0-3,9	27	27
4,0-4,9	20	17
5,0-5,9	11	8
6,0-6,9	5	3
7,0-7,9	2	2
8,0-8,9	1	1
9,0-10	0	0
>10	0	0

Reference: Oversigt over Landsforsøg 2003

Phosphorus index - PI

- Regulation at risk areas

Odense Fjord catchment

Farm types	PI 0-50	PI 50-90	PI 90-100
	Percent of fields		
Plant producers	36	49	15
Pig producers	37	56	7

Summing up

- Regulation of phosphorus use in agriculture is necessary
- One way is by use of surplus taxes supplemented with some command and control measures in risk areas
- Another is by use of a phosphorus index tax – I return with results next year!

Thank you