



# Separation of slurry – a potential option for the animal production sector

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## The structure of presentation

- **Introduction and background**
- **Slurry separation techniques and combined processes and concepts**
- **New legislative incentives for slurry separation**
- **Summary and conclusions**





## **Background for separation of slurry in Denmark**

- **Increasingly restrictive legislation concerning management of slurry:**
  - **9 months storage capacity**
  - **Restricted season for slurry application**
  - **Harmonisation requirements (restricted input of nitrogen/ha)**
  - **Area requirements (minimum share of owned land)**
- **Excess of P from slurry application**
- **Need to export and redistribute nutrients away from intensive areas**
- **High costs of slurry storage, transport and application**



## Why is slurry separation interesting for farmers?

- **Slurry separation seen as a potential solution to the environmental problems and the legislative pressure faced by the intensive animal production sector**
- **A variety of slurry separation technologies and concepts available**
- **Recent legislative incentives**



## Slurry separation techniques

Slurry separation technique	The technique separates:		
	Dry matter/ fibres	Phosphorus	Nitrogen
Strainer	+	-	-
Sedimentation	+	-	-
Screw press	+	partly	-
Decanter centrifuge	+	partly	-
Ammonia stripping	-	-	+
Ultra centrifuge	partly	+	-
Flocculation/ chemical precipitation	-	+	+
Evaporation	-	+	partly
Membrane technologies (e.g. reversed osmosis)	-	+	+

Source: LRC, 2003



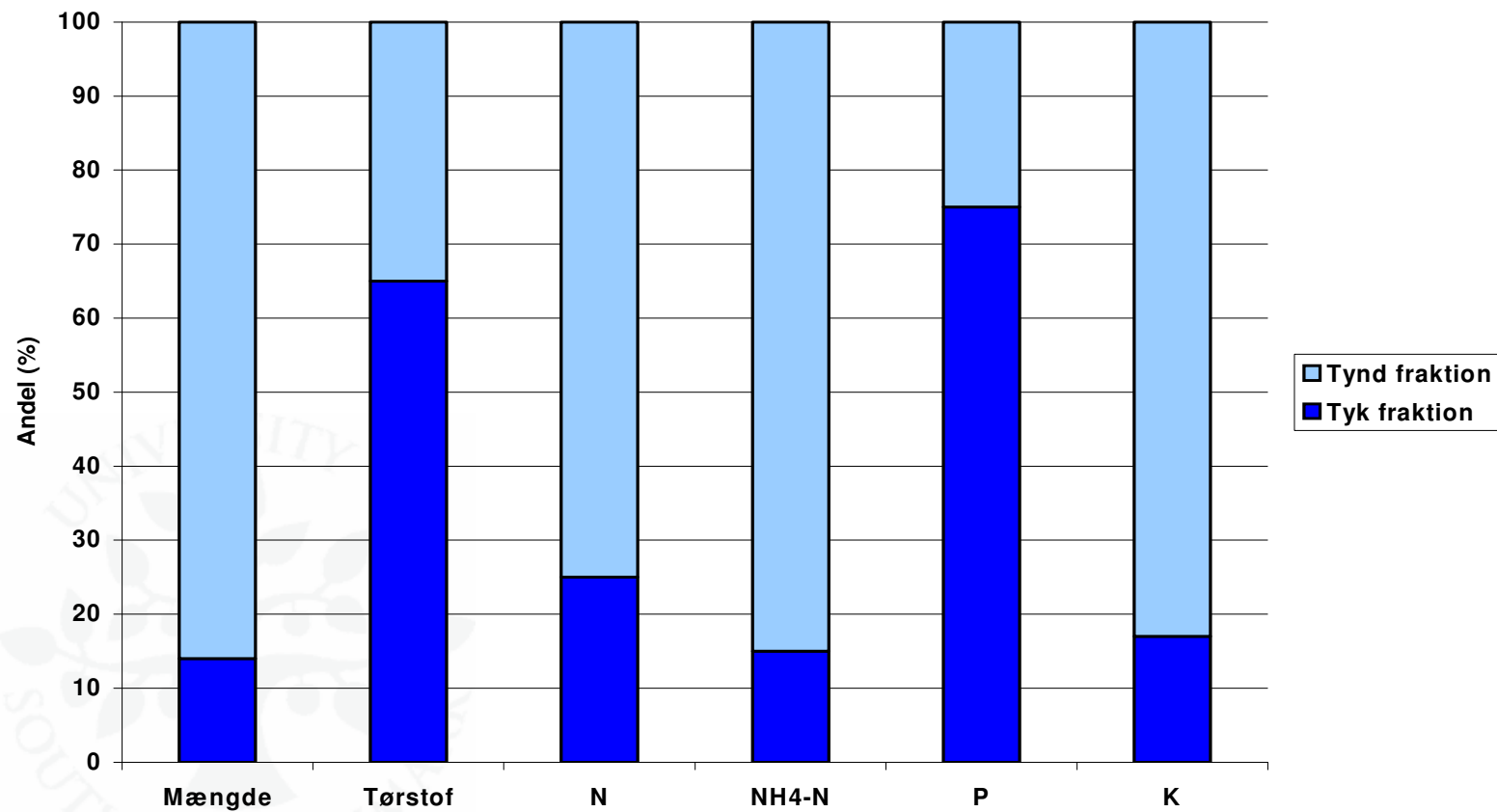
## Separated fractions by decanter centrifuge

	<b>Amounts</b> %	<b>DM</b> %	<b>N</b> %	<b>NH4-N</b> %	<b>P</b> %	<b>K</b> %
<b>Raw slurry</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
		(6,4%)	(5,7%)	(4,2%)	(1,6%)	(2,6%)
<b>Solid fraction</b>	<b>14</b>	<b>65</b>	<b>25</b>	<b>15</b>	<b>75</b>	<b>17</b>
		(30%)	(10,1%)	(4,5%)	(8,7%)	(3,1%)
<b>Liquid fraction</b>	<b>86</b>	<b>35</b>	<b>75</b>	<b>65</b>	<b>25</b>	<b>83</b>
		(2,6%)	(4,9%)	(4,2%)	(0,5%)	(2,5%)

Source: Jakobsen and Hjort-Gregersen, 2002



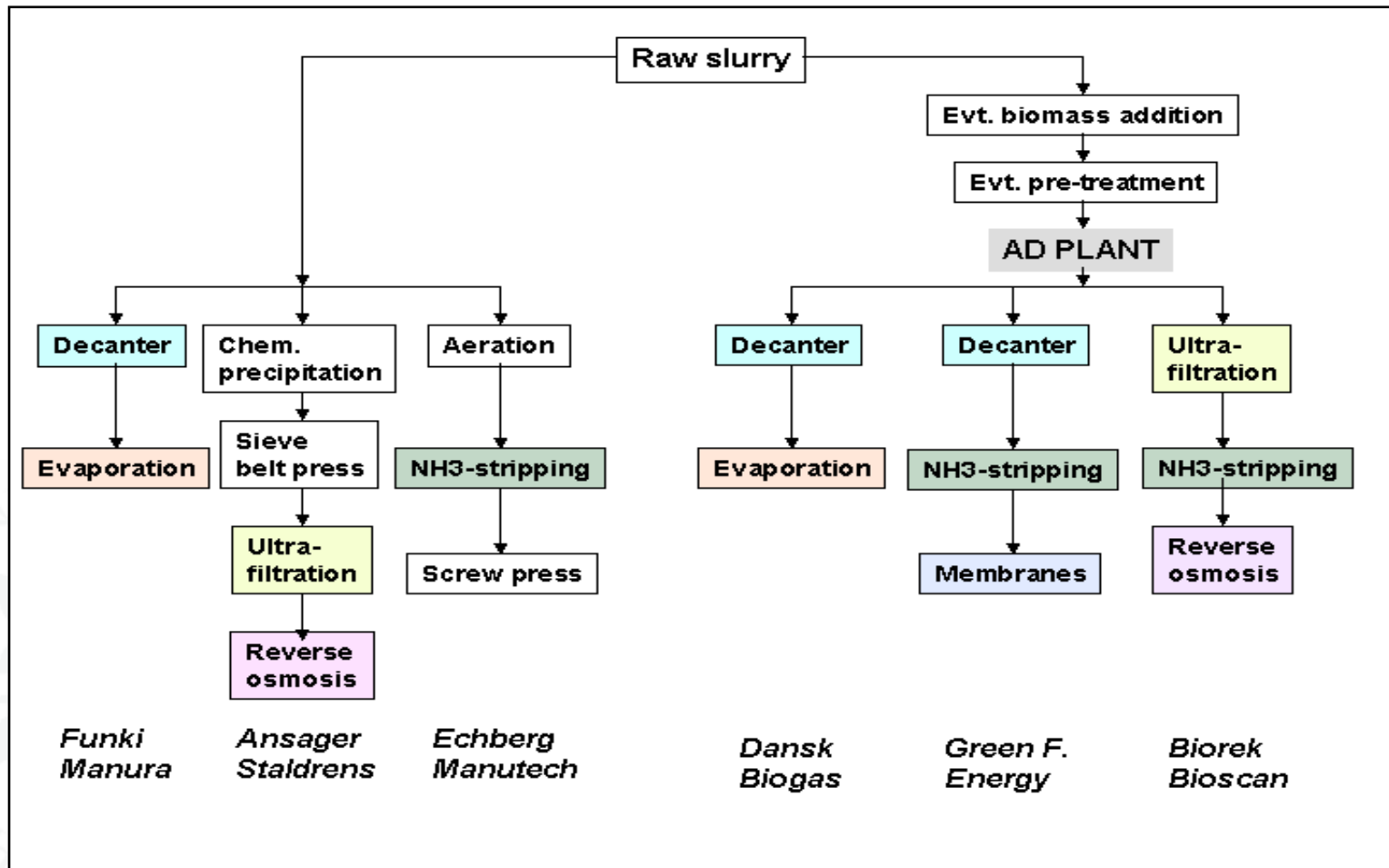
## Distribution of dry matter and nutrients in separated fractions from decanter centrifuge



Source: Jakobsen and Hjort-Gregersen, 2002



## Combined processes and concepts of slurry separation



Source: Møller, 2002 and personal data.



## New legislative incentives

### Harmony and area requirements without and with separation of slurry.

Nr. LU	Harmony requirement	Area requirement	Reduced area requirement by separation	
			Low technology <sup>1)</sup>	High technology <sup>2)</sup>
	Ha	Ha	Ha (25 % reduction)	Ha (50 % reduction)
100	71	18	14	9
250	179	77	58	39
500	357	256	192	128
749	535	434	325	217
750	536	536	536	536
1000	714	714	714	714

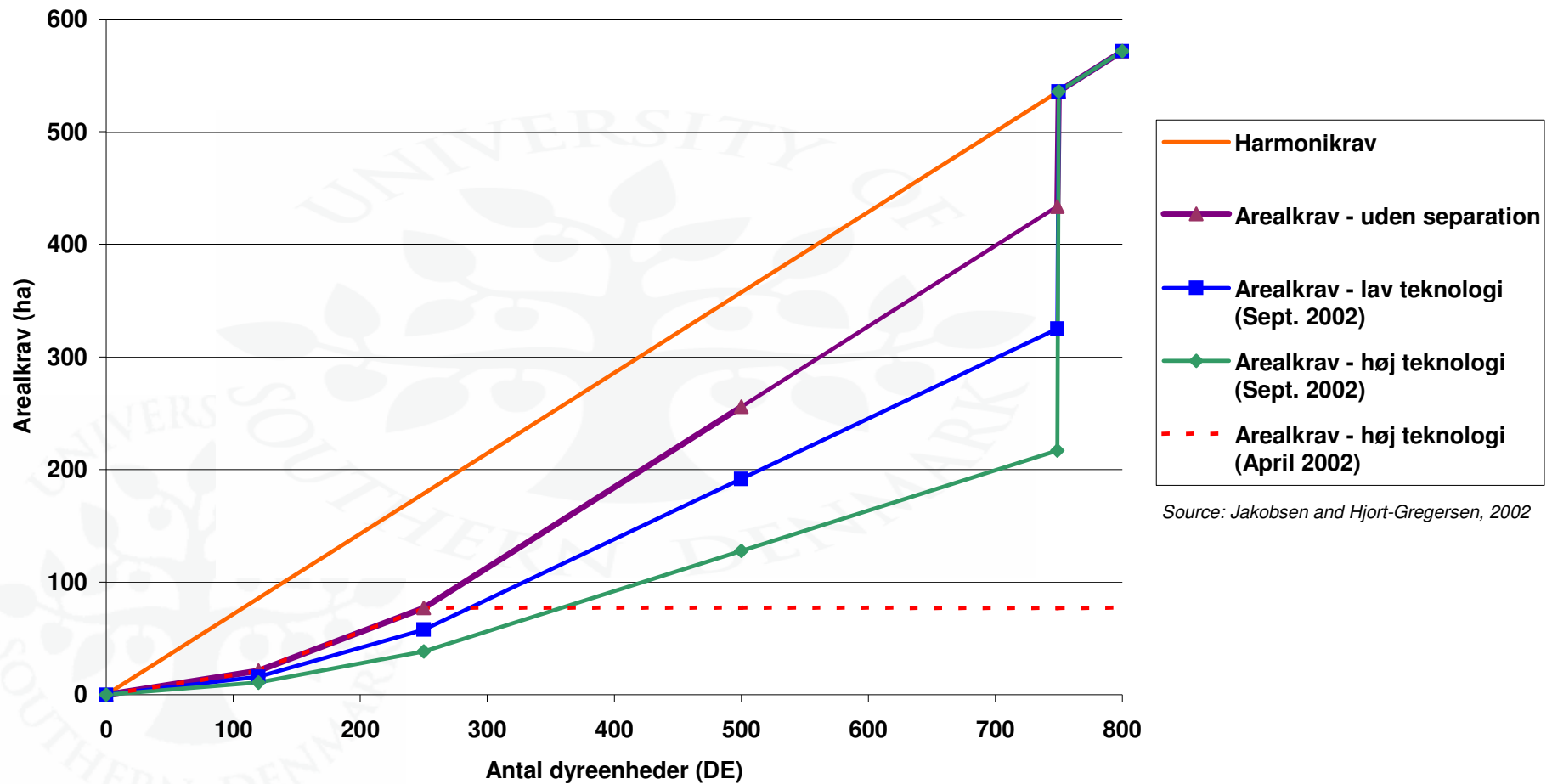
(Source: Jakobsen and Hjrt-Gregersen 2002 and personal data)

- 1) **High technology** concepts separate nutrient rich fractions, containing more than 70% of the P and more than 70% of the N, with an average concentration of nutrients at least 2,5 times higher than untreated slurry.
- 2) **Low technology** concepts must be able to separate nutrient rich fractions containing more than 20% of the N and more than 60% of the P, with an average concentration of nutrients at least 1,5 times higher than untreated slurry.



## New legislative incentives

### Harmony and area requirements without and with separation of slurry.



Source: Jakobsen and Hjort-Gregersen, 2002



## Summary and conclusions

- **The intensive animal production sector under increasing environmental and legislative pressure.**
- **Need for export and redistribution of the excess of nutrients from animal slurry.**
- **Transport of slurry over longer distances expensive compared to the concentration of nutrients.**
- **Volume reduction and separation of nutrients considered for some time.**
- **A number of slurry separation technologies available; Need for further research and development in the area.**
- **New legislative incentives offered by the government.**
- **Expected further development of slurry separation; combination of AD and separation anticipated advantageous.**
- **Development of a market for separated nutrients necessary for a major break-through.**