Baltic Manure

Baltic Forum for Innovative Technologies for Sustainable Manure Management

or the other story of

BATMAN
Baltic Forum for Innovative Technologies for Sustainable Manure Management

Baltic MANURE

2nd Policy Forum on Climate Change Adaptation in the Baltic Sea Region

Workshop 3: Agriculture and Biodiversity in a changing climate
10 – 11 December 2012,
Stockholm, Sweden

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MTT – A strong contributor in the food system

- MTT Agrifood Research Finland is a leading research institute in Finland developing sustainability and competitiveness of the food system.
  - From farm to fork and fork to farm
- 15 offices; headquarters in Jokioinen
- about 700 experts
  - 320 academic
- Turnover 55 Meur
  - 20 Meur competitive
Baltic MANURE (BatMan) Project

- Baltic MANURE is a Flagship project in the Action Plan of the EU Strategy for the Baltic Sea Region adopted by member states in 2009

- The project is financed by the European Union's Baltic Sea Region Programme 2007-2013

  Lead Partner: MTT Agrifood Research Finland
  Total budget: 3.7 million €
  18 partners from 8 countries (+ Russia associated)
  Duration 2010 - 2013
Baltic MANURE - Partners

1. MTT Agrifood Research Finland (Lead) (FI)
2. SYKE Finnish Environmental Institute (FI)
3. Agro Business Park A/S, Innovation Centre for Bioenergy and Env Technology (DK)
4. Aarhus University, DK
5. University of Southern Denmark, DK
6. JTI - Swedish Institute for Agricultural and Environmental Engineering (SE)
7. Julius Kühn-Institut, Federal Research Centre for Cultivated Plants (JKI) (DE)
8. Estonian University of Life Sciences (ES)
9. University of Rostock (DE)
10. Green Federation GAJA (PL)
11. University of Helsinki, Department of Agrotechnology (FI)
12. University of Gdansk, Pomeranian Center for Environmental Research & Technology (PL)
13. Latvia Agricultural University (LV)
14. Lithuanian Research Centre for Agriculture and Forestry (LT)
15. Innovation and Education Centre Hohen Luckow IBZ, German Biogas Association Mecklenburg-Vorpommern (DE)
16. LTC AB/Enterprise Europe Network (SE)
17. Turku Science Park Ltd (FI)
18. Estonian Research Institute of Agriculture (EE)
OBJECTIVE to turn manure problems into business opportunities by:

- Bringing together stakeholders and enhancing knowledge
- Stimulating technology and business development
- Providing useful policy recommendations
- Improving manure handling and use in the Baltic Sea region
“Turning manure into business opportunities”

- To establish a **manure knowledge forum** by transnational R&D efforts, communication and business innovation
- To evaluate the existing systems and **technologies for animal housing and manure processing** in the Baltic Sea Region
- To evaluate the existing norms for manure in relation to housing and technologies to **reach sustainable nutrient cycles**, with a special emphasis on phosphorus
- To perform **sustainability analysis** of new technologies
- To identify and analyse the **commercial potentials** of manure technologies, e.g. for energy purposes
- To evaluate the **structure of incentives** and national interpretations of EU directives influencing the development of inventive manure processing technologies
- To stimulate **business innovation** for manure technologies and to recommend specific investments
www.balticmanure.eu

The project is partly financed by the European Union
European Regional Development Fund
Baltic MANURE
Manure Knowledge Forum

Technology producers
- Research
- Business

Technology users
- Farmers

Administration
- Carrots
- Whip

Public pressure / Public acceptance
The Project and Climate Change Adaptation
- contents -

• Brief Project Presentation (DONE)

• Summary of Climate Change
  • As described in the “Baltic Sea Region Climate Change Adaptation Strategy DRAFT VERSION PROVIDED FOR DISCUSSION AT THE BALTADAPT POLICY FORUM”

• Agriculture and eutrophication in changing climate

• Baltic Manure and changing climate

• Food for thoughts
Summary of Climate Change and Agriculture

• The estimates are valid!

• Temperature increase, with the largest changes in winter and most so in the north-eastern parts.
  • reduction in snow and sea ice.
  • temperature extremes will change more than long-term averages.

• Cold extremes will be unusual while summertime heat extremes will be more intense.

• Winter precipitation is expected to increase in the whole region.
  • Scenarios for summer precipitation are less certain, but indicate more precipitation in the north and less in the south.

• Increase of extreme precipitation events are also expected in areas that may experience decreased summer precipitation.

• And so on…
Climate change: winter conditions

Winter rye
Winter wheat
Triticale

1985

2025

Climate change: winter conditions

- Winter barley
- Winter oat
- Winter turnip rape
- Winter oilseed rape

2055

2085

Aineisto: Ilmatieteen laitos
19 ilmastomallia

Balancing between good and bad?

- Climate change will alter the balance of agricultural production within Europe
- Northern regions are likely to not only suffer but possibly also benefit from the change at certain extent
- This, however, means balancing between emerging increased production potential and associated risks
- Adapting to climate change induced risks and opportunities requires comprehensive and as "truthful" assessment as possible about the most potential impacts of climate change → well designed adaptation measures
  - In other words, adaptation strategies cannot relay on "easy simplifications" and generalizations
Opportunities or challenges?

- Not only thermal but also physiologically effective part of the growing season will prolong
- Yield potential and biomass production will be markedly enhanced
- Drought problems will likely become more severe
- Cultivars need to be changed – already by 2025
- Mild winters – more rain in “watery” form + several decades of increasingly challenging overwintering conditions
- Extreme events become more common
- Environmental risks may increase
- Risks related to pests and diseases will surely increase
Eutrophication Context

- Climate
- Environmental legislation
- Common Agricultural Policy
- Markets
- Other legislation etc.
- Current non-green Greening

![Bar chart showing contributions to eutrophication: Agriculture 51%, Deposition 16%, Municipal waste waters 16%]
International and national legislation

- **Water Framework Directive**
  - to achieve good ecological and chemical status for all inland and coastal surface waters by 2015

- **Marine Strategy Framework Directive**
  - aims at achieving or maintaining a good environmental status of European marine waters by 2020

- **HELCOM Baltic Sea Action Plan**
  - cut P inputs by 42% and N by 18% from the average loads of 1997–2003 by the year 2016

- **Nitrate Directive**
Agri-Environmental Programme (FI)

- To maintain sustainable agricultural production
  - With less environmental pressures
  - With protected biodiversity and cultural landscape

- To subsidize costs and losses of income due to measures
  - 2.3 billion €, paid by EU and Finland

- Basic measures
  - Farm scale environmental planning and monitoring
  - Lay out and care of fallows and filter strips

- Additional measures
  - Targeted fertilization
  - Vegetation cover in winter or reduced tillage
  - Manure spreading during growing period

- Special measures
  - Riparian zones
  - Multifunctional wetlands
Environmental risks in changing climate

- Soil microbial processes will be enhanced
- Risks for nitrogen release and leaching will increase
- Shorter period for frosty soil will increase again leaching and erosion
- And particularly so in soils remaining uncovered during winters

Kuva: Tapio Tuomela
Agriculture and eutrophication in changing climate
- example of annual erosion in “normal” and “mild” winter -

Annual erosion in surface runoff on clay soils

Source: Puustinen et al 2007
Environmental risks

- **Annual erosion (P-load)** seems to increase more than N-leaching
  - Diversification of land use not sufficient measure to compensate the increase
  - Targeted actions needed

- **Increase of inorganic N load** easier to compensate
  - Diversification of land use
  - N-balanced fertilization, stubble cultivation

Baltic Manure and changing climate

• The Baltic Sea Basin is an area of intensive, and intensifying agricultural production.
  • 36 million units of cattle,
  • 67 million units of pigs, and
  • 190 million units of poultry in the region. (Gren, I.-M. et al., 2008: Cost of nutrient reductions to the Baltic Sea - technical report).

• Environmental problems caused by manure based nutrient surplus and water eutrophication in some regions.

• Manure nutrient value > 1650 million €
  • 981 000 ton of Nitrogen x 1 €/kg = 981 million €
  • 281 000 ton of Phosphorus x 2,4 €/kg = 674 million €
    (BalticSea2020 report "best available technologies for manure treatment").
  – 31 million ha -> 37 kg N and 9 kg P /ha agricultural land
Manure and eutrophication in changing climate

• In the climate change context; manure is not so much a special case

• Eutrophication:
  • A nutrient is a nutrient
  • Too much in a wrong time and place is a risk for the environment
    • Big concentrated animal production units – too much nutrients in one place
    • Need to process the manure into more useful and transportable form
      • Separation for N and P
      • Biogas production for the use of C
      • Technologies can be combined

• Spreading:
  • Timing (vegetative period – to be used by the plants)
  • Placing (put it in-soil or in-vegetation)
  • Heavy axle loads spoil the soil structure – erosion risk rises!
Manure and the environment

– Ammonia emissions a key factor in the environmental effects of manure, effect on climate change considerably smaller
  • 90% of ammonia emissions from agriculture, most of this from manure
  • 8-9% of GHG emission from agriculture
  • Recommendations: injection into soil and/or immediate mulching, covered storages

– Eutrophicating effect significant on areas with intense animal production
  • Dose (tarkentaminen), timing (during vegetative season) and spreading method (injection, mulching) of manure fertiliser use the key to reduce nutrient leakages

– Changes in legislation and subsidies required in order to promote better practices in manure management
Manure and changing climate

- Soil compaction due to heavy field traffic persisted in subsoil at least 30 years – increased precipitation – increased risk
- Nutrient surplus -> long distance logistics -> public perception
- Transport of 95% water!
Baltic Manure Vision in practise?

• Large livestock units and regionally intensive production
  – 1320 IPPC-regulated farms in the Baltic region (EU MS)
  – High amount of nutrients to be distributed
    • Environmental loading?
  – Logistic challenges
    • Liquid manure?

• Economy of scale
  – Processing of manure more cost-effective in large units
    • Concentration of nutrients (water removal)
    • Transportation over longer distances feasible
    • Separation of nutrient fractions (N, P)
    • Recirculation of P
    • Production of renewable energy
Manure processing

• More efficient use of manure
  – Material reuse: carbon & nutrients
    • Renewable energy
    • Development of new fertiliser products
• Several partial solutions available / being pilotted
  – Separation
  – Aerobic treatments
  – Anaerobic digestion (biogas)
  – Drying, incineration
  – Acidification, ozonization
  – Biological treatments
  – Others
• Emerging technologies in the lab
• Business opportunities to be developed
Food for thoughts

• Manure is an agricultural product; rich in nutrients and carbon
  • Especially industrial animal units should have an industrial manure treatment solution

• Animal products demonstrate the highest carbon foodprints
  • Vegetarian diet is good for the climate

• Increased erosion and leaching calls for perennial (multiannual) crops
  • Grasses a good for the Baltic Sea – and feed for ruminants...
Food for thoughts

• Farmers are between stone and a hard place when trying to mitigate nutrient leaching; changing climate is likely to eliminate part of the actions
  • Not only reduction targets;
  • but support to new technology and investments not yet profitable on a commercial basis

• Phosphorus is vital for food production
  • It should not be wasted nor fixed into formulas not usable by plants
  • Also human nutrients must be re-ciculated
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