Resource efficient anaerobic digestion of fur animal manure in a centralized biogas plant

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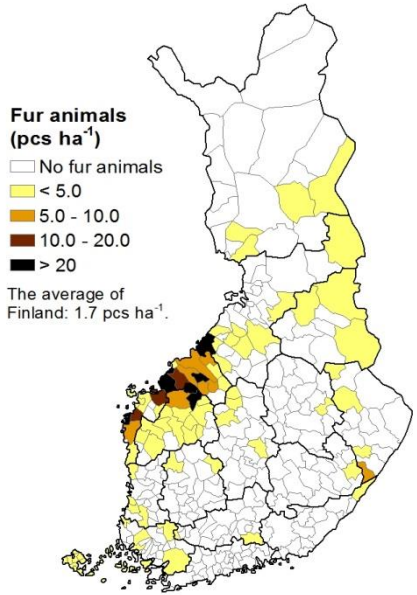
Motivation

- In Finland, 150 000 tons of fur animal manure is produced annually
- Production concentrated in region with intensive livestock farming
- Phosphorus supply exceeds current need
  - Need for centralized solutions, processing and transportation of manure P outside region

- Aim of the study was to assess the treatment of fur animal manures in a centralized anaerobic digestion with mass, nutrient and energy balances and life cycle assessment methodology
  - Compared to current practice where stored manure is locally used as fertilizer/soil amendment



Ylivainio et al. 2014. Regional P stocks in soil and in animal manure as compared to P requirement of plants in Finland. MTT Report 124. http://urn.fi/URN:ISBN:978-952-487-505-9

Photos: Elina Tampio

Case study

- Use of experimental and literature data to calculate nutrient balances and life cycle analysis

	Mass (t/a)	TS (%)	VS (%)	N (g/kg)	NH_4-N (g/kg)	P (g/kg)	BMP (m^3/tVS)
Fox manure	40 000	29	22	14	5	14	220
Mink manure	10 000	29	22	16	7	12	250
Cattle slurry	40 000	9	7	5	3	1	200
Pig slurry	10 000	8	7	5	3	1	320

- Technology selection
  - CSTR
  - Biogas to transport fuel or CHP
  - Processing of digestate with centrifuge and concentration of liquid fraction with membrane filtration (UF+RO)
    - Fertilizer products
      - Nutrient concentrate (NPK)
      - Solid fraction
    - Process water to feedstock preparation

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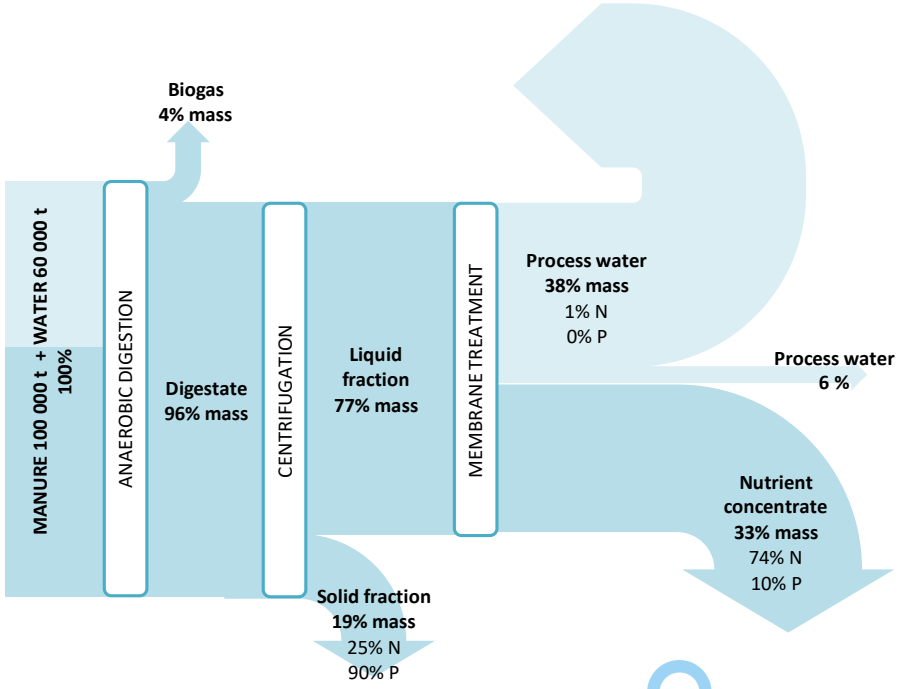
Results, mass and nutrient balance

- Energy production
  - 32 GWh/a vehicle fuel
  - 29 GWh/a heat and electricity
- Energy consumption 15 GWh/a
- Fertilizer products
  - Solid fraction
    - TS 34%
    - N 8 g/kg
    - P 21 g/kg
  - Nutrient concentrate
    - TS 5%
    - N 14 g/kg
    - P 1g/kg



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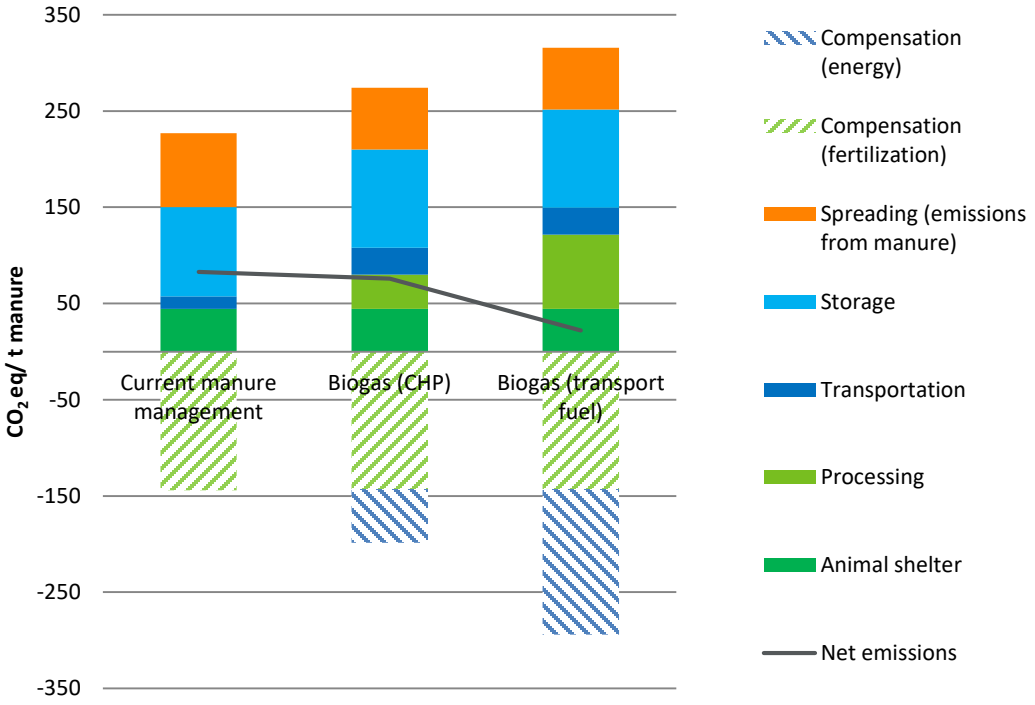
Results, life cycle analysis



- Anaerobic digestion of fur animal manure had lower climate impact when biogas was upgraded to vehicle fuel

Thank you!

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The European Agricultural Fund for Rural Development: Europe investing in rural areas

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