EIP-AGRI Workshop 'Opportunities for Agriculture and Forestry in the Circular Economy'

28-29 October 2015
Naantali, Finland

All information of the workshop available on www.eip-agri.eu at the event webpage

https://ec.europa.eu/eip/agriculture/en/content/eip-agri-workshop-opportunities-agriculture-and-forestry-circular-economy

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eip-agri
AGRICULTURE & INNOVATION

Biovakka Suomi Oy
Nutrient recovery and closing loops with biogas technology in Western Finland

Development manager Teija Paavola, Biovakka Suomi Oy

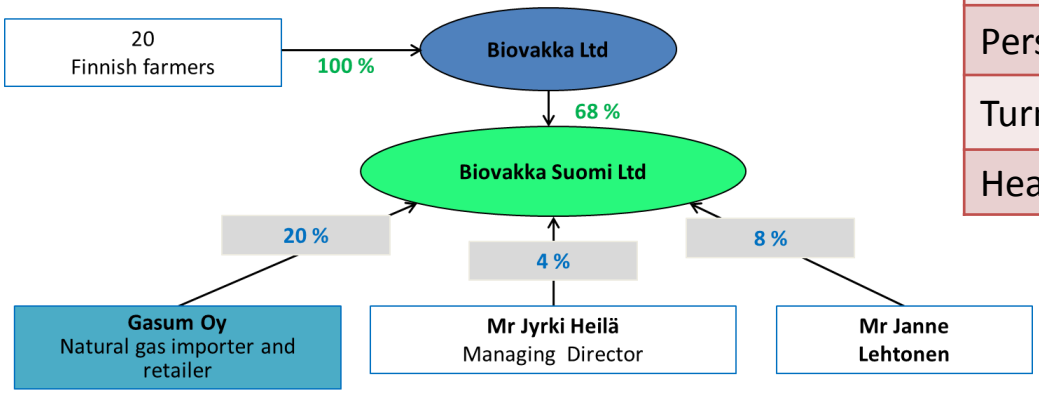
EIP-AGRI ”Workshop Opportunities for Agriculture and Forestry in the Circular Economy”, 28 October 2015, Naantali, Finland

Company Overview

- Established in 2002 by 21 farmers
- Original idea was to find a solution
  - To refine pig manure as an environmentally benign way
  - To enable enlargement of pig production
- Basis of the present operation is
  - To offer waste management service by processing variety of organic materials from agriculture, industry and municipalities
  - To produce biogas
  - To produce safe nutrient products
  - To build a network of biogas plants with nutrient recovery and concentration process

Biovakka was established in 2002 by Jyrki Heilä (CEO) and 20 farmers

Facts	Figures
Vehmaa plant in production	Since 2005
Turku plant in production	Since 2009
Personnel in 2015	13, indirectly 20
Turnover 2014	8,3 M€
Head office location	Turku, Finland



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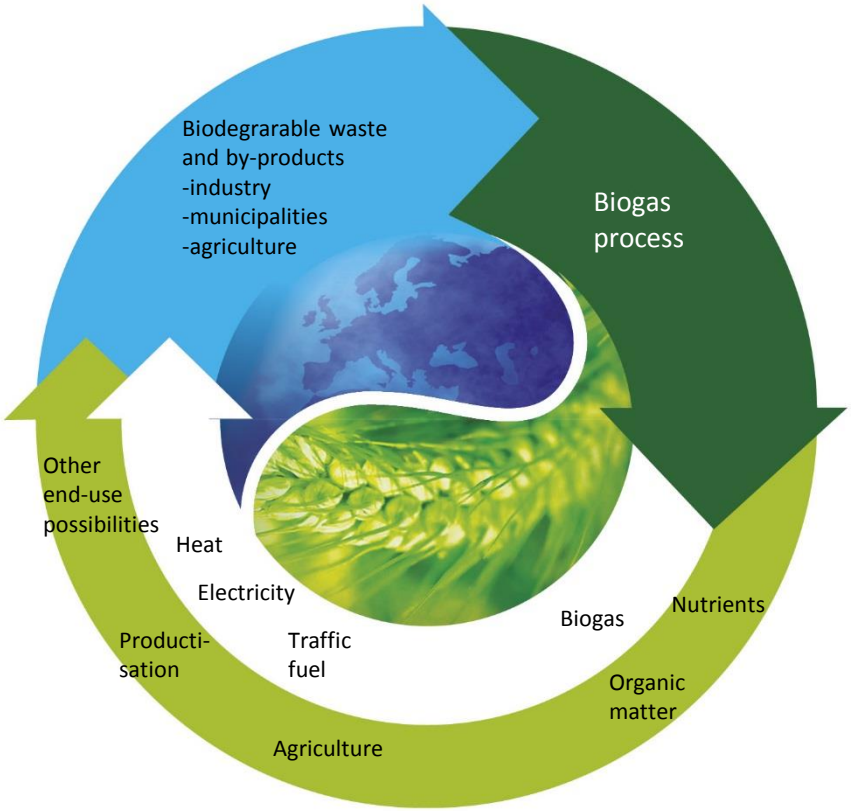
Closed loop with biogas technology

Reducing emissions from manure management

Replacing fossil fuels and reducing emissions



Reducing emissions from waste management

Recycling nutrients and organic matter

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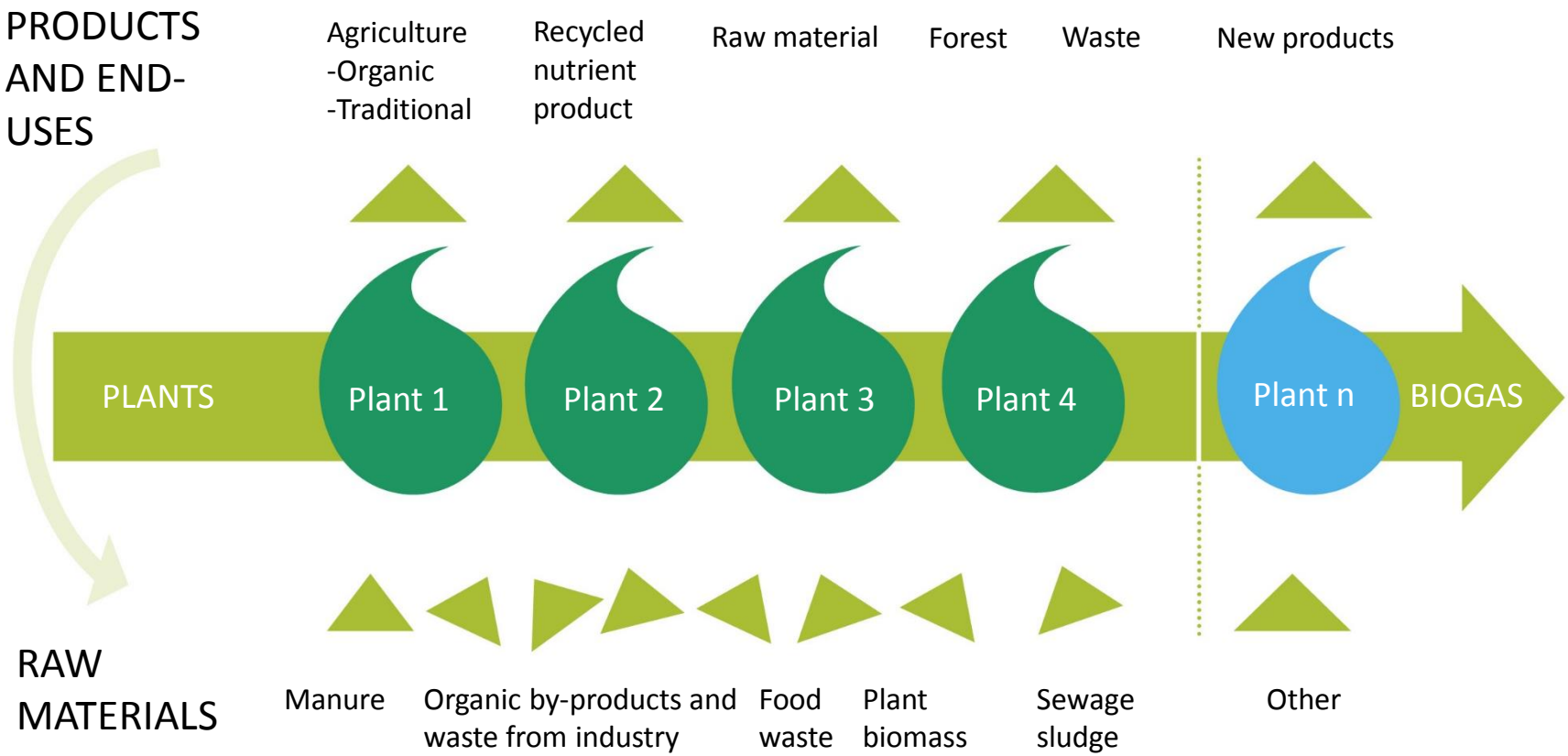
Company's strategy: From the end-use



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Production sites

Vehmaa biogas plant

- Operations started in 2005
- The first large-scale biogas plant in Finland
- Raw materials: pig slurry and industrial by-products from enzyme and food production
- Environmental permit: 120 000 tons/a
- Energy output: 4 MW (electricity and heat)
- Pasteurisation: 1 h at 70 °C before biogas process
- Biogas process: 41 °C, OLR ~2.1 kgVS/m^3d, HRT 20 – 25 d
  - High nitrogen concentration (N_{tot} 8 g/l, NH_4-N 6 – 7 g/l)
  - Specific methane production >500 m^3CH_4/t-VS_{add}
- Digestate post-treatment and productisation

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Turku biogas plant

- Operations started in 2009
- Raw materials: sewage sludge from municipal waste water treatment plants
- Environmental permit: 150 000 tons/a (in use: ~50%)
- Energy output: 4 MW (elec. and heat)
- The generated heat is supplied into the district heating network of the City of Turku
- Thermal hydrolysis, 20 min, 150 °C, 5-6 bar
- Biogas process: 52 – 53 °C, OLR ~4 kgVS/m^3d, HRT 17 – 21 d
  - Specific methane production 300 m^3CH_4/t-VS_{add}
- Solid fraction of the digestate is utilised in landscaping and agriculture (liquid fraction is directed to WWTP)
  - Nutrient recovery from the liquid fraction is under development

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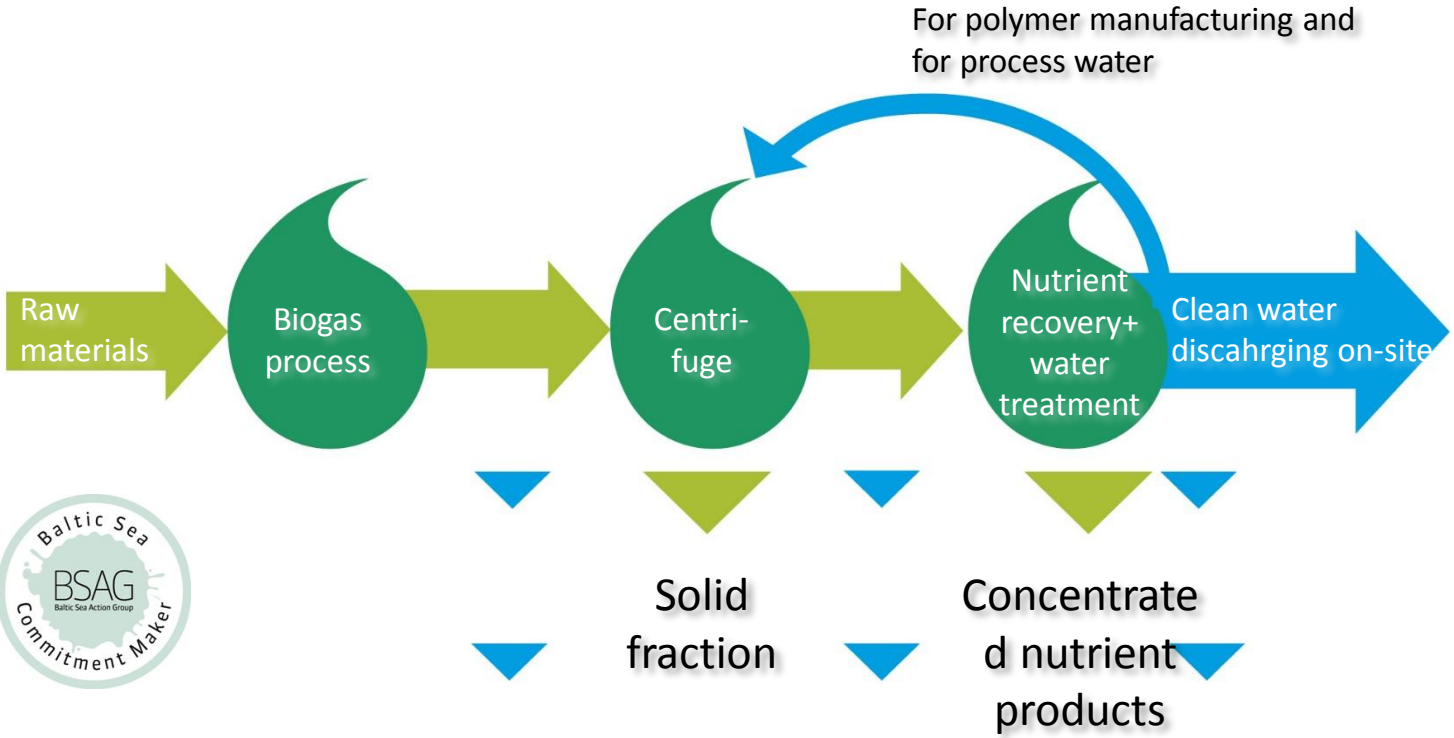
Nutrient recovery and concentration process



- **Nutrient recovery** from the digestate liquid fraction as a concentrated form and production of clean condensate (purified water), which can be discharged **directly into soil or waters** on-site
- Meets the demanding Northern climate conditions and environmental legislation
- **Major savings** in storage and logistics → **Solution for competition** against plants with feed-in tariff

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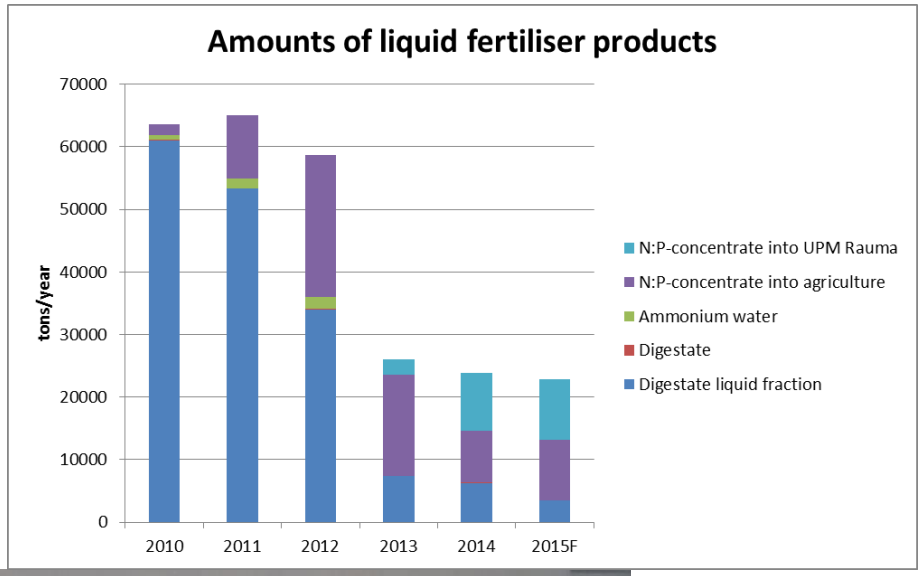
Purified water from digestate liquid fraction



Digestate liquid fraction

N:P Concentrate

Process water

Purified water

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Recycled nutrients in industrial use

- Use as a chemical
  - Replacing phosphoric acid and urea
- Security of supply
- Uniform quality
- Consumption all over the year

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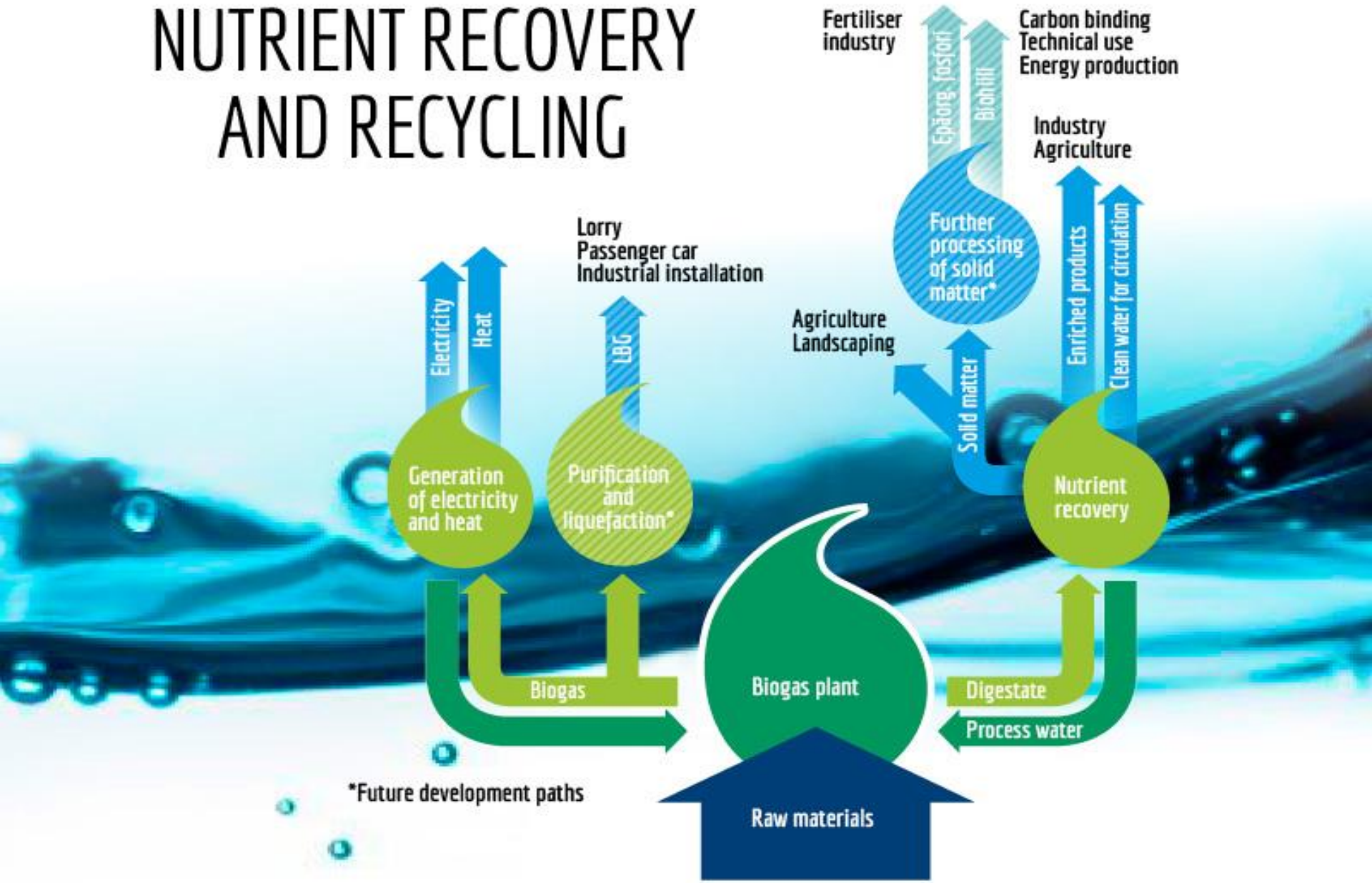
NUTRIENT RECOVERY AND RECYCLING



Competitive fuel for heavy traffic
Reduction of GHG emissions via LBG use

Source of energy in biogas plant	Transport of raw materials and digestate products by diesel trucks		Transport of raw materials and digestate products by LBG	
	vs. fossil diesel, %	vs. LNG, %	vs. fossil diesel, %	vs. LNG, %
Average electricity and natural gas	67	63	71	68
Average electricity and wood chips	82	80	87	85
Renewable electricity and natural gas	75	72	79	77
Renewable electricity and wood chips	90	88	95	94

LBG: liquefied biogas LNG: liquefied natural gas

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Luke LUONNONVARAKESKUS

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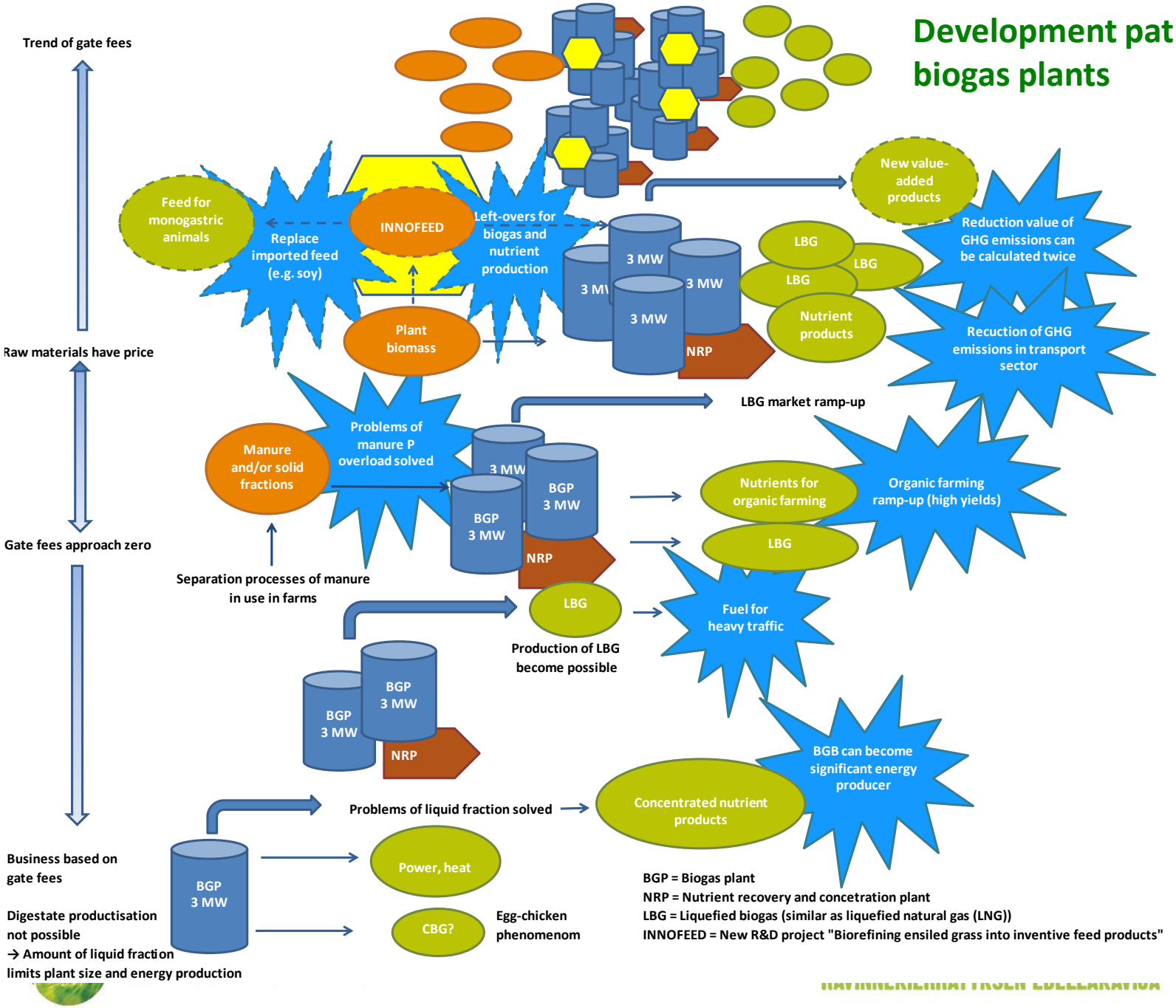
Development path of biogas plants



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Thank you for your attention

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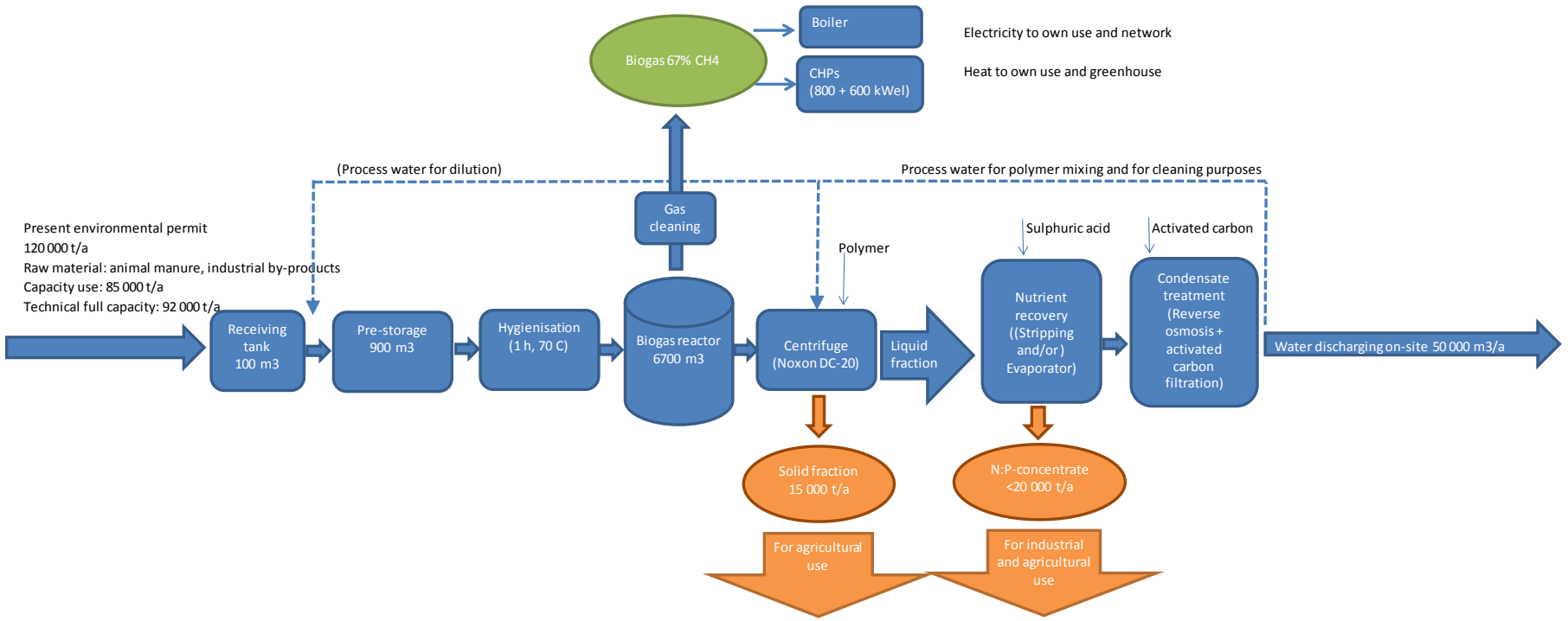
Additional information

Vehmaa plant: flow chart



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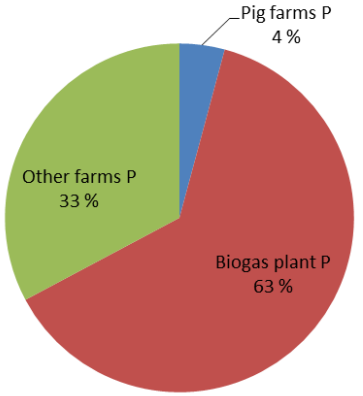
Target of Vehmaa biogas plant: A regional solution for managing environmental problems of manure

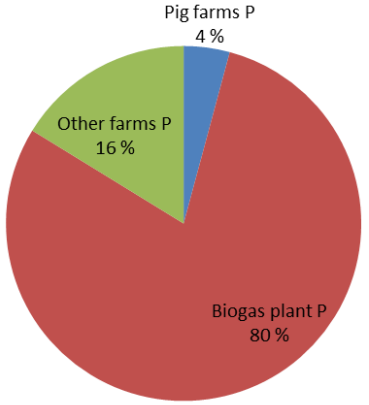
- Vakka-Suomi: 8 municipalities (Vehmaa, Taivassalo, Uusikaupunki, Mynämäki, Laitila, Masku, Nousiainen, Kustavi)
  - Pig slurry from Vehmaa and separated solid fraction from other municipalities → Redistribution of 60% of animal manure P and 90% of pig manure P
  - If additional 50 % of cow and chicken manure → Redistribution of 80% animal manure P

→Solution for regional and farm-scale problem of phosphorous overload

All manure: 382 tons of P
Pig manure: 257 tons of P



All manure: 382 tons of P
Pig manure+50% of cow manure+50% of chichen manure: 304 tons of P



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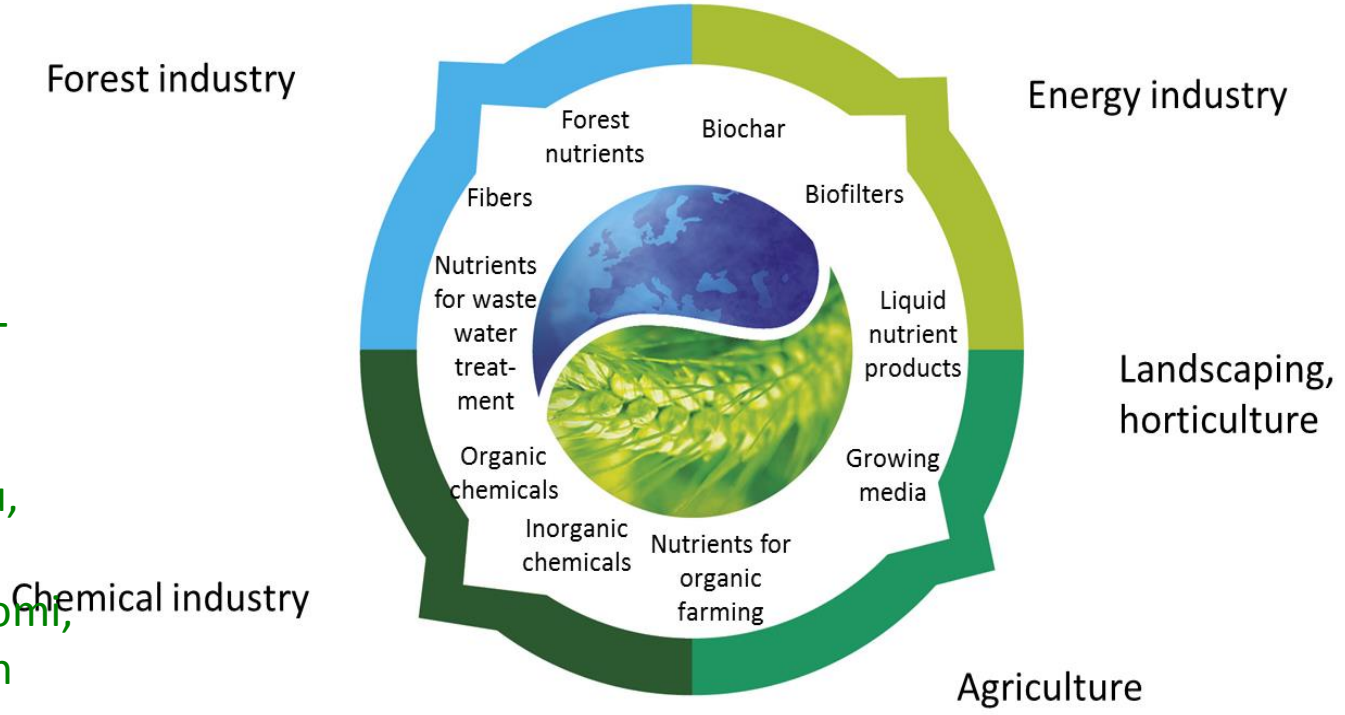
Preliminary results of R&D project LantaTeko

Future: Added value from new products and end-uses

New project:
Biorefining ensiled grass into inventive feed products ”INNOFEED” 2015 – 2018
Partners: VTT, Luke, Tekes, Valio, A-Rehu, Eastman, Pohjolan Maito, Biovakka Suomi, Pirteä Porsas, Pellon Group, Roal



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