Palopuro Agroecological Symbiosis - Increasing sustainability in organic farming

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What is Agroecological Symbiosis?

• Model where concepts of Industrial Ecology (IE) and Industrial Symbiosis (IS) are applied to food production
  – Symbiosis from biology
  – Actors operate in close proximity to each other (IS)
  – Energy and nutrient flows resemble those in natural ecosystems (IE)
Palopuro pilot case of AES in Hyvinkää, Finland

ARABLE AREA FOR FOOD CROPS AND FOR BIOMASS FROM LEYS FOR GREEN MANURING

KNEHTILÄ FARM

FIELDS

INTERACTION BETWEEN PRODUCERS AND CUSTOMERS

LIFE CIRCLE OF BIOGAS

BEYOND THE BIOGAS PLANT

LOCAL AND REGIONAL CUSTOMERS AND RESTAURANTS

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Elina Virkkunen

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Jyväskylä
Knehtilä farm

- Organic cereal farm (360 ha)
- Farm store and restaurant
- Local food market days
- Over 10,000 visitors a year
- www.knehtilantila.fi
Palopuron Biokaasu Ltd

- Regional energy company (Nivos Energia Oy), local operators and biogas plant manufacturer (Metener Oy)
- Local biomasses
  - Green manure leys 2 300 tn (100-130 ha)
  - Horse manure 1 000 tn
  - Chicken manure 80 tn
- Dry fermentation TS % ~ 35
- Heat for the harvest dryer and gas for the bakery
- Fuelling station
- Replicable business model - New project to examine replication started September 2017, founded by Ministry of Environment’s RAKI-program)
Dry matter biogas plant, 2 batch reactors
Biogas building site
6th of March, 2018
Biogas production increases sustainability in Palopuro AES

• **Enhance nutrient recycling**
  – Enables the more efficient use of green manure grasses
  • Enables spreading biogas residue where needed
  • More soluble nitrogen
  – Enables the more efficient use of horse manure
• **Reduces nutrient leaching** (soluble N and DRP)
  – Plant residues from green manure grass are not left on the field anymore
• Production of **renewable energy**
Energy flows in Palopuro AES (unit: MWh/a)

Field biomass energy potential

Biogas plant

Knehtilä farm

Biomethane

Heat production

Net energy production 1300 MWh

Biogas

Biogas refining

Bakery

Horse manure energy

Hen manure energy

Biogas

Horse manure energy

Hen manure energy

Biogas

Biogas

Biogas

Bakery

Biomethane for sale

Electrical grid

Biogas

Heat production

Biogas

Net energy production 1300 MWh

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Jyväskylä

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Energivirtakaavio on laadittu Wienin teknillisen yliopiston STAN 2.5 (subSTance flow ANalysis) elinkaariohjelmistolla.

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Localizing the food system – not only about biophysical aspects

• Turning from energy consumer to energy producer
• Sustainable way to increase resource efficiency
• Turning from raw material producer to food producer
• Building cooperation with consumers and local community
• Economic impacts
  – New model, new opportunities, big investments
  – Strengthening local economies
• Social impacts
  – Communality
• Coming two doctoral thesis (Kari Koppelmäki and Sophia Hagolani-Albov)
Kiitos!