Palopuro Agroecological Symbiosis - Increasing sustainability in organic farming

HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI

MAATALOUS-METSÄTIETEELLINEN TIEDEKUNTA
AGRIKULTUR-FORSTVETENSKAPLIGA FAKULTETEN
FACULTY OF AGRICULTURE AND FORESTRY

Kari Koppelmäki, University of Helsinki
Sophia Hagolani-Albov, University of Helsinki
Tuure Parviainen, University of Helsinki
Elina Virkkunen, Natural Resources Institute Finland
Juha Helenius, University of Helsinki

Luke
LUONNONVARAKESKUS

What is Agroecological Symbiosis ?

- Model where concepts of Industrial Ecology (IE) and Industrial Symbiosis (IS) are applied to food production
  - Symbiosis from biology
  - Energy and nutrient flows resemble those in natural ecosystems (IE)
  - Actors operate in close proximity to each other (IS)

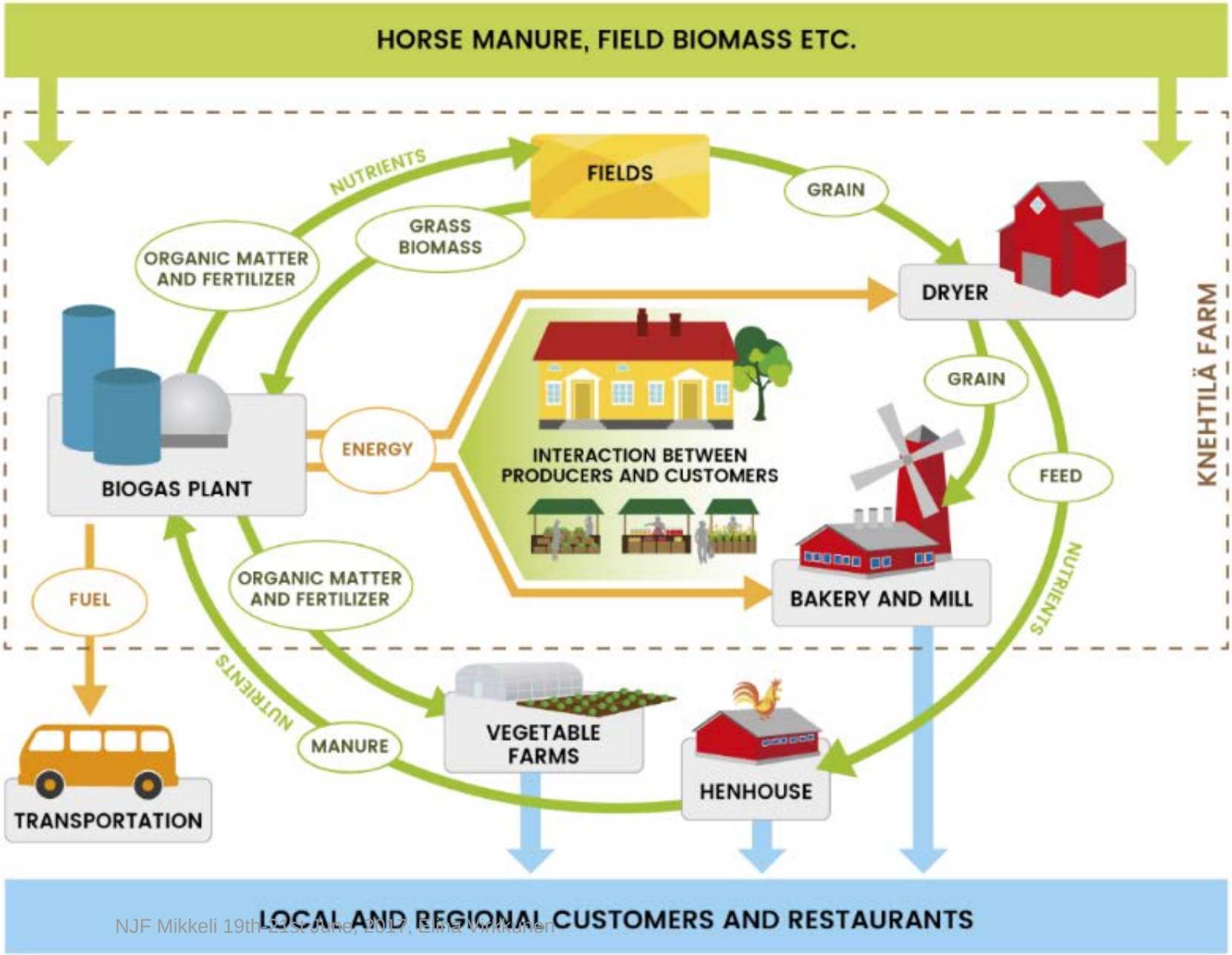
Implications

Case study of the first AES in Finland indicates:

- Biogas production increases the productability of an organic crop farm
  - Green manure leys and other local biomasses

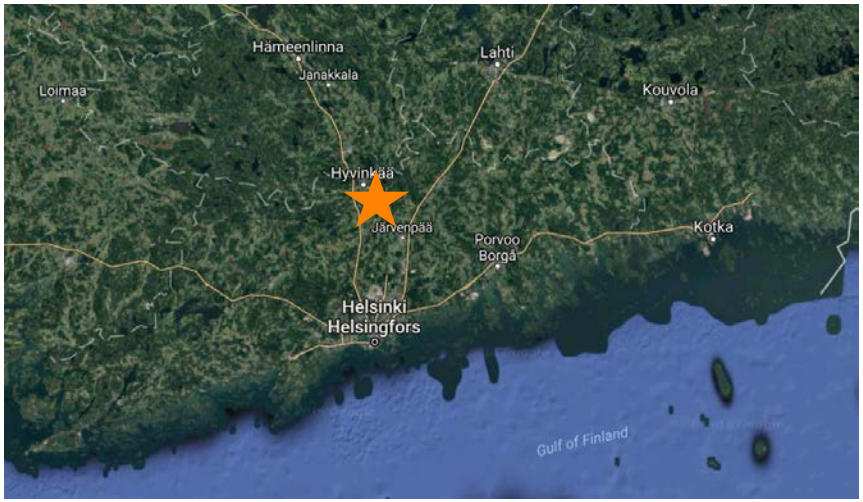
    -> energy and nutrients
- Farm becomes a net-energy producer instead of consumer and from raw material producer to food producer
- Sustainability of the local food system
  - Combining crop, food and energy production + interaction with consumers

Palopuro Agroecological Symbiosis



Knehtilä farm

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



Joonas Fritze/WWF

Palopuron Biokaasu Ltd

- Regional energy company (Nivos Oy), local operators and biogas plant manufacturer (Metener Oy)
- Local biomasses
  - Green manure leys 2 300 t (100-130 ha)
  - Horse manure 1 000 t
  - Chicken manure 80 t
- Production ~ 2500 MWh/a
- Heat for the harvest dryer and gas for the bakery
- Fueling station (60 % of the gas)
- Relocatable business model –> Nivos tries to get 10-20 distributed biogas plants in its area
- 105 000 ha biomass area available for harvesting in Finland – huge potential for biogas

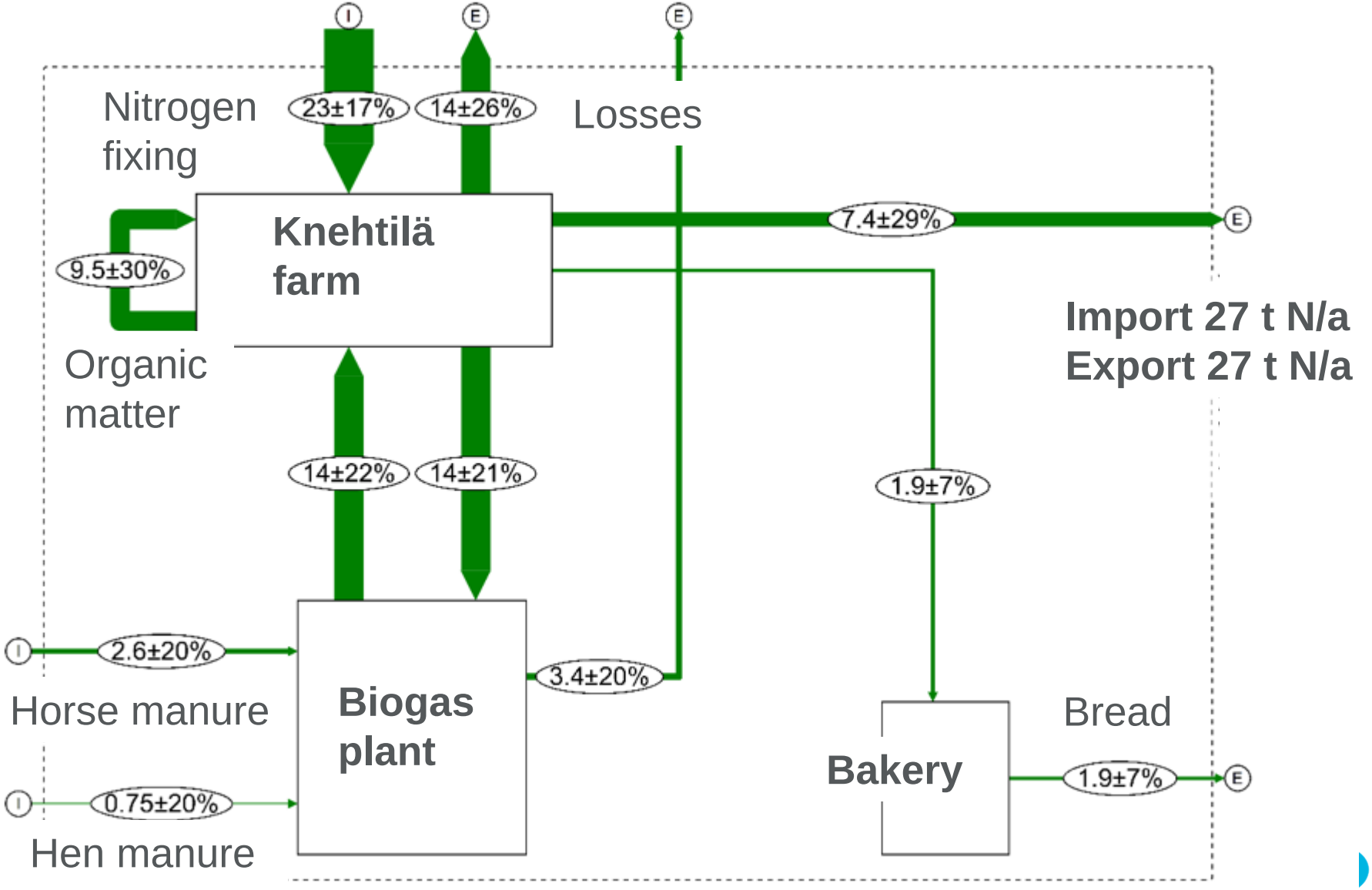
Dry fermentation (TS % ~ 30-35) biogas plant, 2 batch reactors

Luke
LUONNONVARAKESKUS

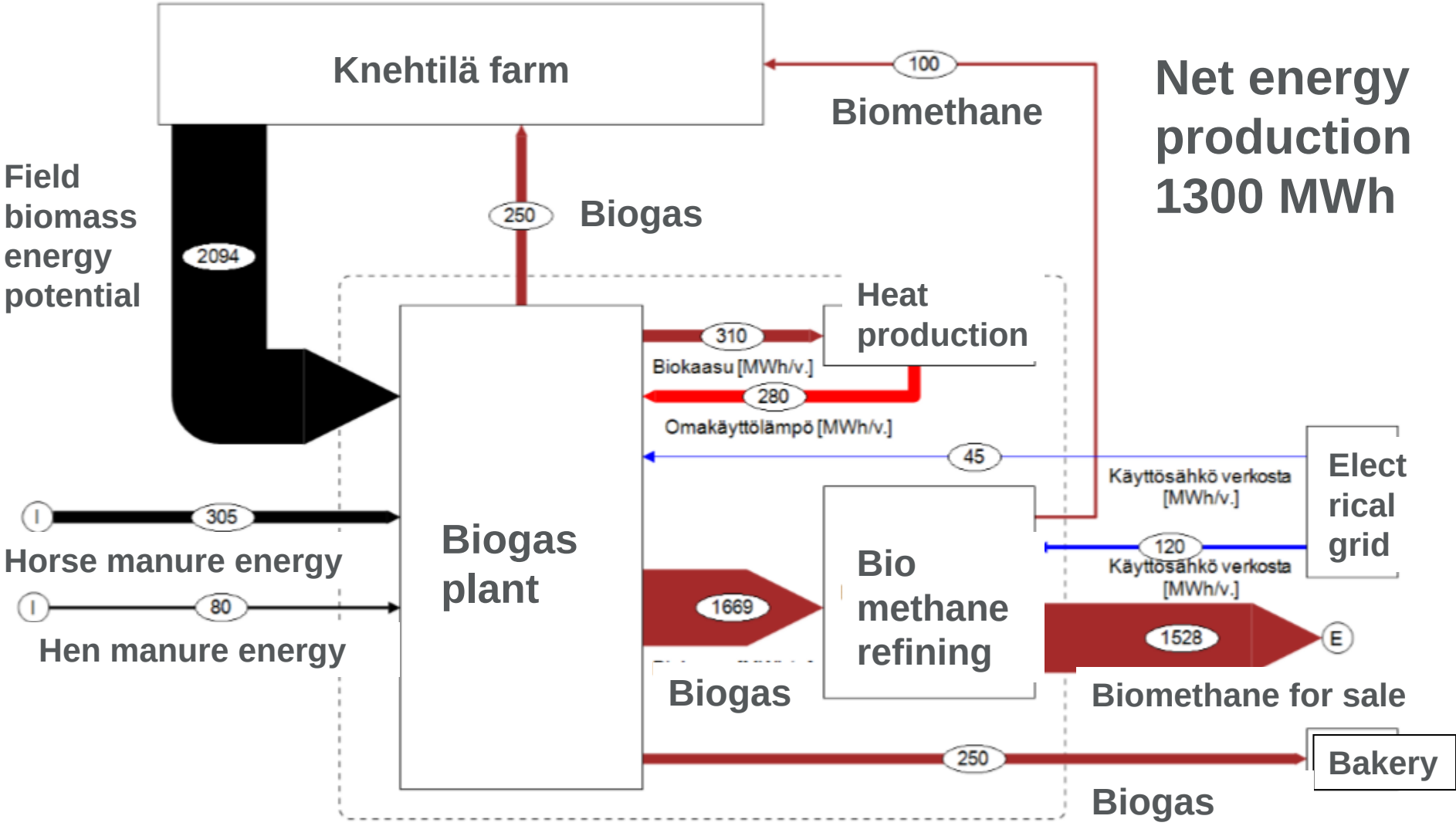
Biogas production increases sustainability in Palopuro AES

- **Enhance nutrient recycling**
  - Enables the more efficient use of green manure grasses
    - 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**

Nitrogen balance in Palopuro AES (unit: t N/a)



Energy flows in Palopuro AES (unit: MWh/a)



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

Localizing the food system – not only about biophycial aspetcs

- Sustainable way to increase resource efficiency
- Building cooperation with consumers and local community
- Economic impacts
  - New model, new opportunities, big investments
  - Strengthening local economies
- Social impacts
  - Communality, social capital in rural areas
- Coming two doctoral thesis (Kari Koppelmäki and Sophia Hagolani-Albov)

Kiitos!

http://blogs.helsinki.fi/palopuron symbioosi/english/