Value from food waste

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Luke in a nutshell

- Natural Resources Institute Finland (Luke) is a research and expert organization with expertise in renewable natural resources and sustainable food production
- Luke provides innovative solutions for new business opportunities based on natural resources
- Our strengths are in sustainable production and use of natural resources and thorough knowledge of bio-based raw materials

Luke
NATURAL RESOURCES
INSTITUTE FINLAND

Adding value in resource effective food system (AVARE) project

Objective is to **reduce** the occurrence of food waste and to **address unavoidable food waste as a renewable resource** for bio-based products adding value to the supply chain.

Target segment is the hospitality sector.

AVARE

Partners

LUKE – Natural resources Institute Finland, Finland	Luke NATURAL RESOURCES INSTITUTE FINLAND
University of Applied Science Münster – Institute of Sustainable Nutrition, Germany	iSuN FH MÜNSTER
Technische Universität Berlin – Institute of Biotechnology, Germany	Technische Universität Berlin; Institute of Biotechnology, Technische Universität Berlin, Bioprocess Engineering
Ostfoldforskning – Ostfold Research, Norway	Østfoldforskning
Swedish University of Agricultural Sciences, Sweden	SLU

Funding Organisations

Ministry of Agriculture and Forestry, Finland	mmm.fi MINISTRY OF AGRICULTURE AND FORESTRY
Federal Ministry of Food and Agriculture, Germany	Gefördert durch: Bundesministerium für Ernährung und Landwirtschaft; ptble Projektträger Bundesanstalt für Landwirtschaft und Ernährung; aufgrund eines Beschlusses des Deutschen Bundestages
The Research Council of Norway, Norway	With funding from The Research Council of Norway
Formas – The Swedish Research Council, Sweden	FORMAS

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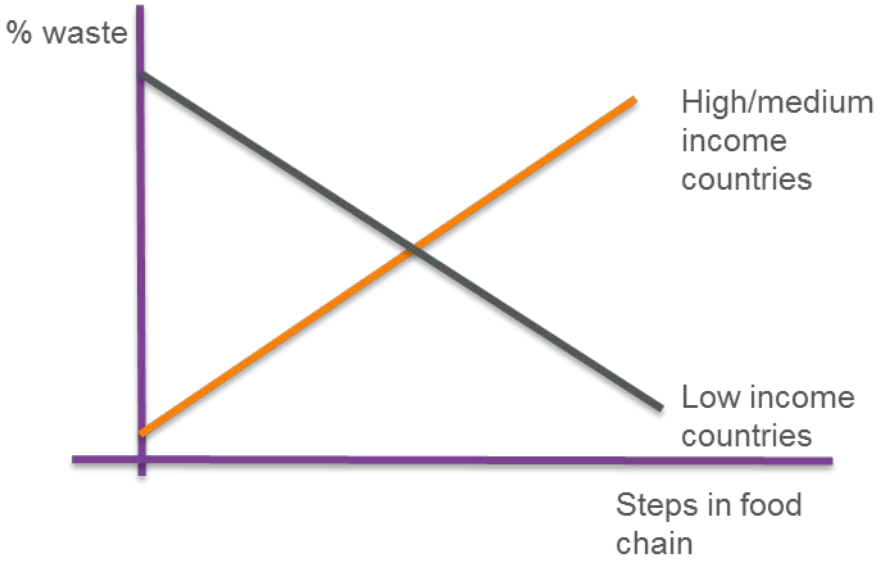
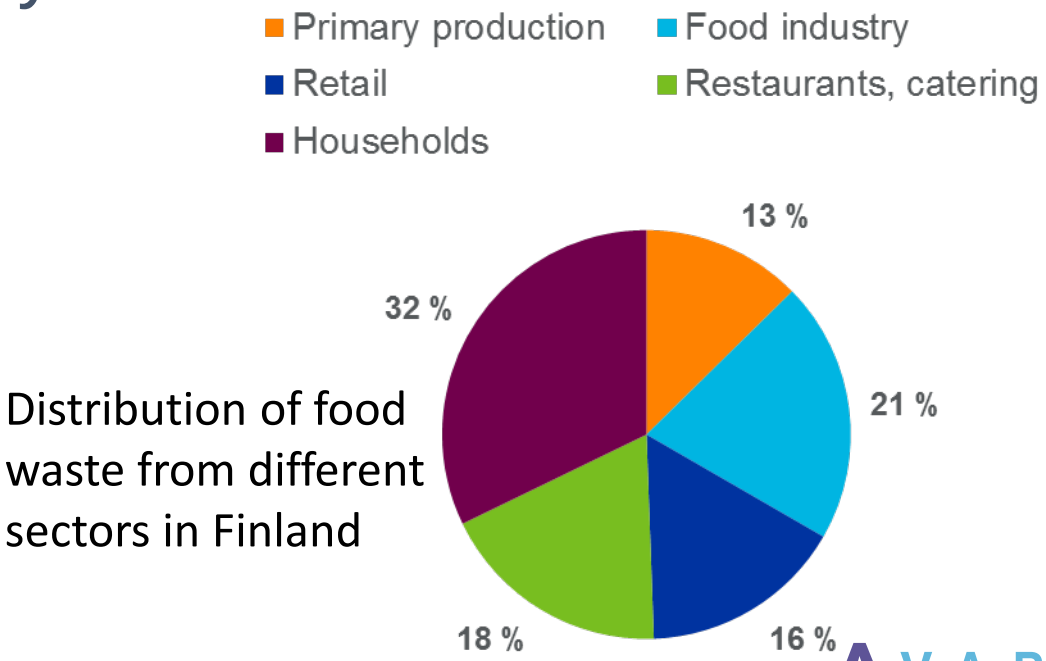
Food waste – a problem?

- According to FAO (2011), globally about 1/3 of food is wasted
  = about 1.3 billion tons annually





Distribution of food waste from different sectors in Finland

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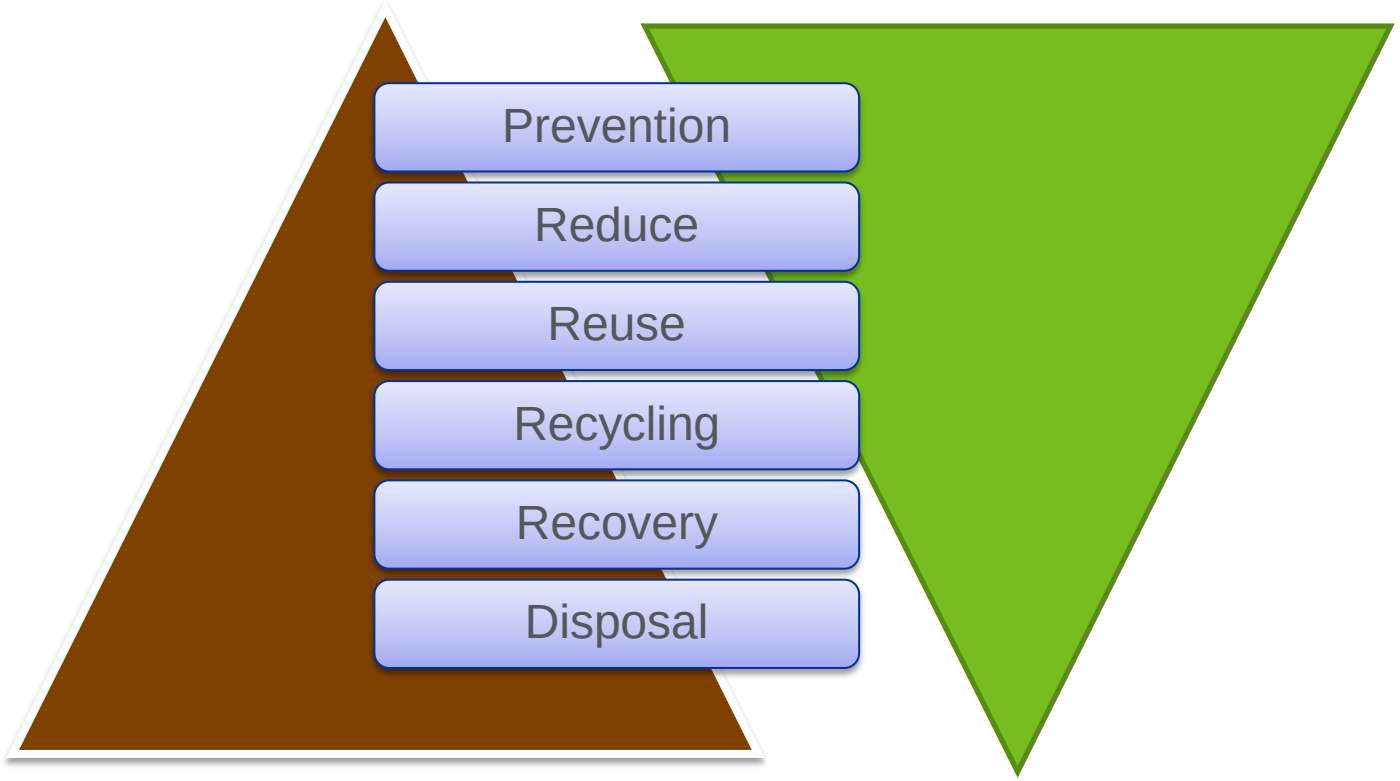
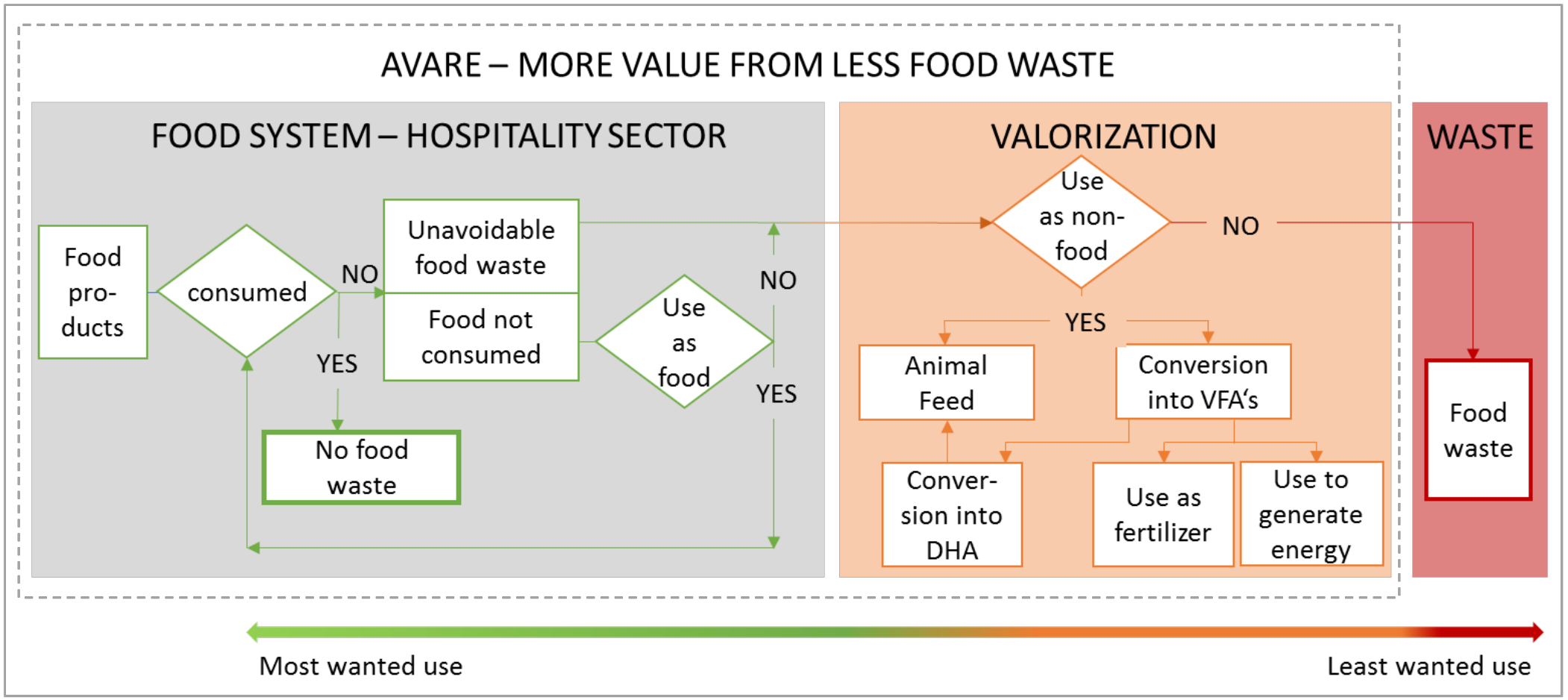
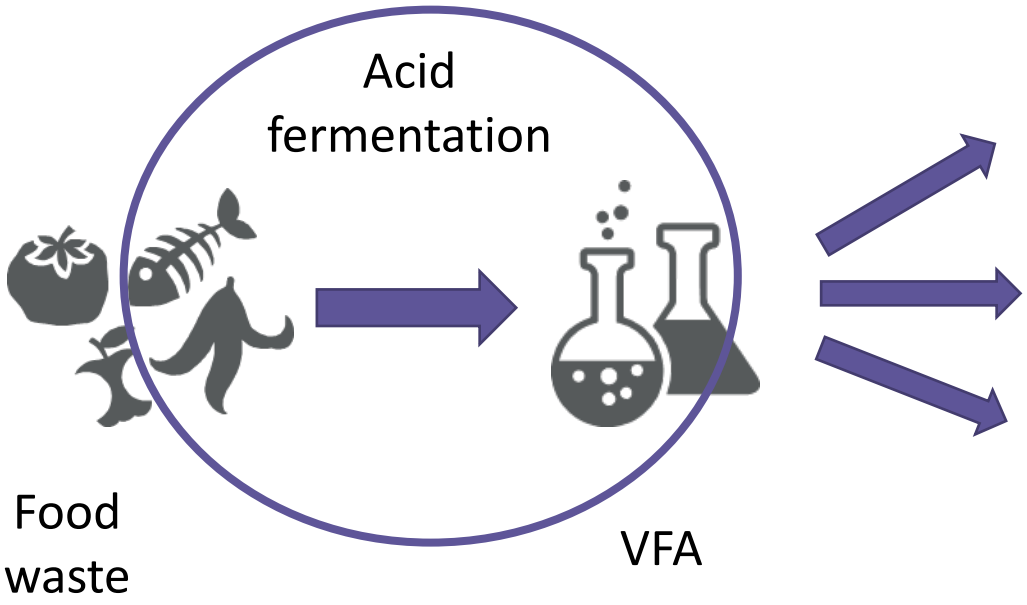
Waste hierarchy



The aim of the project



Possible end products from unavoidable food waste



- Acetic Acid
- Polyhydroxyalkanoates (PHA) → bio plastic
- Docosahexanoic acid (DHA) → feed
- Energy & Nutrients
- Biological nutrient removal (e.g. waste water treatment plant)

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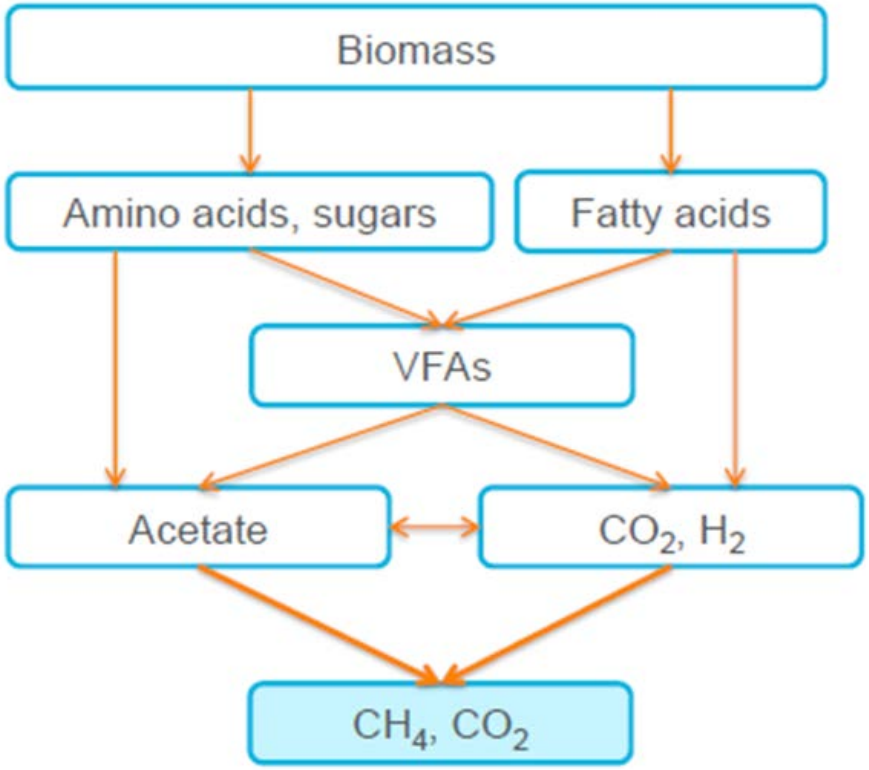
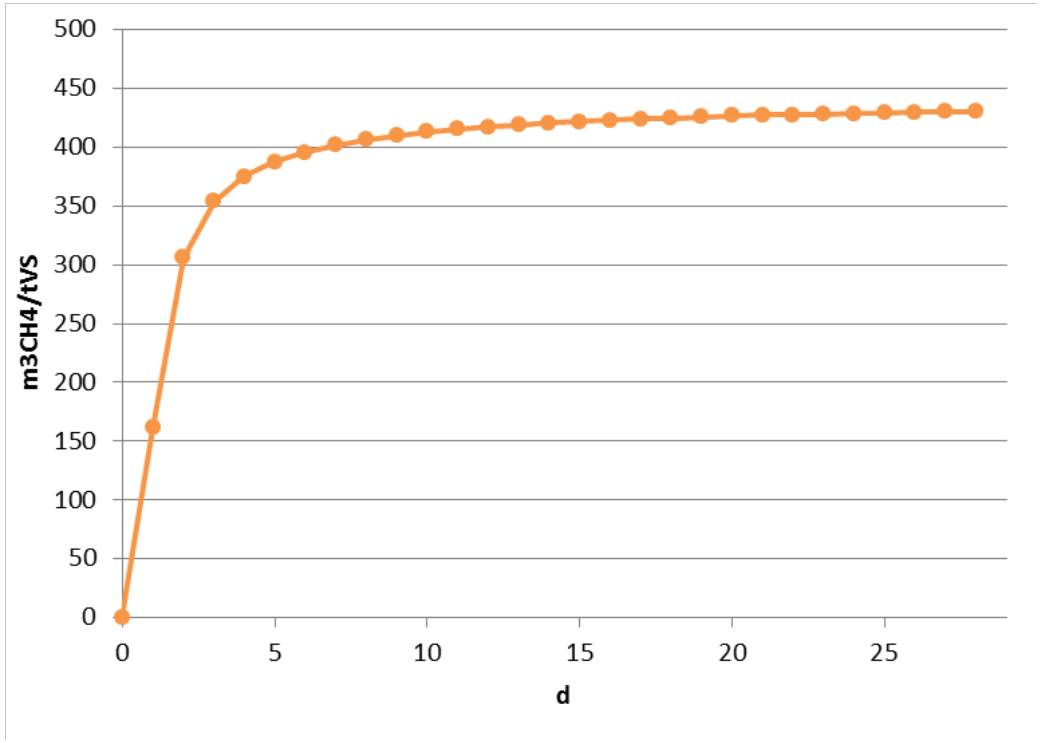
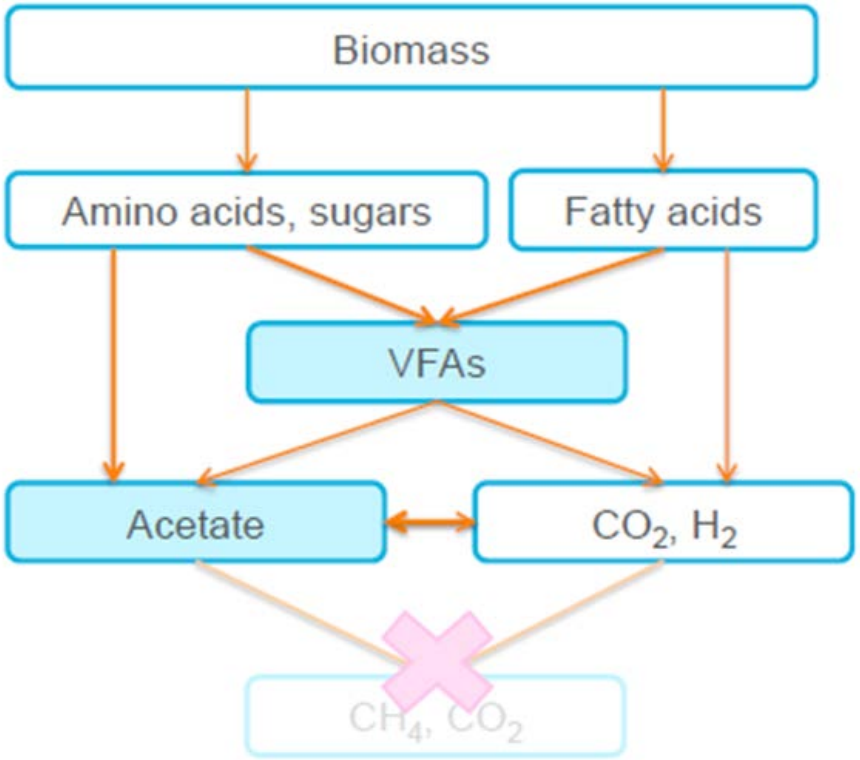
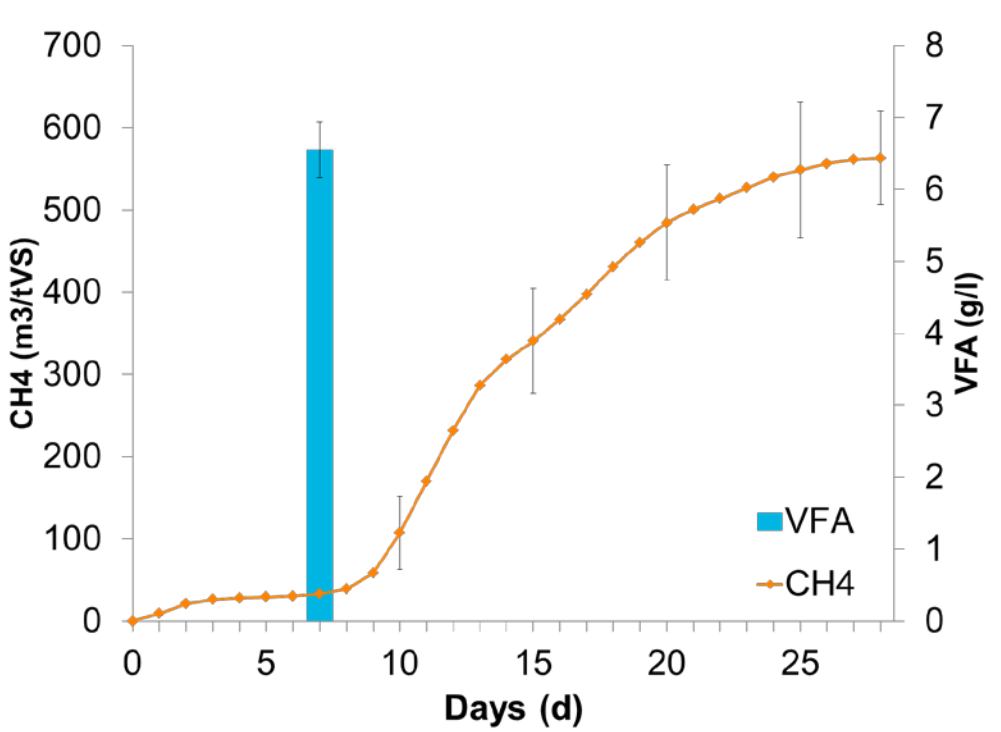
Biogas production





Acid fermentation





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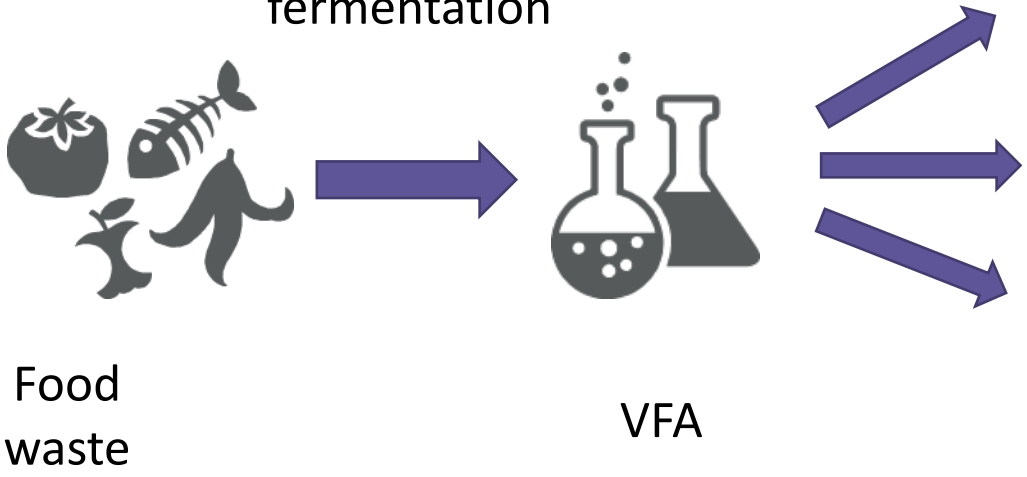

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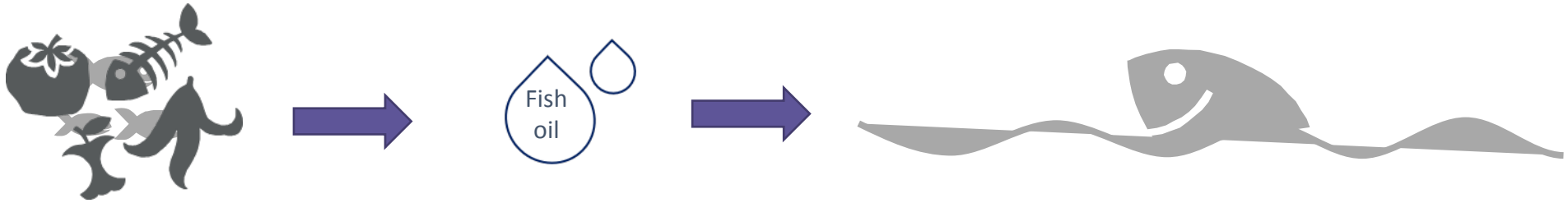
DHA

- Docosahexanoic acid (DHA) is a 6-fold polyunsaturated fatty acid, which has positive health properties
- We consume the essential fatty acid, when consuming (fatty) fish



- Production of several acids in a fermentation process including acetic acid and propionic acid
- Separation of the supernatant of the fermentation from the culture broth
- Production of DHA with a pure culture of microalgae in a 2-stage process
- In the 1st stage (growing phase) carbohydrates are added
- In the 2nd stage (production phase) the effluent of the dark fermentation is added

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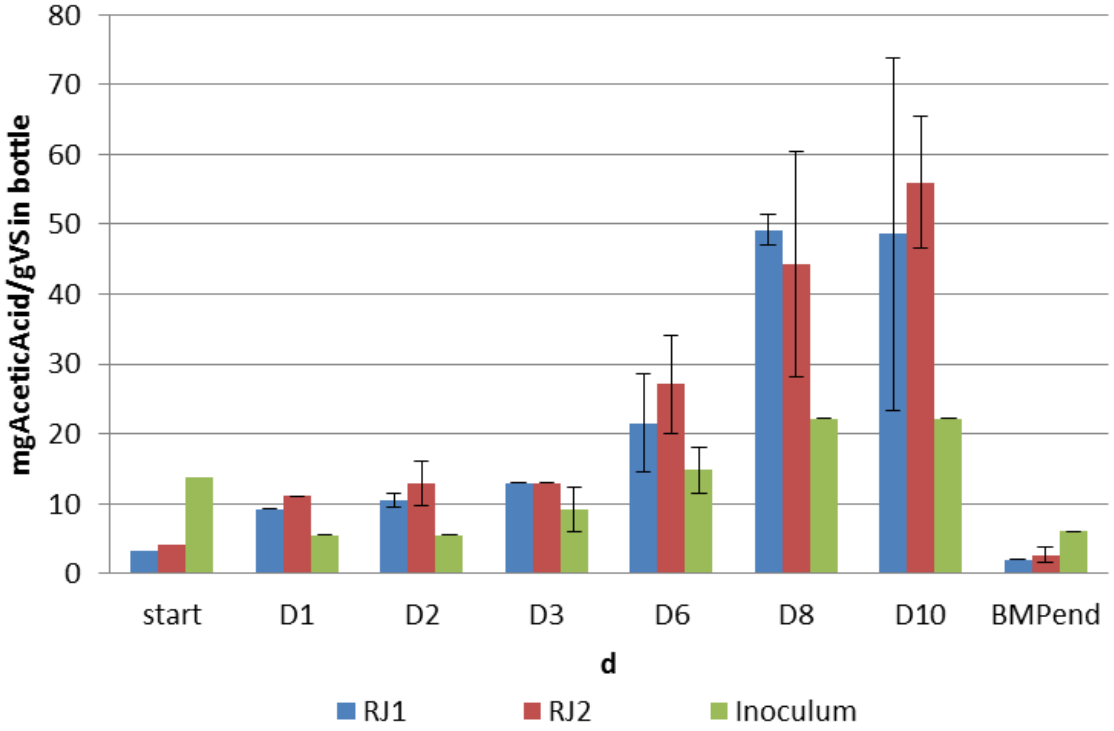
Experiments on food waste

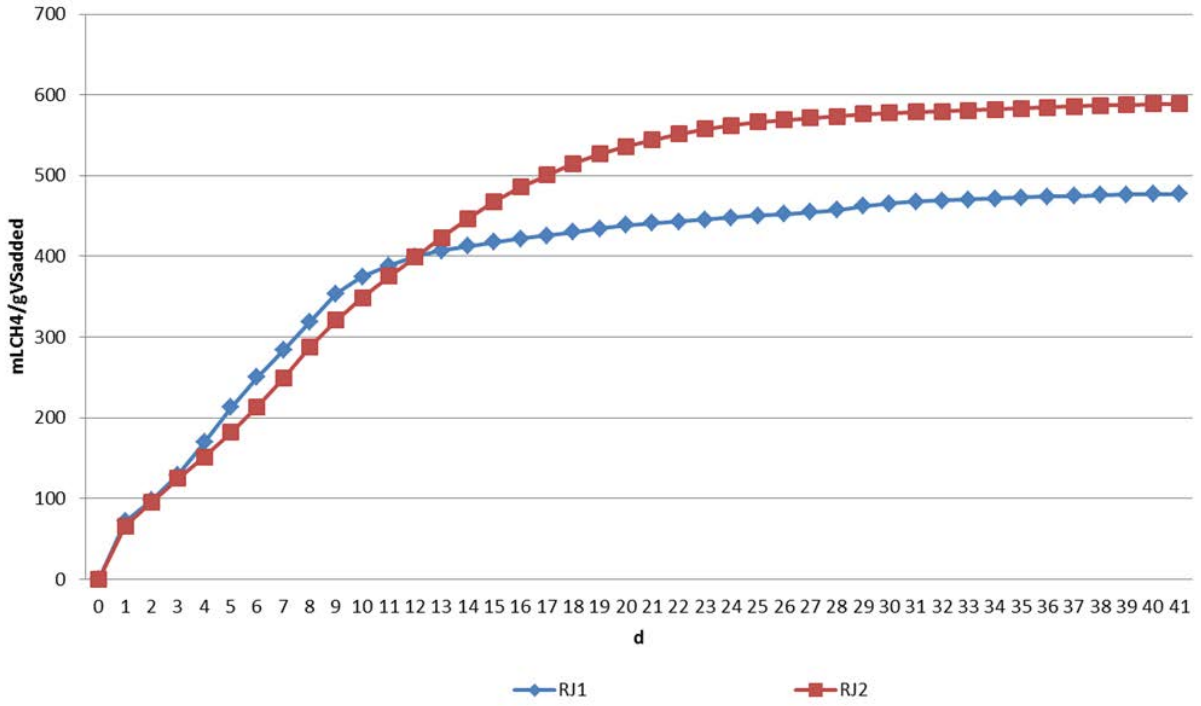
Methods

- Food waste characterisation
  - Food waste samples from day-care
  - Analysis: pH, VFA's, total FA, COD, TS, VS, Hemicellulose, Cellulose, Lignin, Carbohydrates, Lipids, Proteins
  - Microbial samples
- Two batch experiments
  - With pH treatment & overload

- mesophilic (37 °C) conditions
- Biowaste/inoculum VS:VS –ratio 2
- pH controlled to 5-5.5
- Gas is collected and analysed
- 10 day experiment

Results





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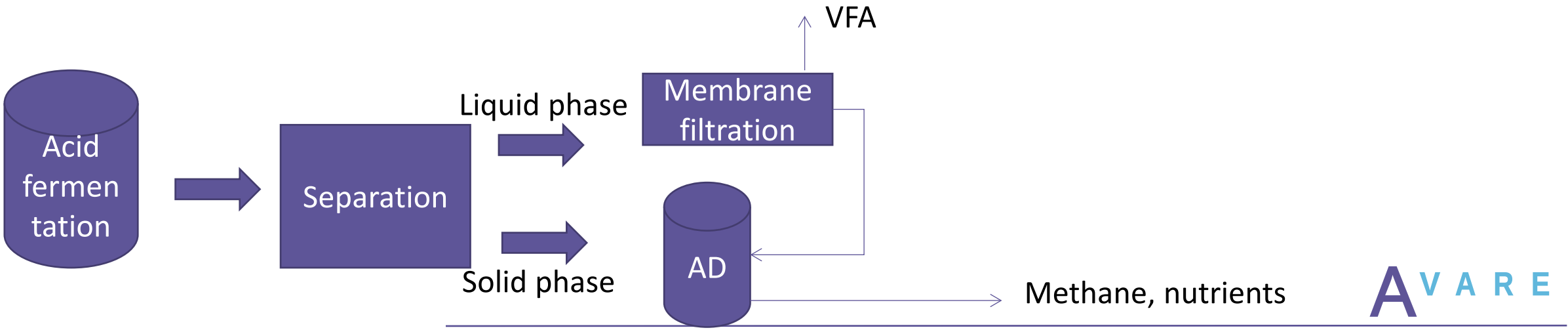
Next steps

- Continuous processing
- Separation of the supernatant of the fermentation from the culture broth
- Methane and nutrient production from rests of the waste
- Comparison of the process to methane production



Thank you

Kiitos

Takk

Danke

Tack

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