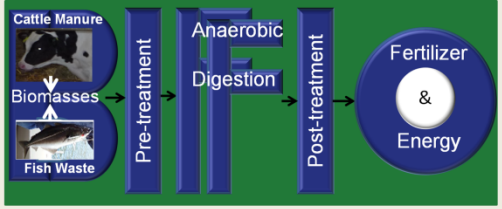

Biogas potential from sludge from aquaculture industry. Preliminary results from the BiFFiO project

Teknologisk Institutt AS/BiFFiO project Project
Morten Berntsen, Senior Project Manager

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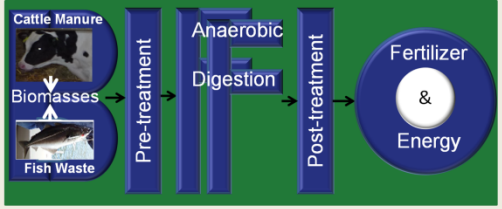
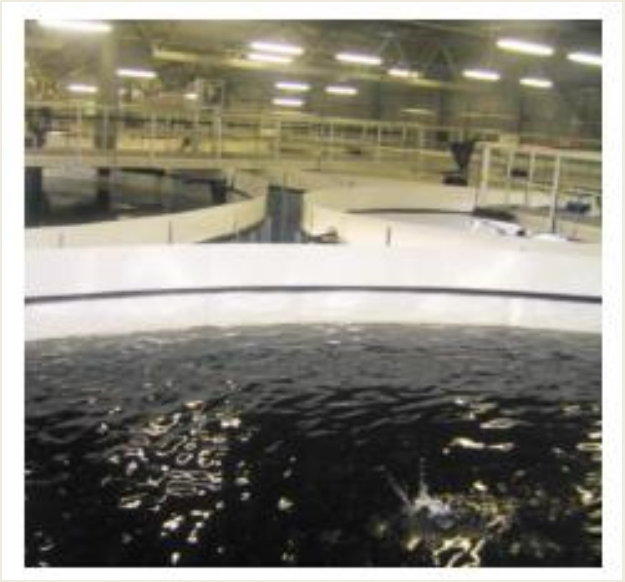
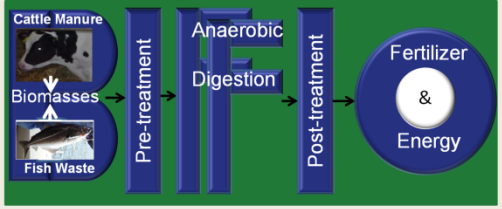


Aquaculture industry - trends

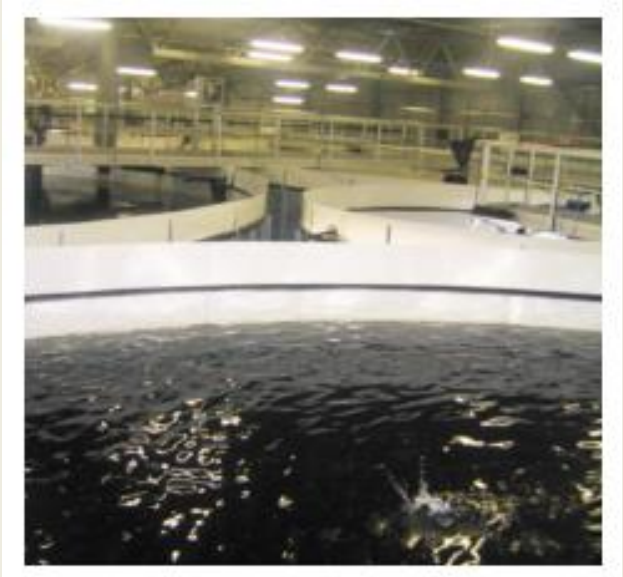
- Last two decades – development from small scale to large scale/intensive commercial farming
- Surpassing the landings from capture of fish in many areas of the world
- Annual growth of 9,1 % compared to annual growth of 1,2 % for capture fisheries

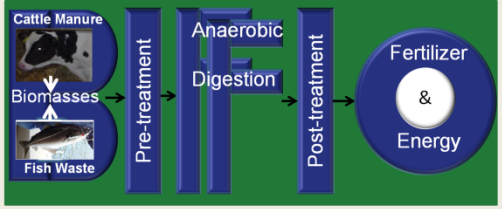




Aquaculture industry - trends

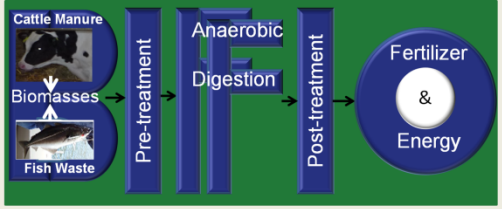
- World aquaculture production is 63 million tons (FishStat).
- Globally, fish currently represents about 16.6 percent of animal protein supply and 6.5 percent of all protein for human consumption (FAO 2012).
- Increasing use of land based recirculation technology
- Future limitations with regards to discard/emissions to the sea





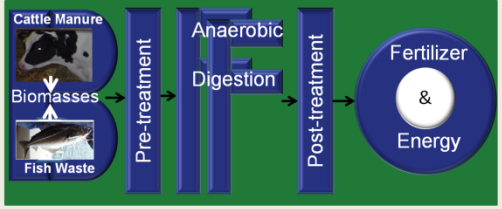
Aquaculture – production of sludge

- Sludge from aquaculture activity consists of:
  - Fish faeces: 0,18 – 0,2 kg/kg of food
  - Uneaten food (minimized through good farming practices)



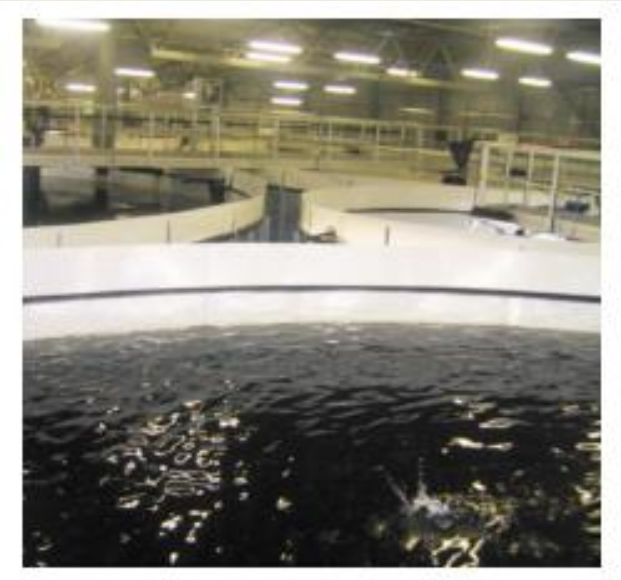
Aquaculture – biogas potential of sludge

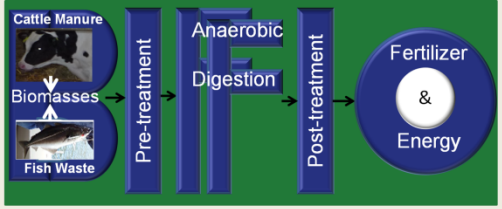
- Analyses of sludge from aquaculture demonstrate:
  - 194 litres methane/kg volatile solids
  - Comparable to gas potential from sewage sludge
  - Considerable lower than food waste of fats (400 – 500 litres methane/kg volatile solids)



Aquaculture – case study

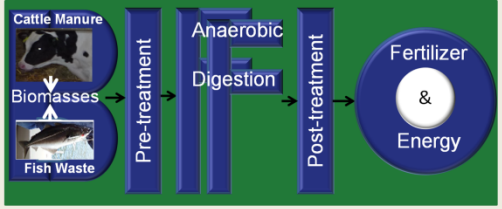
- Case study from state-of-the art recirculation plant
- Annual production: 1000 tons of sea bass
- Total energy consumption of 4.800.000 kWh/year
- Annual production of sludge: 200 tons (dry solids)
- Methane potential: 40.000 m3
- Max energy potential: 400.000 kWh = 8 % of total annual energy consumption (1m3 CH4 = 10 kWh)
- Can substitute 40.000 litres of diesel (1 m3 of methane = 1 litres of diesel)





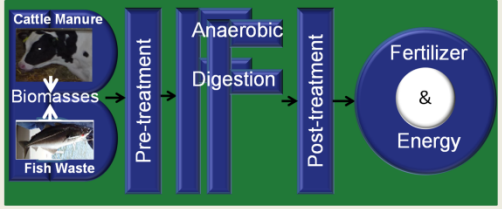
Aquaculture sluge – anaerobic digestate

- Content of anaerobic digestate:
  - Total Nitrogen: 4 g/kg
  - Total Phosphorous: 0,8 g/m3
- High content of nitrogen and phosphorous compared to manure from cow, pig and poultry (x 2)
- High N:P ratio compared manure from cow, pig and poultry



Aquaculture sluge – total potential

- World aquaculture production is 63 million tons (FishStat), representing:
  - A total volume of sludge of 12 million tons
  - Methane potential of 2.400 million m3
  - A energy potential of 24.000 million kWh = 24 TWh (total annual energy consumption in Norway is 125 TWh
  - 50 tons of phosphorous
  - 250 tons of nitrogen



BiFFiO project

- Cooperation between the aquaculture and agriculture sectors with the intent to use animal manure and fish faeces for sustainable production and utilization of renewable energy and recovered nutrients
- Total budget: 2,3 Million Euro
- Financed by EU 7th Framework Program – Capacities – Research to the benefit of SME Associations
- Project start 1. November 2013.
- Duration 36 months

(http://ec.europe.eu/research/rea (FP7/2007-2013)) under Grant Agreement no. 605815

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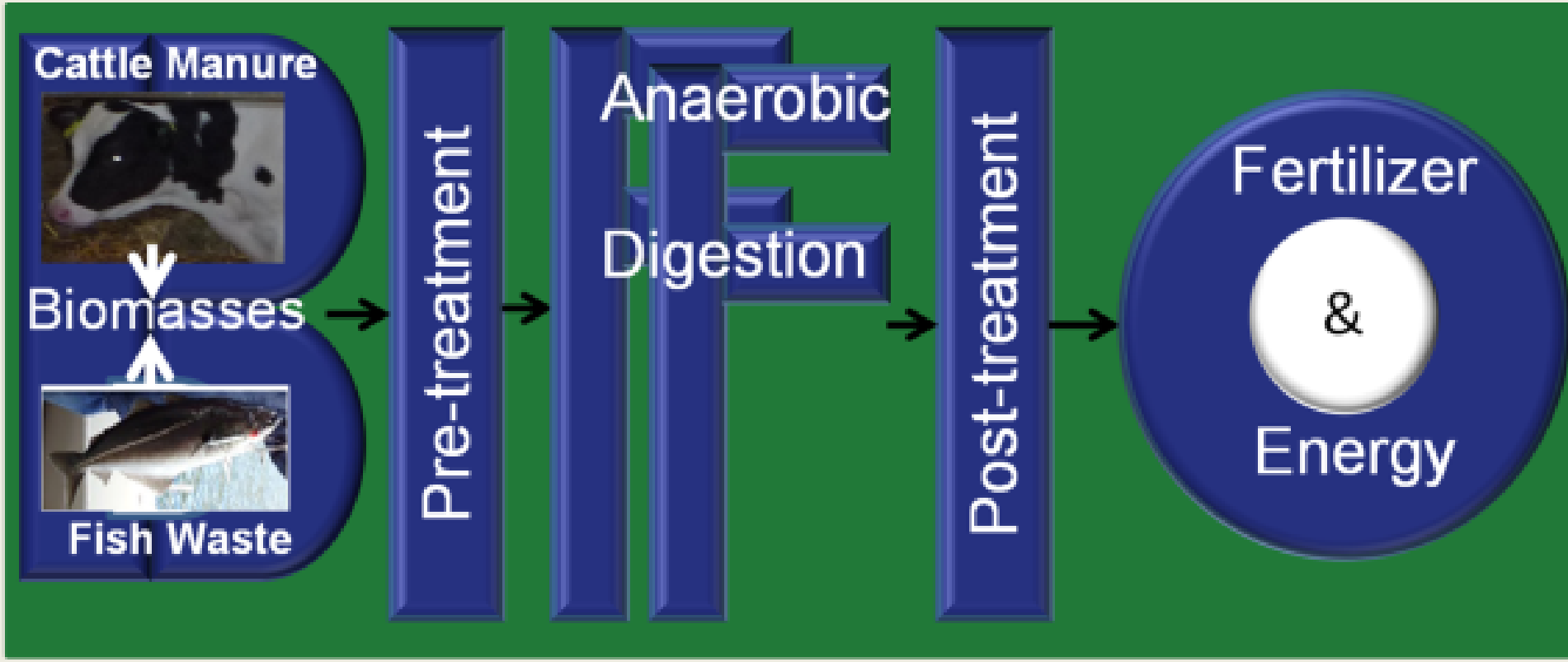
The BiFFiO project



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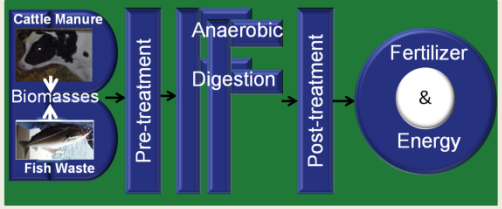

BiFFiO project consortium

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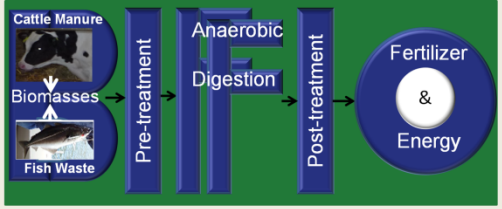

BiFFiO project – further information

www.biffio.com

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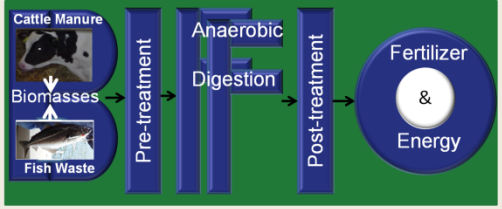

Thanks for your attention

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