Marine Biogas

A commercial concept to recapture nutrients and producing biogas

Fredrik Norén at IBBA Workshop Esbjerg 2015-08-25

MARIN BIOGAS

The Marin Biogas team

Fredrik Norén (founder, RnD manager)

- PhD Marine ecology
- Inventor and founder of Marin Biogas and several other marine inventions
- Experienced marine biological/technical consultant

Olle Stenberg (CEO)

- PhD in Chemical Reaction Engineering
- Experienced innovation and incubator manager
- 100+ high tech start-ups
- Currently CEO of Marin Biogas

The world is facing several key challenges

1

Climate change and peak oil

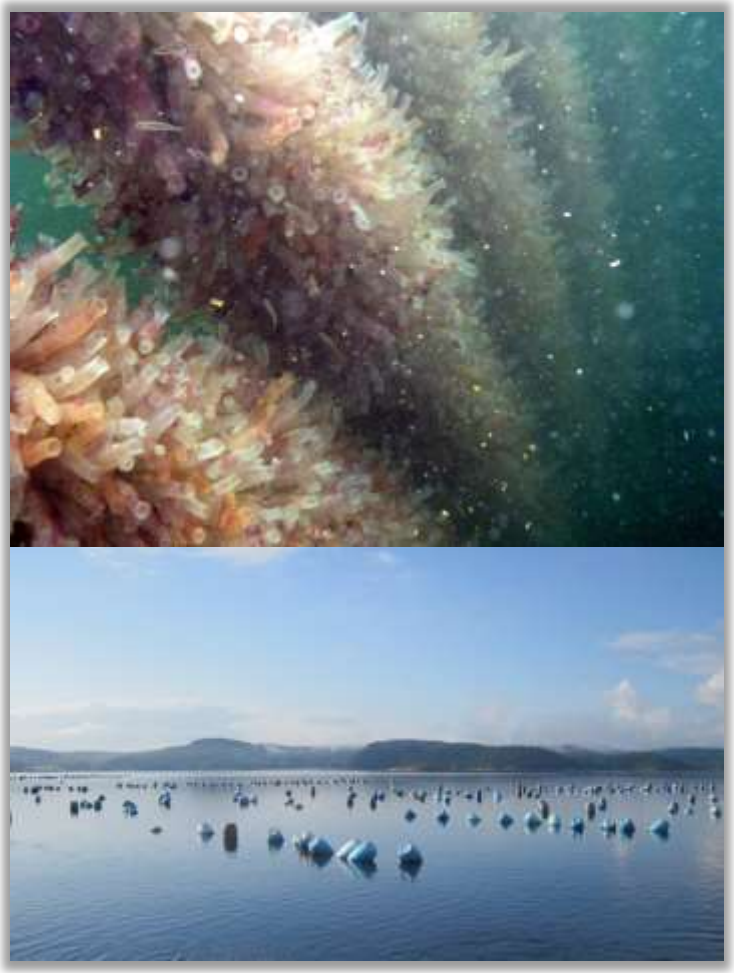
2

Competition for agricultural land to feed a growing population

3

Eutrophication caused by high nutrient emissions (e.g. fertilizers)

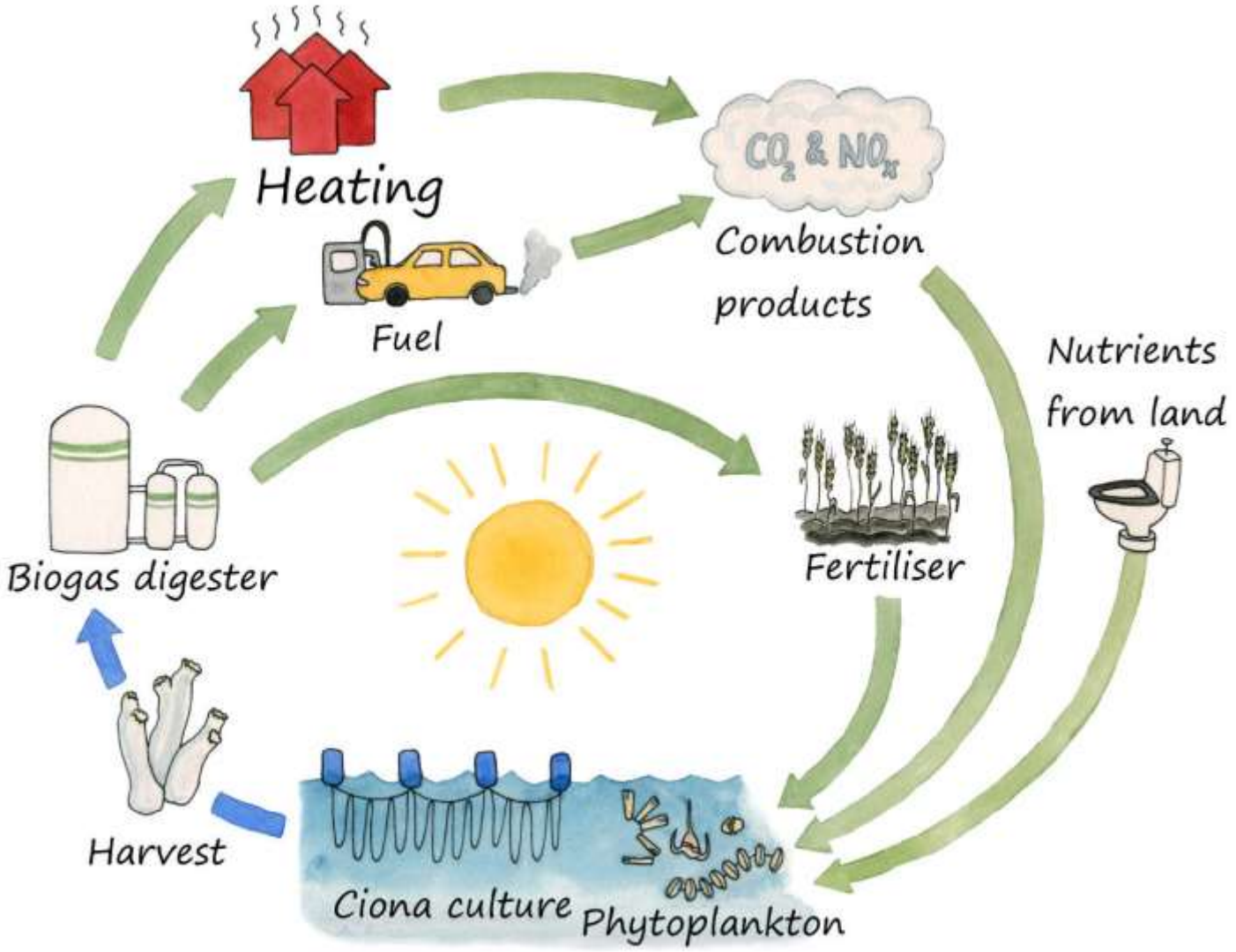
Partial solution: Ciona intestinalis (sea squirts)



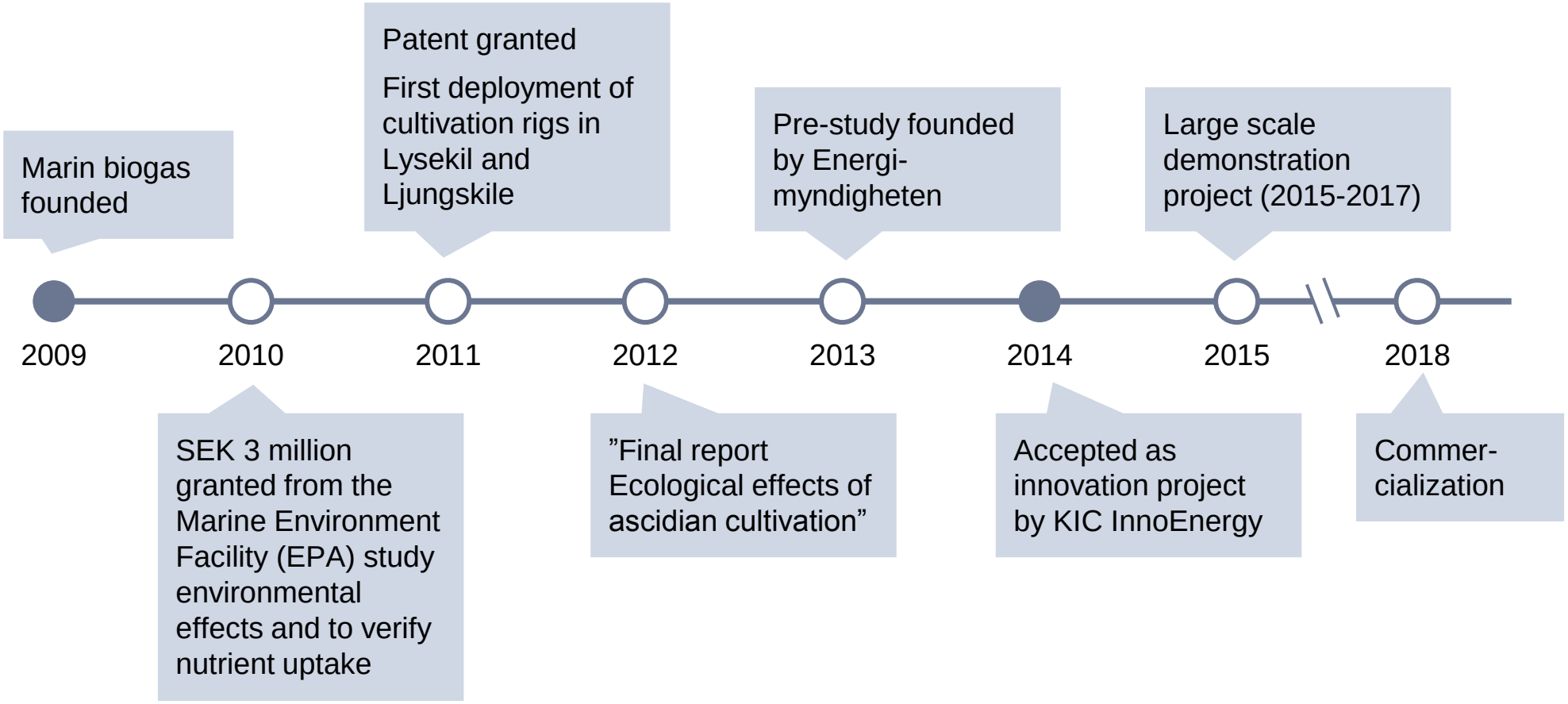
About Ciona intestinalis

- Filters large amounts of water to capture plankton algae and bacteria
- Found on all continents except Antarctica
- Rapid growth (~20 mm/month) and reproduction (> 10 000 eggs per individual)
- Can be cultured in large scale
- Readily digested to biogas in traditional fermenters
- Provides good eco-fertilizer

The concept


Heating
CO_2 & NO_x
Combustion products
Fuel
Nutrients from land
Biogas digester
Fertiliser
Harvest
Ciona culture
Phytoplankton

The Marin Biogas history

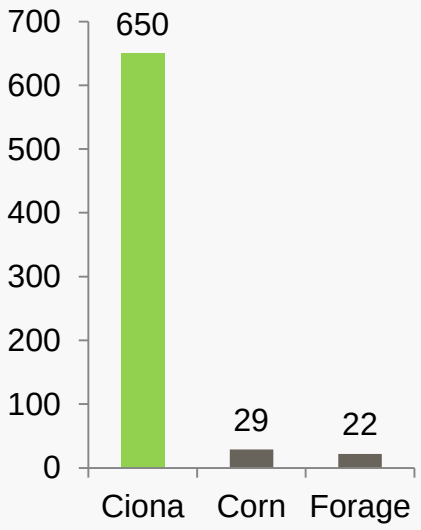


Marine biomass has high biogas yield and nitrogen removal and does not compete with food production

Competitive advantage

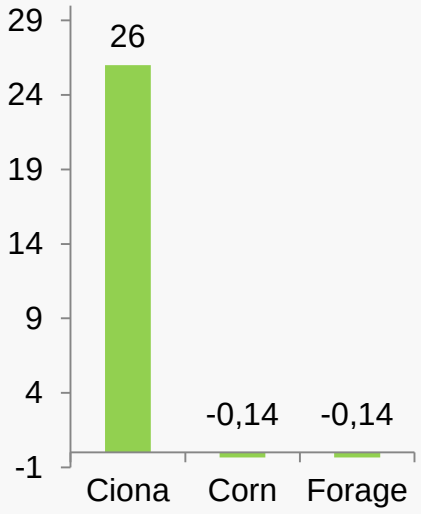
High biogas yield

MWh / hectare



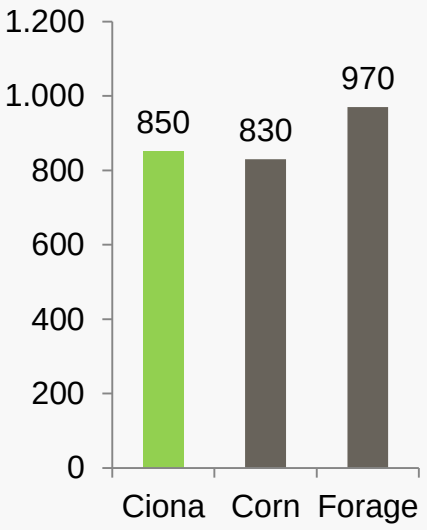
High nitrogen removal

ton / hectare



Competitive cost

Production cost (SEK/MWh)



No rural land needed

No need for expensive rural land or competition with food production

A demonstration project to verify the concept are *ongoing* 2015-2017

Demonstration project scope

Why

- Scale up and verify the business opportunity of using ascidians for biogas production
- Develop the concept

When

- 2015-2017

What

- 1 hectare ascidian cultivation on the Swedish west coast
- Use of improved farming methods based on currently available technology for mussel farming

Partners

- Marin Biogas AB
- Scanfjord Mollösund AB
- E.ON Biofor Sverige AB
- Swedish Environmental Research Institute
- Engage Key Technology Ventures AG

Budget

- Total project cost: 2,47 MEUR
- Project financed by KIC InnoEnergy (55 %) and Energimyndigheten (45 %)

The Demonstration project

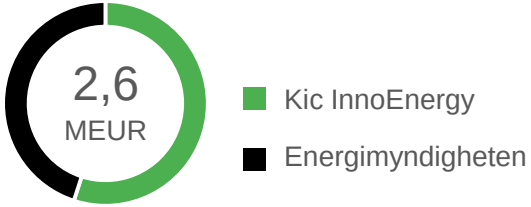
Project purpose:

- Scale up and verify the concept
- Develop the concept

Time frame

2015-2017

Project budget



Cultivation site

A European partner consortium:

MARIN BIOGAS · SCANFJORD · e·on · IVL Swedish Environmental Research Institute · engage Key Technology Ventures

1 hectare ascidian cultivation generates 650 MWh / year, enough for...

...driving a car

35x

laps around the earth

or...

...cover the annual energy demand for

26

villas

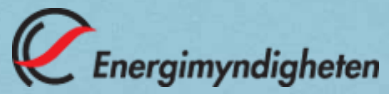
1 hectare yields 8 640 ton ascidians per year, removing:

26 TONS N[7] Nitrogen

2,3 TONS P[15] Phosphorus

Marin Biogas

Renewable energy from a clean ocean



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