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Fund

RAS combined with microalgae cultivation in Denmark

Oliver Körner,
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Danish Technological Institute, AgroTech



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Pilot 4

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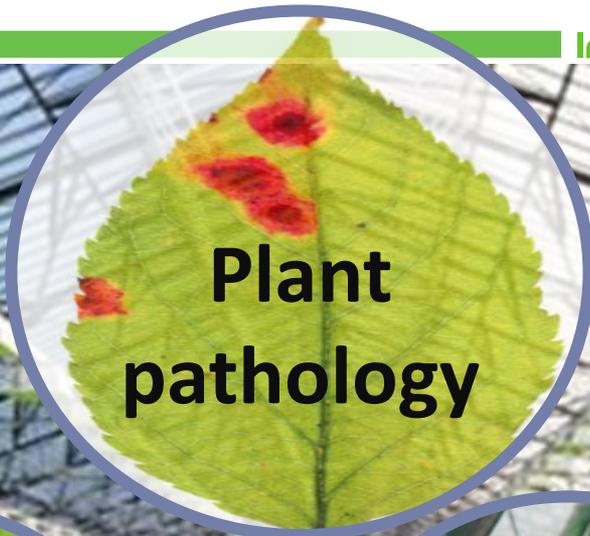
Who are we? AgroTech ..



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**Plant
breeding**



**Plant
pathology**



**Optimised
plant
production**



**High value
compounds**



Algae

DTI-AgroTech – Plant Technology

What we do(n't) know

Optimised
plant
production

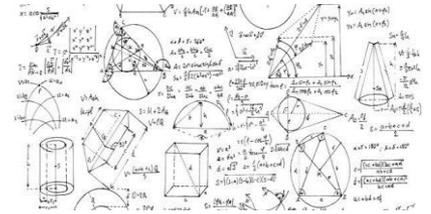
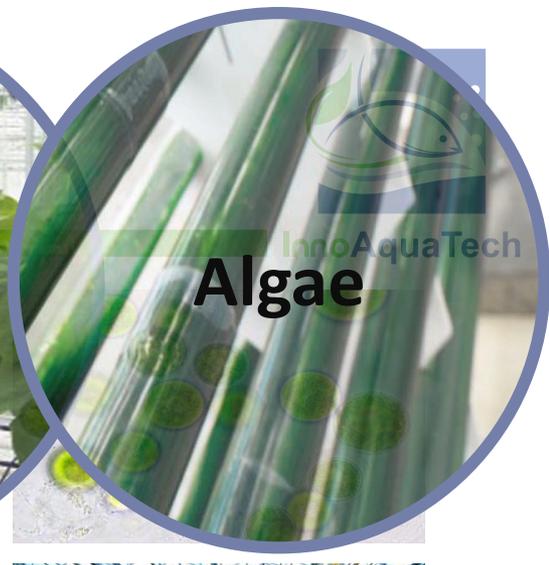
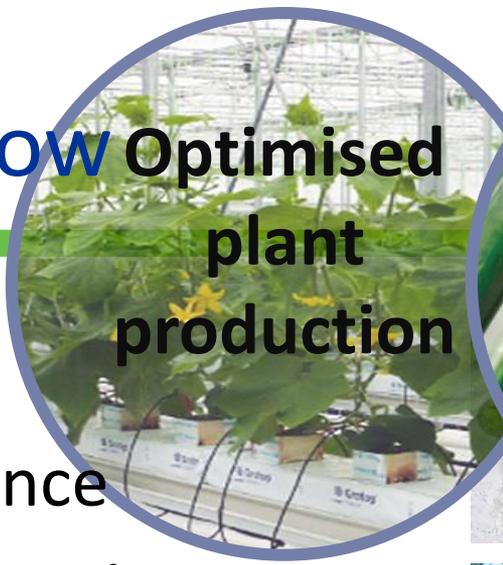
Algae

We do know

- Agriculture & Plant Science
- Greenhouse & Plant Factories
- Microalgae
- Environmental Modelling

We don't know much about

- Fish!



The algae bioreactor



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- **High-value bio products**
 - Monoculture
- **Remediation of nutrients**
 - Selected algae polyculture

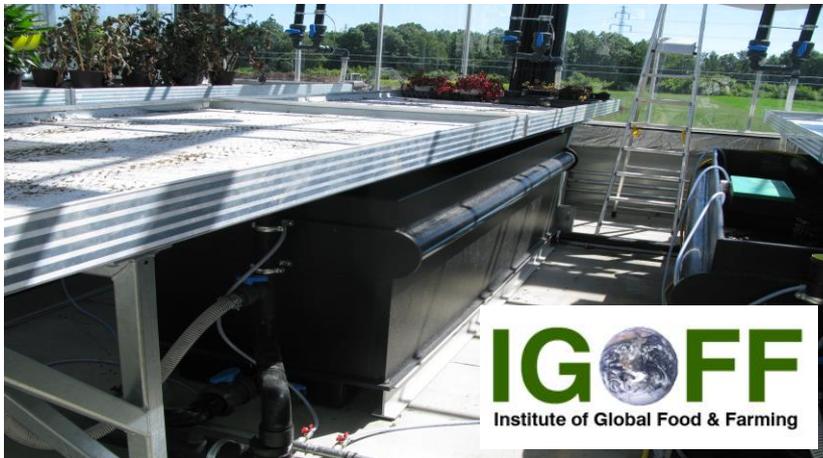


We do have a little experience with Aquaponics



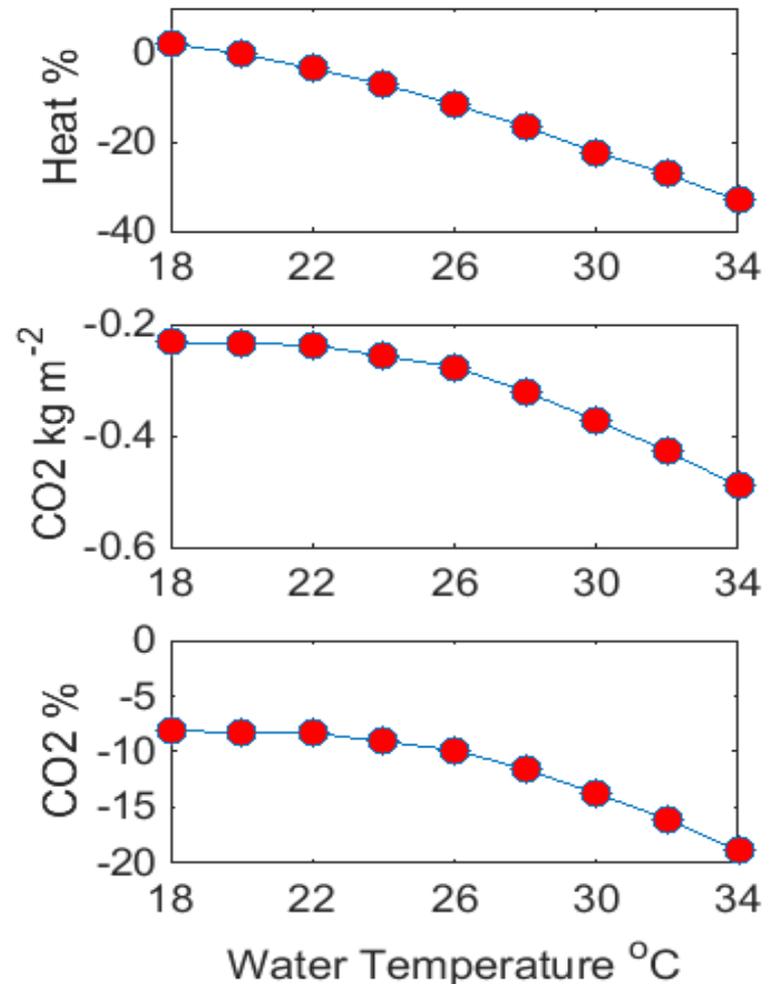
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- Low-scale experiments with tilapia and pike perch
- Modelling synergies in energy and CO₂
- **Increased plant growth & decreased energy use**



- PL

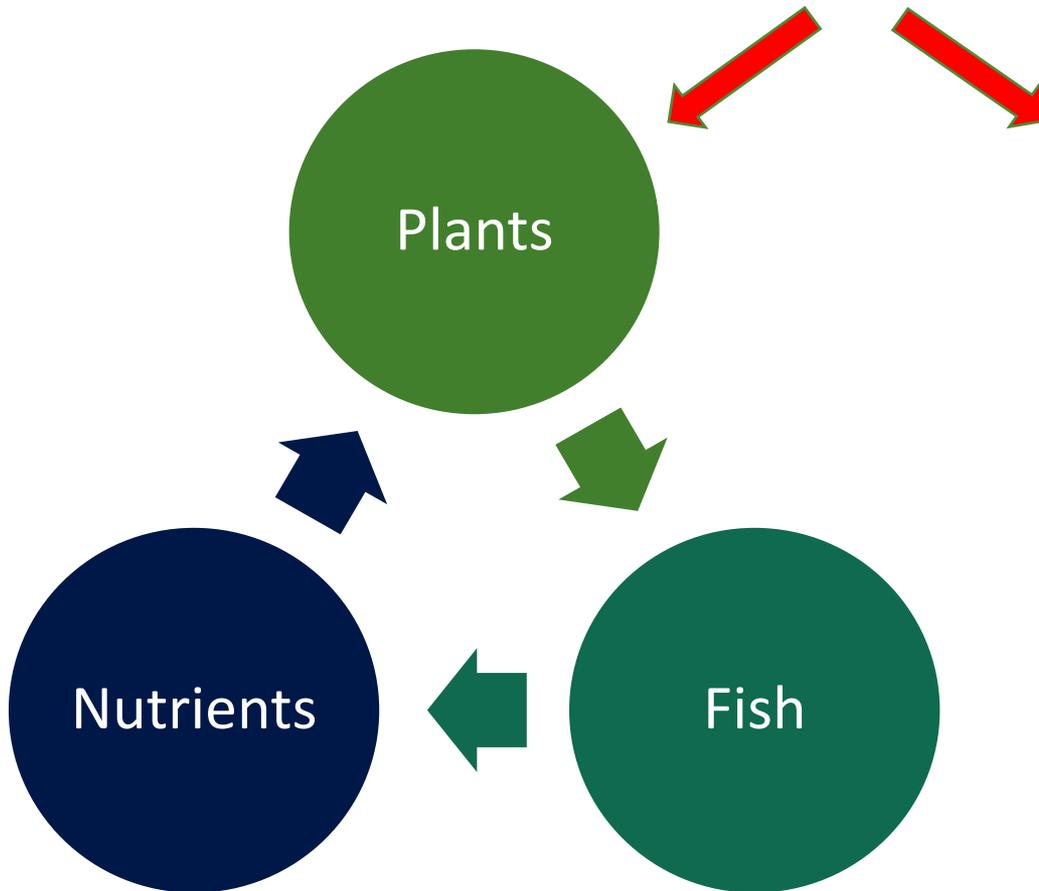
Difference to standard greenhouse



Pilot 3: Aquaponics (fish & plants)



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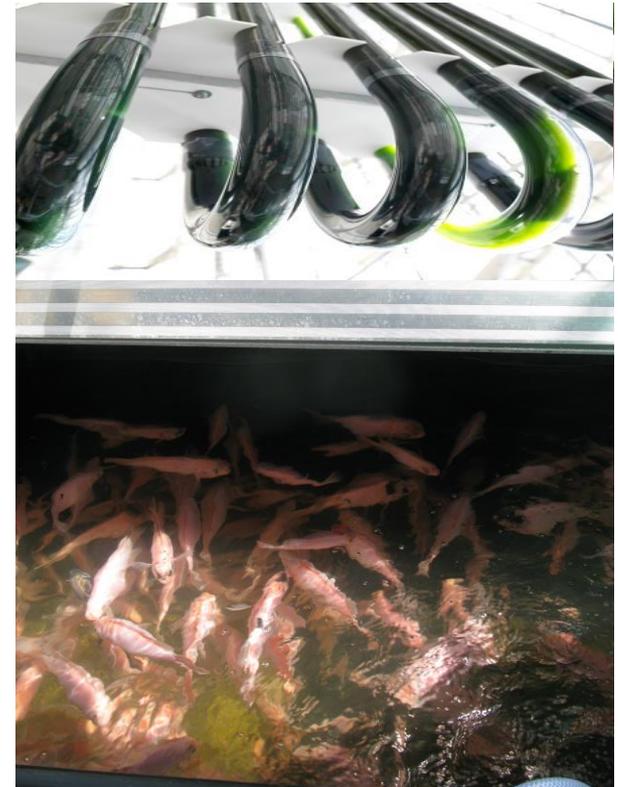
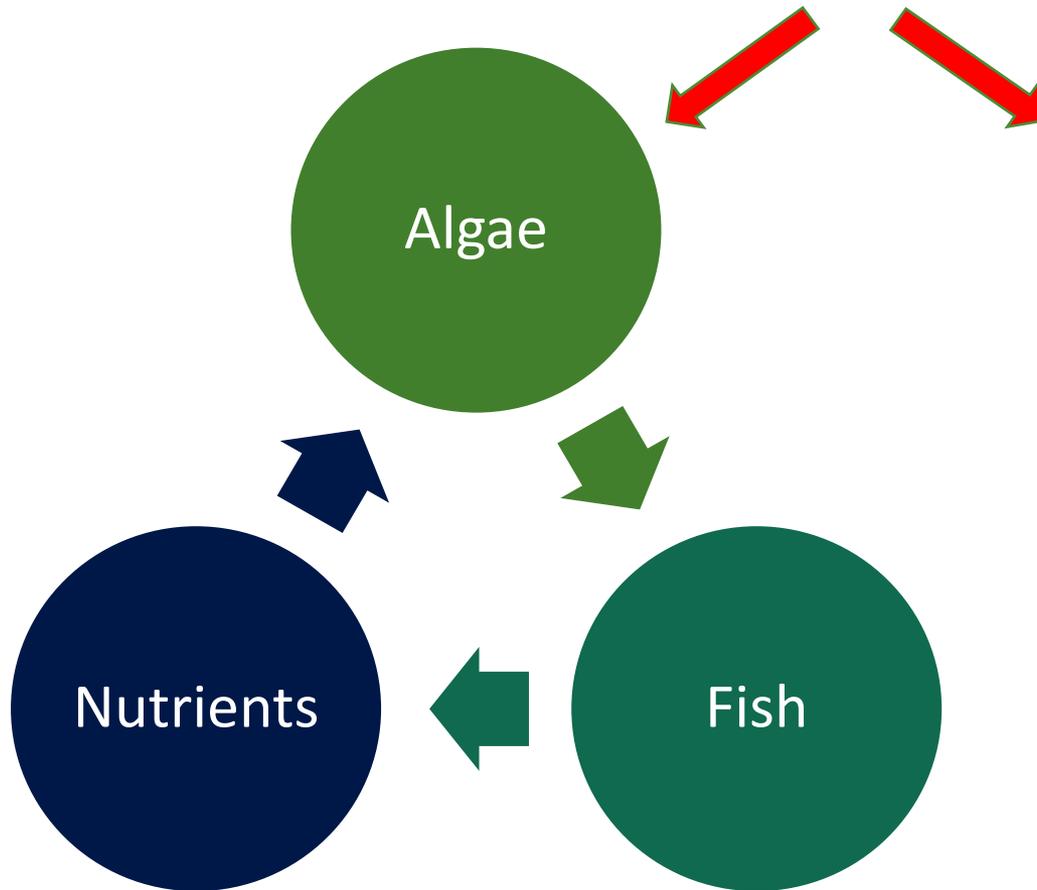


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Pilot 4 Aquaponics (fish & algae)



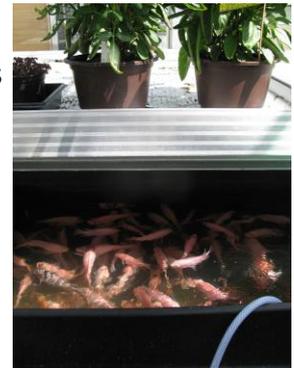
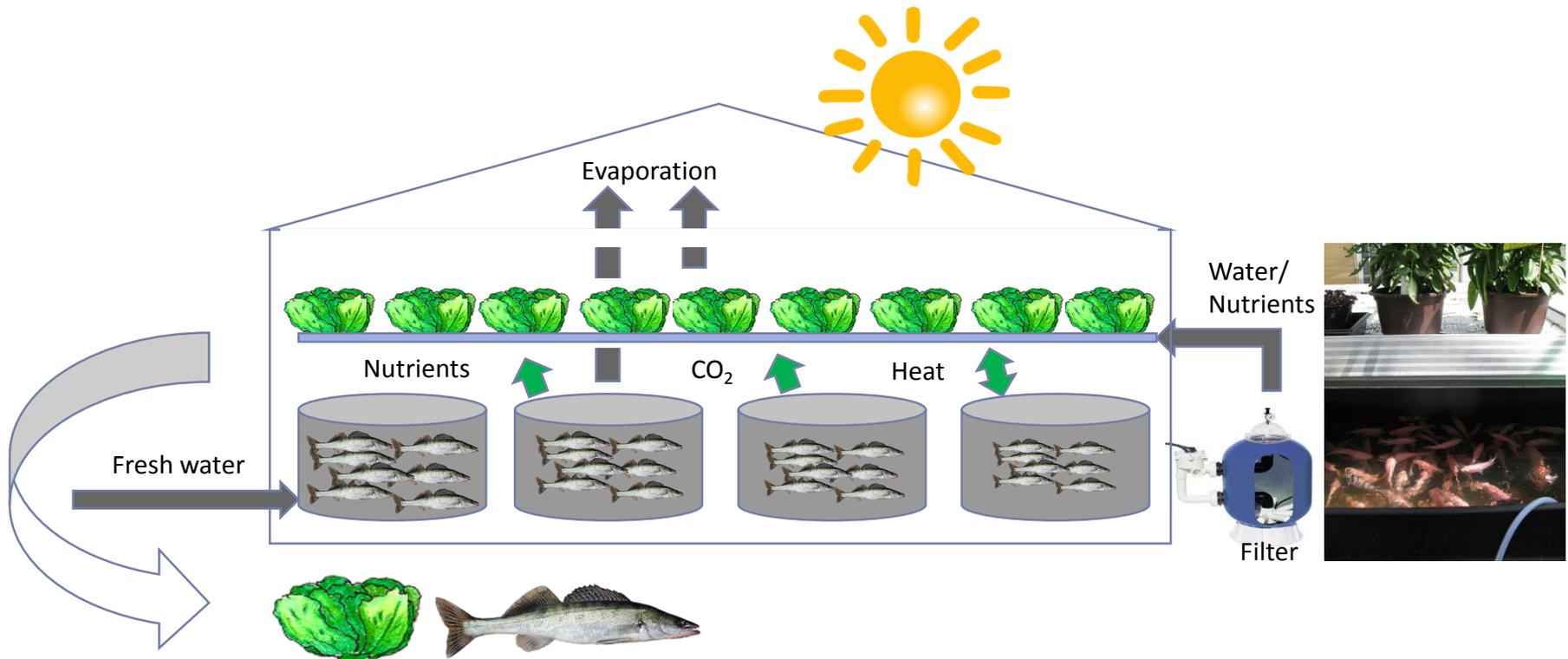
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Aquaponics (fish & plants)



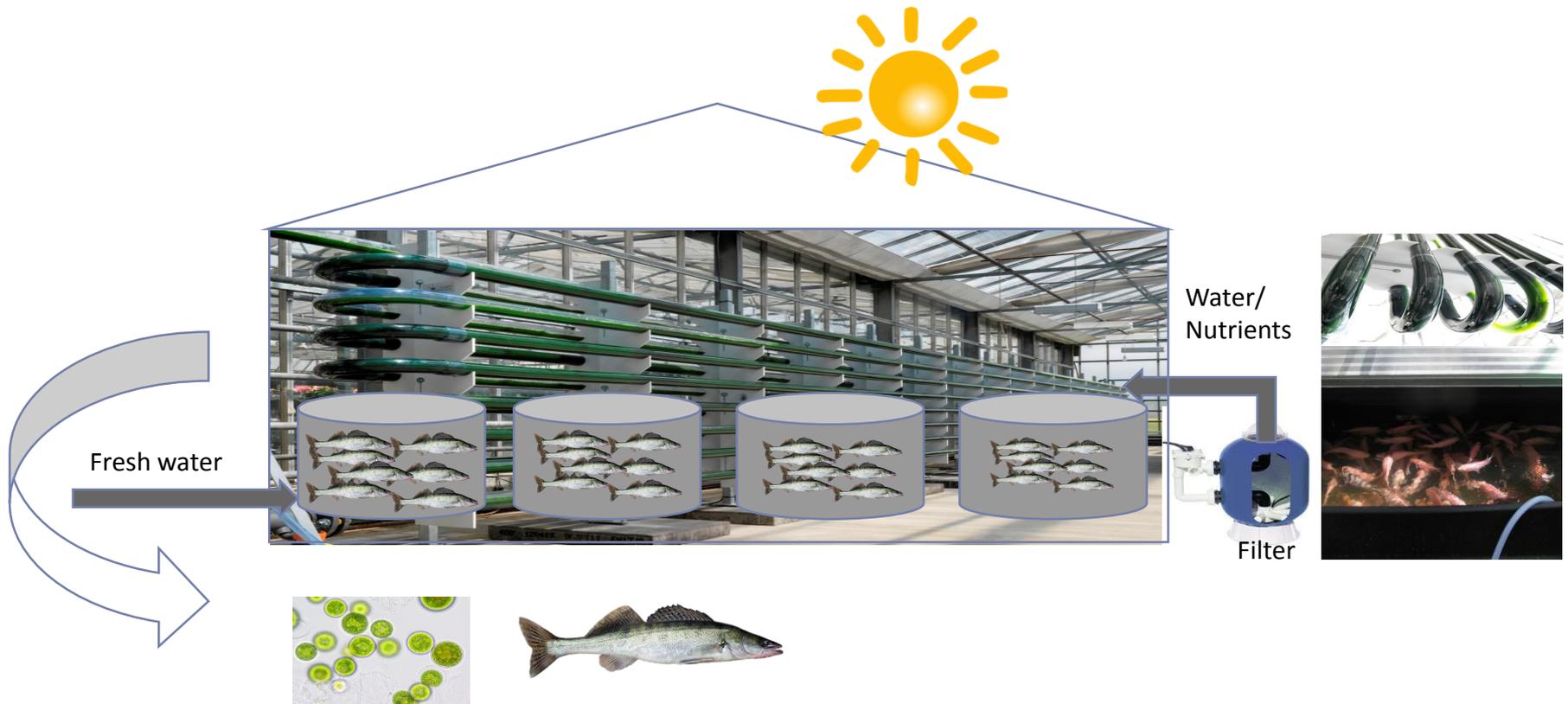
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Pilot 4 Aquaponics (fish & algae)



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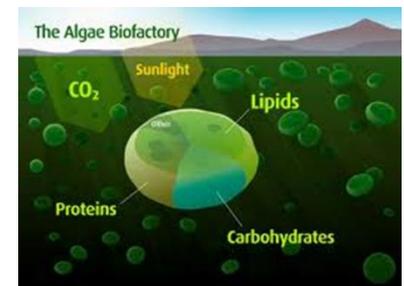
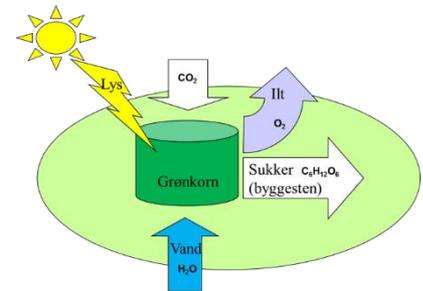
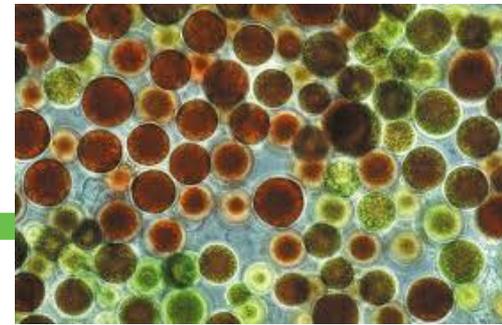
Gdynia - PL



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Why microalgae?

- Important future bio resources
- Renewable energy (biofuels)
- Supplements for food & health products
- Components for medicine
- Feed for livestock and fish farming
- Environment – treatment of waste water, slurry, remediation of nutrients, ...



Pilot 4 – Structured in 3 Phases



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Phase 1
(Lab-Analysis)

Phase 2
(Demo &
Development)

Phase 3
(Service)

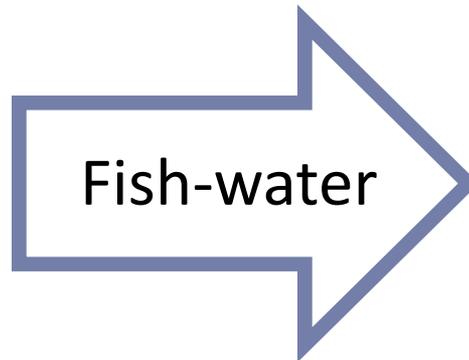
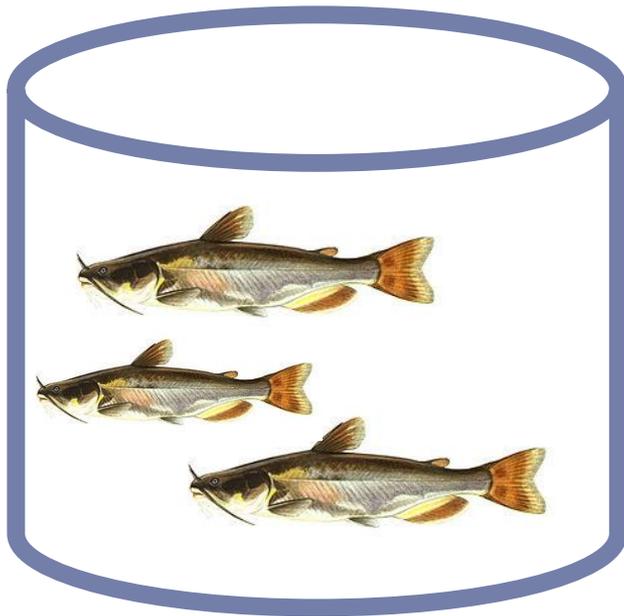


Pilot 3 / Pilot 4 – Synergy



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African Cat Fish
production for water at
1. Rostock University
2. Agrotech



Algae production at
Agrotech (DK)



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Pilot 4 – Phase 1



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Phase 1 (March – June 2017)

Analysis of fish waste water from Rostock University (UROC)

Lab-scale algae cultivation in fish waste water

Selection of algae strain/culture for pilot (phase 2)



Pilot 4 – Phase 2



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Phase 2 (April 2017 – October 2018)

Construction of
small
demonstration
pilot (DK)

Prototype
mathematical
model

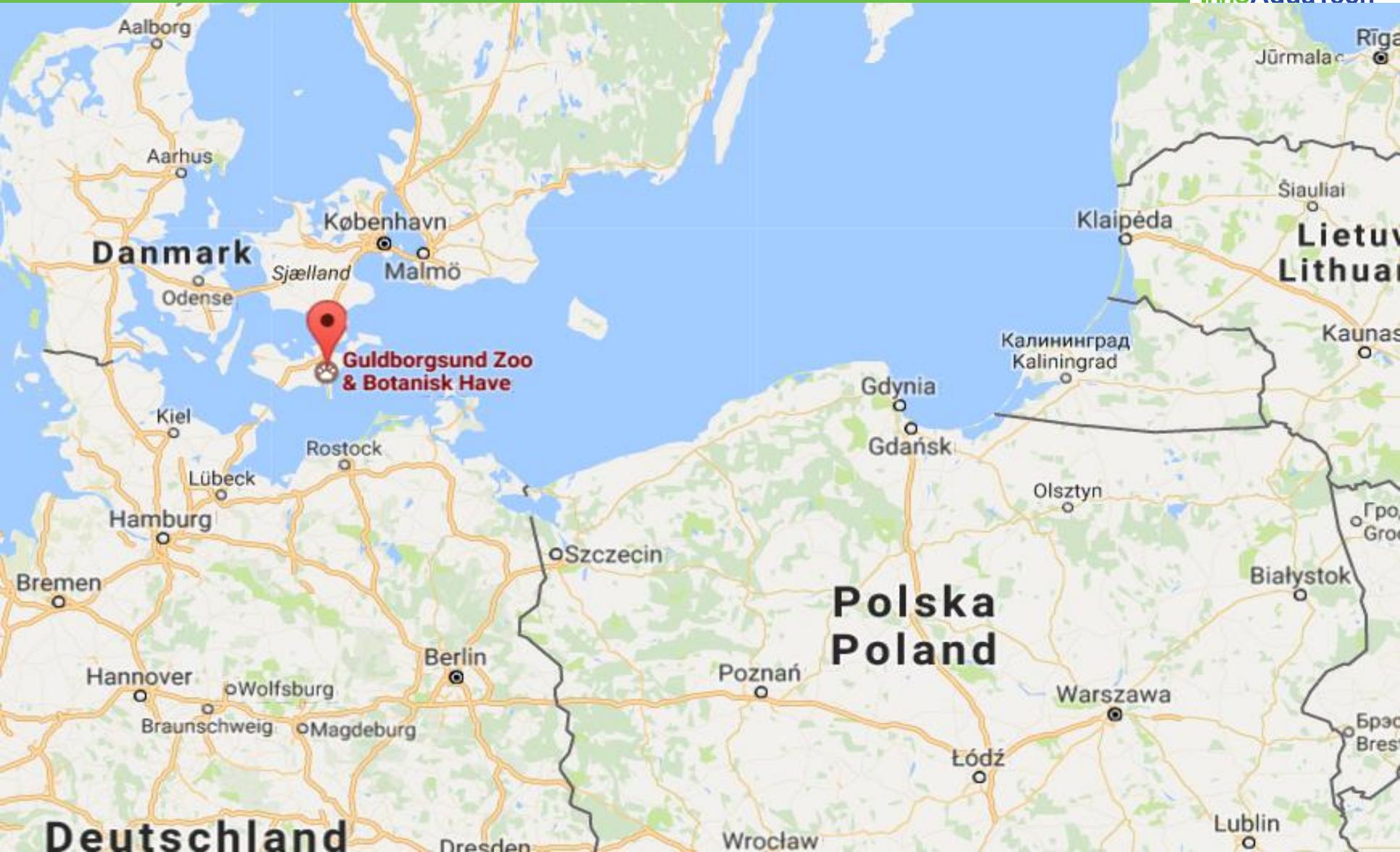
Calibration of
sub-models

Pilot 4 Demonstration, Guldborgsund Zoo (DK)

Pilot 4 Demonstration



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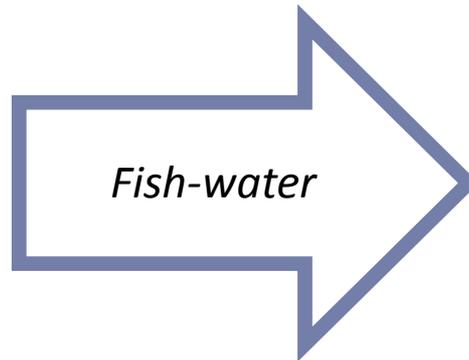
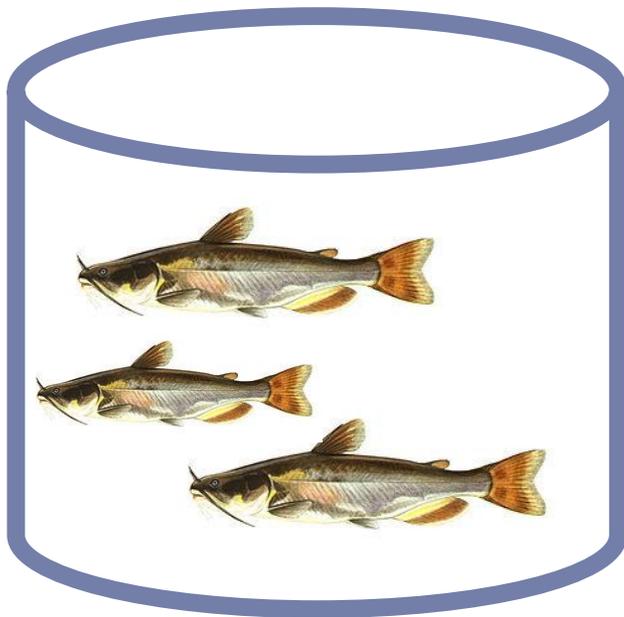


Phase 3: Algae bioreactor in Germany



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Complete system in Rostock



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Pilot 4 – Phase 3



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Phase 3 (October 2017 – December 2018)

Implementation
of Algae
Bioreactor at
UROC

Operation of
Algae
Bioreactor in
fish
glasshouse

Simulation-
model
construction
and validation

Input of
models to DSS
(WP3)



Pilot 4 extension: Algae-Fish Match

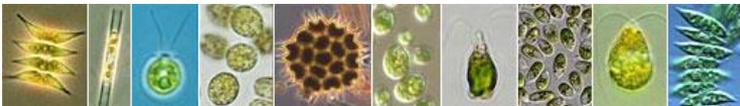


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Screening of waste from various fish and systems

Screening of various microalgae types



Decision Matrix

Algae – Fish Match



Service offer 1: Microalgae production

Plant Technology
AgroTech

Production of microalgae under controlled conditions

- Upscaling of microalgae production from research to pilot scale
- Characterisation of climate and nutrient requirements for optimal growth



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Service offer 2: Greenhouse investment simulations

Plant Technology
AgroTech

Virtual Greenhouse

Know the results before you invest!



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Service offer 3: Bio-remidation

Plant Technology
AgroTech

Bio-remediation using microalgae

- Screening of side-streams for nutrient content
- Analysis and testing of cultivation and remediation potentials
- Upscaling of microalgae production from laboratory to pilot scale



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Service offer 4: On the flow simulations & monitoring

Plant Technology
AgroTech

InfoGrow

Monitoring of photosynthesis and energy consumption with online data from greenhouses.



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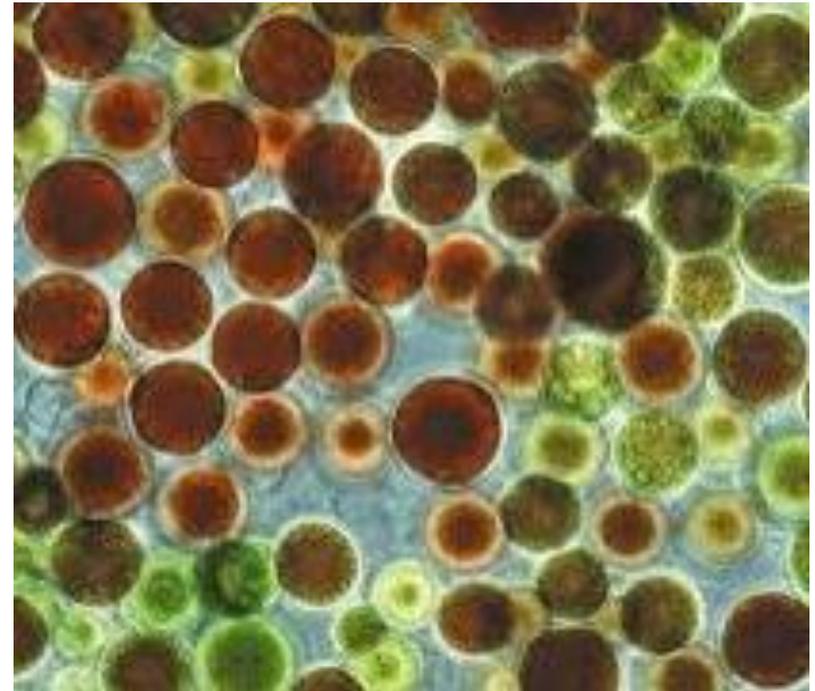
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