



AQUAENT workshops - Support for small and medium enterprises in RIS regions in aquaculture

## Multi-trophic aquaculture - possibilities of intensifying production in fresh and salt waters



Co-funded by the  
European Union



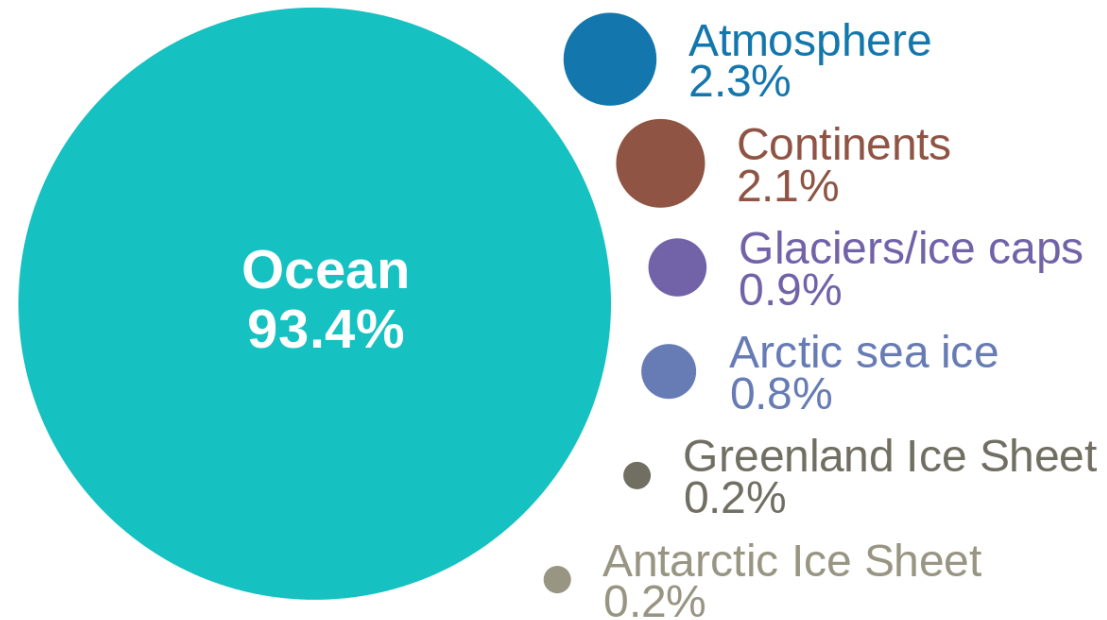
Radosław Kowalski | Poland | 17.11.2022

# Aquaculture potential

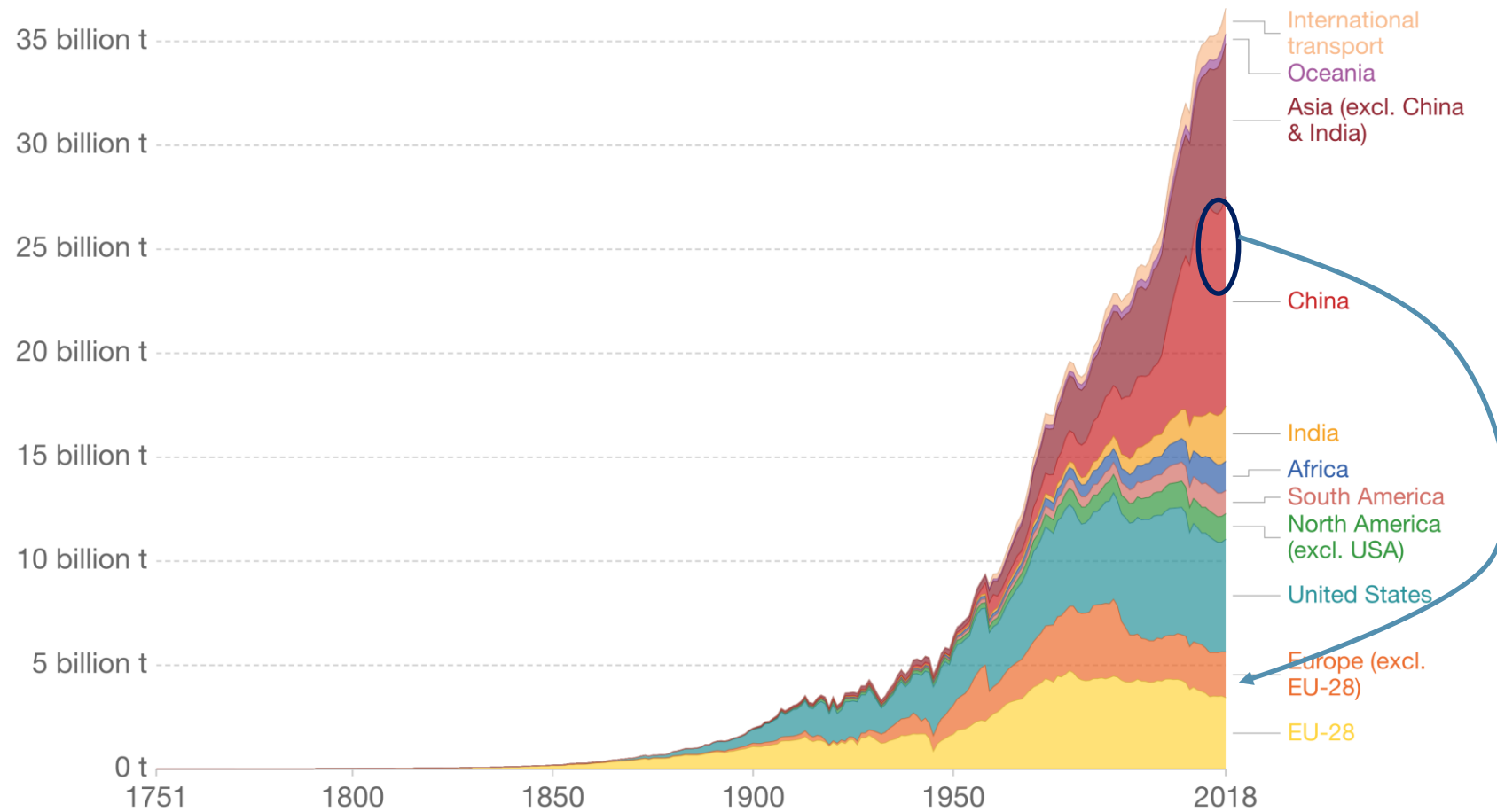
1. **Healthy value,**
3. **Great feed conversion ratio,**
4. **Possibility of indoor self-maintained recirculating systems,**
5. **Possible benefits for the microclimate (small retention systems).**

# Why the water is so important

## Where is global warming going?



# Do Europe fight strong enough for the climate?





## Inland Fisheries – impact of the global warming

### Pros

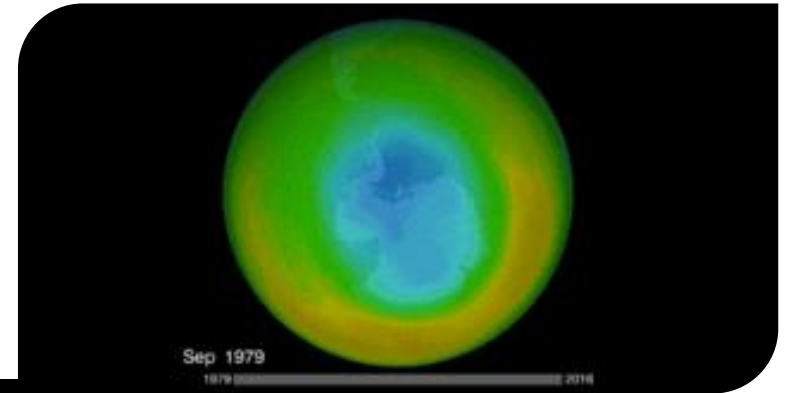
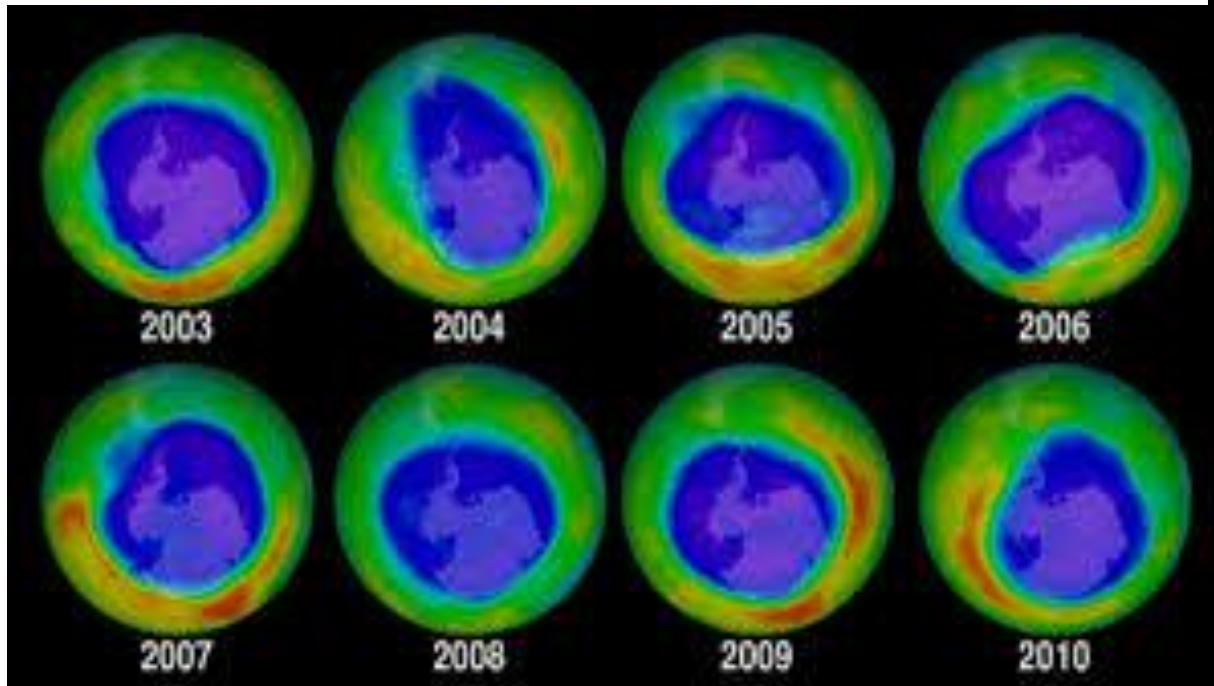
- Warmer water – a better growth rate of many fish species
- Warm water species could be produced more north
- Possibilities for new species production
- New rivers become possible for salmonids production year-round.

### Cons

- Low effectiveness of cold water species production
- A further change in fish species habitats
- Risk of new invasive species propagation
- Possibilities of new pathogens outbreaks

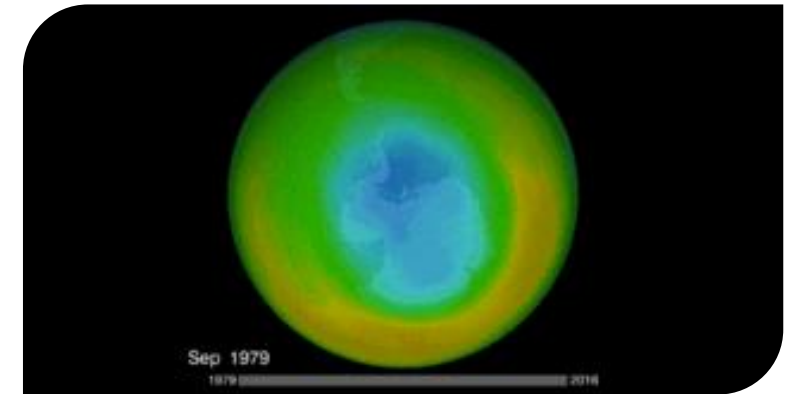
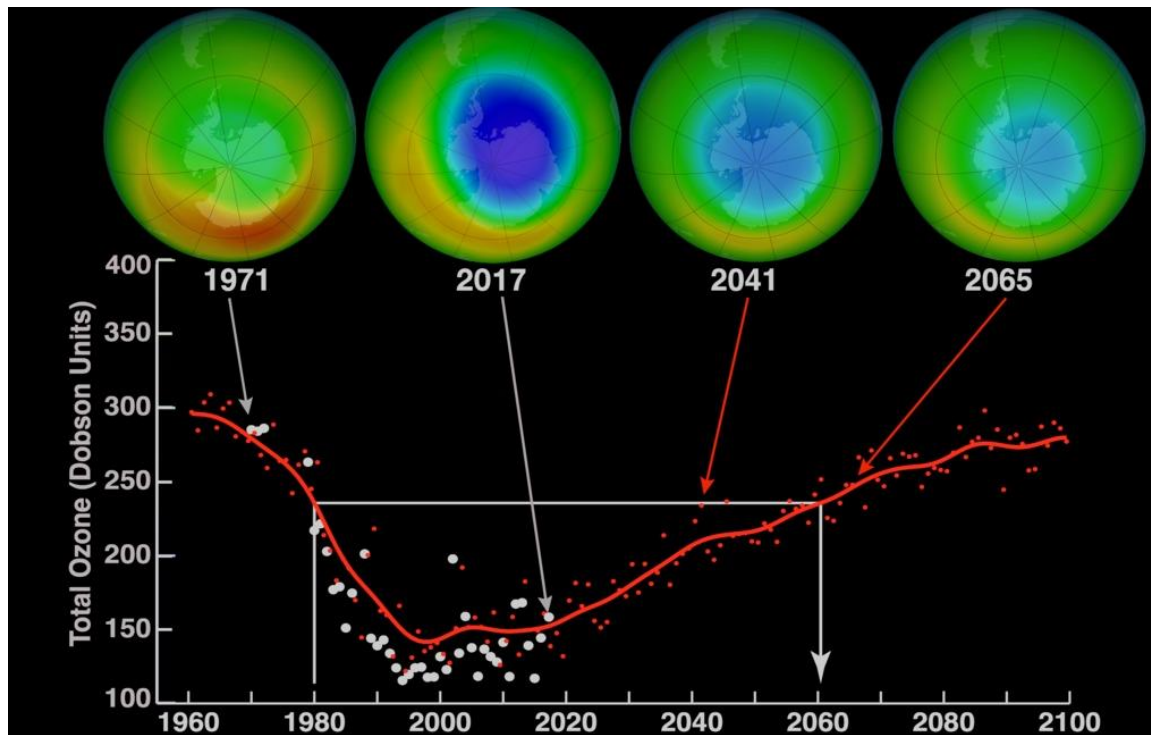
# Can we change anything?

- Ozone lesson



# Can we change anything?

- Ozone lesson



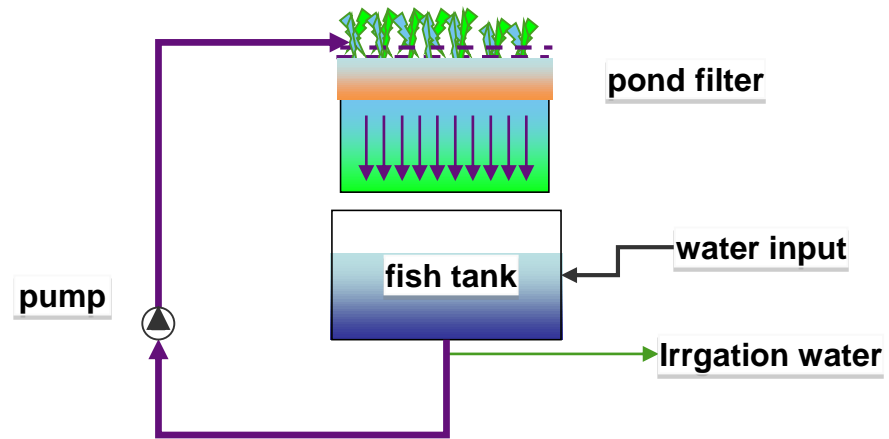
# How does Aquaculture can support the blue revolution?



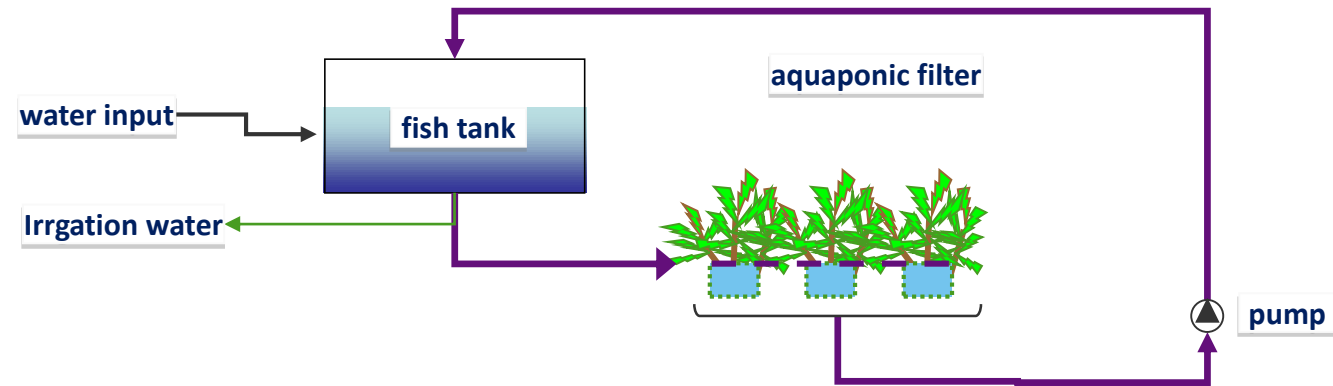
# Aquaponics

What is it?

# Plant based filters



# Plant based filters

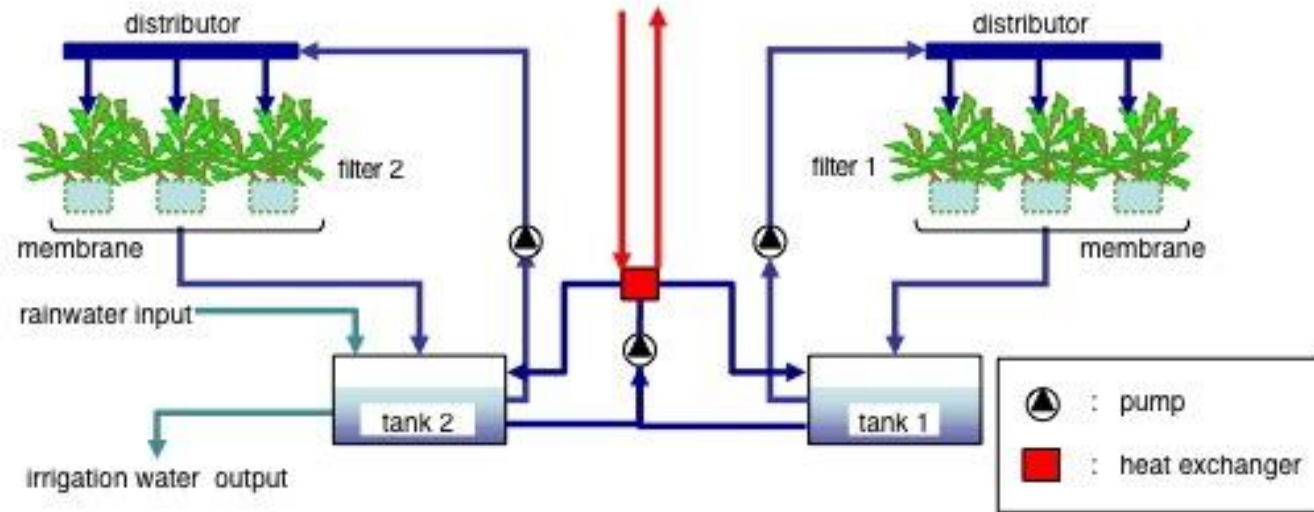
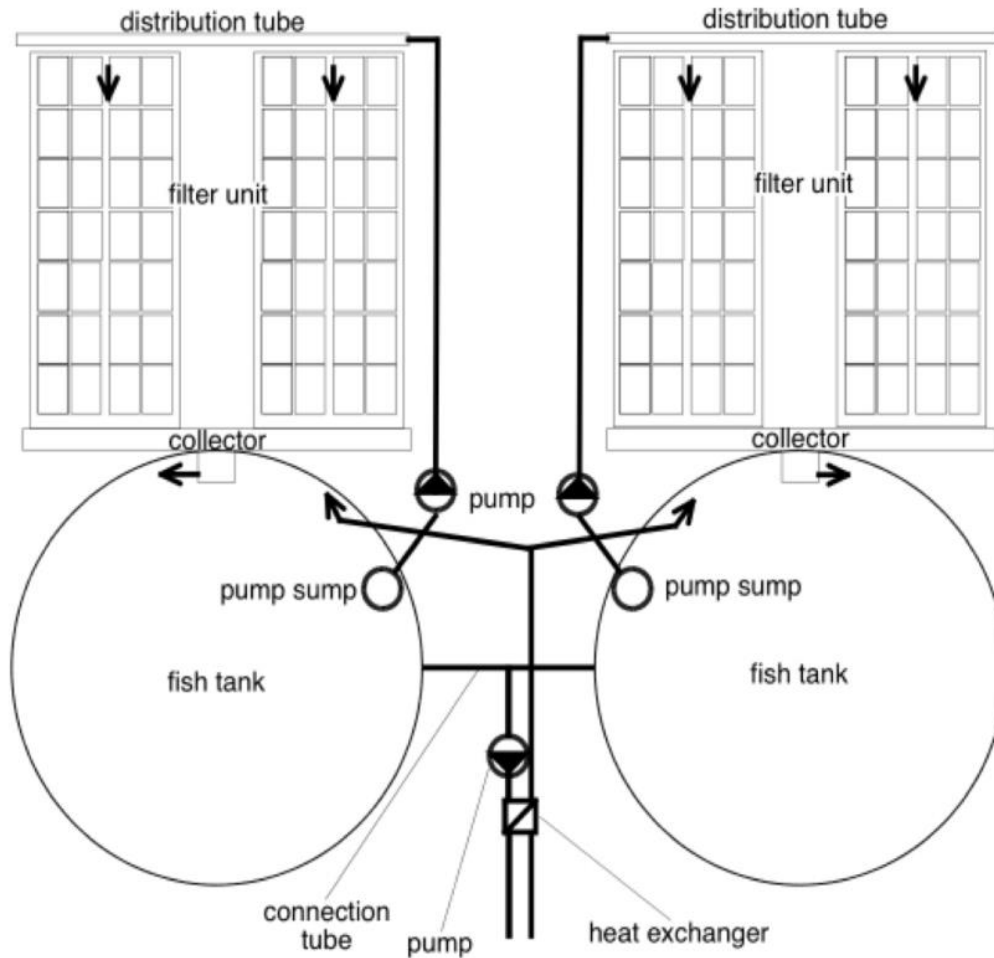


# Aquarium scale – aquaponics in use





# Basic scheme of aquaponic filter





## High efficiency

- Traditional filter: 0.27 hour/kg
- Aquaponic filter: 0.04 hour/kg

running cost reduced by 85%

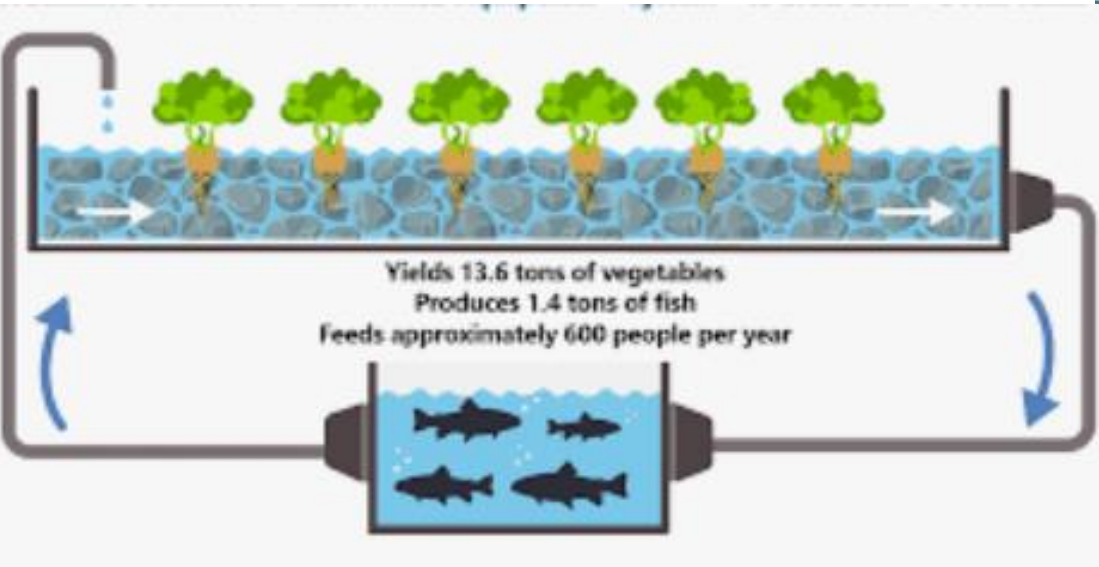


High stability of the water quality in the system

- Basic aquaponig filter with use of the expanded-clay aggregate
- Max load: 1 m<sup>3</sup>/h or 18 l/min/box



# Multi-trophic aquaculture

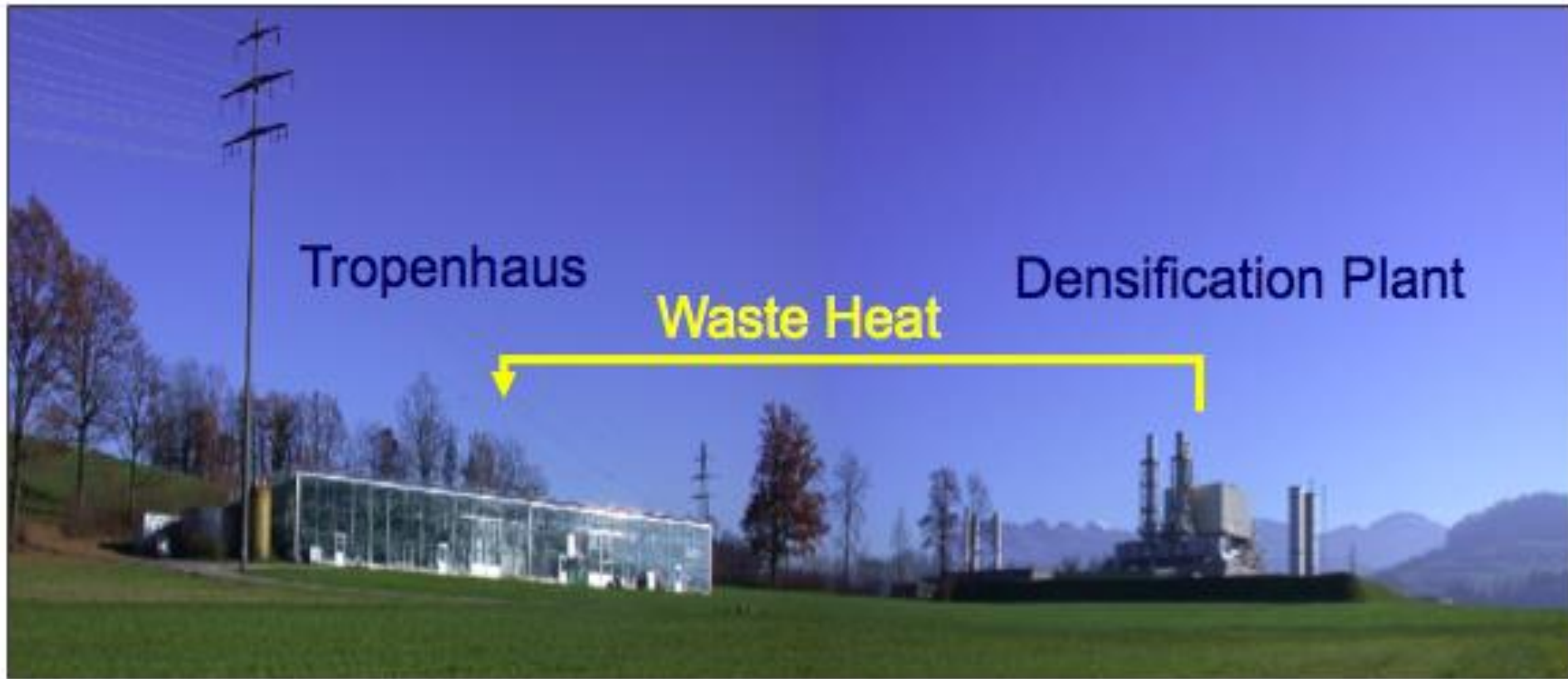


# Examples

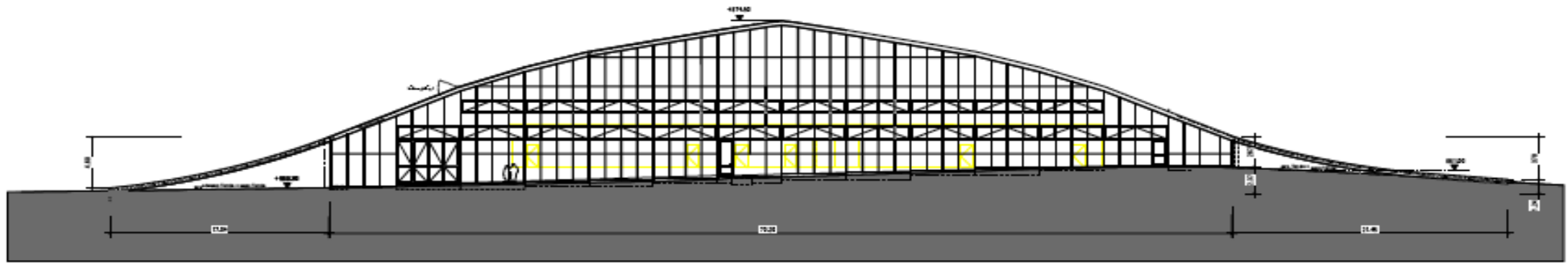


Sturgeon and tilapia produced together with papaya and bananas

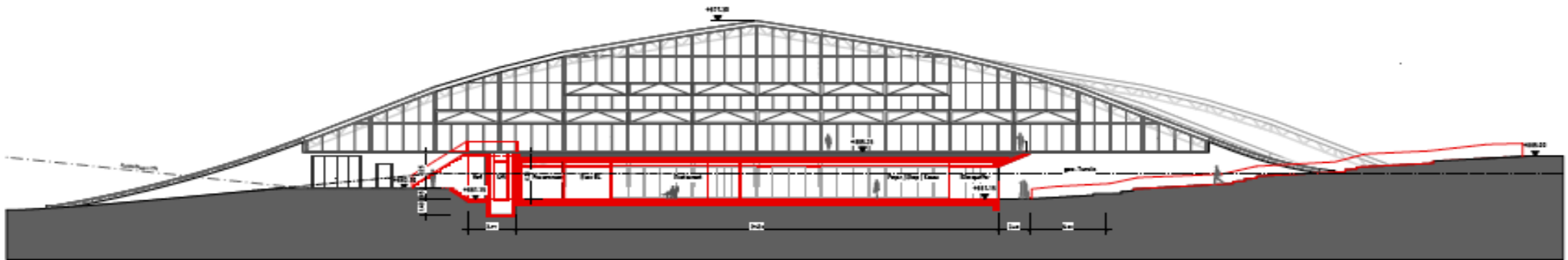
## Electric power plant waste heat use



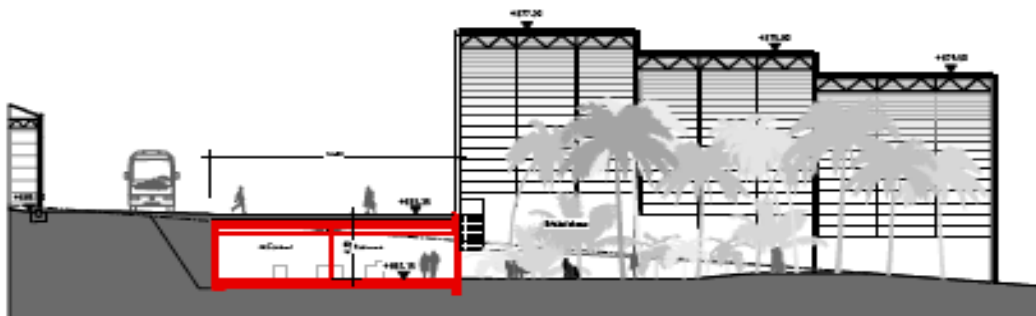




Ansicht Süden



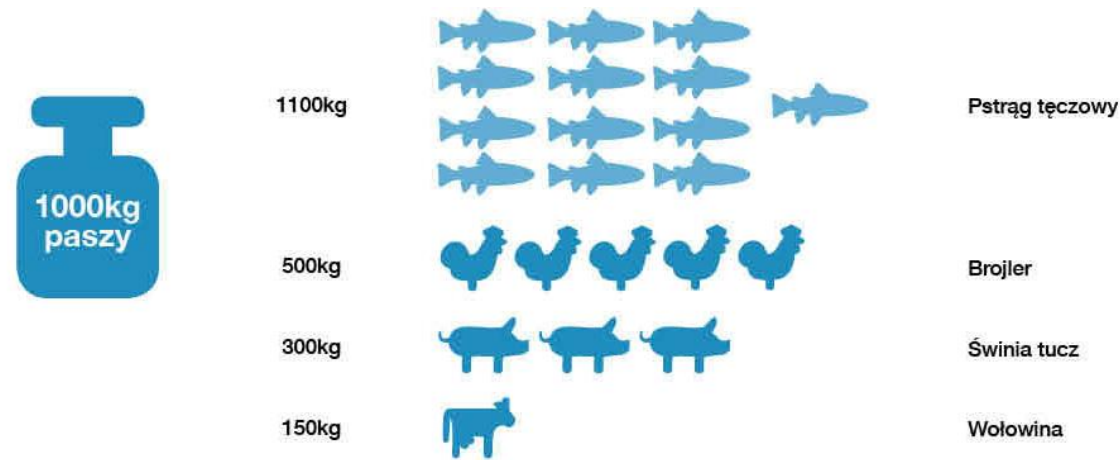
Längsschnitt Süden



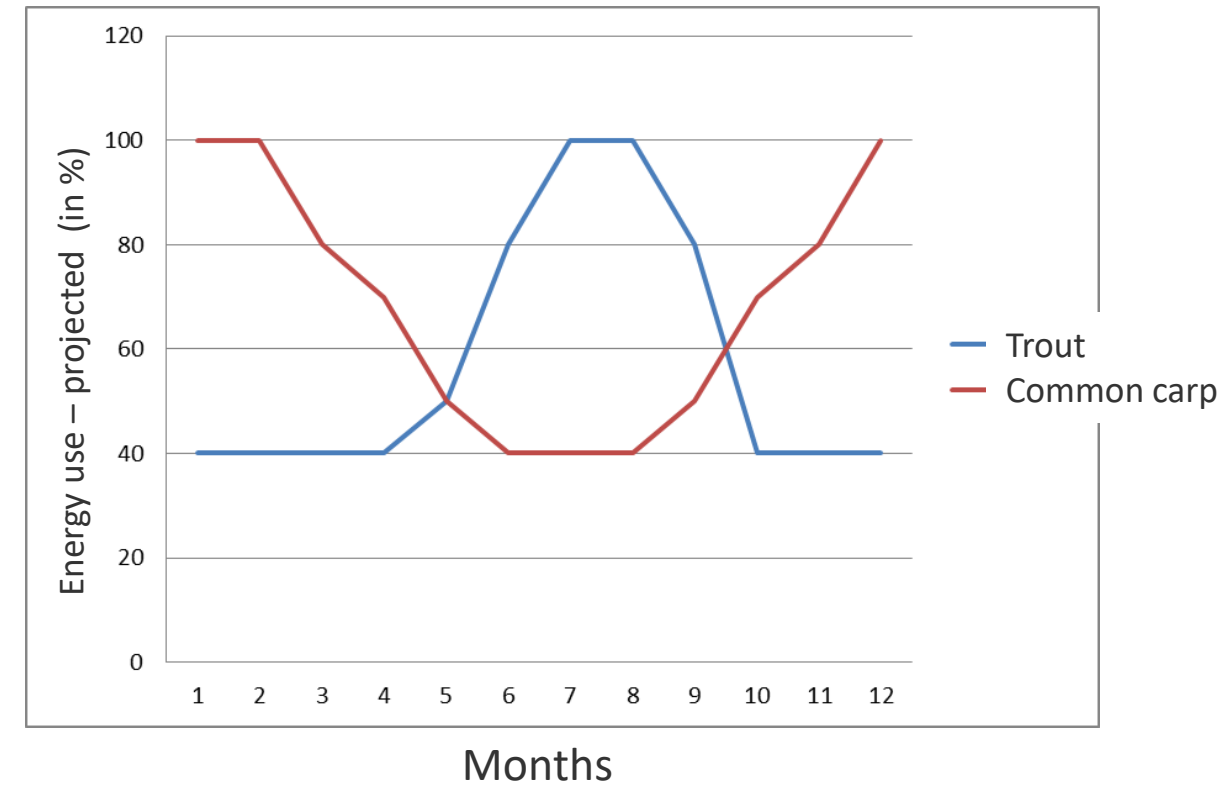
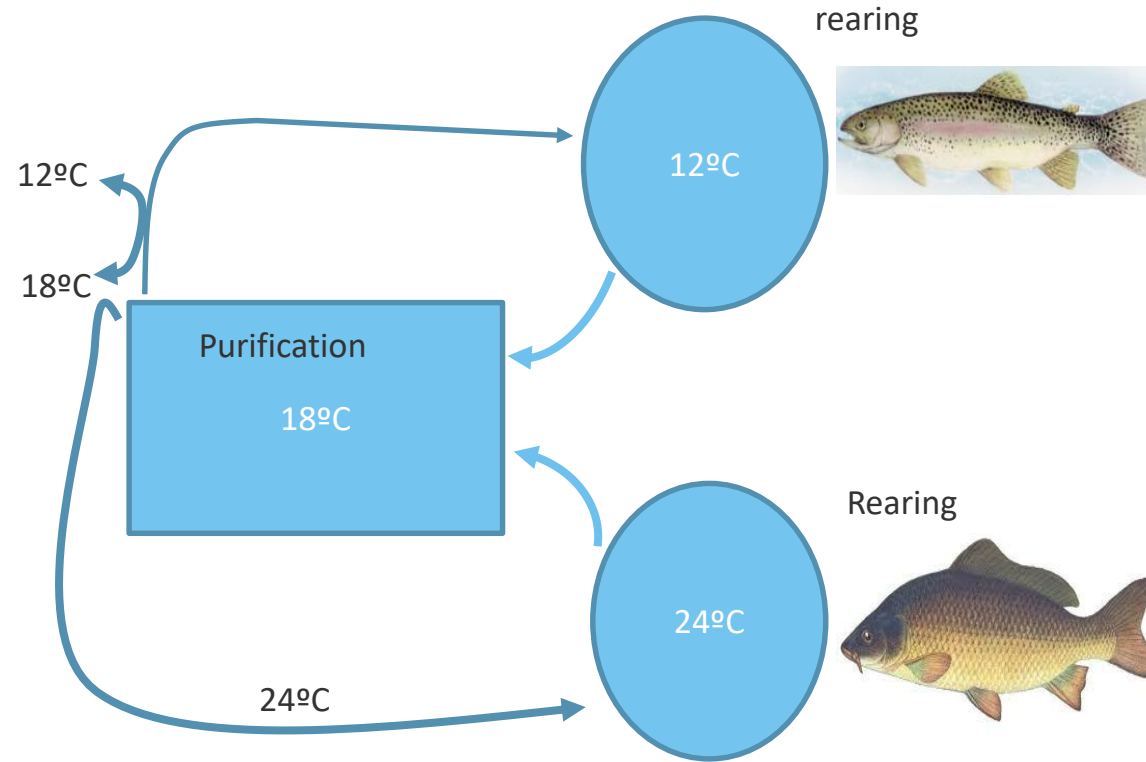


# Sustainable aquaculture

1. Low fish meal use
2. Effective water use
3. Effective land use



# Bi-thermic and recirculating aquaculture



# Possible application

Multi - trophy:

- Shrimp,
- Mollusc,
- Water plant (watercress),
- Sea weeds,



Aquaponics

- Greenhouse (vegetables and fruits),
- Land based production (any plants),



# Perspectives

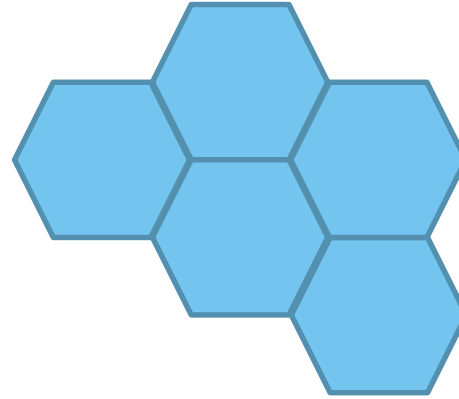
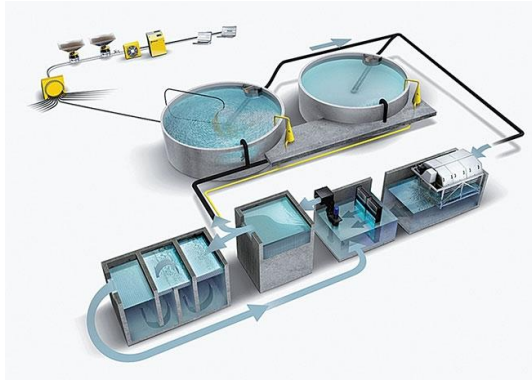
- Additional value of the production
- Advantage for the environment
- Sustainability
- Stronger economy

# Local aquaculture vision

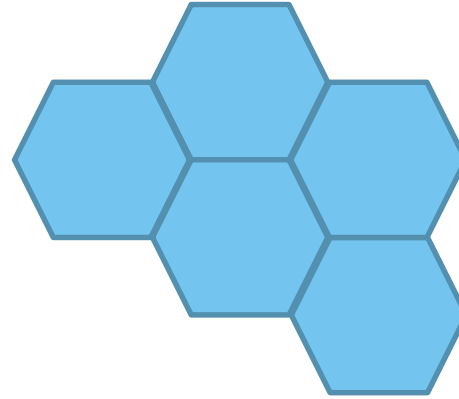
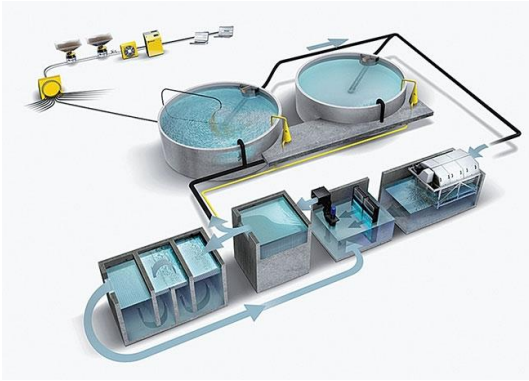
## A perspective for recirculating systems



# Modular systems



# Modular systems



# **New approach**

# **Bigger is better**

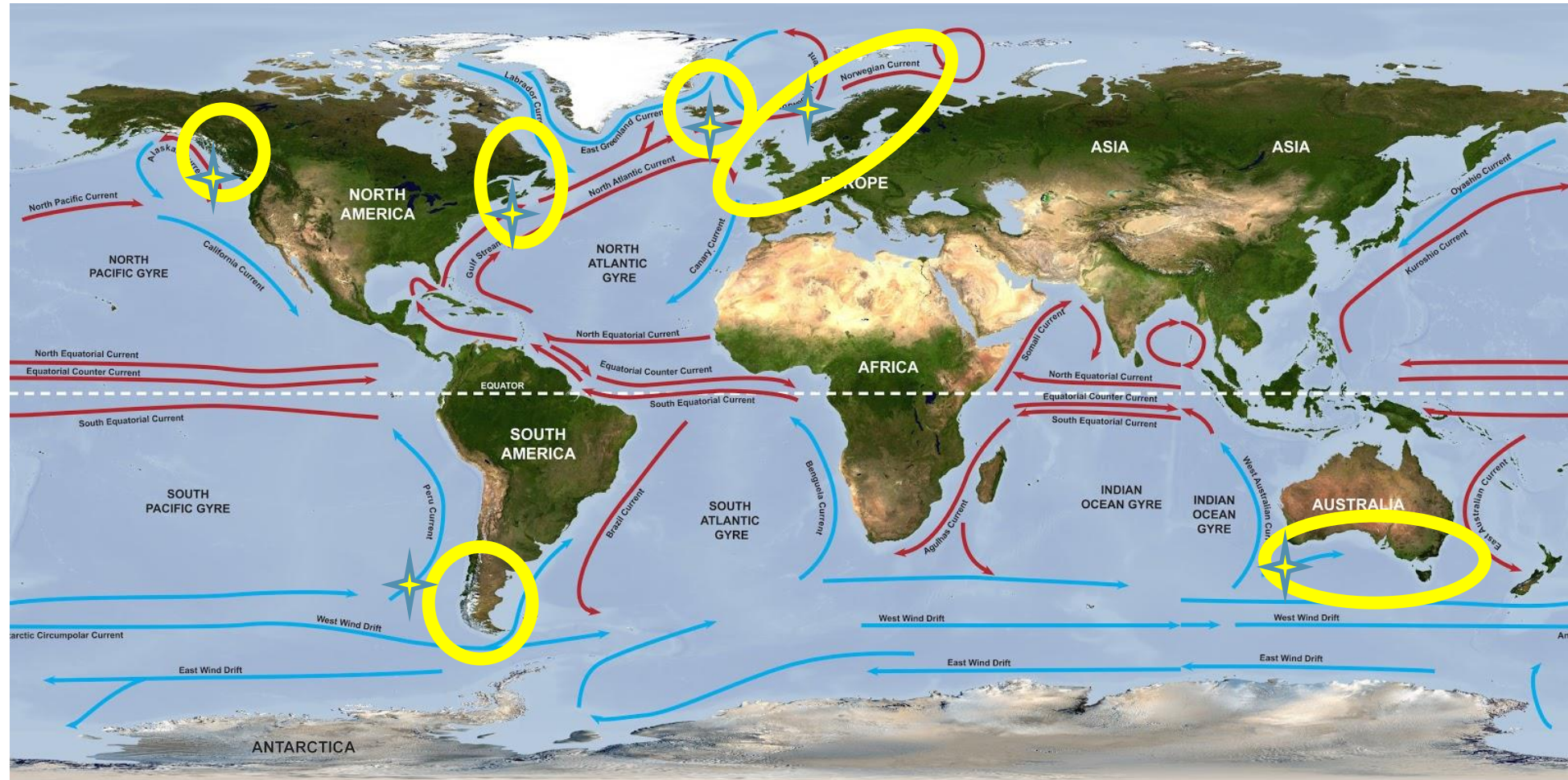
# Aquaculture production on the sea

Deep blue 1 – 300 000 salmons

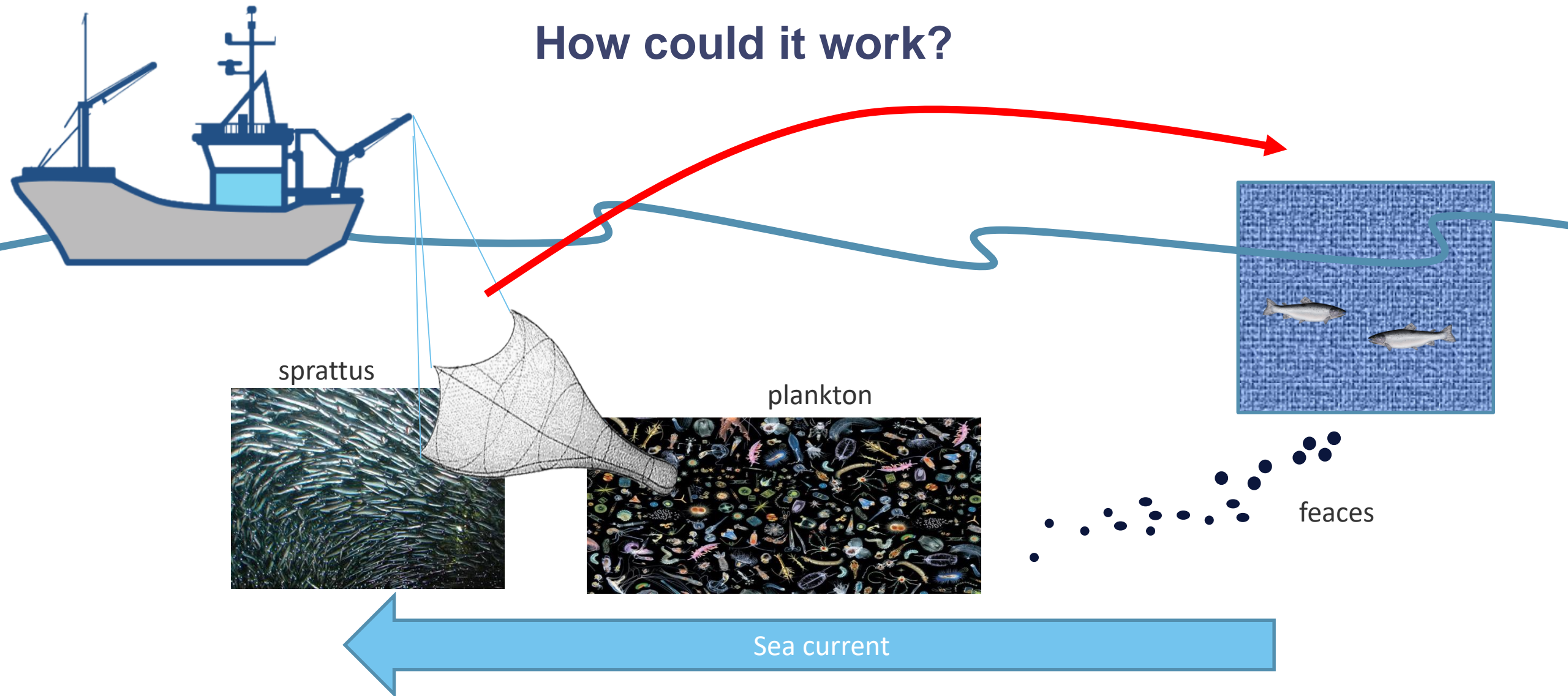
Deep blue 2 – 1 000 000 salmons



# Offshore fish farming



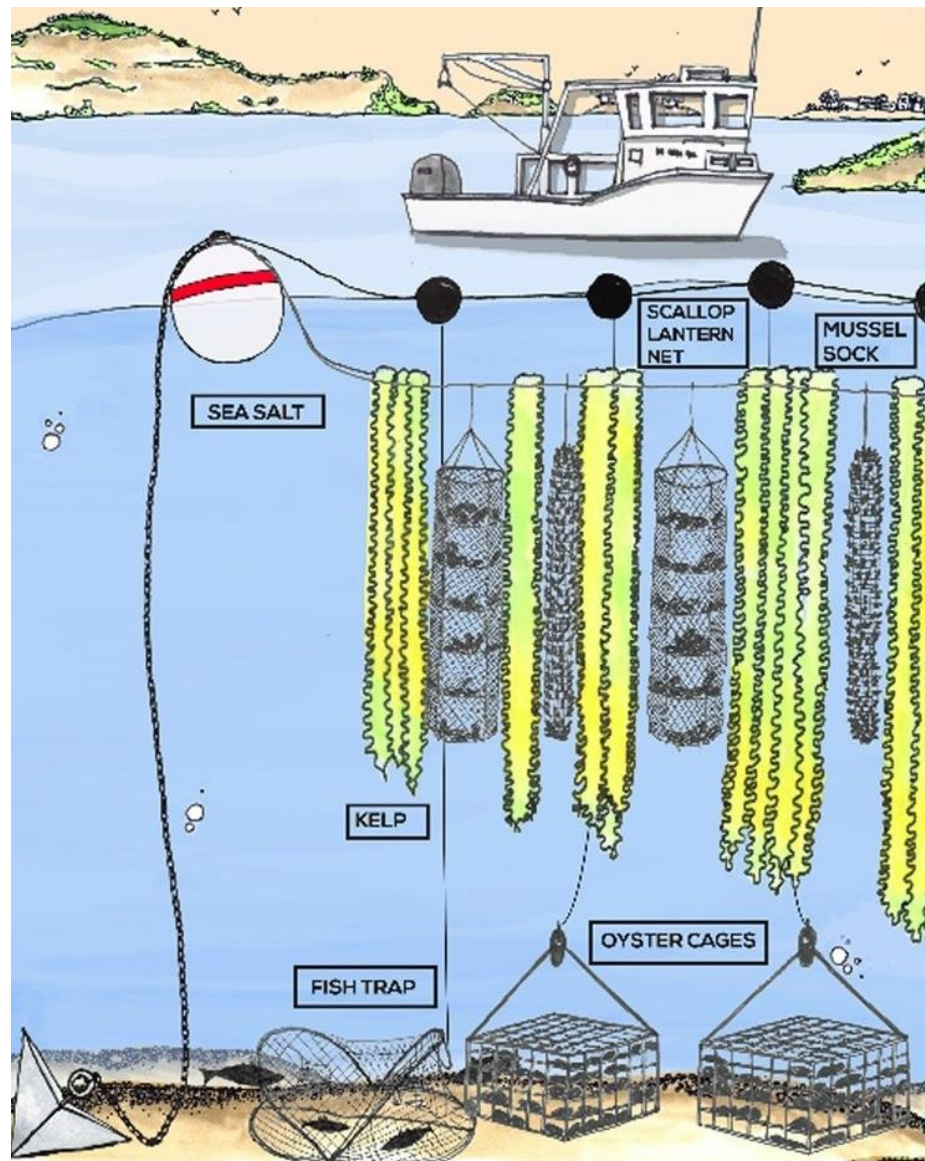
# How could it work?



# New perspective on the sea

## 3D ocean farming

<https://www.youtube.com/watch?v=00o1PHx39so>



# Seaweed potential



If we cover 9% of the ocean surface with seaweed farms, we can get uptake of the total human-born CO<sub>2</sub>



## Sea weeds perspective



# Eadible sea weeds



Wakame



Kombu



hijiki

# Eadible sea weeds



Sea grapes



Nori

# Using red seaweed protein for plant-based meat

**2019-2021**

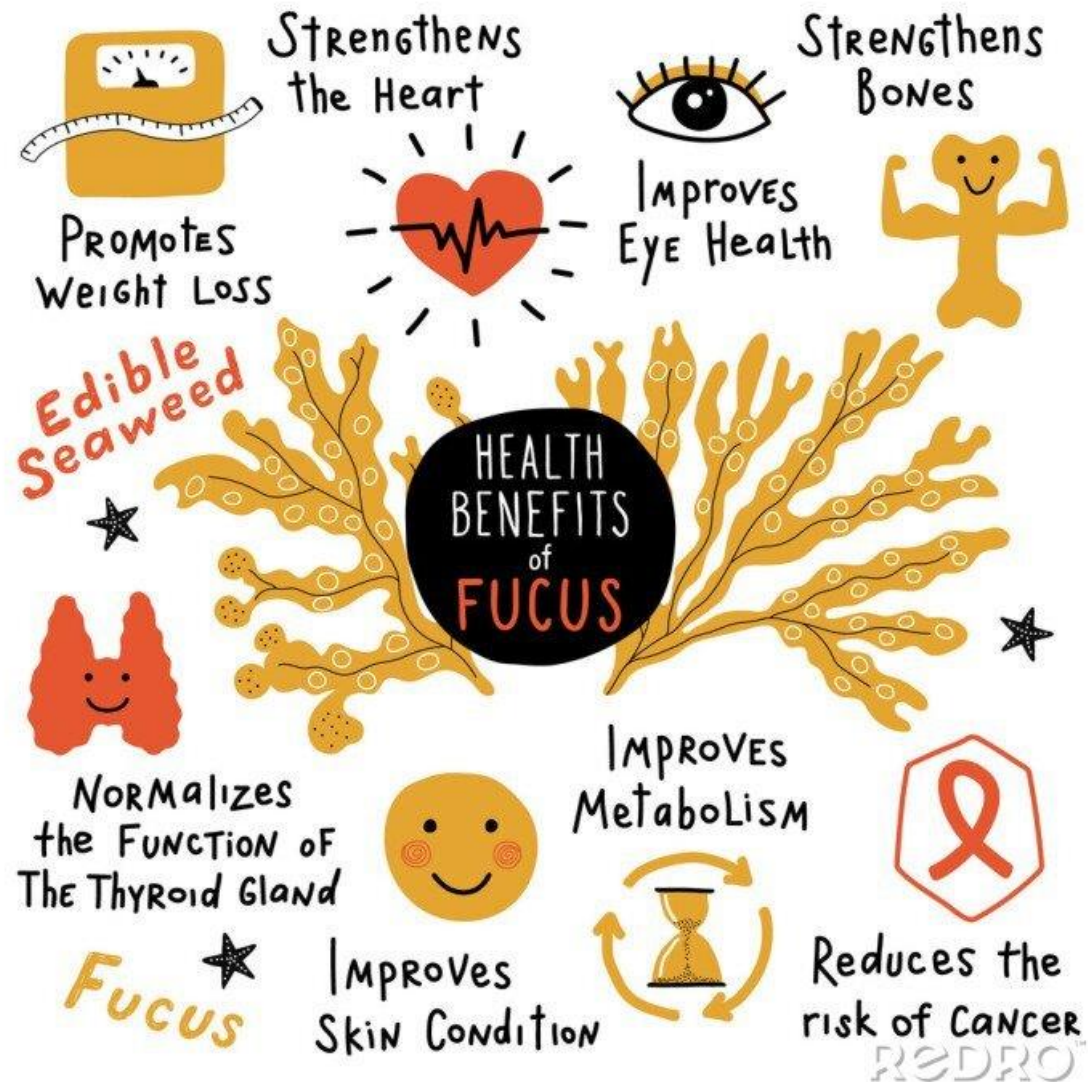
UMARO (formerly known as Trophic) is a startup focused on developing sustainable, meaty, and nutritious plant-based protein from the ocean.

**PRODUCTION PLATFORM:** Plant-based

**TECHNOLOGY SECTOR:** Ingredient Optimization

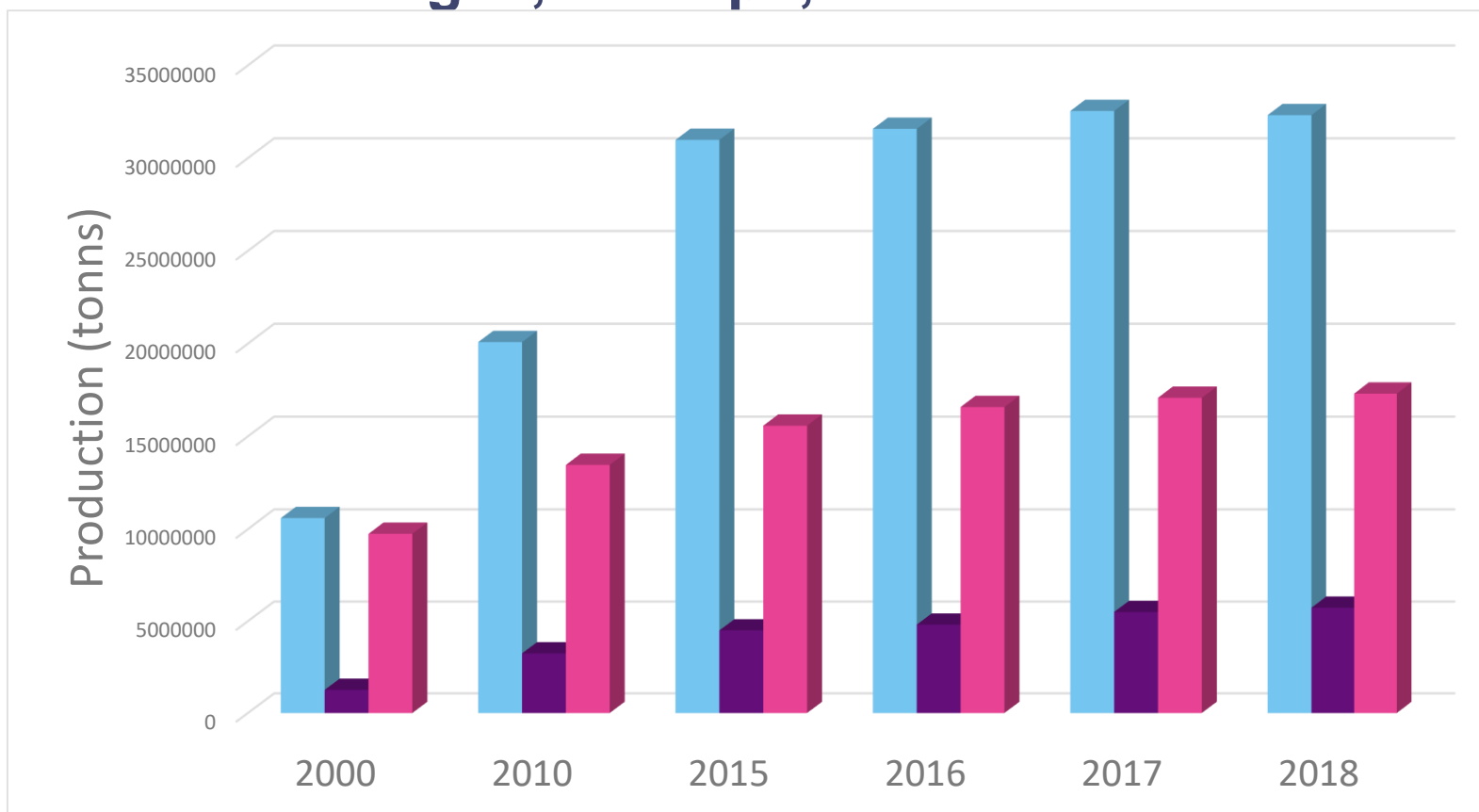


# Sea weeds advantages



# Side production in Aquaculture in 2000 – 2018

## Algae, shrimps, mollusc



# Future

- Increased production efficiency through diversification
- Lower energy consumption per kilogram of production
- Transformation towards increased crop production (also aquatic)
- Exploiting ecological adaptations of different animal and plant communities
- Continuous reduction of the carbon footprint



Thank you for attention



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# Improving food together

[eitfood.eu](http://eitfood.eu)

