



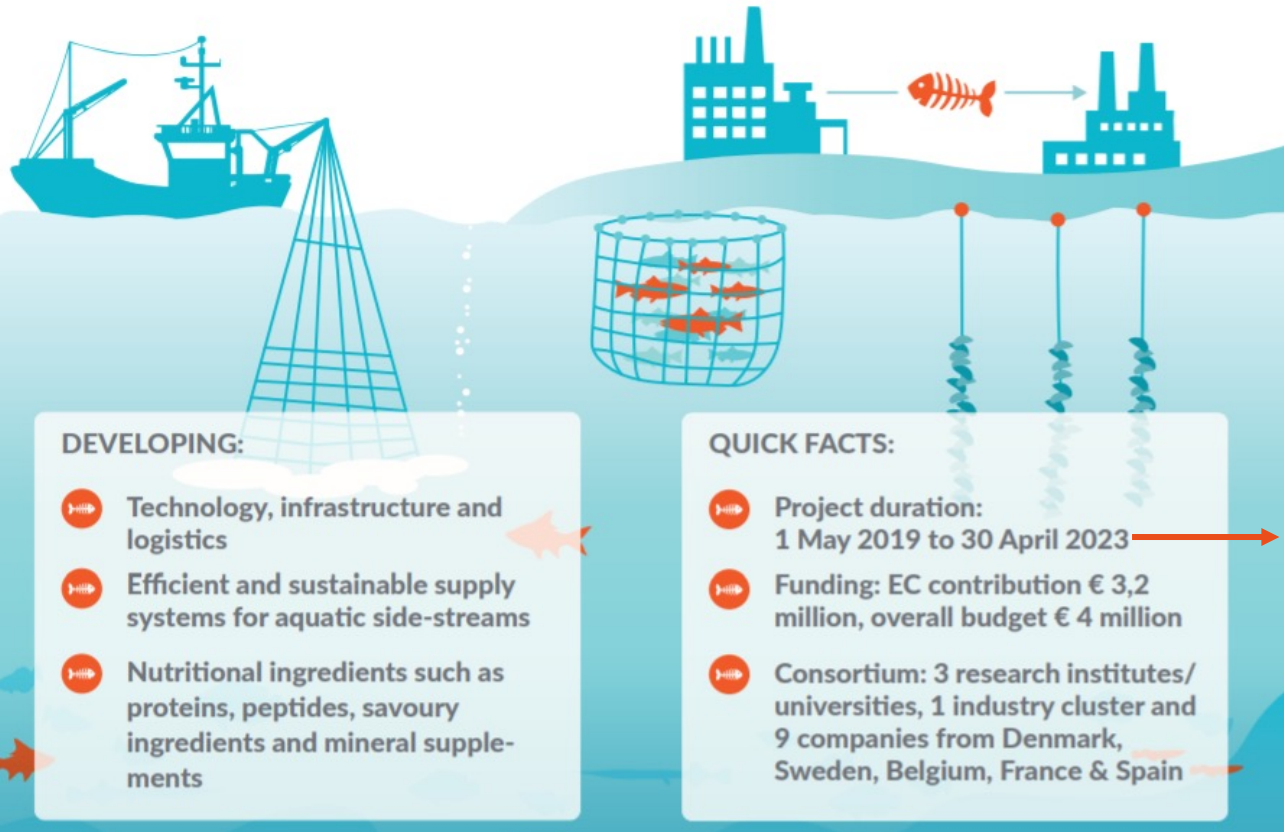
Optimal utilization of seafood side-streams through  
the design of new holistic process lines

# Scaling up of savouring compounds from Mussel Cooking Side streams

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# Optimal utilization of seafood side-streams through the design of new holistic process lines



## COORDINATOR



## PARTNERS



Extended until  
Sept 2023



## THE CONTEXT:

The current exploitation of the aquatic resources is hampered by inefficiency as up to 70 % end up as low-value products or waste, unsustainable considering the rising population.

## WaSeaBi OBJECTIVE:

Ensure that side-streams from aquaculture, fisheries and aquatic processing industries can be exploited for production of new products and ingredients. By **developing storage solutions, sorting technologies and decision tools** that will secure an efficient, sustainable supply system for valorization of these raw materials into marketable products.



### Efficient and Sustainable Supply Systems for Aquatic Side-Streams

#### Nutritional ingredients

Proteins, peptides, savoury ingredients and mineral supplements



## 6 different side-streams:

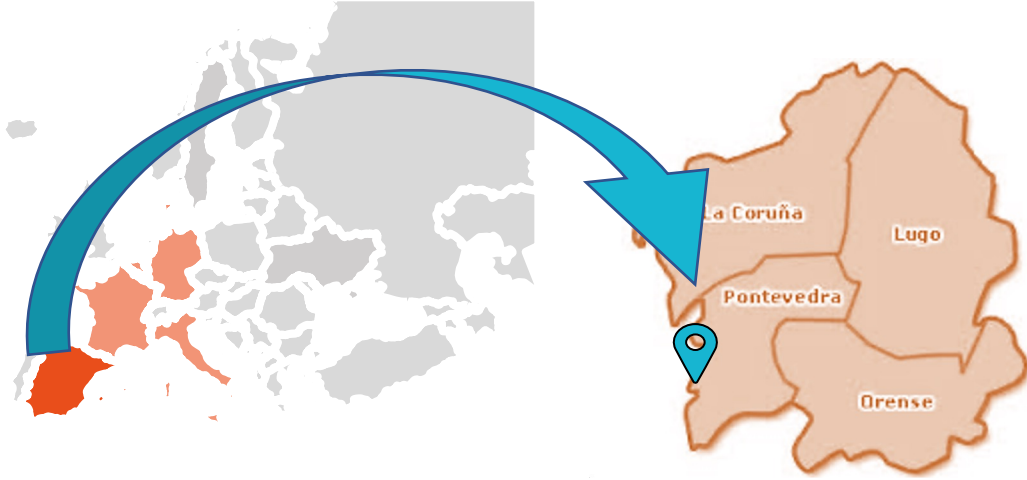
Representing typical **aquaculture, fisheries and aquatic processing industries** in Europe:

Side-stream	Potential use
Solid side-stream from Cod industry	Food ingredient
Brine from salted Cod	Protein for reinjection/in-house use
Solids & process water from herring	Food ingredients
Salmon solids, mackerel, by-catches	Food & Feed ingredients
Mussel cooking water	Food ingredients (Savoury compounds)
Mussel shells	Food & Feed ingredients (mineral supplements)

WaSeaBi will take a whole chain perspective to succeed with **high quality production of:**

- Bioactive peptides for nutraceutical, food and feed application
- Protein-based food ingredients
- Savory ingredients and mineral supplements for food and feed





## Some facts about mussel production:

- The EU is the **second largest producer** after
- In the north-West of Spain, the **annual production** of mussels is 200 000 tons (35 % of the world)
- The mussel processing requires large amounts of water for its processes.
- The water used is seawater, which is why large amounts of wasted-brine are generated.

Culture of mussels in rafts



Mussel harvest



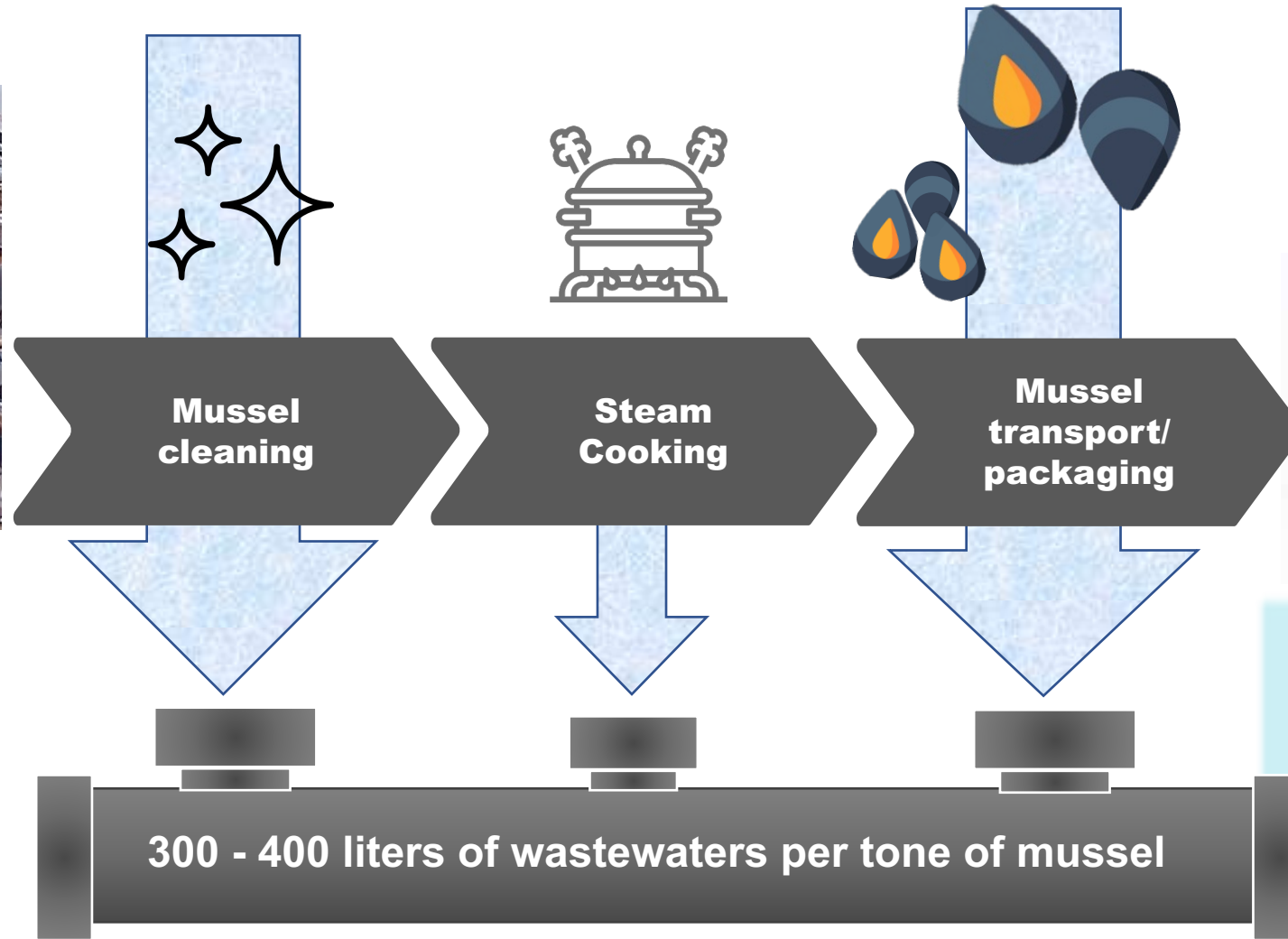
Production



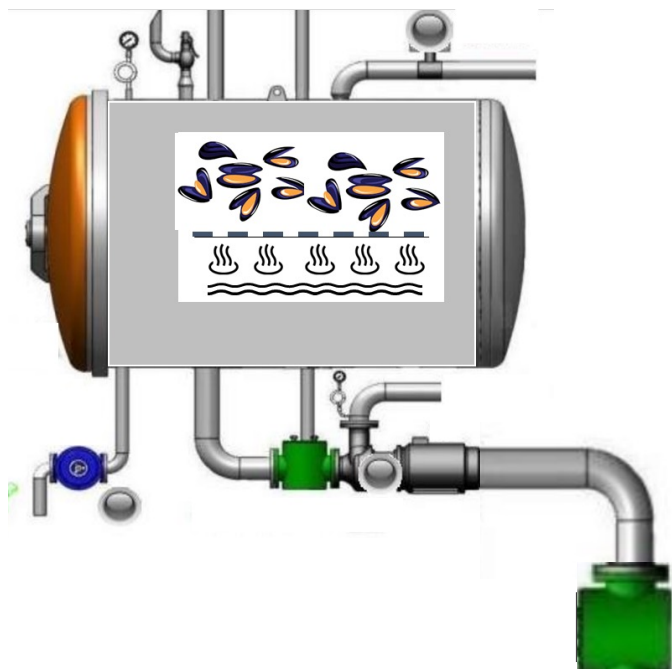
Comercialization



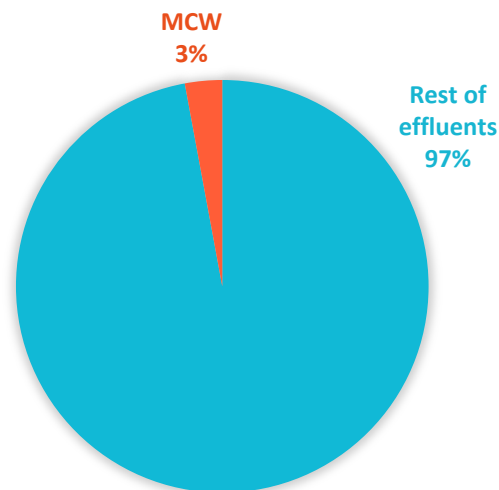
# Mussel Processing



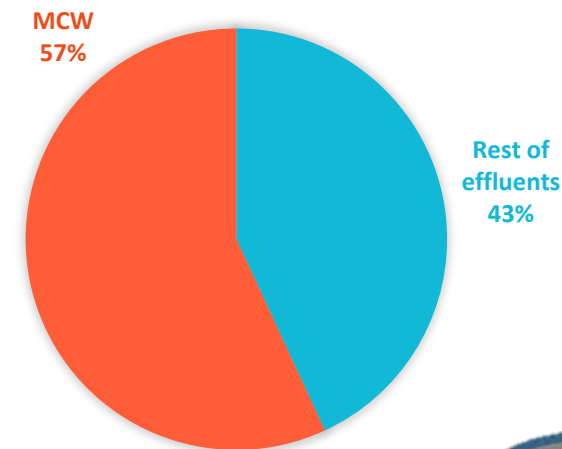
# Mussel processing wastewaters



% VOLUME OF EFFLUENTS



% COD LOAD



## Sidestream from mussel cooking

DQO = 22 000 – 100 000 mgO<sub>2</sub>/l  
SS = 250 – 700 mg/l

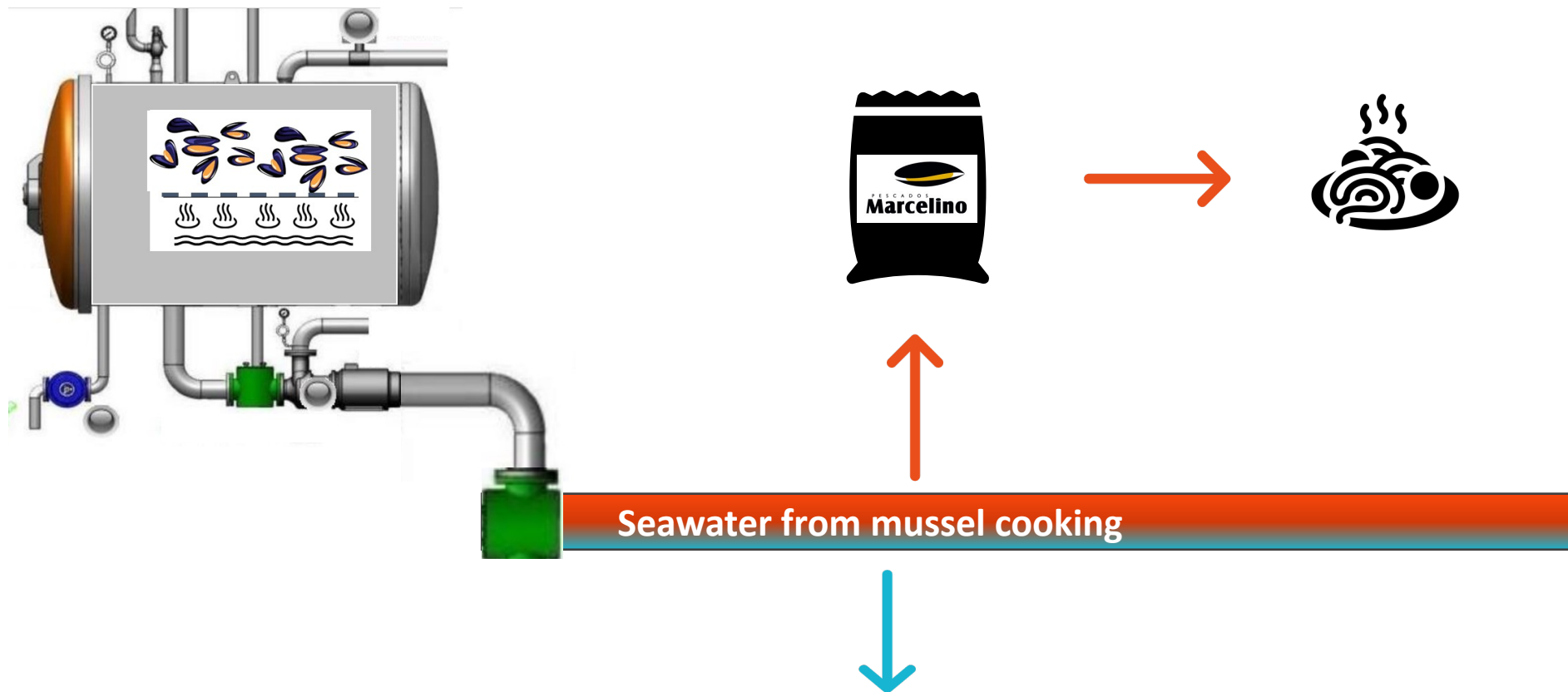
Seawater from mussel cleaning,  
product transport (conveyor-tray)  
and factory cleaning

DQO = 500 – 1 000 mgO<sub>2</sub>/l  
SS = 500 – 1 000 mg/l

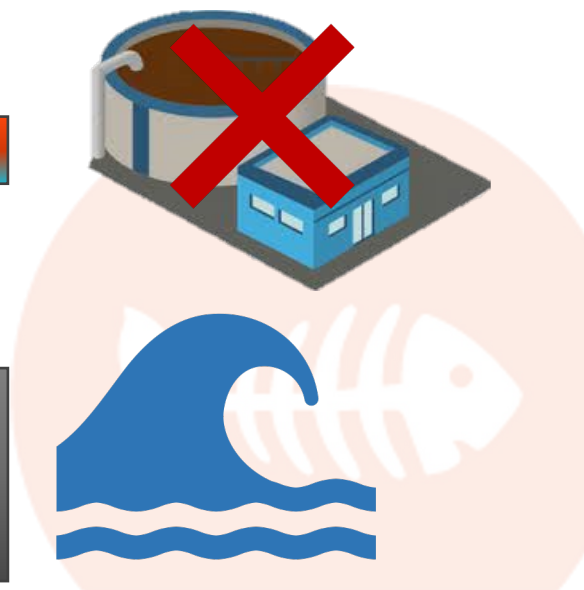


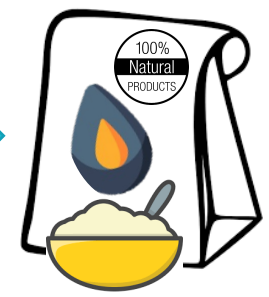
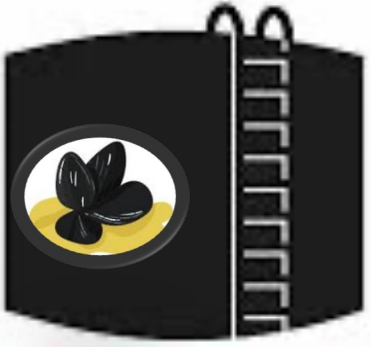


# Mussel processing wastewaters

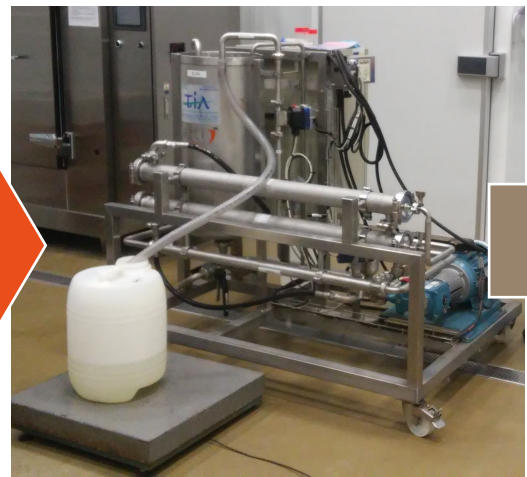


Seawater from mussel cleaning,  
product transport (conveyor-tray)  
and factory cleaning

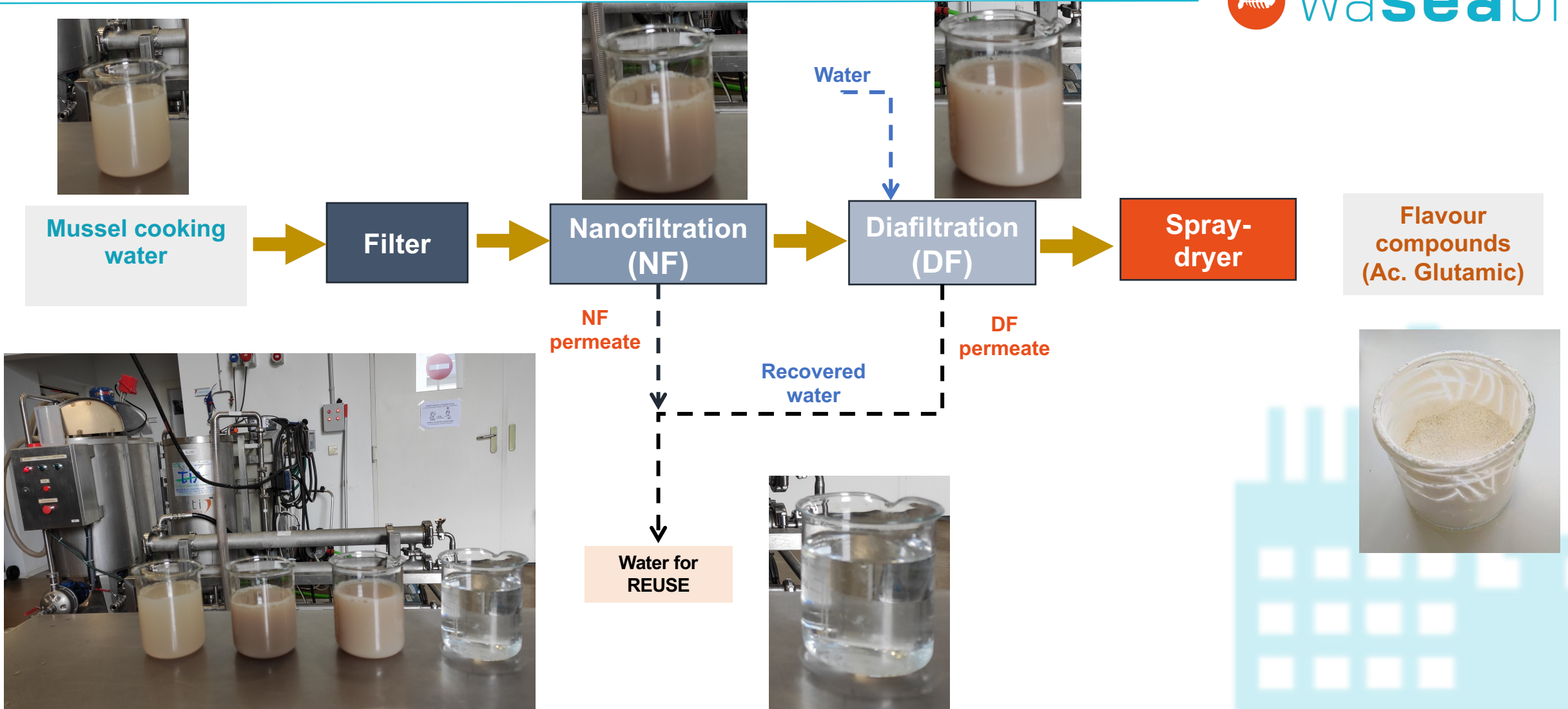




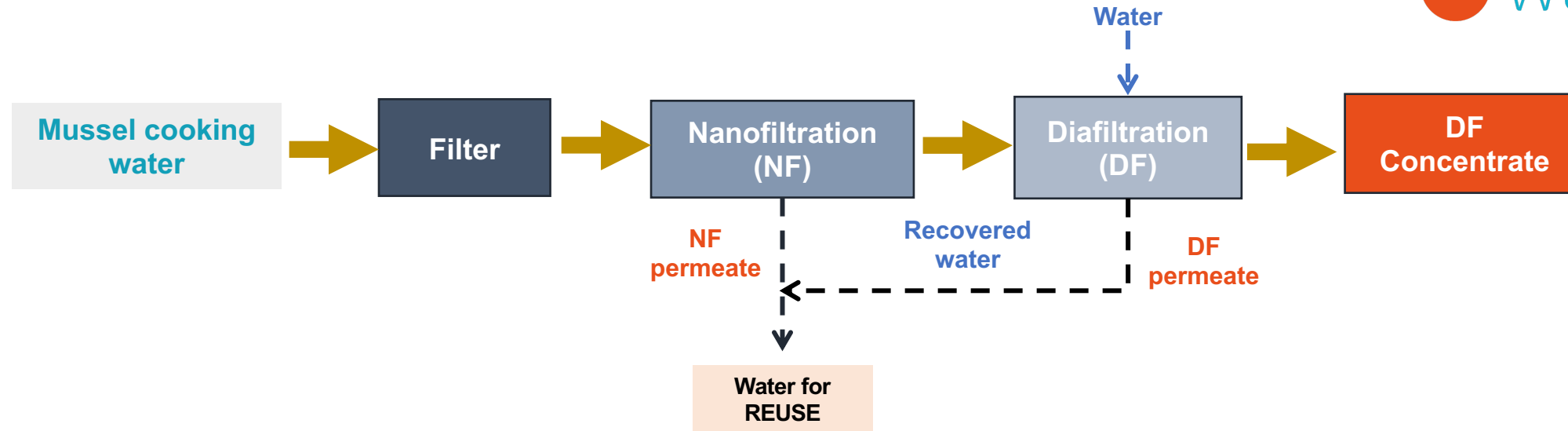
- |  |   |  |  |
|--|---|--|--|
| <ul style="list-style-type: none"><li>➤ Controled conditions</li><li>➤ Variable study</li><li>➤ Separate Effects</li></ul> | <ul style="list-style-type: none"><li>➤ Controled conditions</li><li>➤ Assays in optimal conditions</li><li>➤ Cross Effects</li></ul> | <ul style="list-style-type: none"><li>➤ Real conditions</li><li>➤ High variability</li><li>➤ Adjustment of conditions</li><li>➤ PID specifications</li></ul> | <ul style="list-style-type: none"><li>➤ Installation</li><li>➤ Equipment Start up</li><li>➤ Final adjustmens / Operation</li></ul> |
|--|---|--|--|



# MCW Concentration







Different assays carried out in the scale-up in Mussel Facility

	Nanofiltration VCF	Diafiltration VCF
Assay 1	10	10
Assay 2	10	20
Assay 3	20	20

VCF = Volumetric Concentration Factor

## RESULTS: Comparison between different performance parameters

	Assay 1 NF 10x - DF 10x	Assay 2 NF 10x - DF 20x	Assay 3 NF 20x - DF 20x
NF (VCF) – DF (VCF)			
Protein recovery (%)	0.53	<b>0.67</b>	0.56
Concentrate Volume l/m <sup>3</sup> MCW)	10	5	<b>2.50</b>
Energy (kWh/m <sup>3</sup> MCW)	21.42	<b>17.12</b>	21.51
Final effluent Vol. (m <sup>3</sup> /m <sup>3</sup> MCW)	1.98	1.95	<b>1.49</b>
COD in final effluent (mg O <sub>2</sub> /l)	1013	<b>856</b>	<b>854</b>
CIP Reagents (€/ m <sup>3</sup> MCW)	128	<b>121</b>	136

# Production of Mussel savoury compounds



Mussel Cooking Water



MCW concentrate



MCW permeate



## MCW powder composition



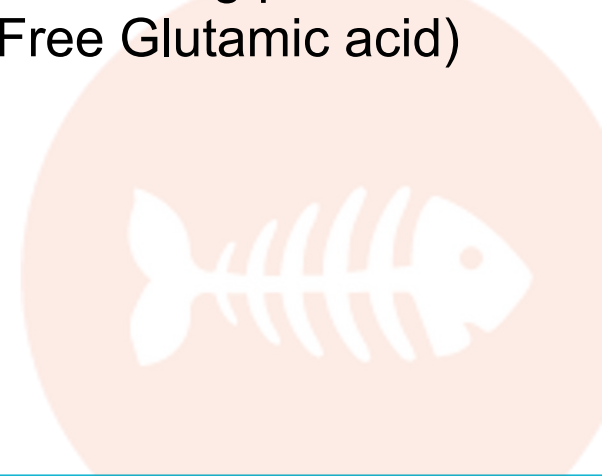
- Moisture 3 %



- Protein > 50 %



- 20 mg Total Glu / g powder  
(60% of Free Glutamic acid)





# Market applications



## PROCESSED FOOD INGREDIENT

- Fish & Seafood savor
- Umami flavor



MCW powder



## PET FOOD

- Anti-inflammatory properties
- Seafood flavor






## BEAUTY & COSMETICS

- MAP (Mussel adhesive protein)
- Skin regeneration
- Nutraceutical ingredients



# Conclusions

-  A solution for a seafood side-streams recovery was developed and implemented from lab-scale to industrial scale-up
-  The main pollution flow was separated and valorized to avoid the organic matter contamination in the final effluent. Treated brine can be discharged to the sea within the regulatory frame or reused.
  - The water recovered from the NF and DF processes had the hygienical conditions to use for cleaning purposes in the factory
-  **New protein source was obtained for savory ingredient industry**







# Thank you! Any questions?

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