Mussel Farming in the Baltic May Recycle Nutrients Into High Quality Feedstuff

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BALTIC SEA 2020

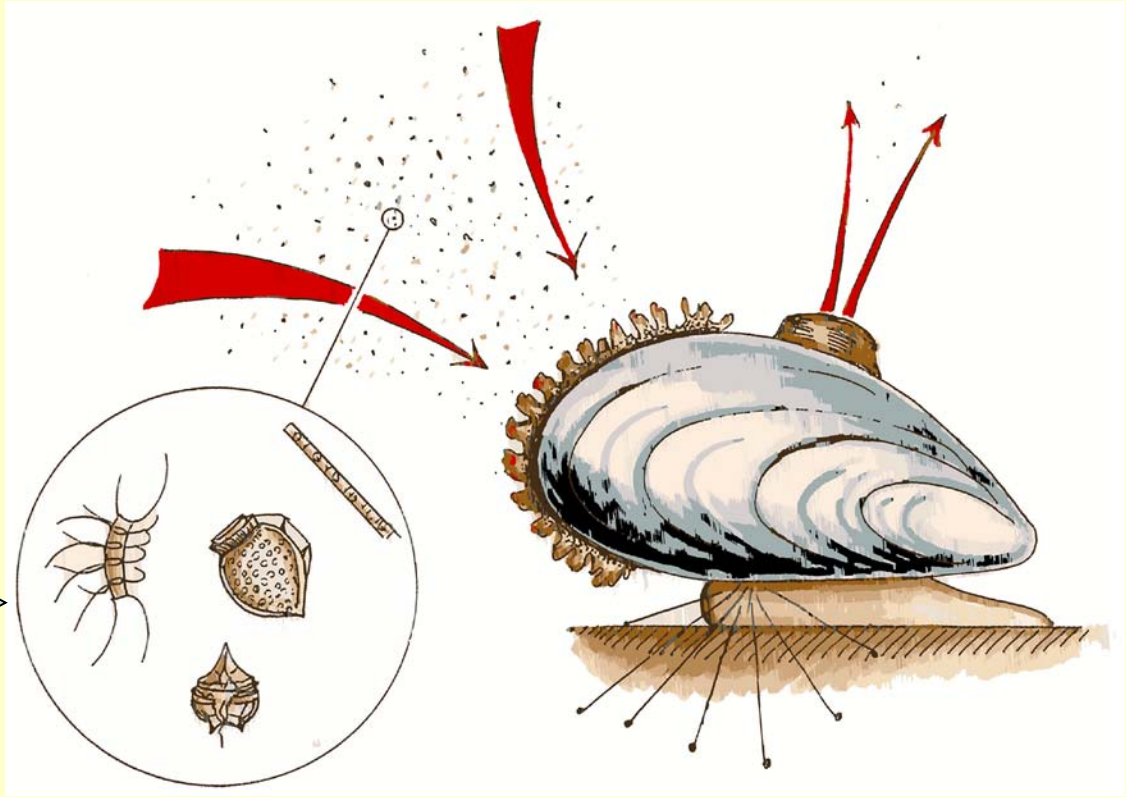
SUBMARINER

Nutrients – a resource to recycle:

Nitrogen - **because the production process is climate forcing and energy demanding.**

Phosphorus - **because it is a limited resource on a global scale.**

The natural phytoplankton community acts as a catch croop for the nutrient discharge and the mussels as grazing-animals

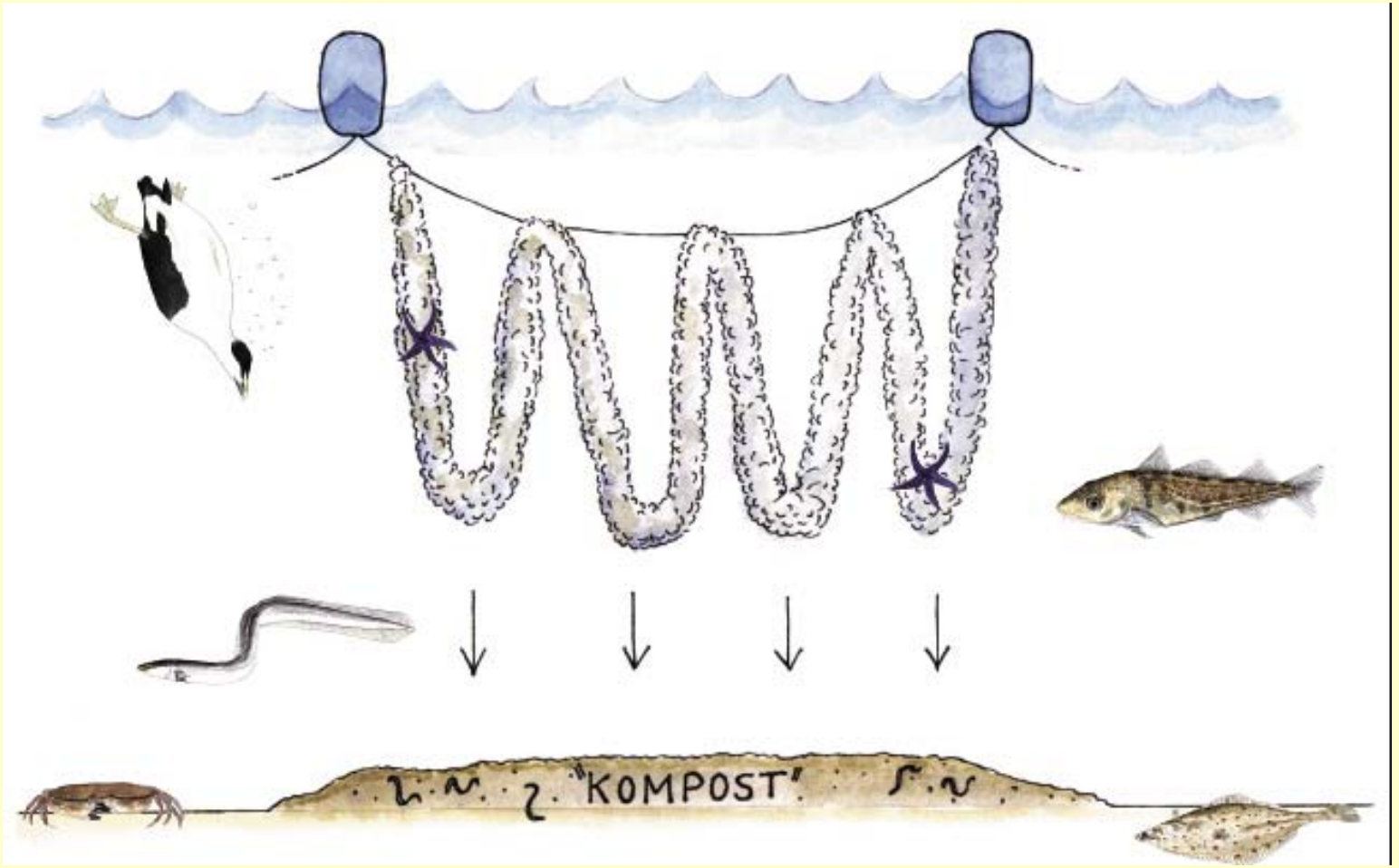


Nutrients

Mussel farming – Open landscape feeding in the sea

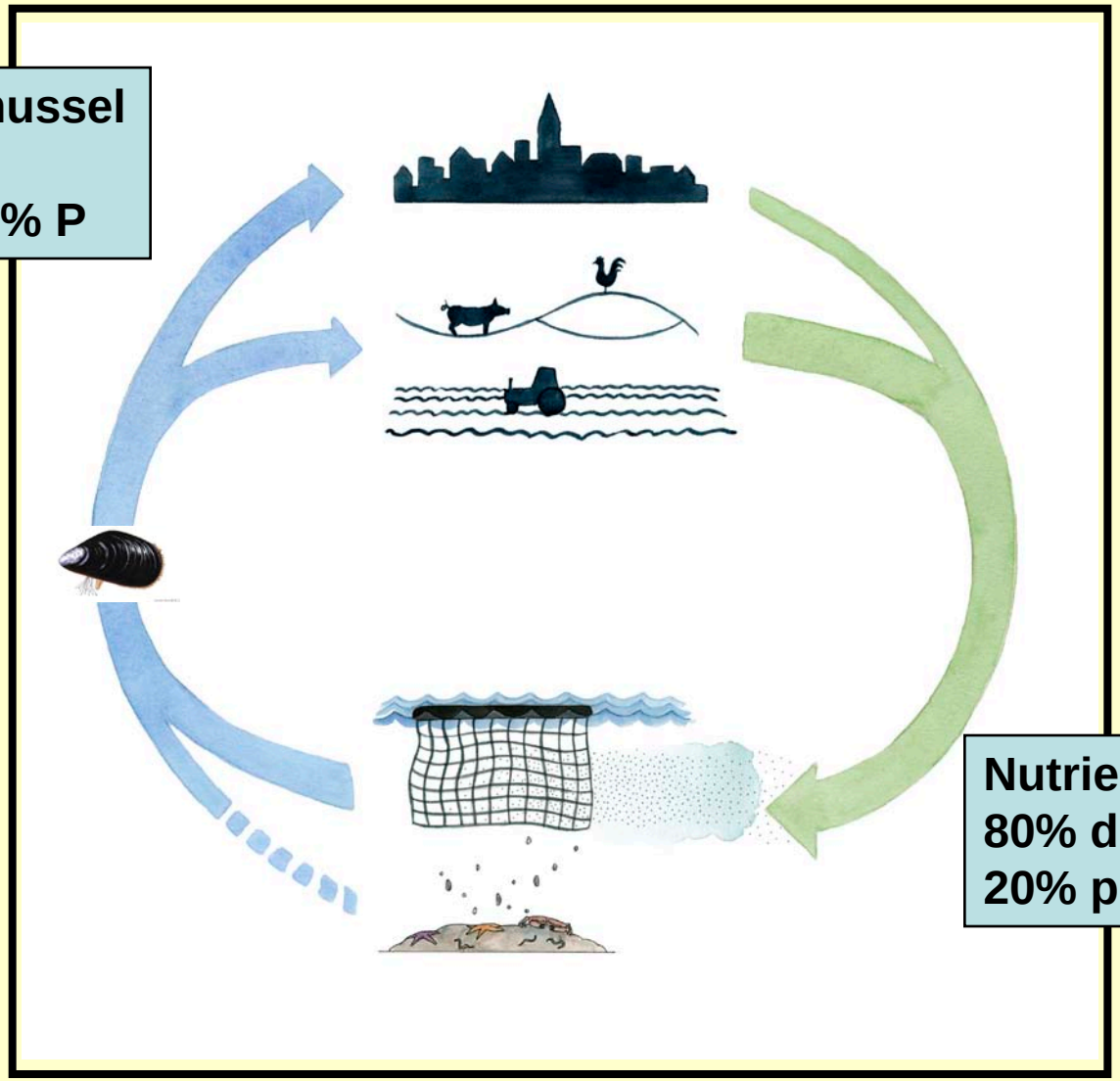
Photo; Pia & Karl Norling

A mussel farm is like an floating reef and becomes a natural part of the ecosystem



The Agro-Aqua recycling of nutrients

A harvested mussel contains ca:
1 % N and 0.1 % P



Nutrients to the sea:
80% diffuse sources,
20% point sources.

The possible use of mussels

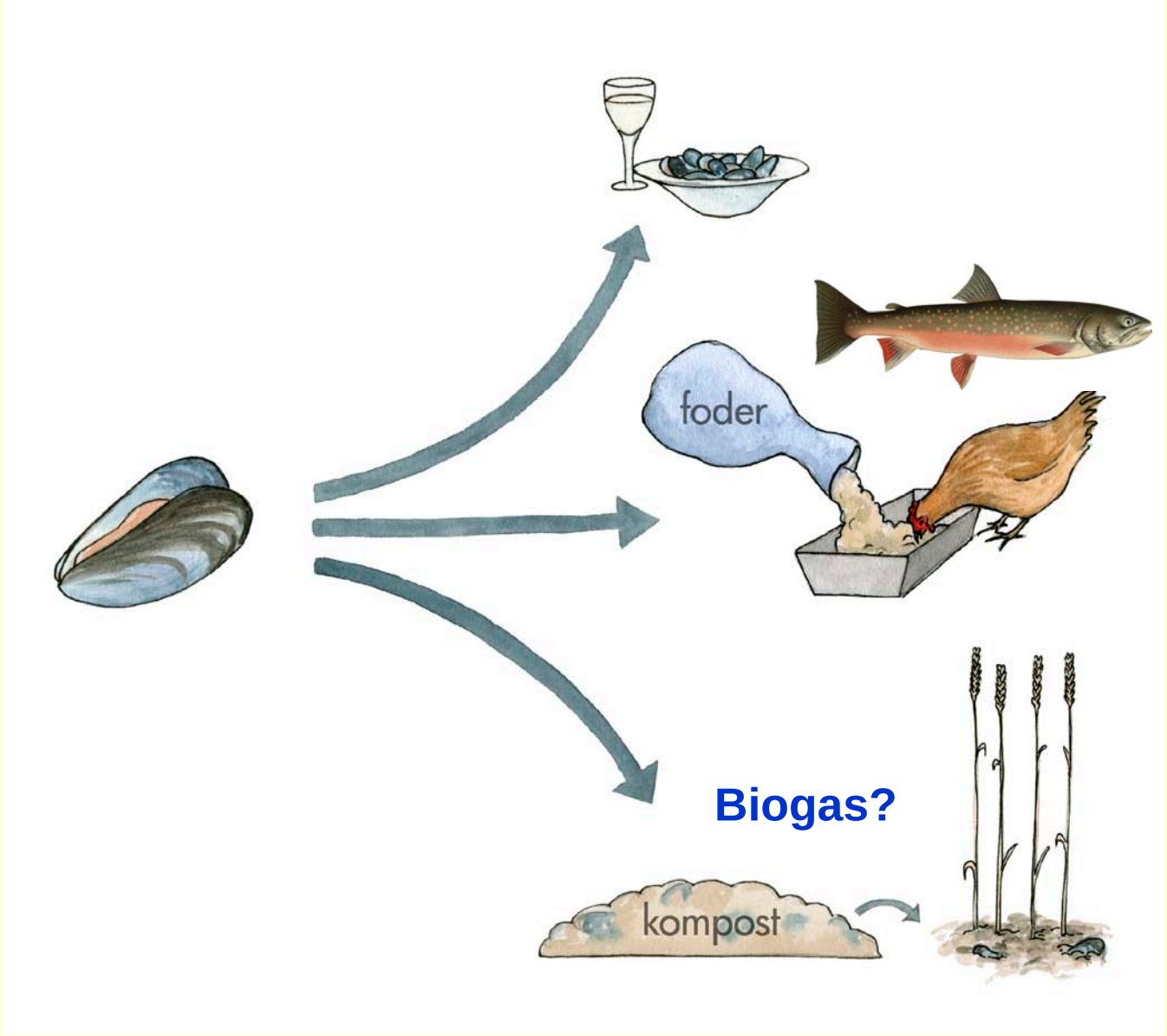


Illustration: Maj Persson

Market

Food

Feed

Fertilizer and energy

Mussels – good, healthy and festive

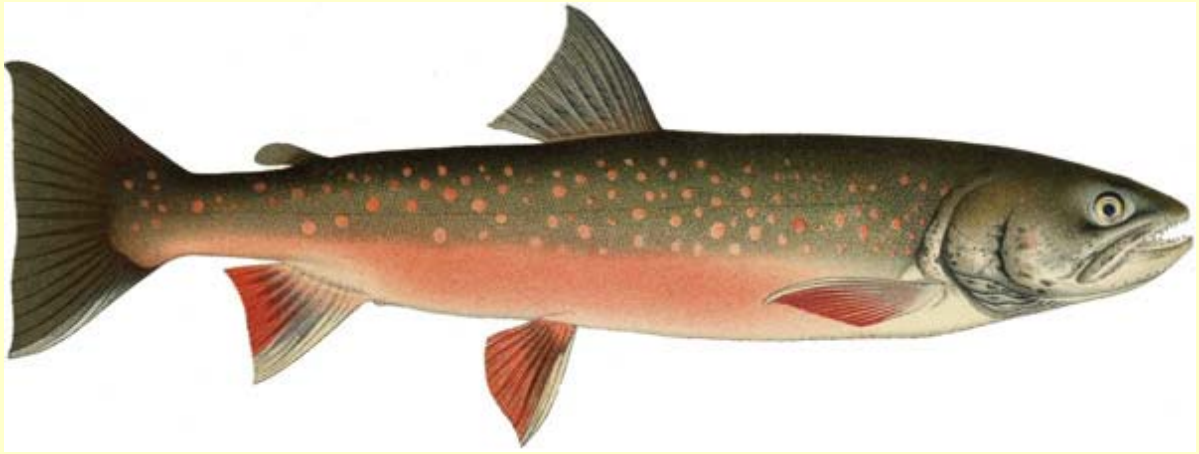
Mussel meal can replace fish meal

Steamed mussel meat **Standard feed**

Large scale and long term studies at Swedish Agro. Univ.

Chicken bred on mussel meal

Mussel meal has been tested on both trout and artic char



The content of protein and share of sulphur-rich amino acids and lysine in mussel and fish meal and some other commonly used feedstuff products

	Mussel meat	Mussel meal	Fish meal	Rape cake	Peas	Soy cake	Wheat
Protein, g kg^{-1} DW	645	764	670	237	265	520	120
Methionine, % of protein	1,8	2,5	2,8	2,0	1,0	1,4	1,6
Methionine + Cystine, % of protein	2,6	4,2	3,7	4,5	2,4	2,9	3,9
Lysine, % of protein	6,0	7,7	7,4	5,6	7,1	6,2	2,8

From Berge and Austreng, 1989 and Johansen, 2008.

The content of some heavy metals and harmful organic substances in blue mussels in relation to limits in food, feed, fertilizer and the Norwegian classification for environmental state.

Substance	Food mg/kg DW	Feed mg/kg DW	Fertilizer mg/kg DW	Norw. class. mg/kg DW	Blue mussel mg/kg DW	n
Lead	10	11.4	100	< 3	1.9	72
Cadmium	6.7	2.3	2	< 2	1.25	87
Nickel	-	-	50	< 5	1.4	73
PCB (7)	-	0.23	0.4	< 0.33	0.016	38
Dioxin	$27 \cdot 10^{-6}$	$1.4 \cdot 10^{-6}$	-	$< 1.33 \cdot 10^{-6}$	$9.3 \cdot 10^{-6}$ * $0.83 \cdot 10^{-6}$	82
Sum DDT	-	0.06	-	< 0.013	0.004	8

(Kollberg and Ljungqvist, 2007).

Pilot plant for production of mussel meal

Located in Ellös on the Swedish west coast

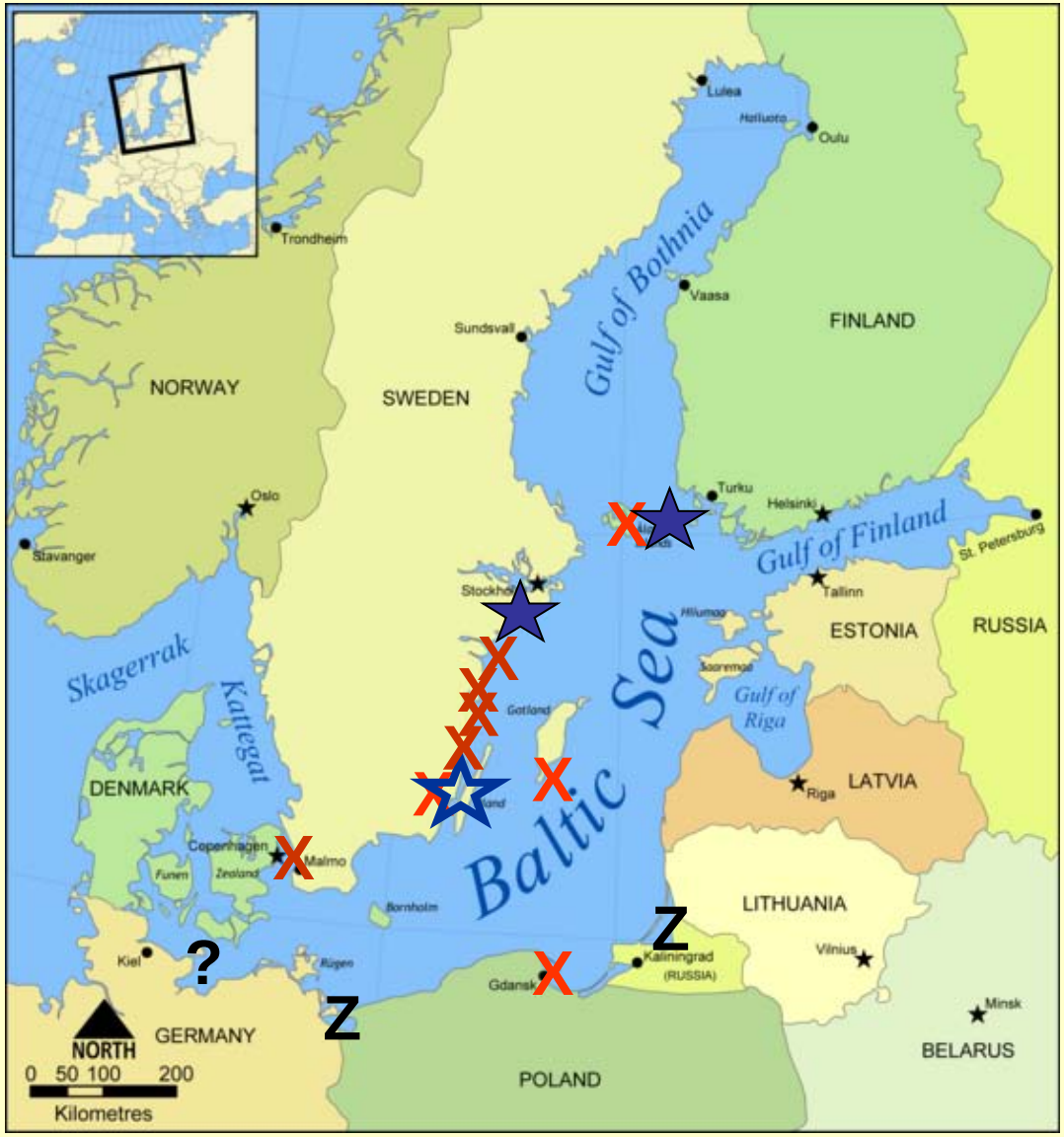
Estimated capacity is 10 ton of mussel meal per year.

The mussel reminder used as a fertilizer

Composting mussels with straw

Composting mussels with barch

Mussel farming trials in the Baltic



X = ongoing and completed small scale trials

★ = ongoing large scale trials

Z = zebra mussel trials

Kalmarsund, August 2009

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Kalmarsund after 3 summers

Estimated biomass about 12 kg m-2, 20 x20 cm mesh size

Cost-effective system for maximum biomass

Seafood mussels in Sweden are paid 1 – 2 euro per kg.

Feed mussels can be produced at around 0.2 – 0.3 euro per kg.

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Farming feed mussles – *an example of calculation*

Farming

Feed mussels cost 0.2 – 0.4 euro per kg to produce.

The feed industry can pay the farmer at most 0.1 euro.

Process

Transportation and processing of feed mussels to mussel meal is estimated to at most 1 euro per kg.

Feed Market

Mussel meal can be produced for 2.5 – 3 euro per kg.

To be compared with fish meal which today costs about 1.2 euro, but the price is slowly increasing.

Farming feed mussles – *an example of calculation*

Farming

Feed mussels cost 0.2 – 0.4 euro per kg to produce.

The feed industry can pay the farmer at most 0.1 euro.

The farmer must also get paid 0.1 – 0.3 euro per kg for the nutrient harvest.

Process

Transportation and processing of feed mussels to mussel meal is estimated to at most 1 euro per kg.

Feed Market

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To be compared with fish meal which today costs about 1.2 euro, but the price is slowly increasing.

Feed and environmental mussels - a ruling condition:

The mussel farmer must get paid for the environmental benefit performed.

A win-win situation can thereby be created between society, environment and aquaculture.

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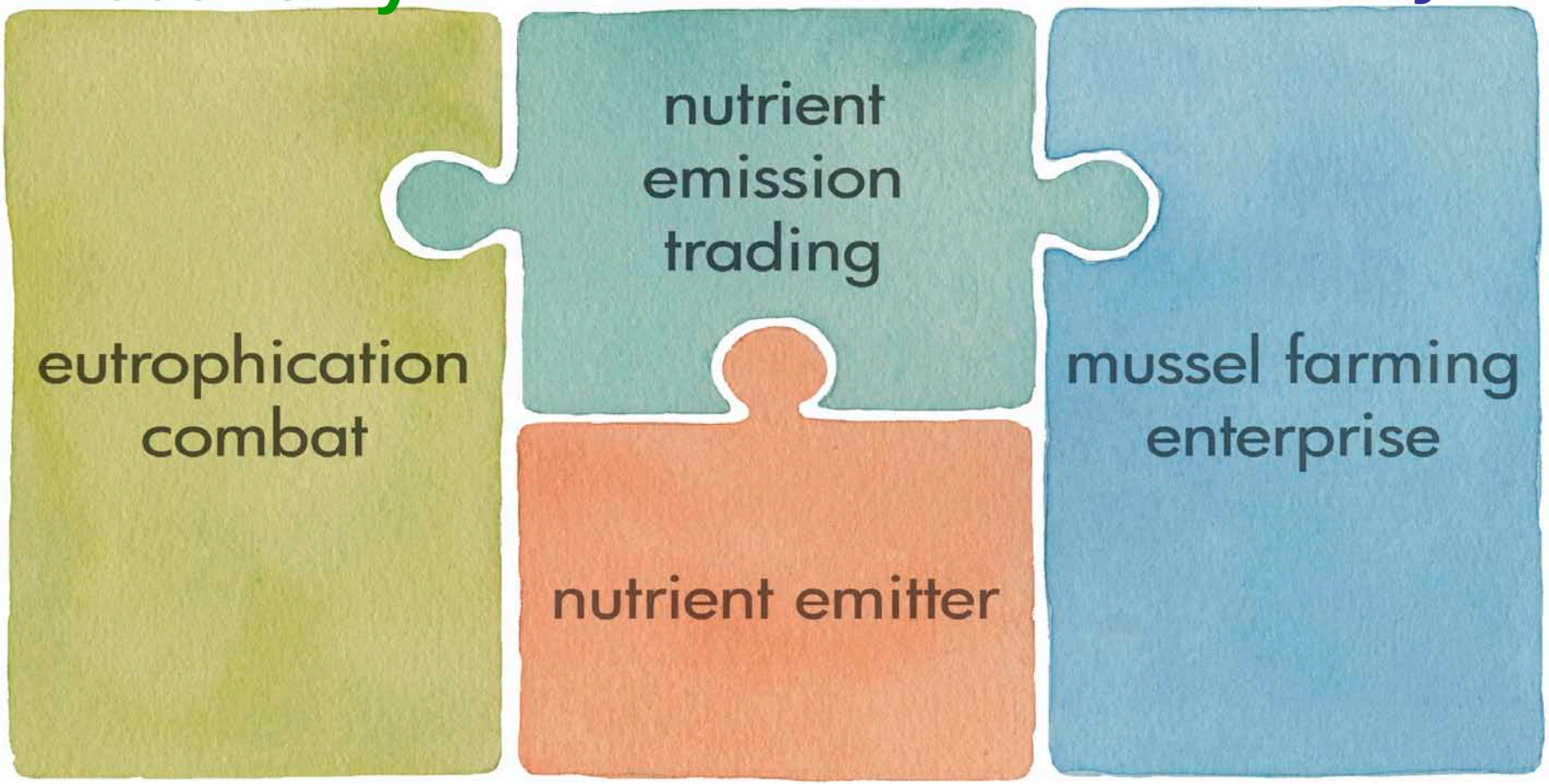
But according to which principle shall the mussel farmer get paid?

Nutrient trading as a part of coastal zone management

Environmental economy ⟷ **Market economy**



Environmental measures in agriculture comparable with mussel farming

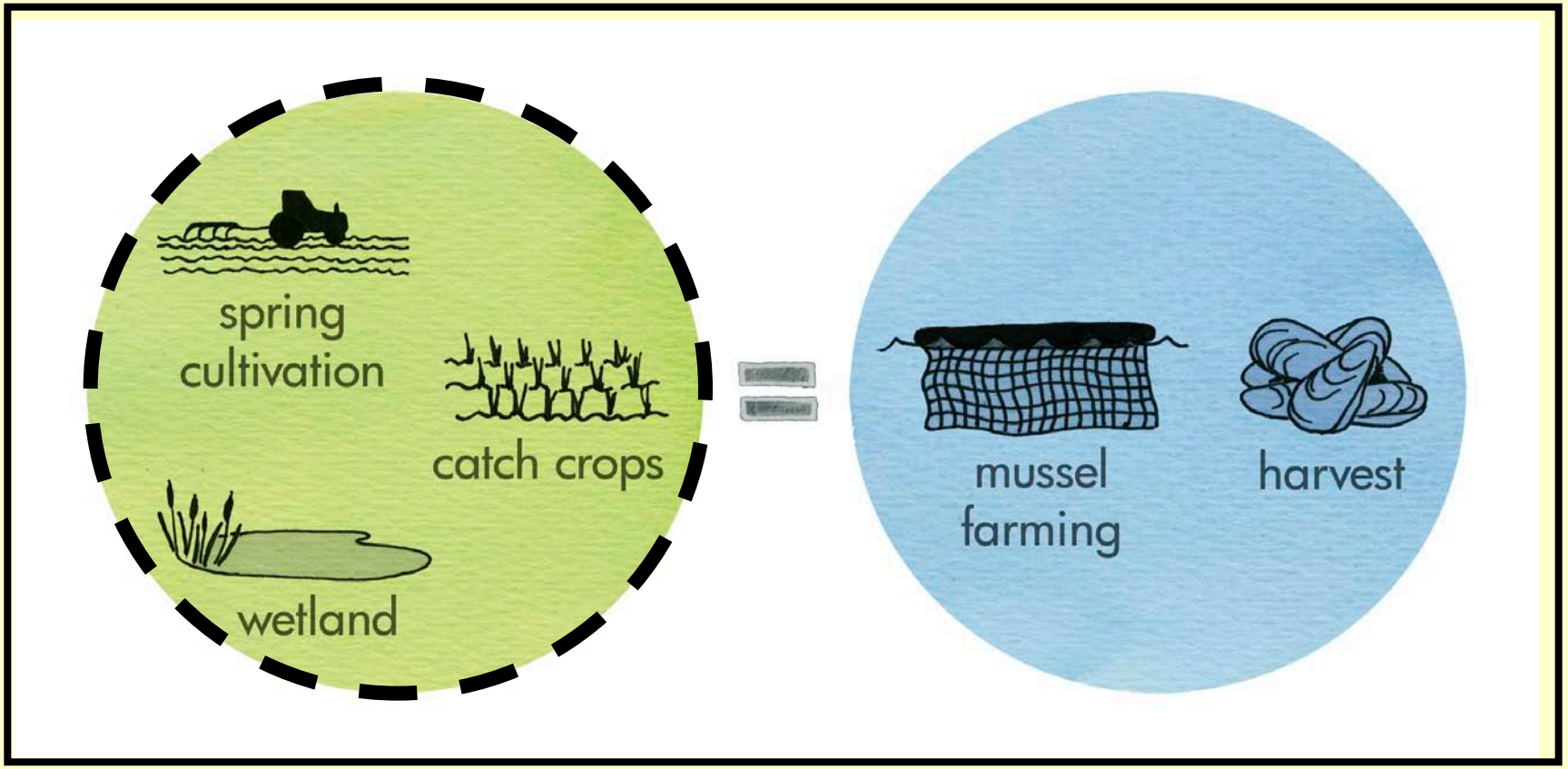
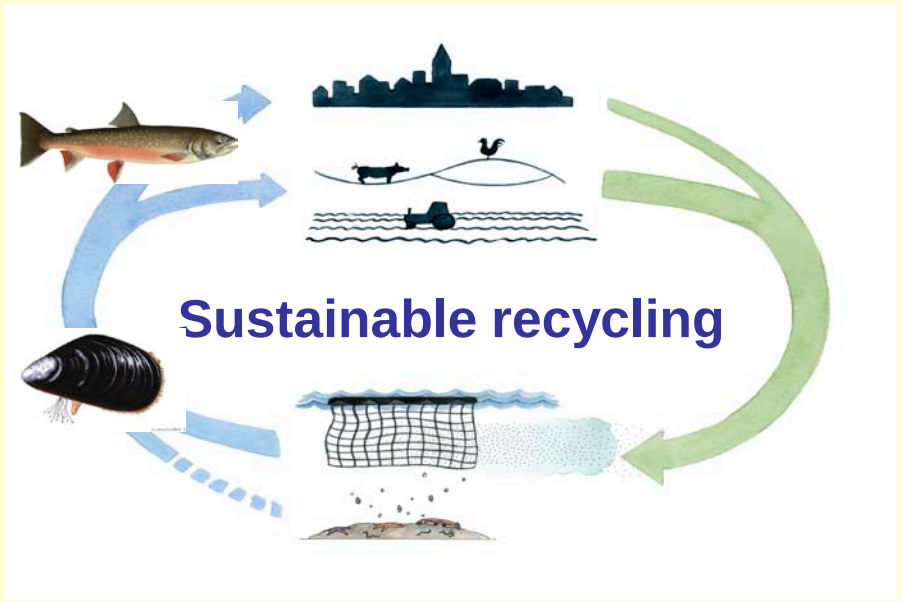


Illustration: Maj Persson

Cost = 10 – 30 euro/kg N → **Corresponds to 0.1 – 0.3 euro per kg mussels and is the payment to the mussel farmer the environmetal service provided.**



Make the environment and the future a favour – farm more mussels

http://www.miljomusslor.loven.gu.se/

http://www.balticsea2020.com/

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