

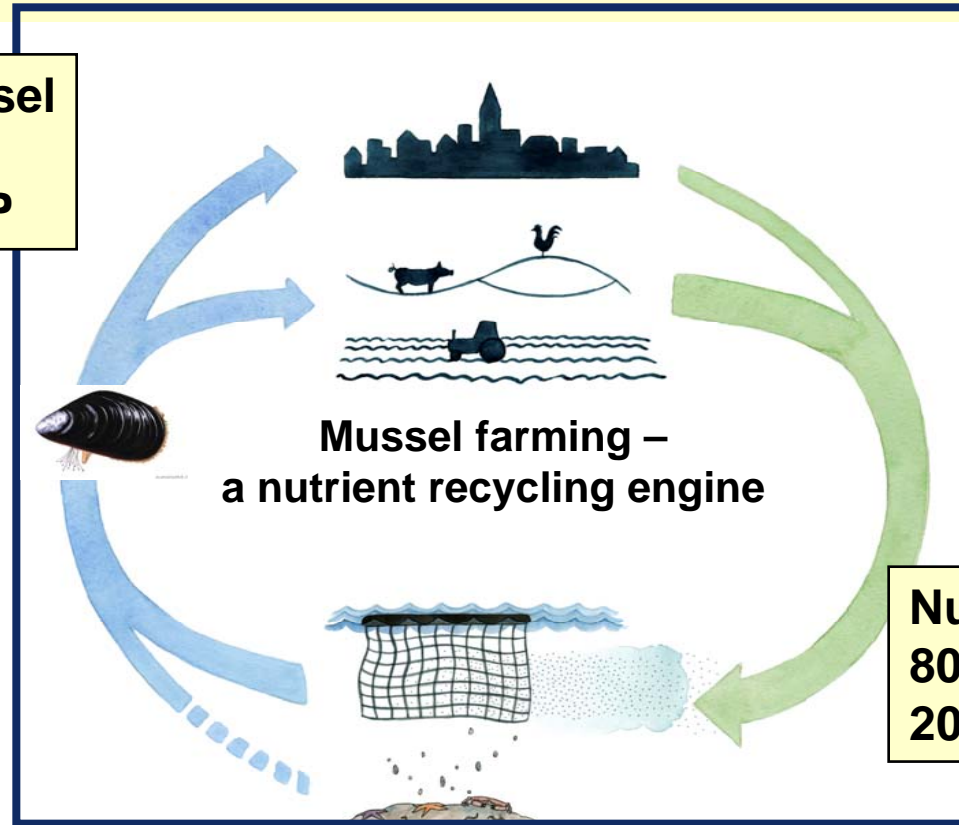
# **Perspectives for mussel farming in the Baltic Sea Region – with focus on feed mussels**

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# The Agro-Aqua recycling of nutrients by mussel farming

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



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

**Why recycle nutrients?**

Nitrogen (N) is energy demanding and climate driving to produce.  
Phosphorus (P) is a limited resource on a global scale.





# Mussel farming in the Baltic



≡ = food mussel production



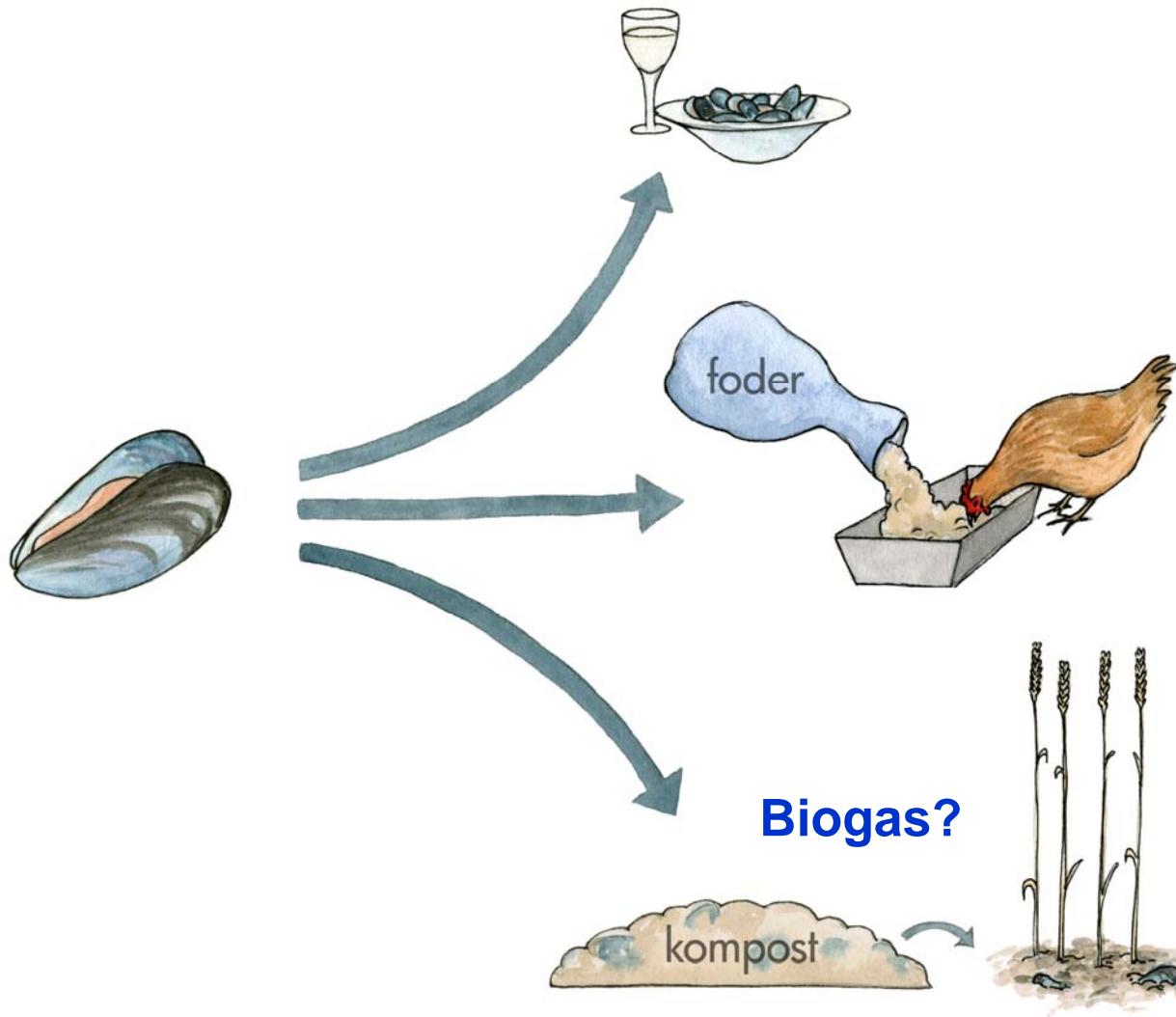
# The possible uses of mussels

Market

Food

Feed

Fertilizer  
and energy



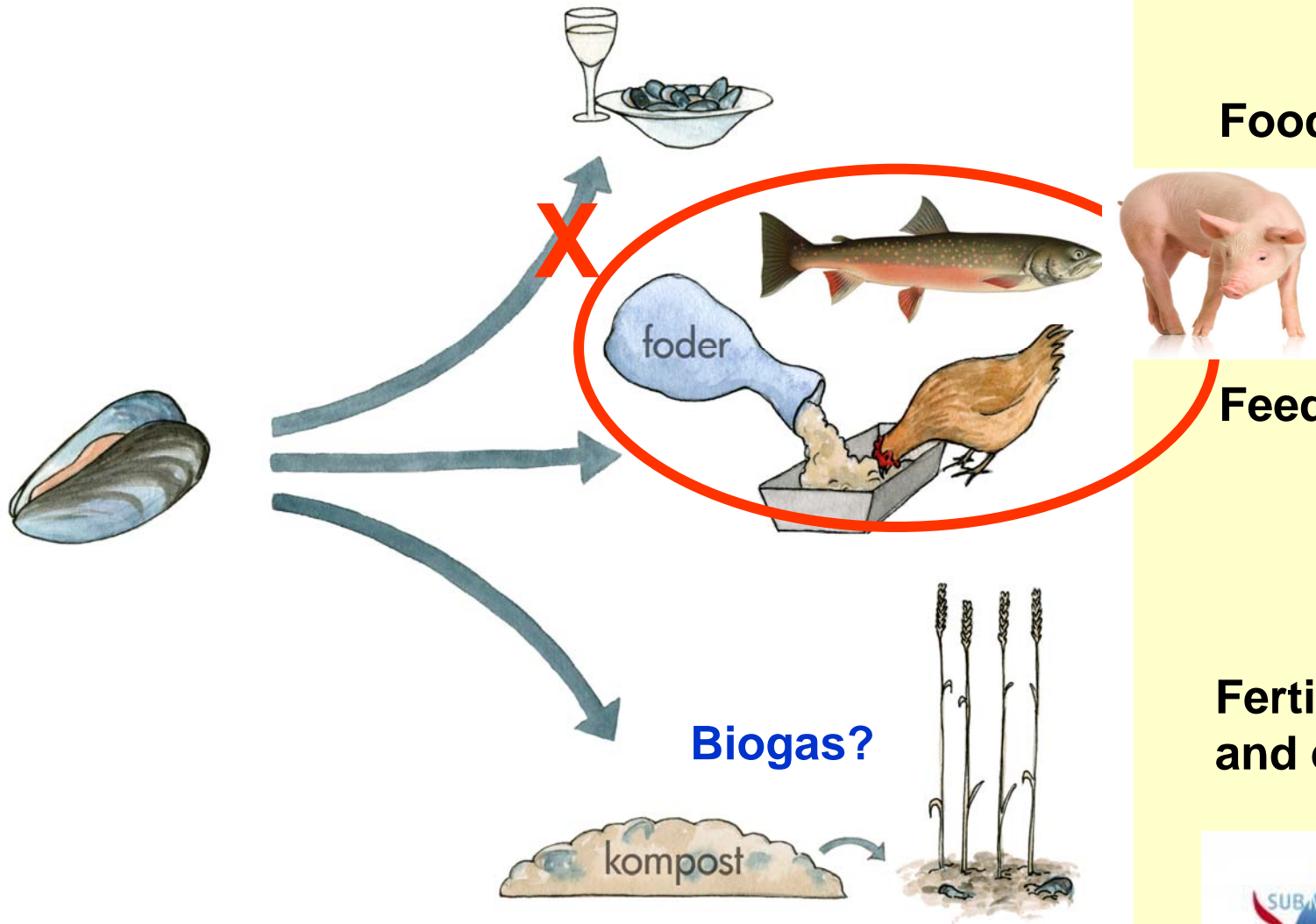
# The possible uses of mussels

Market

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# Pilot plant for the production of mussel meal



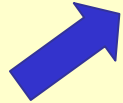
**The entrance of the pilot,  
situated in Ellös, Sweden**



**A part of the rotating dryer  
and surrounding equipment**



# Two options to process fresh mussels into mussel meal



**Mussels are steamed open, followed by mechanical separation of meat and shells. Meat pieces are dried.**



- + • Easy to separate meat and shells.
- High quality of meal.
- • High energy demand.
- Expensive equipment.
- Difficult to try meat.

**Biochemical dissolution of the soft tissues, followed by filtration/separation from shells. A suspension is dried.**

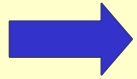


- + • Easy to run at a large scale.
- Valuable dried shell/meat/meal mixtures as "biproducts".
- Lower energy demand.
- • Difficult to separate out the shells.
- The quality of products somewhat uncertain.





# Products as a result of the dissolution method



- 1. Pure mussel meal, more or less without shell pieces (for all kinds of feeds, especially fish feed).**
- 2. Various mixtures of mussel meal, meat pieces and shell pieces with dried meat attached or shell meal (especially useful in feeds for poultry).**
- 3. Dried mussel shell pieces of certain sizes with variable amounts of dried mussel meat attached (is presently tested on laying hens, mainly for improving the social behaviour of the hens).**
- 4. Wet mussel feed, with or without shell pieces (this product is not yet tested).**



# Added values of dried shells

- 1. Mussel meal and dried shells are produced in a weight ratio of 1 to 10.**
- 2. The economic value between meal and shells is the opposite, or ca 10 to 1.**
- 3. The sum of above involves that the shells may more or less double the total income.**



# First attempt to process Baltic mussels

**It should be pointed out that it is technically more difficult to process the thin-shelled and fragile Baltic mussels.**

**It is for the moment not clear if and how it is possible to completely separate the shells from the meal. Trials are ongoing but will require some time and resources.**



# Comparison of Aquabest, west coast and Åland mussel meals

	<b>Ash g/kg</b>	<b>Protein g/kg</b>	<b>Ca g/kg</b>	<b>P g/kg</b>
<b>Aquabest mussel meal (steamed)</b>	<b>105</b>	<b>656</b>	<b>4.6</b>	<b>9.5</b>
<b>West coast mussels (dissolved)</b>	<b>162</b>	<b>480</b>	<b>27.7</b>	<b>9.0</b>
<b>Åland mussels (dissolved)</b>	<b>307</b>	<b>384</b>	<b>77.8</b>	<b>7.5</b>

# Approvement of processing method

**The developed dissolution method is under ongoing approval to meet the standards of the EU legislation for feed production.**

**Most likely, the method will be approved under 2012.**





# Mussel meal



# Mussel meal can replace fish meal

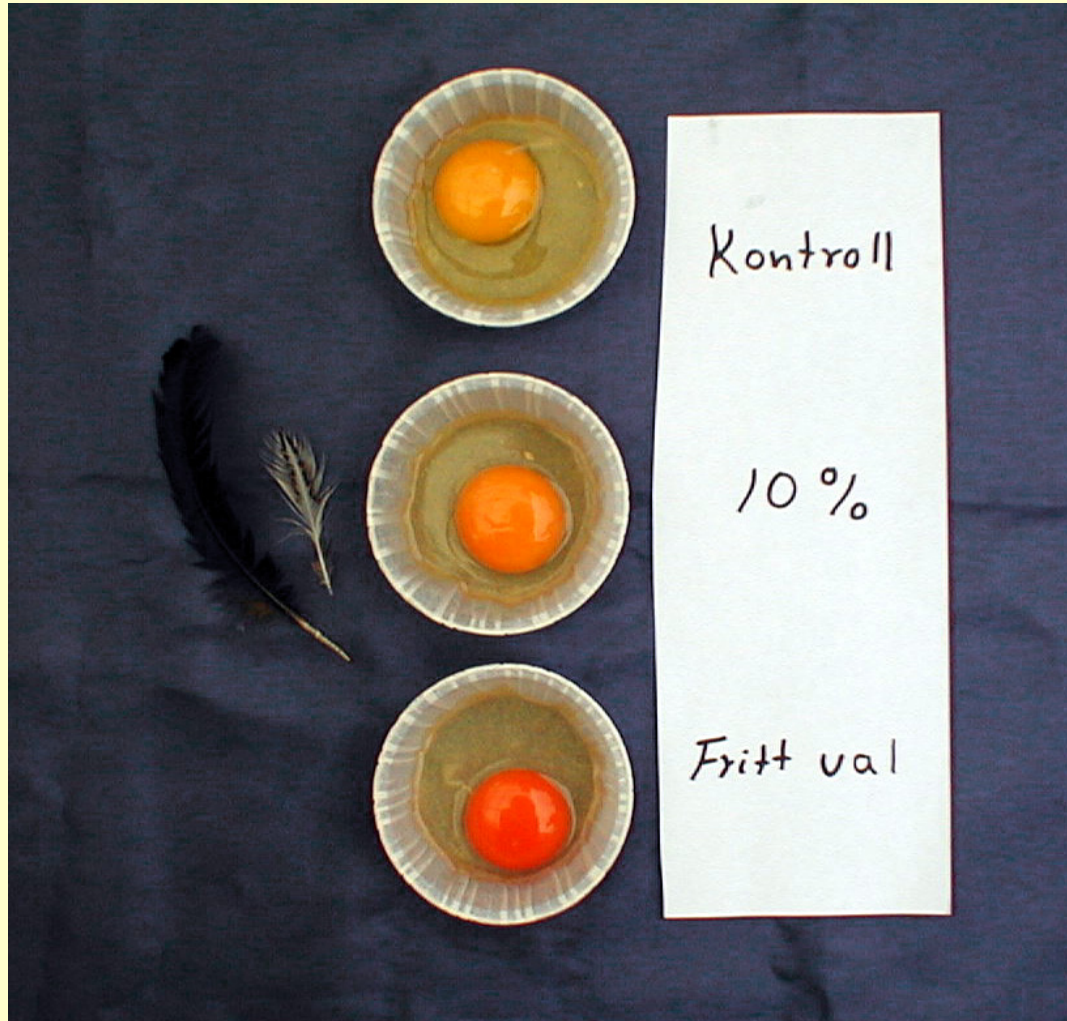


**Steamed mussel meat**

**Standard feed**



# Mussel feed gives a strong yolk colour



**Colour on  
LaRoche scale**

**6 - 9**

**12 - 14**

**15 -**



**Mussel meal is presently tested on  
artic char, trout, and atlantic salmon**





# Filets of Salmon trout, fed on mussel meal for 45 days



<b>Control</b>	<b>50 % mussel meal</b>	<b>100 % mussel meal</b>
<b>100 % fish meal</b>	<b>50 % fish meal</b>	<b>0 % fish meal</b>
<b>meal</b>		

**(From NICE-project: Local fish feed ingredients for competitive and sustainable production of high-quality aquaculture feed).**

# Some basic mussel feed economics

- Fish meal costs about 2 euro on the market.
- To be competitive, mussel meal can not cost more than 3 euro.
- 5 % (weight) of a fresh mussel becomes mussel meal, which means that the "mussel cost" increases 20 times going from fresh mussels to meal.
- Processing cost of making 1 kg of mussel meal is between 0.5 and 1 euro.
- The sum of above is that a mussel meal producer cannot pay more than about 10 cent per kg mussels.

# Production cost of feed mussels

- **Production cost of feed mussels along the Swedish Skagerak coast is roughly between 20 and 40 cents per kg.**
- **Production cost of feed mussels in the Baltic is presently not known.**

# **Feed and environmental mussels - a ruling condition:**

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

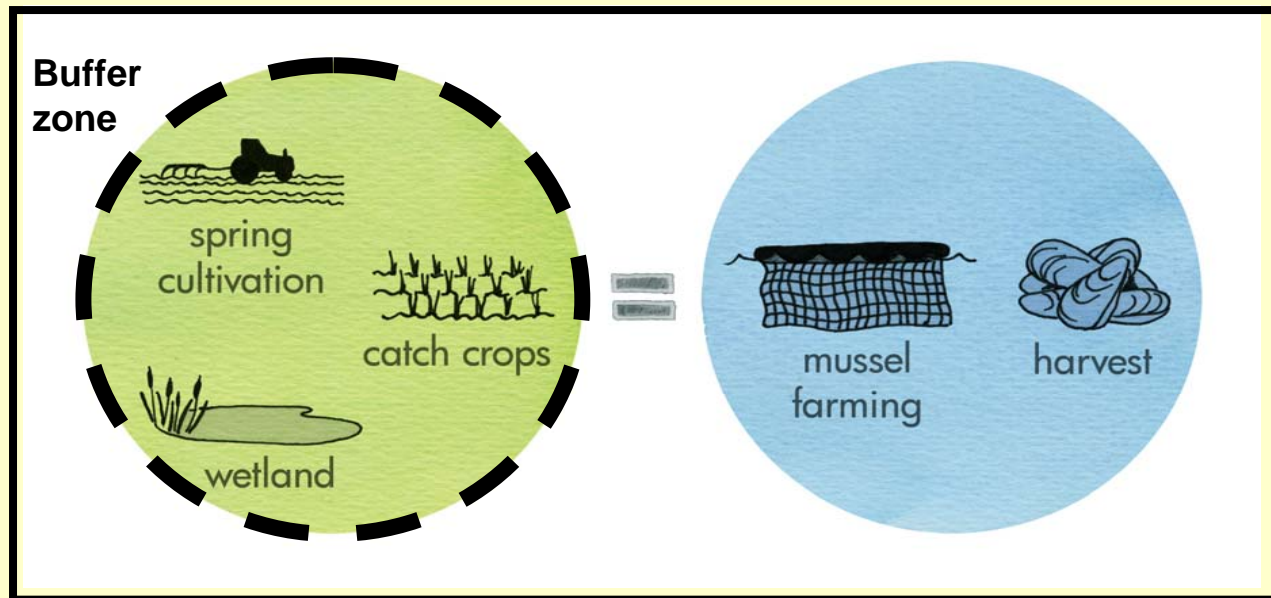
**A win-win situation can thereby be  
created between society, environment  
and aquaculture.**

***But how shall the mussel farmer get paid?***





# Mussel farming is comparable with environmental measures in agriculture



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



**Mussel farming –  
a win-win measure  
for environment,  
society and industry  
and hopefully also  
for the Baltic.**

***Thank you for attention!***

