

# Aquabest

## 5.1. Supply of regionally obtained feed ingredients

Presenter:

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Partner coordinator :

Swedish University of agricultural Sciences, SLU



WP5, Closing the nutrient loop of  
Baltic Sea aquaculture by  
innovative fish feeds

## 5.1. Supply of regionally obtained feed ingredients

- **5.1.1. Detoxified fish oil and fish meal from BSR**
  - Fish meal industry contacts and delivery promised.
  - At moment no production but promised delivery soon.
  - Test on cell lines is presently carried out.
- **5.1.2. Mussel meal from southern Baltic Sea as ingredient in fish feeds**
  - SLU is presently writing contract with the meal producers, represented by Odd Lindahl.
  - Production line ready and a technical report is presently being produced.
  - In addition is a state of the art of different sources in Southern (Germany), Western (Sweden) and Northern (Åland) production sites. This includes production, composition (nutrients) and contaminants (incl. algae toxins).
- **5.1.3. Microbial meal from organic waste as ingredient in fish feed**
  - Has access to whole yeast cells.
  - Presently testing possible improvement with open cells and cell extracts of yeast.
  - Chemical and biological quality tested of both yeast and mycell
  - Started work at pilot scale production using waste streams from food industry
- **Example additional protein concentrate from German Bio-diesel production**



## 5.2. Manufacturing of feed to pilot farming: FGFRI



## 5.3. Farming of fish using regionally obtained ingredients

### 5.3. Farming of fish using regionally obtained ingredients

- **5.3.1 Rainbow trout in net cages**
  - FGFRI In Progress to be carried out.
    - Will use cyprinid fish ensilage as alternative to present sources.
    - Will have one diet only local sources.
- **5.3.2 Arctic charr using regional ingredient-based diet**
  - SLU has a contract with Kälärne
  - Fish from 30 families are selected.
  - Diets are planned and sources presently tested in digestibility test at Ultuna
- **5.3.3. Turbot in marine recirculating systems with regionally obtained feed ingredients**
  - Experiment is under preparation.
  - Has conducted digestibility trials.



5.4. Decision tools and round-table discussions to facilitate nutrient loop closing

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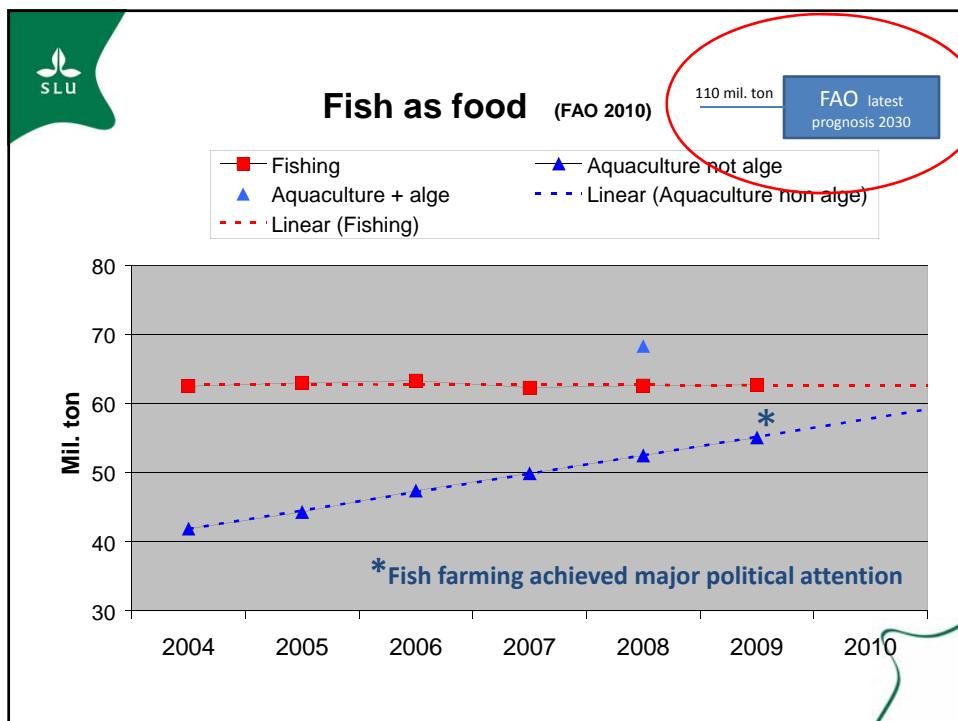
- **5.4.1. Economic, environmental and source availability scenarios**
  - FGFRI
- **5.4.2. Round table discussion with feed manufacturers and other stakeholders.**
  - Have initiated discussion with feed manufacturer.
  - Question of stakeholder selection.
  - Work together with WP3 closer
  - Suggest a special meeting Autumn 2013 at Åland together with, WP2, WP3 and WP4.

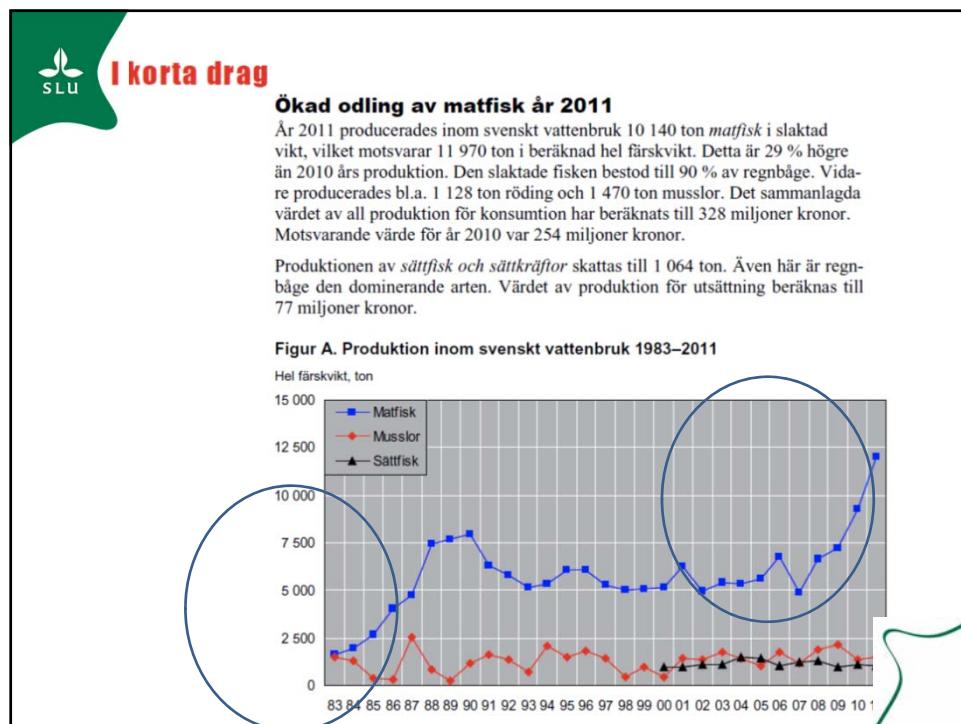
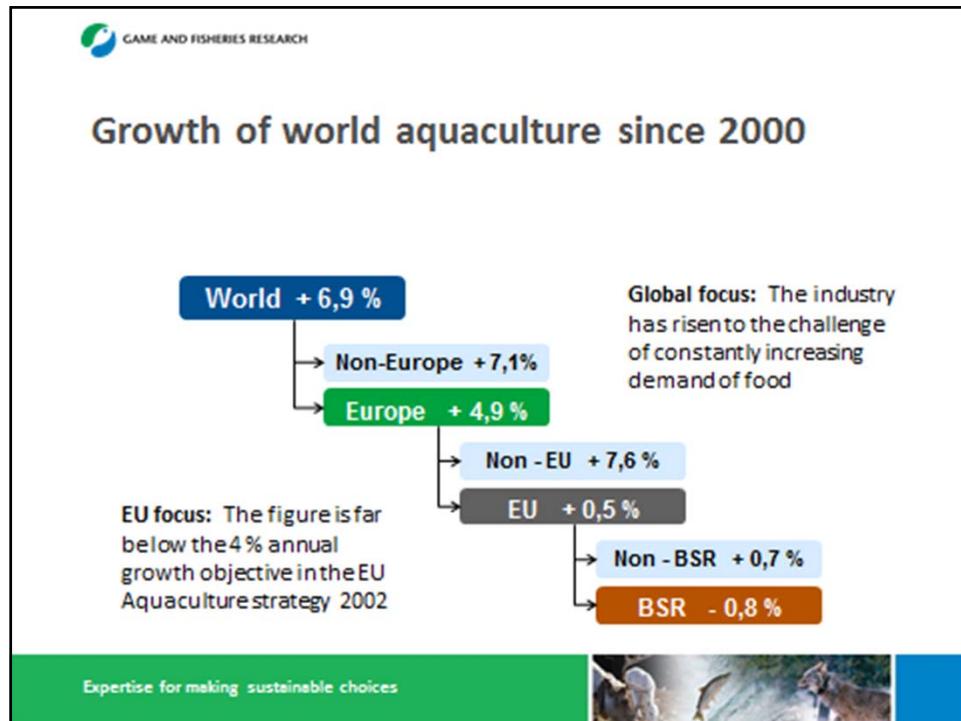
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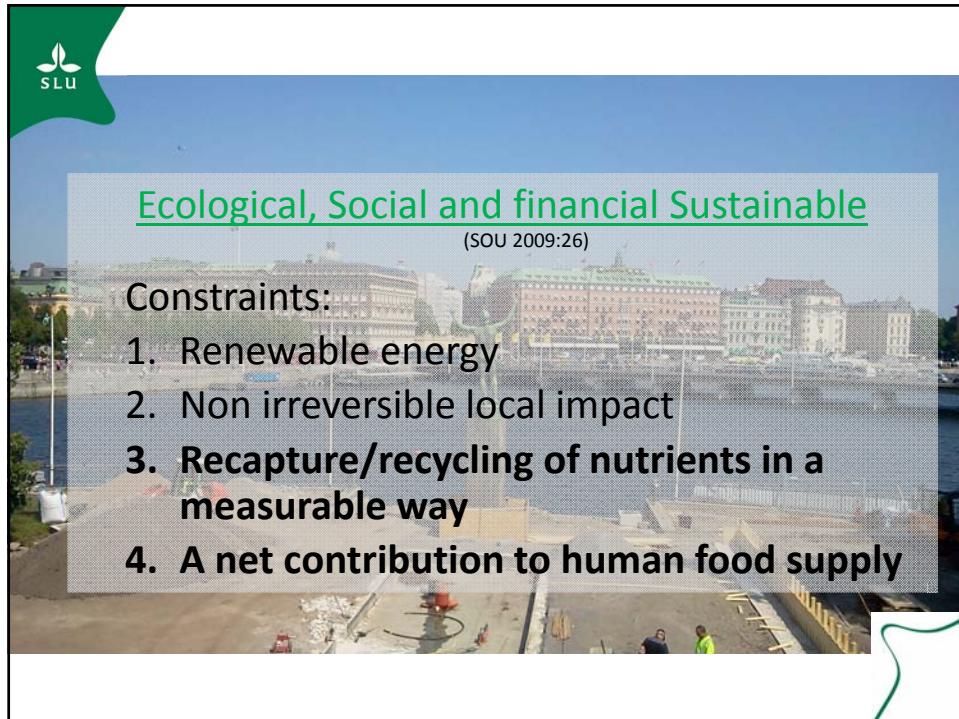
**Closing the nutrient loop:  
The Baltic case**

One key factor to achieve sustainable fish farming

- Anders.Kiessling@
- SLU.SE



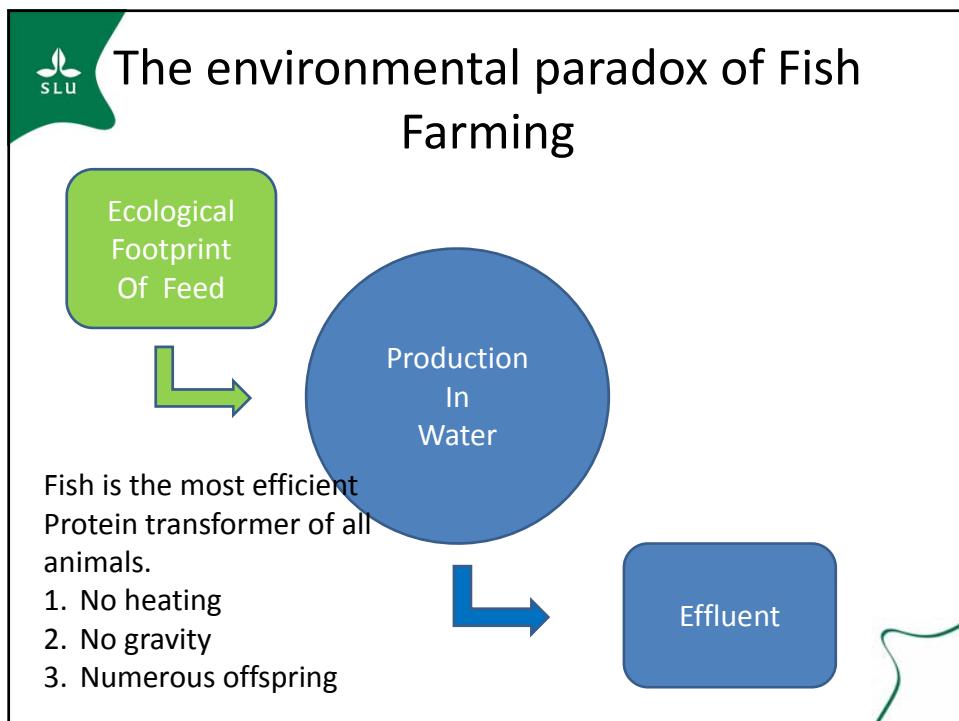




**Ecological, Social and financial Sustainable**  
(SOU 2009:26)

**Constraints:**

1. Renewable energy
2. Non irreversible local impact
- 3. Recapture/recycling of nutrients in a measurable way**
- 4. A net contribution to human food supply**



**The environmental paradox of Fish Farming**

**Ecological Footprint Of Feed**

**Production In Water**

Fish is the most efficient Protein transformer of all animals.

1. No heating
2. No gravity
3. Numerous offspring

**Effluent**

**Eutrophication  
Of  
Southern Baltic**

**Constraints**  
**Short term: Localisation**

**Baltic Sea Region: BSR**  
**Aquabest WP 4**  
[www.aquabestproject.eu](http://www.aquabestproject.eu)

**R&D FiV,  
Sweden**

**from Selective  
Fishing:**

- Reduce intermediate predators (zooplankton feeders),
- Reduce Xenobiotics
- Maintain natural food web.

**-Recapture Nutrients as  
Detoxified fish meal**

*Van Leeuwen et al. 2008 (J. Sea Res.)*



**Fish farming as an eco service**

1 kg farmed fish reduce nitrogen (N) in Southern Baltic with 77 g N=> 45 g fertilize the hydro power dam and 32 g N is turned in to food.

100.000 ton farmed fish reduce N in Southern Baltic with 7.700 ton =>

- 3.200 ton in to food
- 4.500 ton fertilize
- Total recapture of N by the Baltic fishing 1999 was 7.500 ton

Bild A.Kiessling

**Tidens gång i ett regleringsmagasin....**

FAS	FÖRE	INI-TIAL	ÖVER GÅNG	AV-KLING-NING	EFTER
År	4-5	5-8	8-15	15-	
Produk-tion (gCm <sup>2</sup> /år)	50-70	100-120	80-100	40-60	30-50
Total P	2-4	10-14	6-8	2-4	1-3
Trof-i-status	Oligo-trof	Meso-trof	Oligo-trof	Ultra-Oligo-trof	Ultra-Oligo-trof
Fisk-prod (kg/ha/år)	Låg (1-5)	Måttlig (10-15)	Låg (6-9)	Låg (1-3)	Mycket låg (0,2-2)

Effluent from 100.000 ton farm is estimated to result in a nutrient level (N and P) equal to pre historic ones.

(Estimate based on the five big rivers in Northern Sweden. By A.Alanärä, SLU)

Bild A.Kiessling

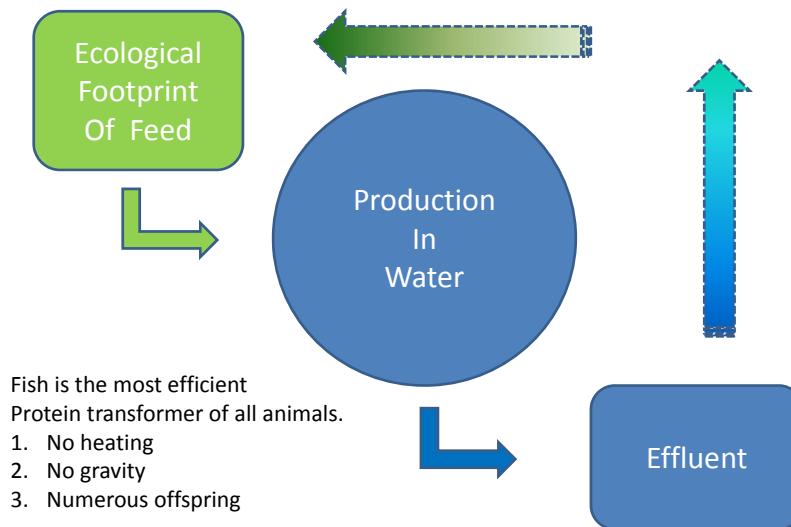


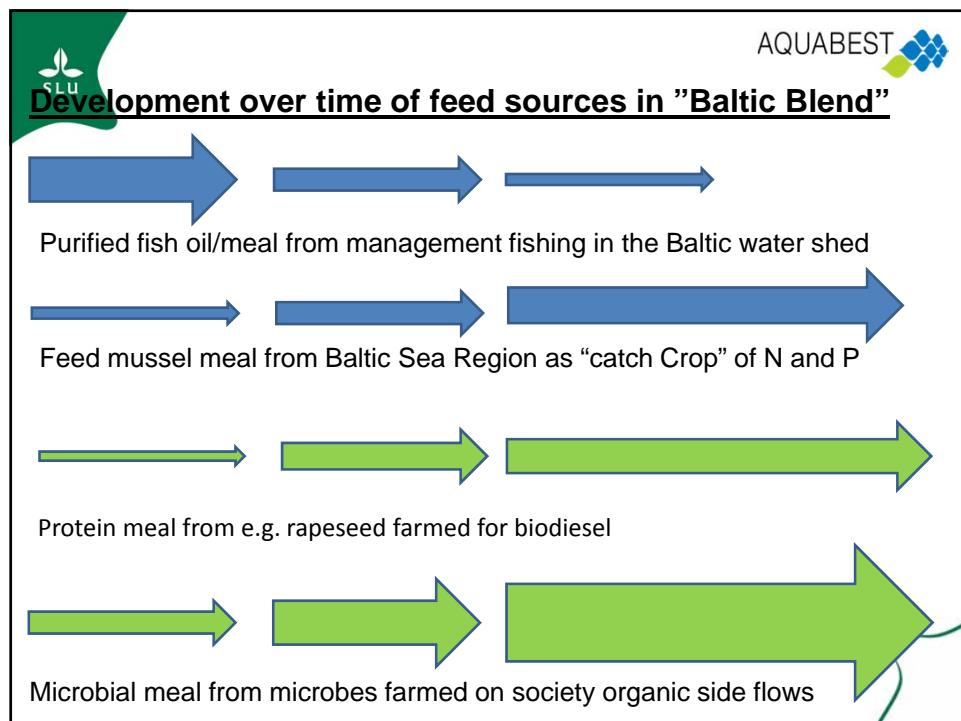
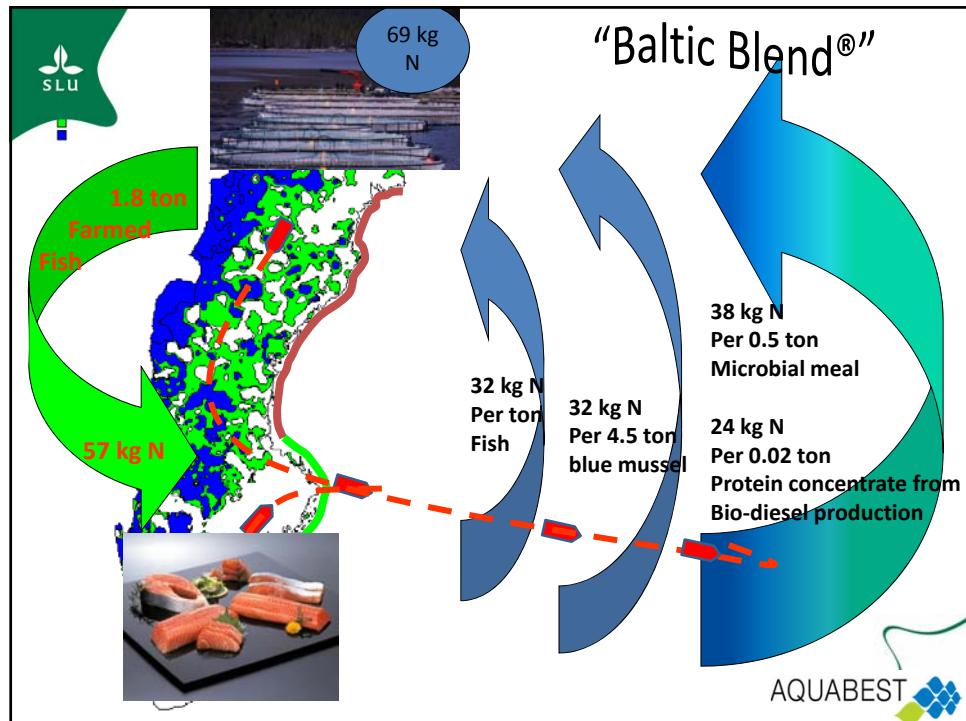
## Issues need dealing with

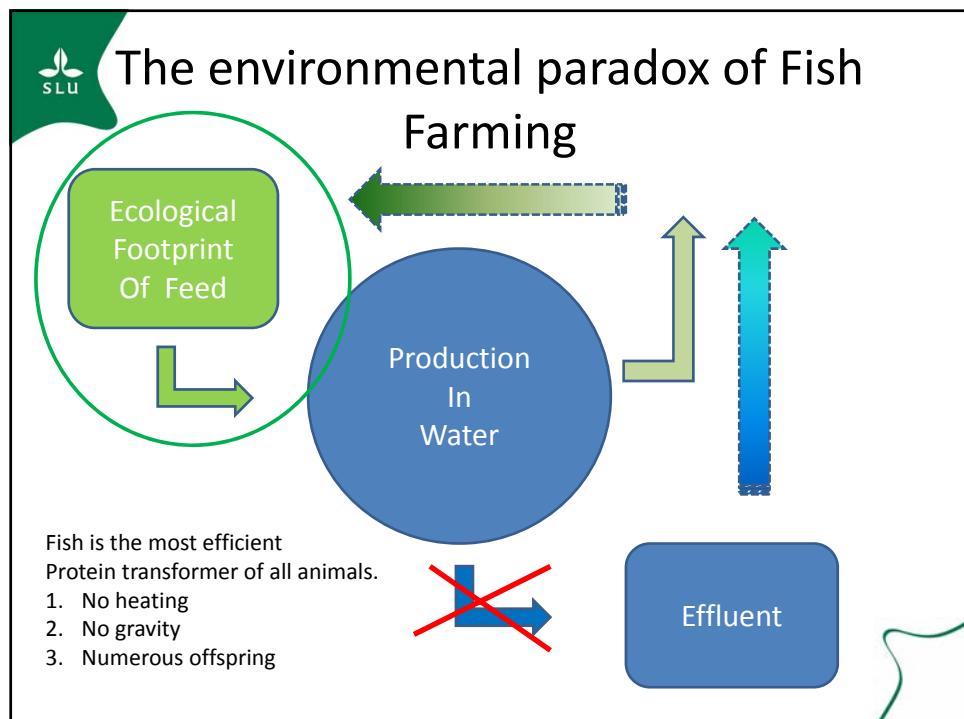
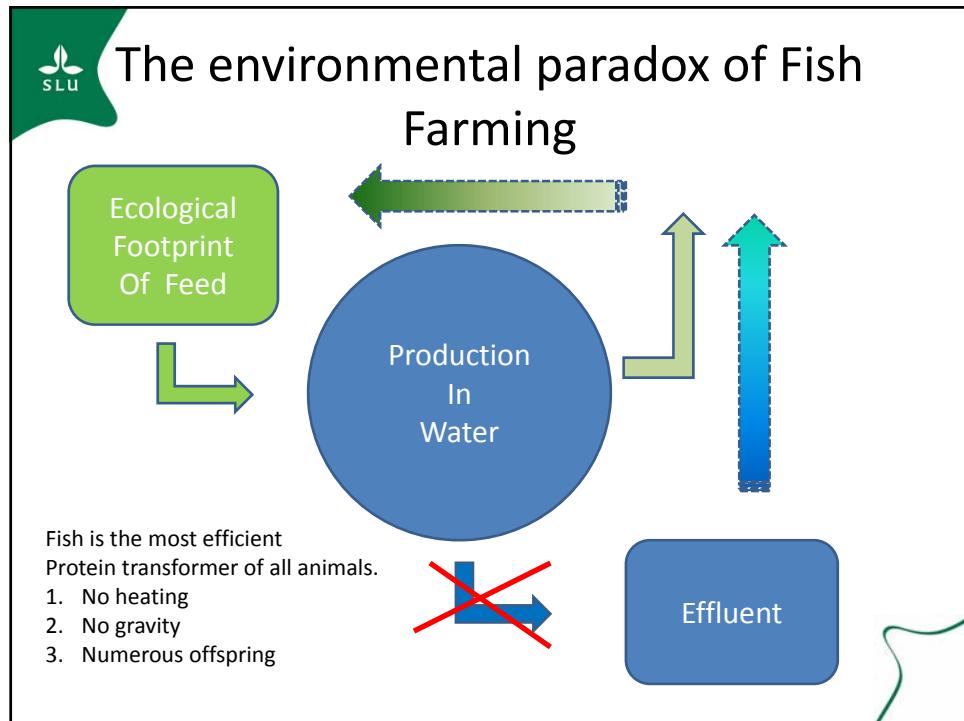
- Do the nutrients become incorporated in the food web?
- Is there a risk of genetic contamination if escapes?
- Diseases? At present one of the best health situation in the world, but what will happen if cage farming of hydro power dams in the inland increases by 10 fold?



## The environmental paradox of Fish Farming



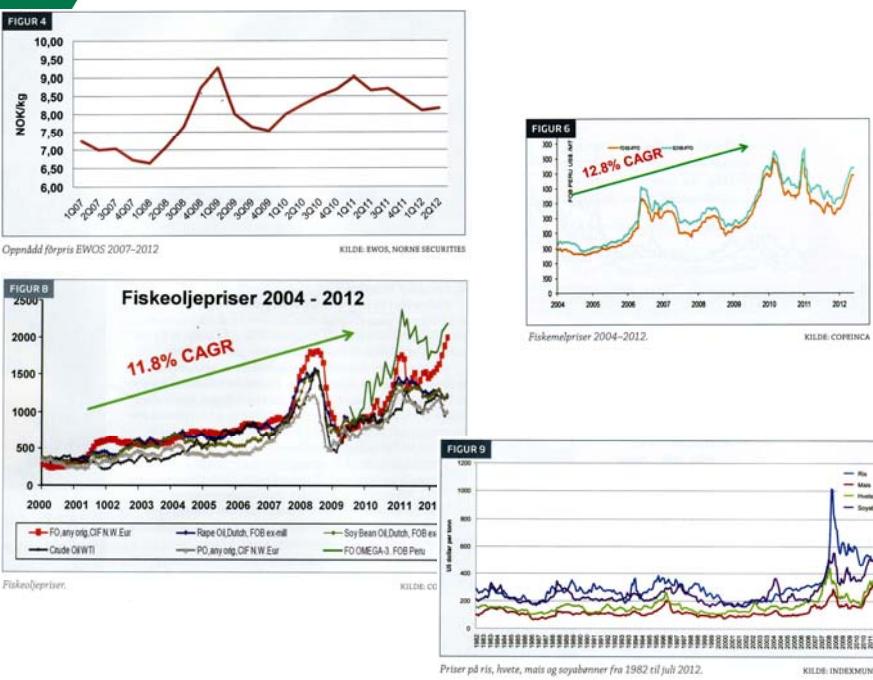


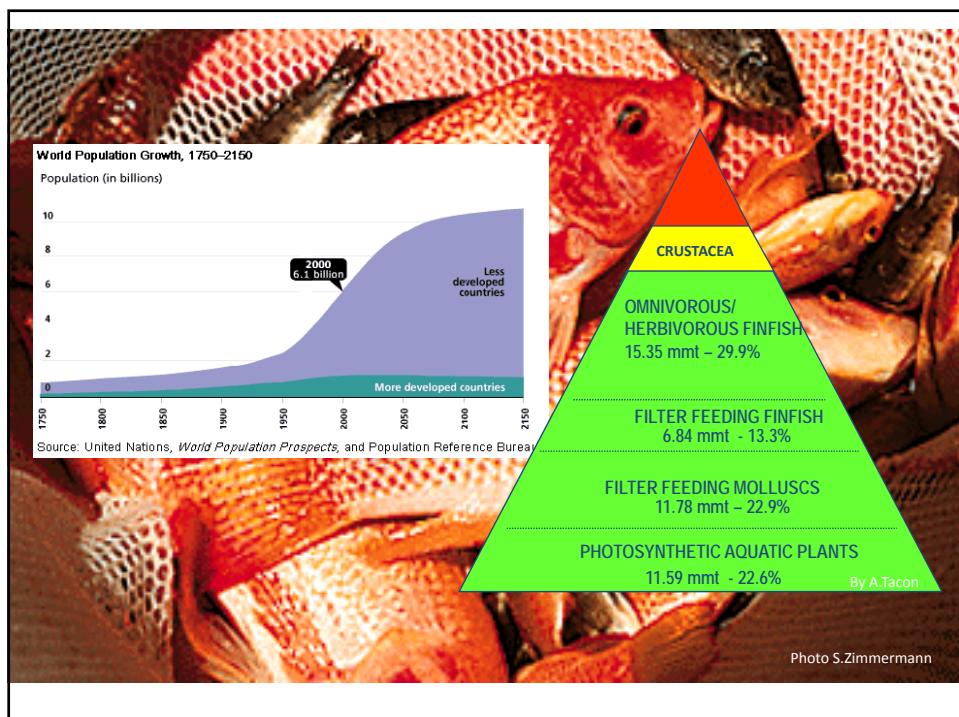
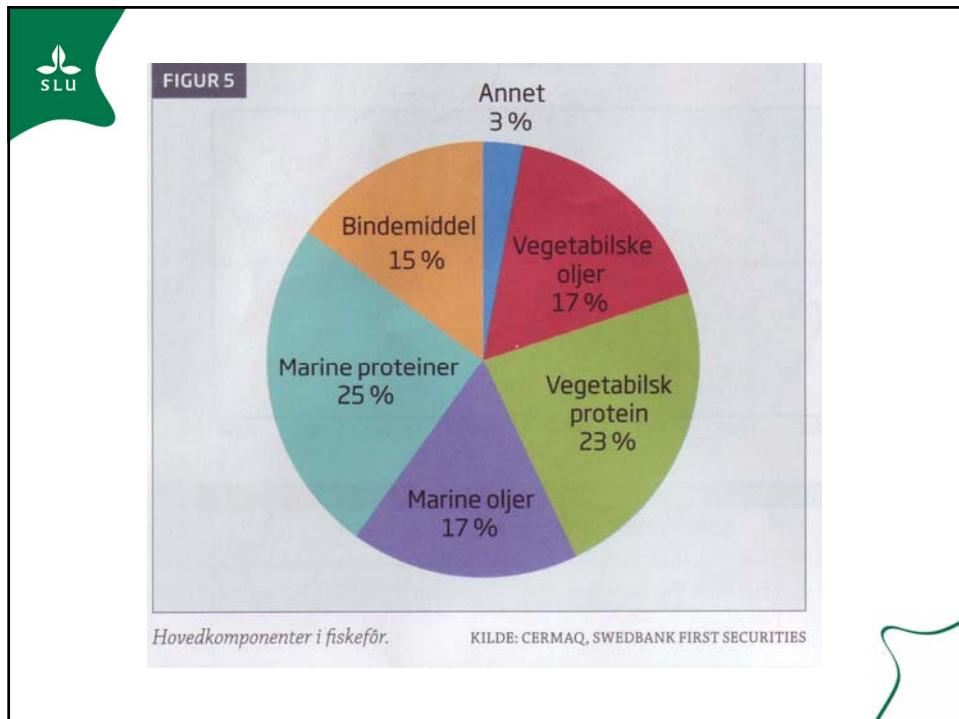


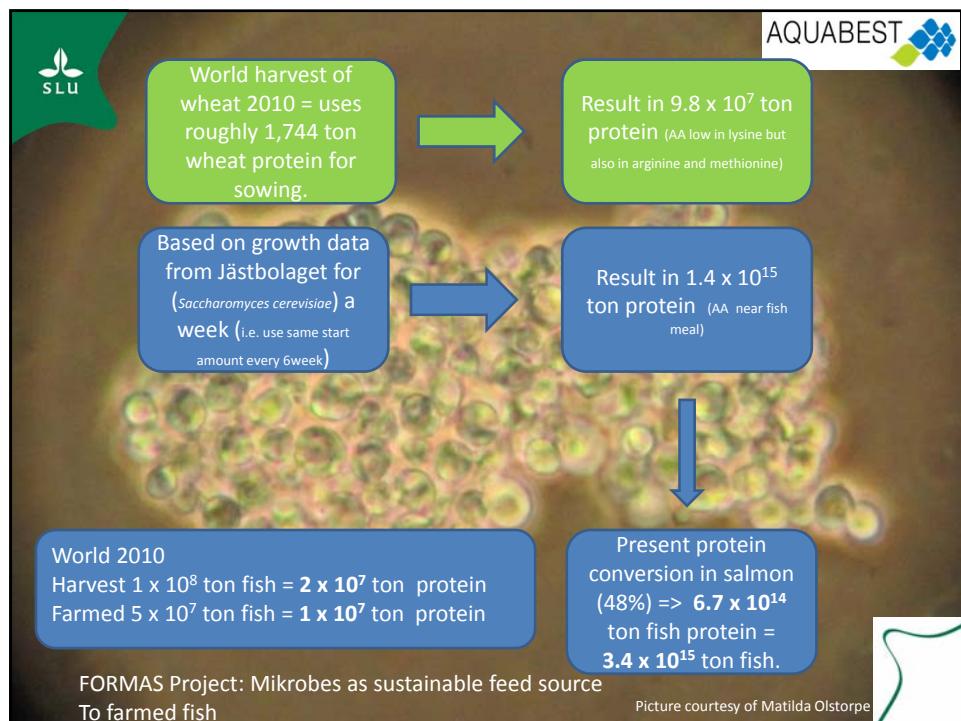
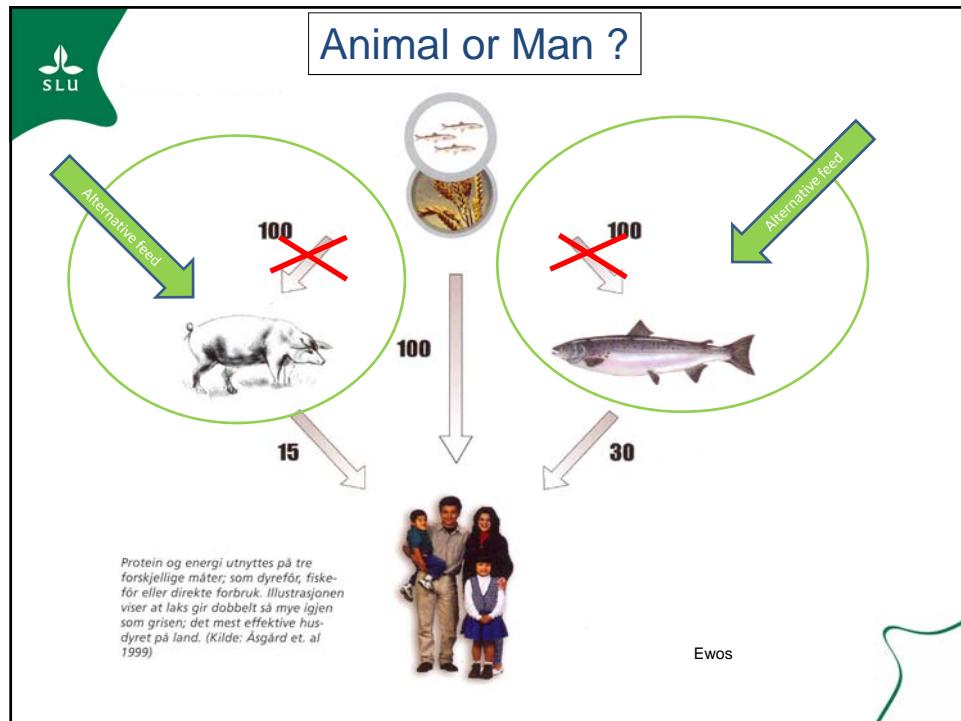


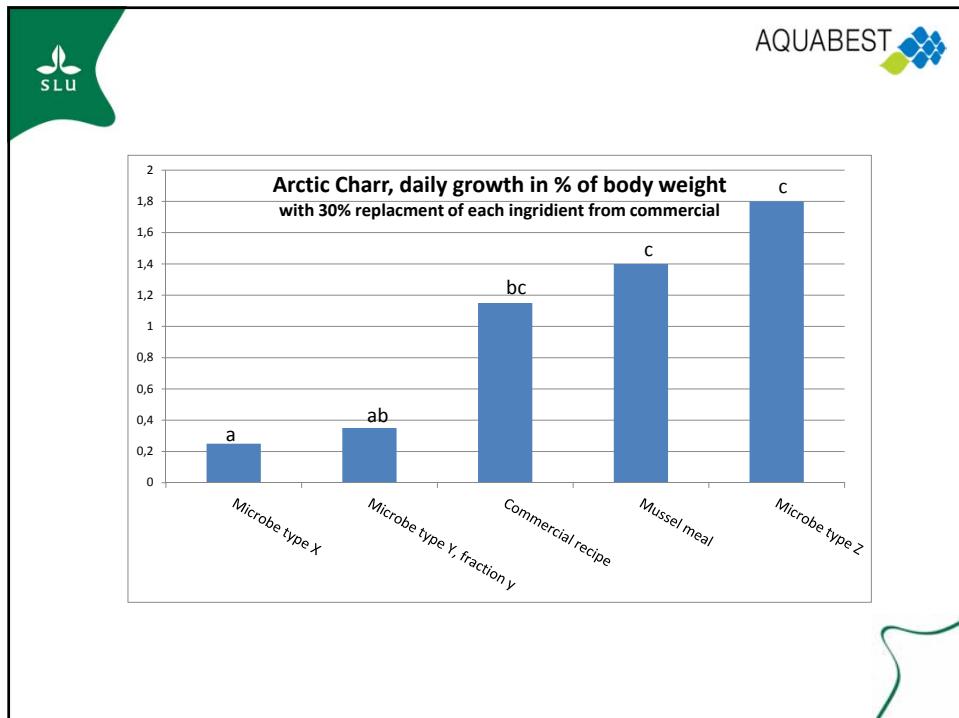
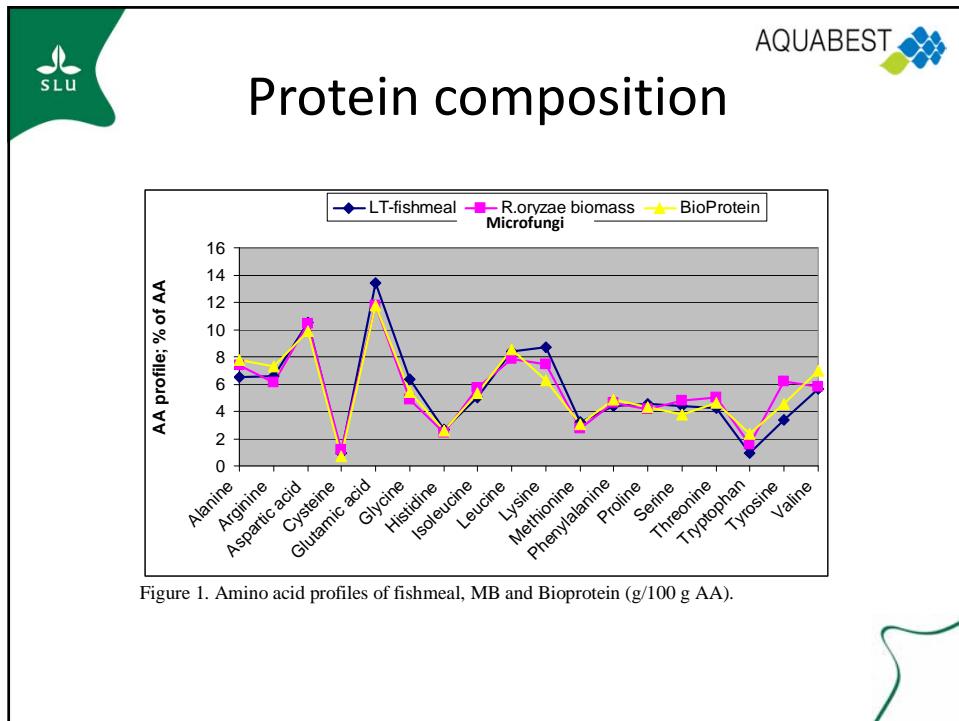
## Protein & Fat but not carbohydrate

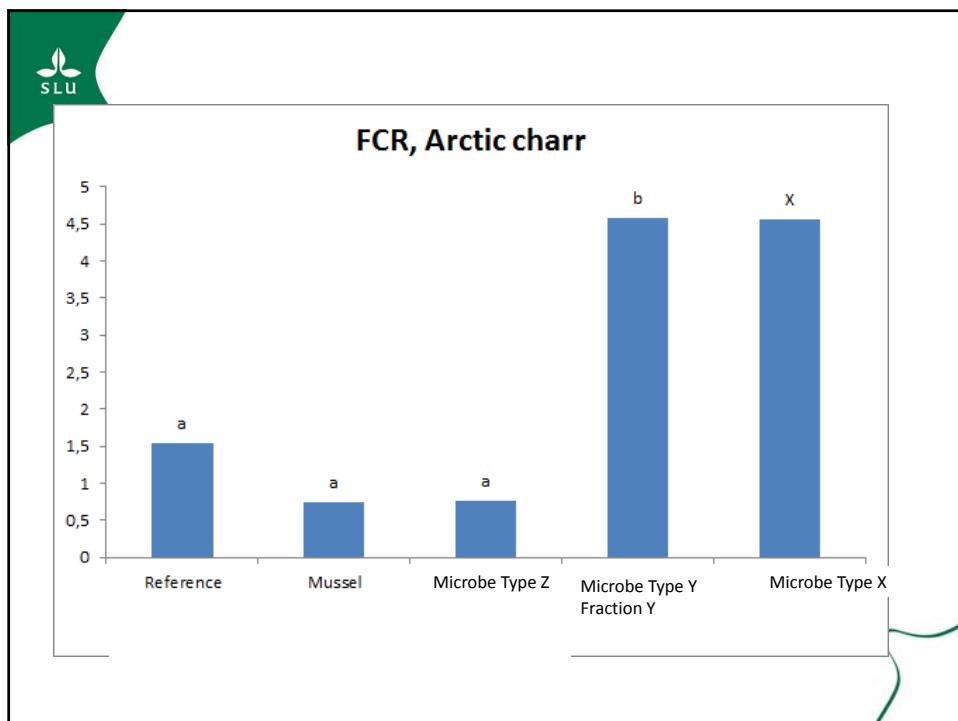
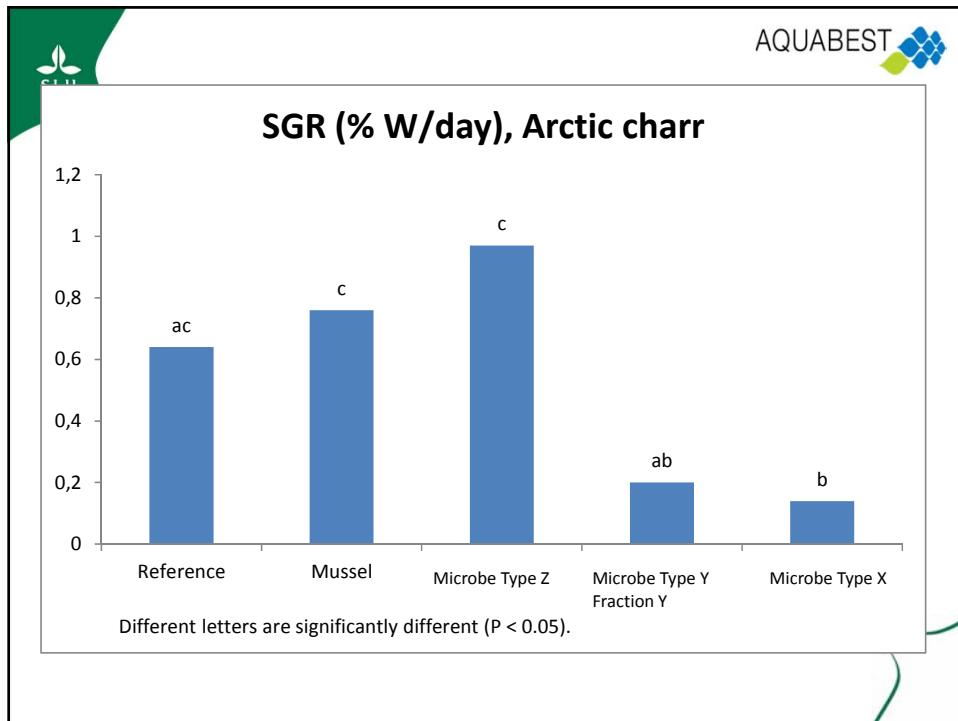
Species		Energy source [%]		
		Carbohydr.	Fat	Protein
Mammals		55-60	~30	10-15
Fishes	Carn.	5-10	45-65	30-50
	Omn.	30	40	30

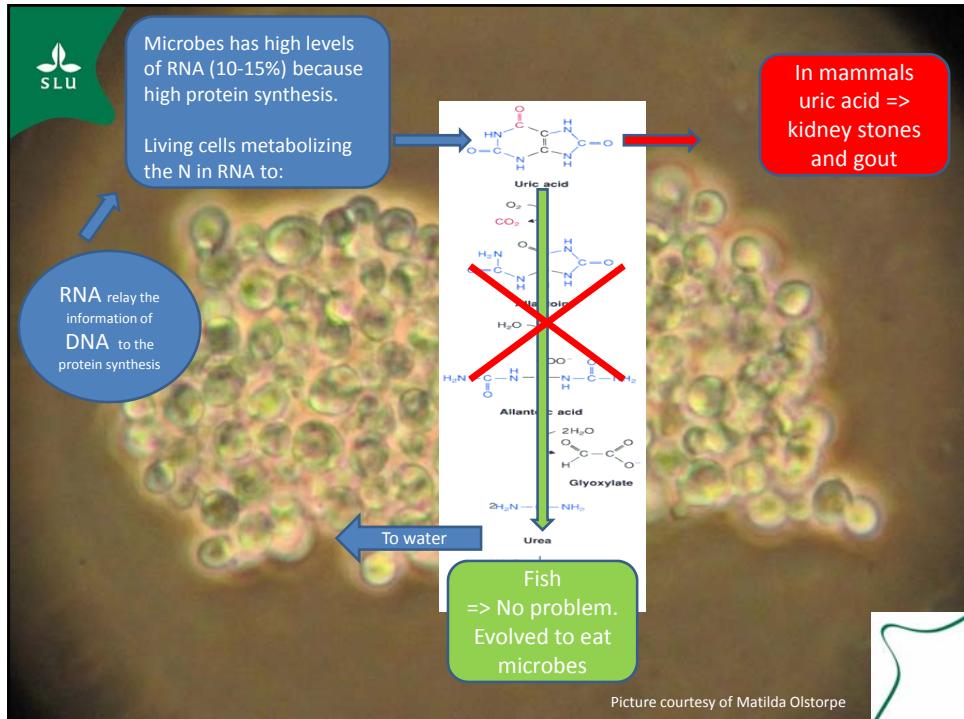












## Phytic acid – antinutritional substances in plants. A giant problem in all mono-gastric animals.

- A number of microbes has phytase !!

