GLOBAL AQUACULTURE - SECURING OUR FUTURE - AN INDUSTRY PERSPECTIVE

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Marine Harvest ASA
Marine Harvest in brief

- One of the world's leading seafood companies
- The world's largest producer of Atlantic salmon
- Fully integrated value chain from broodstock to ready-to-eat meals
- Pioneering the international development of our industry

- Volume produced 2011: 344,000 tonnes
- Salmon meals each day: 4.2 million
- Sales 2011: NOK 16 billion
- Employees: 6,200 in 22 countries
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- Salmon meals each day: 4.2 million
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- Employees: 6,200 in 22 countries
From smallholding to modern industry
# of sites to produce 100,000 tons:
1992: ~200
2012: ~30
2020: <10?
# Feed recipe development

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>2000</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish meal</td>
<td>63,8</td>
<td>37,5</td>
<td>25,6</td>
</tr>
<tr>
<td>Plant protein</td>
<td>0</td>
<td>15,4</td>
<td>36,9</td>
</tr>
<tr>
<td>(various sources)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Starch (mainly wheat)</td>
<td>10,3</td>
<td>10,9</td>
<td>9,4</td>
</tr>
<tr>
<td>Fish oil</td>
<td>23,4</td>
<td>30,7</td>
<td>17,0</td>
</tr>
<tr>
<td>Plant oil</td>
<td>0</td>
<td>0</td>
<td>12,0</td>
</tr>
</tbody>
</table>

Sørensen et.al 2011
Nofima report 52/2011
FHF Grant # 900568
«Fish in fish out ratio» (FIFO) (Norway)

Ytrestøyl et.al 2011
Nofima report 53/2011
FHF Grant # 900568
Wild fish in fish feed > we need to secure sustainable supply

Basis of main ecosystem goods & services

We needed to lower catches: How?

From Fishmeal to Fish meals!
Successful vaccine development

> Antibiotics – a closed chapter
Effective breeding programs

• Salmon of today use 25% less feed than offspring of wild salmon and growth rate has been more than doubled (time to harvest reduced from around 40 to 20 months) (Sonneson, Storset, Rye, 2007)

• The importance of selective breeding will increase as molecular genetics and genomics are further developed
Climate-friendly food production

Emissions of greenhouse gases
in kg of CO₂ equivalents per kg produced

Source: Eurostat Aquaculture and Wild Catch, Norwegian Seafood Export Council
Norway
- Salmon is the biggest meat producer

Where are we on the learning curve?

Knowledge

Time /Resource use
Knowledge based management requires strong RTD focus

- Fish health and welfare
- Biological lifecycle
- Breeding & Genetics
- Environmental integration
- Climate change
- Sustainable feeds
- Technology and logistics
- Quality and consumers
Aquaculture is a fantastic story  >  we need to tell it!

- Makes up approx. 40% of global seafood production (60 million t vs. 89 mill t capture fisheries (FAO 2011)
- Healthy, nutritious food
- Big growth potential all over the world
- Employs 16.5 million people (FAO 2011)
Industry growth must be sustainable!
It seems so simple!

But......bridging the perception gap requires **Action** and **Communication**

Actual perception  -  Reality

Perception gap

Actual perception  -  Reality
Proactivity, dialogue and transparency

For more information on sustainable salmon farming:
www.marineharvest.com
The role of aquaculture in food security is recognised

“If Aquaculture did not exist we would have to invent it. … the declining European fisheries stocks complicate the supply of fish. Aquaculture plays a significant role in offsetting this ever-increasing gap …”

European Commissioner for Maritime Affairs and Fisheries Maria Damanaki

“Farmed fish is an excellent source of protein and, when produced well, helps protect the environment. I am totally convinced that aquaculture is the most sustainable way to feed the world.”

Director WWF Aquaculture Program Jose Viallon

“The strongest growth (in animal production) is expected in the consumption of farmed fish and chicken. By convenient coincidence, these also seem to be the animal protein sources with the smallest carbon footprint.”

Former Director-General of the FAO Dr. Jacques Diouf

… the fish farming industry must be able to document that the production is truly sustainable. Both the fishery and the fish farming industry must have the perspective of eternity. Industry and nature must go hand in hand”

Norway’s Minister of Fisheries and Coastal Affairs Lisbeth Berg-Hansen
## Aquaculture production per continent

<table>
<thead>
<tr>
<th></th>
<th>Fish and shellfish (million tons)</th>
<th>% of production</th>
<th># employed (thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia</td>
<td>53.3</td>
<td>89.0</td>
<td>16078</td>
</tr>
<tr>
<td>Americas</td>
<td>2.6</td>
<td>4.3</td>
<td>252 (248 in Latin Am/4 N. Am)</td>
</tr>
<tr>
<td>Europe</td>
<td>2.5</td>
<td>4.2</td>
<td>85</td>
</tr>
<tr>
<td>Africa</td>
<td>1.3</td>
<td>2.2</td>
<td>150</td>
</tr>
<tr>
<td>Oceania</td>
<td>0.2</td>
<td>0.3</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>59.9</strong></td>
<td><strong>16571</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: World review of Fisheries and Aquaculture 2011 (2010 data)
Europe needs more seafood

Seafood production in million tonnes

EU 27 imports 60 percent of consumption

Norway exports 97.5 percent of production

Source: Eurostat aquaculture and Wild catch, Norwegian Seafood Export Council
Increasing aquaculture production is essential for meeting seafood demand

Seafood is 1.8% of global food production (FAO, 2008)

Source: FAO
"Given the projected population growth, it is estimated that at least an additional 40 million tonnes of aquatic food will be required by 2030."

- Rohana Subasinghe, FAO
More aquaculture research needed!

- The European Aquaculture Technology and Innovation Platform (EATIP) has recently released their strategic research agenda

**EATIP Thematic areas**

1. Product Quality, Consumer Safety & Health
2. Technology & Systems
3. Managing the Biological Lifecycle
4. Sustainable Feed Production
5. Integration with the Environment
6. Knowledge Management
7. Aquatic Animal Health & Welfare
8. Socio-Economics & Management
Genetic research has contributed to remarkable development in productivity.

Estimates suggest that at least 40% of the overall production increase can be attributed to genetic improvement.

(Modified from Eknath et al., 1991 by A. Storseth, Aqua Gen)
“Importantly, animals selected for faster growth have also been shown to have improved feed conversion and higher survival, implying that increased use of selectively bred stocks leads to better utilization of limited resources such as feed, labour, water, and available land and sea areas”

“It is estimated that at present less than 10% of aquaculture production is based on genetically improved stocks”
Potential of breeding programs

Fig. 2. Aquaculture production (fish and shellfish) based on varying frequencies of genetically improved stocks with a genetic gain of 5.4% per year (12.5% genetic gain per generation / 2.3 years generation interval).
**Summing up**

- Aquaculture plays an important role in food security.
- Knowledge-based management is required for ecological and economical sustainability of the industry.
- Continuous strong R&D effort is needed to overcome challenges and maintain cost-effective production (feed, fish health, selective breeding, product quality, ++).
- Openness and transparency are a must.
- Communication skills of the industry must be improved.
- Consumer trust in production practices and product quality is essential for the standing of the industry.
- More production sites are required.
Thank you!