Factors of Change in the Global Aquaculture Industry

Gorjan Nikolik | Rabobank
Since joining Rabobank in 2005, Gorjan Nikolik has focused on the global seafood sector, including aquaculture, wild-catch fisheries, seafood trade and processing.

Nikolik is a regular speaker at global seafood and aquaculture conferences and has published numerous research reports on the industry.

Holds a masters degree in finance and business administration from the University of Maastricht and an MBA from Maastricht School of Management.
Supply side factors of change in the aquaculture industry

• Rabobank Group Food & Agribusiness Research

• Gorjan Nikolik,
• Dublin, Ireland 2017
Rabobank: Globally leading food and agribusiness lender and financial services provider

46 Countries
Over 600 Offices
Over 55,000 Employees
If farmed fish have a much better FCR then terrestrial animals, why are animal proteins cheaper per kilogram of meat?

<table>
<thead>
<tr>
<th>FCR</th>
<th>1/8</th>
<th>1/5</th>
<th>1/4</th>
<th>1/1.8</th>
<th>1/1.4</th>
<th>1/1.3</th>
<th>1/1.2</th>
</tr>
</thead>
</table>

A number of reasons account for the price difference

1. Scale
2. Maturity
3. Logistics / distance to market
4. S/D balance
5. Feed price is high
6. High mortality / biological cost
I

Novel feed ingredients
After a two decades of decline Fishmeal supply bottomed out in 2016 due to El Niño

Long-term decline in FM production halts in 2017 but still far below historical levels

- 2m tonnes, about 1/3 of production

Source: Kennet Analysis, Oil World, Rabobank 2017
Due to the scarcity of fishmeal and fish oil, alternatives have attracted attention and investors.

- Key alternative source so far
- Logistics issues
- No growth in supply long term?

- Lower protein content
- Anti-nutritional factors
- Will not work for all species

- Lack minerals, amino acid profile
- Also limited in supply

- Expensive?
- Lack minerals, amino acid profile

Source: Rabobank 2017
Major aquaculture industry participants focus on algae, primarily for the algae oil

Companies investing in micro algae based ingredients

- DSM
- Evonik
- Cargill
- ADM
- Cellana
- Omegaix
- Synergy
- EWOS
- Teraview
- BioMar
- Bioprospecta
- Altech
- Syndel
- Heliae
- Phycome
- Neo Algae
- Corbion
- TomAlgae
- BlueBioTech
- Subitec

Sustainability
- Bottom of the food chain organism
- Algae production uses only 3% of the land and 2% of the water that other land crops use

Cost efficiency
- The current price of algae oil is considerably higher than that of FO
- But due to a very scalable production process, algae oil costs can decline once scale is reached

Reliability
- Due to a highly controlled, closed system—such as a heterotrophic production system—supply should be reliable and have a stable cost
- Prices and supply are likely to remain stable in the future

Taste
- The flesh will have a more ‘natural, fish-like’ taste, equal to fish/shrimp caught in the wild
- Fish fed with corn/soy meal has a milder, less natural taste

Consumer health
- Algae-based food would present a better ratio of omega-3/omega-6 oils in fish flesh vs. vegetable sources
- More health benefits than in fish fed with soy and corn-based foods

Animal health
- Although there are variations across different algal species, all generally contain all essential amino acids and high levels of protein
- Better digestibility and better growth rates

Source: Rabobank Food & Agri Research, DSM (2017)
Bacterial proteins are one of the other novel alternatives which are expected to grow.

Companies investing in microbial based ingredients:

- Cargill
- CALYSTA
- CONAGEN
- MANGOMATERIALS
- bluepha
- IMENON
- unibio
- KnipBio
- OAKBIO

Source: Barrows, Calysta, Rabobank Food & Agri Research (2017)
Image courtesy of Calysta 2017
Insects look promising, and can be a source of meals and oils but lack large investors.

Companies investing in insect based ingredients:

- PROTIX
- BÜHLER
- AgriProtein
- Prot-Farm
- krea
- bioflittech
- HEXAFLY
- NextProtein
- Enviroflight
- Enterra
- HiPromine
- NextAlim
- HERMENNA
- Entomo Farms
- MealFood Europe
- entofood

- Black soldier fly
- Larvae
- Protein-rich meal, potentially used in aquaculture feeds

Sustainable features:

- Can use food waste as a feed stock
- Requires limited land
- Lower environmental impact
- Very quick lifecycle
- Has high protein content
- Hypoallergenic

Already in the natural diet of fish

Source: Barrows, NIPES, WUR, Rabobank Food & Agri Research (2017)
Outlook: good fishmeal / alternative protein supply in near and mid term

Rough estimate of total FM supply and alternative proteins

<table>
<thead>
<tr>
<th>Year</th>
<th>Recovery from El Niño</th>
<th>Alternative proteins</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014-2016</td>
<td>4,400 thousand tonnes</td>
<td></td>
</tr>
<tr>
<td>2017-2019</td>
<td>500 thousand tonnes</td>
<td>4,900 thousand tonnes</td>
</tr>
<tr>
<td>2022F</td>
<td>5,400 thousand tonnes</td>
<td>Supply depends on FM price development</td>
</tr>
</tbody>
</table>

Source: Kontai, Rabobank 2017
Consequently we expect a price range to be formed for the near and medium term.

After the correction in 2016 FM prices likely to move sideways as long as no new El Nino arrives.

Source: Bloomberg, Oil World, Rabobank Food & Agri Research (2017)
Huge possible impact on the aquaculture sector, but how to get to scale in the current low price environment?

**Winning strategies for alternative protein producers**

**Be ahead of the rest**
Those who will reach scale, lower costs, and achieve commercial acceptance will have a strong advantage.

**Follow a niche strategy**
Do not compete with FM or SMB on price, but have additional functionality. Sustainable, organic, natural, hypoallergenic, marine ingredients free.... etc.

**Have a long-term view**
Ensure good capital availability, and have investors with a long-term view.
II

Technology and new business models tackling biosecurity
Aquaculture is open to the aquatic environment......
and most aquaculture is performed by smallholders

**Typical Shrimp farming business model in Asia**

- Vertical integrators: Capital-efficient model, suited to Asia and good for rapid growth
- But farming remains out of the vertical integration, very fragmented and difficult to control
These and other features means biosecurity is an acute issue in aquaculture

- Farming in open environment
- Small holders
- Volumes growing rapidly mostly combined with increasing farming density
- Over 90% is in a tropical (high biodiversity) climate
- Mostly a developing country industry (grey sector / lack of legislation)
- Aquatic animals are recently domesticated—we do yet know what we lost while breeding for growth

High likelihood of disease / biosecurity issues
**Farm Design:** Evolving to deal with the rising biological challenges, but this requires considerable capital

1. *Shrimp farm design evolution: an example of an industry switching to a higher level of farming intensity and biosecurity*

![Diagram of shrimp farming evolution](source: Rabobank 2015)

2. *Introduction of new technology in farming to isolate the farm from the environment in salmon aquaculture*

![Diagram of new farming technologies](source: Company website, Rabobank F&I)
Cooperation through the value chain, across regions and across species to combat diseases and pathogens
New business models emerging to tackle the biosecurity challenges of the sector

Multi-disciplinary approach not just for cross-sell but also aiming to do multi disciplinary research

Life cycle / disciplines
- Genetics
- Hatchery
- Early stage grow out
- Grow-out 114-125 days

Health
- Veterinary health services; diagnostics

Biocides
- Biocides

Genetics
- Genetics programme

Hatchery diets & novel additives
- Micro diets feeds
- Meditative feeds

Vaccines
- Vaccines

Complete solution to tackle aquaculture diseases (shrimp example)

Sources: Benchmark Holdings PLC.
III Growth and technological innovation attracts investors
Due to technology and growth investor interest towards aquaculture is improving

**Venture capital** – attracted by new technology solutions in aquaculture. Some driven by the CSR qualities of aquaculture

**Private equity** moving from a focus on seafood processing to a focus on aquaculture value chain technology. Increasingly understand disease risk and cyclicality of aquaculture better

**Family & sovereign wealth funds:** attracted by long term growth drivers of aquaculture, modernisation and technological changes

**Listed equity investors:** primarily attracted by stellar share performance of listed salmon companies but increasingly interested in the rest of the industry

(Source: Rabobank, 2017)
But most importantly the leading global agro industry players are increasingly more active in the aquaculture value chain.
Contact details

Rabobank
Food & Agribusiness Research

Office address
Croeselaan 18
3500 HG Utrecht
Tel.: +31 71 23 807

Rabobank International
Gorjan Nikolik
Senior Analyst Seafood

Telephone: +31 30 7123825
Mobile: +31 (0) 612432463
Email: Gorjan.Nikolik@rabobank.com