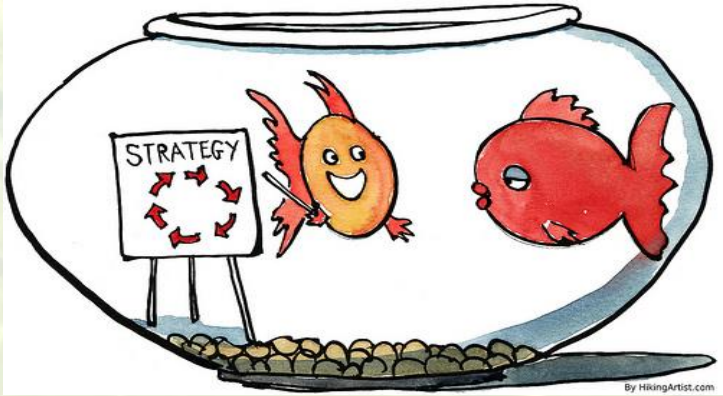
# The business proposition for land-based production of post-smolt at Grieg Seafood

*"How can RAS on land can make traditional seawater operations more sustainable?"*

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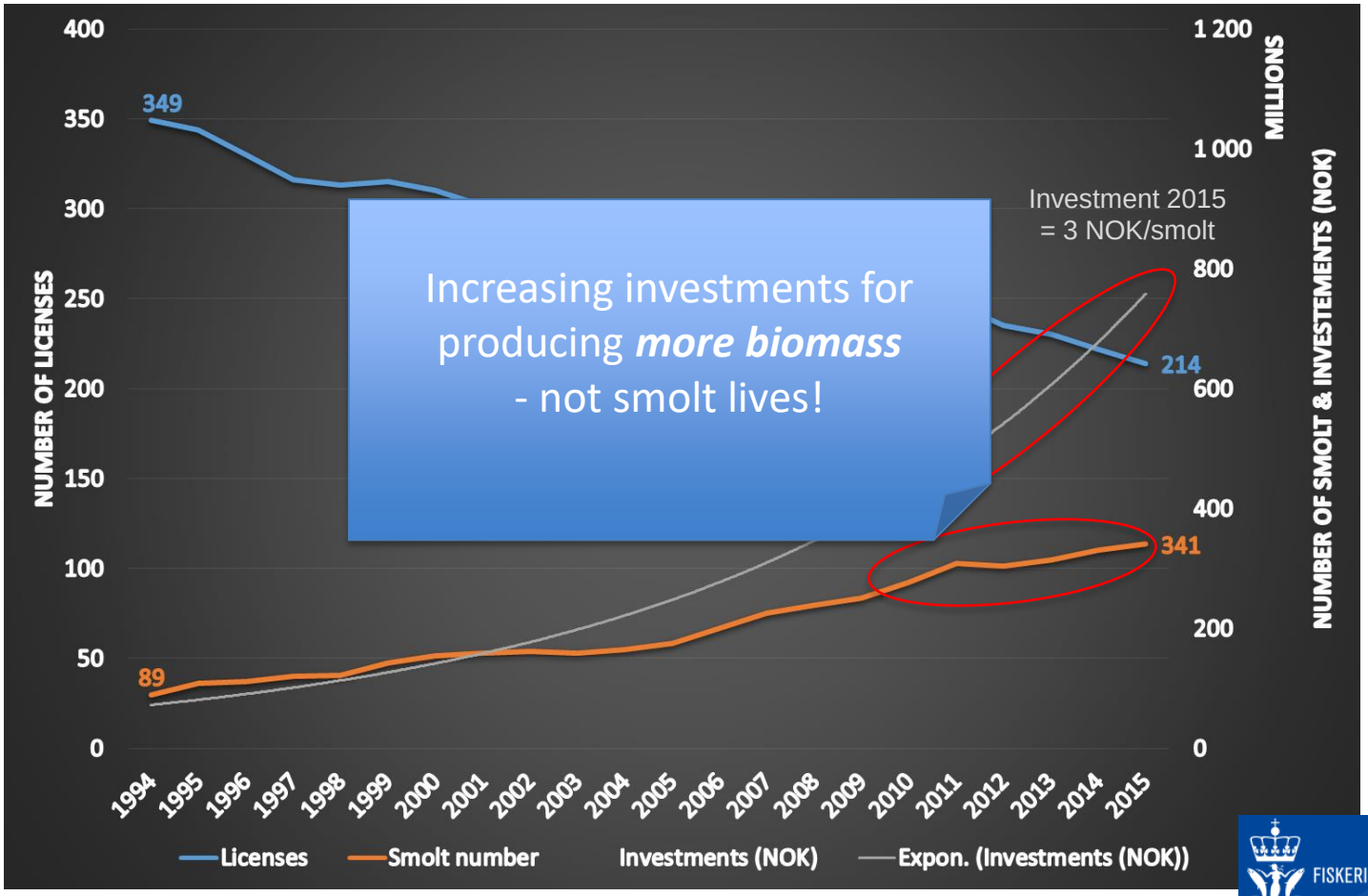
# Overall trend in the industry…

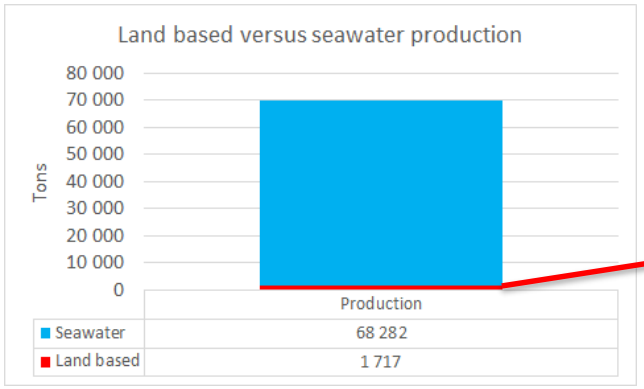


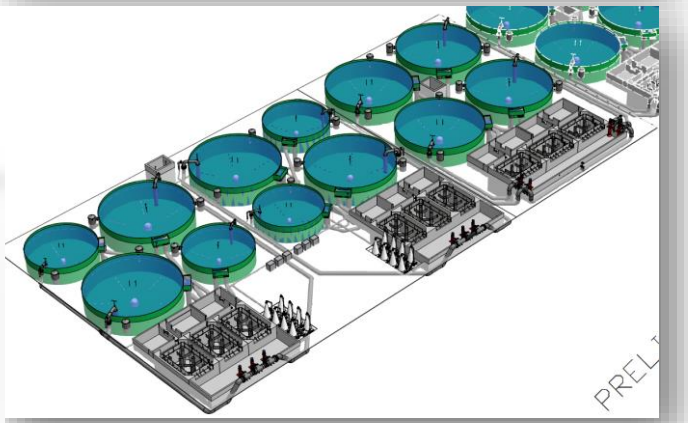

- *Trout ±20 mill smolt last years, i.e. 5 % of total in 2015*
- *15 % of licenses inactive*


99 %

# Grieg Seafood ASA


| | 2016 |
|---|---|
| **Operating income (TNOK)** | 6 603 591 |
| **EBIT (TNOK)** | 1 167 745 |
| **Harvest (kg)** | 64 726 |



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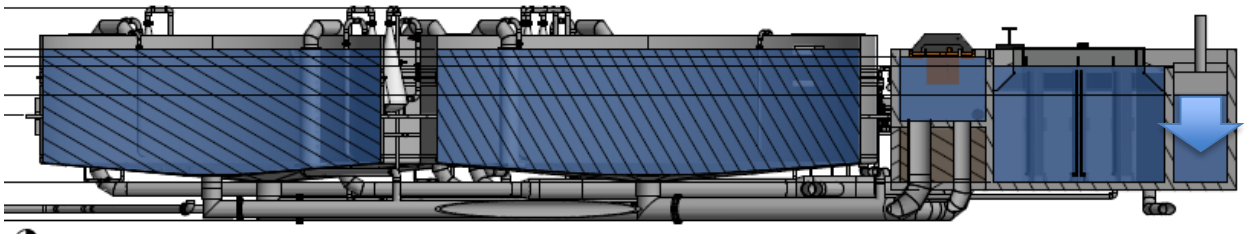
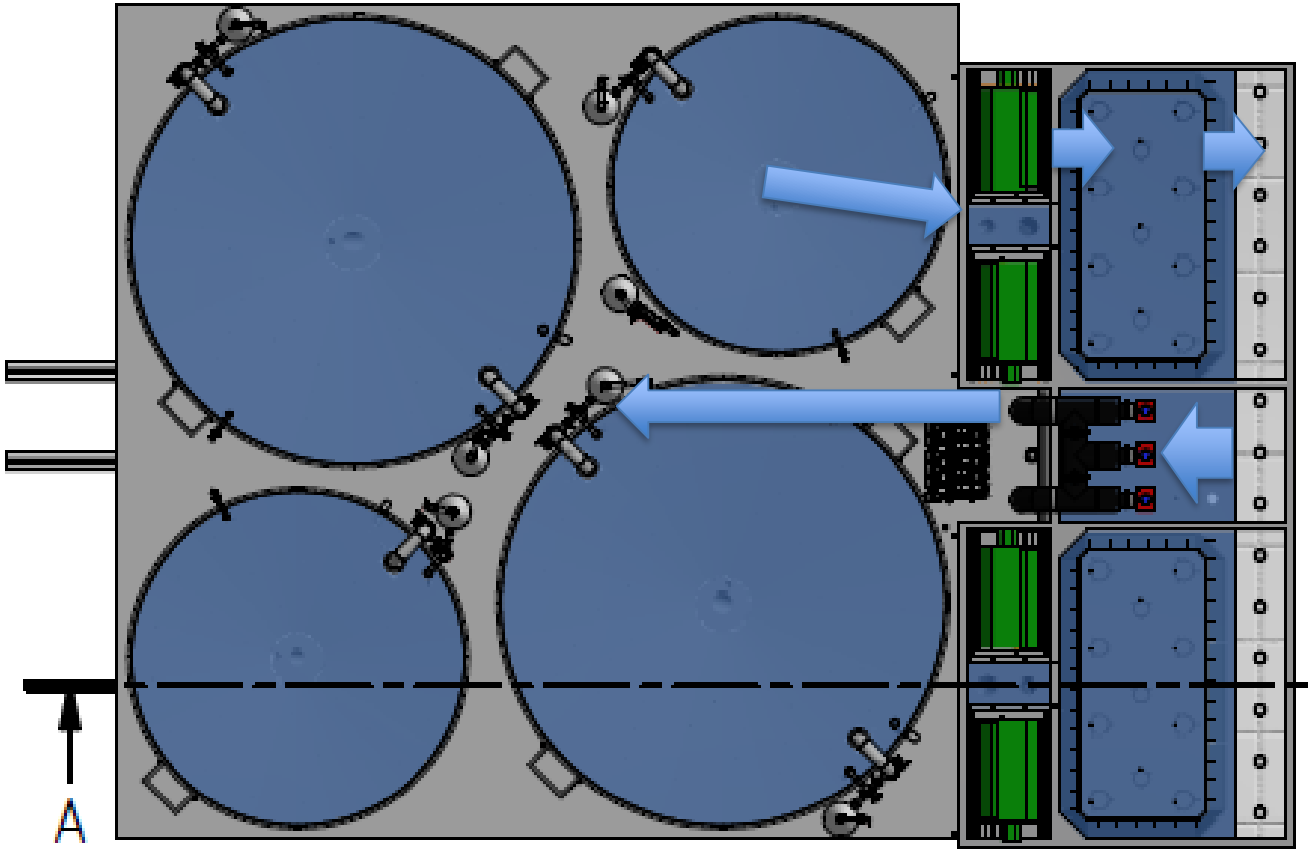
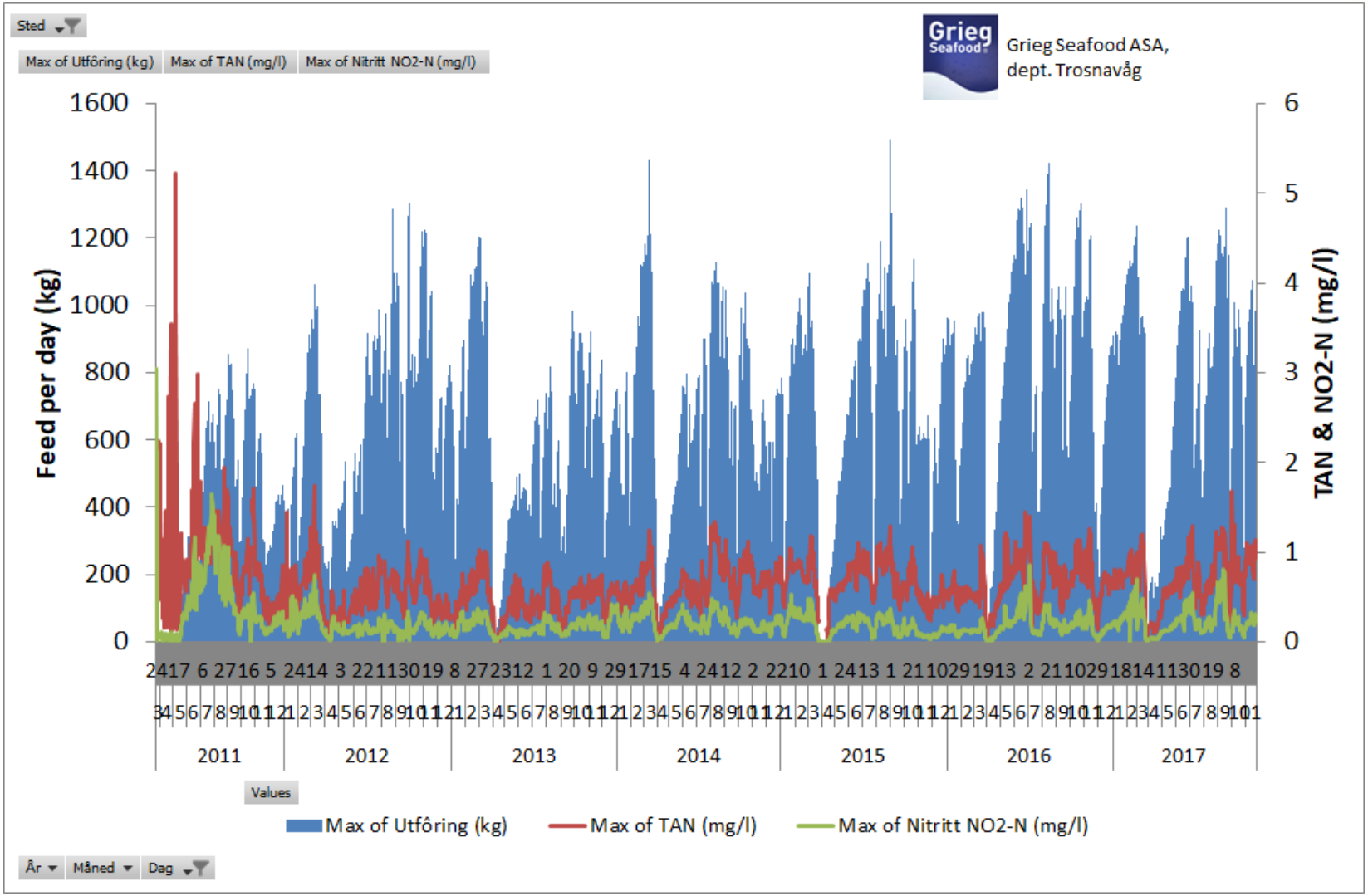
# 1 of 2 on RAS…

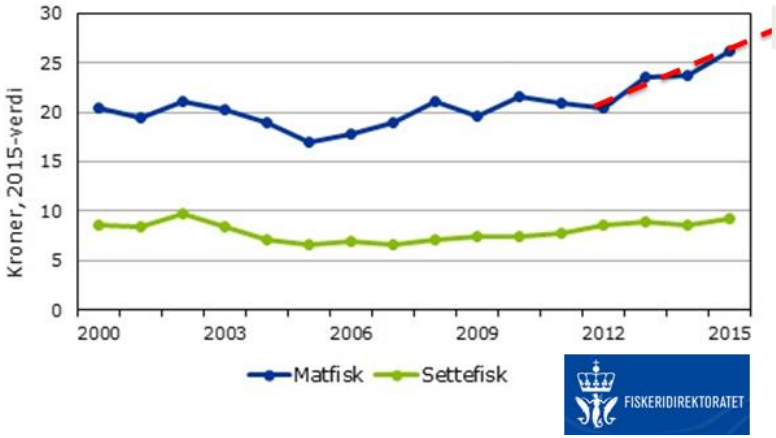




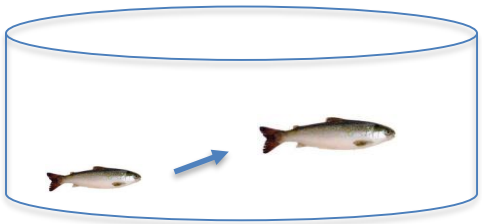
# 2 of 2 on RAS…


Sted
Max of Utfôring (kg)
Max of TAN (mg/l)
Max of Nitritt NO2-N (mg/l)
Grieg Seafood ASA,
dept. Trosnavåg
Feed per day (kg)
TAN & NO2-N (mg/l)
1600
1400
1200
1000
800
600
400
200
0
6
5
4
3
2
1
0
2011
2012
2013
2014
2015
2016
2017
Values
Max of Utfôring (kg)
Max of TAN (mg/l)
Max of Nitritt NO2-N (mg/l)
År
Måned
Dag


Avg prod.cost per smolt/kg

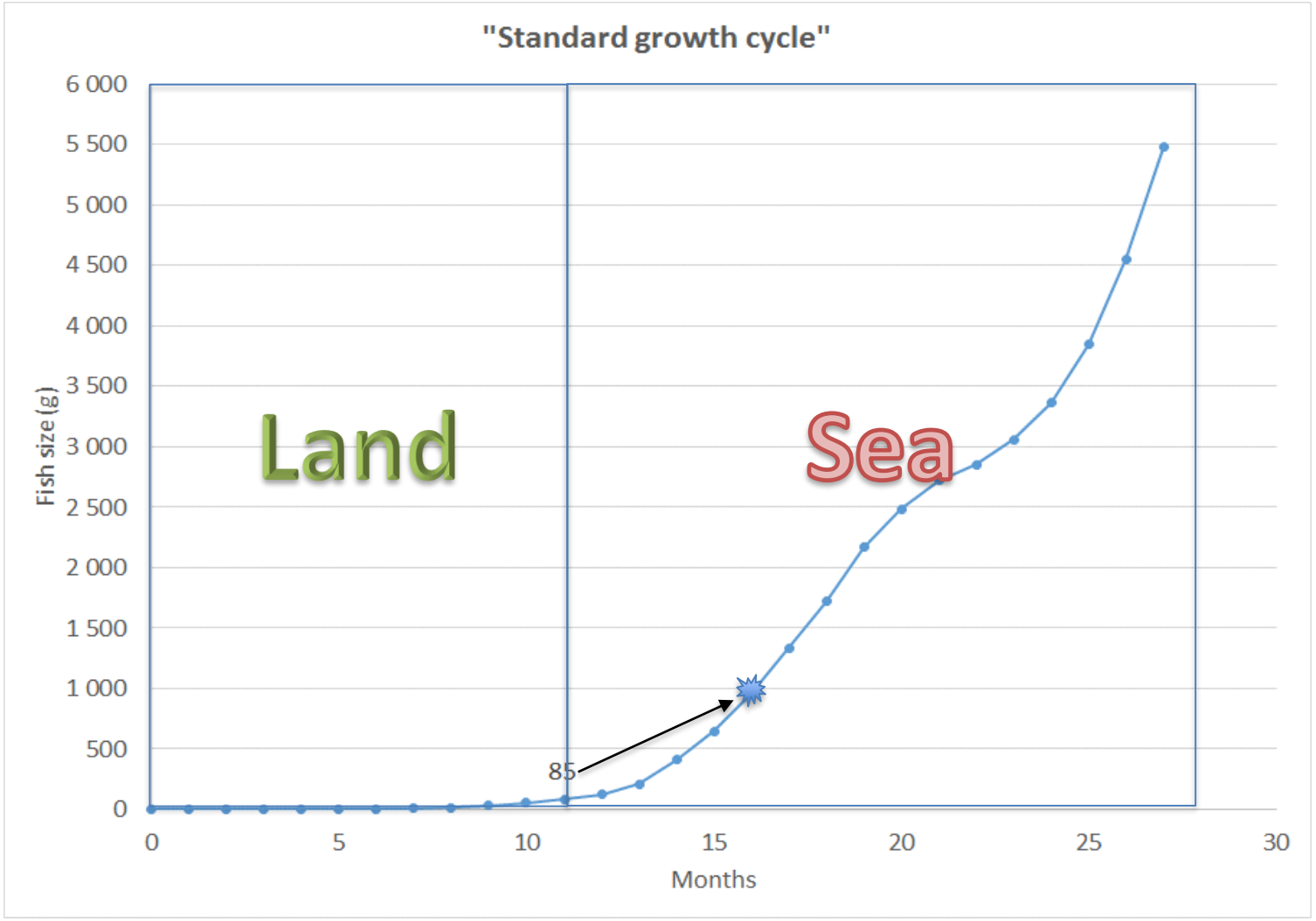


RAS




Natural Environment
Sustainability
Economic Vitality
Healthy Communities

# Effect of larger fish on land



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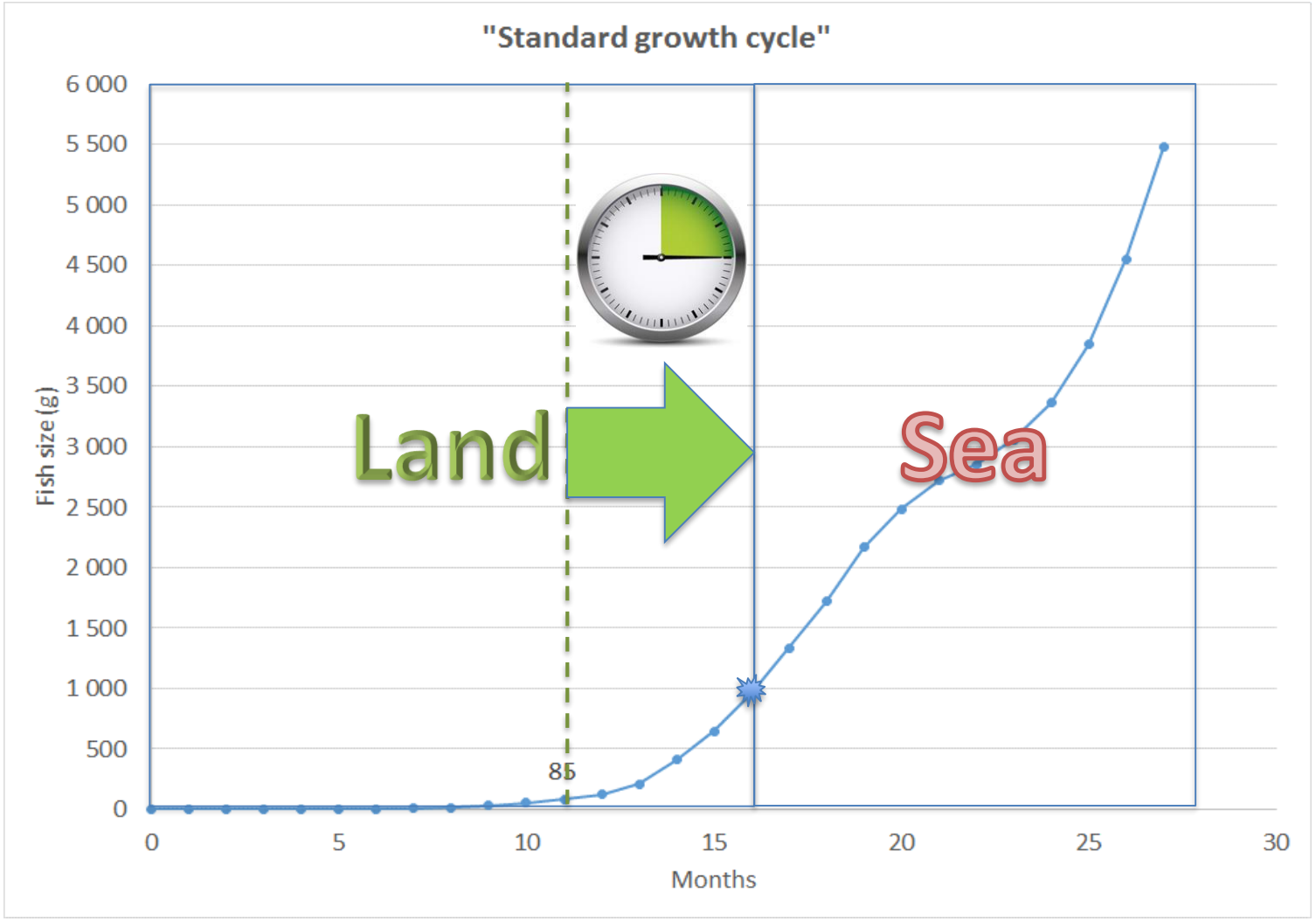
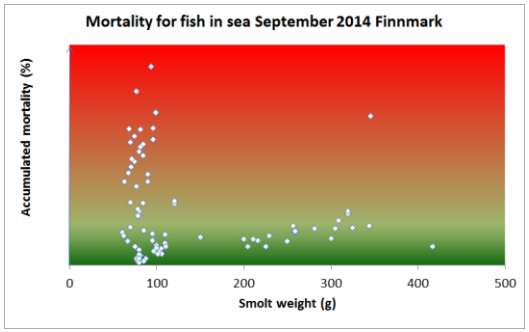
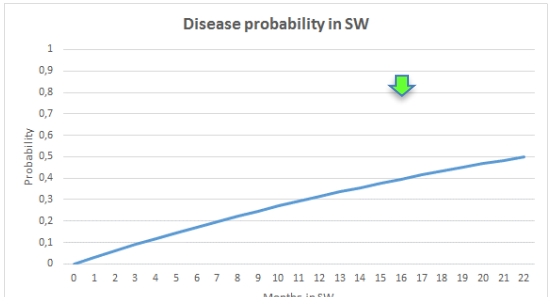
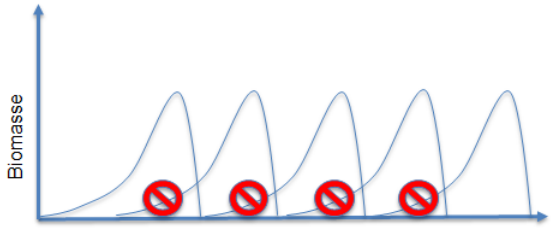


# Effect of larger fish on land

- Robustness
- Shorter growth cycle
  - Risk reduction
    - Disease ★
    - Parasites
    - Blooms
    - Escapees ★
  - Longer fallow periods…
  - Reduced number of active sea sites…
    - 2 year cycle to 1 year cycle → 50 % reduction



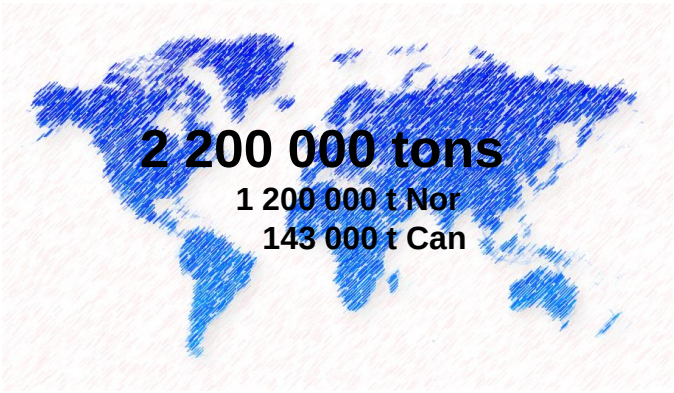

Sustainability
Straight Ahead


Why don’t we do it entirely on land?


| | 1 m³ RAS | 1 m³ SCCS | 1 m³ open cage |
|---|---|---|---|
| Investment: | • 25 000 NOK | • 2 500 NOK | • 100 NOK |
| Realistic production: | • 0,5 kg/day | • 0,2 kg/day | • 0,03 kg/day |
| Investment per kg daily production first year: | 50 000 NOK/kg | 12 500 NOK/kg | 3 750 NOK/kg |

# Cost of moving production on land

(assumption 0,4 kg production/day/$m^3$ = 146 kg/year/$m^3$)



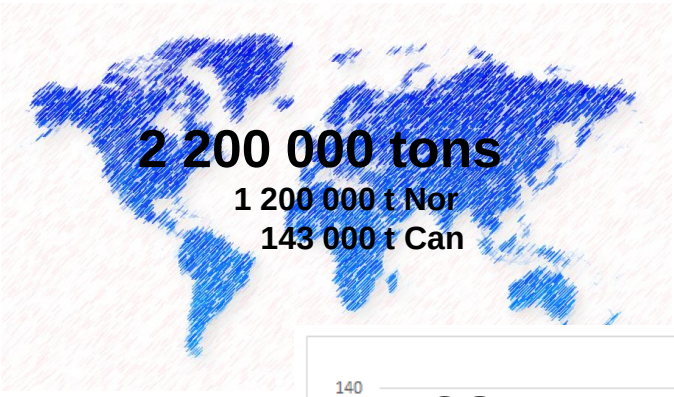
*Need 15 mill $m^3$ tank volume*

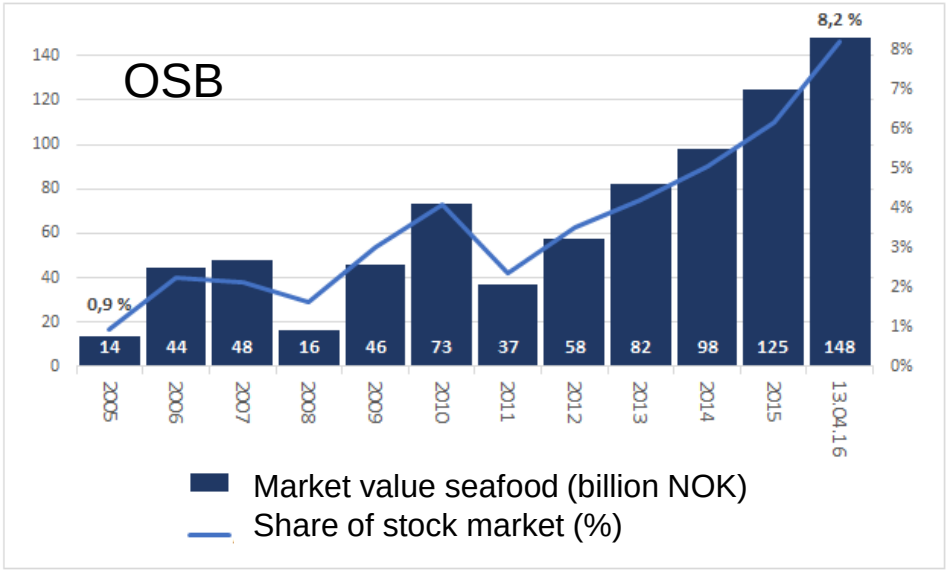
*1 $m^3$ = 3 600 CAD capex*

→ ***CAPEX 54 billion CAD***

→ *3,5 billion CAD for Canada*

# Existing assets in sea…



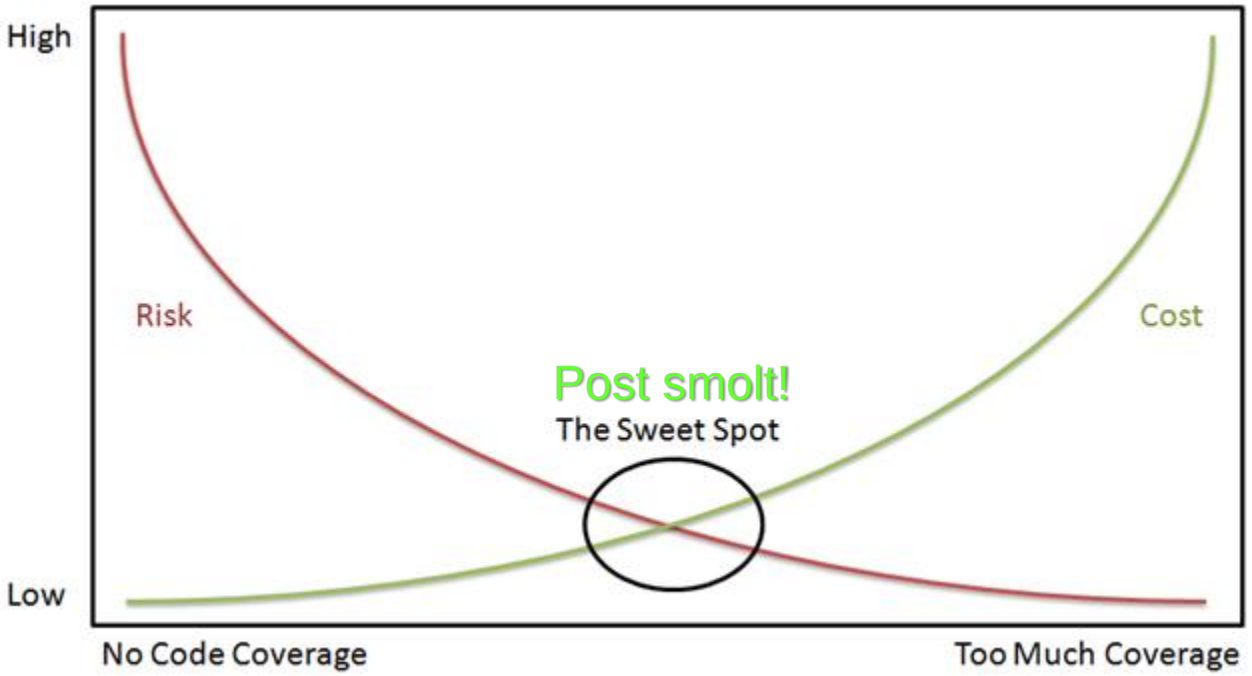



# Open net cage production in sea

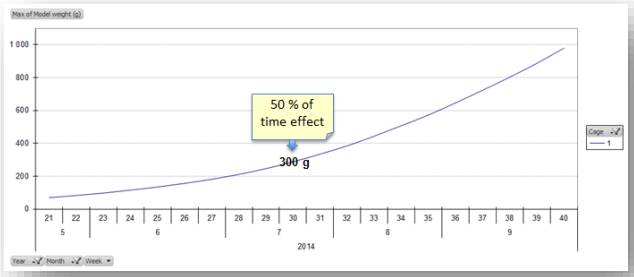
- Higher risk for **escapees**
- Open to environment
  - **Lice**
  - Disease
  - Blooms
- Area conflicts
- Discharge to environment…

- "Low cost" investment
- Energy efficient water movement
  - Can ensure optimal water quality and animal welfare
  - Can disperse the discharge and fertilize the sea
- Minimal long lasting footprint
- Productive systems developed

# Companies operating in SW



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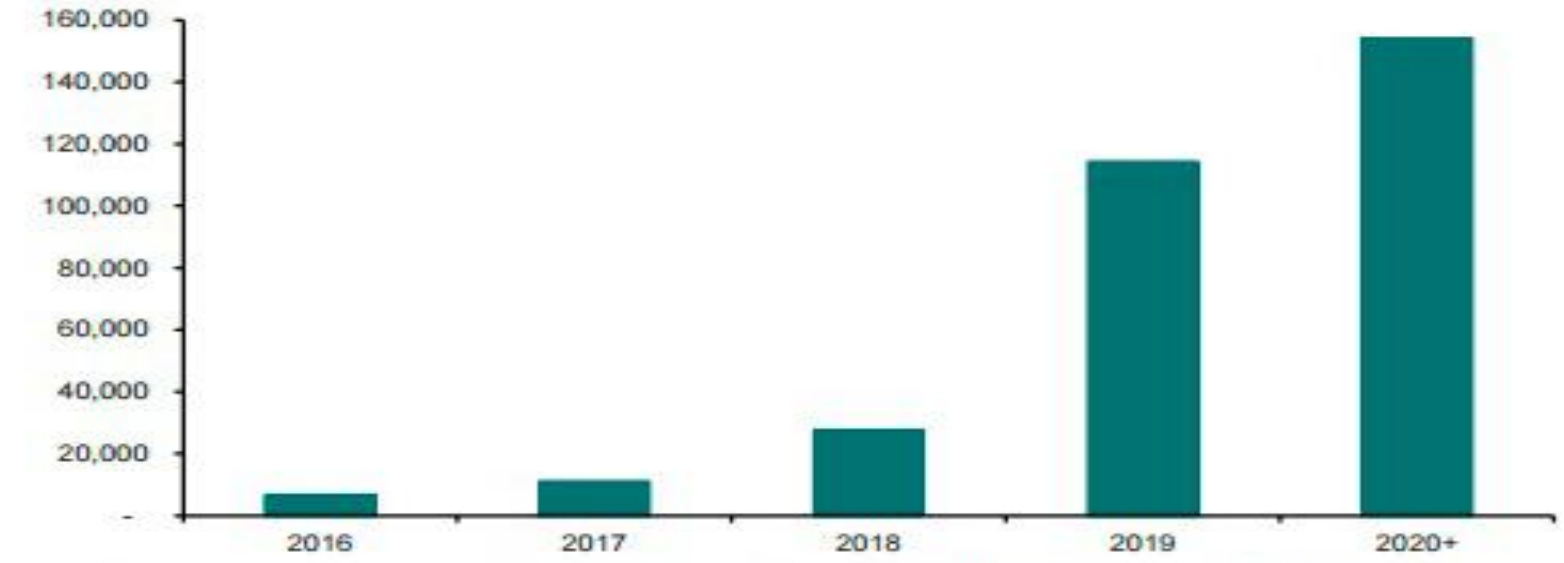
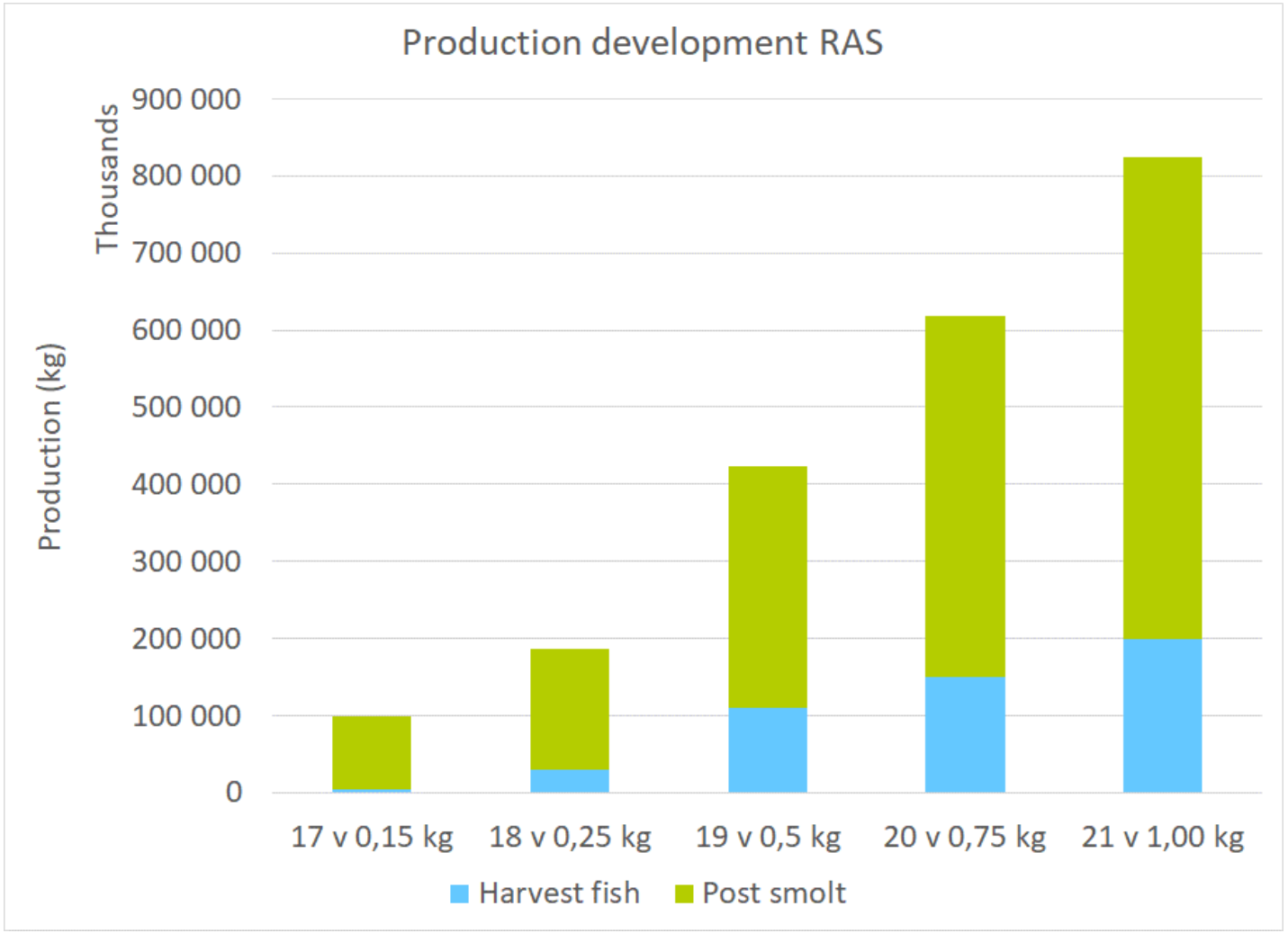
# Volume post smolt *v* RAS harvest fish

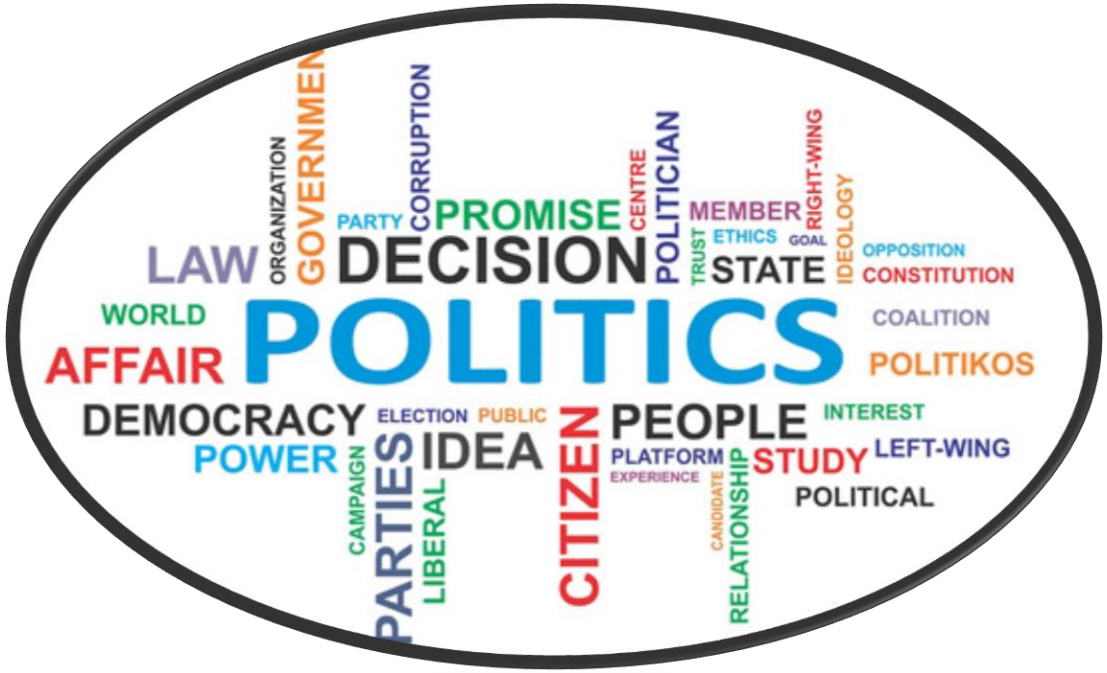
**Figure 1: Capacity plans full on-growing of salmon (harvest volume, HOG, tons)**



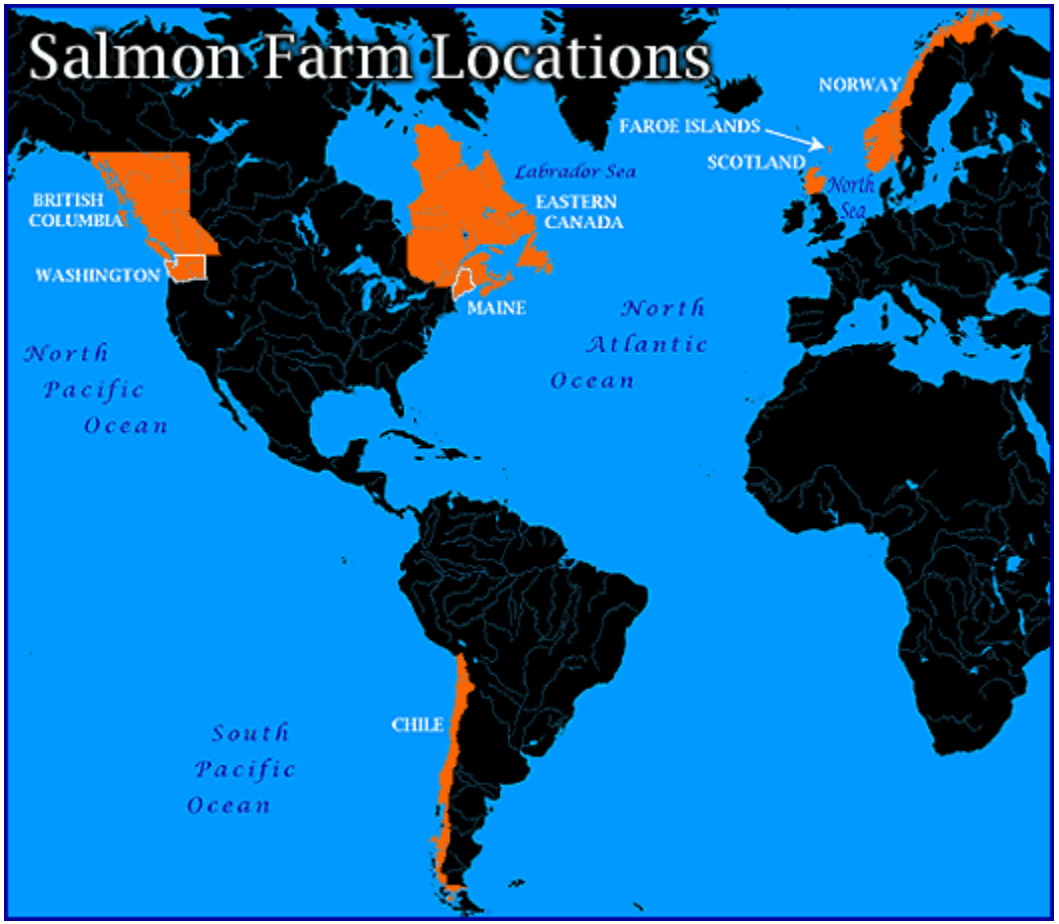

Source: Company information (on volumes in total and distribution if available), DNB Markets (estimate on distribution if not available)

# Post smolt *v* harvest fish in RAS




ORGANIZATION
GOVERNMEN
CORRUPTION
PARTY
PROMISE
CENTRE
POLITICIAN
MEMBER
RIGHT-WING
IDEOLOGY
LAW
DECISION
TRUST
ETHICS
GOAL
STATE
OPPOSITION
CONSTITUTION
WORLD
POLITICS
COALITION
AFFAIR
POLITIKOS
DEMOCRACY
ELECTION
PUBLIC
PEOPLE
INTEREST
POWER
IDEA
PLATFORM
EXPERIENCE
STUDY
LEFT-WING
CAMPAIGN
PARTIES
LIBERAL
CITIZEN
CANDIDATE
RELATIONSHIP
POLITICAL

# Locations for open net production is governed by nature



# Land based is not governed by nature…

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ensis FISHERIES PVT. LTD.

## Atlantic Sapphire building USD 350 million land-based salmon farm in Miami

By Cliff White
Published on March 19, 2017

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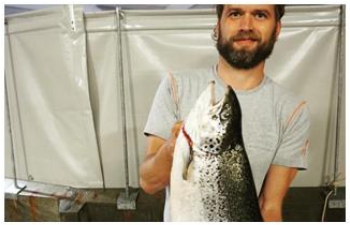

Atlantic Sapphire USA, a subsidiary of Norwegian farmed salmon firm Atlantic Sapphire A/S, will soon start construction on a massive land-based aquaculture facility in Miami, Florida, U.S.A.

Atlantic Sapphire CEO and Founder Johan Andreassen confirmed to SeafoodSource the company has acquired all approvals necessary to begin the first phase of the project, which will cost around USD 100 million (EUR 94 million). Andreassen said he expects the facility will be capable of producing around 10,000 metric tons of rought-weight salmon, or 22 million pounds annually, by the time the phase-one build-out is complete, expected by the end of 2019 or beginning of 2020.

«We used years on site selection. I don't see any comparative advantages for Norway. We will not consider to start land based aquaculture in Norway – neither in Chile…"

*Johan E. Andreassen to* iLaks.no

griegseafood.com