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INDICATORS FOR SUSTAINABLE PRODUCTION METHODS IN ATLANTIC SALMON FARMING

Hans Tobias Slette, SINTEF Ocean
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Project details

Increased knowledge about effects on climate, nature, and environment from different production methods for salmon



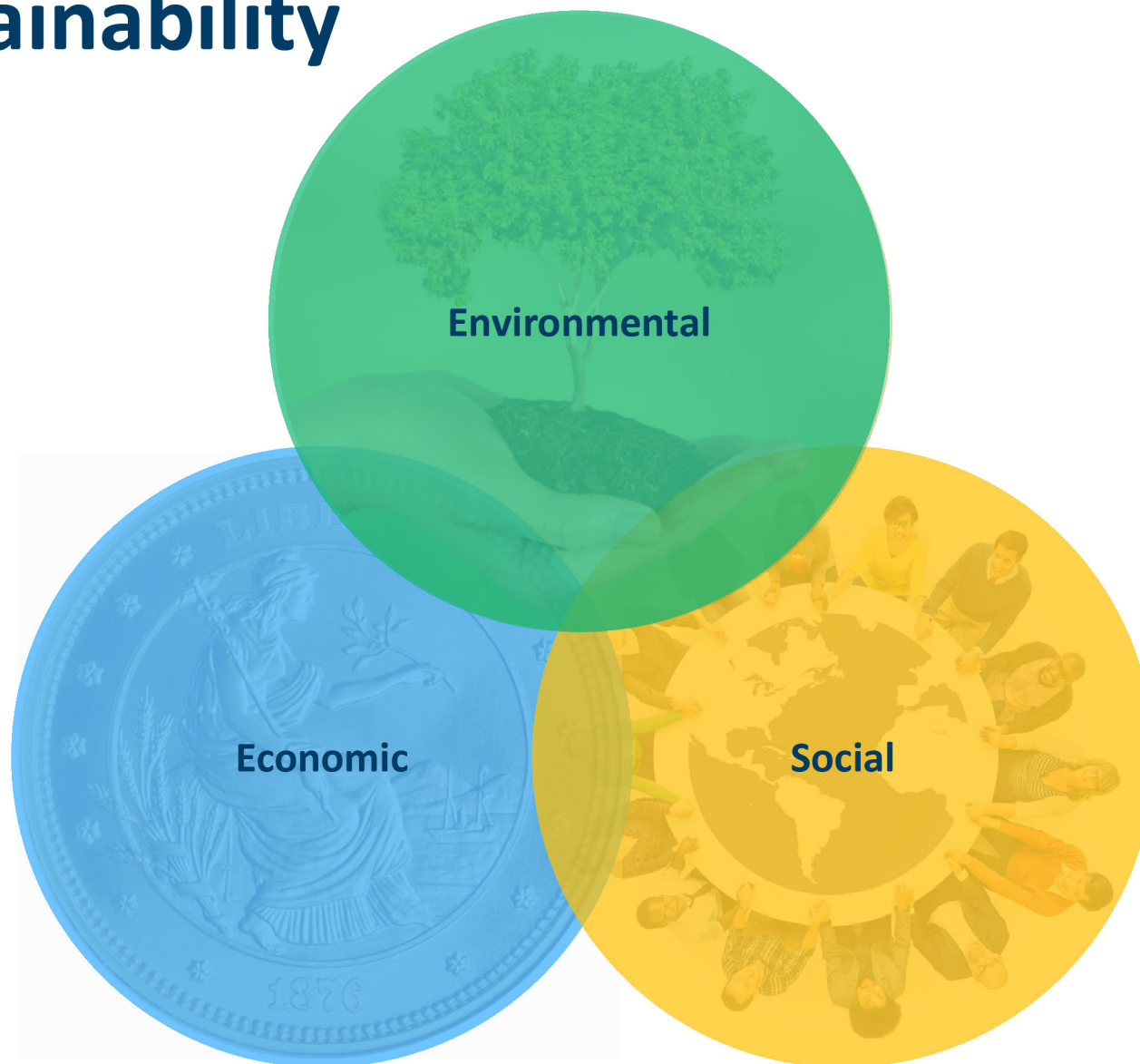
SalMarAker**Ocean**





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Sustainability



Source: Coins Numismatics

Source: Iberdrola

Source: Mad Scientist Laboratory

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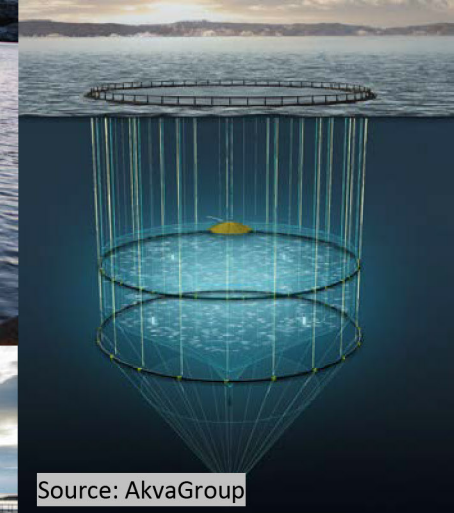
Production methods

- Production method = Technological solution for enclosures and fish farm
- New concepts entering the market
- Changes to regulations



Production methods

- Traditional
- Semi-closed
- Closed
- Submerged
- Offshore
- Land-based





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Indicators and topics

Topic	Sub-topic	Criteria	Indicator
Resources	Water	Water Consumption	Litres consumed per year
			Litres consumed per kg fish produced
		Water Scarcity	Source
			Consumption as share of source supply
			Number of other consumers being out-competed

Literature

- Research
 - Annual risk report for Norwegian fish farming
 - FHF901255, FHF901554, FHF901738
- Regulations
 - Governing allocation and operation of licences
- Standards
 - ASC Salmon Standard
 - Standards Norway
 - European Sustainability Reporting Standards
 - Global Reporting Initiative (GRI 13)
 - GLOBALG.A.P
- Guidelines and principles
 - Blue Economy Sustainability Framework
 - Aspirational principles and criteria for a sustainable bioeconomy
 - Global Salmon Initiative
- Indexes
 - Coller FAIRR



Norwegian Ministry of Trade,
Industry and Fisheries



Veterinærinstituttet
Norwegian Veterinary Institute



Indicators for environment

- Resources
 - What is used? How much? How does it relate to other possible usages? What are the effects?
- Emissions
 - What emissions come from construction and operation of the production facility/fish farm?
- Welfare
 - How is the welfare of the fish the fish farmer is responsible for?
- Nature
 - How is nature affected by construction and operation of the fish farm?
- Waste
 - What waste is generated during construction, operation and end-of-life? How is this managed?





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Indicators for environment – Resources

- Water
 - Consumption
 - Scarcity
 - Source
- Energy
 - Consumption
 - Mix
 - Efficiency
- Materials
 - Efficient use
 - Origin / sources
 - Value chain
- Area
 - Size/need
 - Conversion / transformation
 - Deforestation



Indicators for environment – Emissions

- Emissions to air
 - Climate effect
 - ODS, NOX, SOX, P.M. and other significant pollutants.
- Emissions to water
 - Sewage
 - nutrient eutrophication
- Chemicals
 - Drugs / medicines
 - Pesticides



Photo: Aleksander Nordahl

Indicators for environment – Welfare

- Disease and parasites
 - Biosecurity
 - Infrastructure
- Mortality
 - Salmon
 - Cleaner fish
- Handling
 - Treatment
- Water quality
- Individual indicators
 - Shell loss, skin bleeding, body wounds, fin condition

Indicators for environment – Nature

- Ecosystems interaction
 - Birds
 - Marine mammals
 - Critical or sensitive habitats and species
 - Conservation / restoration
- Seabed
 - Presence of fauna, chemical and sensory condition
- Escapes
- Wild salmon
 - Spread of disease and lice



Photo: Rune Muladal

Indicators for environment – Waste

- Recirculation
- Re-use
- Utilization of residual raw material
- Waste management
- Product design
 - Life cycle consideration





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Indicators for social sustainability

Wider impacts



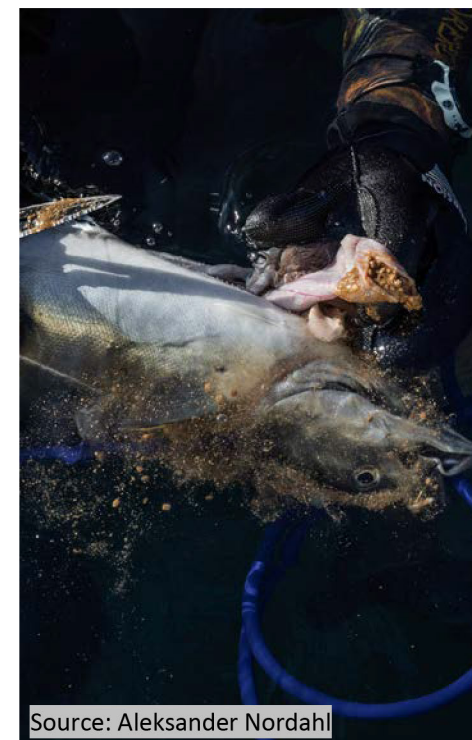
Safety



Area conflict of interest



Reputation



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Indicators for economic sustainability

- Value creation
- Utilization of financial capital
- Utilization of real capital
- Utilization of input factors
- Exploitation of natural resources
- External costs



Sustainability of production methods in Atlantic salmon farming

Environmental

- Water consumption
- Energy consumption
- Area use
- Greenhouse gas emissions
- Emissions to sea
- Use of medicine and chemicals
- Fish health and welfare
- Lice and treatments
- Mortality
- Escapes
- Ecosystem impacts
- Waste, re-use and recirculation

Sosial

- Safety
- Area conflict of interest
- Wider impacts
- Acceptance / reputation

Economic

- Value creation
- Utilization of financial capital
- Utilization of real capital
- Utilization of input factors
- Exploitation of natural resources
- External costs



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