

The value of fish health

Opportunities for the Norwegian Aquaculture industry

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The fish health challenge is real – but can be addressed



1| Fish health is a 15+ NOKbn challenge. Annually

Cost associated with addressing fish health and revenue loss from quality-related price reductions



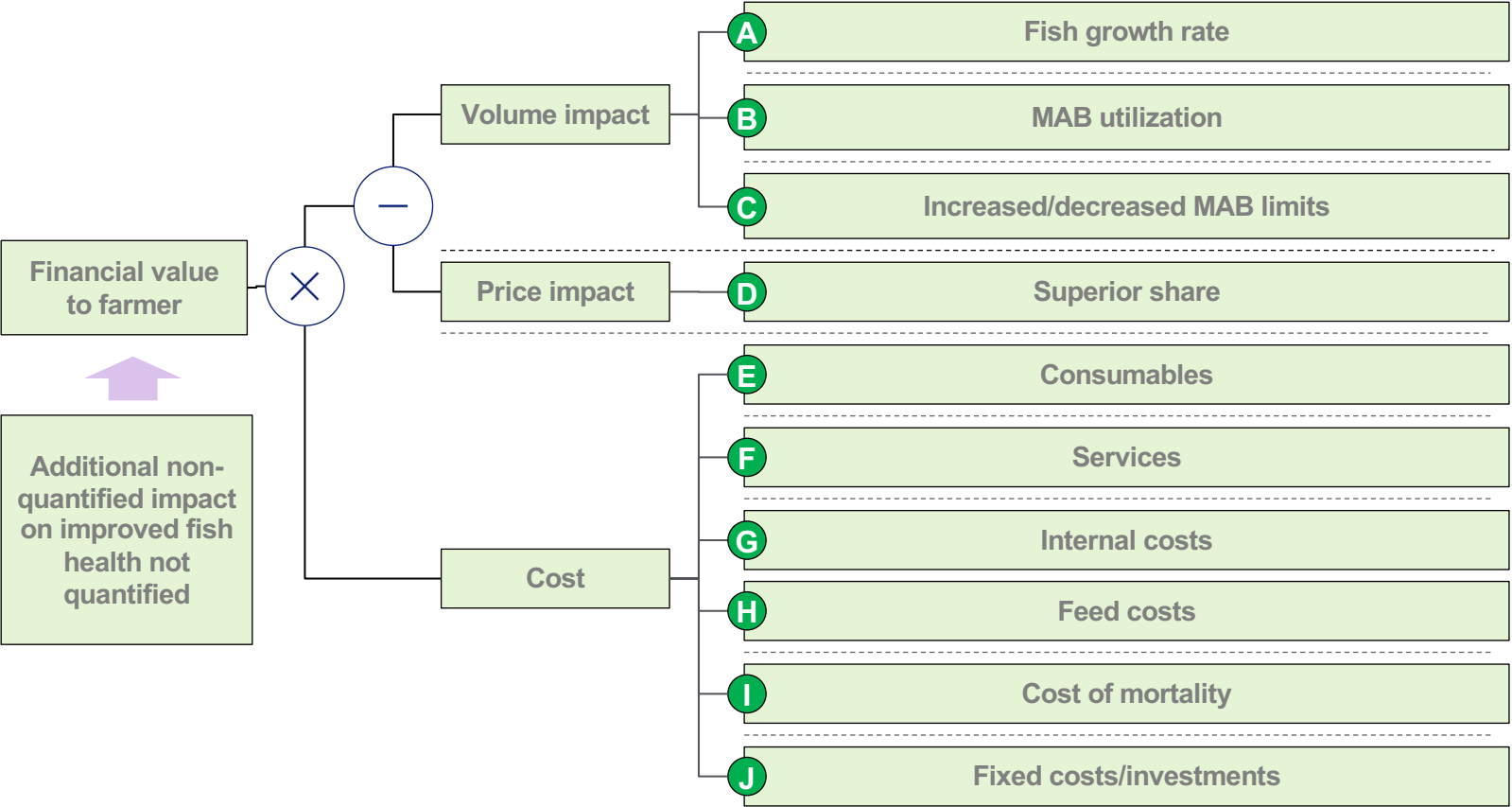
2| Use of data is the key understand and solve the problem

Analyzing and isolating the impact of different solutions on lice, diseases, etc.



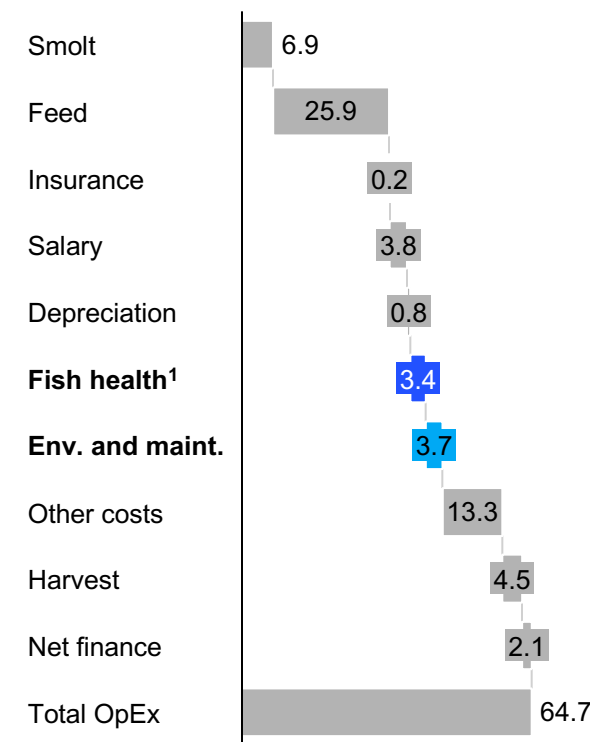
3| *Case study:* Analysis of SuperSmolt, observed impact of fish health, and estimated value for the farmer

1| We assess the value to a farmer using a framework of volume, price, and cost

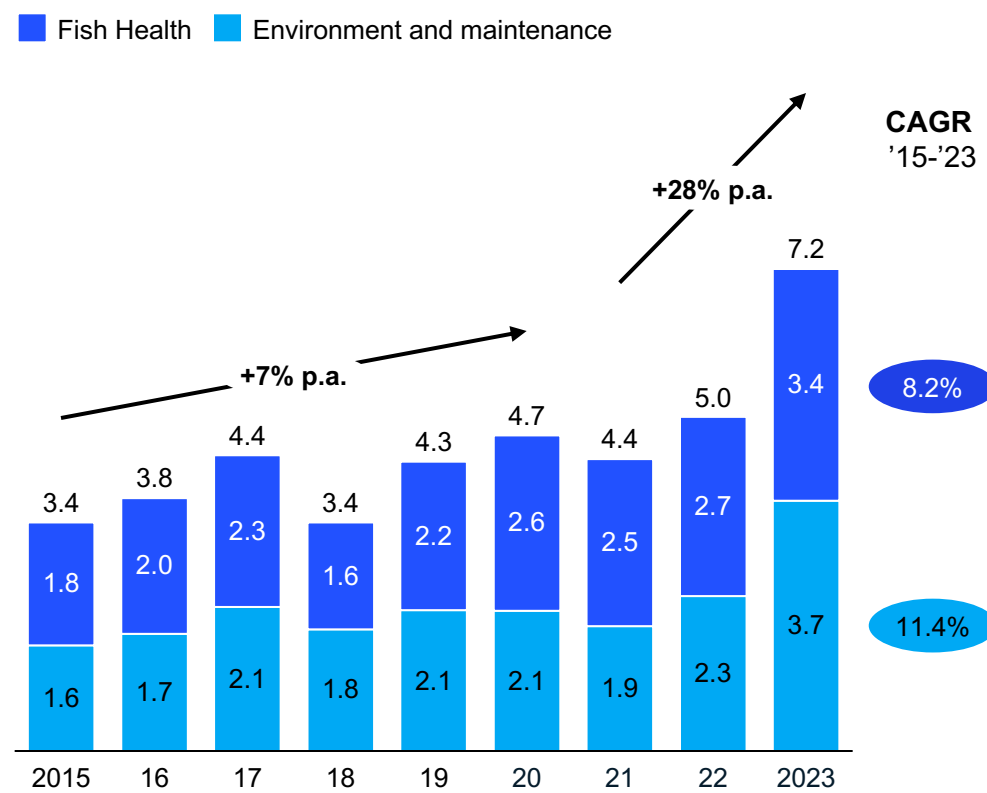


1| Cost impact: Fish health & environmental costs have grown by 28% per year since 2021, and are now above 10+ bn NOK annually
Figures for the Norwegian market

Operating costs breakdown, NOK/kg 2023



Fish health and environment cost development, NOK/kg 2015-2023



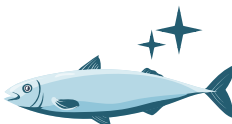
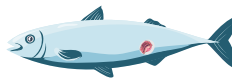
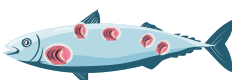
Annual cost for the farmer

10+ bn NOK

- **7+ NOK per kilogram** spent on fish health and environment in 2023
- **~1.5m tons** farmed Atlantic salmon in 2023

1. Including services and products
Source: Norwegian Directorate of Fisheries

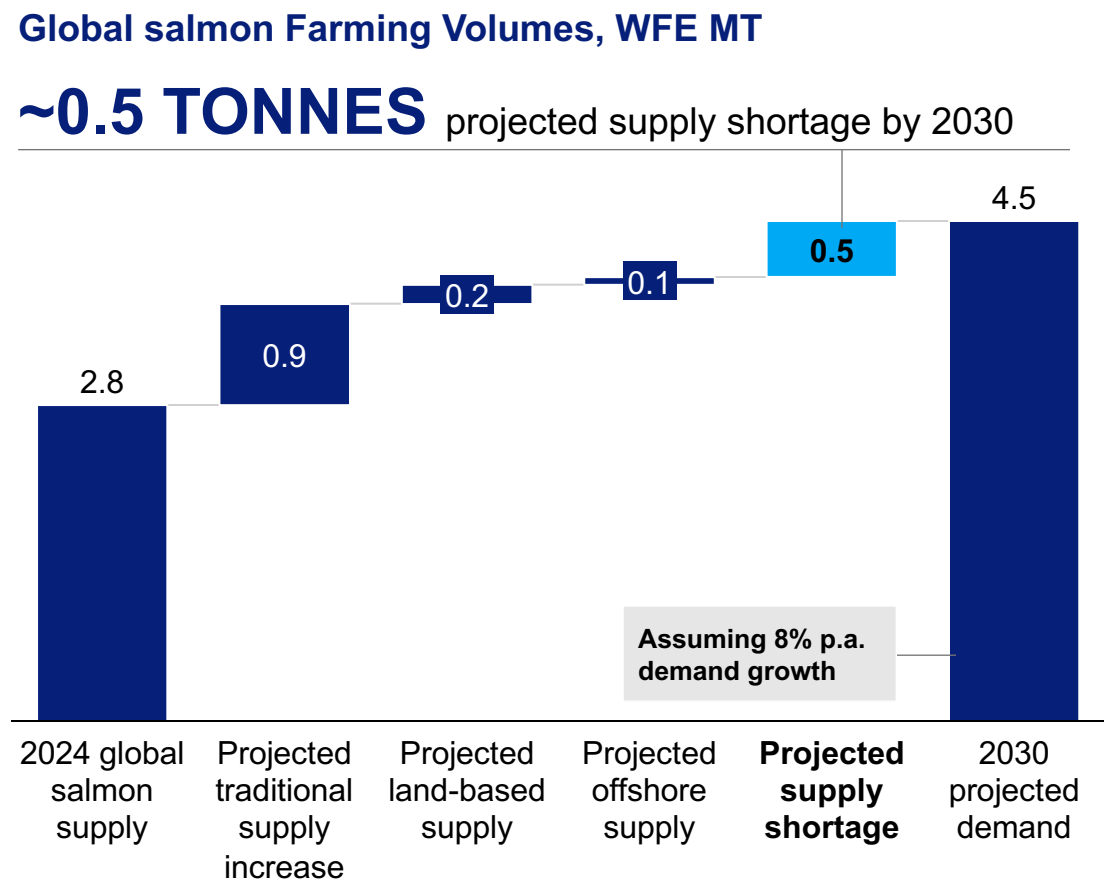
1| ... and farmers lose revenues (and profits) due to downgrades of ~5 NOKbn per year

				
Quality	Superior	Ordinary	Production	Sum
Share ¹ , %	85%	3%	12%	
Discount ¹ , %	0%	10%	30%	
Value loss ² , NOKbn	0	0.5	4.5	~5

1. Share of fish in quality class and corresponding discount varied from year to year
2. Assuming average superior 3-6 kg salmon price of 95 NOK/kg, 1500 kt RWT annual production = 1333 kt HOG

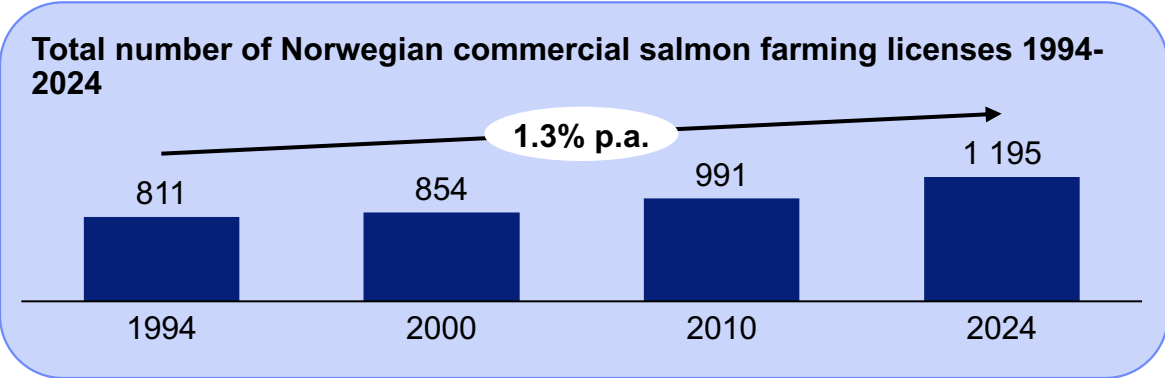
1| ...and solving this can allow the industry to tap into the unmet demand

There is a projected structural undersupply of salmon in the market...



... driven by governmental and public concerns on fish health and biodiversity

-  In Norway, the **traffic light system** regulates the growth of the industry across production areas (and upcoming "Havbruksmelding")
-  **Ban on open net pen farming due to impact to take place from 2029** due to concerns on environmental impact. However, recent optimism observed, and the tide might turn
-  In 2022, **Chile imposed new regulations applicable to salmon farms** in protected areas as part of an **attempt to encourage them to relocate because of their effects on the environment**
-  In 2023, **Scottish lawmakers called for a halt to any expansion of salmon farms due to environmental and welfare concerns** after official figures showed that fish mortality doubled in 2022



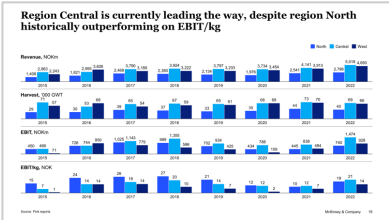
2| At McKinsey we have built an industry leading ecosystem of proprietary assets for advanced market analytics in the aquaculture sector

Not exhaustive

Proprietary assets

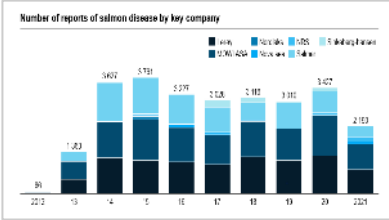
1 McKinsey Farming benchmarking

Overview of harvest volumes, profitability, and production costs for leading salmon farmers
Detailed benchmarks per step in the value chain (smolt, farming, processing and sales)



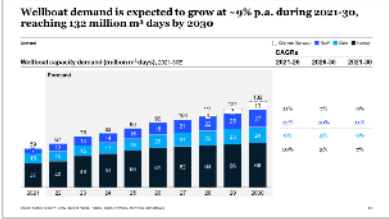
2 McKinsey Fish Health Model

Large scale model to analyze disease outbreaks per salmon farming site. Includes type of medication used



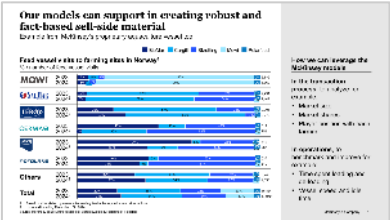
3 McKinsey Global Wellboat Model

Model forecasting future demand for wellboat capacity (capacity and # of wellboats) across key markets, covering both traditional farming and emerging offshore farming demand



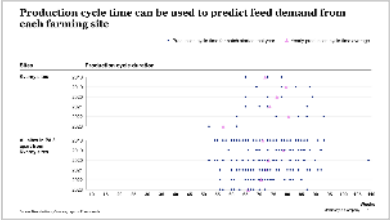
4 McKinsey Vessel Tool

Tool to analyze the movements of all aquaculture vessels. Can be used for feed market analysis by tracking which farming companies the feed players deliver volumes to. Includes granularity on the level of each farming site



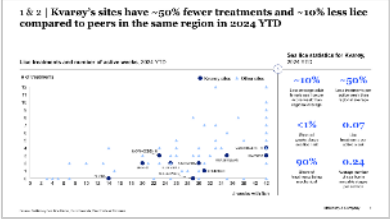
5 McKinsey Cycle Time Tool

Tool to analyze the production cycle time of each farming site, including when smolt is released and when fish is harvested



6 McKinsey Sea Lice Model

Model to analyze sea lice numbers and sea lice treatments per salmon farming site. Includes type of treatment and medication used



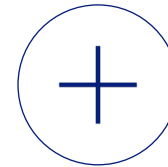
3| We worked with STIM to analyze the impact of SuperSmolt

Problem statement

“Can we analyze the impact of SuperSmolt for the farmer based on observable data?”



We worked together explore the effects of SuperSmolt

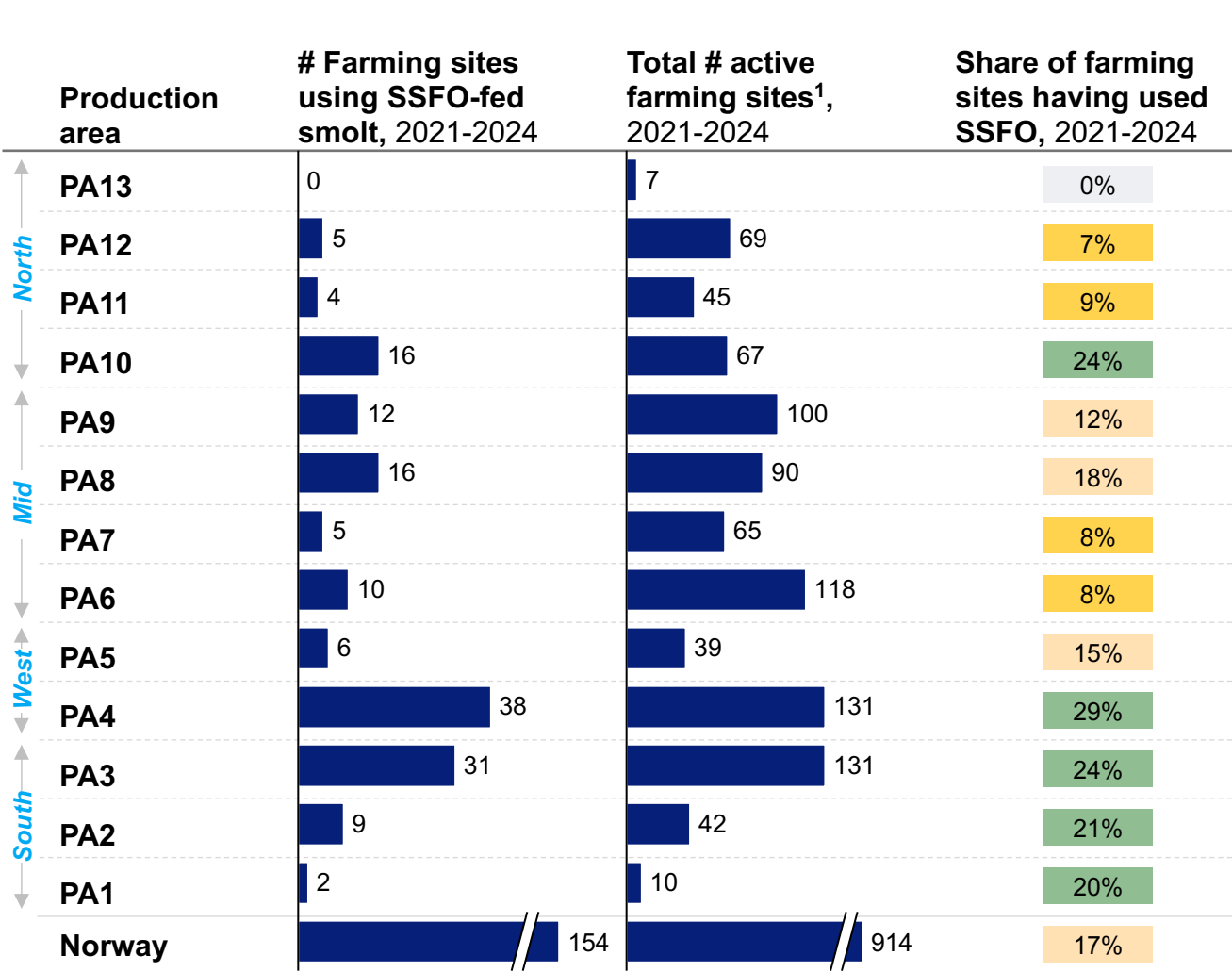


**McKinsey
& Company**

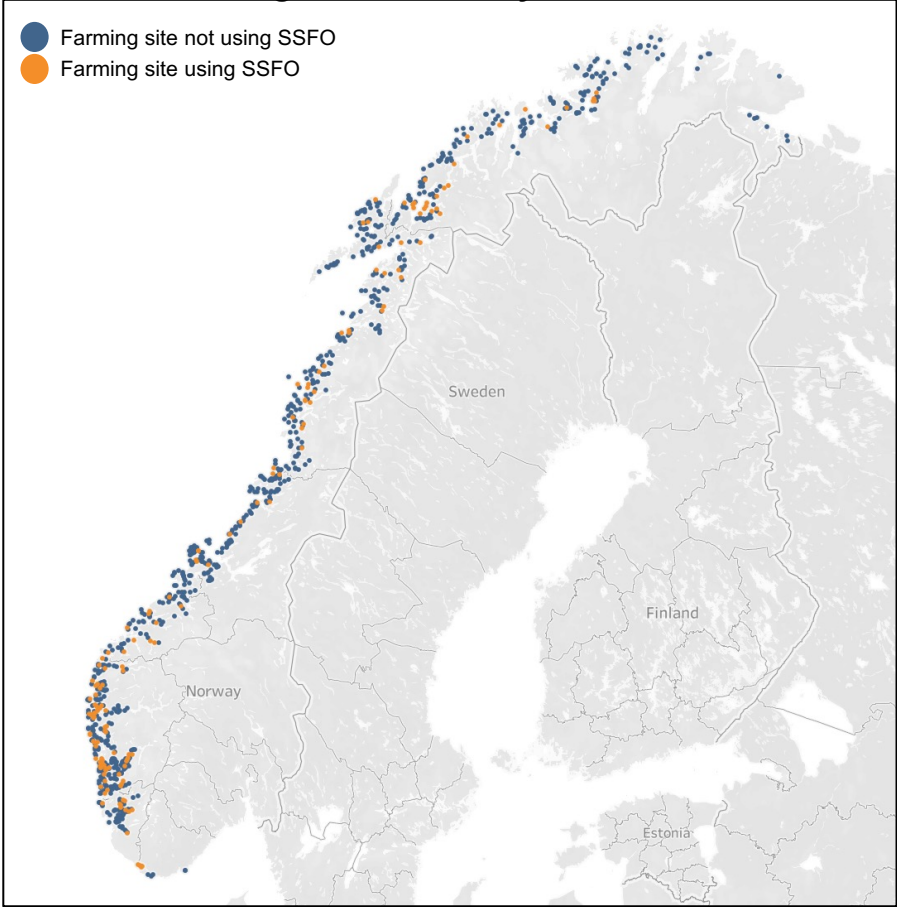
- Product expertise
- Customer trials
- Customer feedback

- Proprietary tools and algorithms to analyze fish health, lice, and treatments
- Analytical approach to measure and value effects

3| Use of SuperSmolt is largest in PA 1-4 and PA 10, with a range of use from 0 to 29% of all sites in a PA



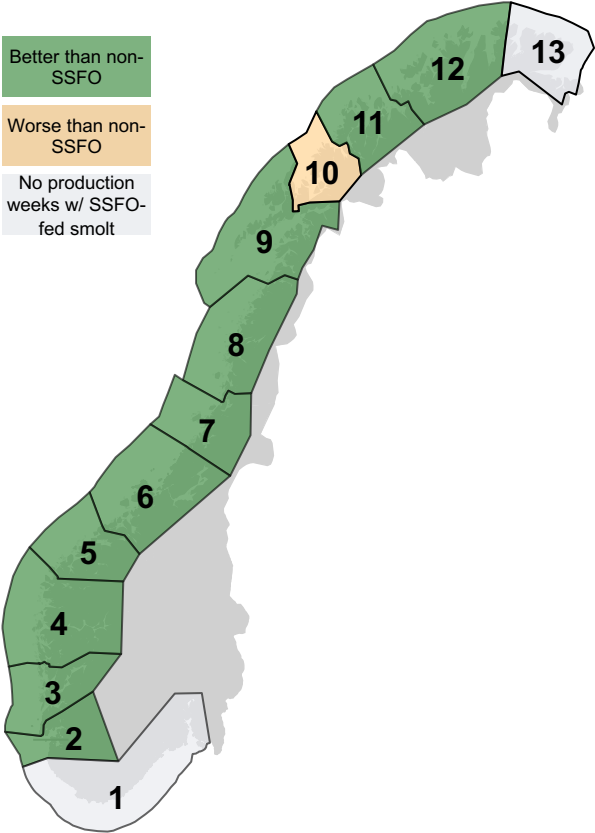
Active fish farming sites in Norway¹



1. An active farming site is a site with lice counting reports in 2021-2024

3| ~30% fewer outbreaks of notifiable diseases observed on sites using SuperSmolt

Outbreak intensity² of sites w/ SSFO-fed smolt vs. PA average, 2021-2024

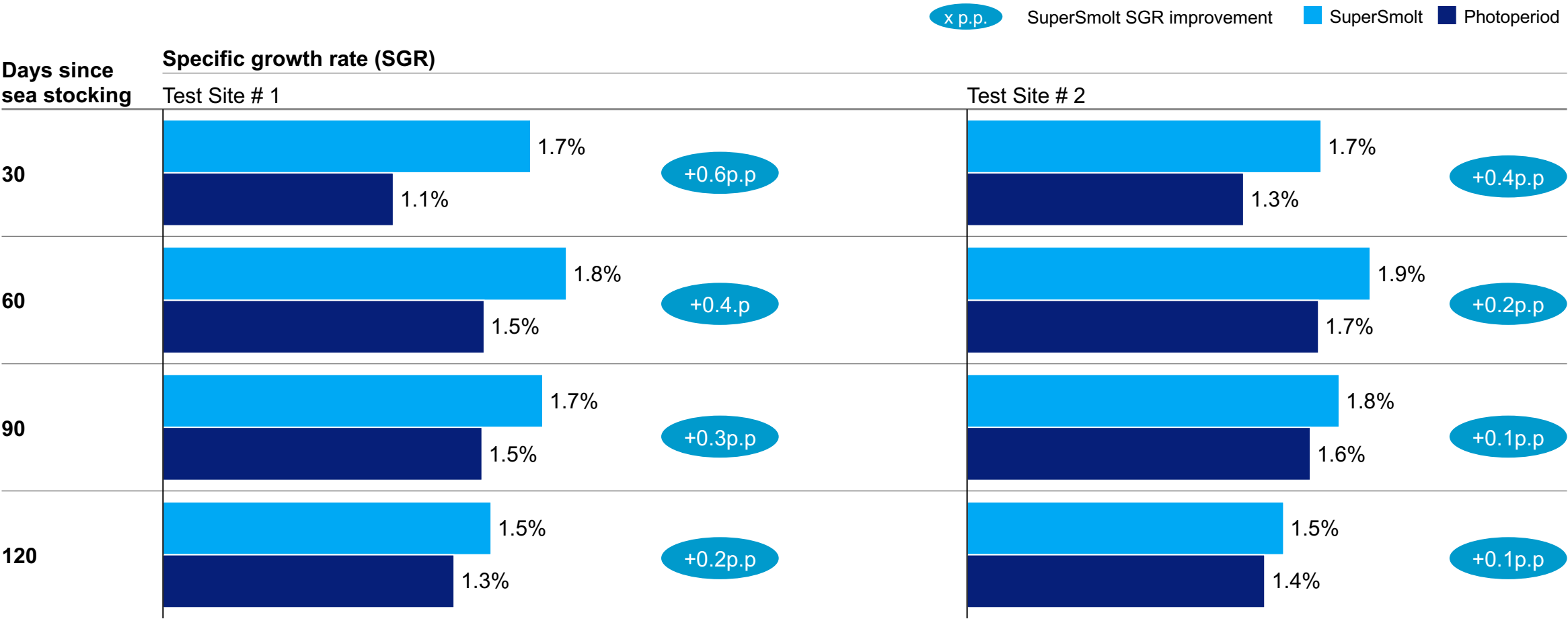


Outbreak intensity 2021-2024², number of outbreaks per production week¹

Outbreak intensity 2021-2024 ² , number of outbreaks per production week ¹						PD outbreaks	ISA outbreaks
Production area	# Production weeks w/o SSFO-fed smolt	# Outbreaks on sites w/o SSFO-fed smolt	# Production weeks w/ SSFO-fed smolt	# Outbreaks on sites w/ SSFO-fed smolt	SSFO efficacy ³ , outbreaks per production week		
North	PA13	729		0			
	PA12	8,257	10	71		-100%	
	PA11	5,270	12	47		-100%	
	PA10	8,042	7	440	1	205%	
Mid	PA9	12,199	3	322		-100%	
	PA8	11,883	12	312		-100%	
	PA7	7,532	8	57		-100%	
	PA6	16,657	122	483	3	-16%	
West	PA5	5,862	17	155		-100%	
	PA4	15,707	128	1,170	4	-54%	
	PA3	16,857	69	1,147	4	-30%	
	PA2	6,645	48	89		-100%	
South	PA1	1,324		66			
	Norway	116,964	436	4,359	12	-26%	

1. A production week is defined as a week with sea lice counting reports
2. Defined as number of observed outbreaks per production week
3. Percentage change for sites with SSFO-fed smolt versus relative to sites without SSFO-fed smolt

3| Farmer trials show 0.1-0.2p.p increased SGR using SuperSmolt

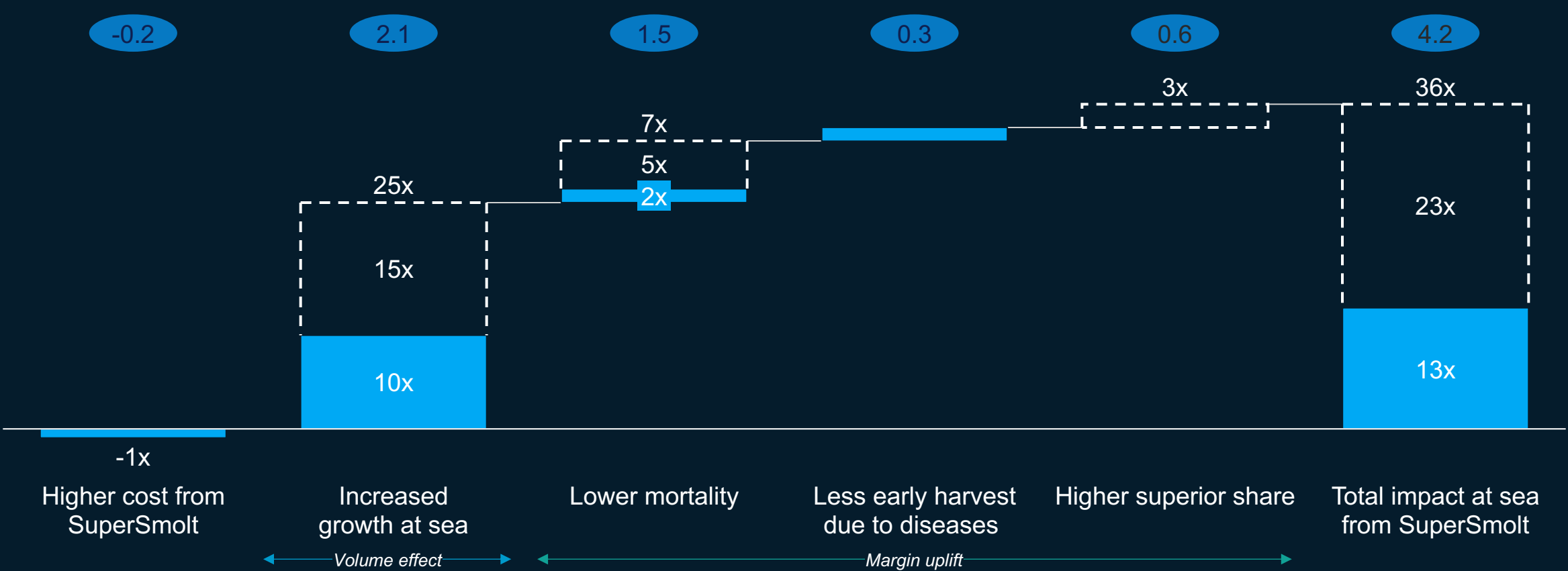


Source: Independent tests conducted by farmer, STIM

3| Impact calculation: Solving fish health challenges can lead to increased production, lower costs, and increased price achievement

Example calculation: Seawater SuperSmolt ROI for a typical farmer, Money-Over-Money¹

Legend:
x EBIT / kg WFE harvested fish²
■ Typical impact ▭ Additional upside



1. Money-Over-Money (MoM) ROI is a simple way to measure investment returns by comparing the total money received to the initial investment
2. Assuming average harvest weight of ~4.5 kg WFE