FISH2.0
INVESTMENT INSIGHTS

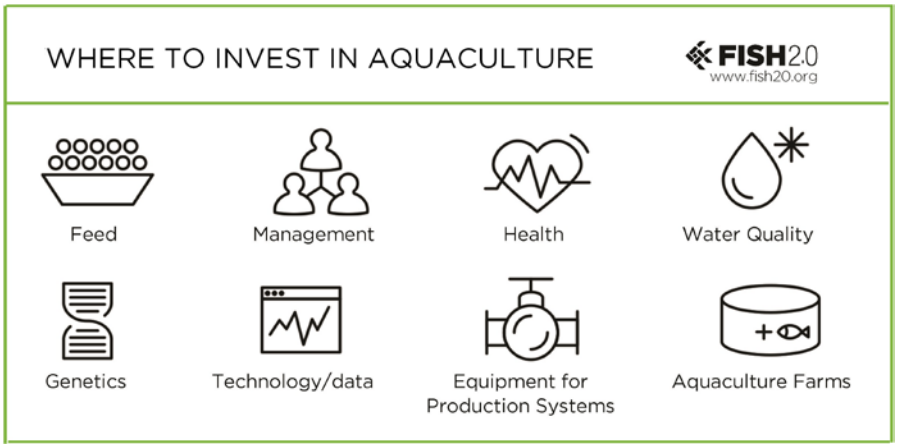
Marine Aquaculture Technology

Marine aquaculture requires a broad array of technological innovation to sustainably satisfy the ever-increasing global demand for seafood. While aquaculture is widely considered the most environmentally responsible form of protein production, there are still problems that hamper growth. And, increasingly, concerned governments have capped new leases and production, which has further dampened growth. In 2014, global marine aquaculture produced 26.7 million tonnes of food fish—an increase of more than 25% since 2009—but this still lags behind the growth of inland aquaculture during the same period.[1]

The impact of aquaculture on local habitats and wild fish stocks must be reduced. The concentrated wastes produced by an aquaculture farm can lead to eutrophication and toxicity, which negatively affect surrounding ecosystems, while undermining the farm's productivity and product quality. Similarly, disease outbreaks and the related use of antibiotics and chemicals are costly to farms, while negatively impacting other local marine organisms. Moreover, the escape of farmed fish into the wild can cause major losses for operators and are a great environmental concern: escaped farmed stocks can transmit disease and outcompete or interbreed with wild stocks, which can reduce a wild species' life span, or disrupt its life cycle.

Relocating aquaculture farms, either further offshore or to on-land recirculating systems, is a key strategy for mitigating several environmental and operational risks at once. Moving farms offshore can limit their impact on coastal ecosystems, improve the dispersal of effluents, and reduce disease risk. However, new technological solutions are required to overcome the inherent challenges of offshore farming: long distances, rough seas, predators, and dangerous diving conditions.

The good news is that we're seeing the advent of "precision aquaculture," which heralds a new age of greater control, higher profitability, and reduced environmental impacts of marine aquaculture operations. Many new technologies—robotics, sensors, computer vision, AI, and IoT—find new applications in aquaculture and spawn many new investable ventures (both specialists and full-stack providers). The market potential for these tools is significant.



Opportunities and Innovation Areas

New cage systems

New cage and farm structures are needed to allow aquaculture to move further offshore, to accommodate more automation technology, and to reduce the likelihood of escapes. Cage systems are generally becoming larger, giving rise to mega fish farms with highly automated production processes. We see innovation in making cages more robust for rough sea conditions and predators, more resistant to fouling, and easier to recycle. Moreover, new closed systems are being designed that sit in the open ocean yet tightly control water exchange to reduce the risk of diseases and escapes.

Rise of the robots

To date, marine aquaculture operations are dependent on manual work and close monitoring by humans, including risky and expensive cage dives. Greater automation promises to make operations more efficient and controlled, and to make farming viable offshore or in rough weather conditions. ROVs are now tasked with monitoring and reporting on fish health, size, and numbers. They can monitor and fix nets to prevent escapes and losses, as well as remove dead fish and excrements, thereby managing a farm operation's effluents. Similarly, automatic feeders, which promise greater growth rates and feed efficiency, are increasingly used in all types of aquaculture operations.

Sensing an opportunity

Automated farming and disease management in aquaculture is providing a multitude of new applications for sensor technology paired with robotics, computer vision, and/or artificial intelligence (AI) technologies. Sensor-based monitoring of environmental parameters enables continuous optimization of growth conditions and feeding, as well as more-timely remedial action if injuries or diseases are detected. Integration with AI supercharges their application, and fish farms that raise a single species are the ideal place for AI to gain a foothold in the seafood industry.

Smarter management platforms

Connecting all of the technologies above are new Internet of Things (IoT) platforms that perform like self-optimizing, automated systems. New user-friendly management interfaces give (highly skilled) farm operators access to real-time information and the ability to direct necessary actions, right from their mobile phones. So far, large-scale operators in developed countries have driven adoption. However, the greater opportunity for growth and impact lies in making these systems suitable and affordable for the thousands of aquaculture operators in developing economies.

Source:
[1] FAO, *The State of World Fisheries and Aquaculture 2016.*

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