

**Focus Area: ECOSYSTEM AND NATURAL RESOURCE MANAGEMENT**  
**Market Segment: AQUACULTURE & MARICULTURE**

SIC Code: 1312

Segment Score: 21

**Sample Investments:**

- **Private:** Establishment and expansion of land-based aquaculture farms, meeting standards of Aquaculture Stewardship Council (ASC).
- **Private:** Development of feeds, vaccines, processing, canning and management systems to improve sustainable aquaculture and mariculture production.
- **Public:** Shared investments and control of aquaculture production and certifications across regions

**1. Relevance to ADB Ocean Action Plan? (Score: High=3)**

- a. High relevance as Aquaculture (aka, the Blue Revolution) is the fastest growing segment of the global blue economy, scoring high on all ADB criteria. Aquaculture provides the opportunity for DMCs to increase local protein production, without the risks and constraints of either wildcatch or climate.
- b. Aquaculture has strong potential for all DMCs, for both land-based (aquaculture) and sea-based (mariculture) production. Asia provides the majority of global production (with China controlling 60%).
- c. Production sustainability issues must be addressed, along with regional and national strategies to responsibly develop the segment.

**2. Positive Environmental Impacts? (Score: Medium=2)**

- a. Aquaculture and mariculture are lower carbon protein sources than the wild-catch segment, which is already lower than beef and pork. Benefit of climate mitigation vs other animal-food segments.
- b. However, solutions are needed at scale for several negative impacts: plant-based feeds (to relieve pressure on fisheries), pollution of surrounding ecosystems, disease transmission on a large scale, and overproduction of single species rather than biomimicry with multiple species. Low impact, scalable technologies are now being implemented in all these areas.
- c. Recirculating Aquaculture Systems (RAS) seek to isolate production from the local environment. This offers many benefits to DMCs: meet sustainable seafood demand, local and export markets, independent of location, managed waste treatment, free of ocean toxins (eg, plastics, mercury).

**3. Positive Social Impacts? (Score: Medium=2)**

- a. Poverty: Employment opportunities are also high. Aquaculture job growth has been 5% per annum vs 1% for the fishing segment.
- b. Gender: In most countries men are the owners of fish ponds. Fish farming, especially pond construction, is regarded as man's work. However, women

hold more jobs than in fishing but generally at lower rates of pay and ownership than men. Women may increase ownership where cultures allow. Associations for fish-farming have been created by women (even in Bangladesh) where women perform all stages of the production chain. Today, more women are graduating in aquaculture from higher education institutes and gender parity has been achieved in some cases.

- c. Covid19: Due to market disruptions, fish farmers cannot sell their harvest, must keep live fish fed for an indeterminate period, and face ongoing problems of sourcing inputs and labor.

#### **4. Potential for Market Scalability? (Score: High=3)**

- a. Aquaculture/Mariculture has surpassed wildcatch for global seafood production, with potential to increase current production levels by 6x. Historically high growth rates continue (CAGR 7% for past 20 years).
- b. Production is more fragmented than other animal-food segments, with <\$100mn revenue companies dominating (except some salmon and shrimp producers). Opportunity to consolidate and scale.
- c. Most constraints to scalability of aquaculture and mariculture center on technology and sustainability issues: Development of plant-based feeds, Vaccines and production safety rather than antibiotics for disease control, Diversification of artificial habitats with multiple species and seagreens, Production siting to avoid environmental externalities.

#### **5. Capacity for Innovation & Growth? (Score: High=3)**

- a. The segment requires innovation - especially with the 4 features noted above - to sustainably meet the demands for farmed fish, with up to \$300bn of global investment needed by 2030. Progress on disease management - which can account for up to 40% of some species production - is urgent.
- b. Small-scale or artisanal production technologies will enable sustainable food independence for smaller nations and communities. Overall, demand for farmed fish outstrips supply: Technology needs to catch up.

#### **6. Benefit from Regional Governance Mechanisms? (Score: Medium=2)**

- a. Regional governance mechanisms are needed for scale issues, like: Large-scale production facilities, sustainable feeds, coordinated processing, distribution and certification programs.
- b. However, this is less of an issue than with the wild-catch segment as there are fewer regional production assets to manage.

#### **7. Opportunity for SMEs? (Score: High=3)**

- a. SMEs are prevalent in this segment for fish farming, feeds, processing, distribution, disease and data control technologies. Barriers to entry are generally lower than for wild-catch, which gives opportunity for SMEs and smaller nations.
- b. In this highly competitive and fragmented segment, consolidation is now underway which - by definition - creates winners and losers. Niche strategies and operations catering to local populations will still create SME opportunities.

**8. Attract Private Investment? (Score: High=3)**

- a. The fastest growing segment of the food-animal industry has been attractive to private investors for two decades. Activity is evenly split between farming operations and other parts of the value chain: feed, processing, distribution.
- b. There is a range of valuations among species and markets, which favors either industry insiders or well-informed specialty investors. Also favors patient investors as biomass takes time to build then leads to steady returns.

**REFERENCES: AQUACULTURE & MARICULTURE**

*See publications noted under Fishing & Fisheries, plus:*

Aquaculture Industry: An Ocean of Investment Opportunity. *Forbes Magazine*. April 2019

[Aquafeed.com - The Aquaculture Feed Industry's Information Gateway](#)

[Aquaculture Magazine](#)

[Aquaculture Stewardship Council | Home](#)

[Aqua-Spark](#)

[The women's blue revolution - Gender equality in Aquaculture](#). September 2018

[GAF Networks - Women in Aquaculture. 2013](#)