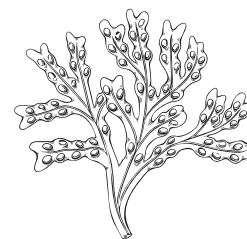


GLOBAL SEAWEED NEW AND EMERGING MARKETS REPORT 2023



EXECUTIVE SUMMARY

With its ability to sink carbon, sustain marine biodiversity, employ women, and unlock value chains, **seaweed farming demonstrates how development, climate, and nature work together to generate value and uplift communities.** Seaweed farming can help build a world free of poverty on a livable planet and has enormous growth potential. **This report has identified ten global seaweed markets with the potential to grow by an additional USD 11.8 billion by 2030** (Figure A). Yet, much of the seaweed sector's value remains untapped - it has clear growth potential beyond its current markets. Today, most farmed seaweed is used for direct human consumption, as fresh feed in aquaculture, or as hydrocolloids. However, seaweed-farmed products may be able to displace fossil fuels in sectors such as fabrics and plastics; can provide ecosystem services, such as carbon sequestration and nitrogen cycling; and can generate socioeconomic benefits in fragile coastal communities. Further, the market is currently dominated by a handful of Asian countries, which produce 98 percent of farmed seaweed by volume globally. Opportunities for growth in new regions and applications are high.

Aims and methodology

The **Global Seaweed New and Emerging Markets Report 2023** provides an analysis of the commercial opportunities for new high-growth seaweed market applications that could increase the scale of seaweed cultivation and enhance value-added seaweed processing. The report assesses realism and readiness-to-scale of technologies needed to grow more seaweed, extract increasingly valuable compounds, and create quality products for a range of markets. It assesses the potential for the industry to provide optimal socioeconomic and environmental benefits and guide entrepreneurs, investors, and policy makers towards ensuring the seaweed sector fulfills its potential now and into the future.

The report focuses on **10 relatively new and emerging seaweed applications** that have the greatest market opportunities outside the established agar, alginate, carrageenan, food and aquaculture feed sectors. It examines the ecosystem service side of the seaweed sector, providing case studies from emerging projects, along with predictions relating to whether – and how – these services could one day be monetized.

Information was gathered through interviews with key players in the sector, supported by scientific literature and market data. The interviews covered a range of topics including the applications that present the greatest opportunities for seaweed; when seaweed-based products are likely to become cost-competitive; and the challenges the seaweed sector needs to overcome.

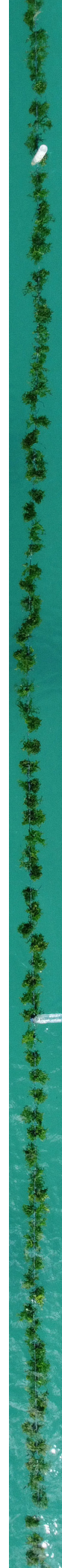
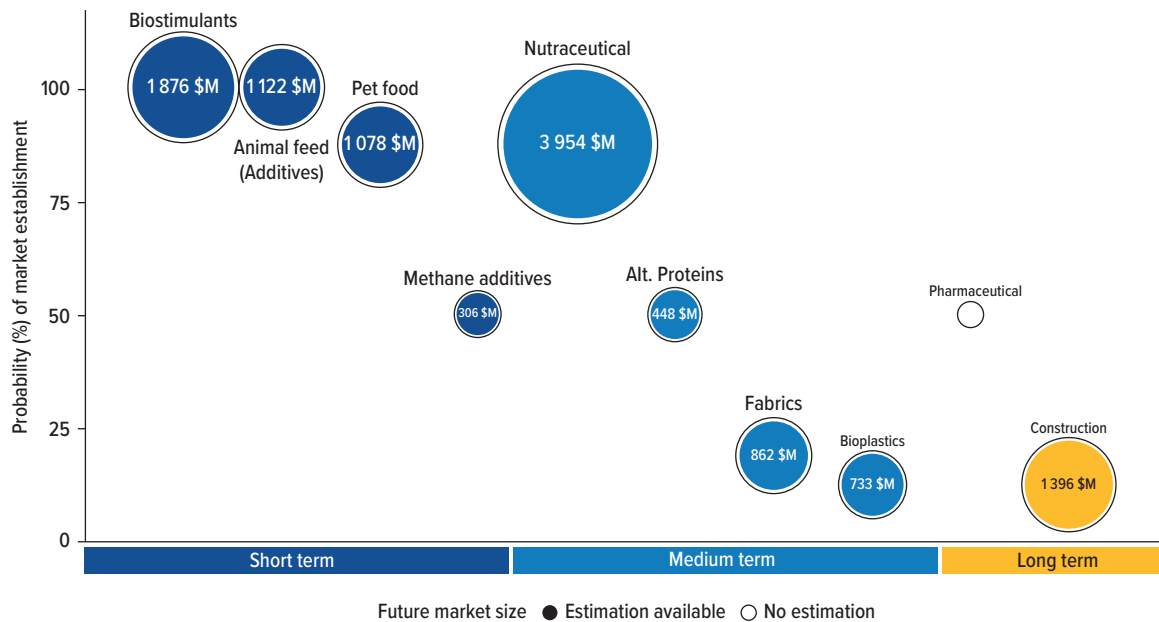


FIGURE A: Predicted seaweed market size by 2030 (\$ millions) with chance of market establishment indicated by color on a high-level market horizon timeline



Key findings of this study

Finding 1: The most promising short-term markets for seaweed (beyond conventional market applications) are biostimulants, animal feed, pet foods, and methane-reducing additives.

- Short-term markets (before 2025)

Biostimulants, animal feed additives, and pet food are the most promising short-term markets for seaweed, projected to reach USD 4.4 billion by 2030 (Figure A). Seaweed-based products in these high-growth markets already show competitive value propositions and prices. They also present low processing complexity with no significant challenges to scaling compared to other applications. Animal-feed additives reduce dependence on synthetic products and improve animal productivity by reducing feed conversion ratio. Methane-reducing additives represent a totally novel market and, even though there are significant technological and regulatory challenges, there are more vigorous efforts to overcome these in the short term compared to other markets.

Finding 2: Nutritional supplements, known as nutraceuticals, alternative proteins, bioplastics, and fabrics offer medium-term opportunities.

- Medium-term emerging market opportunities (2024–2028)

Nutraceuticals offer medium-term market entry points at high value but with the potential for regulatory hurdles to slow down the development of this market, which is projected to reach USD 6 billion by 2030. Alternative proteins, bioplastics -plastics substitutes from renewable biomass sources- and fabrics are also emerging medium-term market opportunities. Because of the challenges they face from significant production costs, prices, and functionality, these markets will need to achieve significant improvements in the cost and availability of seaweed, or else find only niche use cases in the future.

Finding 3: Pharmaceuticals and construction offer long-term opportunities.

- Long-term emerging market opportunities (after 2028)

Pharmaceuticals are thought to offer a long-term market opportunity, but with significant regulatory challenges and a high cost of product development. Due to many complex assumptions and lengthy approval times, projections on the market value for pharmaceuticals are unreliable. Construction, such as for building materials, may present a long-term emerging market **projected to reach USD 1.4 billion by 2030** but more likely as a niche application, or through waste valorization in processing seaweed for other applications.

Finding 4: To fully realize its potential, the industry will need to overcome several key issues, including the availability of seaweed, pricing challenges, and regulatory barriers.

Beyond application forecasts, a major challenge across all markets is the **availability of seaweed** because of current limitations in volume, consistency, and the quality of the supply. Current main markets, including seaweed for human consumption and hydrocolloids, are growing consistently and any new markets will have to compete with these established supply chains. This emphasizes the need to significantly increase primary production of seaweed.

In addition, the more the application competes with commodity or commodity-derived products such as plastics or construction materials, the higher the **challenge of developing competitive price levels** for seaweed.

To overcome this, **biorefinery** development presents opportunities to obtain an economically feasible process by deriving several products from a single input of seaweed. However, **competition between markets** that are based on the same compound is expected, and producers will likely switch to the higher-value markets once accessible, reducing the size of previously established markets.

Regulations will also play a significant role in the trajectory of the markets assessed and will have to be analyzed on an individual basis.

Finding 5: The climate and environment benefits of seaweed farming will help drive growth as interest in “green” products continues to increase

Overall, a major driver for most of these potential emerging markets is the “green” benefits of seaweed, and many product developers have expressed a **reliance on sustainability premiums** to generate profits.

Credit schemes relating to **ecosystem services** could potentially improve the business case for seaweed-based products, but require robust monitoring, reporting and verification before they can be widely established.

Finding 6: Ecosystem services offering environmental benefits can boost green economic growth potential

The current focus for seaweed cultivation is **provisioning services**, which relate to material benefits produced by natural ecosystems that can be extracted directly from nature to meet basic human needs. However, macroalgae provide a range of other ecosystem services that moderate, regulate, or support the natural world that have not been fully commercialized or leveraged. Multiple organizations have submitted proposals for blue carbon credits using seaweed. Based on this, it is possible that internationally recognized credit certifications for blue carbon seaweed projects will be available by 2025.

The scale-up of land-based bioremediation operations that can remove or degrade contamination, pollution, and toxins from soil and water to restore land, are expected over the next 12 months, and more attention is shifting toward the **bioremediation potential of ocean farming and macroalgae-based, integrated, multi-trophic aquaculture (IMTA)**.

Several stakeholders suggested that **biodiversity enhancement** could become one of the more important ecosystem service attributes of seaweed farming and restoration over the next decade. Nevertheless, there are some critical challenges to address for these applications: including insufficient measuring, reporting, and verifying; slow certification procedures; a lack of awareness; and a lack of alignment between members of the scientific community.

Conclusion

The seaweed sector has clear growth potential beyond its current markets and can help shape a world free of poverty on a livable planet. Enhanced seaweed production and improved value chains can contribute to meeting at least nine of the 17 U.N. Sustainable Development Goals (SDGs). For example, seaweed farming can sink carbon, sustain marine biodiversity, and employ women. At a time when global resources are increasingly overstretched, it is particularly important that the world makes the most of those resources – such as seaweed – that can both be swiftly regenerated and potentially help to regenerate the ecosystems that support them. Seaweed farming in new markets and with new applications can support development, climate, and nature work to generate value and uplift communities.



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