Summary: Seaweed Biorefining to Generate Climate and Livelihoods Benefits with Minimal Waste

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June 25, 2024
Link to full report

Seaweed farming has the potential to absorb and sequester climate-warming carbon while contributing to nature-positive industries and coastal livelihoods. Most farmed seaweed is either sold directly as human food or is processed into products for the food, pharmaceutical, and cosmetic sectors. For many seaweed products, only one compound is extracted ("single-stream processing") and up to 75-80% of seaweed biomass is discarded. Single-stream processing can limit the types of seaweed products that come to market to those with the highest economic value (such as the use of hydrocolloids as a thickening agent), rather than lower-value products with higher climate mitigation potential (such as biomass used in bioplastics and construction materials).

Seaweed biorefineries provide a way to produce these high value compounds, while simultaneously creating value from materials that would otherwise be discarded as waste. In a biorefinery setting, compounds left over from one extraction process serve as feedstock for subsequent products. Companies can increase their revenue through the sale of additional products while limiting the amount of waste they produce. If manufacturers prioritize the production of products with high climate mitigation potential from these waste streams, a biorefinery may make a significant contribution to the green economy.

The seaweed biorefining industry is currently in the early stages of development. This report seeks to inform manufacturers and investors about the potential of biorefining, with the goal of catalyzing growth in this sector. Four companies exploring commercial-scale seaweed biorefining are discussed in this report to illustrate the state of the industry.[1] These companies represent different operating models, namely the hub and spoke model (seaweed harvesting and processing occur across different locations) and the portable micro-biorefinery model (the refinery is located near the area of seaweed farming or harvesting). Each model has different strengths and weaknesses, allowing biorefining to be attractive across regions and production capabilities.

[1] EDF has no financial interest or relationship with any of these companies. EDF does not endorse any of the products or services mentioned.

The emerging seaweed biorefining industry is poised to increase the revenue and decrease the waste associated with seaweed-based products. However, for the industry to scale sustainably and for climate-positive benefits to be fully realized, we emphasize that further research and thorough environmental impact assessments are still needed.