

## What can we do with one metric ton of sargassum?

## ¿Qué podemos hacer con una tonelada métrica de sargazo?

## Que pouvons-nous faire avec une tonne métrique de sargasses?

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### EXTENDED ABSTRACT

The ‘sargassum crisis’ began in 2011, precipitated by repeated mass strandings of pelagic sargassum along Caribbean shorelines. Over the last ten years, the damage to key economic sectors and critical nearshore habitats has been enormous. The costs and manpower required to repeatedly clean and dispose of stranded sargassum in an environmentally responsible manner, are unsustainable. Hence the growing need to consider opportunities for valorizing sargassum to offset costs, mitigate damage and provide additional employment and income, especially in coastal communities that have been heavily impacted by the sargassum events.

In this FAO-Climate Change Adaptation in the Eastern Caribbean Fisheries Sector (CC4FISH) study, a Sargassum Uses Guide was developed for researchers, entrepreneurs and policy makers to provide under one cover, a comprehensive overview of the wide range of current uses of sargassum in the Caribbean and challenges faced to date (Desrochers et al. 2020). This resource also provides insight into potential uses based on examples and research from other parts of the world using different sargassum species or other brown seaweeds. Although seaweeds are commonly used by a wide range of industries around the world, they have not been widely utilized in the Caribbean. This is one of the main reasons why the region has been slow in responding to the sargassum strandings in coastal areas. Other challenges that have been identified, include sporadic and unpredictable supply (strandings), complexities and high costs related to harvesting, variable composition and presence of undesirable elements such as arsenic and salt (Desrochers et al. 2020).

The Sargassum Uses Guide includes a description of the chemical composition of pelagic sargassum and a review of the limited published data on the compositional analyses that have been carried out to date. A literature review was also conducted to determine potential uses of pelagic sargassum, looking at examples using seaweeds in general, brown seaweeds in particular, and sargassum species wherever possible. Technical details are outlined for potential uses of sargassum for fifteen different sectors: (1) Animal husbandry, (2) Crop production, (3) Antifouling, (4) Bioenergy, (5) Bioplastics, (6) Bioremediation and purification, (7) Clothing, footwear and accessories, (8) Construction materials, (9) Cosmetics, (10) Electrochemical industry, (11) Environmental restoration, (12) Food and beverages, (13) Lubricants, surfactants and adhesives, (14) Paper products, and (15) Pharmaceutical and biomedical. Although these offer a wide range of options to entrepreneurs and policy makers desirous of investing in sargassum opportunities, the choice of which ones to develop is complex. Among the many issues to consider is how much sargassum is needed for a particular product versus how much is available. To help with this, a decision support tool was developed, based on information provided by entrepreneurs and researchers currently developing commercial sargassum-based products, to assist in determining how much sargassum would be required for transformation into various value-added products. Termed the ‘Sargassum Biomass Index’ (SBI), this tool is able to give an estimate of what could be produced from one metric ton of fresh sargassum (Desrochers et al. 2020). Although a crude index, it demonstrates the wide range of possible products, and helps to inform what might be possible with regard to ‘scaling-up’ potential uses. It thus highlights which products would utilize large volumes of sargassum biomass (e.g. building blocks, renewable energy, bales, activated carbon) versus which products require minimal amounts (e.g. shoes, soaps, business cards, plates).

With millions of tons of sargassum biomass now reaching Caribbean coastlines annually, there is great opportunity to transform this current hazard into something of value that could support livelihoods, defray current clean-up costs, and even provide sustainable alternatives to existing products. As job losses continue to soar throughout the region due to the COVID-19 pandemic, new entrepreneurial ventures utilizing sargassum could offer much needed relief. Furthermore, with the increasing interest in developing blue economies in the Caribbean, sargassum innovations could be considered as blue growth initiatives to be integrated into blue economy strategic frameworks supporting economic diversification and resilience, while reducing economic vulnerability.

Although the SBI gives an approximate indication of the amount of sargassum required for a particular product, and will therefore help in determining the suitability for investment in a specific venture, there are, of course, many other important factors that must be considered to determine a fit-for-context business plan. These include sargassum harvest, transport and



**Figure 1.** Schematic illustrating the crude Sargassum Biomass Index output to show relative product yields that could potentially be produced from one metric ton (1000 kg) of fresh sargassum (from Desrochers et al. 2020).

storage costs, infrastructure and equipment costs, operating expenses, projected demand and profits, level of technical expertise required, as well as environmental and social impacts *inter alia*.

The lack of well-developed governance arrangements or specific focus on supporting commercialization of sargassum in most countries continues to constrain the development of uses for sargassum, particularly large-scale commercial enterprises, and is complicated by uncertainty and the transboundary nature of the mobile sargassum. In addition, the lack of a regional policy that speaks to the harvesting of sargassum as a shared resource is a hindrance for the development of large-scale, mobile, offshore harvesting enterprises. The lack of local harvest regulations also increases the uncertainties faced by businesses using sargassum as a raw material.

Management and regulation to support commercialization of sargassum is particularly difficult at this relatively early and uncertain stage of development. However, a number of actions are suggested to promote the development of sargassum industries:

A focus on adaptive management strategies or plans tailored to local circumstances would be appropriate, especially given the current uncertainties, allowing frequent review, updating and incorporation of lessons learned.

The general lack of governance arrangements (policies, management plans and regulations), applicable to sargassum harvesting and use, needs to be addressed.

Government policies and programmes need to present a more attractive and enabling environment that fosters innovation and supports the expansion of existing enterprises and the development of new industries using sargassum biomass.

Protocols and standards need to be developed to prevent environmental damage and ensure the safety of products for consumptive or contact uses.

**KEYWORDS:** sargassum, seaweed, valorization, uses, blue economy

#### LITERATURE CITED

Desrochers, A., S-A. Cox, H.A. Oxenford and B. van Tussenbroek. 2020. Sargassum uses guide: a resource for Caribbean researchers, entrepreneurs and policy makers. Report funded by and prepared for the Climate Change Adaptation in the Eastern Caribbean Fisheries Sector (CC4FISH) Project of the Food and Agriculture Organization (FAO). Centre for Resource Management and Environmental Studies (CERMES), University of the West Indies, Cave Hill Campus. Bridgetown: Barbados. CERMES Technical Report No. 97, 172 pp.