

Sargassum: From Horror to Hope

Sargassum: Del Horror a la Esperanza

Sargasse: De l'Horreur à l'Espoir

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EXTENDED ABSTRACT

Prior to 2011, for most residents of the Caribbean, the word *Sargassum* was meaningless. Since then, as the region has been affected by unprecedented standings of *Sargassum* sp. on the windward shores of its islands, it has become a household word. The amounts of the pelagic *S. natans* and *S. fluitans* coming ashore reached critical levels in 2015 and again in 2018 with some Barbados declaring the mass standing event a national emergency. There have been devastating consequences for; wildlife, with dozens of endangered sea turtles, dolphins and other species killed. Sensitive ecosystems including seagrass beds and mangroves have also been negatively impacted. Since regional and international media coverage of the issue often painted the region as being completely covered by decaying *Sargassum*, the damage done to the reputations of the islands as potential holiday destinations is significant. The tourism industry has suffered from hotel cancellations and hoteliers have incurred additional costs as they sought to clean the beaches, and on occasion had to transport their guests to beaches which were *Sargassum*-free. Narrow bays and inlets have been especially heavily affected by sargassum, which once it enters becomes trapped, stagnates and decomposes. Hydrogen sulphide produced from decomposing sargassum may result in respiratory ailments and the noxious odours have made life difficult for nearby communities. As *Sargassum* covered kilometres of coast line and filled bays on the eastern and southern coasts of the islands, there was a significant negative impact on fisheries. It became difficult for fishermen to launch their craft, land catches (Figure 1.) and navigate, especially at night when floating *Sargassum* was difficult to detect. Encountering *Sargassum* at sea carried the risk of damage to craft, and previously plentiful target species were more difficult to find, hook or net.

The region was unprepared for the onslaught. Governments, coastal property owners and managers initiated cleaning efforts using the available machinery which was typically heavy trucks and tractors unsuited for the delicate work required. Cleaning and removal efforts resulted in damage to sensitive ecosystems with the loss of large amounts of sand. These efforts highlighted the need for national management plans/frameworks with beach-specific strategies and prioritisations in order to achieve the most efficient use of time and resources. For this to be successful, multi-sector civil and government partnerships are key, and public education, monitoring and research are required. The development of cleaning techniques and strategies, the acquisition of equipment and the hiring of staff all require significant amounts of funding (Figure 2). There is a heavy cost associated with *Sargassum*, not simply the negative economic impact of its presence, but the cost of management.



Figure 1. Fishing boats surrounded by *Sargassum* on the east coast of St. Lucia in June 2018.
(Source, The Voice of St. Lucia).

While the negative impacts and costs of *Sargassum* landings are undeniable, with this sea of algae also comes a wave of opportunity for innovation and new economic activity. Research and pilot studies are needed to determine what is feasible for the region and to empower individuals and stakeholders. To this end, the Climate Change Adaptation of the Eastern Caribbean Fisheries Sector Project (CC4FISH) has embarked on a *Sargassum* sub-project with the goal of producing a comprehensive and detailed *Sargassum* management guide, as well as a uses document providing resources and information. Thousands of tonnes of algae wash onto shores in the Caribbean and while some countries have started investigating its use, e.g. Red Diamond fertilizer and Miracle Mix soil amendment in Barbados, and Algas with its *Sargassum* derived liquid fertiliser in St. Lucia, only a small fraction of *Sargassum* is currently being utilised. The project explores some of the options for value to be added to *Sargassum* in the areas of Extraction, Agriculture and Manufacturing showing that, not only can we hope to balance the negatives of the *Sargassum* influx with positive activities, but we can exploit it as a potentially valuable resource. This information forms part of the basic structure of the CC4FISH uses document.

Algae has for many years been an important source of compounds useful to other industries. One of the most commonly extracted compounds from algae of the *Sargassum* genus in other regions is sodium alginate (low %). This is used in the food industry as a stabiliser, thickener and emulsifier and is highly marketable (Oyesiku and Egunyomi 2014). There has been a wide range of other commercially interesting compounds discovered in *Sargassum natans*. With these, there are potential applications in the biochemical, pharmaceutical and nutraceutical industries (Jayasankar 1993) and with research and development these could lead to welcome income and economic activity.

Sargassum also has value dried, fresh or composted. It has been shown to have positive results on crop growth and seed germination. *Sargassum* can be very effectively used as mulch, soil amendment, liquid fertilizer and seed germination medium, as seen in the popularity of its use throughout the Caribbean islands. The use of *Sargassum* products can reduce the importation bill of agricultural inputs and generate foreign exchange through export. Another possibility is the production of biochar which is similar to charcoal and is produced by pyrolysis of organic matter. It is

added to soil and believed to increase water and nutrient retention, improving the quality (Karhu et al. 2011) and the growth of the organisms planted in it. We believe that *Sargassum* would make an excellent source of biochar and could help the agriculture sector significantly (Roberts et al. 2015). *Sargassum* has great potential as a source of animal feed/ supplements with high nutritive and digestive values. It has been successfully tested on a range of animals including sheep (Marin et al. 2009).

Another possible use for *Sargassum* is the creation of bioplastics, cardboard and paper. As single use plastics are being phased out around the globe the demand for alternatives to petroleum-based plastics is high. Sodium alginate extracted from *Sargassum* can be used to create bio-plastic (fully biodegradable plastic substitute) which would be a desirable alternative to water bottles and other traditional plastic options (Lim et al. 2018). There has been little research on the production of paper pulp from *Sargassum*. However, the results from investigations using other brown algae (Mukherjee et al. 2018) suggest that it might be a viable option. With countries in the Caribbean implementing legislation to ban Styrofoam and single use plastics, the

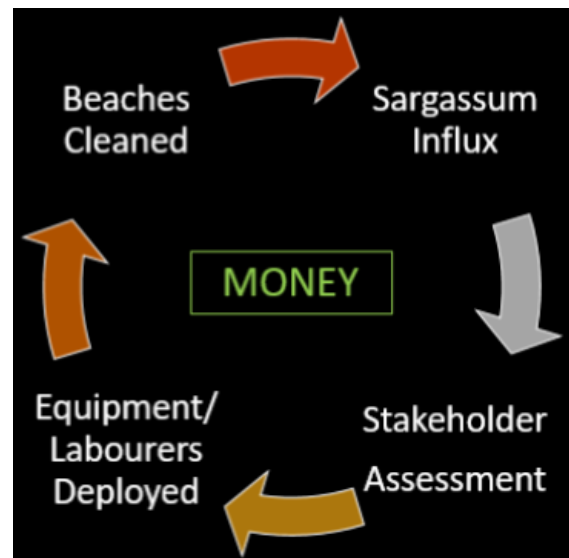


Figure 2. The general response to a *Sargassum* influx in the Caribbean.



Figure 3. *Sargassum* based agricultural products. From the left; Miracle mix soil amendment (Barbados), Total Plant Tonic (St. Lucia) and 100% *Sargassum* Compost (Barbados)

use of *Sargassum* to create environmentally friendly alternatives would be a major benefit to the region.

The utilisation of *Sargassum* is still in its infancy and there are a number of hurdles to overcome. *Sargassum* is expensive, difficult to harvest and transport, and financing is not readily available. Supply may also be an issue as *Sargassum* landings are unreliable and it is difficult to develop a business without surety. However, there are methods of drying and preserving *Sargassum* when it does land in large amounts to ensure future availability. One of the most important factors is contamination. Whether from sand and epi-biota or even perhaps heavy metals, the contaminants present in *Sargassum* could render it unsuitable for options related to food and animal feed. Decontamination is costly and time consuming. Before utilisation it will be important to have *Sargassum* tested to ensure that it is suitable for its projected use. *Sargassum* is a major problem for the region but with investment and innovation, this problem could turn into one of our greatest assets.

KEYWORDS: *Sargassum*, fisheries, CC4FISH

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