

## Sustainable Seaweed: Could this be the Next Big Thing?

## Alga Marina Sostenible: ¿Podría ser la Próxima Gran Cosa?

## Durable algue: Peut-être la Prochaine Grande Chose?

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### ABSTRACT

Belize's fisheries, like so many around the world, are in decline. The cumulative impacts of climate change, coastal development and unsustainable fishing practices threatens the viability of the fisheries industry and the livelihoods of people who depend on it. Fishers are finding it harder to secure stable incomes, resulting in increased fishing pressure, and thus, further aggravating the situation. The Nature Conservancy has been working closely with the Placencia Producers Cooperative Society Limited (PPCSL), a fishing cooperative, in piloting sustainable seaweed farming that employs fishers and women in the community. Sustainable seaweed farming has the potential of being a part of the solution for fishers and fish alike. Belizean fishers have traditionally harvested seaweed while fishing as supplemental income to the traditional catch of lobster, conch and finfish. In addition to providing additional income for fishers, sustainable seaweed farms provide habitat for coral, conch and lobster recruitment and may promote replenishment and restoration. Through an agreement with the Government of Belize, seaweed farms are set aside as no-fishing (no-take) areas with the exception of harvesting seaweed allowing for protection of nursery sites for conch and lobster. The scheme has proven to have the potential for scaling up, providing sustainable livelihoods while also aiding in restoring commercially important species. This model could protect biodiversity, promotes food security and diminishes climate vulnerability of fishing communities.

KEY WORDS: Sustainable seaweed, sustainable livelihoods, Belize, nursery, replenish

### INTRODUCTION

Belize is located in Central America; with over 300 miles of coastline it is no surprise that approximately 38% of its population is located in coastal communities (Neal et al. 2008). These communities are heavily dependent on these resources for food and as a means to sustain their livelihoods. In 2012 the sector supported about 3,000 fishers and total fishery exports earning of US\$12.98 million (Belize Fisheries Department 2012). Marine Protected Areas (MPAs), seasonal closures, catch quotas, gear restrictions and managed access are strategies currently employed by the Belize Fisheries Department to manage the fishery sector. The Nature Conservancy recently spearheaded the development of an economic alternative and fisheries diversification plan (Fish for Life Plan) to identifying areas for diversification to sustain fishers livelihoods while decreasing pressure on wild stocks; designed for fishers by fishers.

Seaweed farming was identified as a potentially sustainable and profitable venture. Sustainable seaweed farming is an environmentally sound practice that, if well designed, has the added benefits of protecting key habitats and species while providing alternative livelihoods for fishers, thereby promoting healthy systems in some of the more heavily used coastal locations, balanced use and improved livelihoods for a struggling fishing sector.

Until about 1980, most of the seaweed production from other nations in the region has been from the harvest of wild stocks although limited culture took place in nations such as the Philippines and Indonesia (Trono 1990). Seaweed has been traditionally harvested from the wild by Belizean fishermen in small quantities on their various fishing trips aside from their primary catch, fin fish, conch and lobster. In Placencia Village, the PPCSL has begun piloting seaweed farming as an alternative livelihood, specifically *Euchema isiforme* and *Gracillaria* spp. Both are red algae species found in Placencia.

Having piloted with the PPCSL, TNC's intervention will improve the ability of Cooperatives at the national level to sustainably harvest seaweed, with special emphasis on conservation practices that reduce fishing pressures and target the replenishment of commercial fisheries stocks, and diversification of the cooperative's income through sustainable production of seaweed. The design and placement of seaweed farms will also be key for restoring resilient reefs. The establishment of a centre of excellence will provide training for fishers, highlight conservation values, facilitate replication, provide quality assurance, and control of seaweed production, as well as provide permanence to retain long-term know how and share lessons across the country and the region.

### METHODS

The Placencia Cooperative has been farming seaweed for the past five years and has over time experimented with various farming methods.

PPCSL Seaweed farming process:

- i) Finding suitable site- preferable clean, clear waters, free flowing current, sandy base and depth between 4 - 8 feet, which facilitates easy planting and monitoring. Based on recommendation from the Belize Fisheries Department areas within existing marine reserves are preferred as it gives the ministry full authority to approve sites for seaweed harvesting.
- ii) Each farm consist of 50 ft by 50 ft plot with eleven ropes submerged mid-way and anchored on buoys to support the weight as they grow. Ten of the eleven roped are used for production and one for seed stock. The one rope for seed stock is planted directly in mesh bags to hold and secure seeds from washing away in currents.

- iii) Monitoring is done at least once every two weeks to ensure other algae and sediments are removed from the seaweed plant to ensure free growth and to ensure the structure of the farms. Depending on size of the original stock, frequent monitoring and current flow harvesting may be done every three-four months.
- iv) Raw seaweed is then harvested, soaked in fresh water and then put out in the sun to dry
- v) Dried seaweed can then be processed into other value added products such as gels, soaps, shampoos etc.

The Centre of Excellence seeks to fine tune this methodology to achieve restorative functions for key commercial species and resilient reefs in addition to maintaining sustainable seaweed farming practices in various ways.

- i) The seaweed farms provide suitable habitat for spiny lobster and coral larvae. As such, anchors for the seaweed farms will be modified to create lobster shades and provide artificial lobster habitat.
- ii) Site selection for seaweed farms will rely on several factors including
  - Proximity to calm waters for all life stages of the spiny lobster and for coral recruitment.
  - Clear and shallow water of 6 - 12 meters which is beneficial to lobster recruitment
  - Hard substrate to prevent subsidence of shades while reducing impact on other organisms.
  - Proximity to coral reefs and seagrass beds to provide for migration to surrounding habitat
  - Proximity to resilient reef sites to bolster habitat protection of these critical areas.

The design of the lobster shades must have multiple entrances, shaded, offer protection from predators and be robust enough to withstand seasons and be low maintenance.

## RESULTS AND DISCUSSION

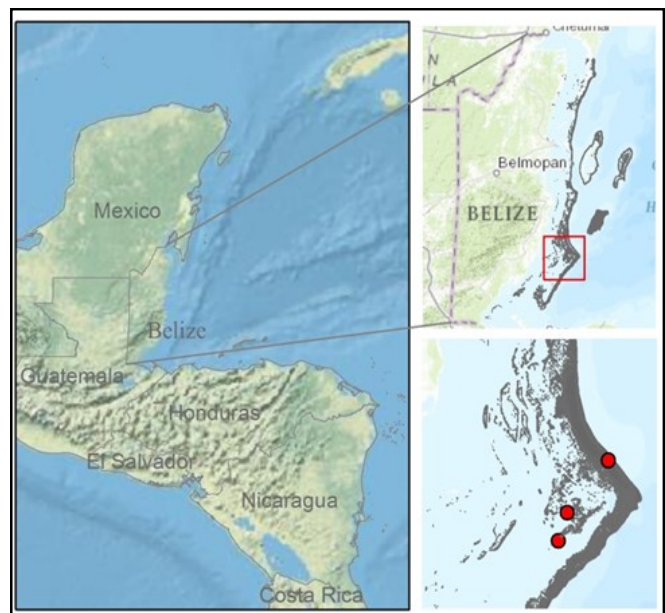
The initial pilot project saw the development of twenty 50" X 50" farms. A recent signing of a Memorandum of Understanding between the Cooperative, the Belize Fisheries department and the Southern Environmental Association (co-managers of the Gladden Spit and Silk Cayes Marine Reserve) has granted them a five year concession to utilize the land to sustainably farm seaweed and designated the area as an area of non-extraction. Under the MOU it provides for training of Cooperative staff to be deputized as fisheries officers to aid in enforcement and monitoring. To date the Cooperative has a total of 44 farms in three locations (Figure 1), each with the capacity of producing 50 - 100 pounds of dried seaweed per quarter with local market price of US\$15 per pound; yielding a gross yearly income of US\$120,000 - \$240,000 (US\$10,000 - \$40,000 per month) (Dubon 2015). However, actual figures are significantly lower due to a decrease in the number of seaweed farmers since the inception of the project leading to improper management and poor market-

ing resulting in a low number of buyers. Other value added products, namely seaweed gels, soaps and smoothies are sold. Figure 2 depicts overall sales during said time period.

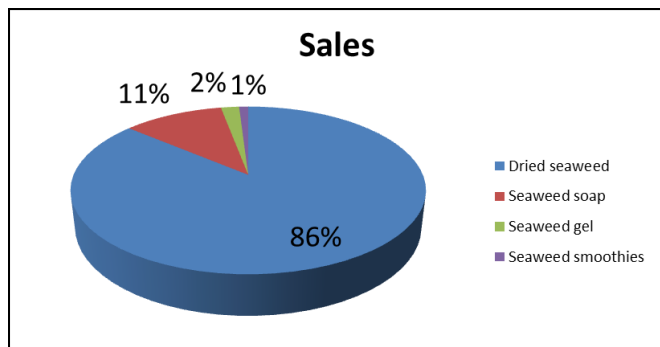
Recent partnership with Fragments of Hope, an NGO whose mission is to reseed devastated reefs in Belize, has also highlighted the possibility of transplanting coral nurseries in the seaweed plots to expand their diversity.

The cooperative has provided training to other fishers across the country as well as engaging other fishers in the region. Most recently they were a part of a fishers exchange visit with Colombia to provide training on seaweed farming practices.

Economically, Spiny lobster is the single most important fishery in Belize valued at US\$11 million in 2013. While almost all spiny lobster fisheries are considered either overfished or fully exploited, the market demand continues to rise. Careful design and placement of seaweed farms will serve to replenish reproductive lobster populations in strategically selected sites across the country. Proper placement will also ensure that habitat for juvenile queen conch is protected. This concept, while still in the design phase combines environmentally sound mariculture with the added benefits of protection of key habitats and species and promoting healthy systems and balanced use in heavily used coastal locations. If the scheme is proven to be effective, a Center of Excellence will be established to provide the capacity for expansion of this model throughout the Mesoamerican Reef and Caribbean region.



**Figure 1.** Map showing Belize in relation to the Mesoamerican Reef and the location of existing seaweed farms in relation to reef areas.



**Figure 2.** Revenue from seaweed sales, soaps, gels and smoothies from November 2013 - April 2015.

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