The renewed interest in the cultivation of seaweeds, as the inorganic extractive component of Integrated Multi-Trophic Aquaculture (IMTA) systems, for the ecosystem services they provide, and novel applications through biorefinery in a circular economy approach

Thierry Chopin
Seaweed and Integrated Multi-Trophic Aquaculture Research Laboratory, University of New Brunswick, Tucker Park Street 100, Saint John, New Brunswick, E2L 4L5, Canada
tchopin@unb.ca

Seaweed cultivation is well established in Asia and needs little explanation or justification. In the western world, a renewed interest in seaweed mariculture has been triggered by their cultivation in IMTA systems, the emerging understanding of the ecosystem services they provide (e.g. nutrient biomitigation, irrigation-less and deforestation-less food production, oxygen provision, habitat restoration, carbon sequestration, coastal acidification reduction, etc.) and the development of novel uses and applications.

However, we should not forget that, systematically, green, red and brown algae do not have much in common and are an unnatural (polyphyletic) grouping. They have very different life histories and, consequently, their culture techniques vary widely. One could say that farming green, red and brown seaweeds is as different as farming chicken, kangaroos and alligators; therefore, it is imperative to know the biology, physiology, biochemistry, etc. of these organisms very well before attempting their cultivation, as they are definitely not the “low-hanging fruits” of aquaculture. Hopefully, as people in the western world begin to recognize the benefits seaweeds offer them and the environment, we will see the emergence of this aquaculture sector, instead of finding ourselves sitting on a missed opportunity.

To bestow full value to seaweeds and IMTA, extractive species need to be valued for not only their biomass and food trading values, but also for the ecosystem services they provide. The value of these ecosystem services should be recognized, accounted for and used as financial and regulatory incentive tools (e.g. nutrient trading credits). The IMTA multi-crop diversification approach (fish, seaweeds and invertebrates) could be an economic risk mitigation and management option to address pending climate change and coastal acidification impacts.

Perceptions should change. Recycling should be encouraged not only on land and in agriculture, but also at sea and in aquaculture. Nutrients should not always be considered as wastes or by-products, but instead as co-products within a circular economy framework.

Evolving from a linear approach, business models should embrace the emerging Integrated Sequential BioRefineries (ISBR) concept of manufacturing diverse products for a wide variety of applications.

Humans will soon have to broaden their thinking from mostly land-based agronomic solutions and fed finfish aquaculture operations for securing their food, or for providing many other derived products, and turn to responsible aquanomy to manage their “aquatic fields”. Extractive aquaculture of seaweeds/aquatic plants/mollusks/crustaceans/non-fed finfish now represents 54.4% of the world aquaculture production, but is unevenly distributed globally (97.6% of seaweed aquaculture is taking place in 6 Asian countries) and needs to increase.