

Mitigating the impacts of climate change through the promotion of seaweed aquaculture in Southeast Asia

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Over the past decade, climate change and its anticipated impacts are among the priority issues being discussed in the national and international arena including several fora under the fisheries sector. In Southeast Asia, the prominent concerns about climate change include a warming atmosphere, increasing seawater temperature, rising sea level and acidification, extending period of El Niño, as well as frequent extreme weather and climate events, among others. As for the aquatic habitats and fishery resources, the impacts of climate change could include degradation of habitats due to extreme drought or flooding in major rivers and their tributaries, coral bleaching, adverse changes in the distribution of aquatic animals and their breeding, spawning, and nursing grounds, or even survival of the species due to changes in water temperature and ocean circulation.

While the major contributors to climate change are identified to be from several sectors, *e.g.* agriculture, forestry, and other land-based industries; the fisheries sector is also considered a contributor, especially from the use of carbon fuel in fishing and aquaculture activities providing direct emission of greenhouse gases. In a broader picture, irresponsible fisheries and aquaculture practices, such as exploitation of non-target species or juvenile fishes, ineffective handling and utilization of fish catch, unsustainable use of fish-based ingredients for aquaculture, etc., also resulted in a situation where fishing efforts are unnecessarily increased to obtain a sufficient amount of fish to attain food security. Nonetheless,

there are sound fishery activities that could also provide a way to mitigate climate change.

Seaweed aquaculture in Southeast Asia

In Southeast Asia, the culture of seaweeds significantly contributes to aquaculture production. In 2021, out of the 24.8 million t of total aquaculture production in the region, 43 % (10.7 million t) was derived from seaweed aquaculture. The major seaweed species cultured were *Eucheuma*, *Kappaphycus*, and *Gracilaria* with Indonesia, Philippines, Malaysia, and Viet Nam being the major seaweed aquaculture producers.

Seaweeds are used not only for human consumption but also as food additives and by pharmaceutical and cosmetics industries. Seaweed aquaculture is therefore one of the important income-earning industries that contribute to the economic growth of the respective countries in the region.

Environmental contributions of seaweed

Aside from food and other industrial applications, seaweeds have other potential contributions to the environment. Seaweeds can absorb excess nutrients in the coastal waters preventing eutrophication (Kee *et al.* 2023). Also, seaweed aquaculture has been advocated as a tool for carbon sequestration to reduce the effect of climate change (Duarte *et al.* 2017).

Regional projects toward the promotion of seaweed aquaculture

The research and development on seaweed aquaculture have long been undertaken by the SEAFDEC Aquaculture Department (AQD), which includes the farming of *Gracilaria* and *Kappaphycus*. Micropropagation techniques were recently developed for *Kappaphycus alvarezii* to mass-produce plantlets for seaweed farming in the Philippines. The culture of seaweed with other aquatic organisms has also been experimented as part of the integrated multi-trophic aquaculture or IMTA initiative of AQD. Moreover, SEAFDEC also embarked on several regional projects to further promote the region-wide



adoption of seaweed aquaculture technologies.

- *USAID Southeast Asia Fisheries Partnership*

The project “USAID Southeast Asia Fisheries Partnership” is a regional project implemented by SEAFDEC with support from the United States Agency for International Development/Regional Development Mission for Asia (USAID/RDMA). Executed since October 2023 for a period of five years, the Project Component “Exploration of Integrated Multi-Trophic Aquaculture for Biodiversity Conservation, Blue Economy, and Climate Change Mitigation” is implemented by SEAFDEC/AQD. The Component aims to provide an opportunity to research and assess seaweed farming areas and wild seaweed utilization areas, and to explore appropriate integrated multi-trophic aquaculture by growing seaweed together with other commercial marine species for biodiversity conservation. The research and assessment results can provide guidelines and recommendations for the sustainable management of freshwater/coastal habitats as well as support the promotion of appropriate integrated multi-trophic aquaculture using seaweed-based farming to facilitate blue economy development in the region.

- *Blue Horizon: Ocean Relief through Seaweed Aquaculture*

“Blue Horizon: Ocean Relief through Seaweed Aquaculture” is another project supported by the Global Environment Facilities (GEF) with the World Wildlife Fund, Inc. (WWF-US) as an Implementation Agency, SEAFDEC as the Regional Executing Agency, and the Bureau of Fisheries and Aquatic Resources (BFAR) Philippines and Department of Fisheries (DOF) Viet Nam as National Executing Agencies. With a duration of four years starting from July 2024 and the objective to create new sustainable seaweed value chains that will deliver ecosystem services and provide socioeconomic benefits, the Project will be implemented in two sites in the Philippines and three sites in Viet Nam. In addition to seaweed culture, the Project will include pilot testing of value-adding technology and the establishment or strengthening of community-based value-adding small and medium-sized enterprises (SMEs) to be operated by seaweed farmers.

Conclusion

Through these projects of SEAFDEC, it is expected that regional policy and approaches will be developed to enhance the capacity of the seaweed industry in the region to support the sustainable management of coastal habitats. The upscaling of seaweed farming and relevant industries along the value chain would contribute to people’s well-being through economic and social benefits such as secured livelihood, increased employment, and improved food security. Moreover, the ecosystem services provided by seaweed farms, *e.g.* absorbing organic matter and excess nutrients from seawater, mitigating eutrophication and ocean acidification, improving habitats to serve as nursery grounds and spawning areas for fish and other aquatic animals, and removing carbon dioxide from the atmosphere, would also be enhanced. With these initiatives, it is expected that seaweed culture will contribute to the global efforts to reduce marine pollution and, at the same time, mitigate the effects of climate change to sustain the future of the next generations.

References

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