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Environmental impact of seaweed culture

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disease, and swollen stipe-twisted frond disease. *Porphyra* is affected by the following diseases which are encountered during artificial seedling production and grow-out phases: filemot spot disease, red-rot disease, white-ring disease, shark skin-like disease, and white-rot disease. *Eucheuma* has been afflicted by "ice-ice" disease which seems to be preceded by poor nutrition and low phosphate concentration. *Gracilaria* in ponds is reported to be affected by epiphytic infestations (e.g., *Enteromorpha, Chaetomorpha, Ectocarpus,* and *Polysiphonia).*

In the Republic of Korea, the two principal cultured seaweeds - *Porphyra* and *Undaria* - are affected by fungal and bacterial infections as well as by environmental conditions like high temperature and low nutrient levels and by the overcrowding of installations.

Source: *Seaweed Health Management* by Jun-ichi Tsukidate, Chen Jia Xin, Yong Gun Gong in **Fish Health Management in Asia Pacific,** ADB/NACA, ADB Agriculture Department Report Series No. 1, June 1991.

Item Three

Environmental Impact of Seaweed Culture

Seaweed culture has expanded rapidly over the past few years. In 1987, the Food and Agriculture Organization of the United Nations estimated 3,139,473 tons (wet weight) of seaweed to have been produced throughout the world with the bulk from Eastern Asia. This expansion has brought benefits in terms of income, employment, and foreign exchange, but has also been accompanied by some conflicts with other users of the coastal zone and concerns over potential environmental impact.

Physical aspects

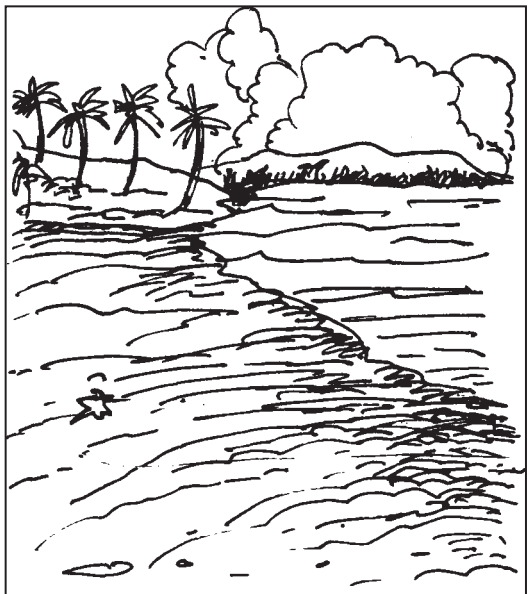
Site preparation of some species involves removal of rocks and other obstructions and potentially competitive grasses or predators. Such operations could result in some damage to coastal ecosystems, and in some instances the loss of species of conservation interest, such as seagrasses. The routine management of seaweed farms in shallow waters, such as *Gracilaria* or *Eucheuma* farms, can result in additional damage through trampling and accidental damage.

There is also some potential for large scale farms, such as the large areas covered by *Laminaria japonica* culture in China, to influence coastal water movement. There is the possibility of enhanced sedimentation, but seaweed farms can also protect coastal areas from erosion. Large seaweed farms may also help protect other more sensitive culture species and systems. For example, *Laminaria japonica* culture zones (in China) are used to shelter areas where more fragile and sensitive culture species and systems, such as mussel or scallop culture, are located. Introduction of seaweed culture rafts, ropes, anchors, and other structures can increase the surface area of substrate which particularly in open waters, may enhance production of other marine organisms in otherwise barren areas in the same way that artificial reefs have been shown to do. Seaweed culture may also be used very effectively to rehabilitate degraded coastal areas and enhance production from otherwise unproductive and barren environments.

Aesthetic aspects and multiuser conflicts

The potential aesthetic impact of aquaculture has dominated arguments over aquaculture development in some countries and aquaculture planners have to ensure that potential aesthetic

changes are considered during the development of new aquaculture ventures in order to avoid conflicts with other users. The recent conflict over the development of seaweed farming on Tubbataha Reef in the Philippines is probably one example where some of the user conflicts were derived from concern over potential aesthetic impacts. The large area required for economically viable seaweed culture in some countries has resulted in significant conflicts with users concerned with visual impact and others, such as fishermen and tourists, concerned with access.



Aesthetic considerations come into play when considering site selection for seaweed farming.

Ecological aspects

Seaweed culture is an extensive culture system which relies mostly on a natural nutrient supply. The reliance on natural nutrient supply is such that there is potential for seaweed culture to deplete coastal waters of nutrients. The effects of nutrient depletion have not been wen-studied, but nutrients diverted through the macroalgae, rather than phytoplankton food chains could affect patterns of nutrient recycling and secondary productivity. The removal of nutrients in high density culture areas also has implications for the long-term viability of seaweed farming itself.

So far, there are only a few reports of chemicals used in seaweed culture to control disease, remove fouling organisms and predators, and to assist processing. Formaldehyde has been used for controlling the growth of epiphytes on *Gracilaria* and slaked lime has been used to control other predators. It is important to ensure that practices continue to be conducive to production of a healthy project with minimal environmental impact.

The influence of seaweed culture on benthic communities has not been well studied. Shading or smothering by large scale seaweed farming could potentially reduce benthic productivity in shallow inshore areas. Increased sedimentation of organic matter from seaweeds and associated organisms could also increase benthic production in areas with low current velocity, although there may be some community changes. The area below seaweed culture areas can be used for production of other aquatic animals. For example, farms in Republic of Korea, Japan, and China find that the benthic area below seaweed farms can be used for culturing invertebrates such as abalone or sea cucumber, thus maximizing production and profit per unit area.

Seaweeds and farm structures (ropes, buoys, rafts, etc.) may also have a significant influence on coastal invertebrate and vertebrate populations. The introduction of seaweeds and structures can considerably enhance the productivity of invertebrates and fish in much the same way as artificial reefs, due to increased availability of shelter and food organisms.

Source: *Environmental Aspects of Seaweed Culture by* M.J. Phillips in **Regional Workshop on the Culture and Utilization of Seaweeds.** Vol. II, NACA. Bangkok. Thailand, August 1990.