

## The Role of SEAFDEC/AQD in the Seaweed Industry of the Philippines

By SEAFDEC Aquaculture Department

In 2010, seaweed production in the Philippines was about 85,000 metric tons (MT) that represented a good 70% of the total aquaculture production of the country. More than 170,000 Filipinos are deriving livelihood, either directly or indirectly, from seaweed farming but only 57,000 hectares (ha) or 23% of the total potential areas for seaweed farming of about 255,000 ha in the country are operational seaweed farms. Seaweed export in 2010 was about 35,000 MT valued at USD 155 million while seaweed carrageenan export was 17,000 MT valued at USD 116 million mostly produced by the 15 carrageenan processors in the country with an estimated capacity of 34,500 MT.

By the middle of the 70s, the development of farming technology on *Kappaphycus alvarezii* and *Eucheuma denticulatum* significantly increased seaweed production in the Philippines. Then for several decades that followed, the Philippines was the world's number one producer of raw materials for carrageenan production but was later replaced by Indonesia starting 2008. Indonesia produced about 108,000 MT of seaweeds in 2010.

The Aquaculture Department (SEAFDEC/AQD) began its research work on seaweeds in the late 1980s with the primary aim of increasing seaweed production in the Philippines by improving culture techniques and developing new strains of cultivable seaweeds. Land-based tanks and sea-based cages were being developed as nurseries to supply healthy seedlings to farmers. The capability of seaweeds as extractive biofilter species was also promoted by AQD in integrated aquaculture.

For *Gracilaria* and *Kappaphycus* in particular, AQD researchers have developed techniques for farming *Kappaphycus* and culture of *Gracilaria* in tanks, established methods for growing *Kappaphycus* and *Gracilaria* from spores or tissues in the laboratory, explored the use of *Gracilaria* as biofilter in a recirculating water system for milkfish broodstock as well as in brackishwater ponds, and collected samples of seaweeds from the wild for characterization of carrageenan quality, for genetic profiling, and for taxonomic identification. These research activities had allowed AQD scientists to come up with an extension manual titled "The Farming of the Seaweed *Kappaphycus*" in 2000 and a taxonomic guide on the "Seaweeds of Panay" in 2006.



The seaweed *Kappaphycus sp* in a tank set-up at SEAFDEC/AQD's Tigbauan Main Station

Recently, the seaweed researches of AQD have come up with "new" plantlets of *Kappaphycus* produced in the laboratory through tissue culture. This is in response to the need for planting materials which is often the problem of newly established farms or when adverse weather conditions devastate existing farms. When super typhoon Haiyan cut a path of destruction across the Philippines in November of 2013, among those hardest hit were the seaweed farmers. They did not only lose their crops, but were also left with no planting materials to start the next season. These new plantlets are timely not only as new planting materials but also for their faster growth. The AQD plantlets are currently being field tested in the seaweed farms in the Philippines where they are reported to be performing very well with growth rates of 6-7% per day compared to the 2 -5% growth rates of seedlings from cuttings that the farmers have been using for many years. The Seaweed Industry Association of the Philippines was impressed by the performance of the AQD plantlets that they now request AQD to produce planting materials for a particular strain of *Eucheuma* called "milyon-milyon" because this strain is also very important to the industry. The hard work of our seaweeds group, currently headed by Miss Maria Rovilla Luhan and also



Close up of *Kappaphycus* plantlets

by *Dr. Anicia Hurtado* during the early years, has paid off. These developments came after many years of testing and refinement.

In the area of capacity building, AQD through its Training and Information Division offers a yearly specialized training course on “Seaweed Farming” starting in the early 90s up to the present. This 15-day course consists of lecture sessions, practical activities, field trips, library work, and presentation of results. More than a hundred international trainees have attended this seaweed course since its inception. Recently, training sessions of shorter duration are also conducted on-site at seaweed farms. The lectures cover topics like the seaweed industry status, biology and taxonomy of eucheumatoid seaweeds, identification of their life stages, common diseases as well as food safety in seaweed production and processing. There are also practical activities such as preparation of culture media, production of micropropagules, land-based nursery culture, planting of seaweeds for grow-out culture, and preservation of seaweed for later taxonomic identification. Aside from this specialized seaweed course, the other regular courses of AQD like “Abalone Nursery and Grow-out” have a seaweed culture component since *Gracilaria* spp are the most suitable food for abalones.

Like in all AQD training courses for other commodities, the economics of seaweed farming is also extensively discussed in this course. The economics of cultivating *Gracilaria* and *Kappaphycus* with both experimental and actual inputs were analyzed by AQD researchers using economic indicators like return on investment (ROI) and payback period. Results showed that farming these seaweeds using the line method, fixed off-bottom, raft (single or multiple), and hanging long line methods are all profitable, however, production is negatively affected

by environmental factors such as typhoons, salinity drops or temperature increases, and by fluctuating farmgate prices.

While it is a given that seaweed farming is a profitable activity, small seaweed farmers are still in dire need of soft- and long-term loans to enhance their production and as a form of crop insurance during times of natural disasters but most importantly to improve their bargaining power with big seaweed exporters and processors. Various sectors have expressed concern that despite the benefits gained by seaweed exporters due to the increasing demand of carrageenan in the world market, small seaweed farmers continue to be exploited and live on subsistence levels. The government should help organize the farmers into cooperatives to serve as a forum for discussing problems, formulating solutions, and drawing of action plans. AQD is aware of these constraints and in 1992, AQD extended its science-based seaweed farming technology to thirty-one families on Malalison Island, Antique, together with an interest-free operating capital. The run was completed in 17 weeks using 190 man-hours of family labor. A second run in 1993, however, failed due to an unexpected off-season typhoon. There were two problems encountered in the Malalison experience: the area suitable for seaweed farming is exposed to “habagat” or the southwest monsoon, and seedlings are not available nearby and had to be sourced from Panagatan Cay which is 6-8 hours by motorboat. But despite these constraints some families on Malalison Island continued to farm seaweed on their own.

As long as the problem of financing is sorted out, on their part, seaweed farmers must ensure that their activities will not conflict with other users of the coastal area as their farms will pose potential aesthetic changes. In the past, there was conflict over the development of seaweed farming at Tubbataha Reef, a pristine dive spot in the Philippines, and is one example where some of the user conflicts are derived from concern over potential aesthetic and ecological impacts. The large area required for an economically viable seaweed culture has resulted in significant conflicts with users concerned with visual impact and for fishermen and tourists concerned with access.

Still and all, the seaweed industry of the Philippines has the potential to grow further and AQD will maintain a significant role in its development. Also, AQD will continue to explore the use of seaweed as extractive species in polyculture systems as well as in multitrophic aquaculture and to study the carrying capacities of farms to prevent disease outbreaks and occurrence of epiphytes. AQD will also continue its work on the micropropagation of quality eucheumatoid seedstocks and to come up with new and improved strains of *Kappaphycus* through strain development and hybridization guided by the use of polymorphic genetic markers and through protoplast fusion techniques. All these advanced technologies will ensure the growth, profitability and sustainability of the seaweed industry in the Philippines and the rest of Southeast Asia. ❖



*Culture flasks containing Kappaphycus micropropagules*