

# THE SEAWEED INDUSTRY IN SABAH, EAST MALAYSIA<sup>1</sup>

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## ABSTRACT

Seaweed cultivation was introduced in Sabah since 1978 and has increasingly become an economically important natural resource for Malaysia, particularly for Sabah. It was known to have wide application potentials similar or even better than other commodity such as cocoa and palm oil. Two significant seaweed-based industries had started and are developing at a moderate pace. These are seaweed cultivation or farming and the production of semi refined carragenan from seaweed. Beside the government agencies focusing on socio-economy development for rural peoples, there are private local companies venturing in seaweed processing and cultivation at larger scale in Semporna. Three methods of seaweed cultivation have been widely practiced and established in Sabah namely, raft system (MKII), stake system and long line system. The long line system is being widely practiced with approximately 95% of seaweed farmers employing this method. This was due to the facts that the long line system is more economical and practically easy to handle compared to other system. *Kappaphycus alvarezii* is the most common species and widely farmed in Sabah beside *Eucheuma spinosom* in small percentage. Sabah is the sole producer for seaweed in Malaysia. GDP in year 2002 was RM21.16 Billion whereby fisheries sector contributed 3.2% of the total GDP. Total production of dried seaweed in 2002 was 2,562.49 MT with the total wholesale value approximately RM 4.4 million. Total export for dried seaweed from Sabah in 2002 was 1,750 MT by weight and RM14 million by value. Most of dried seaweed production in 2002 exported to the United Kingdom (65.5%), Chile (13.0%), Korea (8.0%), Japan (6.0%) and other countries (7.5%). The main issues and challenges facing the seaweed industry in Sabah in particular and in Malaysia in general will be discussed in this paper. Major programmes are in placed to boost the seaweed production in Sabah, subsequently to meet projected production of seaweed in Malaysia in the year 2010 also will be highlighted.

*Keywords: Seaweed cultivation, socio-economy development, raft system, stake system, and longtime system*

## INTRODUCTION

In the early 1960s, most of the dried seaweed particularly *Eucheuma* spp. supplied to the American's carragenan company were sourced from the natural stocks of Indonesian archipelago (Trono, 1987). Only in the late 1970s or to be precised in 1978, seaweed farming was introduced in Semporna, east coast of Sabah in commercial scale by the American's company named Aquatic Resoutces Limited. (DOFS, 1979). Since 1980, the management of seaweed farming project in Semporna was solely under the responsibility of the Department of Fisheries Sabah (DOFS).

The Department of Fisheries Sabah plays an important role in continuously promoting seaweed farming to the local people/fisherman as their promising and reliable source of income. The main reason for the local people/fisherman discouraged to be active in seaweed farming was due to the low market price during the period of 1978-1988. Only in 1989 the production of dried seaweed through this project successful recorded 10.35 MT that was produced by the local seaweed farmers for the very first time.

Since then seaweed has increasingly become an economically important natural resource for the country and for Sabah in particular. Seaweed farming has played an important role in the development of aquaculture sector in Sabah. Aquaculture sector in Sabah has contributed 10,705 MT of exported fisheries products with an estimated export value at MR\$114 million (1994-1997). More than 60% of the export value was contributed by marine aquaculture whereby seaweed was the second largest contributor after prawn farming with 33% and 48% respectively. Sabah is the main seaweed producer in Malaysia and most of the total production is farmed off the coast of Semporna, which is located in the East coast of Sabah. Beside Semporna, the DOFS also has been trying in experimenting and promoting to culture seaweed in the other coastal district of Sabah such as Lahad Datu, Kunak, Kota Belud, Kudat, Pitas, and Tuaran.

It has been proven that seaweed-farming activities are essential not only to improve the income of fishermen or as an effective tool for poverty eradication, but also as the perfect solution for the conservation of coral reefs. The high market value of seaweed particularly *Kappaphycus alvarezii* is relying on its phycocolloid product so-called kappa-carrageenan. Carrageenan is the name given to a family of linear sulfated food grade polysaccharides obtained from the red seaweeds. Historically, the use of carrageenan for food has grown, in the industrialized countries, by at least 5-7% per annum. Carrageenan has unique properties that cannot be substituted by other gums and its future is assured in all areas of the world that demand convenience foods. Countries such as China are already developing convenience foods and the trend will accelerate in the coming decade expanding the demand for carrageenan beyond the traditional annual growth.

## RECENT STATUS OF SEAWEED CULTIVATION SYSTEM IN SABAH

### Existing Seaweed Cultivation sites in Sabah

The main seaweed cultivation sites in Sabah is located in the east coast of Sabah such as Semporna, Kunak and Lahad Datu. Cultivation of seaweed in other coastal district in the west coast of Sabah has been developed slowly. These areas comprising of Teluk Ambong in Kota Belud, Kg, Parapat and Banggi Island in Kudat and few sites in Kota Marudu. The suitability of area such as sheltered, water salinity 30-35 ppm, sandy and coral seabed, far from estuary and vast coral reef area are the some conducive or favorable factors which can be found mainly in the east coast of Sabah, particularly around Semporna waters (Figure 1).

### Species of Seaweed Cultured

At this moment there are only two main species have been cultured widely in Sabah that scientifically known as *Kappaphycus alvarezii* formerly named as *Euchuma cottonii* and *Euchema denticulatum* or formerly known as *Eucheuma spinosom* (FAO,



during low tide and 1.5m during high tide (Figure 2). This system can accommodate a total of 14,500 to 15,000 seedlings per acre. Production cost for this system is approximately \$MR1,800 per acre and consider as the most expensive system compared to Long Line and Raft Systems. This could be due to the material involved such as hard type wooden stake (e.g mangrove or 'Belian' wood stakes), rope and line, and plastic floater.



**Figure 2: Stake cultivation system widely being practiced in shallow water.**

### **Longline System**

Long line system found to be suitable for area with 2m-5m water depth (Figure 3). A total of 6,500 to 9,500 seedlings per acre can be cultured through this system or approximately 21 lines (300 feet per line) per acre. Practically, around 300-450 seedlings per line depending on the size of each seed. The cost of production by employing this system is consider the cheapest system which is around \$MR600 per acre. This system was firstly introduced in 1992 in Semporna and it becomes the most popular system and being practiced almost 95 % of seaweed farmer in Sabah. This mainly due to cheaper cost of production and practically easier for installation and maintenance.



**Figure 3: Long lines cultivation system.**

### **Raft System**

The Raft System is practiced mainly in the deeper area between 3m-15m water depth (Figure 4). The size of each raft is 5m x 27m and each unit consisted of eight (8) lines of rope. One acre area can accommodate between 7,700-11,500 seedlings with a total of twelve (12) lots of rafts.

### **Harvesting, Post Harvest Handling and Processing of Seaweed**

In practical, seaweed is ready to be harvested in 1.5 to 2 months period of time (Figure 5). However some areas particularly in certain village in Semporna has shorter period of cultivation (1-1.5 months). The small wooden boat or locally named as 'Bogo-bogo' in Semporna is being used widely not only during planting, but also during maintaining of farm and harvesting (Figure 6). Fiberglass boat equipped with 15HP out boat engine also being employed, particularly in the area where the farm site is located far from they mainland. It is also being used as a mother-boat to transport larger quantity of wet seaweed from the farm to the drying platform.



**Figure 4: Raft cultivation system mainly being practiced in the deeper water.**



**Figure 5: Bunches of seaweed ready to be harvested.**



**Figure 6: The small wooden type boat locally named as 'Bogo-bogo' in Semporna.**



**Figure 7: Drying of seaweed on the wooden platform.**

There are two types of drying method, which has been practiced widely in Sabah; these are the platform method (Figure 7) and hanging method (Figure 8). The platform method is usually made of three different type of material such as wood, cement or bamboo material is commonly being employed. Basically the drying process will take between 3-5 days and up to 7 days during the dry season and raining season, respectively.

Its moisture content could determine the optimum drying stage ranging from 25-30 % or 90 % dried. The hanging method found to be not so popular among the local seaweed farmer. This could be due to its slow drying rate and difficulty facing by the local farmer during handling. The 'whitish dried seaweed' also being produced but in small quantity (Figure 9).

The transparent plastic is usually used to cover the seaweed throughout the drying process and this product can fetch a better price (\$MR8-10/500 gram) compared to the ordinary dried seaweed. This type of dried seaweed can only be used as salad food and not for Carragenan production. It was believed among the



**Figure 8: Drying of seaweed by using hanging method.**



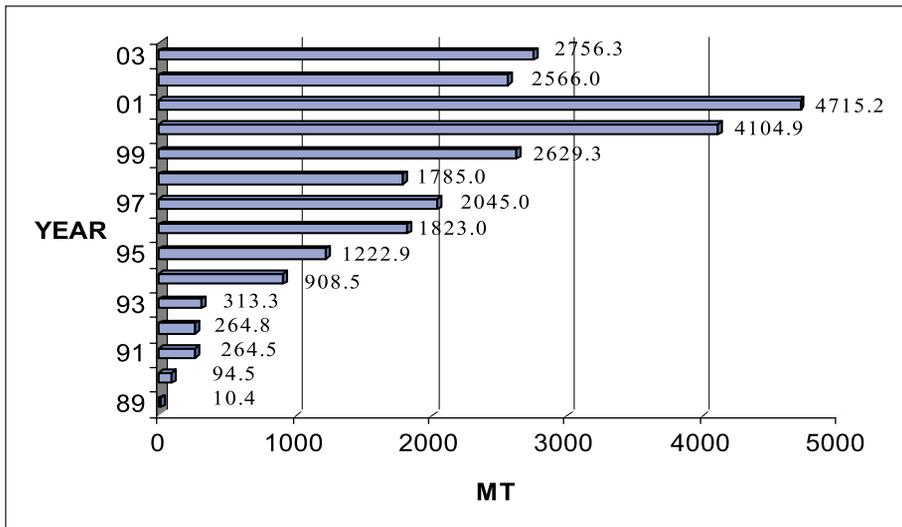
**Figure 9: Producing the 'whitish dried seaweed' that could fetch a better price.**

local people that eating this seaweed may give a good health due to its micronutrients properties.

### **Seaweed Production in Sabah**

Sabah is the one and only state producing seaweed in Malaysia. Total production of dried seaweed recorded since 1989 until year 2003 showed gradually increased from 1989 to 2001 and drastic declined in year 2002 (Figure 11). Total export in 2001 was accounted for 1.4% or value at USD\$5 million of global trade of dried seaweed which total at USD\$357 million. By comparison, the total production of seaweed from Sabah, Malaysia is only accounted less than 9% from total production of seaweed from Philippines in year 2001. Philippines is the main producer for carrageenophyte resources which contribute 88.5% of the world production and followed by Indonesia, Tanzania and others with 25,000, 8,000 and 1000 mt, respectively in year 2001.

In year 2002, seaweed production from Sabah accounted for 39% by volume (2,562 mt) and 4% (\$MR4.4 million) by value from the total marine aquaculture production. By volume, seaweed production from Sabah found to be increased slightly in the year 2003 to 2,756.3 mt compared to the previous year. To date there



**Figure 11: Total production of dry seaweed in Sabah from 1989-2003 (Sabah Annual Fisheries Statistic).**

are only two carragenan extraction plants operating in Sabah, namely Tacara Sdn.Bhd and Omni-Gel Sdn.Bhd which is located in Tawau and Semporna, respectively. Both of these factories are producing a semi-refined carragenan so-called SRC powder and solely for exporting.

### **Implementation and Management of Seaweed Cultivation in Sabah**

The Department of Fisheries Sabah is the lead agency in implementing and managing of seaweed cultivation in Sabah. Other government agency which is also play an important role in developing the seaweed industry in Sabah such as Ministry of Rural Development and Entrepreneur through its local district office and Malaysia Fisheries Development Board. There are three main categories of seaweed farmer in Sabah depending on the size of their farm, such as small, medium and big scales farmer. The full timer small farmer usually has not more than 10 acres of farm and operates by individual or as family business. The medium scale farmer has less than 50 acres and this mainly operate by group of local people. The big scale farmers usually run by a big company with more than 50 acres. Recently, the Sabah Foundation as one of Sabah state investment arms has been actively involved in seaweed farming with larger scale. There are also a number of private local companies investing in seaweed cultivation and mostly concentrated in the east coast of Sabah, particularly in Semporna. Some of this company is actually diversifying their products from cage culture, marine capture fisheries and prawn culture to seaweed culture.

### **Direction of Seaweed Industry in Sabah**

In line with the 3<sup>rd</sup> National Agriculture Policy (NAP3) and the 2<sup>nd</sup> Sabah Agriculture Policy (SAP2), agriculture sector comprising of livestock, agriculture and fisheries has been identified and recognised as the third engine of growth for the Malaysian economy. Additionally, under the new direction of Sabah government

on state economy development agenda it was stated and emphasised the three main sectors notably, agriculture, tourism and manufacturing. Since Sabah has a great potential to spearhead the development of agriculture industry in Malaysia, strategic plan of action or specific mechanism has been underlined and promoted to achieve their target.

By the end of the Ninth Malaysian Plan in year 2010, it was estimated that the national fisheries production would generate a total of 1.93 million metric tons of fish. Whereby, 1.33 metric tons and 0.60 metric tons will be contributed from marine capture fisheries and aquaculture respectively (NAP3). Seaweed is one of the prioritized fisheries commodities under the development of aquaculture industry in Malaysia, particularly in Sabah.

To date the national balance of trade (BOT) for seaweed is at negative side. This clearly indicates that Malaysia has been importing more seaweed compared to its export value. By realizing this fact, certain measures have been taking place in order to achieve a positive BOT on seaweed in the nearest future or by the year 2010. Under the micro-plan of seaweed's BOT, there are five major programs have been identified and implemented through strong support and cooperation between state and federal agency. It was believed that these programs would be a catalyst for luring local and foreign investor either in medium or large-scale operation. This is not only limited to seaweed cultivation but also in post-harvest processing of seaweed as well as in product development derived from seaweed. The five major programs are in placed and must be addressed notably, logistic/ infrastructure; labour /manpower; product quality; transfer of technology (TOT); industrial supports and marketing strategy.

The most urgent projects that needs to be addressed under the logistic matters such as developing suitable sites for seaweed cultivation, promoting and strengthening existing sites, developing collection and drying centers and also to build up seaweed processing plant. To date only about 800 hectares of seaweed cultivation site has been developed where mostly concentrated in Semporna. There are about more than 20,000 hectares of coastal areas throughout Sabah has been identified as suitable and potential sites for seaweed cultivation. Most of these sites are located in the east coast of Sabah namely in Semporna, Kunak, and Lahad Datu as well as in the west coast such as Kota Belud, Kudat and Pitas. Zoning or so-called development of Aquaculture Industrial Zon (AIZ) has been employed as a mechanism in developing and managing of this identified areas.

There are only two seaweed processing plants each located in Semporna and Tawau are now fully operating and another one more to be fully operating in the nearest future which is also located in Semporna. Although there is a need to build up seaweed processing plant in the west coast of Sabah, however sustainability of raw material supply has to be considered seriously and must be fulfilled in order to create promising and encouraging environment for this industry. To certain extent, big investor either from local or foreign country which is interested on seaweed processing only should also be involved or have their own seaweed farming enough to cater their factory capacity rather than depending solely from import or local supplier.

In order to maintain the competitiveness of Malaysian seaweed product in the global market, certain strategic action in ensuring product quality is now being promoted and implemented. In seaweed cultivation sites, the Code of Practice for Responsible Seaweed Farming (COP) and the Standard Operating Procedure (SOP)

for developing the best quality of seaweed are being promoted among local farmer under voluntarily basis. Additionally, the Malaysia Aquaculture Farm Certification Scheme on seaweed and Good Manufacturing Practices for seaweed processing plants will synergise to strengthen product quality assurance for global market. The Department of Fisheries is in the final process of establishing the National Standard Quality for seaweed and its products under the Ninth Malaysian Plan, which is in line with the Third National Agriculture Policy. This to ensure that our product is safeguarded in terms originality and quality as well as to meet international requirements.

Transfer of technology (TOT) has been practiced and promoted in certain identified critical area either at the cultivation site or at the processing plant. This mechanism is proven effective in speeding up the implementation of any new technology as well as to materialise the achievement of positive BOT by 2010 in seaweed industry. Meanwhile capacity and capability building in research and development will be strengthened particularly in relevant public research institute and university. Application of modern biotechnology in high quality seedlings production and products development is one of the main tools to be explored actively. Furthermore, respective department and agency through collaboration with local or foreign research institute have carried out research and development to further improve the cultivation system and developing new cultivation technology.

Industrial supports in several critical areas also need to be addressed seriously in order to achieve 2010's goal effectively for seaweed industry in Malaysia. One of the most vital matters is manpower or labour shortage. Manpower shortage can be seen as one of the weakness or threats that needs to be addressed properly and urgently by the government through any applicable mechanism in order to boost this industry, subsequently to become more productive and yet sustainable industry. Development of human resource in technical and non-technical has to be further enhanced through providing a training, special forum and seminar on business opportunity. Certain approach such as contract of trained or untrained labour from other country may be well suited to be implemented in this seaweed industry. This approach has been proven effective and practicable in other industry notably in oil palm industry. Other strategic actions to further enhance the development of seaweed industry in Malaysia are being carried out such as establishing national industrial information centre on seaweed, promoting existing government investment incentives and enhancing commercial financial loan facilities.

Furthermore, the main goal on the establishments of the Aquaculture Industrial Zones (AIZ) in seaweed industry is to promote healthy environment as well as to ensure the sustainable development for this industry in Malaysia, particularly in Sabah. The development of AIZ eco-friendly environment is not only to luring small and medium entrepreneur but also widely open for a big player either from local or foreign investor. To further enhance and strengthen the competitiveness of seaweed product in the global market, certain marketing strategies are also being implemented such as establishment of the Seaweed Agric Portal, online information on seaweed in Malaysia, and online services for interested and potential business clients. These strategies are also supported by active and continuous promotion through electronic and printed media both locally and internationally.

## CONCLUSION

By considering the pristine marine environmental conditions available in Sabah, it could be assured that Sabah would still remain as the present and future hub for seaweed industry development in Malaysia, particularly for carrageenophytes. Development of seaweed industry through the AIZ concept and supported by strategic actions in line with the Third National Agriculture Policy (NAP3), Second Sabah Agriculture Policy (SAP2) and the direction of agriculture development in Sabah, certainly will ensure sustainability of seaweed industry in Malaysia as a whole and particularly in Sabah. This could be further enhanced through strong commitment among the stakeholders so as to develop the more productive and competitive seaweed industry in Sabah.

It was clearly indicated that there are two most important and common issues facing or sharing by seaweed industry in Asian country notably seasonal disease and market price fluctuation. The government of each participating country should take a lead in forming an official forum for stakeholder including scientist from Asian countries in order to discuss and address every issues relating to seaweed industry either biannually or annually. This could be smoothly implemented through specific presently available mechanism such as BIMP-EAGA or under the SEAFDEC initiative.

## ENDNOTES

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<sup>1</sup> Paper presented at the 7<sup>th</sup> *Asian Fisheries Forum, Penang, Malaysia* on July 17, 2004.

## REFERENCES

1. Department of Fisheries Sabah. *Seaweed Culture Project Semi-Annual Report, no.3*. Prepared by Aquatic Resources Ltd., 1979.
2. Department of Fisheries Sabah. *Annual Fisheries Statistics, Sabah, 1989-2003*.
3. Juanich, G.L. *Manual on seaweed farming*. ASEAN/UNDP/FAO Regional Small-scale coastal fisheries development project, Manila, Philippines. ASEAN/SF/88/Manual No.2, 1988.
4. Kaladharan, P and Kaliaperumal, N. *Seaweed Industry in India*. Naga, The ICLARM Quarterly (Vol. 22, No. 1), 1999.
5. McHugh, D.J. A guide to the seaweed industry. *Food Agriculture Organisation (FAO) Fisheries Technical Paper No.441: 2003*.
6. The Third National Agriculture Policy (NAP3) of Malaysia.
7. The Second Sabah Agriculture Policy (SAP2)
8. Trono, G.C Jr. *Seaweed culture in the Asia-Pacific Region*. Regional Office for Asia and the Pacific (RAPA) Publication Bangkok, 1987/8.