DEVELOPING THE SEAWEED AQUACULTURE SECTOR IN MALAYSIA

SEMINAR REPORT

Kuala Lumpur
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By

Cheryl Rita Kaur and Margaret Ang
Farming of seaweed has expanded rapidly around the world as demand outstripped supply from natural resources. Research has led to the development of seaweed cultivation that now fulfils the world’s market demand. In Malaysia, commercial production of seaweed is mostly in Sabah.

With their excellent nutritional value and production potential, seaweed farming in Malaysia is seen as capable of meeting domestic and international demands. Hence, the government is emphasising on research and development of seaweed culture while promoting its commercial farming. With proper development plans and strategies, it is envisaged that Malaysia may also emerge as a top producer of seaweed-based products with export potential, generating multiple benefits for the coastal communities.

However, there has been a lack of assessment of their progress and the plans executed as well as their effectiveness in achieving the goals. The Maritime Institute of Malaysia (MIMA), therefore, organised the ‘Seminar on Developing the Seaweed Aquaculture Sector in Malaysia’ on 27 October 2009 to review the status and progress of the seaweed industry as well as its economic contributions. Issues relating to the industry such as the regulatory framework, strategies and action plans to support the seaweed industry in the country were also discussed in detail. As a whole, the enthusiastic response of the speakers, participants and members of the panel at the event stood testimony to their keen interest in developing the seaweed sector in the country.

As this report was written based on the outcome of the seminar, we hope that its readers will have a better understanding of the seaweed aquaculture sector in Malaysia, with those involved in the industry gaining insights so that they may better develop the sector in Malaysia.

Appreciation is extended to all involved in making the publication of this seminar report possible. Special thanks go to Dr Pola Singh, the Director General of MIMA; the editors, Mr Benjamin Lian Wey Chiang and Dr Arujunan Narayanan; Mr Zainol Azman Shamsudin, the graphic designer; as well as Mr Nazery Khalid and Mr Mohd Nizam Basiron for assisting in the preparation of this report.

CHERYL RITA KAUR and MARGARET ANG
Seminar Coordinators
INTRODUCTION TO THE SEMINAR

The ‘Seminar on Developing the Seaweed Aquaculture Sector in Malaysia’, organised by Maritime Institute of Malaysia (MIMA) on 27 October, 2009 in Kuala Lumpur was a timely affair. It was held after the announcement of the 2010 National Budget by the Prime Minister and Finance Minister Dato' Seri Mohd Najib Tun Hj Abdul Razak on 23 October, 2009. Under the budget, RM149 million (about US$43.94 million) was allocated for the food industry including seaweed. The seminar was therefore held to discuss on the seaweed cultivation sector’s development in Malaysia.

The major objectives of the seminar were to inform the audience of the issues and current status of the seaweed cultivation sector’s development, review the progress, illustrate and review strategies as well as action plans that are deployed to support the seaweed industry and recommend ways for the industry to progress. The seminar was also an avenue for discussing future development of the seaweed cultivation sector in the country.

At the seminar, two MIMA researchers shared their findings while six distinguished speakers were invited to speak of their experiences and views on the sector in Malaysia.

Dr Pola Singh, the Director-General of MIMA, delivered the Opening Remarks followed by the three sessions below:

- Setting the Scene: An Overview
  Speakers at this session were Miss Cheryl Rita Kaur and Miss Margaret Ang from MIMA.

- Current Situation: Perspectives from Relevant Stakeholders
  Dr Ahemad Sade from the Department of Fisheries, Sabah; Mr Zainal Ali from the Fisheries Development Authority of Malaysia, Associate Professor Dr Charles Vairappan, Associate Professor Dr Suhaimi Yasir and Dr James Alin from the Universiti Malaysia Sabah; as well as Mr Pang Kyun-Fung from TACARA Sdn Bhd were among the speakers at this session.

- Panel Discussion: The Way Forward
  The panel featured key speakers to discuss further on development of the seaweed aquaculture sector in the country with all the participants present at the seminar.
In his opening remarks, Dr Pola Singh elaborated on the history of the seaweed aquaculture sector in Malaysia which dates back to 1978 when it was first introduced in Semporna, Sabah. Although the sector flourished over the years, the current commercial seaweed cultivation is still concentrated in Sabah. Seaweed aquaculture in Sabah has also proven to be successful in improving the livelihood of the coastal communities, which is in line with the government’s efforts to eradicate poverty.

Dr Pola emphasised that the seaweed industry provides a range of products, generating an annual production value of US$6 billion. In this region, Indonesia and the Philippines are among the major producers of seaweed. In Malaysia, seaweed production was valued at RM44.5 million (about US$13.12 million) in 2008. Dr Pola further explained that most of the seaweed cultivated in Malaysia is for the export market. There is a demand for seaweed products from countries such as the United Kingdom, South Korea, and China including Hong Kong.

Although the statistics of seaweed production show that the industry has grown significantly in the last three decades, Dr Pola expressed that there is still much to be done to further develop the seaweed aquaculture sector in Malaysia in terms of species diversity, human resource availability, and value-added activities. For example, only two seaweed species are currently cultivated commercially on a large scale. Furthermore, the country has only two seaweed processing plants with limited capability and inadequate raw materials.

Despite these daunting challenges, Dr Pola Singh was confident on the country’s potential to become an internationally-renowned producer of seaweed. He stated that there is a vast area of pristine waters in Sabah, which is conducive for seaweed cultivation. However, one of the major challenges highlighted was to intensify the aquaculture system through further refinement of technology. Dr Pola described the need to explore new ways of cultivating seaweed, expand the seaweed variety for production, and discover new ways to utilise the products. Therefore, it was emphasised that there is a need to inculcate best practices in cultivating and utilising seaweed, while being mindful of conserving the environment.

Being accorded as a high impact project in the country, governmental agencies and departments, especially the Economic Planning Unit (EPU) and the Ministry of International Trade and Industry (MITI), have to be equipped with detailed and comprehensive information on the seaweed industry to better plan strategies to develop the seaweed industry in Malaysia. Dr Pola stated that among the focus areas include policy, regulation, financial as well as institutional frameworks.

In concluding his speech, Dr Pola expressed his hope that the presence of experts and stakeholders in the seminar would produce forward-looking recommendations to accelerate the development of the seaweed aquaculture sector in the country and at the same time, address the challenges faced in developing and utilising the nation’s maritime resources optimally.
SESSION 1

SETTING THE SCENE: AN OVERVIEW

In the first session, two researchers from MIMA, Miss Cheryl Rita Kaur and Miss Margaret Ang, spoke on ‘Seaweed Culture and Utilisation in Malaysia: Status, Challenges and Economic Potential’. They provided an overview of the seaweed aquaculture sector in the country highlighting the production status, environmental characteristics for farming, stakeholders involved, national framework and strategies in support of the sector, and economic potentials for seaweed aquaculture.

The speakers emphasised that Sabah is the country’s main producer of seaweed on a commercial scale especially in the areas of Semporna, Lahad Datu, Kudat, and Kunak. Two main species of seaweed, namely Kappaphycus alvarezi and Eucheuma spinosum, are currently being cultivated mainly for export. There are two major seaweed processing mills that are active in the country. They are Tacara Sdn Bhd and Omnigel Sdn Bhd in Sabah. It was discussed that the seaweed aquaculture sector has brought about a positive impact by boosting the coastal populations’ income especially those in Semporna.

Speakers at the first session of the seminar (from left): Miss Margaret Ang, the chairman Mr Nazery Khalid, and Miss Cheryl Rita Kaur

Participants at the seminar

Miss Cheryl reiterated that there has been significant emphasis on seaweed development in the national framework and strategies. They include the Ninth Malaysia Plan (2006-2010), Third National Agricultural Policy (1998-2010), and 2010 National Budget which was delivered on 23 October, 2009, with seaweed being mentioned as one of the most important aquaculture commodities in the country. At the state level, the adoption of the National Aquaculture Centre (Sabah Development Corridor) is a laudable move. The sector has developed enormously over the years as evidenced by the increase in production volumes by more than 300% from 26,290 tonnes wet weight in 1999 to 111,298 tonnes wet weight in 2008. However, more concerted efforts by all the relevant stakeholders are required for the country to reach the national production target of 250,000 tonnes (wet weight) in 2010.

Nevertheless, Miss Margaret elaborated that there are strengths that the country could capitalise on to develop the sector. They include the availability of vast cultivation areas, established culture technique, low operation costs, as well as strong government support and policies. Efforts to boost the sector’s growth should encompass:

- Capacity and capability building in R&D activity
- Application of modern biotechnology in high quality seedling production
- Exploration of new seaweed cultivation method
- Expanding seaweed variety for production
- Discovering more ways to utilise seaweed and its product
- Enhancing human resource at the technical and non-technical levels

In conclusion, the speakers reiterated that Malaysia has the potential to be a major seaweed player in the region, provided the country fully develop and utilise the existing strengths. These include the availability of infrastructure, manpower, product quality, transfer of technology, industrial support and marketing. As such, it was stressed that seaweed
production volume and value would increase if more effort is put into boosting the industry. They suggested that stronger emphasis on the sector be included in the Tenth Malaysia Plan (2011-2015) and the Fourth National Agriculture Policy (2011-2020).

SESSION 2

CURRENT SITUATION: PERSPECTIVES FROM RELEVANT STAKEHOLDERS

The perspectives of the relevant stakeholders in the seaweed aquaculture sector were highlighted in this session which featured speakers from the Department of Fisheries (DOF) Sabah, Fisheries Development Authority of Malaysia (LKIM), and academia which are directly involved in the development of the sector in the country.

For instance, Dr Ahemad Sade from the DOF Sabah presented on ‘Seaweed Industry in Sabah: Efforts, Opportunities, Issues and Challenges’. Dr Ahemad explained the history of seaweed aquaculture in Sabah, current status based on evaluation indicators as well as opportunities, issues and challenges in developing the sector in Sabah. The speaker stated that the commercial farming of seaweed was started by a foreign consultant company, Aquatic Resources Ltd, in the Semporna waters in the 1970s. It was taken over by the DOF Sabah in the 1980s. The sector was later identified as a sustainable source of income for the coastal communities, particularly those at Semporna. To encourage farmers to take up seaweed cultivation, DOF provided major incentives for them that included supplying seedling, identifying sites, holding training and workshops as well as discussions on seaweed cultivation. To evaluate the performance of seaweed cultivation sector in Sabah, DOF Sabah evaluates the seaweed proliferation rate, cultivation size, seaweed farmer population size, involvement of private companies/investors in seaweed cultivation, number of factories/companies in seaweed down-stream processing, and income of the farmers. Overall, the sector has registered a growth of 23.2% in seaweed aquaculture production in 2008, compared to 2007. The value recorded in 2008 was 111,298 tonnes wet weight compared to 90,268 tonnes wet weight in 2007. Based on the current figures, DOF Sabah has projected that the production would further increase to 125,000 tonnes wet weight in 2010. Seaweed production would represent about 60.3% of the total aquaculture production in Sabah in 2010. Despite the national target of producing 250,000 tonnes (wet weight) of seaweed in 2010, DOF Sabah deemed that this target is more realistic and achievable.

There are several issues and challenges that are holding back the sector in its quest to achieve the national target by 2010. Dr Ahemad spoke on the lack of quality seedling, seasonal disease, competition with other sectors, shortage of skilled manpower, market price fluctuation, quality of and the inconsistent supply of raw materials, processing plant’s dependence on imports from Cambodia, the Philippines, and Indonesia as well as on environmental concerns. In view of this, the DOF is looking at developing a National Seaweed Action Plan to address the various issues and threats facing the development of seaweed cultivation sector in the country. The plan will basically cover major areas such as policy, regulation, as well as financial and institutional framework of the sector. One of the most recent achievements of DOF Sabah is its adoption of the Agriculture Industrial Zone (AIZ). This will elevate the status of the industry, positioning it as a High Impact Project for Malaysia.

The second presenter, Mr Zainal Ali from the Fisheries Development Agency of Malaysia (LKIM), spoke on the ‘New Approach in Seaweed Cultivation: Application of the Basket System’. Besides DOF, Mr Zainal also mentioned that LKIM has been involved in seaweed cultivation since 1999 with the initial attempt at Pulau Sebangkat, Semporna. Its success in Semporna has spurred LKIM to step up its involvement in Sabah’s seaweed cultivation. Recently, LKIM ventured into developing new cultivation methods such as the basket system, which according to LKIM, increases the seaweed carrageenan content, allows early disease detection, and reduces the likelihood of sea creature feeding on the seaweed. However, cultivating seaweed with this method requires large initial capital. Thus LKIM is working with a local financial institution, AgroBank, to assist farmers who are venturing into seaweed cultivation in Sabah. Others have also been roped in to provide in kind and financial support to the farmers. They are the Sabah State Foundation, Sabah State Union of Fishermen (PENGASAH), and Universiti Malaysia Sabah (UMS). The LKIM will also embark on the journey to modernise the seaweed cultivation sector soon. Some of the efforts will include the development of automatic harvester and the solar dryer system.
This basket system cultivation method being used by the LKIM as a pilot study. Early results show that this method boosts carrageenan content, enables early detection of disease and reduces the risk of sea creature feeding on the seaweed. However, further research is required on the effectiveness of this method.

The third presenter, Assoc Prof Dr Charles Vairappan of UMS spoke of his experiences especially on diseases such as ice-ice, epiphyte infection, and post-harvest processing of cultivated seaweed in his presentation entitled ‘Challenges in Seaweed Cultivation in Sabah’. He elaborated that the destruction of the cultivated seedling crop in Indonesia and the Philippines in 2005 and 2006 respectively were caused by the outbreak of ice-ice disease and proliferation of epiphytes. He added that the outbreak was mainly because no quarantine measures were practised. Bacterial infections also pose a major threat. Infection is usually seasonal, occurring twice a year, mainly due to the drastic seawater abiotic change. In view of this, he called for coordinated effort from all relevant parties besides reiterating the need for quarantine.

The next speaker, Assoc Prof Dr Suhaimi Yasir of USM, said the university’s involvement in the seaweed sector began in 1998 when they were helping the Development Programme for the Hardcore Poor or Program Pembangunan Rakyat Termiskin (PPRT). This programme ended in 2008 but followed with the establishment of a National Committee on Seaweed Industry Development in the same year to ensure the sustainability of the industry.

Under the Seaweed Developing Action Plan, UMS assisted in developing database for AIZ and mini estate concept, conducting R&D on germplasm collection and nursery, developing new cultivation method, improving and mechanising the post-harvest processing, enhancing downstream processing, and boosting quality.

The speaker also highlighted that Malaysia has been appointed to head the Seaweed R&D Group under the Brunei Darussalam-Indonesia-Malaysia-Philippines – East ASEAN Growth Area (BIMP-EAGA) cooperation. UMS is currently chairing this group. Members of the group comprised stakeholders from the public and private sectors, research institutes and universities. The group is responsible for conducting R&D on all activities in the seaweed sector. Dr Suhaimi believes that Malaysia has the potential to be a major player in this region and reiterated that R&D plays a crucial role in developing the sector.

The seaweed aquaculture sector improves the income of coastal communities, which is in line with the Government’s move to eradicate poverty.

Next was Mr Pang Kyun-Fung of Tacara Sdn Bhd who shared with the audience the history of this establishment. The managing director of this leading seaweed processing factory said the company was involved in seaweed farming and trading before venturing into processing. According to him, the company which is the pioneer in manufacturing...
food-grade carrageenan in Malaysia, had overcome many challenges to not only survive but also thrive in the sector.

Mr Pang also said the world’s hydrocolloid market demands 41,600 tonnes (dry weight) of carrageenan annually. However, to meet the demand which is about US$416.4 million worth, the amount of dried seaweed required to meet the demand is 200,000 tonnes. But with Malaysia’s production volume of only 11,300 tonnes, it is obvious that the global market offers a vast opportunity for Malaysia to tap on. He warned that the new players, India and Tanzania, are closing the gap with Malaysia. Action must be taken fast. Otherwise, the new players will soon surpass Malaysia in seaweed production.

R&D activities in seaweed sector

Later in his presentation, Mr Pang listed seven major issues plaguing the seaweed processing sector. Of concern are the ice-ice disease and the proliferation of epiphyte, which not only affect the seaweed production volume but also the carrageenan recovery rate. If the problem is not resolved, the carrageenan powder from the affected seaweed will contain black spots, compromising its purity and reducing its value in the global market. Next, he reiterated that there is an urgent need to adopt the practice of quarantining the seedling, and setting up sites for selecting and isolating foreign seedlings. Thirdly, he said Malaysia currently has an inferior post-harvest handling method. This method does not dry the seaweed to the 45% moisture content requirement, leading to the degradation of carrageenan in the seaweed. Also, the tie-tie cultivation method, which uses raffia string, further erodes the carrageenan quality. The other disadvantage is that, it is time-consuming and costly to remove the string. He strongly urged the farmers to stop using raffia string and use nylon string instead.

He further explained that the industry has to endure the tedious and time-consuming process of applying for a Temporary Occupation Licence (TOL), issued by DOF Sabah. Next issue highlighted was on the degeneration of seedling. The frequent propagation of seedling from the same plant degenerate the genes, indirectly affecting the quality of the future seedling.

The speaker called for better coordination among government regulators, as well as planters, researchers, and processors in the sector to resolve these issues.

In addition to that, Mr Pang spoke on fraudulent investment schemes in the industry, which is tarnishing the image of the industry in the country. He therefore suggested that the illegal activity be stopped through legal recourse. Finally in order for the sector to progress, Mr Pang suggested that someone should take the lead in steering the industry to the right direction.

The next speaker, Dr James Alin of UMS, in his presentation entitled ‘Economic Returns from Seaweed (Eucheuma cottonii) Family Farming in Tun Sakaran Marine Park (TSMP), Semporna’, said the park management’s goal is to protect and conserve the natural features, habitat and species of the park while ensuring the latter is ecologically sustainable when in use. With the zoning system in place, the islanders whose livelihood is heavily dependent on artisanal fishing or other marine/aquaculture activities such as pearl culture, rearing giant clams and caged fish, will be affected unless there is an alternative income source for them. As such, seaweed cultivation is an alternative income
source for the islanders while at the same time reducing their dependency on fishing. This will also ease the pressure on wildlife stock.

ii) There is a need for at least an agency to lead the development of the local seaweed sector in the country.

iii) Farmers should adopt the integrated aquaculture system, for example, farming seaweed and sea cucumber at the same time for additional or alternative income. However, proper seaweed aquaculture zoning system has to be in place in Sabah in order to effectively maximise seaweed production locally.

iv) Local seaweed farmers should also consider ‘grouping up’ to increase economies of scale.

CONCLUSION

The seminar generated fresh ideas and concrete suggestions on identifying weaknesses and opportunities. Once they are identified, the relevant parties can strategise and work on improving the weaknesses and capitalising on the opportunities to improve the seaweed aquaculture sector in Malaysia. The seminar also succeeded in raising awareness of the challenges in the local sector as the stakeholders present at the seminar were able to gauge from the experiences shared by the distinguished speakers from various backgrounds.

From the speakers’ presentations, we can deduce that to promote the local seaweed sector growth and boost seaweed production in the country, five areas need to be improved on. They are infrastructure, manpower, quality of product, transfer of technology, industrial support and marketing.

i) Government regulators need to exercise prudent management to ensure that seaweed production is sustainable. It was suggested that local practitioners quarantine seedling and establish sites for the selection and isolation of seedlings from other countries.

Other salient points raised and discussed during the panel session are:

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PROGRAMME
Seminar on Developing the Seaweed Aquaculture Sector in Malaysia
27 October 2009 (Tuesday)

8.30 – 9.00
Registration / Running Coffee

9.00 – 9.10
Welcoming Remarks
By Dr Pola Singh
Maritime Institute of Malaysia

SESSION 1
Setting the Scene: An Overview
(Chairman: Mr Nazery Khalid, Maritime Institute of Malaysia)

9.15 – 9.50
Seaweed Culture and Utilisation in Malaysia: Status, Challenges and Economic Potential
By Cheryl Rita Kaur and Margaret Ang
Maritime Institute of Malaysia

9.50 – 10.00
Questions and Answers

10.00 – 10.30
Coffee Break

SESSION 2
Current Situation: Perspectives from Relevant Stakeholders
(Chairman: Mr Mohd Nizam Basiron, Maritime Institute of Malaysia)

10.30 – 10.55
Seaweed Aquaculture in Sabah: Efforts, Opportunities and Challenges
By Dr Ahemad Sade
Aquaculture Resource Management Branch
Department of Fisheries Sabah

10.55 – 11.05
Questions and Answers

11.05 – 11.30
New Approach in Seaweed Cultivation: Application of the ‘Basket System’
By Mr Zainal Ali
Fisheries Development Authority of Malaysia

11.30 – 11.40
Questions and Answers

11.40 – 12.05
Challenges in Seaweed Cultivation in Sabah
By Associate Professor Dr Charles S Vairappan
School of Science and Technology
Universiti Malaysia Sabah

12.05 – 12.15
Questions and Answers

12.15 – 1.30
Lunch

1.30 – 2.00
Research and Development Efforts in Seaweed Cultivation
By Associate Professor Dr Suhaimi Yasir
Institute of Tropical Biology and Conservation
Universiti Malaysia Sabah

2.00 – 2.10
Questions and Answers

2.10 – 2.35
Seaweed Production and Trade: TACARA’s Experience
By Mr Pang Kyun-Fung
TACARA Sdn. Bhd.

2.35 – 2.45
Questions and Answers

2.45 – 3.10
Economic Returns from Seaweed (Eucheuma cottonii) Family Farming in Tun Sakaran Marine Park, Semporna
By Dr James M Alin
School of Business and Economics
Universiti Malaysia Sabah

3.10 – 3.20
Questions and Answers

SESSION 3
Panel Discussion: The Way Forward
(Moderator: Dr Capt Mohd Ibrahim Haji Mohamed, Maritime Institute of Malaysia)

3.20 – 4.00
Dr Ahemad Sade
Mr Zainal Ali
Associate Professor Dr Suhaimi Yasir
Mr Pang Kyun-Fung

4.00
End of Programme / Coffee
LIST OF PARTICIPANTS

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SPEAKER’S PROFILE:

1. Cheryl Rita Kaur
   Researcher
   Centre for Maritime Security and Environment
   Maritime Institute of Malaysia

   Miss Cheryl Rita Kaur graduated from the Universiti Malaysia Terengganu with a Bachelor of Science (Marine Biology) in 2005. She was appointed as a researcher at the Maritime Institute of Malaysia (MIMA) in March 2006.

2. Margaret Ang Guat Hee
   Researcher
   Centre for Maritime Economics and Industries
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   Miss Margaret Ang graduated from the Monash University in Australia with a Bachelor of Environmental Science degree in 2003 and subsequently obtained her MSc. in Applied Economics from the Cornell University in 2008. She joined the Centre for Maritime Economics and Industries at Maritime Institute of Malaysia (MIMA) as a researcher in September 2008. Her research area is on maritime economics focusing on ports, shipping, environment and marine resources.

3. Dr Ahemad bin Sade
   Head
   Aquaculture Resource Management Branch
   Department of Fisheries Sabah

   Dr Ahemad has been serving the Department of Fisheries Sabah since 1989. He is now an Assistant Director with the department and the Head of Aquaculture Resource Management Branch at the Fisheries Research Centre located at Likas, Kota Kinabalu. Prior to that, Dr Ahemad served as the Head of Post-Harvest Handling & Processing Unit (1989-1995), Head of Communication & Information Branch (Nov. 1998-1999), the Head of Marine & Resource Research Branch at the Fisheries Research Centre in Likas (2000-2006), before joining the current position since June 2006. Dr Ahemad has represented the Department of Fisheries Sabah to numerous meetings, conferences and forums, besides publishing his research work in journals and other publications.
4. **Assoc Prof Dr Charles Santhanaraju Vairappan**  
Institute for Tropical Biology and Conservation  
Universiti Malaysia Sabah

Assoc Prof Dr Charles obtained his doctorate degree from the Hokkaido University of Japan and did his post doctoral studies at the Tokyo University of Japan. He specialises in marine natural products chemistry, seaweed biochemistry, marine biotechnology, and organic spectroscopy. He is currently a member of the American Chemical Society and the Japanese Phycological Society. By virtue of his expertise, Dr Charles is also the a committee member of the ‘Algae as CO2 Sink’ Asia Pacific Phycological Forum (since 2005), a member of the Board of Editor of the Journal of Tropical Biology and Conservation (2008-2012), the Head of BioNexus Partner Natural Products Chemistry Laboratory of the Institute for Tropical Biology and Conservation at the Universiti Malaysia Sabah, as well as a scientific reviewer for the Journal of Natural Products and the Journal of Applied Phycology. He has published extensively on his work at the national and international levels.

5. **Assoc Prof Dr Suhaimi Yasir**  
School of Science and Technology  
Universiti Malaysia Sabah

Assoc Prof Dr Suhaimi Yasir is an expert in the field of Chemistry as well as Applied Chemistry. He holds a doctorate degree from the Canterbury University in New Zealand. He is currently an associate professor at the university (specialising in Protein and Flavour Chemistry) for the Programme of Industrial Chemistry. He is also a member of the National Committee on Seaweed Industry Development and involved in the Development Plan for Seaweed Cultivation in Malaysia. His main area of focus is on research and development (R&D).

6. **Dr James Eng @ James Mohamad Alin**  
School of Business and Economics  
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With a doctorate degree in Economics (International Development) from the Yokohama National University of Japan (2003), Dr James specialises in public sector economics, economics of conserving wildlife and natural areas, as well as labour economics.

Before joining the university, he was an Administration and Diplomatic Officer (1994-1996) for the Ministry of Domestic Trade and Consumer Affairs. Dr James is also a member of the International Association for the Study of Commons, Japan Society for the Promotion of Science, the South East Asian Economics Association, North America Econometrics Association, and the Association of Latin America Studies-Japan. Besides carrying out consultancy works, he has also published extensively in journals and presented papers at various forums.

7. **Pang Kyun Fung**  
Managing Director  
TACARA Sdn. Bhd.

Mr Pang has a degree in Finance from the University of Kent in United Kingdom. He has working experience in the banking line for about 15 years, before he founded TACARA in 1998 with three other shareholders. TACARA is a full Malaysian owned company, based in Tawau, Sabah. With no relevant experience in seaweed industry before starting the business, his founded company is now a pioneer in manufacturing Food Grade Carrageenan in Malaysia. Basically, carrageenan produced from seaweed, is a popular ingredient vastly used in the food, beverages, cosmetic and pharmaceutical industries.

8. **Zainal bin Md Ali**  
Director  
Division for Development of Fisherme  
Industries (Bahagian Pembangunan Industri Nelayan)  
Fisheries Development Authority of Malaysia

With a diploma in Agriculture from the Universiti Pertanian Malaysia (1974) and a degree in Agro Business (1978), Mr Zainal has been serving the Fisheries Development Authority of Malaysia for a long time (since 1981). He is currently heading the Division for Development of Fisherme Industries, based in Kuala Lumpur.
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**MARITIME INSTITUTE OF MALAYSIA:**

**A brief history and functions**

The Maritime Institute of Malaysia (MIMA), as a policy research institute, looks after and promotes Malaysia's interests at sea. Its role is to deal with national, regional and global maritime issues especially those affecting Malaysia. MIMA complements the efforts of the various Government agencies involved in the maritime sector by providing expertise to assist and support them in national maritime policy planning and implementation. The Institute's role is advisory and consultative, giving advice and second opinions to Government agencies and other relevant organisations. MIMA is also tasked with promoting the free exchange of ideas on all maritime matters and contribute meaningfully to critical discourse pertaining to the nation's maritime interests such as providing an international stage for discussion on the Straits of Malacca and to promote the conservation of the coastal and marine environment. The Institute also advances maritime literature through publication in addition to providing fellowship opportunities for researchers and scholars.

**ORGANISATION**

MIMA research centres are designed for multi-disciplinary research. The Institute is organised into five research centres while the Resource Centre plays a key role in supporting research.

**Centre for Coastal and Marine Environment (CMER)**

**Introduction**

Malaysia's coasts and seas are endowed with a wealth of marine bio-diversity, ecosystems, habitats and natural resources. They play a vital role such as providing fish for food and preventing coastal erosion among others. Sustainable development of our coasts, seas and related resources is therefore a priority to the Government. Hence, the Centre for CMER was established to contribute towards ecologically-sustainable ocean management through policy research and the provision of timely and appropriate inputs for policy-making to advance Malaysia's environmental-related interests.

**Research Thursts and Areas**

The research thrust of the Centre is on environmental sustainability and protection of marine life. The Centre’s research areas are manifold and include research on the state of marine environment, sustainable development of marine resources, ecosystems protection, marine pollution, coastal zone management, conservation of coastal and marine biological diversity, as well as environmental-friendly shipping activities. Accordingly, policy research undertaken by the Centre has been translated into recommendations and inputs to the Government and other relevant stakeholders on areas and issues affecting the sustainability of the nation’s coastal and marine environment.

The Centre also continuously undertakes the role of promoting awareness on coastal and marine environment protection and conservation to its stakeholders as well as the public by conducting talks, seminars, workshops and conferences.

**Centre for Maritime Economics and Industries (MEI)**

**Introduction**

The Centre for MEI was established to promote Malaysia's maritime economic interests and to enhance the competitiveness of its maritime industries. The core principle guiding research at the Centre is identifying the underlying factors influencing various industries within the maritime sector as the basis to developing sound policy options. The latter will help Malaysia realise her ambition to become a maritime nation.

**Research Thursts and Areas**

The research thrust of the Centre for MEI is in understanding the dynamics, components and features of maritime economic activities and industries. Thus, the Centre conducts research on maritime trade, ports, shipping, maritime ancillary services as well as offshore oil and gas sector. Its core research areas include port competitiveness, ship financing, multimodal transport, marine leisure industry, offshore oil and gas, maritime trade issues, and greening the maritime sector to counter climate change.

The work at the Centre is not exclusively Malaysia-centric. It monitors global and regional events, developments and issues affecting maritime economic activities to ensure that its research outputs are informed by the latest happenings in the fast-moving maritime industry.

**Centre for Maritime Security and Diplomacy (MSD)**

**Introduction**

The Asia-Pacific region is important in terms of security and economic growth. Major powers, namely The US, China, Russia, India and Japan as well as the European Union have vital interests in the region. Cordial relations amongst these states are a pre-requisite for peace, stability and growth in this region.

Despite the end of the Cold War, there are potential conflict areas which can be a source of military concern. Overlapping and conflicting territorial claims in the Spratly Islands for example have the potential to become full blown conflicts that can destabilise the region. Regional naval build-ups too, can spark an “arms race” and create an uneasy situation in the region.

Meanwhile, non-traditional security issues such as terrorism, piracy, the trafficking of human, drugs and arms, smuggling, illegal fishing, separatist movements, religious and ethnic conflicts have emerged as new security challenges with regional implications.

Understanding these developments is crucial to the maritime security of any country, especially a littoral state like Malaysia. Thus, the Centre aims to contribute towards enhancing Malaysia's maritime security through policy research on traditional and non-traditional security issues, confidence building measures and providing timely inputs for policy developments.

**Research Thursts and Areas**

The Centre's research thrusts are manifold and among them are studying major power relations in the region, the development of armed forces especially maritime forces, the study of traditional security issues, such as the Spratly
Islands claims and maritime border disputes and non-traditional security issues especially maritime terrorism and piracy, and the role of diplomacy in resolving the problems and implications of these developments on Malaysia's national interest.

Centre for Ocean Law and Policy (OLAP)

Introduction
The Centre for OLAP was established to identify legal developments in the maritime realm, assess their impact on Malaysia, advise the Government on the formulation, interpretation and implementation of maritime law and policy and disseminate legal updates to provide a clear picture of the legal environment affecting maritime interests.

The Centre also fosters good relationships with other regional and international organisations such as the International Maritime Organisation (IMO), Division for Ocean Affairs and the Law of the Sea (DOALOS), International Labour Organisation (ILO) and similar entities to assist in its work.

In tandem with Malaysia's vision of being a developed maritime nation by the year 2020, the Centre for OLAP undertakes the role of promoting awareness in maritime legal aspects to appropriate stakeholders and the public through seminars, workshops and conferences.

The Centre for OLAP aspires to be Malaysia's national centre of excellence for ocean law and policy issues.

Research Thrusts and Areas
The Centre's research thrust is on ocean law and securing Malaysia's maritime sovereignty. The three main research areas are Ocean Law, Maritime Law and Admiralty Law. Ocean Law deals with governance of the seas and is an area of public international law which covers relations between governments. Maritime Law on the other hand, is an area of private international law and is used generally to refer to laws relating to ships, shipping and maritime commerce. It is sometimes used interchangeably with Admiralty Law, although the latter strictly refers to matters relating to jurisdiction and the arrest of ships.

Policy research undertaken by the Centre has in the past been translated into policy options for the Government in areas such as security, insurance costs, shipping acts, the leisure industry, waste reception facilities and sovereignty issues on disputed islands.

Additionally, the Centre's continuous dissemination of maritime legal knowledge through seminars, workshops, and conferences has triggered considerable interest among stakeholders.

Centre for Straits of Malacca (SOM)

Introduction
In recognition of the strategic and economic importance of the Straits of Malacca, the Centre for SOM was launched by the Deputy Prime Minister of Malaysia on 21 October 2008. The Centre's goal is to be recognised as a one-stop centre of excellence for research initiatives and an authoritative source on matters pertaining to the Straits of Malacca.

The SOM which stretches 805km between Peninsular Malaysia and the Indonesian island of Sumatra is among the most important shipping lanes in the world as it links the Indian Ocean to the Pacific Ocean bridging the major economies of India, China, Japan, South Korea and ASEAN with the rest of the world. The tremendous growth in international trade has resulted in a commensurate expansion in the number of vessels traversing the Straits which is expected to exceed 100,000 by 2020. In addition, almost 50% of world energy shipments transit the Straits every year. This expanding volume of commercial shipping poses a challenge to the long-term economic viability and environmental sustainability of the Straits.

The Straits is also home to marine assets and natural resources such as fisheries, mangrove forests, and coral reefs. These assets are under tremendous pressure as the Straits become busier. Major threats include oil spills and other forms of pollution, ballast water and solid waste discharges, and vessel accidents and incidents.

Research Thrusts and Areas
The Centre is dedicated to the protection of the Straits' maritime environment, growth sustainability, safety of navigation, security, improving management and control, and promoting initiatives to enhance its role as a major sea lane of communication. It is in the interest of the littoral states and other stakeholders to strengthen the management and economic viability of the Straits to boost development of the region. Among the Centre's major initiatives is the publication of the Profile of the Straits of Malacca: Malaysia's Perspective in 2008 outlining Malaysia's stance on the Straits and organising the MIMA International Conferences on the Straits of Malacca aimed at providing a platform for stakeholders to discuss important issues concerning this strategic international waterway. A major study is also underway by the Centre to determine the optimum vessel-carrying capacity of the Straits in achieving the overriding objective of promoting a safe, secure, and sustainable Straits of Malacca.