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Date published: 2005

To cite this document : Hashim, M. & Kathamuthu, S. (2005). Shrimp farming in Malaysia. In: Regional Technical Consultation on the Aquaculture of *P. vannamei* and Other Exotic Shrimps in Southeast Asia, Manila, Philippines (pp. 50-56). Tigbauan, Iloilo, Philippines : SEAFDEC Aquaculture Department.

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Shrimp Farming in Malaysia

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1. OVERVIEW OF FISHERIES IN MALAYSIA

Malaysia has a long coastline of 4,055 kilometers (km), of which 1,640 km is in Peninsular Malaysia and 2,415 km is in the state of Sabah and Sarawak. With the declaration of the 200 miles Exclusive Economic Zone (EEZ), the total fishing area of Malaysia has expanded to 160,000 square nautical miles. Given this large fishing area, fisheries are a significant sector in the Malaysian economy. The sector produced 1.5 million mt of fish valued at about RM5 B in 2003. The marine fisheries production was 1.3 million mt valued at RM4 B, constituting 1.4 % of the Gross Domestic Production (GDP). The aquaculture production was 196,874 mt valued at over RM1.2 B constituting only 13 % of the total fisheries production. In the case of the marine capture fisheries, the bulk of the landings came from trawl nets (57%), purse-seine nets (21%) and traditional gerars (22%). Whereas in aquaculture, cockles (*Anadara granosa*) is the dominant harvest, accounting for 37% of the total aquaculture production. With regard to employment, the fishing industry involves about 89,400 fishermen and 21,100 aquaculturists giving a total of 110,500 people.

In 2002, Malaysia exported an estimated 198,892 mt of fisheries products valued at RM1.5B. The bulk of the exports were higher for chilled fresh fish and frozen crustaceans mainly shrimps to Japan, Singapore and USA. At the same time, Malaysia imported an estimated 353,794 mt from neighboring country Thailand valued at RM1.3 B. In terms of quantity, Malaysia was a net importer of fish but in terms of value there was a net gain in foreign exchange to the tune of RM156 M.

Traditionally, the mainstay or backbone of the Malaysian fisheries is the inshore sub-sector both in terms of production and socio-economic considerations. However, the inshore sub-sector has reached a saturation point as evidenced by declining catch rates in recent years. This is coupled with substantial fisheries resources in the EEZ waters of Malaysia and vast potentials for aquaculture development in the country. Focus of development has been shifted towards offshore fisheries and aquaculture.

2. ROLE AND IMPORTANCE OF AQUACULTURE IN MALAYSIA

Malaysia does not have a long-standing aquaculture tradition unlike its neighbors in the Indo-Pacific Region. Freshwater fish culture was only introduced in the early twenties while coastal aquaculture has even a shorter history. Nonetheless, the industry has expanded significantly in the last two decades. In 2003, a total of 14,200 hectares were used for pond culture, 7,447 hectares of mud-flats for cockle culture and 1,376,300 m² for cage and raft culture. There are 94 shrimp hatcheries with a production capacity of 12 billion fry a year and some 79 freshwater fish hatcheries/nursery producing 50 million fry per year.

Compared with shrimp production from aquaculture, landings of marine shrimp from capture fisheries were from 81,627 mt in 1984 to a peak of 107,550 mt in 1984 to a peak of 107,550 mt in 1989, and then fell slightly to 100,847 mt in 1991. The harvest rose in 1992 to 126,405 mt and fell again to 105,761 mt in 1993 and 100,545 in 1994. Overall, marine shrimp landings registered a growth rate of 2.7% indicating that the shrimp catch from capture fisheries was approaching its limit. This means that any substantial increase in shrimp production in the future will have to come from aquaculture. Shrimp farming has registered a creditable growth rate comprising about 28.6 % of total shrimp production in 2003.

Under the Third National Agriculture Policy (NAP 3), aquaculture is identified until 2010 as a key area for development to produce fish for the country both for local consumption and for export. At present, the marine resources of the country are being exploited at about the maximum sustainability and any significant increase in production from this sector is rather unlikely. The government has proposed an ambitious Aquaculture Development to increase aquaculture production in the country by nearly six-fold, to 600,000 mt with estimated value of RM6.5 billion by 2010. Under this plan a total area of 330,200 ha. of land and water resources suitable for aquaculture development has been identified. These areas are as follows:

Inland areas	105,000 ha.
Open seas	100,000 ha.
Coastal areas	28,000 ha.
Lakes and impounded water bodies	90,000 ha.
Protected coastal areas, lagoons	7,200 ha.
Total	330,200 ha.

3. OVERVIEW OF SHRIMP FARMING IN MALAYSIA

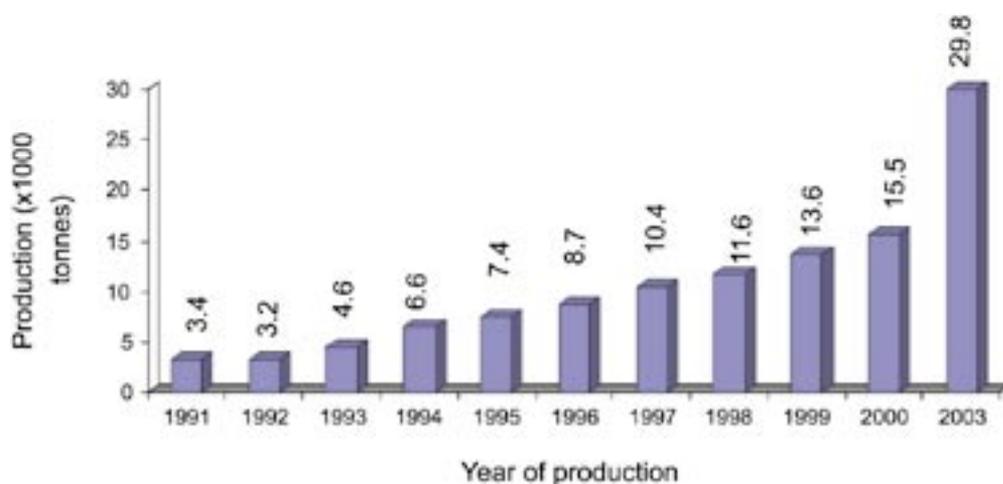
3.1 Background

Traditional shrimp farming began in Malaysia in the 1930s with the utilization of the trapping pond culture system that supply of wild fry depended on incoming tides. Successful larviculture of shrimp in the late 1960s led to large scale seed production and the establishment of government and private sector shrimp hatcheries in the late 1970s and early 1980s. The ample supply of hatchery produced seed facilitated the development of shrimp farming industry in the late 1970s.

It was not at all smooth sailing, though. Many of the earlier farms were excavated type, constructed within mangrove areas and depending totally on tides for water exchange. Consequently, these ponds encountered soil quality problem resulting in mass mortalities of shrimp. This problem was alleviated to a large extent with a shift to levee-type pond construction, involving little or no excavation; especially out-side mangrove areas, and the utilization of pumps for water exchange.

The improvement of the ponds in late 1980s, where engineering problems were minimized signaled a new phase in shrimp farming. In 1993 there were 1,877 ha of brackishwater ponds in the country.

Production of farm cultured penaeid shrimps increased from the mid-1980s, from 60 mt in 1984, to 3,057 mt in 1991. The production fell slightly in 1992 to 2,963 mt, but increased subsequent in two years. Production in 2003 stood at 30,000 mt of whole shrimp. The bulk of the production consists of the tiger shrimp, *Penaeus monodon*, although some banana shrimp, *P. merguensis*, and the Indian white shrimp, *P. indicus*, are also cultured. There is a steady growth in shrimp production over the last 10 years as shown in the graph below.



The number of shrimp farms and farming areas has increased steadily over the years due to the active participation of farmers, intensive training and courses provided by the government. Locally developed technology and global access to culture and processing techniques, easy access to credit facilities, government incentives and consistent good market price have also contributed to the steady growth. Under this scenario, it is believed that the potential development of shrimp aquaculture industry in Malaysia is promising in the future.

Major farming areas are located in the states of Sabah, Perak, Johor, Sarawak and Kedah accounting for 42%, 13%, 11%, 10% and also 10% respectively, of the total shrimp farming areas. States that still have vast potential are Sarawak, Sabah, Pahang, Selangor and Johor.

3.2 Development of shrimp hatchery

There are about 94 shrimp hatcheries in Malaysia, where most of them are located in Peninsular Malaysia and Sabah. Hatchery designs vary from simple low budget projects with a shed to house the culture tanks to more sophisticated enclosed buildings with transparent roofs. Most hatcheries are of the latter type. Circular or rectangular tanks made of fiberglass or concrete tanks coated with non-toxic epoxy paint are commonly used by most of the hatcheries for larval and post-larval rearing.

All the hatcheries are dependent on wild broodstock and spawners while a few have their own maturation programmes to supplement wild broodstock supply. Unilateral eyestalk ablation is used to induce ovarian development in female spawner shrimp. Broodstock shrimps are generally transported in oxygenated plastic bags with reinforced bottoms. Some of the hatcheries operate by obtaining nauplii which can be purchased from established hatcheries or spawner suppliers. Initial stocking density is around 50-100 nauplii/litre.

Vibrio is the most common disease organism encountered in shrimp hatcheries. The organism is difficult to control as it is usually present in the culture media thereby causing heavy larval mortalities usually at mysis-1 stage. Normally these losses occur following a bacterial bloom of 70,000 cells/ml or more. Most hatcheries prefer to discard the infected batch as treatment is not economical or worthwhile. Many hatcheries still use antibiotics such as furazolidone or oxytetracycline as a prophylactic measure, though this practice is officially discouraged.

Post-larvae are harvested using harvesting nets and/or basins and an estimate of numbers is made at this stage. Double-layered plastic bags are used for the transport of shrimp seed. For overland transport, the bags are simply transported by truck to their destination, usually at night when the weather is cooler.

3.3 Grow-out

There are two different culture systems, namely semi-intensive and intensive that are widely practiced for *P. monodon* culture. The system commonly practiced in Malaysia is the intensive culture system using stocking density ranging from 25 to 50 pieces per square meter.

Pond preparation involves drying the pond until the surface cracks and then scraping the dried organic matter. Flushing of the pond with water jets, although still practiced by some farmers, is not recommended as it causes environmental pollution. The pond bottom and bunds are limed and some water let into the pond. Tea seed cake is applied to get rid of predatory fish and fertilization carried out to encourage a bloom of phyto- and zooplankton that will serve as natural food for the shrimp. The post-larvae are then stocked in the pond, usually in the early hours of the day when the weather is not too hot.

In semi-intensive and intensive culture, the shrimp are fed with pellet feeds, beginning with the starter feed and followed later by the grower feed. There is a whole range of commercial brands of pellet feeds for shrimps available in the market. Feeding frequency varies from 3-5 times a day. The amount of feed given is adjusted periodically according to the growth rate of the shrimp, which is monitored by means of feedings trays.

Zero water exchange or closed system is also being practiced and to some extent, certain farms use probiotics as bioremediators to improve culture system. As a procedure to sterilize, the water is disinfected from pathogenic microbes using chlorine-based compound such as calcium or sodium hypochlorite.

Fresh, clean and treated seawater is added whenever necessary to compensate loss through evaporation.

Common diseases affecting shrimp during growout are Bacterial Black Spot, vibriosis and viral diseases. Algal blooms can also cause mortality of the stocks and eventually heavy losses to shrimp growers.

The culture period varies according to the culture system used. When lower stocking densities are used, growth rate is faster and the shrimp can reach marketable size within 2.5 months. In semi-intensive and intensive culture, the shrimp are harvested after 3-5 months. Partial harvest is also being carried out in many farms with first harvest usually done in the third month.

Harvest is undertaken using lift nets or bag nets placed at the pond outlet. Lift nets are used, especially for live shrimp (20-25g) for both the local market and Singapore restaurant market. For the export market, larger sizes (30-35g) are preferred. A slightly longer growth period (4.5 months or more) may be needed to acquire such size. Shrimp intended to be processed for the export market must be handled with great care to prevent quality deterioration so as to meet the stringent quality standards of the target countries. The shrimp must thus be iced immediately after harvest and transported to the processing plants under properly cooled conditions. In all the stages of processing within the processing plant, cool and hygienic conditions must continuously be maintained.

4. MAJOR ISSUES OF SHRIMP FARMING IN MALAYSIA

4.1 Diseases

Proper culture management will prevent disease outbreak to occur. Disease can cause mass mortality to the culture stocks at all stages. White Spot disease badly hit shrimp farms throughout Peninsular Malaysia in 1996. White Spot disease causes mass mortalities of shrimps that can wipe out the stocks within 3-10 days after the onset of the signs, especially juvenile shrimps of all ages and sizes. Black Tiger shrimps infected with White Spot Disease or White Spot Syndrome Virus (wssv) have red discoloration and white spots or patches about 0.5-2.0 mm in diameter on the surface inside the carapaces. These white spots are abnormal deposits of calcium salts.

Disease Control and Prevention measures taken include the following:

- The use of shrimp post larvae, which are wssv free and confirmed through Polymerize Chain Reaction (PCR) analysis.
- Encourage the use of Specific Pathogen Free (SPF) bloodstock in hatchery operations.
- Provide bio security measures such as fencing and netting pond are to prevent entry of vectors and carriers into culture ponds.
- Promote environment friendly culture practices such as proper waste/sludge disposal to prevent wssv.

4.2 Environmental Impacts

Shrimp farming in the coastal areas has been developed rapidly over the last 15 years especially along the west coast of Peninsular Malaysia and in Sabah. However, little is known about the impact of such activities on the coastal resources. There is an urgent need to address the impact of all aquaculture activities together with all forms of marine organisms and their ecosystems. The costly collapse of the shrimp aquaculture industry in Taiwan and China, the drop in pond production in the Gulf of Thailand as well as in the south-eastern part of Thailand, the massive destruction of mangrove forests in Philippines and Indonesia and more recently the drop in production in Ecuador would serve as a timely reminder to Malaysia, to act accordingly and learn from this costly lessons in our endeavour to further develop the shrimp farming industry in this country. To reduce the impact of shrimp culture to the environment, farmers and investors are advised to follow the Code of Practice and Farm Certification Scheme guidelines.

4.3 Competitiveness

Cost of production appears to be one of the major factors likely to affect the future expansion of shrimp farming in Malaysia. High cost of local labor and the competitive export market will pose some problem. To remain competitive, more efficient pond management measures must be adopted to reduce production cost and increase productivity. Management measures including proper pond preparation, optimum stocking densities, cost effective feeding regime, and implementing process to control discharges will go a long way to improve productivity leading to a sustainable aquaculture development in Malaysia.

4.4 Conflict of Interests

Land for expansion has become increasingly more expensive and difficult to acquire especially in Peninsular Malaysia partly because of conflict of interest. In an effort to expedite the processing of land for aquaculture purposes, the Department of Fisheries has initiated action to draft the proposal for zoning areas for aquaculture.

5. SHRIMP PROCESSING AND MARKETING IN MALAYSIA

Shrimp harvested from farming operation are marketed either as raw or processed products. The raw products are distributed to wholesale and retail markets with different market price at different states of Peninsular Malaysia, Sabah and Sarawak.

Shrimps for processing are sent to processing plants in Malaysia, particularly Peninsular Malaysia and in eastern States of Sabah and Sarawak. Some processing plants cater specifically for shrimp while others, together with other marine products. In the northern States of Kedah, Penang and Kelantan of Peninsular Malaysia, most of the harvested shrimp are processed at Seberang Prai, Penang.

Shrimps are processed in the processing plants and classified as shown in table below:

- | | |
|-----------------------------|--|
| a) Head-on Shell on | - Frozen fresh shrimp which comes in the original description |
| b) Headless Shell-on | - Frozen fresh shrimp which was not peeled but cut the head |
| c) Peeled Deveined Tail-on | - Frozen fresh shrimp which was peeled and cut the head and deveined |
| d) Peeled Deveined Tail-off | - Frozen fresh shrimp which was peeled, cut the head and tail and deveined |
| e) Peeled Undeveined | - Frozen fresh shrimp which was peeled, cut the head and tail |

Processed shrimp are exported to Japan, Europe, USA, Australia and New Zealand. Headless shell-on or peeled shrimp are preferred by the Japan and American markets while cooked and peeled shrimp are preferred by Australian and New Zealanders.

To comply with international trade and World Trade Organization (WTO) requirement, Hazard Analysis Critical Control Point (HACCP) certificate must be obtained from the Ministry of Health Malaysia.

6. STATUS OF AQUACULTURE OF *P. VANNAMEI* AND OTHER EXOTIC PENAEID SPECIES

There was an official application from a foreign investor in 2000 to introduce *P. vannamei* as alternative to *P. monodon* in Malaysia. The application was thoroughly scrutinized by the Department of Fisheries Malaysia (DoF). Import Risk Assessment studies were done. After thorough considerations, the Department of Fisheries Malaysia has officially rejected the proposal. DoF made a press statement on 17th May 2000 to caution the public.

There hasn't been any approval given even to import specific pathogen free or specific pathogen resistant broodstock from abroad. Since the importation of *P. vannamei* broodstock is not allowed in the country, shrimp hatcheries in Malaysia are not allowed to produce *P. vannamei* post-larvae.

Malaysia implemented an indefinite ban on introduction of *P. vannamei*, operative from 1st June 2003, in an effort to prevent the introduction of TSV and other viruses in Malaysia (The Wave website, 2nd April 2003). The ban, however, was implemented after *P. vannamei* was imported into Peninsular Malaysia from Taiwan Province of China in 2001 and Thailand in 2002, and also in one farm in Sabah (FAO, 2004/10).

There are some pockets of illegal culture operations in remote areas in Peninsular Malaysia and Sabah. However, the state of Sarawak has no *P. vannamei* farms since they have to obtain licenses from the Malaysian government to operate their farms and are concerned that these licenses could be revoked and their ponds be destroyed if they are caught farming *P. vannamei*.

Government effort is being enhanced to ensure registration of all farms with the Department of Fisheries. This is done to monitor culture activity and carry out a risk assessment to ensure that practical, longer-term legislation could be introduced to manage imported alien species and limit disease transmission.

7. OTHER CONCERNS

Availability of *P. vannamei* from the neighboring country tend to flood the local market, offering half the established price for local white shrimp from the capture fisheries or even below. This in turn affects the livelihood of local fisherfolk.

Under the Third National Agriculture Policy (NAP 3) which cover the duration from 1992-2010, aquaculture in Malaysia is designated to play a lead role to supplement the natural fishery resources, which has already reached its maximum sustainable yield. A prospective plan has been drawn up by the Department of Fisheries Malaysia with the aim of gradually increasing shrimp production particularly *P. monodon* production from the present production of about 30,000 mt to 150,000 mt by the year 2010 involving some 30,000 ha of brackish water ponds. Having experienced the wssv problems, development of SPF/SPR shrimp broodstock is the major consideration under NAP 3.

Guidelines to prospective farm operators are being introduced on Good Aquaculture Practices (GAP) to address the discharge of waste matters from shrimp farms. Implementation of Aquaculture Industrial Zone (ZIA), undertaken by the federal government with the cooperation of state/provincial government is a step towards the right direction to ensure that conflict of interest is minimized in such areas.

Environmental Impact Assessment (EIA) is required from all future aquaculture proposals in order to standardize GAP. In addition, an integrated coastal zone management plan involving inter-sector approaches are adopted to ensure the success of the prospective aquaculture plan.

Farm Accreditation schemes are being implemented to award Farming Certificates to shrimp farms that meet the prescribed criteria; thus, assuring the production of quality and safe product. Code of Practice (COP), Aquaculture Guidelines and Standard Sanitary Operating Procedure (SSOP) are emphasized towards responsible and sustainable aquaculture development.

8. CONCLUSION

There is a good potential for the development of the shrimp culture industry in Malaysia provided the available land resources and technical expertise in the country are well utilized. With significant incentives and promotion from the government, promising domestic and export market as well as good financial viability, the shrimp culture industry can be a very promising industry in Malaysia.

Under the current scenario and a prolonged period to overcome WSSV problem, Malaysia is pro-active and committed in developing SPF/SPR broodstock in collaboration with the industry which might take another few years to materialize.

With an ambitious target production of 150,000 mt to be achieved by the year 2010, immediate measures have to be taken to increase shrimp production in the country. The possibility of using local white shrimp (*P. merguensis* and *P. indicus*) is widely explored by the DoF as an alternative to *P. monodon*. Early findings are very encouraging.

Though DoF of Malaysia is not in favor of *P. vannamei* officially, it is still open to views and experiences from the neighboring country. Due consideration would be given if there are established protocols, guidelines and management practices to avoid introduction of TSV and other viral pathogens in the country.