UNIVERSITI PUTRA MALAYSIA

ASSESSING EFFICIENCY OF PRIVATE SHRIMP SEED PRODUCERS IN SELECTED HATCHERIES OF PENINSULAR MALAYSIA

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By

MOHD AMMARR BIN MOHD ARIPIN

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Master of Science

ASSESSING EFFICIENCY OF PRIVATE SHRIMP SEED PRODUCERS IN SELECTED HATCHERIES OF PENINSULAR MALAYSIA

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May 2013

Chairman : Md. Ferdous Alam, PhD

Faculty : Institute of Agricultural and Food Policy Studies

This study aims at estimating technical, allocative and cost efficiency of shrimp/prawn seed producers of Malaysia and determining costs and return in shrimp/prawn seed production. Data collected from 19 hatcheries (comprising 10 brackishwater shrimp hatcheries and 9 freshwater prawn hatcheries) from the states of Penang, Perak, Terengganu and Selangor were used in the study. Data Envelopment Analysis was applied to estimate efficiency scores of the hatcheries. Besides, cost, return and profitability of hatcheries was examined using farm management procedure.

The TE_{CRS} (overall technical efficiency) was found to be 0.582 for brackishwater shrimp hatcheries and 0.692 for freshwater prawn hatcheries. Inefficiency associated with the overall technical efficiency was 42 percent for brackishwater shrimp hatchery and 31 percent for freshwater prawn hatcheries. Pure technical efficiency (TE_{VRS}) averaged 0.907 for shrimp

hatcheries and 0.918 for prawn hatcheries indicating that inefficiencies to the level of 9-10 percent do exist. The scale efficiency was even lower than pure technical efficiency. Thus, the overall level of inefficiencies could be reduced by operating at optimal scales and by eliminating pure technical inefficiencies via the adoption of the best practices of efficient hatcheries. Scale inefficiencies for the shrimp and prawn hatcheries make a greater contribution to overall inefficiency. Allocative efficiency (AE) and cost efficiencies (CE)were 0.78 and 0.70 for brackishwater shrimp hatchery and 0.79 and 0.73for freshwater prawn hatcheries suggesting that the realized level of spawn/fry could be produced by the hatcheries by spending 21.5 percent less on inputs.

Ratios of technically efficient input quantity to cost efficient quantities were more than 1.00 for brood feed, spawn feed and labour for the two shrimp and prawn hatcheries. However, it was lower than 1.00 for electricity cost. Thus both types of hatcheries overused brood feed, spawn feed and labour while the electricity appeared to have been underused. Overshooting and undershooting of inputs was traced. Gross and net margins were positive. Benefit cost ratios of the shrimp and prawn hatcheries were more than 1.00 indicating that spawn/fry production was profitable in the short and long-run.

Abstrak tesis yang dikemukan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

MENAKSIR KECEKAPAN PENTERNAKSWASTA BENIH UDANG PADA HATCERI TERPILIH SEMENANJUNG MALAYSIA

Oleh

MOHD AMMARR BIN MOHD ARIPIN

Mei 2013

Pengerusi : Md. Ferdous Alam, PhD

Fakulti : Institut Kajian Dasar Pertanian dan Makanan

Kajian ini bertujuan untuk menganggar kecekapan teknikal, peruntukan dan kos terhadap pengeluar-pengeluar benih udang di Malaysia dan juga menentukan kos dan pulangan terhadap pengeluaran benih udang. Data dikutip dari 19 pusat hatceri (terdiri 10 hatceri udang air masin dan 9 hatceri udang air tawar) dari negeri Pulau Pinang, Perak, Terengganu dan Selangor untukkegunaan kajian itu. Analisis Penyampulan Data digunakan untuk menganggar skor kecekapan pusat hatceri. Selain itu, kos, pulangan dan keuntungan hatceri dikenalpasti menggunakan prosedur pengurusan ladang.

Hasil TE_{CRS} (Kecekapan teknikal keseluruhan) diperolehi adalah 0.582 untuk hatceri udang air masin dan 0.692 untuk hatceri udang air tawar. Ketidakcekapan yang dikaitkan dengan kecekapan teknikal keseluruhan adalah 42 peratus hatceri udang air masin dan 31 peratus untuk hatceri

udang air tawar. Kecekapan teknikal tulen (TE_{VRS}) dipuratakan 0.907 untuk hatceri udang air masin dan 0.918 untuk hatceri udang air tawar menunjukkan bahawa ketidakcekapan bagi tahap 9-10 peratus adalah wujud. Kecekapanskala malahan adalah lebih rendah dari kecekapan teknikal tulen. Oleh itu, tahap keseluruhan ketidakcekapan dapat dikurangkan dengan beroperasi pada skala optimum dan juga menghapuskan ketidakcekapan teknikal tulen melalui mempraktikan cara-cara terbaik yang dilakukan oleh hatceri cekap. Skala ketidakcekapan untuk hatceri-hatceri udang air masin dan air tawar telah memberi sumbangan lebih besar untuk ketidakcekapan menyeluruh. Kecekapan peruntukan (AE) dan kecekapan kos (CE) merupakan 0.78 dan 0.70 untuk hatceri udang air masin dan 0.79 dan 0.73 untuk hatceri udang air tawar sekaligus mencadangkan bahawa menyedari tahap benih udang boleh dikeluarkan oleh hatceri dengan kurang membelanjakan input-input sebanyak 21.5 peratus.

Nisbah kuantiti input teknikal cekap terhadap kuantiti kos cekap adalah lebih dari 1.00 untuk makanan induk,makanan anak udang dan buruh bagi kedua-dua jenis hatceri udang.Bagaimanapun, ia ada lebih rendah dari 1.00 untuk kos elektrik. Oleh itu, kedua-dua jenishatceri terlebih guna makanan induk, makanan anak udang dan buruh manakala bekalan elektrik adalah kurang digunakan. Penggunaan lebihan dan kurangan input turut dikenalpasti.Keuntungan kasar dan bersih adalah positif. Nisbah kos faedah

hatceri udang air masin dan air tawar diperolehi lebih daripada 1.00 yang menunjukkan bahawa pengeluaran anak udang adalah menguntungkan dalam jangka masa pendek dan panjang.

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I certify that a Thesis Examination Committee has met on 8 May 2013 to conduct the final examination of Mohd Ammarr Bin Mohd Aripin on his thesis entitled "Assessing Efficiency of Private Shrimp Seed Producers in Selected Hatcheries of Peninsular Malaysia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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DECLARATION

I declare that the thesis in my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institutions.

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MOHD AMMARR BIN MOHD ARIPIN

Date: 8 May 2013

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LIST OF ABBREVIATIONS

AE	Allocative Efficiency
BCR	Benefit Cost Ratio
BEP	Break-even Price
BEQ	Break-even Quantity
CE	Cost Efficiency
CRS	Constant Returns to Scale
DEA	Data Envelopment Analysis
DMUs	Decision Making Units
GDP	Gross Domestic Product
GM	Gross Margin
IRS	Increasing Return to Scale
MP	Market Price
NM	Net Margin
PL	Post Larvae
RTS	Returns to Scales
SE	Scale Efficiency
TC	Total Cost
TE	Technical Efficiency
TFC	Total Fixed Cost
TR	Total Revenue
TVC	Total variable cost
VRS	Variable Returns to Scale

CHAPTER 1

INTRODUCTION

1.1 Importance of Shrimp Sector

Fishery is an important sub-sector and plays a vital role in the national economy of Malaysia. The sub-sector provides direct employment to 89,453 fishers and 21,504 fish culturists. The figures are much higher if those indirectly involved in the sector are taken into consideration. Fish constitutes 60-70 percent of the national animal protein, with per caput consumption of 53 kg in 2005, which is expected to have increased to 56 kg in 2010 (Department of Fisheries Malaysia, 2010).

Malaysian spends about 20 percent of their food budget on fish consumption. With the increasing population, Malaysia may be deficient in producing the necessary amount of fish required for the country consumption. Hence, all sectors of fisheries such as capture and culture including the fish seed production needs to be emphasized.

Fisheries sector in Malaysia consists of four sub-sectors such as (a) Marine Capture Fisheries, (b) Aquaculture, (c) Fish Seed Production and (d) Inland Fisheries Production or Public Water Bodies. The fisheries sector still plays an important role in providing fish as a source of food and protein. In the year 2010, the fisheries sector contributed 1.3% to the GDP.

The workforce of the fisheries sector consisted of 129,622 fishermen working on licensed fishing vessels while 26,291 fish culturists were involved in various aquaculture systems. For the year 2010, a total of 49,756 units of fishing vessels were licensed with the majority operating traditional fishing gears (Department of Fisheries Malaysia, 2010).

The shrimp industry in Malaysia has developed rapidly since the early 1980s after the so-called successes experienced in neighbouring Thailand, Indonesia and Philippines. Malaysia, however, is not one of the major producers of cultured marine prawn in the world, as the area under marine prawn culture is about 5,100 hectares (2,627 hectares in 1995).Despite this, the Government of Malaysia is very proud to claim that the country's average production (metric tonnes per hectare) is the third highest in the world, after Taiwan and Thailand. And plans for intensification and expansion have been drawn up.

Table 1.1 shows that the total production of Tiger Shrimp, White Shrimp and Giant Prawn in the year 2010 was 87,821.83 metric tonnes. This amounts to a jump in production by about five times from the 2000 level of 17,231.05 metric tonnes.

Table 1.1: Estimated Production of Shrimp and Prawn from Brackishwater and Freshwater Ponds by Species, 2001 – 2010 (Quantity in Tonnes)

Year	Species			Total
	Tiger Shrimp	White Shrimp	Giant Prawn	
2000	15,539.64	353.75	1,337.66	17,231.05
2001	26,351.29	661.94	752.00	27,765.23
2002	23,986.84	844.46	705.80	25,537.10
2003	25,375.12	803.59	627.14	26,805.85
2004	25,720.60	5,117.49	316.86	31,154.95
2005	21,866.36	11,497.80	513.77	33,877.93
2006	17.011,67	18.600,59	193,76	35,806.02
2007	11.435,38	23.737,42	246,45	35,419.25
2008	13,503.31	37,544.31	355.50	51,403.12
2009	16,351.42	52,926.42	551.10	69,828.94
2010	18,118.51	69,084.10	619.22	87,821.83

Source: Department of Fisheries Malaysia, 2010

In the early 1990's, the government identified 110,000 hectares of mangrove forest suitable for tiger prawn rearing and allocated RM15.38million for aquaculture development in the Sixth Malaysia Plan. State governments and related agencies were quick to alienate very valuable mangrove and peat swamp forests for this ecologically destructive activity and had even acquired very productive paddy lands for this purpose. Little thought had been spared for the impact of such destruction would have on the environment and the communities who depend on mangroves for their livelihood.

The major environmental impacts resulting from shrimp farming have been mangrove loss, water pollution and fisheries decline in coastal waters. Mangroves form only about three percent (some 650,000ha) of the total land area in Malaysia. Most of the ponds opened during the 1980's and early 1990's involved the clear cutting of mangroves. Local fisher folk are severely concerned about the increased loss of mangroves as this has led to decrease in wild stocks and extinction of several commercial fish species in some places. The Penang Inshore Fishermen Welfare Association states that its survey revealed that 34 species of fish have become extinct and another 50 or more are becoming rare in the waters off Penang.

The destruction of coastal mangroves has also brought about coastal erosion. The coastal villages are susceptible to critical erosion, battered by strong waves and storms. Their life and property is at stake as the raging sea is slowly swallowing the coast. Some ponds have been abandoned due to the erosion, acid sulphate soil conditions and occasional mass mortality of prawns due to disease outbreaks. The culturists do not make any effort to rehabilitate the degraded mangroves and again the coastal communities are victims of such development.

Although prawn farming is still a small industry in Malaysia, the social impacts have already become evident. Among the most worrying are the loss of livelihood and income of small coastal fisherfolk due to mangrove loss

and fish decline, negative changes in agricultural practices, and human rights violations.Total export and total import for shrimp products in Malaysia including frozen, unfrozen and prepared shrimps are increasing from year 2000 to 2009. The highest growth rate for export is 40.89 % on year 2004 and for import is 136.54 % also on year 2004 (Table 1.2).

Table 1.2: Total Export, Total Import and Balance of Trade (BOT) of Shrimp Products in Malaysia, Including Frozen, Unfrozen and Prepared Shrimps, 2000 - 2009

Year	Total Export (RM million)	Growth Rate (%)	Total Import (RM million)	Growth Rate (%)	BOT (RM million)	Growth Rate (%)
2000	762.89	NA	144.41	NA	618.47	NA
2001	750.39	-1.64	198.54	37.48	551.85	-10.77
2002	743.08	-0.97	177.59	-10.55	565.48	2.47
2003	889.21	19.66	283.64	59.72	605.56	7.09
2004	1,252.76	40.89	670.94	136.54	581.82	-3.92
2005	1,317.95	5.20	560.21	-16.50	757.74	30.24
2006	1,119.28	-15.07	462.94	-17.36	656.33	-13.38
2007	1,223.66	9.33	539.73	16.59	683.93	4.20
2008	1,217.77	-0.48	317.01	-41.27	900.76	31.70
2009	1,058.48	-13.08	467.51	47.48	590.96	-34.39

Source: www.gtis.com/gta, 2009

Malaysia has a good retail price of shrimp and prawn at major markets. Based on Table 1.3, Giant Prawn is a higher price with weighted price being

RM36.23 per kg. The next importance species in terms of average weighted price were Tiger Shrimp and White Shrimp having RM26.46 and RM15.88 per kg respectively.

Table 1.3: Estimated Retail Prices of Shrimp and Prawn at Major Markets by State and Species, 2010

State	Species (RM/KG)		
	Tiger Shrimp	White Shrimp	Giant Prawn
Perlis	45.00	12.33	30.00
Kedah	24.14	15.26	34.08
Penang	27.63	13.53	51.83
Perak	25.40	14.00	38.73
Selangor	25.65	15.08	33.08
Negeri Sembilan	27.00	16.00	38.40
Malacca	30.00	13.17	35.00
Johore	24.46	15.72	35.23
Pahang	27.70	16.95	43.33
Terengganu	25.97	15.75	30.08
Kelantan	13.00	12.75	25.93
Sarawak	24.00	18.00	23.00
Sabah	24.00	12.00	16.00
Weighted Price	26.46	15.88	36.23

Source: Department of Fisheries Malaysia, 2010

1.2 Background to the Establishment of Shrimp Hatcheries in Malaysia

Malaysia would like to increase production from marine shrimp aquaculture. Shrimp culture industry in Malaysia has succeeded commercially with the adoption of improved aquaculture methods and the commitment of large companies. The farmed species are mainly the Giant Tiger and the Pacific White Shrimps, and a little quantity of the Banana Prawn. Culture of Specific Pathogen-Free Pacific White Shrimp was allowed in the country only in mid 2005.

Malaysian shrimp production, mostly the Tiger Prawn, *Penaeus monodon*was 21,866 mt, whereas for the White Prawn, *Penaeus penicillatus* production was 11,498 mt, in 2005. Shrimp farmers harvested a total of 33,364 mt, of shrimps in 2005, of which 23,615 mt, was produced in Peninsular Malaysia, and 9,749 mt, in Sabah and Sarawak, East Malaysia. It is estimated that in 2006, shrimp production will be 40,000 mt, especially with the increased popularity of the culture of the White Shrimp. About 80 percent of the Malaysian shrimp culture production is exported, mostly to Singapore, Japan, the United States, and Europe.

In 2005, Malaysia produced 3,118 million shrimp post larvae (PL) for stocking in grow-out ponds. Production of post larvae in 2006 was targeted at 6,640 million. Since Malaysia's post larvae production exceeds the domestic shrimp farmers' needs, the surplus is exported. It was estimated

that about 1,550 million PL and 3,320 million PL have been exported in 2005 and 2006, respectively. There are currently about 11,580 farms operating in Malaysia, covering a total of about 7309 hectares (ha). In Peninsular Malaysia, 7115 farms are operating the 4810 ha, and 4465 farms cover about 2,500 ha in Sabah and Sarawak. The Malaysian Government has targeted to further develop a total of 25,000 ha of coastal land into aquaculture ponds, which are expected to yield 180,000 mt of shrimps by 2010.

Most of the shrimp farming activities are carried out in earthen ponds, using intensive culture systems, located in the coastal lands, which have traditionally been mangrove forests. The production technology is uniform using hatchery produced PL and commercial feeds for growing, with productivity as high as 10 mt, per hectare per cycle.

The main shrimp producers are from large farms located in various parts of the country. Most of the smaller farms that require estuaries for their water intake are located along the western coastline of Peninsular Malaysia and also in Johor as well as Tawau, Sabah and Kuching, Sarawak.

Table 1.4 shows the estimated production of Tiger Shrimp and White Shrimp for nauplii and fries in million pieces from private hatcheries in Malaysia (2001-2010). Production of white shrimp is higher than Tiger Shrimp which is

12,262.85 million pieces for White Shrimp and 1,229.18 million pieces for Tiger Shrimp.

Giant Prawn is a freshwater species native to the Indo-Pacific region, Northern Australia and Southeast Asia. This species is commercially important for its value as a food source. Table 1.4 also shows estimated production of Giant Prawn for Larvae and Juvenile in million pieces from Malaysia private hatcheries (2001-2010). Production of larvae and juvenile Giant Prawn production in 2010 was 38.01 million pieces.

Of the total production of private shrimp and prawn hatcheries in 2010, White Shrimp constituted 90.63 percent comprising of 37.02 percent of nauplii production and 53.61 percent of White Shrimp fry. Giant Prawn larvae and juvenile produced in private hatcheries was only 0.25 percent of the total. On the contrary, nauplii and fry production of Tiger Shrimp constituted 0.98 percent and 8.18 percent of the total production (Table 1.4). Thus White Shrimp seed production is most important in the private hatcheries in Malaysia.

Table 1.4: Estimated Production of Private Shrimp and Prawn Seed Hatcheries by Species (Million Pieces), 2001 - 2010

Year	Tiger Shrimp			White Shrimp			Giant Prawn			TOTAL
	Nauplii	Fry	Total	Nauplii	Fry	Total	Larvae	Juvenile	Total	
2001	7,169.80	1,455.76	8,625.56	0.00	47.90	47.90	0.00	16.44	16.44	8,689.90
2002	3,966.00	1,275.96	5,241.96	0.00	2.50	2.50	1.50	37.15	38.65	5,283.11
2003	3,961.49	2,316.56	6,278.05	21.60	24.00	45.60	0.00	18.59	18.59	6,342.24
2004	1,458.80	2,187.67	3,646.47	74.00	95.00	169.00	0.65	24.02	24.67	3,840.14
2005	2,900.80	2,652.44	5,553.24	78.00	440.90	518.90	2.00	16.41	18.41	6,090.55
2006	8,493.42	2,133.80	10,627.22	8,223.10	1,228.92	9,452.02	6.00	11.43	17.43	20,096.67
2007	1,337.30	1,654.21	2,991.51	5,274.90	4,033.18	9,308.08	0.00	13.45	13.45	12,313.04
2008	267.70	1,737.82	2,005.52	3,948.68	4,093.88	8,042.56	0.00	16.69	16.69	10,064.77
2009	331.00	1,031.71	1,362.71	15,197.89	8,011.62	23,209.51	0.00	159.75	159.75	24,731.97
2010	133.20	1,095.98	1,229.18	5,009.96	7,252.89	12,262.85	0.00	38.01	38.01	13,530.04

Source: Department of Fisheries Malaysia, 2010

1.3 Concept of Shrimp Hatchery

A hatchery is a facility where eggs are hatched under artificial conditions, especially those of fish or poultry. It may be used for ex-situ conservation purposes like to breed rare or endangered species under controlled conditions. Alternatively, it may be for economic reasons to enhance food supplies or fishery resources. Along with natural sources of shrimp or prawn fry, hatcheries also produce fry from mother shrimp or prawn. The farmers reported, based on their experiences, that the mortality rate of hatchery produced fries is higher than that of the natural sources. As a result, the market price of wild fry is higher than the artificial fry. But due to high demand for shrimp or prawn fries, the artificially produced fries of hatcheries play important roles in the value chain along with natural fries for higher farming.

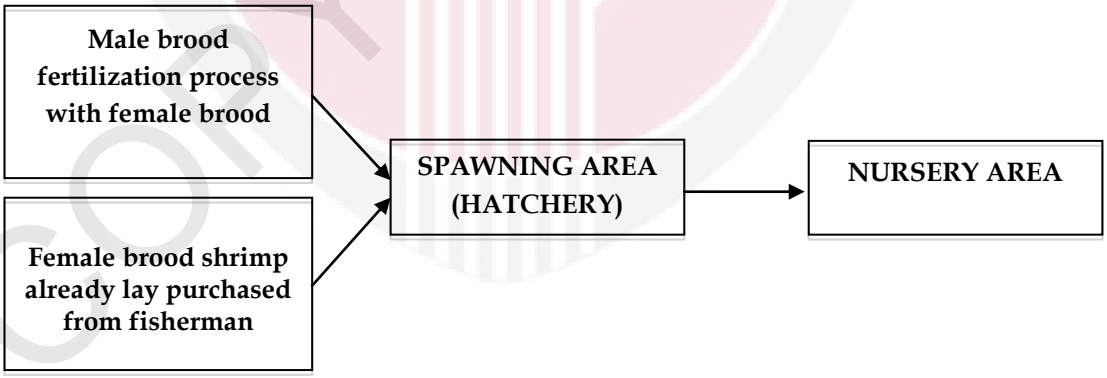

Figure 1.1: Conceptual Framework in Hatchery Process

Based on Figure 1.1, there are two types of hatchery processes in Malaysia. First technique can be done through male brood fertilization process with female brood. Second technique is female brood shrimp already lay

purchased from fisherman. Freshwater prawn is usually using second technique.

Lay-out of the hatchery should provide a schematic design of the location and integration of various facilities such as buildings, broodstock tanks, larval rearing tanks, nursery tanks, spawning tanks, pump house, air supply and power house, laboratory, staff house, piping for water supply and drainage canal.

1.4 Present Status of Shrimp Hatcheries in Malaysia

At present the number of private brackishwater shrimp including tiger shrimp and white shrimp hatchery is 54 and freshwater prawn is 34 in Malaysia based on Department of Fisheries Malaysia Report 2010 (Table 1.5). However, during the field visit some hatcheries were found already closed.The highest number of hatcheries is in Perak for Tiger and White Shrimp but there was no production of Tiger Shrimp seed. They produced White Shrimp fry only. Perak also has 25 Giant Prawn hatcheries producing 15.73 million pieces of Giant Prawn juvenile.

Table 1.5: Number and Estimated Production of Private Shrimp and Prawn Seed Hatcheries by State, 2010

State	Production (Million Pieces)						
	No. of Hatcheries	Tiger Shrimp		White Shrimp		No. of Hatcheries	Giant Prawn
		Nauplii	Fry	Nauplii	Fry		Juvenile
Perlis	0	0.00	0.00	0.00	0.00	0	0.00
Kedah	1	8.20	4.00	0.00	0.00	1	0.50
Penang	10	0.00	236.66	0.00	1,323.45	2	17.60
Perak	13	0.00	0.00	0.00	1,053.68	25	15.73
Selangor	6	125.00	399.00	87.00	189.40	1	3.50
Negeri Sembilan	0	0.00	0.00	0.00	0.00	4	0.66
Malacca	0	0.00	0.00	0.00	0.00	1	0.02
Johore	6	0.00	0.00	2,347.50	1,810.00	0	0.00
Pahang	3	0.00	269.80	2,575.46	1,746.57	0	0.00
Terengganu	2	0.00	155.00	0.00	90.10	0	0.00
Kelantan	0	0.00	0.00	0.00	0.00	0	0.00
Sarawak	7	0.00	11.30	0.00	444.45	0	0.00
Sabah	6	0.00	20.22	0.00	595.24	0	0.00
Total	**54**	**133.20**	**1,095.98**	**5,009.96**	**7,252.89**	**34**	**38.01**

Source: Department of Fisheries Malaysia, 2010

1.5 Problem Statement

Shrimp is the most important fishery commodity in Malaysia. According to Malaysia Department of Fisheries (2010), shrimp commodities constituted the highest production quantity with an average price of RM26,977 per tonne for Tiger Shrimp, RM14,510 per tonne for White Shrimp and RM36, 299 per tonne for Giant Prawn.

Table 1.6: Estimated Production of Shrimp and Prawn from Brackishwater and Freshwater Ponds by State and Species, 2010

State	Tiger Shrimp		White Shrimp		Giant Prawn	
	Tonnes	Value in RM'000	Tonnes	Value in RM'000	Tonnes	Value in RM'000
Perlis	90.75	4,083.75	192.96	2,010.00	0.00	0.00
Kedah	93.97	2,268.39	2,733.30	41,712.44	307.85	10,492.55
Penang	520.18	14,369.97	7,463.66	100,958.44	0.00	0.00
Perak	457.00	11,605.90	17,601.35	246,462.90	157.23	6,089.91
Selangor	3,594.50	92,183.95	4,951.63	74,687.09	3.23	106.86
Negeri Sembilan	31.00	837.00	1,367.52	21,880.32	80.86	3,105.02
Malacca	0.00	0.00	155.63	2,049.13	0.00	0.00
Johore	521.53	12,755.75	13,326.29	209,522.59	11.41	401.94
Pahang	11,687.12	323,684.53	257.10	4,358.92	40.34	1,748.00
Terengganu	31.54	818.94	349.75	5,509.44	15.82	475.93
Kelantan	0.00	0.00	131.76	1,679.94	0.00	0.00
Sarawak	0.00	0.00	7,499.00	134,982.00	2.48	57.04
Sabah	1,090.92	26,182.08	13,054.15	156,649.80	0.00	0.00
Total	18,118.51	488,790.25	69,084.10	1,002,463.00	619.22	22,477.26

Source: Department of Fisheries Malaysia, 2010

The shrimp commodities in Malaysia are regarded as one of the prominent fishery commodity as it is one of the high value fishery commodities. Besides, shrimp commodity is being seen as a source of foreign currency earning because of its surpluses trade value over years.

In fact, the Malaysian shrimp marketing studies were conducted by Megat (1995) and also Kusairi (1995), whereas a brief descriptive study on the market channel was also conducted in Othman (2008). Therefore, it is vital to update the information studies and review the market for Malaysian shrimp products in terms of domestic market as well as foreign markets. At present, private shrimp hatchery is getting more importance and it is more profitable than crop and livestock. The hatchery owners are the resource users and decision makers as well as policy makers. Although there have been many studies conducted in fisheries sector, rigorous empirical and economic study on shrimp hatchery is almost non-existent.

So, private hatchery led to increase the production of shrimp seed in the country with the expansion of production programme. Private shrimp hatcheries have proved to be economically profitable institutions and have a very wide impact on shrimp production. The absence of private hatchery will definitely be a limiting factor to the expansion of aquaculture and thus, involvement of private sector would lead to self-sufficiency in fish seed production of the country.

Thus it appears that Malaysia has great potentiality to increase shrimp production and in this respect shrimp hatchery can play a vital role to the socio-economic development in terms of nutrition, income generation, employment, poverty alleviation and also foreign exchange earnings.

In 2001, a research study by Wang Yin Geng found six viruses, namely *monodon baculovirus* (MBV), *white spot syndrome virus*(WSSV), *hepatopancreatic parvovirus* (HPV), *baculoviral midgut gland necrosis*(BMNV), *yellow-head virus* (YHV) and *infectious hypodermal and hematopoietic necrosis virus* (IHHNV).*Penaeus monodon cytoplasmic giant body* (PmCGB) was a newly recognized inclusion with unknown aetiology. With the exception of MBV, this is the first confirmation of the presence of these viruses in the Malaysian shrimp farming systems.

The White Spot Disease of shrimps is caused by a type of virus called the *Systemic Ectodermal and Mesodermal Baculovirus* (SEMBV) which was first detected in 1993 attacking white shrimps (*Penaeus chinensis*) in China. The same virus infection was also detected to have infected white shrimps (*Penaeus merguiensis, P Indicus*) and Tiger Prawn (*Penaeus monodon*) in India in 1994. Similar disease infection was reported in Taiwan, Japan, Indonesia and Thailand.

Malaysia needs to increase shrimp production to help meet the increased domestic demand resulting from population growth and meet protein availability. However, the availability of pure quality of shrimp seed is essential to the establishment of aquaculture industry. Department of Fisheries Malaysia has strengthened to encourage the establishment of private sector shrimp hatcheries to meet increasing demand for pure shrimp seed production.

The foregoing discussions indicate that quite a good number of hatcheries are conducted over the years in Malaysian shrimp industry. However, most of them are biological in nature like study by P. C. Liong. Economic studies on shrimp seed industry are very rears. So far there has not been any study on shrimp hatcheries, technical efficiency, in view of the necessity of shrimp seed production, a study on technical efficiency in shrimp seed production is very timely. This is why this study has been conducted.

1.6 Objective of the Study

The overall objective of the study is to examine the economics and efficiency of shrimp seed production system in Malaysian Industries. The specific objectives are as follows:

i. To determine technical, allocative, scale and cost efficiencies in shrimp seed production

ii. To estimate costs, returns and profitability of shrimp seed production

1.7 Significance of the Study

This study aims at estimating technical efficiency (TE), allocative efficiency (AE) and cost efficiency (CE) of shrimp seed producers of Malaysia and determining costs and return in shrimp seed production. The study is expected to provide valuable information on efficiencies of individual hatcheries, which are very useful for the policy makers to design intervention strategy for the shrimp production sector. It is also hoped that knowledge that would be obtained from this research would also be helpful for probable diagnosis and practical solutions to many problems of shrimp hatchery owners.

1.8 Organization of the Study

The thesis consists of 5 chapters. The present chapter is followed by Chapter II which deals with a short review of literatures related mainly to this study. Chapter III deals with methodology and research design. In Chapter IV, there are four sub-headings in this chapter. First, a brief description of socio-economic conditions of hatchery owners presented. Second, presents technical, allocative, scale and cost efficiencies. Third, costs, returns and profitability and fourth, problems and measures for improvement and sustainability. Finally, summary, conclusion and recommendations for future research is included in the Chapter V.

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