



UNIVERSITI PUTRA MALAYSIA

**AN ECONOMIC ANALYSIS OF MARINE CAGE CULTURE
IN PENINSULAR MALAYSIA**

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by

KAMARUZAMAN BIN HAJI SALIM

A thesis submitted in partial fulfilment of the
requirements for the degree of Master of Science
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by

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Marine fish cage culture is a new emerging aquaculture enterprise in Malaysia. Recently, it has been selected as one of the culture methods to be promoted in the Malaysian Aquacultural Development Programme. However, the present productivity of this culture system seems low compared to its potential. Therefore, the objective of this study is to find ways to increase productivity of marine cage culture which could reduce per unit cost of production, leading to improved profit.

This study explores the issue of relative economic efficiency (which includes technical and price efficiency) between the family-unit and commercial farms, and the issue of farmers' production behaviour. The profit function approach is used to achieve the objectives. The normalized restricted



translog profit function is specified as a function of three normalized prices of variable inputs (ie. fingerlings, feed and labour), two fixed inputs (ie. cage volume and experience) and a dummy variable to distinguish the family-unit and commercial farm groups.

The result indicates that all sampled farms are not able to maximise their short-term profit. This is because there is a significant difference in relative economic efficiency between family-unit and commercial farm groups. It is also revealed that the family-unit farmers are not able to maximise their short-term profit. This result reflects that they are not price efficient because their efficiency in utilizing their feed resources. As a result, they are not able to equate marginal product value of the feed to its price. The reason is that they are not able to adopt fully the new culture technology. On the other hand, the commercial farmers maximize their profit and use their resources efficiently. It is also found that the commercial farms possess a superior technical efficiency as compared to the family-unit farms. Besides, the commercial marine cage culture production does not follow constant returns to scale. In addition, the translog functional form is found out to be more appropriate than Cobb-Douglas form for data analysed.

The productivity and profitability of the family-unit marine cage culture can be increased through improving price and technical efficiency. While, the productivity and profit can only

be increased through enhancing technical efficiency for the commercial farming. As such, it is recommended that marine cage farming within the commercial size should be encouraged in Peninsular Malaysia.

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**ANALISA EKONOMI PEMELIHARAAN IKAN DALAM SANGKAR AIR MASIN
DI SEMENANJONG MALAYSIA**

oleh

KAMARUZAMAN BIN HAJI-SALIM
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Perusahaan ternakan ikan dalam sangkar air masin adalah merupakan satu industri akuakultur yang sedang berkembang pesat di- Malaysia. Baru-baru ini, ia telah pun dipilih sebagai salah satu daripada cara ternakan yang akan dikembangkan didalam Program Pembangunan Akuakultur di Malaysia. Walau bagaimana pun, adalah didapati daya pengeluaran sekarang bagi perusahaan ini adalah rendah jika dibandingkan dengan potensinya. Jadi, objektif kajian ini adalah untuk mencari langkah-langkah bagi meningkatkan daya pengeluaran perusahaan ternakan ikan dalam sangkar air masin yang membolehkan pengurangan setiap unit kos pengeluaran dan seterusnya meningkatkan keuntungan.

Kajian ini akan menyelidik isu berkaitan kecekapan ekonomi relatif (termasuk kecekapan teknikal dan harga) diantara ladang unit-keluarga dan ladang komersial, dan juga isu berkaitan

perlakuan penternak dalam aktiviti pengeluaran. Pendekatan fungsi keuntungan (The profit function approach) telah digunakan untuk mencapai objektif-objektif tersebut. "The normalized restricted translog profit function" telah dispecifikasikan sebagai fungsi kepada tiga normal harga-harga untuk input berubah (anak ikan, makanan dan buruh), dua kuantiti input tetap (isipadu sangkar dan pengalaman) dan satu angkubah "dummy" untuk membezakan kumpulan ladang unit-keluarga dengan ladang komersial.

Keputusan menunjukkan bahawa semua sampel ladang-ladang tidak berupaya untuk memaksimakan keuntungan jangka pendek mereka. Ini kerana terdapat perbezaan didalam kecekapan ekonomi relatif diantara kumpulan ladang unit-keluarga dengan komersial. Adalah didapati juga penternak dari unit-keluarga tidak memaksimakan keuntungan dalam jangkamasa pendek. Keputusan ini menggambarkan mereka tidak mencapai kecekapan harga kerana mereka tidak cekap didalam menggunakan sumber-sumber makanan. Akibatnya, mereka tidak berupaya untuk menyamakan nilai keluaran sut bagi makanan dengan harga makanan. Ini kerana mereka ini masih baru dan masih belum berupaya untuk menerima sepenuhnya teknologi penternakan. Sementara itu, penternak komersial adalah memaksimakan keuntungan mereka dan telah menggunakan sumber-sumber dengan cekapnya. Adalah didapati juga, ladang-ladang komersial mempunyai kecakapan teknikal yang lebih baik jika dibandingkan dengan ladang-ladang unit-keluarga. Disamping itu, pengeluaran ladang-ladang komersial bagi ternakan ikan dalam

sangkar air masin adalah tidak mengikuti kadar pulangan tetap. Tambahan pula, didapati "Translog functional form" adalah lebih sesuai daripada "Cobb-Douglas" untuk data yang dikaji.

Daya pengeluaran dan keuntungan didalam ladang-ladang ternakan ikan dalam sangkar air masin untuk unit-keluarga bolih ditingkatkan menerusi kecekapan harga dan teknikal. Sementara itu, daya pengeluaran dan keuntungan untuk ladang-ladang komersial hanya bolih ditingkatkan menerusi kecekapan teknikal sahaja. Oleh itu, adalah dicadangkan ternakan ikan dalam sangkar air masin secara komersial haruslah digalakkan di Semenanjung Malaysia.

CHAPTER 1

INTRODUCTION

THE MALAYSIAN FISHERY SUBSECTOR

Malaysia like any other developing country has moved towards industrialization in her economic development. Although industrialization has taken place, Malaysia essentially remains an agricultural country. The agricultural sector still plays an important role in her economy, even though the percentage share of this sector in the Gross Domestic Product (GDP) has declined from 32.1 per cent in 1970 to 21.3 per cent in 1985. It is still the major source of employment and accounts for 33.9 per cent of the total labour force (Economic Report, 1986/87).

The fishery industry, including aquaculture, is a subsector of the agricultural sector. This subsector plays a significant role in the national economy. The main contributions of this subsector are the supply of protein food, the generation of employment and the earning of foreign exchange (T.Ubaidillah, 1986b;p.88). In 1985, the fishery subsector accounts for about one per cent of GDP, and about 0.8 per cent of export earnings and employs about two per cent of the national labour force



(Annual Fisheries Statistics, 1986). Although its contribution to the overall national economy is relatively small, this subsector should and has always received greater attention from the Government of Malaysia (GOM). This is because the fishing community represents one of the poorest groups of the Malaysian population. The Fifth Malaysian Plan, 1986-90 indicates that in 1984, 27.7 per cent of fishing households in Peninsular Malaysia were in the poverty category. Although this figure compares favourably with that of earlier years (45.3 per cent for 1980) the apparent reduction in poverty in recent years may be largely due to the nature of the poverty line used at various times.

THE SUPPLY AND DEMAND OF FISHERY PRODUCTS

The fishery production of Peninsular Malaysia comes from two sources, freshwater and marine (including brackishwater) fisheries. For the period 1980-85, the average annual total production was about 591,000 mt valued at more than M\$1.2 billion. In 1985, capture fisheries accounted for nearly 90 per cent of total production in the country. The remaining 10 per cent of production was from culture fisheries (Table 1).

As shown in Table 1, the total catch from marine capture fisheries declined from 580,000 mt in 1981 to about 463,000 mt in 1985. This phenomenon occurs due to the limits of fish stocks within the inshore waters. Coupled with rapid increase in fishing effort this results in overfishing especially on the West-coast

of Peninsular Malaysia. T.Ubaidillah (1986b;p.88) estimated that some 90 per cent of total landing was caught within the inshore areas and this concentration of fishing activities has led to over-exploitation of fish resources. Another related problem that limits the supply of consumable fish is the increasing proportion of trash fish in the total catch. Only 50 per cent of total landings can be consumed (Ang,1986;p.5). Therefore, one can foresee that the total catch of capture fishery is hardly sufficient to meet the increasing demand for fish unless new resources especially in the Exclusive Economic Zone (EEZ) are exploited. Due to the limited experience of local fishermen in these new areas and techniques of exploitation, the commercial viability of this venture is still questionable.

Table 1

**QUANTITY AND VALUE OF ANNUAL FISHERIES PRODUCTION
IN PENINSULAR MALAYSIA, 1980-85**

Year	Capture		Culture		Total	
	Quantity (*000mt)	Value (\$ mil)	Quantity (*000mt)	Value (\$ mil)	Quantity (*000mt)	Value (\$ mil)
1980	502.63	940.41	129.48	59.11	623.11	999.52
1981	580.40	1,189.88	78.44	51.70	658.84	1,241.58
1982	517.86	1,214.45	64.32	65.92	582.18	1,280.37
1983	570.52	1,286.52	51.44	59.27	621.96	1,345.79
1984	481.64	1,059.13	63.59	45.82	545.23	1,104.95
1985	462.86	1,051.13	51.71	49.61	514.57	1,100.74

(Source: Annual Fisheries Statistics, 1980-85)

Note: All values are at current prices.

On the other hand, both the domestic and export demands for fishery products are increasing with the rising per capita income and population growth. Fishery products are considered as one of the important staple food for the Malaysian people. The present per capita consumption of fish in Malaysia is about 30 kg. per annum (Ang, 1986;p.5) while the population growth is expected at about 2.5 percent annually. Based on these figures, the demand for human consumption by the year 1995 would be about 600,000 mt. (Labon,1974). Thus, there is a need to increase fish production for human consumption by almost 240,000 mt by the year 1995 (Ang, 1986;p.5). In order to meet these increasing demand for fish, the GOM has implemented several programmes to develop the aquaculture industry. This move is in recognition to the fact that the aquaculture production process can be controlled and managed in order to achieve maximum production as opposed to capture fishery production which depends solely on natural stocks and environment (Shang, 1981;p.4). Furthermore the development of the aquaculture industry will create additional employment opportunities in order to absorb the excess fishermen in the over-exploited capture fisheries. In addition, the programmes attempt to fully utilize the available natural resources and to distribute evenly the development projects all over the country (Second Malaysian Plan, 1971-75).

AQUACULTURE IN PENINSULAR MALAYSIA

The Aquacultural Subsector's Contribution To National Economy

Aquaculture in Malaysia is still at an early stage of development compared with agriculture or capture fisheries. However, with the advances in cultural technologies there has been significant aquaculture development in recent years. During the period of 1980-85, the average annual aquaculture production is about 73,000 mt, valued at about M\$55 million (Table 1).

Although the amount of aquaculture production is relatively small as compared to capture fisheries, the aquacultural industry assumes an important role in supplementing fish supply in the country especially in providing quality fish to the inland population. It has also generated some 14,000 employment opportunities and a source of additional income to the rural people (Annual Fisheries Statistics, 1985).

Aquaculture Production

Aquaculture production represents only about 10 per cent of total fisheries production in the country. For the period 1980-85, the overall aquaculture production shows a declining trend both in terms of quantity and value. The declining trend in the aquaculture production is largely due to the strict enforcement on cockle collection by eliminating illegal cockle collectors as well as preventing undersized cockle harvest. This is because a large percentages of aquaculture production came from cockle