UNIVERSITI PUTRA MALAYSIA

FACTORS AFFECTING THE TECHNICAL EFFICIENCY OF INSHORE FISHERIES IN KUALA TERENGGANU, MALAYSIA

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By

NURUL AISYAH BINTI MOHD SUHAIMI

Thesis submitted to the School Graduate Studies, University Putra Malaysia, in fulfillment of the requirements for the Degree of Master of Science

August 2009

Especially dedicated to my dearly beloved:

Husband,

Muhammad Hafeez bin Mohammad Noor

Son,

Ahmad Ilman Solihin

And

Family

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

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Chairman **: Professor Mohd Ariff bin Hussien, PhD**

Faculty **: Agriculture**

Marine fish landings in Terengganu have shown a declining pattern starting from year 1985 to 2007. Most of the total landings in Terengganu had come from inshore fisheries. The objective of this study is to determine the factors affecting the technical efficiency of the inshore fisheries in Kuala Terengganu. Data for the study was collected from a survey conducted between June and August 2007 where 100 fishermen in 14 villages were chosen by stratified sampling. Data envelopment analysis (DEA) and Tobit analysis were employed to determine the technical efficiency level and factors influencing among the fishermen.

Results of the study show that, most fishing units exhibit a low degree of technical efficiency. This implies that either fishing inputs were used inefficient or insufficient inputs were used in fishery activities. The mean technical efficiency for the sample was estimated to be 55% for the peak season and 40% for the non peak season. About 37%

and 62% of the fishermen had less than 40% level of technical efficiency in peak season and non peak season respectively. Management variables (planning, staffing and controlling) and demographic variables (size of horsepower, size of family and formal education) exert positive effect on technical efficiency on inshore fisheries in Kuala Terengganu.

These findings suggest that there is much room for improvement in efficiency among a large segment of the inshore fishermen. With appropriate training and using more advanced technologies, fishermen' level of technical efficiency can be raised.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Master Sains

FAKTOR-FAKTOR YANG MEMPENGARUHI KECEKAPAN TEKNIKAL PERIKANAN PESISIR PANTAI DI KUALA TERENGGANU, MALAYSIA

Oleh

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Pendaratan ikan laut di Terengganu menunjukkan penurunan sejak tahun 1985 hingga 2007. Kebanyakan daripada jumlah pendaratan ikan di Terengganu adalah disumbangkan oleh perikanan pesisiran pantai. Objektif kajian ini adalah untuk menentukan faktor-faktor yang mempengaruhi kecekapan teknikal dalam perikanan pesisiran pantai di Kuala Terengganu. Data untuk kajian ini dikumpul daripada kaji selidik yang dijalankan di antara bulan Jun hingga Ogos 2007 di mana 100 orang nelayan dari 14 kampung dipilih secara persampelan strata. Data Envelopment Analysis (DEA) dan Tobit Analysis digunakan untuk menentukan tahap kecekapan teknikal dan faktor-faktor yang mempengaruhi nelayan.

Keputusan kajian menunjukkan bahawa kebanyakan bot mempunyai darjah kecekapan teknikal yang rendah. Ini disebabkan oleh samada penggunaan input tidak cekap ataupun input tidak mencukupi dalam aktiviti perikanan. Min kecekapan teknikal untuk sampel

adalah dianggarkan sebanyak 55% untuk musim banyak ikan dan 40% bagi musim kurang ikan. Sebanyak 37% nelayan mendapat kurang daripada 40% tahap kecekapan teknikal di musim banyak ikan manakala 62% pada musim kurang ikan. Pembolehubah pengurusan (perancangan, penstafan dan pengawalan) dan pembolehubah demografik (saiz enjin kuasakuda, saiz keluarga dan pendidikan formal) menunjukkan kesan positif terhadap kecekapan teknikal di perikanan pesisiran pantai di Kuala Terengganu.

Hasil kajian ini mencadangkan masih terdapat banyak ruang untuk peningkatan dalam kecekapan di kalangan nelayan pesisir pantai. Dengan latihan yang bersesuaian dan penggunaan teknologi moden, tahap kecekapan teknikal nelayan akan meningkat.

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DECLARATION

I declare that the thesis is 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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NURUL AISYAH MOHD SUHAIMI

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LIST OF ABBREVIATIONS

CRS	Constant Returns to Scale
DEA	Data Envelopment Analysis
DOF	Department of Fishery
DMU	Decision Making Unit
EEZ	Exclusive Economic Zone
GDP	Gross Domestic Product
GRT	Gross Registered Tonnage
SFA	Stochastic Frontier Analysis
SPF	Stochastic Production Frontier
TE	Technical Efficiency
VRS	Variable Returns to Scale

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CHAPTER 1

INTRODUCTION

1.1 Background

From ancient times, fishing has been a major source of food for humanity and a provider of employment and economic benefits to those engaged in this activity. However, with increased knowledge and the dynamic development of fisheries it was realized that aquatic resources, although renewable, are not infinite and need to be properly managed, if their contribution to the nutritional, economic and social well-being of the growing world's population were to be sustained. This chapter introduces the general overview of the fisheries sector in the country with the emphasis on the efficiency of marine fishery sector. This is followed by the statement of research problems, research objectives and the significant of the study.

1.2 Maritime Jurisdiction

The coastal waters (up to 20-m depth) of Malaysia have a surface area of 373,500 km^2, which encompasses territorial waters of 161,205 km^2. Malaysia claims an Exclusive Economic Zone (EEZ) of 548,800 km^2 of which 298,800m^2 is located off Peninsular Malaysia and 160,000 km^2 (29%) is located off Sarawak State and 90,000km^2 (16%) is off Sabah State. Malaysia's coastal waters represent about 69% of the EEZ. Malaysian waters are generally divided into four sub-areas: the west coast and the east coast of Peninsular Malaysia and the coast of Sarawak and the coast of Sabah. The west coast and the east coast of Peninsular Malaysia are clearly

distinguishable, as the two areas are facing different water bodies, which are the Indian Ocean and the South China Sea, respectively. Brunei Darussalam separates Sarawak coast and Sabah west coast. Both coasts face the South China Sea. Much of the sea off the west coast of Peninsular Malaysia is comparatively shallow with a muddy and flat sea floor and fringed my mangrove swamps and estuaries. The fishing grounds are bounded by the island of Sumatra on the opposite side of the straits, and have been subject to biological and economic overfishing (Ishak, 1994; Vincent *et al.,* 1997). The east coast fishing grounds along the South China Sea are larger in area, face a more severe monsoon, have deeper and rougher waters, more reefs, fewer prawns and a coastline more fringed by sandy beaches and coconut palms than the west coast. West coast fishers exploit the pelagic (migratory), demersal (bottom-dwelling), and prawn resources while east coast fishers are more likely to harvest pelagic fish (Ooi, 1990).

1.3 Closed Fishing Area

The more efficient commercial fishing gears such as trawl and purse seine nets are prohibited from operating in the inshore waters up to 5 nautical miles from the coast. This is to protect the juveniles of fish that are concentrated in the inshore waters from the intensive fishing pressure of these commercial gears.

The trawlers and the purse-seiners are restricted to operate in designated zones depending on the tonnage of the vessels. The establishment of the management zones is to reduce conflict among the fishermen and to ensure an equitable allocation of resources between the fishing vessels of the different sizes and capacities. The

Fisheries Comprehensive Licensing Policy (FCLP) divides Malaysian fishing waters into four zones:

Zone A: 0-5 miles from shore, reserved for traditional fisheries;

Zone B: 5-12 miles from shore, for commercial fisheries that uses gear such as trawls and purse-seines below 40 GRT (Gross Registered Ton);

Zone C: 12-30 miles from shore, for commercial fisheries that uses boats above 40 GRT;

Zone C2: 30 miles from the shore and beyond, for commercial fisheries that uses - boats 70 GRT and above.

1.4 Fisheries Sector in Malaysia

In the year 2007, the fisheries sector which comprised of marine capture fisheries and aquaculture, produced 1,654,217.98 tonnes of food fish with a value of RM6,467.40 million and 558,178,294 pieces of ornamental fish valued at RM647.05 million. It recorded an increase in production by 4.17% and in value by 3.65% as compared to the year 2006. In the year 2007, the fisheries sector contributed 1.20% to the GDP. Marine capture fisheries produced 1,381,424 tonnes, contributing 83.51% to the total national fish production with a value of RM5,039.92 million, increasing by 0.71% from the year before. In this fisheries sub-sector, the coastal fisheries remained the major contributor with a production of 1,117,056 tonnes valued at RM4,166.66 million or 80.86% of the nation's fish production. Meanwhile, deep-sea fisheries contributed 264,367 tonnes with value of RM873.25 million.

The aquaculture sub-sector recorded a production of 268,514.21 tonnes, constituting about 16.23% of the total fish production with a value of RM1,393.35 million. This sub-sector showed an increase in production by 26.64% and in value by 7.87% as compared to the year before. The production of ornamental fish in 2007 indicated a significant decrease when compared to the trend in previous years. The production was 558,178,294 pieces recording a decrease of 13.34% from 644,099,783 pieces in 2006. However, the value of the ornamental fish increased as well by 256.03% from RM181.74 million in 2006 to RM647.05 million in 2007. (Source: Department of Fisheries Malaysia, 2007)

1.5 Marine Fisheries in Malaysia

1.5.1 Fishermen

A total of 99,617 fishermen were recorded working on licensed fishing vessels in 2007 compared with 97,947 in 2006, increasing by 1.71%. Out of this total, 28,656 were foreign (non Malaysian citizen) fishermen from Thailand, Indonesia and Myanmar. The number of fishermen who worked on fishing vessels operating commercial gears namely trawlers and purse seiners was 44,775 (47.95%) while the remainder 54,842 (55.05%) fishermen worked on fishing vessels operating traditional gears.

1.5.2 Fishing Vessels

On the whole, the number of fishing vessels licensed has increased by 2.47% from 38,276 units in 2006 to 39,221 units in 2007. The rise was due to the additional number of renewed fishing vessels licensed during 2007.

The number of licensed fishing vessels in Peninsular Malaysia was 24,161 units in 2007 which accounted for 61.60% of the total nation's fishing fleet. The number of fishing fleet recorded for the West Coast was 17,392 units contributing 71.98% in Peninsular Malaysia, while the East Coast recorded a percentage of 28.02% amounting to 6,769 units only. In the West Coast, the bulk of the fishing vessels were from the state of Perak which recorded 4,890 units (28.12%) while Terengganu recorded the highest number of fishing vessels in the East Coast with 2,422 units (35.78%).

Sabah, Sarawak and Federal Territory of Labuan recorded a total of 15,060 units of licensed fishing vessels contributing to only 38.40% of the total fishing fleet in Malaysia. However, it indicated an increase of 1.80% compared to 2006 which recorded 14,798 units only with Sabah recording the highest number of 10,456 units.

The number of deep-sea fishing vessels remained small when compared to those operating in the inshore waters. Deep sea fishing vessels are fishing vessels of sizes 70 GRT and above and are licensed to fish in waters 30 nautical miles from shore and beyond. In 2007, there were 38,420 fishing vessels licensed to operate in coastal areas. There were only 801 deep-sea fishing vessels licensed in 2007 decreasing by

2.79% from 824 units in 2006. The said deep-sea fishing vessels do not include vessels of sizes 70 GRT and above licensed to catch tuna, as well as anchovy purse seiners and anchovy processing vessels.

1.5.3 Fishing Gears

The number of fishing gear licenses issued in 2007 increased by 2.26% to 38,554 units from 37,703 in 2006. It may be noticed that the number of fishing vessels licensed did not match the number of fishing gears licensed equally. Contributing factors include firstly, in a normal circumstance, each fishing vessel was licensed to operate only one fishing gear, however, there were instances where a fishing vessel was licensed to operate more than one fishing gears. These gear licenses were issued with a purpose to permit fishing throughout the year or for certain seasons only. These instances could be seen in cases of vessels operating traditional gears which were fisheries resource friendly. Dual or multiple traditional gear licenses were also issued for the purpose of increasing the income of the traditional fishermen.

Secondly, the difference between the number of fishing vessels and fishing gears was due to the fact that there were vessels licensed without any licenses to operate any gears. These vessels include anchovy processing vessels and vessels used for fish aggregating devices surveillance. Another reason was that there were licenses issued for two vessels to operate only one gear as in the case of the vessels operating the gear known as *kenka-2-boats* gear.

Table 1.1: Major marine fishing gears by types of vessels.

Area	Vessel		Gear
Inshore	Traditional	Non-motorized	Gill/drift net, seine net, hook and line, bag net, traps, stakes
		Motorized	Gill/drift net, hook and line, traps, bag net, lift net, stakes, seine, barrier net, push net
	Commercial (<70 GRT)	Motorized	Trawl, purse seine
Deep sea (>30nm)	Commercial (>70 GRT)	Motorized	Trawl, purse seine

Source: Department of Fisheries Malaysia

1.5.4 Marine Fish Landings

In the year 2007, the total marine landings went up moderately which amounted to 1,381,424 tonnes and increased by 0.71% as compared to 1,371,733 tonnes in 2006. The rise was brought about by the increase in landings by both inshore and deep-sea subsectors.

The inshore landings decreased by 0.30% from 1,120,401 tonnes in 2006 to 1,117,056 tonnes in 2007. Meanwhile, landings from the deep-sea fisheries sector increased by 5.19% from 251,331 tonnes in 2006 to 264,367 tonnes in 2007. The total marine landings consisted of 36.66% pelagic fish amounting to 506,324 tonnes, 20.58% of demersal fish amounting to 284,353 tonnes and 42.76% of molluscs, crustaceans and others which was 590,747 tonnes.