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Level of technical efficiency of inshore fisheries in Kuala Terengganu

(Tahap kecekapan teknikal perikanan pesisir pantai di Kuala Terengganu)

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Abstract

The level of technical efficiency of the inshore fishermen in Kuala Terengganu. was determined. A survey was conducted between June and August 2007 where 100 fishermen in 14 villages were chosen by stratified random sampling. Data envelopment analysis (DEA) was employed to determine the technical efficiency level among the fishermen. Results of the study showed that most fishing units exhibited a low degree of technical efficiency. This implies that either fishing inputs were used inefficiently or insufficient inputs were used in fishery activities. The mean technical efficiency for the sample was estimated at 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. These findings suggest that there is much room for improvement in efficiency among a large segment of the inshore fishermen in Kuala Terengganu.

Introduction

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. The marine capture fisheries in Malaysia and in Terengganu developed from an inshore traditional fishery to its present mix of traditional, commercial and deep-sea fishery subsectors. Although the bulk of the marine fish landings come from the inshore commercial and deep sea fishery subsectors, the inshore traditional fishery is of no less important as it involves a small scale of fishermen generally associated with low income and poverty.

In 2009, the fisheries sector contributed 3.4% to the Malaysia GDP. In Terengganu, production from marine captures fisheries in 2007 contributed 81,007 tonnes (5.86%) of the nation's fish production valued at RM384 million. It also provided employment to 8,651 fishermen (5,884 local workers and 2,767 foreign workers) who worked on 2,422 units of licensed fishing vessels. In 2007, most of the total landings in Terengganu had come from inshore fisheries (Department of Fisheries Malaysia).

In general, problems and constrains faced by small-scale fisheries in most countries in the region are similar, only varying from one country or village to

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another in terms of local importance. In contrast to large-scale commercial fisheries, inshore fisheries are owner-operated and labour intensive, employing rudimentary technologies. Inshore fisheries harvest the sea from comparatively small vessels, powered by sail, paddles or lower powered outboard motors which have limited fishing range and generally deploy passive fishing gears that are set and later retrieved (Squires et al. 1998). In Terengganu, about 1,909 of the fishermen working on licensed vessels used traditional fishing gear and the domination gear type used is hooks and lines.

The measurement of efficiency has long been a subject of study for many economists and hence is of great interest to policy planners. It is important as a first step in identifying the process for resource saving and how to increase productivity. In an economy, where resources are scarce and opportunities of new technologies are lacking, an efficiency study will be able to show the possibility of raising productivity by improving efficiency without increasing the resource base or developing new technology. A firm is technically efficient if it produces a higher level of output as compared to another firm at the same level of input (Youtopoulos and Lau 1973). The objective of this study was to examine the level of technical efficiency of inshore fishermen in Kuala Terengganu.

Methodology

Source of data

Primary data was collected from June to July 2007. The data were based on fishing activities from January to December 2006. A total of 100 fishermen were selected as respondents based on a stratified random sampling method. The 100 respondents were chosen randomly from the 14 villages selected in Kuala Terengganu based on the lists provided by the Department of Fisheries (DOF), Terengganu.

Theoretical framework

Generally, a firm is technically efficient if it produces a higher level of output compared to another firm at the same level of inputs. Farrell (1957) explained that the concept of technical inefficiency refers to the amount by which output is less than the potential output for a given combination of inputs used in a production process. The potential output is a maximum output attainable from a given set of inputs. A fishing vessel's technical efficiency is a measure of its ability to produce in relation to the maximum output possible from a given set of inputs and production technology (Aigner et al. 1977; Meeusen and van den Broeck 1977).

The non-parametric estimation of Data Envelopment Analysis (DEA) was used to estimate the level of technical efficiency of fishermen. Data envelopment analysis (DEA) is a powerful aggregate comparative method for assessing the productivity of an organization with multiple incomparable inputs and outputs. The input-output regression of ordinary least square model produces results in average or expected level of outcome given certain inputs, instead of the desired maximum achievable outcome (Soteriou et al. 1998). Moreover, econometric approach used in evaluating efficiency is based on the assumption that all decision making units are operating efficiently and would not be appropriate if technical efficiency assumption is dropped (Fukuyama 1993).

Non-parametric analysis does not require a priori functional specification of the unknown technology or distribution assumptions about the error term that may cause potential specification error. The multiple outputs and variable return to scale of production provide meaningful technical and scale efficiency measures for each decision making units without having data on input price and costs. Non-parametric approach also identifies sources of production growth, hence provides recommendation for performance improvement (Fukuyama 1993; Grabowski et al. 1994). Non-parametric analysis also avoids the problem arising from multicollinearity among variables (Elyasiani and Mehdian 1993).

Data envelopment analysis (DEA) is currently the most widely used method for estimating capacity in fisheries (Kirkley et al. 1998), although stochastic production frontier (SPF) methods have also recently been applied to this problem (Kirkley et al. 2002). Both methods have their advantages and disadvantages, so neither is clearly preferable (Resti 2000). In particular, DEA does not easily disentangle noise from efficiency or permit prediction of output responses to changes in input or stock levels or the underlying technology.

A fishing vessel's technical efficiency is a measure of its ability to produce relative to the fleet's best-practice frontier, the maximum output possible from a given set of inputs and production technology (Meeusen and van den Broeck 1977; Aigner et al. 1997).

DEA has been tested empirically in many settings including rate-collection department (Thanassoulis et al. 1987), health care organization (Sherman 1984; Rosko 1990; Miller and Adam 1996), court systems (Lewin et al. 1982) and university accounting departments (Tomskins and Green 1988).

Model specification

In establishing the model specification, DEA was adopted and tested. In this study, Frontier 4.1 was used to analyse the data. DEA is multi-factor productivity analysis model for measuring the relative efficiencies of the homogeneous set of decision making units (DMUs). The general form of the model is:

$$\text{Efficiency} = \frac{\text{weighted sum of output}}{\text{weighted sum of inputs}} \qquad (1)$$

Assuming that there are n DMUs, each with *m* inputs and *s* outputs, the relative efficiency score of a test DMU *p* is obtained by solving the following model proposed by Charnes et al. (1978):

$$\text{Maximize} \quad Z_0, \quad \frac{\sum_{k=1}^{s} v_k\, y_{kp}}{\sum_{j=1}^{m} u_j\, x_{jp}}$$

$$\text{Subject to} \quad \frac{\sum_{k=1}^{s} v_k\, y_{ki}}{\sum_{j=1}^{m} u_j\, x_{jp}} \leq 1 \forall i$$

$$v_{kv},\ u_j \geq 0 \quad \forall k,j, \qquad (2)$$

Where

k = 1 to s,

j = 1 to m,

i = 1 to n,

y_{ki} = amount of output k produced by fishermen i,

x_{ji} = amount of input j utilized by fishermen i,

v_k = weight given to output (catch per kg) k,

u_j = weight given to input (GRT, number of workers, distance from shore and expenditure per trip) j.

The fractional program shown as (2) can be converted to a linear program as shown in (3).

$$\text{Maximize } Z_0 \quad \sum_{k=1}^{s} v_k\, y_{kp}$$

$$\text{Subject to} \quad \sum_{j=1}^{m} u_j\, x_{jp} = 1$$

$$\sum_{k=1}^{s} u_j\, x_{jp} - \sum_{j=1}^{m} u_j\, x_{ji} \leq 0 \quad \forall i$$

$$v_{kv},\ u_j \geq 0 \quad \forall k,j \qquad (3)$$

The above problem is run *n* times in identifying the relative efficiency scores of all the DMUs. Each DMU selects input and output weights that maximize its efficiency score. In general, a DMU is considered to be efficient if it obtains a score of 1 and a score of less than 1 implies that it is inefficient.

The Constant Returns to Scale model (CRS)

We shall begin by defining some notation. Assume there is data on K inputs and M outputs on each of N firms or DMU's as they tend to be called in the DEA literature. For the i-th DMU these are represented by the vectors x_i and y_i respectively, K x N input matrix, X and the M x N output matrix. Y represents the data of all N DMU's. The purpose of DEA is to construct a non-parametric envelopment frontier over the data points which lay on or below the production frontier. For the simple example of an industry where one output is produced using two inputs, it can be visualized as a number of intersecting planes forming a tight fitting cover over a scatter of points in three-dimensional space.

The best way to introduce DEA is via the ratio form. For each DMU, we would like to obtain a measure of the ratio of all outputs over all inputs, such as $u'y_i/v'x_i$, where u is a M x 1 vector of output weights and v is a K x 1 vector of input weights. To select optimal weights we specify the mathematical programming problem:

$$\begin{aligned} &\text{Max}_{u,v} \quad (u'y_i/v'x_i) \\ &\text{s.t. } u'y_j/v'x_j \leq 1,\ j=1, 2,\ldots, N, \\ &u, v \geq 0. \end{aligned} \tag{1}$$

This involves finding values for u and v, such that the efficiency measure of the i-th DMU is maximized, subject to the constraint that all efficiency measures must be less than or equal to one. One problem with this particular ratio formulation is that it has an infinite of solutions. To avoid this, one can impose the constraint $v'x_i = 1$ which provides:

$$\begin{aligned} &\text{Max}_{\mu,v}\ (\mu'y_i) \\ &\text{s.t.} \quad v'x_i = 1 \\ &\qquad \mu'y_i - v'x_j \leq 0,\ j = 1,2,\ldots,N, \\ &\qquad \mu, v \geq 0 \end{aligned} \tag{2}$$

where the notation changes from u and v to μ and v which reflects the transformation. This form is known as the multiplier form of the linear programming problem.

Using the duality in linear programming, one can derive an envelopment form of this problem:

$$\begin{aligned} &\min\ \theta,\lambda,\theta \\ &\text{s.t.} \quad -yi + Y\lambda \geq 0, \\ &\qquad \theta xi - X\lambda \geq 0, \\ &\qquad \lambda \geq 0, \end{aligned} \tag{3}$$

Where θ is a scalar and λ is a N x 1 vector of constants. This envelopment form involves fewer constraints than the multiplier form (K+M ≤ N+1), and hence is generally the preferred form to solve. The value of θ obtained will be the efficiency score for the i-th DMU. It will satisfy θ ≤ 1, with a value of 1 indicating a point on the frontier and hence a technically efficient DMU, according to the Farrell (1957) definition. Note that the linear programming problem must be solved N times, once for each DMU in the sample. A value of θ is then obtained for each DMU.

The Variable Returns to Scale model (VRS) and scale efficiencies

The CRS assumption is only appropriate when all DMU's are operating at an optimal scale (i.e. one corresponding to the flat portion of the LRAC curve). Imperfect competition, constraints on finance, etc. may cause a DMU to be not operating at optimal scale. The use of the CRS specification when not all FMU's are operating at the optimal scale will result in measures of TE which are confounded by scale efficiencies (SE). The use of the VRS specification will permit the calculation of TE devoid of these SE effects.

The CRS linear programming problem can be easily modified to account for VRS by adding the convexity constraint: N1'λ = 1 to **(3)** to provide:

$$\begin{aligned} &\text{Min}\ \theta,\lambda,\theta, \\ &\text{St} \quad -y + Y\lambda \geq 0, \\ &\qquad \theta x_i - X\lambda \geq 0, \\ &\qquad N1\lambda = 1 \\ &\qquad \lambda \geq 0, \end{aligned} \tag{4}$$

where N1 is a N x 1 vector of ones. This approach forms a convex hull of intersecting planes which envelope the data points more tightly than the CRS conical hull and thus provides technical efficiency scores which are greater than or equal to those obtained using the CRS model. The VRS specification has been the most commonly used specification in the 1990s.

Results and discussion

Vessel background

Of the total number of vessel owners surveyed, 46% used outboard powered engine, 54% used inboard powered engine and none of the vessels was without engine (*Table 1*).

Most of the respondents were owners of the vessel they operated. Meaning, the owners were also the skippers of the vessel. Fishing vessels ownership patterns can be classified into three types, namely, vessels jointly owned with a friend or relative, owner operated vessels and vessels rented from others. About 89% of vessel owners purchased their vessels with their savings and acquired their vessels through government schemes. About 9% of the vessels surveyed were rented from other people and 2% were jointly owned with friends and relatives.

Table 1. Vessel background (n = 100)

Vessel background	Percentage
Type	
Outboard powered	46
Inboard powered	54
Vessel Acquisition	
Owned	89
Rental	9
Shared with other people	2
Horsepower	
1–20	40
21–40	44
41–60	4
61–80	1
81–100	8
>100	3
GRT (Meter)	
0.51–5.51	55
5.52–10.52	19
10.53–15.53	14
15.54–20.54	10
>20.54	2

The most widely used craft was the wooden vessel except for one which was made from fibre plastic. All vessels were motorized and the engine horsepower (hp) ranged from 8 to 120 hp. About 44% of the fisherman surveyed used vessels with 21–40 hp and another 40% used vessels with 1–20 hp. It means that 80% of the fishermen had vessels with 40 and less engine horsepower.

Boat size is usually measured by gross registered tonnage or GRT (meter). The maximum gross tonnage of the boat used by the fishermen was 24.10 m and the minimum recorded was 0.72 m. About 55% of the boat size ranged from 0.51 to 5.51 m.

Vessel activity

Most of the fishermen surveyed (71%) chose hooks and lines as their fishing gear. Hooks and lines are gears where the fish is attracted by a natural or artisanal bait (lures) placed on the hook fixed to the end of a line or snood, on which they get caught. About 27% of the fishermen surveyed used gill/drift net in their daily routine.

The results showed that 84% of inshore fishermen in Kuala Terengganu made their trips to the sea and came back on the same day and during the trip the fishermen's vessels on average travelled about 15.3 nautical miles. The average number of days fished in a month for peak season was 20.18 and average number of days fished in a month for non-peak season was 15.69 (*Table 2*).

Socio-economic and demographic background

The age of the fishermen surveyed ranged from 36 to 70 years with an average age of 52 years. The majority of the fishermen (72%) were between 36 and 57 years old. There was, however, a significant percentage

Table 2. Average value of fishing trip and distance travelled

	Mean	Min.	Max.
Operation distance (nautical mile)	15.3	1	70
Days fished			
Peak season (days)	20.18	2	26
Non peak season (days)	15.69	2	26

Table 3. Socio-economic and demographic background (n = 100)

	Percentage
Age (years)	
36–46	29
47–57	43
58–68	27
More than 68	1
Education background	
No formal education	14
Primary education	54
Secondary education	30
Satisfaction	
Yes	76
No	24
Catch (RM per month) for peak season	
Less than 1,000	10
1,000–5,000	45
5,000–10,000	32
10,000–15,000	4
15,000–20,000	7
20,00–25,000	3
More than 25,000	1
Catch (RM per month) for non-peak season	
Less than 1,000	60
1,000–2,500	22
2,500–4,000	10
4,000–5,500	3
5,500–7,000	2
7,00–8,500	1
More than 8,500	2

of the fishermen (28%) who were more than 57 years old. It is also noteworthy that young fishermen of age 35 and below were non-existence. This is consistent with the observed migration of rural youths to urban areas in search of employment and they are not attracted to fishing activity. Majority of the respondents were married and their average household size was 5.43 persons (*Table 3*).

The highest education level achieved was secondary school, which was represented by 30% of the fishermen surveyed. There were also 14% of the respondents who did not have any formal education while the majority of the respondents (54%) had their education until primary school only.

From *Table 3*, we can say that 76% of fishermen were satisfied with their income. Most of those who were not satisfied gave the reason of declining fisheries resources and about 6% of the fishermen cited the high price of fuel as the reason for dissatisfaction.

The average catch per month in the survey area ranged from RM400 to RM30,000 with a mean of RM6,306. About 10% of the fishermen obtained a catch per month of less than RM1,000 while 45% obtained RM1,000–5,000 per month (*Table 3*). Only one fisherman had a catch of more than RM25,000 per month. The range of catch per month for peak season is much higher than for non-peak season.

About 60% of the fishermen obtained a catch of less than RM1,000 per month for non-peak season while 22% obtained RM1,000–2,500 per month (*Table 3*). Overall catch per month was RM120–10,000 with a mean of RM1,565. Only two fishermen had a catch of more than RM8,500 per month during the non-peak season.

Income

The survey found that 20% of the fishermen had an income of less than RM500 per month with an average of RM878 per month (*Table 4*). Most of the fishermen (59%) had an income of RM500–1,000 per month while only 1% of fishermen had an income exceeding or equal to RM2,500 per month. In the non-peak season, 50% of the fishermen had a monthly income of RM100–300. Another 44% had RM300–600 as monthly income with an average of RM354 per month. Hence

Table 4. Income of fishermen in peak and non-peak season (n = 100)

Income (per month)	Percentage
Peak season	
Less than 500	20
500–1000	59
1000–1500	18
1500–2000	2
2000–2500	0
More than 2500	1
Non peak season	
Less than 100	3
100–300	50
300–600	44
600–900	2
More than 900	1

income in non-peak season was much lower (40%) than in peak season (*Table 4*).

Data Envelopment Analysis result

The value of technical efficiency, that is the ratio of actual to potential output, was calculated for each of the 100 fishermen. The efficiency range of 80% and above indicated higher level of technical efficiency while 40% and below was categorized as very low efficiency level. For the peak season where most of the fishermen go out fishing, the technical efficiency for each individual fisherman ranged from 0.073 to 1 with a mean of 0.5469 (*Table 5*).

Table 5.Technical efficiency index of inshore fisheries in Kuala Terengganu

Efficiency Index	CRS		VRS	
	Frequency	Percentage	Frequency	Percentage
Peak season				
0.000–0.099	8	8	4	4
0.100–0.199	16	16	12	12
0.200–0.299	17	17	13	13
0.300–0.399	15	15	8	8
0.400–0.499	12	12	16	16
0.500–0.599	6	6	8	8
0.600–0.699	10	10	2	2
0.700–0.799	2	2	10	10
0.800–0.899	3	3	4	4
0.900–0.999	1	1	3	3
1.00	10	10	20	20
Mean	0.4236		0.5469	
Minimum	0.056		0.073	
Maximum	1		1	
Non-Peak season				
0.000–0.099	24	24	12	12
0.100–0.199	22	22	20	20
0.200–0.299	25	25	23	23
0.300–0.399	8	8	7	7
0.400–0.499	8	8	7	7
0.500–0.599	6	6	4	4
0.600–0.699	0	0	7	7
0.700–0.799	0	0	3	3
0.800–0.899	2	2	2	2
0.900–0.999	1	1	1	1
1.00	4	4	14	14
Mean	0.2686		0.4017	
Minimum	0.017		0.025	
Maximum	1		1	

For VRS, about 73% of the fishermen achieved less than 80% of technical efficiency and 23% of the fishermen, however, showed an impressive efficiency index of greater than 90% in the peak season. About 43% of the fishermen operated at technical efficiency level greater than the mean. Meanwhile for CRS, about 14% of the fishermen achieved greater than 80% level of technical efficiency and only 11% achieved greater than 90%.

For the non-peak season where the fishermen went out fishing for 7–11 days a month, the technical efficiency for each individual fishermen ranged from 0.025 to 1 with a mean of 0.401 (*Table 5*). For VRS, about 83% of the fishermen attained less than 80% level of technical efficiency and 62% achieved less than 40%. Only about 15% of the fishermen achieved an impressive index of technical efficiency greater than 90% while 38% of the fishermen operated at the technical efficiency level greater than the mean. For CRS, about 79% of fishermen attained less than 40% level of technical efficiency while only 7% of fishermen achieved over 80%. The mean of 0.401 technical efficiency level across the non-peak season is lower than those generally found from stochastic frontier for developing country agriculture (Bravo-Ureta and Pinheiro 1993) and the high value found by Squires et al. (2002) for Peninsular Malaysian gill net fleet of artisanal fishers. The comparatively low mean level of technical efficiency found in this study contrasts with Schultz's (1964) thesis of 'poor and efficient' smallholders and peasants in developing country agriculture.

Conclusion and recommendation

This study has revealed that the inshore fishermen in Kuala Terengganu are not fully technically efficient and there is room of efficiency improvement. The findings of this study suggests that there exists allowance for improvement in efficiency among a sizeable proportion of the fishermen studied by addressing some important policy variable that negatively and positively influenced fishermens' levels of technical efficiency. With appropriate training and introduction of more advanced technologies fishermen's efficiency level can be raised.

References

Aigner, D.J., Lovell, C.A.K. and Schmidt, P. (1997). Formulation and estimation of Stochastic Frontier Production Function Models. *Journal of Econometrics* 6: 21–37

Bravo-Ureta, B. and Pinheiro, A. (1993). Efficiency analysis of developing country agriculture: A review of the frontier function literature. *Agricultural and Resource Economics Review* 22(1): 88–101

Charnes, A., Cooper, W.W. and Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research* 2: 429–444

Elyasiani, E. and Mehdian, S. (1993). Measuring technical and scale inefficiencies in the beer industry: non-parametric and parametric evidence. *The Quarterly Review of Economics and Finance* 33(4): 383–408

Farrell, M.J. (1957). The measurement of productive efficiency. *Journal of the Royal Statistical Society Series A* 120: 253–290

Fukuyama, H. (1993). Technical and scale efficiency of Japanese commercial banks: A non-parametric approach. *Applied Economics* 25: 1101–1112

Grabowski, R., Rangan, N. and Rezvanian, R. (1994). The effect of deregulation on the efficiency of US banking firms. *Journal of Economics and Business* 46: 39–54

Kirkley, J., Paul, C.M. and Squires, D. (2002). Capacity and capacity utilization in common-pool resource industries: Definition, measurement, and a comparison of approaches. *Environmental and Resource Economics* 22(1–2): 71–97

Kirkley, J., Squires, D. and Strand, I. (1998). Characterizing managerial skill and technical efficiency in a fishery. *Journal of Productivity Analysis* 9: 145–160

Lewin, A.Y., Morey, R.C. and Cook, T.J. (1982). Evaluating the administrative efficiency of vourts, *OMEGA*10: 401–411

Meeusen, W. and van den Broeck, J. (1977). Efficiency estimation from Cobb-Douglas production functions with composed error. *International Economic Review* 18: 435–444

Miller, J.L. and Adam Jr, E.E. (1996). Slack and performance in health care delivery. *International Journal of Quality and Reliability Management* 13(8): 63–74

Resti, A. (2000*)*. Efficiency measurement for multi-product industries: A comparison of classic and recent techniques based on simulated data. *European Journal of Operation Research* 121: 559–578

Rosko, M.D. (1990). Measuring technical efficiency in health care organizations. *Journal of Medical Systems* 14(5): 307–321

Schultz, T.W. (1964). *Transforming traditional agriculture*. New Haven: Yale University Press

Sherman, H. (1984). Hospital efficiency measurement and evaluation: Empirical test of a new technique. *Medical Care* 22(10): 922–938

Soteriou, A.C., Karahanna, E., Papanastasiou, C. and Diakourakis, M.S. (1998). Using DEA to evaluate the efficiency of secondary schools: The case of Cyprus. *International Journal of Educational Management* 12(2): 65–73

Squires, D., Grafton, Q., Alam, F. and Ishak, O. (1998). Where the land meets the sea: Integrated sustainable fisheries development and artisanal fishing. Discussion Paper No. 98–26, Department of Economics, University of California, San Diego

—— (2002). Technical efficiency in the Malaysian gill net artinasal fishery. Discussion Paper No. 98–26, Department of Economics, University of California, San Diego

Thanassoulis, E., Dyson, R.G. and Foster, M.J. (1987). Relative efficiency assessments using data envelopment analysis: An application to data on rates departments. *Journal of the Operational Research Society* 38(5): 397–411

Tomskins, C. and Green, R. (1988). An experiment in the use of data envelopment analysis for evaluating the efficiency of UK University Departments of Accounting. *Financial Accountability & Management* 4(2): 147–164

Youtopoulos, P.A. and Lau, L.J. (1973). A test of relative economic efficiency: Some further results. *American Economic Review* 49(1–3): 476–495

Abstrak

Tahap kecekapan teknikal dalam perikanan pesisiran pantai di Kuala Terengganu telah dikenal pasti. Data dikumpul daripada kaji selidik yang dijalankan antara bulan Jun hingga Ogos 2007. Sejumlah 100 orang nelayan dari 14 buah kampung di Kuala Terengganu dipilih secara persampelan strata. Data Envelopment Analysis (DEA) digunakan untuk menentukan tahap kecekapan teknikal di kalangan nelayan. Keputusan kajian menunjukkan bahawa kebanyakan bot mempunyai darjah kecekapan teknikal yang rendah. Ini disebabkan sama ada penggunaan input tidak cekap ataupun input yang tidak mencukupi dalam aktiviti perikanan. Min kecekapan teknikal untuk sampel dianggarkan sebanyak 55% untuk musim banyak ikan dan 40% untuk musim kurang ikan. Secara amnya, sebanyak 37% dan 62% nelayan mendapat tahap kecekapan teknikal kurang daripada 40% pada musim banyak ikan dan pada musim kurang ikan. Hasil kajian ini mencadangkan masih terdapat banyak ruang untuk peningkatan dalam kecekapan di kalangan nelayan pesisir pantai di Kuala Terengganu.