



UNIVERSITI PUTRA MALAYSIA

**TECHNICAL EFFICIENCY AND PRODUCTIVITY GROWTH ANALYSIS OF
AQUACULTURE IN PENINSULAR MALAYSIA**

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**DOCTOR OF PHILOSOPHY
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By

ABDULLAHI ILIYASU

**Thesis Submitted to the School of Graduate Studies, Universiti Putra
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Philosophy**

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DEDICATION

To

All members of our family



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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Doctor of Philosophy

**TECHNICAL EFFICIENCY AND PRODUCTIVITY GROWTH ANALYSIS
OF AQUACULTURE IN PENINSULAR MALAYSIA**

By

Abdullahi Iliyasu

July 2014

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Faculty: Agriculture

The demand for animal protein especially fish is expanding due to the population growth, increased incomes, and changes in eating habits and life styles. The capture fisheries in Malaysia which supply over 70% of the fish used for food are over-exploited and the yield has become stagnant over the last decades and in some cases it has even declined. In addition, the balance of trade for the past decade has been negative signaling a threat to the economic growth. However, aquaculture has the potential to meet these challenges if it is well practiced. This can be done through intensifying production levels which require a high usage of inputs though it may lead to technical inefficiency and increase the production costs of the farmers. This can ultimately make them to abandon the farms and opt for alternative sources of income due to low profits or losses. Hence, there is a need to improve the inputs usage efficiency as well as increase productivity in aquaculture. The study, therefore, aims to estimate the Slack Based Measure (SBM) of technical efficiency and evaluate the determinants of technical inefficiency in aquaculture. The study aims to compute the Total Factor Productivity (TFP) growth and its components. In addition, it aims to identify the sources of TFP growth in aquaculture. Data Envelopment Analysis (DEA) Malmquist Productivity Index, and regression model have been employed to analyze data. Three states have been selected for the studies because of their high production levels and active fish farmers. Data

from 248 fish farms were collected using well structured questionnaires and oral interviews. The estimated mean technical efficiency scores for ponds, tanks, cages and pen production technology were estimated to be 0.86, 0.91, 0.97 and 0.94, respectively. The findings show that the technical efficiency scores are relatively high for the sample fish farmers, which indicate that there is little room for improvement in the production. All the input variables revealed presence of slacks, an indication of inefficiency. The second-stage DEA analysis shows that factors such as experience, extension services, workshops attended and water management are found to have positive significant impact on technical efficiency. Furthermore, the TFP growth was estimated to be 3.7%, indicating progress in the productivity. However, this figure was less than average annual production growth of 10%. Accordingly, the contribution of Technological Change (TC) and Efficiency Change to Total Factor Productivity Change (TFPC) was 1.9% and 1.8%, respectively. Therefore, increment of TFPC should be geared towards both improving the managerial skills of farmers as well as introduction of new and improved technology. Information on factors influencing technical efficiency should be disseminated to farmers by the extension agents to reduce production inefficiency. Government should provide some water quality analyzing tools as an incentive to fish farmers for testing water quality at affordable rate. This will help in reducing mortality rate as well increasing production. Research towards improving production technologies should be encouraged by the government through provision of easy access to grants and other relevant facilities necessary to improves productivity.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Doktor Falsafah

ANALISIS PERTUMBUHAN PRODUKTIVITI DAN KECEKAPAN TEKNIKAL BAGI AKUAKULTUR DI SEMENANJUNG MALAYSIA

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Permintaan bagi protein haiwan terutamanya ikan pesat berkembang disebabkan oleh beberapa faktor iaitu pertambahan bilangan penduduk, peningkatan pendapatan, dan perubahan dalam tabiat pemakanan dan gaya hidup. Perikanan di Malaysia yang membekalkan lebih daripada 70% bekalan ikan yang digunakan untuk makanan telah dieksploitasikan secara berlebihan dan hasil tangkapan menunjukkan jumlah yang agak statik sejak beberapa dekad lalu dan di dalam beberapa keadaan ia telah menunjukkan kemerosotan. Di samping itu, situasi perdagangan bagi dekad yang lalu telah memberi isyarat negatif ancumannya kepada pertumbuhan ekonomi. Walau bagaimanapun, akuakultur mempunyai potensi untuk menghadapi semua cabaran tersebut jia ia diamalkan dengan baik. Ini boleh dilakukan dengan meningkatkan tahap pengeluaran yang memerlukan penggunaan input yang tinggi walaupun ia boleh membawa kepada ketidakcekapan teknikal dan meningkatkan kos pengeluaran bagi penternak ikan. Ini akhirnya boleh mengakibatkan mereka untuk mengabaikan ladang dan memilih sumber pendapatan alternatif lain kerana keuntungan yang rendah atau kerugian yang dialami. Situasi semasa menunjukkan terdapat keperluan untuk meningkatkan kecekapan penggunaan input serta meningkatkan produktiviti dalam pengeluaran akuakultur. Oleh itu kajian ini bertujuan untuk menganggarkan kecekapan teknikal dan menilai penentu ketidakcekapan teknikal di dalam akuakultur. Matlamat kajian adalah bertujuan untuk mengira pertumbuhan Produktiviti Faktor Keseluruhan (TFP) dan komponennya. Selain itu, ia juga bertujuan untuk mengenalpasti sumber

yang menyumbang kepada pertumbuhan TFP dalam akuakultur. Analisis Penyampulan Data (DEA), indeks produktiviti Malmquist, dan model regresi telah digunakan untuk menganalisis data. Tiga buah negeri telah dipilih untuk kajian ini kerana mempunyai tahap pengeluaran yang tinggi dan penternak ikan yang aktif. Data daripada 248 ladang ikan dikumpulkan dengan menggunakan borang kaji selidik dan sesi menemubual. Min bagi skor kecekapan teknikal yang diperolehi bagi kolam, tangki, sangkar dan teknologi pengeluaran pen adalah masing-masing 0.86, 0.91, 0.97 dan 0.94. Hasil penemuan kajian menunjukkan bahawa skor kecekapan teknikal yang tinggi untuk sampel penternak ikan, menunjukkan bahawa terdapat hanya ruang kecil untuk penambahbaikan dalam pengeluarannya. Semua pembolehubah input mendedahkan serba kekurangan, suatu tanda kepada ketidakcekan. Analisis peringkat-kedua DEA menunjukkan bahawa faktor-faktor seperti pengalaman, perkhidmatan pelanjutan, bengkel yang dihadiri dan pengurusan air didapati mempunyai kesan positif ke atas kecekapan teknikal. Tambahan pula, pertumbuhan TFP yang dianggarkan 3.7%, menunjukkan kemajuan dalam produktiviti. Walau bagaimanapun, angka ini adalah kurang daripada purata pertumbuhan pengeluaran tahunan sebanyak 10%, oleh itu terdapat keperluan untuk meningkatkan produktiviti. Seterusnya, sumbangan Perubahan Teknologi (TC) dan kecekapan perubahan kepada Jumlah Produktiviti Faktor Perubahan (TFPC) adalah masing-masing 1.9% dan 1.8%. Oleh itu, kenaikan TFPC perlu digerakkan ke arah meningkatkan kemahiran pengurusan petani dan juga pengenalan teknologi baru dan yang lebih baik. Maklumat mengenai faktor-faktor yang mempengaruhi kecekapan teknikal harus disampaikan kepada penternak oleh agensi yang bertanggungjawab untuk mengurangkan ketidakcekan pengeluaran. Kerajaan harus menyediakan alat-alat menganalisis kualiti air sebagai insentif kepada penternak ikan untuk menguji kualiti air pada kadar atau harga yang berpatutan. Ini akan membantu dalam mengurangkan kadar kematian dan seterusnya meningkatkan tahap pengeluaran. Penyelidikan ke arah meningkatkan teknologi pengeluaran perlu diberi galakkan oleh kerajaan melalui penyediaan kemudahan akses kepada permohonan geran dan kemudahan lain yang berkaitan untuk meningkatkan produktiviti.

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I certify that a Thesis Examination Committee has met on 8th July, 2014 to conduct the final examination of Abdullahi Iliyasa on his thesis entitled "Technical Efficiency And Productivity Growth Analysis of Aquaculture in 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 Doctor of Philosophy.

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