UNIVERSITI PUTRA MALAYSIA

APPLYING DATA ENVELOPMENT ANALYSIS TO EVALUATE THE EFFICIENCY OF FISHERMEN ASSOCIATIONS IN MALAYSIA

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By

JAMILAH BINTI DIN

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia in Fulfilment of the Requirement for the Degree of Doctor of Philosophy

April 2006

Dedicated to my four children:

Liyana, Farhana, Kamalhasan and Ashavani.

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

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Chairman: **Professor Zainal Abidin bin Mohamed, PhD**

Faculty: **Economics and Management**

The fishermen association (FA) in Malaysia has a dual character, as it is both an enterprise and also an association. Hence the business and social performances have to be closely linked. The organization has to perform efficiently to sustain its existence in business and to function as a social organization to its members. With both aspects (economic and social) evaluated equally, it could be categorized as a good or poor performer society.

Currently, financial ratios are used to measure the overall financial soundness of the association and the quality of its management. However, due to the association's dual nature (as it is both an enterprise and also an association) and its multipurpose activities, the overall performance evaluation is often a complicated process. As an alternative form of analysis of the many analytical tools that have been in existence, this study introduces the Data Envelopment Analysis (DEA) method, a non-parametric method to evaluating the performance

of the association. Applying DEA to the panel data of 68 FAs from 1994 to 2001, produces estimates of efficiency (the distance of inefficient FAs from the frontier) and the separation of technical efficiency from scale efficiency. Then the measurement of technical progress (the shifting of the best practice over time) allows Malmquist indices of total factor productivity (TFP) to be constructed from the efficiency and technical change measures without recourse to prices. The results are presented as chained indices, so that the rates and causes of TFP growth can be analysed. The Malmquist index is ideal for investigating this problem because it decomposes total factor productivity into technical progress, technical efficiency and scale efficiency measures.

Results from this empirical study have identified five “best-practice” FAs, which are located in three different “regions” in Malaysia. The derivation of the Malmquist productivity indices indicated a productivity growth in the socio-economic dimension of 1.033. The economic dimension efficiency showed a productivity growth with a TFP change of 1.015. In contrast, the social performance dimension was marked by a productivity regress with the TFP change score of 0.889. The productivity growth in the socio-economic and economic dimensions had been driven by positive technical change. With respect to the social dimension, the principal cause for the productivity regress was the efficiency change. Overall, the results showed that the FAs needed to improve in their efficiency to catch up with the best-practice frontier as much as by 3.9% in economic performance, 9% in social performance and 3.5% in socio-economic performance. Results indicated that the efficiencies in the economic

and social dimensions were determined neither by the length of time in operation and geographical location of the association nor by the amount of grant or subsidy allocated by the government.

In conclusion, for the FAs to be efficient with their dual-purpose objective, they need to achieve their optimum productivity in business and provide social benefits for their members, at the same time conforming to the values and practices of cooperative organizations.

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

APPLIKASI "DATA ENVELOPMENT ANALISIS" UNTUK MENILAI KEEFISYENAN PERSATUAN NELAYAN DI MALAYSIA

Oleh

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Persatuan nelayan (PN) di Malaysia mempunyai dua ciri iaitu sebagai sebuah badan perniagaan dan ciri-ciri sebuah persatuan. Dengan yang demikian, prestasi dari sudut ekonomi dan sudut sosial adalah berkaitan. Organisasi ini perlu efisyen bagi memastikan kesinambungan kewujudan perniagaan dan kesinabungan fungsi sebagai organisasi sosial kepada anggota-anggotanya. Kedua-dua aspek ekonomi dan sosial perlu dinilai secara seimbang bagi mengkategorikan organisasi itu sebagai berprestasi baik atau sebaliknya.

Ketika ini, nisbah kewangan telah menjadi satu metod ukuran keseluruhan pencapaian kewangan dan kualiti pengurusannya. Walau bagaimanapun oleh kerana dwi ciri yang ada pada persatuan (sebagai sebuah badan perniagaan dan juga sebagai badan sosial) dan kepelbagaian aktiviti, maka penilaian keseluruhan percapaian organisasi ini kerap melalui proses yang rumit.

Sebagai alternatif kepada beberapa kaedah analisis yang sedia ada, kajian ini memperkenalkan “Data Envelopment Analysis” (DEA) suatu kaedah “non parametric” untuk penilaian. DEA ini dipakai dengan menggunakan data panel 68 PN dari tahun 1994 hingga tahun 2001 untuk menghasilkan anggaran keefisyenan (jarak diantara PN yang tidak efisyen dengan PN yang efisyen) dan pecahan keefisyenan teknikal daripada keefisyenan skel. Kemudian ukuran progress teknikal (anjakan praktik terbaik bagi tempoh masa) yang membolehkan indeks Malmquist total faktor produktiviti (TFP) dibentuk daripada perubahan kefisyenan dan perubahan teknikal tanpa memerlukan unsure kos. Hasilnya adalah dalam bentuk rangkaian indeks yang membolehkan penganalisaan seterusnya keatas kadar dan penyebab perkembangan TFP. Indeks Malmquist index ini sesuai untuk penyiasatan masalah kerana ia dipecahkan kepada ukuran progres teknikal, efisyen teknikal dan efisyen skel.

Hasil kajian empirikal ini telah mengenal pasti 5 PN “praktik terbaik” yang mana terletak di tiga daerah yang berlainan di Malaysia. Hasil indeks Malmquist menggambarkan perkembangan dalam dimensi sosio-ekonomik sebanyak 1.033. Dalam dimensi ekonomik, perkembangan produktiviti mempaparkan perubahan TFP sebanyak 1.015. Dalam sosial, sebaliknya dikesan pengecutan dengan perubahan TFP 0.889. Perkembangan produktiviti dalam dimensi sosio ekonomik dan dimensi ekonomik telah digerakkan perubahan positif teknikal. Manakala dimensi sosial asas utama pengecutan produktiviti ialah perubahan keefisyenan. Secara keseluruhan, PN perlu membaiki pencapaian keefisyenan prestasi ekonomik sebanyak 3.9%, keefisyenan prestasi sosial sebanyak 9%

dan keefisyenan prestasi sosio-ekonomik sebanyak 3.5% untuk setanding dengan PN praktik terbaik.. Keefisyenan dalam prestasi ekonomik dan prestasi sosial tidak ditentukan oleh umur, lokasi geografi dan dengan jumlah bantuan geran atau subsidi kerajaan.

Kesimpulannya, untuk PN efisyen sebagai sebuah badan dengan dwi matlamat maka pencapaian produktiviti optima dalam perniagaan dan dalam memberi manfaat kepada anggota adalah satu kemestian. Dalam masa yang sama organisasi ini harus mendokong nilai-nilai dan praktis yang organisasi koperasi.

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I certify that an Examination Committee has met on 5 April 2006 to conduct the final examination of Jamilah binti Din on her Doctor of Philosophy thesis entitled "Applying Data Envelopment Analysis to Evaluate the Efficiency of Fishermen Associations in Malaysia "in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

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JAMILAH BINTI DIN

Date:

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LIST OF ABBREVIATIONS

AFA	Area Fishermen Association
AHP	Analytic Hierarchy Process
ANGKASA	Angkatan Koperasi Kebangsaan
BCC	Banker, Charnes, Cooper
BSC	Balance Score Card
CCR	Charnes, Cooper, Rhodes
CRS	Constant Return to Scale
DEA	Data Envelopment Analysis
DMU	Decision-Making Unit
EFFCH	Efficiency Change
FA	Fishermen Association
FAs	Fishermen Associations
FCS	Fishermen Cooperative Society
FSA	Financial Statement Analysis
GRA	Grey Relation Analysis
ICA	International Cooperative Alliance
LKIM	Lembaga Kemajuan Ikan Malaysia
LP	Linear Programme
LPP	Lembaga Pertubuhan Peladang
NEKMAT	National Fishermen Association
PECH	Pure Efficiency Change
SE	Scale Efficiency
SECH	Scale Efficiency Change
SFA	State Fishermen Association
TECH	Technical Efficiency Change
TFPCH	Total Factor of Productivity Change
VRS	Variable Return to Scale

CHAPTER 1

INTRODUCTION

1.1 Background

As reported in the 1992 International Cooperative Alliance (ICA) Congress in Tokyo, throughout the world the cooperative sector in economic terms had experienced rapid growth in the 1950s. In the 1960s the cooperative economy was relatively stable. During this period it was reported that cooperative members benefited from their membership and thus cooperatives played an important contribution to society economically.

However, in the middle of the 70s, there was a decline in the economic growth of cooperatives. The situation became worse in the early 80s. Cooperatives were not to be able to offer satisfactory economic benefit to their members. This led to various critical reports and some blamed the leaderships for their inability to adapt to the changing environment.

The ideological climate in the 70s was another factor that restricted the participation of professional management to join cooperatives. Moreover, cooperatives were also markedly slow in the decision-making process. The structure of cooperative societies was also seen to contribute to the problem. However, some observers, mainly researchers, consider such problems as just symptoms of an ageing organization.

Towards the end of the 80s and the beginning of the 90s the world cooperative sector started to recover from the shock of the radical changes. However, the cooperatives had lost one basic economic advantage, the comparatively low cost of transformation. Members then needed more to be persuaded of their benefits than before because their confidence had disappeared.

Generally, cooperative economic systems are built upon members' scarce savings, often those of low income people. Thus cooperatives are shouldered with a special responsibility to use these resources to provide the best possible return.

The responsibility is much heavier if cooperatives are established with public financing. Unlike many other kinds of development project, cooperatives are expected to function normally over an unlimited period of time. Furthermore, they also function as a socio-economic organization and are expected to promote the interest of their members who are the owners and at the same time beneficiaries of their services (Dulfer, 1976).

Because of the positive role towards development shown by well-run cooperatives, the governments of various developing countries actively promote their establishment and development. By regarding them as "instruments" or agents for the achievement of national socio-economic development goals, they often allocate considerable human and financial resources to the establishment and development of cooperatives.

The fishermen associations (FAs) in Malaysia are among the many examples in which the government assists in developing and promoting the organizations. The involvement of the government in this “top-down” type of cooperative aims to address the socio-economic problems in the country as fishermen are found to be the poorest in the national economy. Within the fishermen community, the percentage of the lowest income category (poor) as reported in the socio-economic research, 1995, by the Lembaga Kemajuan Ikan Malaysia (LKIM) was 18.7%.

The supports given by the government to the FAs are numerous and varied. The FAs are often assigned projects to conduct programmes to induce innovation and promote social and economic changes for their members. The government thus expects the FAs to contribute to the achievement of national development goals. Being the donor, and the ultimate decision-maker on cooperative-related national development policies, it plans and implements strategies, programmes and policies for the cooperatives.

However, the government has been quite disappointed with the increasing poor performance of these supported organizations (details are in Chapter 2). Dulfer (1976) pointed out two major reasons for this disappointment in many countries. These can be summarized as: i) too high an expectation was formed from the cooperative performance in a relatively short period, and ii) inappropriate and/or insufficient strategies, actions and appraisal measures were applied by the government to monitor the establishment and the development of the

cooperatives. Therefore an adequate/appropriate evaluation of the cooperatives on their different activities is needed.

1.2 Problem Statement

Most FAs have been receiving financial and institutional assistance from the government since their establishment. The assistance has continued for the last 25 years, but with the ultimate aim to develop them into strong and dynamic FAs that can stand on their own one day, as support and assistance have some limits. For monitoring, the LKIM uses profit as the key performance index of the association. The FAs are grouped as “successful”, “moderate” or “poor” based on their profit scores as identified by the LKIM (details of the score are given in Chapter 2, para 2.9.6).

In 1986, about 3% of the FAs were considered “successful” (categories A1 and A2), 22% as “moderate” (categories B1 and B2) and 65% were “poor” (categories C1 and C2). In 1990, the figures showed some improvement. The “successful” and the “moderate” categories had risen to 17% and 38% respectively whereas the “poor” had dropped to 45% (LKIM, 1990). This trend was not sustained long as in the year 2000, the percentage of “poor” category dominated the overall performance of the FAs. Fifty-four percent of the FAs were grouped in the “poor” category where 40% of the FAs were not profitable. The “moderate” category had dropped to 28% and the “successful” decreased to 18%.