UNIVERSITI PUTRA MALAYSIA

A PROGRAMMING MODEL FOR THE DETERMINATION OF BENEFITS OBTAINABLE FROM THE MANAGEMENT OF OPEN-WATER INLAND (RIVERINE) FISHERIES OF BANGLADESH

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By

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A Thesis Submitted in Partial Fulfilment of the Requirements for the Degree of Doctor of Philosophy in Resource Economics in the Faculty of Economics and Management Universiti Pertanian Malaysia

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LIST OF ABBREVIATIONS

BCAS	Bangladesh Centre for Advanced Studies
BDT	Bangladesh Taka (M$ 1 = BDT 12)
BFRSS	Bangladesh Fisheries Resources Survey System
CPI	Consumer Price Index
CPUE	Catch Per Unit of Effort
DOF	Department of Fisheries
FAO	Food and Agricultural Organisation
MPO	Master Plan Organisation
NFMP	New Fisheries Management Policy
NSB	Net Social Benefit
UNDP	United Nations Development Programme

Abstract of the thesis presented to the Senate of Universiti Pertanian Malaysia in partial fultilment of the requirements for the Degree of Doctor of Philosophy

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July 1989

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In Bangladesh, most of the inland open-water fisheries had retained an open-access character in the absence of a consistent and effective management policy. Consequently the resulting pattern of fishing activities is characterised by economic inefficiency. In view of this, the current concern of the Government is to increase economic performance of the industry through some direct measures of control on the allocation of fishing rights, fishing effort and fish catch.

The objective of this research is to derive an operational model, which can be used to analyse the performance of the fisheries under different simulated

alternatives of techno-economic and biological conditions.

Functions and parameters of a Base Model were estimated by deriving two sub-models: (a) bio-economic production and (b) the market, using regression techniques. Both primary and secondary data were used for empirical estimation of the sub-models.

Accordingly, the model was developed, in a linear programming (LP) framework, to represent various fisheries in the riverine waters of Bangladesh. Results of the base model suggest that the riverine fisheries of Bangladesh are capable, under optimal conditions, of generating a total net benefit of BDT (Bangladesh Taka) 1,383 million per annum (US$1 = BDT32), of which 96% accrues as producer surplus. Also, a significant overcapacity (118%) exists in the existing fleet in terms of application of effort relative to the resource availability.

Simulation of cost and demand changes reveal that the effect of changes in the cost condition of harvest will in general be related negatively to the intensity of total effort use, total langings, benefits and costs; while the effects of changes in the aggregate demand on total effort, total costs, landings, prices and net benefits will be positive. The implication of the results for management is that

intervention into the fisheries through control on effort intensity would produce substantial net benefits from the open-water fisheries.

Abstrak tesis yang dikemukakan kepada Senat, Universiti Pertanian Malaysia sebagai memenuhi sebahagian daripada Keperluan bagi Ijazah Doktor Falsafah

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Di Bangladesh, kebanyakan perikanan pedalaman masih bersifat terbuka kerana tiada terdapat polisi pengurusan yang kekal dan berkesan. Ini mengakibatkan pola aktiviti perikanan yang tidak cekap dari segi ekonomi. Oleh sebab itu, tumpuan kerajaan sekarang ialah untuk meningkatkan prestasi ekonomi industri perikanan melalui langkah-langkah pengawasan langsung di dalam pengagihan hak dan usaha perikanan serta jumlah tangkapan.

Objektif kajian ini adalah untuk mendapatkan satu model operasi pengurusan dan penternakan ikan yang boleh digunakan bagi menganalisa prestasi dan keberkesanan penternakan ikan di dalam pelbagai kaedah dan alternatif teknologi, ekonomi dan keadaan biologi.

Fungsi dan parameter model asas dianggarkan melalui dua sub-model: (a) pengeluaran bio-ekonomi dan (b) pasaran, yang menggunakan teknik regrasi. Kedua-dua jenis data primer dan sekundar digunakan untuk penganggaran empirik sub-model tersebut di atas. Seterusnya, satu model telah dibina dalam rangka pemprograman linear untuk menggambarkan pelbagai perikanan sungai di Bangladesh. Hasil dari model asas ini menunjukkan bahawa perusahaan ikan sungai di Bangladesh mampu menghasilkan untung bersih sebanyak BDT (Bangladesh Taka) 1,383 juta setahun (US$1 = BDT32) di dalam keadaan optimum, di mana 96% daripadanya adalah merupakan 'lebihan pengeluar'. Juga kapasiti berlebihan (118%) wujud di dalam jumlah kapal nelayan yang ada sekarang dari segi penggunaan usaha relatif kepada sumber yang tersedia ada.

Simulasi kos dan perubahan dalam permintaan menunjukkan bahawa kesan perubahan di dalam keadaan kos penangkapan ikan, secara amnya berhubung secara negatif dengan jumlah usaha yang digunakan, jumlah tangkapan, faedah dan kos; sementara kesan perubahan dalam permintaan agregat ke atas jumlah usaha, jumlah kos, tangkapan, harga dan faedah bersih adalah positif. Implikasi keputusan di atas k ada pengurusan menunjukkan bahawa campurtangan kerajaan di

dalam perikanan melalui pengawasan tingkat usaha akan menghasilkan faedah bersih yang sangat besar daripada perusahaan perikanan yang terbuka.

CHAPTER I

INTRODUCTION

The Problem

The pervasive tendency of open-access fisheries to expand effort to the point where resource rent is dissipated, first pointed out by Gordon (1954) and many others after him, has been a major cause of concern for fisheries managers all over the world. In many fisheries, the tendency to economically overexploit the resources has driven stocks to levels below their maximum yield potentials and to gradual worsening economic conditions of the fishing community, especially of small-scale traditional fishermen.

In Bangladesh, most of the inland open-water fisheries exploitation activities are small-scale and traditional. Over the years, these fisheries have retained an open-access character in the absence of a consistent and effective management policy. For a long time fisheries in the open-waters had been managed by a group of middlemen who secured yearly lease from the government through auctions. Consequently, increasingly large number of fishing dependent population and an oversized effort intensity relative to the availability

of stock have contributed to declining catches of some or all species and a deteriorating fishing income. As such, the fisheries will require some kind of control directed to regulate the exploitation activity over the stock and effort intensity, in order to improve their economic performance.

In response to these problems, a comprehensive policy for open-water fisheries management is in the process of implementation by the government. The objective of the new policy, called New Fisheries Management Policy (NFMP) is mainly to redirect the potential benefits of fisheries exploitation activities to actual fishermen and at the same time maintaining and improving the productivity of the open-water fisheries on sustainable basis. In this effort, a system of licensing of water bodies to genuine fishermen or groups of fishermen has been introduced in selected areas of inland open-water fisheries. This would replace the traditional system of leasing out the water-bodies to the private individuals. The economic consequences of these new practices are yet to be addressed and studied.

A major problem confronting policies with regard to management is the determination of the type and level of control which should be applied to the fisheries in order to best achieve the above objectives. This necessitates the understanding of the performance-response of the fisheries to alternative