

Declaration

I declare that the thesis entitled "**The Economics of Pond Fishery: A Study of North Bengal Region of West Bengal**" has been prepared by me under the guidance of Dr. Tamash Ranjan Majumder, Assistant Professor, Department of Economics, University of North Bengal and Dr. Anil Bhuimali, Professor, Department of Economics, University of Economics. No part of this thesis has formed the basis for the award of any degree or fellowship previously.

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1 The Economics of Pond Fishery- A Study of North Bengal Region of West Bengal A Thesis submitted to the University of North Bengal For the Award of Doctor of Philosophy in Economics By Kishan Agarwalla Research Scholar Department of Economics University of North Bengal Under the supervision of Dr. Tamash Ranjan Majumdar Assistant Professor Department of Economics University of North Bengal And Dr. Anil Bhumali Professor Department of Economics University of North Bengal Department of Economics University of North Bengal July 2023

2 Chapter 1 Introduction 1.1 The Context The economy of human activity continuously consumes natural resources. It is derived from the environment. Most of them are essential for our survival while others are used for satisfying our wants. Learning more about natural resources allows for a sustainable method to manage resources and makes sure that they are made available for future generations. The goal of natural resource management is to develop an efficient economy in the long run. But with the passage of time, natural resources including fishery resources get depleted due to over-extraction or overuse, which causes environmental problems such as air and water pollution, land erosion, or destruction of ecosystems and a decrease in biodiversity. The excessive extraction and use of natural resources along with other human activities may adversely interfere with biodiversity, that is, the existence of a variety of organisms that live on the earth. Diminishing biodiversity has a substantial human cost because biological species including a wide variety of fish species and natural ecosystems are crucial resources without which life on Earth ceases to exist. With respect to renewability, natural resources are divided into two kinds- a) resources with the capacity for self-generation and b) resources without the capacity for self-generation. The former type is known as renewable resources and the latter is known as non-renewable resources. For renewable resources to survive over time, the maintenance of a critical minimum stock is an urgent necessity. If their stock levels heavily dwindle, they could not completely replenish themselves such as fishery, forestry, crop cultivation land, groundwater irrigation, grazing ground, etc. On the contrary, non-renewable resources are formed over a long geological period. Their rate of regeneration is too slow, so they cannot replenish themselves on an economically relevant time scale once they get depleted. A large number of people depend on existing natural resources for their subsistence. This put them under the threat of deterioration and degradation and even extinction. In recent times, we began to use fertilizers and pesticides to further boost the production of food from the same amount of land. However, we now realize that all this has led to several unwanted environmental changes. Industrial growth, urbanization, and the enormous increase in the use of consumer goods have all put further stress on the environment. They create great quantities of solid

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CERTIFICATE

We certify that Sri Kishan Agarwalla has prepared the thesis entitled "**The Economics of Pond Fishery: A Study of North Bengal Region of West Bengal**" for the award of the Ph.D. degree from the University of North Bengal under our guidance. No part of this thesis has previously formed the basis for the award of any degree or fellowship. It is a genuine and original work of the scholar. He has carried out work at the Department of Economics, University of North Bengal, West Bengal, India.

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List of Tables

| Table No. | Legends of the tables | Page No. |
|-------------|---|----------|
| Table 2.1: | Inland Water Resources of India | 23 |
| Table 2.2: | Marine Fisheries Resources of India | 24 |
| Table 2.3: | Fish Production in India for the Period 1980-81 to 2017-18 | 24 |
| Table 2.4: | Contribution of Fisheries sector to GDP | 28 |
| Table 2.5: | Contribution of India to World Fish Production in Selected Years | 29 |
| Table 2.6: | Inland Fisheries Resources by States and union territories, 2017-18 | 32 |
| Table 2.7: | State/UT wise Inland and Marine Fish Production during 2011-12 to 2017-18 | 36 |
| Table 2.8: | Inland Fishery Resource of West Bengal | 42 |
| Table 2.9: | Source-Wise Inland Fish Production during Last Five Years | 44 |
| Table 2.10: | District-wise fish production from 2012-13 to 2017-18 | 45 |
| Table 2.11: | Year-Wise Demand and Production of Fish in West Bengal | 47 |
| Table 3.1: | District Wise impounded Water Area | 53 |
| Table 3.2: | District wise Impounded Fresh Water Area | 56 |
| Table 3.3: | District Wise Fish Seed Production in North Bengal | 57 |
| Table 3.4: | District-Wise Fish Production in North Bengal | 60 |
| Table 3.5: | District Wise & Year Wise Fish Production under FFDA | 64 |
| Table 3.6: | District wise & Year wise Average Productivity | 66 |
| Table 4.1: | Market Information about whole salers & Retailers | 77 |
| Table 4.2: | Demand, Supply & Surplus or Deficit table of North Bengal from 2016-17 to 2018-19 | 80 |
| Table 4.3: | Demand, Supply & Surplus or Deficit table of North Bengal from 2019-20 to 2020-21 | 80 |
| Table 4.4: | District-Wise & Species-Wise import of Fish 2017-18 | 84 |

| Table No. | Legends of the tables | Page No. |
|------------------|--|-----------------|
| Table 4.5: | Different Marketing Channels in the fish Market of North Bengal | 87 |
| Table- 4.6: | Percentage Share of Fishermen in the Consumer Rupee (PSFCR) | 89 |
| Table 6.1: | Socio-economic Characteristics of Fish Farmers from two districts of West Bengal | 114 |
| Table 6.2: | Shows the different fish species preferred by aquaculture farmers mostly in the northern region of West Bengal | 115 |
| Table 6.3: | Maximum likelihood estimates of the stochastic production function for fish Production | 116 |
| Table 6.4: | Frequency distribution of the technical efficiency of Fish Producers | 118 |
| Table 7.1: | Descriptive Statistics of Inputs and Output variables of Uttar Dinajpur | 128 |
| Table 7.2: | Descriptive Statistics of Inputs and Output variables of Dakshin Dinajpur | 128 |
| Table 7.3: | Descriptive statistics of TE scores | 129 |
| Table 7.4: | The Percentage ranges of Technical Efficiency frequency | 130 |
| Table 7.5: | Return to Scale of the respective districts | 133 |
| Table 7.6: | Zone-wise composition of Efficient DMUs of Uttar Dinajpur and Dakshin Dinajpur | 135 |
| Table 7.7: | Input Excesses and Output Shortfalls of Uttar Dinajpur | 136 |
| Table 7.8: | Input Excesses and Output Shortfalls of Dakshin Dinajpur | 138 |
| Table 7.9: | Mean Output and Input Slack of Uttar Dinajpur and Dakshin Dinajpur | 141 |
| Table 7.10: | Descriptive Statistics of Inputs and Output variables | 142 |
| Table 7.11: | Descriptive Statistics for TE Scores | 142 |
| Table 7.12: | Distribution of Efficiency Score of Fish Farms in North Bengal | 143 |
| Table 7.13: | Input Excesses and Output Shortfalls of Dinajpur (Uttar + Dakshin) | 145 |
| Table 7.14: | Output Slack and Inputs Slack of Combined Dataset | 149 |

List of Figure

| Figure No. | Legends of the Figures | Page No. |
|--------------|--|----------|
| Figure 2.1: | Fish Production from 2005-06 to 2017-18 | 26 |
| Figure 2.2: | Fish Production in India | 26 |
| Figure 2.3: | Contribution of Fisheries Sector to GDP | 28 |
| Figure 2.4: | Inland Fisheries Resources by States and union territories | 35 |
| Figure 2.5: | Major Fish Producing States | 41 |
| Figure 2.6: | Type of Fisheries | 43 |
| Figure 2.7: | District-Wise Fish Production from 2012-13 to 2017-18 | 46 |
| Figure 2.8: | Year-wise Demand & Supply of Fish in West Bengal | 48 |
| Figure 2.9: | Demand, Supply & Deficit Curve of WB | 48 |
| Figure 3.1: | Share of Impounded Water Area | 54 |
| Figure 3.2: | Categories of Impounded Water Area | 54 |
| Figure 3.3: | District Wise Allocation of Impounded Water Area | 55 |
| Figure 3.4: | 3-year CAGR of Impounded Water Area | 56 |
| Figure 3.5: | Fish seed production in North Bengal | 58 |
| Figure 3.6: | District-Wise Fish Seed Production for Selected North Bengal Districts | 58 |
| Figure 3.7: | Coefficient of Variation of Different district of North Bengal | 59 |
| Figure 3.8: | District-Wise Fish Production in North Bengal | 61 |
| Figure 3.9: | Year-Wise Fish production in North Bengal | 61 |
| Figure 3.10: | Year wise Average Productivity of different Districts | 66 |
| Figure 4.1: | Market information about wholesalers and Retailers | 77 |
| Figure 4.2: | Demand-Supply Gap of North Bengal | 81 |

| Figure No. | Legends of the Figures | Page No. |
|-------------------|--|-----------------|
| Figure 4.3: | Demand- Supply Gap of each District in North Bengal | 81 |
| Figure 4.4: | District-wise & Species-wise import of Fish | 85 |
| Figure 5.1: | Technical Efficiency: Input and Output Measures | 97 |
| Figure 5.2: | Input-Oriented measures for technical, allocative and economic efficiency | 100 |
| Figure 5.3: | Output-oriented measures for technical, allocative and economic efficiency | 102 |
| Figure 6.1: | Fish Species Preferred by Aquaculture Farmers in WestBengal | 115 |
| Figure 6.2: | Frequency distribution of the Technical Efficiency of Fish Producers | 119 |
| Figure 7.1: | Detailed scheme for collecting Primary Data | 124 |
| Figure 7.2: | VRS Score and Scale Efficiency | 131 |
| Figure 7.3: | Scale Efficiency | 131 |
| Figure 7.4: | Technical Efficiency (VRS) & Scale Efficiency (SE) | 144 |

Acronyms

AAGR: Average Annual Growth Rate

ADP- Agriculture Development Project

AE: Allocative Efficiency

BCC: Banker, Charnes & Cooper

BCC-I: Input Oriented Banker, Charnes & Cooper Model

CAGR- Compounded Annual Growth Rate

CCR: Chares, Cooper & Rhodes

CCR-I: Inputs Oriented Charnes, Cooper & Rhodes Model

CCR-O: Output Oriented Charnes, Cooper & Rhodes

CRS: Constant Return to Scale

CSO: Central Statistical Organization

DAHD: Department of Animal Husbandry and Dairying

DEA: Data Envelopment Analysis

DMUs: Decision Making Units

DRS: Decreasing Return to Scale

EEZ; Exclusive Economic Zone

EEZ-Exclusive Economic Zone

FAO: Food and Agriculture organization

FFDA: Fish Farmer Development Agency

FSI: Fishery Survey of India

GDP: Gross Domestic Product

GLS- Generalised Least Square

GMM-Gross Marketing Margin

GOI: Government of India

GVA- Gross Value Added

IMC- Indian Major Carp

IRS: Increasing Return to Scale

LP: Linear Program

LPP: Linear Programming Problem

MMT- Million Metric Tonnes

MMT- Million Metric Tons

MSY: Maximum Sustainable Yield

NFSB: National Fisheries Development Board

NGO: Non- Governmental Organisation

PS- Price Spread

PSFCR- Percentage Share of Fishermen in the Consumer Rupee

RBI- Reserve Bank of India

RLEGP: Rural Landless Employment Guarantee Programme

RTS – Return to Scale

SBM- Slacked Based Measure

SFR- Stochastic Frontier Regression

SMLR: Small, Medium and Large Reservoir

VRS- Variable Return to Scale

Abbreviations used for inland fisheries:

AP : Andhra Pradesh

Assam : Assam

B : Bihar

C : Chhattisgarh

GJ : Gujarat

H : Haryana

Jhar : Jharkhand

K : Kerala

Kar : Karnataka

M : Maharashtra

O : Odisha

T : Telengana

TN : Tamil Nadu

UP : Uttar Pradesh

WB : West Bengal

Other : Other states