STRATEGIC MANAGEMENT OF INDIAN SEAFOOD TRADE

Thesis Submitted to the

Cochin University of Science and Technology

In partial fulfilment of the requirements

for the award of the degree of

Doctor of Philosophy

in

Applied Economics

Under the Faculty of Social Science

By

S. SATEESH BINO I.P.S

Under the Supervision of

Dr. P. ARUNACHALAM

Professor & Head

Department of Applied Economics

Cochin University of Science and Technology

Kochi – 682022

June 2015

Strategic Management of Indian Seafood Trade

Ph.D. Thesis under the Faculty of Social Science

Author

S. Sateesh Bino I.P.S
Research Scholar
Dept. of Applied Economics
Cochin University of Science and Technology
Kerala, India
email: sateeshbino@rediffmail.com

Supervising Guide

Dr. P. Arunachalam
Professor & Head
Dept. of Applied Economics
Cochin University of Science and Technology
Kerala, India
email:arunachalam14@yaho.co.uk

Department of Applied Economics
Cochin University of Science and Technology
Kochi – 682022, Kerala, India

June, 2015

DEPARTMENT OF APPLIED ECONOMICS
COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY
KOCHI - 682 022, KERALA, INDIA

Dr. P. ARUNACHALAM
Professor& Head

Off: 0484 - 2576030
Res: 0484 - 2577741
Mob: (0) 9746770732
arunachalam14@yahoo.co.uk

Certificate

This is to certify that this thesis entitled **"Strategic Management of Indian Seafood Trade"** is an authentic record of research work carried out by Mr. S. Sateesh Bino I.P.S (Reg. No. 3246) under my supervision and guidance, at the Department of Applied Economics, Cochin University of Science and Technology, Cochin-22 in partial fulfillment of the requirements for the award of the degree of Doctor of Philosophy in Social Science of Cochin University of Science and Technology under the Department of Applied Economics and no part of this work has been presented for the award of any degree in any other University.

Kochi-22
-06- 2015

Dr. P. Arunachalam
Supervising Guide

Declaration

I hereby declare that the thesis entitled **"Strategic Management of Indian Seafood Trade"** is an authentic record of research work carried out by me under the supervision and guidance of Dr. P. Arunachalam, Professor and Head, Department of Applied Economics, Cochin University of Science and Technology, Cochin-22 in partial fulfillment of the requirements for the award of the Degree of Doctor of Philosophy of Cochin University of Science and Technology, and that no part of this work has been presented for the award of any degree in any other University

Kochi **S. Sateesh Bino I.P.S**
-06-2015

Acknowledgement

I wish to place on record the deep sense of gratitude and thanks to my research guide Dr. P. Arunachalam, Professor and Head, Department of Applied Economics, Cochin University of Science and Technology, Cochin – 22 for his constant support and encouragement. I am highly indebted to all his contributions of time, ideas and patience to make my research experience productive and stimulating. I have found every discussion with him inspiring and enlightening and I owe him a lot for sparing his valuable time for going through the manuscript and give it its present form.

I express my deep sense of gratitude to the former Vice Chancellors of Cochin University of Science and Technology, Cochin Dr. Abdul Azeez, Dr. Gangan Pradhap and Dr. Ramachandran and present Vice Chancellor Dr. Latha Nair for their constant support, encouragements and guidance to complete this research work. I joined as a full time research scholar of CUSAT during 2006 and continued as such till my joining for training on 20-12-2008 at Sardhar Vallabhai Patel National Police Academy, Hyderabad, after my selection in the Civil Services Examination of 2008. As the design and field data collection work was over, my request to convert my research work into part time Ph.D Programme was conceded by the Vice Chancellors as per the rules and regulations of the University. I thank them and all the Administrative officials of the Cochin University of Science and Technology for extending their timely support and help by granting me more time, which enabled me to complete this work.

I express my deep sense of gratitude to Sri. K. Padmakumar IPS, Additional Director General of Police, Sri. Manoj Abraham IPS, Inspector General of Police, Sri. M.R. Ajithkumar IPS, Inspector General of Police and other officials of Police Department to their support and help.

I express my deep sense of gratitude to Dr. D.Rajasenan, Professor, Dr.M.Meerabai, Professor, Dr.S.Harikumar, Professor, Dr.P.K.Manoj, Faculty Member, Department of Applied Economics, CUSAT for their sincere advise and extending their expertise in finalizing the research programme and its implementation.

I also would like to express my sincere thanks to all the research scholars, office staff and the librarian in the Department of Applied Economics for their support and encouragement.

I also extend my whole hearted thanks to Sri. Biju P.R., Assistant Sub Inspector of Police and Sri. Manoj T.R., Civil Police Officer, for their support especially for assistance in tabulation, typing and other logistics.

I would like to express my sincere thanks to the Directors/Head and librarians of the Center for Development Studies, Thiruvananthapuram, Madras School of Economics, Chennai and JNU, New Delhi for permitting me to make use of their facilities.

I am highly indebted to Dr. R. Narayanakumar, Principal Scientist and Head, Socio Economic Evaluation and Technology Transfer Division (SEETTD) of CMFRI and Dr. C. Ramachandran, Principal Scientist of CMFRI for sharing their knowledge. The innumerable interactions and directions received from them were valuable for the successful completion of this work. I am also thankful to Sri. N.K. Harshan, Technical Assistant of SEETTD of CMFRI for his assistance in tabulation and typing work.

I extend my sincere thanks to S/Shri. S. Achutha Rao, N. Vinodkumar, M. Lazer, D. Jayapal and M. Khambadker for serving as key informants and their assistance in the collection of data at selected centres of Andra Pradesh, Tamilnadu, Kerala and Maharashtra.

I express my deep sense of gratitude to my parents Dr. R. Sathiadhas and Mrs. Margaret Sathiadhas for their constant encouragement and to my brother S. Sateesh Jino and his wife Mrs. Benny Jino for their inspiration and motivation.

Last but not least, I express my thanks to my wife Mrs. S. Ajeetha Begum IPS for her sincere support, suggestions and critical comments and son S. Arhan Ryan Bino for his sacrifice of losing lot of play time, joy and companionship during the final phase of this work.

S. Sateesh Bino

Contents

List of Tables

List of Figures

Abbreviations

BIS	-	Bureau of Indian Standards
BOP	-	Balance of Position
C	-	Total Cost of Marketing
CF	-	Cost Borne by the Fishers in Marketing His Produce
CFP	-	Common Fisheries Policy
CGE	-	Computable General Equilibrium
CIFE	-	Central Institute of Fisheries Education
CIFT	-	Central Institute of Fisheries Technology
CMFRI	-	Central Marine Fisheries Research Institute
CODEX	-	Codex Alimentary
CPUE	-	Catch Per Unit Effort
DRC	-	Domestic Resource Cost
EBFM	-	Ecosystem Based Fisheries Management
ECGC.	-	Export Credit Guarantee Corporation of India
EEZ	-	Exclusive Economic Zone
EU	-	European Union
FDA	-	Food and Drug Administration
GAAT	-	General Agreement on Traffic and Trade
GDP	-	Gross Domestic Product
GMP	-	Good Manufacturing Practices
GPS	-	Global Positioning System
GOI	-	Government of India
HACCP	-	Hazard Analysis Critical Control Points
IBM	-	In Board Machine
ICES	-	International Council for the Exploration of the Sea
IFQs	-	Individual Fishing Quotas
ITQs	-	Individual Transferable Quotas
MDF	-	Multi Day Fishing
MEY	-	Maximum Economic Yield
MFRA	-	Marine Fisheries Regulation Act

MLE	-	Maximum likelihoods estimation
MPEDA	-	Marine Products Export Development Authority
MSY	-	Maximum Sustainable Yield
NBER	-	National Bureau of Economic Research
NMFS	-	National Marine Fisheries Service
NPC	-	Nominal Protection Coefficient
NPC	-	Net Protection Coefficient
NSSO	-	National Sample Survey Organization
OAL	-	Over All Length
OBM	-	Out Board machine
OECD	-	Organisation for Economic co-operation Development
OGL	-	Open General License
OY	-	Optimum Yield
SCM	-	Supply Chain Management
SDF	-	Single Day Fishing
SPS	-	Sanitary and phyto-Sanitary
SSB	-	Spawning Stock Biomass
TAC	-	Total Allowable Catch
TBT	-	Technical Barriers to Trade
TQM	-	Total Quality Management
UNCED	-	United Nations Conference on Environment Development
UNCLOS	-	United Nations Conference on the Law of the Sea
USFDA	-	United States Food and Drug Administration
VAP	-	Value Added Products
VAR	-	Vector Auto Regressive
WTO	-	World Trade organization

…..ᘓᘘ…..

Chapter 1

INTRODUCTION

Contents

India, with an arable land space of 184 million hectares, is the world's largest annual producer of milk (132.43 million tonnes), Second largest producer of fruits and vegetables (150 million tonnes), second largest producer of food grains (264.4 million tonnes) and third largest producer of fish (9.45 million tonnes) (Economic Survey 2012-13). It has the world's largest 485 million livestock which annually produces 489 million poultry and 69.73 billion eggs. From a situation of famines and an era when even basic food grains were imported, India has emerged as the second largest food producer in the world today. However, the bulk of the food produced in the country is for domestic consumption and India's share in the global food trade still stands at a meager 1.7 percent only. Among the Asian countries, India ranks second in aquaculture and third in capture fisheries (Mohan Joseph, *et al.*, 2006). Fish production has increased at a higher rate compared to food grains, milk, egg and many other food items, but the consumption of fish among the 56 per cent fish eating population of India still remains at about 9 kg per capita per annum. India trades to the extent of 1.7 percent in the global fish market. With the rising pressure on food production, an increasing share of the future food supply needs, especially of developing countries like India, may have to be met from fisheries (Dehadrai, 2006).

Marine fisheries form a vital segment of the Indian economy. The Indian Exclusive Economic Zone (EEZ) extends to an area of 2.02 million sq.km., which is about two-third of the land area of the country. The different segments of fisheries such as marine capture fisheries, mariculture, coastal aquaculture, inland capture fisheries, fresh water aquaculture, cold water fisheries, and aquaculture significantly contributes to the food basket of the country. The rich aquatic biodiversity that a few countries have and the range of ecosystems from coastal and inland systems to mountainous lakes and cold streams present both challenges and opportunities (FAO 2007). India is one among the top ten fish producing countries in the world contributing over 5.4 per cent (9.45 million tonnes (t)) of the world fish production. The marine fisheries sector contributes nearly 50 per cent of the total fish production and the total export of seafood during 2013-14 was estimated at 9,28,215 t at a value of ₹ 30,213.26 crores.

Until the 1970s, the emphasis of the Central and State Governments with regard to the marine fisheries development in India was to increase production through improved fishing technology, infrastructure (harbours, roads, processing and market facilities) development and incentives and subsidies to the fishermen.

The estimated manpower employed in the marine fisheries sector in 2005 was a whopping 1.24 million and in addition an almost equal number are reported to be involved in the post harvest activities including marketing. (Vivekanandan 2006). In the last five decades, the technological advancements fostered by fisheries research in the harvest and post-harvest sectors have accelerated the process of transformation of a traditional, subsistence level marine fisheries sector into a market driven multi-crore rupees industry. The marine fish production has made great leaps through successive stages; first with a change in gear material from natural to synthetic fibers and concurrent introduction of mechanized trawlers in the fifties, second with the introduction of mass harvesting gear, the purse seine along the southwest coast in the 70s followed by the introduction of motorization (OBM) of country crafts and the subsequent proliferation of innovative gears like ring seines in the late 80s. With the introduction of multi-day fishing in the late 90s the yield reached 2.7 million tonnes in 1997, and remained almost static for nearly a decade before reaching a record production of 3.93 mt in 2012 and the present production is 3.78 million t(mt) in 2014. The overall valuation at point of first sales also recorded an increase of 74.8 per cent between 1995 (₹ 7409 crore) and 2014 (₹ 29,372 crore).

Marine fishery, inspite of its various complexities and intrinsic sectoral conflicts has come to an industrial footing and requires rigorous research on all economic aspects for management of sustainable resource utilization enabling to face new challenges of globalization (ICES 2003). Resource management for maintaining sustainable production demands in-depth economic analysis of different production techniques to ensure optimum exploitation, equitable distribution, efficient marketing and evolution of alternate management strategies. (Sathiadhas, 1996) Marine fisheries in India is accorded priority in the planned development process due to its significant contribution to the economy for generating income in the most backward regions and creating employment to the people who are in the lowest rungs of the social ladder besides providing precious forex earnings and ensuring food and nutrition security.

Although the level of exploitation of the fishery resources in our country, in general is far below the optimum level, there is too much concentration in certain areas and in respect to certain varieties which perhaps is a reflection of the lack of appropriate fishery management policies or their implementation. The ultimate aim of the marine fishery management is to make full use of the available fish resources without endangering their renewability. But, as nature would have it, that the quantum of resources amenable for exploitation, otherwise called the Maximum sustainable Yield, (MSY) appears to be more or less fixed. The primary task of, management is to determine the effort needed to exploit the permissible level of resource.

Sustainable development is a globally accepted goal for natural resource management, identified at UNCED 1992. The basic principle that governs sustainable development of fisheries is that, it must be conducted in a manner that does not lead to over-fishing, or for those stocks that are over-fished: the fishery must be conducted such that there is a high degree of probability the stocks(s) will recover and also fishing operations should be managed to minimize their impact on the structure, productivity, function, and biological diversity of the ecosystem. The general stagnation in marine fish production during the last decade gives rise to concern about the sustainability of Indian fisheries.

The major issues that have to be addressed to overcome stagnation/ decline in marine fish production in India are identified as; a)Unregulated open access fisheries b) Over capitalization and unwarranted capacity overload c) Excessive fishing pressure in the coastal areas up to about 50m depth zone on target species resulting in declining trends in their catch and catch rates d) Lack of enthusiasm among the entrepreneurs for extension of fishing to the deeper waters e) Discards/indiscriminate exploitation of juveniles/sub-adults of many commercially important species by reducing the mesh size and resulting discards f) Damage to the benthos and benthic ecosystem by continuous sweeping of the same ground by shrimp trawlers, often destroying the food web of commercially exploitable species g)Inter and intra-sectoral conflicts among different categories of fishermen particularly between the artisanal and mechanized groups of fishermen and also between those engaged in coastal artisanal fishing and coastal aquaculture h) Harvest and post-harvest losses i) Ecosystem degradation affecting the productivity and the carrying capacity j) Threats from climate changes and natural calamities k) Lack of participatory fisheries management l) Lack of effective enforcement of MFRA m) Lack of implementation of code of conduct for responsible fisheries n) Absence of an informed management regime and o) Global pressure on trade.

Fish passes through a number of hands before it reaches the ultimate consumers. Both domestic and export marketing have several entirely different flows of products through different marketing channels. The export and domestic marketing system has many marketing channels where the products pass from one to four intermediaries. There is considerable variation in the unit price of products moving through export and domestic marketing channels, the products moving through export marketing channels having higher unit price than those moving through the domestic channels. There is an interrelationship between the different intermediaries involved in the marketing flow. In the case of marine fish domestic marketing, fish travels long distances from coastal areas to interior parts of the country. The usual prominent marine fish marketing channels prevailing in India are given below:

1). Fisher > Auctioneer > Agents of freezing plants > Exporters > Importers & retail consumers

2). Fisher > Auctioneer > Processor (dry fish) > Wholesaler > Retailer > Consumer

3). Fisher > Auctioneer > Wholesaler (Primary Market) > Wholesaler (retail market) > Retailer > Consumer

4). Fisher > Auctioneer >Commission Agent > Wholesaler > Retailer > Consumer

5). Fisher > Auctioneer > Retailer > Consumer

6). Fisher >Auctioneer > Consumer.

The major portion of domestic fish marketing takes place through the 3rd to 6th channels. The major problems confronted in the marketing system are: a) Uncertainty in supply and demand b) Price fluctuations c) HACCP and quality issues d) Changing international trade regulations e) The perishable nature of the products f) Too many varieties and too many demand patterns g) Assembling the products from too many distant and remote centers h) Too many intermediaries in the marketing channel i) Inadequate storage facilities j) Lack of refrigerated transporting system and k) Lack of vertical and horizontal integration of markets.

The overall average unit value realized for all fish in the domestic marketing system is about ₹ 70 per kg as against ₹ 148 per kg in export marketing (2003–2004). Export of marine products set an all-time record of US$1.48 billion in 2004–05. Exports increased by 11.97 percent in volume, 9.11 percent in rupee (₹) value and 11.10 percent in US$ realization. The marine products of India have attracted many new customers in foreign markets and brought about a new era of hope and optimism to the fishing community. The fisher folk got better prices for their catches and gained respect and recognition in society as primary producers of raw materials for marine export industry. The European Union emerged as the largest market for Indian marine products, accounting for 27 percent of the total exports, while the United States of America (USA) held the second position with a 23 percent share in exports. Frozen shrimp continued to be the main item in terms of value (with 64 percent of the total export value), and frozen fish continued to be the largest item in terms of volume (with 35 percent of the total export volume). India's share in the booming world trade of fish is less than 2 percent, which is very low considering the huge potential for exports. Within the ever-expanding internal market, fish and fishery products also recorded the highest increase in price among all food products. The dwindling catch rates in capture fisheries and rampant disguised unemployment in the coastal region focus governments and the private sector on the development of mariculture and coastal aquaculture as a source of remunerative alternate occupations.

Future demand for fish and fish products will grow substantially due to escalating population growth and increasing per capita fish consumption. The consumption of fish is projected to increase from 5.2 million tonnes in 1998 to 6.0 million tonnes in 2005 and to 7.7 million tonnes in 2015. Out of this, in-home consumption accounts for about 66 percent, while the rest will be consumed away from home or enter industrial processing.

The demand for fish is determined by factors such as increase in the number of consumers and increasing preference for seafood backed by growing purchasing power. Consumer preferences and patterns have shifted from cereals and other items to more nutritive yet affordable animal products like fish. According to National Sample Survey Organization (NSSO) the per capita cereal consumption is declining, recording a decline of 0.52 percent per annum in rural areas and of 0.23 percent per annum in urban areas during the period 1970–71 to

1991–92. This shift in dietary pattern may be attributed to diversification in the food basket in favour of non-cereal food items like eggs, meat and fish. There has been considerable product diversification and market expansion of fishery products over the last three decades. There is increasing demand for "ready to cook" or "ready to serve" type seafood– hygienically prepared and attractively packed convenience foods to match the changing needs of urban populations. Seafood processing and marketing have become competitive all over the world, and exporters are switching over to value addition to increase profitability.

The marketing and distribution system in the fishery sector of the country is not well equipped with quality maintenance mechanism comprising essential marketing infrastructure and proper administrative procedures. In the light of HACCP regulations the governments as well as the industrialists have started paying proper attention to the quality standards of the export products. However quality maintenance in the internal distribution system of fresh and processed fish is also essential. Some of the simple aspects which can be easily taken care of are, (I) Fish and shellfish should be preserved properly immediately after catch, (ii) Ice should be prepared from good quality water and used in appropriate proportion, (iii) Handling area and containers should be properly disinfected, (iv) Proper drainage should be provided in markets and landing centres, (v) Fish should be protected from flies, rodents, insects, birds and animals, (vi) Immediately after catch, fish should be sorted species wise. Shrimps should be graded, be headed, peeled and de-veined as soon as possible, (vii) The quality standards like fixing limits etc should be imposed, (viii) The bivalves as far as possible should be depurated before shucking, (ix) Sun drying of fish in sandy beach should be strictly stopped. While salting, only good quality salt should be used, (x) Quality of fish sold in domestic market should be assured, (xi) Proper cost effective preservation facilities should be provided at all retail outlets. For this, preservation or cold storage units can be established on cooperative basis or by the local bodies extending the facilities by nominal charges and (xii) Educate public as well as fisher folk about the need of seafood safety norms through proper extension strategies.

Production and marketing problems of marine fisheries are interdependent and an integrated approach at the regional level is very much essential to suggest management strategies. The sustenance of different harvesting techniques of capture fisheries depends upon its profitability which in turn depends upon the market demand and unit price of the produce. Vladimir Baum (1973) rightly indicted that the sectoral approaches which have so long dominated both national and international dealings with the sea do not meet the requirements of the day and even less those of the future. Khorshid and Morgan (1990) also stated that the experience being accumulated with fisheries development programmes in many regions has led to the now widespread understanding that fisheries development needs to be based initially on detailed understanding of the fish resources and the way they respond to changes in fishing effort or fishing techniques. The broader function of the fisheries development also requires data on marketing and infrastructural aspects to analyze the multi-input and multi-objective problems of ocean fisheries (David Cushing 1975; Vito Blomo *et al.,* 1978).

The concept of strategic management involves both strategic formation (content) and also strategy implementation (process). It is the process of specifying the mission, vision and objectives, developing policies and plans, often in terms of projects and programmes, which are designed to achieve these objectives and then allocating resources to implement the policies and plans, projects and programmes. A balanced score card is often used to evaluate the overall performance of the business and to progress toward objectives. Thus the strategic management of sea food business in India envisages the plans and policies to be adopted for optimizing the production of fish and maximizing earning and profit from trade of fish. The great challenge of fisheries management is to choose and implement the best management strategies to achieve the objectives, despite the fact that there will always be gaps and uncertainties in the knowledge required for fully informed decision and actions (Pascoe *et al.*, 2004).

1.1 Statement of the Problem

Fish trade is rapidly changing in India. Multi-dimensional development of fish trade is seen on live, fresh, iced, cure, dried, frozen, canned and ready to eat form. The historical review clearly indicate that the supply of this highly perishable product which has been confined within a radius of 25-50 kms from the producing centres has now not only penetrated far off centres in the internal markets but also fetch substantial forex earnings through international business. Product diversification and taking advantage of price discrimination prevalent, among the affluent nations is vital to succeed in the international trade. The real challenge for Supply Chain Management (SCM) in the food and allied industries is to search for strategies to resolve the conflict between production – driven reality and customer driven reality. The strategies should consider the use of integrated planning to optimise the 4Ps of the traditional marketing mix: Product, Price, Place, Promotion. A key element of this study is the performance of the various levels of the supply chain, in addition to analysing the pertinent trends in production and trade of fish and fish products both in international and domestic markets.

1.2 Objectives of the study

The following are the major objectives of the study

1). To review the current status of fishery business and its contribution to economic development of India

2). To assess the costs and earnings of different types of fishing units in Kerala state

3). To evaluate supply-demand dimensions of marine fisheries with special emphasis on technological options, investment structure, earnings and employment for sustainable development

4). To analyze the price behaviour of domestic and international marketing of marine products

5). To assess the inter-relationship of primary-wholesale-retail prices of selected varieties of fish as case study of different marketing channels

6). To give policy suggestions for strategic management of sea food business for reaping optimum benefits and integrated development of the coastal zone.

1.3 Methodology

1.3.1 Data base

This study is based on secondary as well as primary data. The secondary data were collected from various publications of Central and State Government Departments such as Marine Products Export Development Authority (MPEDA), Central Marine Fisheries Research Institute (CMFRI), Central Institute of Fisheries Technology (CIFT), Central Institute of Brackish water Aquaculture (CIBA), Central Institute of Fisheries Education (CIFE) Central Institute Fresh

Water Aquaculture (CIFA) and Department of Fisheries of concerned states. The primary data collection was done from selected sample landing centres on costs and earnings of different craft-gear combinations and price information on identified marketing channels using appropriate interview schedules. (Appendix I & II).

1.3.2 Primary data and Period of study

Primary data on costs and earnings of different craft - gear combinations have been collected from sleeted centers of Kerala such as Vizhinjam, Neendakara, Valanjavazhi, Arthungal and Munambam continuously for one year during 2007, covering selected sample mechanized, motorized and non mechanized fishing units as shown below.

1). Three categories of Trawlers operating single day, multi day of 2-5 days and above 5 days

2). Three categories of Purse seiners operating single day, multi day of 2-5 days and above 5 days

3). Two categories of motorised fishing units operating ring seines and mini- trawls and

4). Non Mechased fishing units operating different gillnets.

Quarterly 15-20 fishing trips of each types of craft gear combination have been observed in person or through key informants during January – December, 2007. The primary data were collected during January – December 2007. However, the macro economic data and indicators relating to the fisheries sector have been updated up to 2012 – 13.

There is considerable variation in the price of fish between seasons, regions and daily between different times in the same day. The size of each fish variety, supply of identical type of other varieties, overall market arrivals, demand pattern and various other factors influence the price of fish. Fish and fishery products, both fresh and frozen, move in the marketing chain through different channels, domestic or export, as the case may be. The marketing channels are distinguished from each other on the basis of market functionaries involved in carrying the produce from the producers to the ultimate consumers. The length of the marketing channel depends on the size of market, nature of the commodity and the pattern of demand at the consumer level. (Ganeshkumar *et al.,* 2008*)* Fish marketing systems in India involve several marketing channels, each with a number of intermediaries between producer and consumer of fish. The common domestic fish marketing channel for marine fish in India is one that the auctioneer, commission agent, wholesaler and retailer as intermediaries.

Since maximum marine fish is distributed and sold through the fish marketing channel consisting of fishermen – auctioneer – wholesaler and retailer, this channel has been purposely selected for detailed data collection on fish marketing. In the West coast, States like Kerala and Maharasthra and in the East coast states like Tamil Nadu and Andhrapradesh have been identified as representative states for collecting price information from landing, wholesale and retail level from the above marketing channel as shown below

1). Cochin Fisheries Harbour (Landing Centre) – Champakara Wholesale Market, - Ernakulam and Thevara Retail markets ------- Kerala

2). Versova (Landing Centre) C.S. Mandi (Wholesale Market) C.S. Mandi and Malad (Retail markets) ---------- Maharashtra

3). Tuticorin Fisheries Harbour (Landing Centre) VOC Market Tuticorin (Whole Sale/Retail Market) Palayamkottati (Retail Market)------ Tamil Nadu

4). Visakhapatnam Fisheries Harbour (Landing Centre) –Nehru Bazar (Wholesale market)- Poorna Market (Retail market)------- Andhrapradesh.

Data on packing, transportation charges, marketing costs and price of each varieties fish at each stage of the above marketing channel have been collected on ten sample days in each quarter for two years (2007 and 2008) by personal visit and through local key informants in the specifically designed schedule (appendix II).

Simple tabular analysis and appropriate statistical tools were used for tabulation, analysis and interpretation of data. Tabular analysis, percentage analysis, cost – return (benefit – cost) analysis, price spread analysis, (including estimation of marketing cost and margin) correlation and regression analysis were employed to analyze the collected data. To compute price spread (by concurrent method) the gross marketing margin (GNM), percentage of marketing margin (PMMCR) and percentage share of fishermen (PSFCR) in consumers rupees are calculated as follows:

$$GMM = RP - LP$$

$$PMMCR = (RP - LP) \times 100/RP$$

$$PSFCR = LP \times 100/RP$$

Where RP denotes average retail price and LP is the price at the landing centre.

Since correlation coefficient is the commonly used measure of pricing efficiency and market integration in developing countries (Blyn, 1973; Lundal and Peterson, 1983; Naik and Arora, 1986) the same has been used in this study also.

1.3.3 Scope of the study

Sea food export earns consistently around one billion US $ annually for the last few years. This is made possible through diversification of sea food export market and adoption of improved marketing practices. Domestic marketing system is also expanding and rapidly changing. This study analysis the various problems involved in the sea food industry and provides management solutions. This will be helpful for the industry to reap more benefits.

1.4 Hypothesis

1). The growth and development of open access marine fisheries and aquaculture in India are almost entirely dependent on exports

2). There is a steady decline in catch rates of all types of fishing methods which made marine fishing operations uneconomic over the years

3). There is tremendous development in the marketing system of marine products in India over the years

4). The scope for product diversification and increasing quality control needs preservation and processing techniques coupled with state of modern supply chain management of processing plants and cold storage

5). Excess capacity of fishing fleets and processing plants in fisheries sector is inevitable due to seasonality of production.

1.5 Limitations of the Study

The prices and values of products mentioned in the study are subject to change from region to region and from season to season. Since there is heavy fluctuations in price, the annual average price at national level published by government agencies are taken for the present analysis. As there are large number of varieties of fish traded in the internal and export marketing system, only selected commercially important varieties were dealt in detail in the present analysis. Some of the quality standards for products discussed is subject to change as per the requirement of the importing countries.

1.6 Scheme of the Study

The thesis is presented in 8 chapters including this introductory chapter. This chapter introduced the topic with statement of the problem, objectives hypothesis, methodology and data base and limitations of the study. The Scheme of the study is also furnished in this chapter.

Chapter 2 presents the review of literature and theoretical framework focusing on the concepts and definitions used in this study. The extensive review of the literature at national and international level pertaining to fish production, marketing and management aspects is dealt with focusing the thrust for the present study. Chapter 3 deals with the development and growth of fisheries as an important component of GDP of the country as well as its emergence as a business enterprise in terms of capital investment on fishing fleets, income, employment generation in primary and secondary sectors and domestic and export marketing aspects. Chapter 4 contains the supply –demand dimensions of marine fish for the last 25 years. The production trend by motorized, mechanized and non mechanized sectors and the effort expended over the years has been probed. The state wise production and their increasing or decreasing trend were also analyzed and given in this chapter.

The costs and earnings of different fishing units in Kerala coast as a case study has been dealt with in Chapter 5. The increasing trend of multi day fishing by trawlers and gillnetters have been given due emphasis. The operating profit and per capita income of these units and returns to different factor of production are discussed in this chapter. Chapter 6 deals with the domestic marketing channels and price spread of fish .An attempt was made to estimate the fishermen share in consumers rupee for the selected marketing channels. The economic value of fish at the procuring level as well as consumer level has also been worked out. The growth and development of international trade of fish and fishery product have been explained in Chapter 7. Chapter 8 contains summery of findings, conclusions and policy recommendations.

…..ഇരു…..

Chapter 2

REVIEW OF LITERATURE

The need for fishery management assumed importance in recent years on account of the uncontrolled or rather reckless exploitation of the resources in many countries leading to depletion of stock. Most of the countries in the world depend on fisheries as a source of protein rich food. From very ancient time fish from the oceans and other aquatic sources have been an important source of food. But those who harvest fish cannot live by it alone. Fish is equally perishable and hence there is need to barter or exchange. Thus, fish has an inherent tendency to trade, is thus more innate to a fishery than to livestock or agriculture. Several studies on production to marketing and various aspects of fisheries have been made by many international and national agencies and individual research workers. In order to develop clarity and comprehension in any study, it is necessary to review the various concepts, research methodologies and analytical tools used by researchesrs in earlier studies. Such an attempt would help the researcher to have better and precise understanding of the perspectives of the research problem and would also facilitate the researcher to modify and improve the present analytical framework in the right direction to suit the problem situation. Further the findings of earlier studies would guide the researcher in setting the hypotheses and objectives and enable him to evaluate the validity of his own findings. This chapter briefly reviews the concepts, analytical tools and findings of the past studies and theoretical frame work, which are relevant for the present study.

2.1 Review of concepts

In order to develop clarity and better understanding of the research problem, a brief review of the following techno-economic and biological concepts related to fishery are presented.

2.1.1 Fishery and Fishery Resources

2.1.2 Exclusive Economic Zone and Access to Fisheries

2.1.3 Fishing Crafts and Gears

2.1.4 Fishing Area and Stock

2.1.5 Fishing Effort and Catch Per Unit Effort

2.1.6 Diminishing Returns in Fisheries

2.1.7 Fisheries Management

2.1.8. Maximum Sustainable Yield (MSY) and Maximum Economic Yield (MEY)

2.1.9 Trade Liberalization

2.1.10 Growth and Instability

2.1.11 Structural Changes in Exports

2.1.12 Export Demand and Supply

2.1.13 Competitiveness

2.1.14 Nominal Protection Coefficient

2.1.1 Fishery and Fishery resources

Anderson (1977) defined fishery as a stock or stocks of fish and the enterprises that had the potential of exploiting them while Hector (1979) viewed fishery as a geographical location usually defined by topographical features, where single or multispecies exploitation was commercially undertaken. International Council for the Exploration of the Sea, (ICES, 2003), defined fishery as group of vessel voyages targeting the same species or same stock, using the same gear, operating during the same period of the year and in the same area. Fishery resources are renewable resources. Renewable natural resources are those capable of self reproduction. According to Pearce and Turner (1990), a renewable resource has the essential feature that it is not fixed over time. Fishery resources are classified into pelagic and demersal depending upon the nature of dwelling habitat. The former group included fish inhabiting the surface and near surface water while the latter group referred to those species which lie at the bottom and near bottom.

2.1.2 Exclusive Economic Zone and access to fisheries

It is the common knowledge by now that most coastal States assert and exercise jurisdiction over fisheries within a 200 mile Exclusive Economic Zone. For centuries the basic claim by nations to exercise authority over marine fisheries insisted that access to them must be open to all beyond a narrow belt of national territory in the ocean. Further many coastal States over the years insisted through unilateral legislation that the coastal State could law fully extend some degree of control over living resources beyond national territory. However, the first (1958) and second (1960) United Nations Conference on the Law of the Sea (UNCLOS) were unable to agree on an extension of the territorial sea or an exclusive fishery zone in the water column (Anderson, 1977). But these conferences left no doubt that a 3 mile territorial sea has little international support while a wider area of exclusive coastal control and preferential rights over fisheries met with widespread approval.

During the period following the 1958 conference until the beginning of the third UNCLOS in 1974, many countries extended their jurisdiction beyond the traditional 3 miles. The third UNCLOS held at Caracas established broad and exclusive coastal state authority over fisheries within a zone of 200 nautical miles measured from the base line for the territorial sea. The quality of "exclusiveness" in relation to authority over resources of the economic zone including fisheries is emphasized. The coastal States right in the zone are declared to be "sovereign" for certain particular purposes, namely exploring and exploiting, conserving and managing the natural resources; whether living or non-living, of the seabed and subsoil and the superjacent waters (William,1983). George *et al.* (1977) observed that all the 200mile EEZ would constitute about 40 per cent of the world oceans and that of 90 percent of the traditional fishing grounds and 70-80per cent of the global catch.

With the declaration of EEZ, India had assumed not only exclusive jurisdiction, but also a great responsibility for the optimum exploitation of living and non-living resources from about2 million sq. km. area. The 41st amendment to the constitution enacting "The Territorial Waters, Continental shelf, Exclusive Economic Zone and other Maritime Zones Act 1976" came into force on the 25th August, 1976. The Act defines the various Zones and the rights and jurisdiction in respect of these zones. The limit of the "Territorial Water" extends to a distance of 12 nautical miles from the appropriate base line. The sovereignty of India extends to these waters with the right of innocent passage for all foreign ships, but only with the Government's permission for foreign war ships. As per the classification, the area beyond and adjacent to the territorial waters and extending to a distance of 24nautical miles from the appropriate base line shall form the "contiguous Zone". The Government of India had full jurisdiction in this area to take measures with regard to the security of the country in immigration, sanitation, customs and other fiscal matters.

The "continental shelf" extends to the outer edge of the continental margin or to a distance of 200 nautical miles from the appropriate base line. In this area, India had sovereign rights for exploration, exploitation, conservation and management of all resources. The Exclusive Economic Zone is an area beyond and adjacent to the territorial waters with a limit of 200nautical miles from the base line. In addition to the rights mentioned for continental shelf, India will have sovereign rights for producing energy from tides, winds and currents and such other rights as recognized by international law.

The maritime boundaries between India and other countries adjacent to it shall be determined by mutual agreement. Pending such an agreement, the maritime boundary between India and such countries shall not exceed beyond the line which is equi-distant from either coast line. The area under EEZ of India works out at 2.02million sq. km. comprising of 0.86 million sq. km. off the west coast, 0.56 million sq. km. off the east coast and 0.60 million sq. km. around the Andaman and Nicobar Islands (George *et al.,* 1977).The Indian EEZ would thus represent about 2.8 per cent of the surface area of the Indian Ocean (excluding Antarctic).

2.1.3 Fishing Crafts and Gears

The fishing craft is a platform on which the fishermen sail to and from the fishing ground, haul his gear, keep the catch and process them. A fishing fleet is a physical group of vessels sharing similar characteristics in terms of technical features or major activity. Durairaj (1980) broadly classified the fishing crafts as mechanised and non-mechanised crafts. The non-mechanised sector consists of indigenous and motorised crafts.

(i) **Indigenous /Artisanal Crafts**: A variety of indigenous crafts are used in the fishery. They vary from simple catamarans in the East Coast to well built canoes of Maharashtra on the West Coast. Catamaran is a keel less raft formed by rigging together several logs, which are curved and shaped like a canoe. Plank built canoes are dugouts, which are further enlarged with planks on the sides. They are largely used in Kerala for boat seining and other fishing (SIFFS, 1992).

(ii) **Motorised Crafts:** Motorisation of indigenous crafts was the first step in the mechanisation of marine fishing. A motorised fishing unit consists of a wooden or plywood indigenous vessel fitted with one or more out board engines. These vessels use mechanised means only for voyage and not for actual fishing operation.

(iii) **Mechanised Crafts:** Mechanised fishing vessels are crafts which use mechanised means both for voyage as well as for fishing operation. They are divided into trawlers, seiners, liners and gillnetters based on the gears used for fishing.

A fishing gear referred to any material such as a net, an arrow, a harpon or even a piece of cloth used for catching the fish. Based on the mode of operation, gears are broadly classified into passive and active gears. Active fishing gear is a fishing device characterized by gear movements, and/or the pursuit of the target species by towing, lifting and pushing the gears, surrounding, covering, dredging, pumping and scaring the target species to impoundments; such as trawl, purse seines and bag nets, whereas passive or static gears are those that are dropped and left in place for a period before retrieval. They may either attract fish using bait, or may passively wait for a fish to swim into a net or trap. It includes methods such as lining/longlining or gillnetting/driftnetting. A fishing unit consists of different gears at a time.

2.1.4 Fishing area and stock

Fishing area or fishing ground in the sea generally referred to as continental shelf. The usual concept of continental shelf was that it ended at 100 fathoms (Mithra, 1970). The classification followed by different commercial organizations in India is as follows:

Inshore area	-	0-10 fathoms depth
Offshore area	-	10-40 fathoms depth
Deep sea area	-	40-100 fathoms depth
Oceanic	-	Beyond 100 fathoms depth

Sparre and Venema (1998) defined stock as a group of fish species having the same growth and mortality parameters. It is the part of a fish population usually with a particular migration pattern, specific spawning grounds and subject to a distinct fishery. A fish stock may be treated as a total or a spawning stock. Total stock refers to both juveniles and adults, either in numbers or by weight, while spawning stock refers to the numbers or weight of individuals which are old enough to reproduce. Spawning Stock Biomass (SSB) refers to the total weight of all sexual mature fish in the population. This quantity depends on year class abundance, the exploitation pattern, the rate of growth, fishing and natural mortality rates, the onset of sexual maturity and environmental conditions (United States National Marine Fisheries Service Website, www.rmfs.noaa.gov).

2.1.5 Fishing Effort and Catch Per Unit Effort

Fishing effort is measured in terms of the number of boats (in some cases the number of trips), their catching power, the spatial distribution, time spent on fishing, the skill of the crew etc. The fishing effort concept is often applied by dividing into two components, namely fishing time and fishing power (Bhat & Bhatta, 2001). Fishing power is the catch which a particular gear or vessel takes from a given density of fish during a certain time interval. For example, larger vessels (horsepower) have a greater ability to catch more fish, thus the greater their fishing power. Improvements in a vessel or gear, such as fish finders can increase fishing power. Royce (1972) expressed the fishing effort as the unit of time fished by standard crafts and gears such as hauling hours and horse power of fixed gears. Fishing effort measures the capital, energy and labour devoted to fishing during a particular time period. It might be measured by the number of standardized vessels operating in a fishery during a particular day. Nominal fishing effort is expressed as fishing days or actual fishing hours. The fishing effort is proportional to fishing mortality (Hanley *et al.*, 2004).

Sultan and Chacko (1967) measured the catch per unit effort per hour of mechanized vessels as 51. 2 kg to 75.8 kg with gillnets and 13.4 kg to 29.5 kg with trawl nets. For 32 ft vessels, the catch varied from 38.3 to 40.1 kg per hour with trawl net. The intranet variations in this were omitted. Rao and Venkataraman (1973) estimated the daily catch by multiplying the average Catch Per Unit Effort (CPUE) with the total number of respective units operated during that day. From the daily estimates monthly catches were estimated. Total estimates of catches divided by total number of unit times will give the CPUE per day. Jones and Banerji (1973) pointed out that Catch Per Unit Effort was influenced by fishery stock, accessibility of fishing ground by fishing crafts and vulnerability. The change in fishing intensity or change in efficiency or both together would affect the Catch Per Unit Effort.

According to Lindebo (2004), CPUE could be the volume or value of landings of the fleet divided by the number of actual fishing hours using aggregated data.

2.1.6 Diminishing returns in Fisheries

The extension of fishery jurisdiction by most of the coastal States was the dominant event in global fisheries during the seventies. These extensions changed the open access regime to an extended jurisdiction of fisheries management. World fisheries have changed drastically since 1960, when annual landings and fishing industries were growing rapidly. Now, growth appears to be virtually stagnant, despite dramatic changes in coastal State jurisdiction. Under the open access regime, the coastal States had little management control over the stocks of fish. Fishing was accompanied by considerable economic waste, many stocks were over fished or depleted to historically low levels of abundance, fishing in the distant waters of coastal States diverted economic benefits away from those States and the capability and effectiveness of fishery management organizations became a matter of global concern (FAO 2003).

In 1970, the annual increase in the global fish catches that had been experienced in earlier years had diminished considerably. Brain (1983) points out that the stabilization of the global catch required the notion, that those stocks that comprised the catch had to be utilized with greater efficiency than they had in the past. The efficiency could only be increased through improved management of the extended jurisdiction region. However, the anticipated benefits could not fully be realized. To be sure, distant water fishermen were driven from their traditional grounds off the coastal States or charged fees for the right to fish in the extended jurisdiction zones, but other than this, wherever active management was attempted, it did not appear to work well; many of the old problems of management under the open access region remained and new ones developed. He further indicates that in the absence of hard data on the economic performance of management, people haggled over boundaries, over objectives, over quotas, over the right to fish, over what optimum yield meant, over data and even over whether fishery management was a worthwhile enterprise. Further, the applicability of standard management procedures, particularly to multiple-species fisheries was challenged and it became apparent to many that traditional approaches to enforcement of regulations were not cost-effective (Barber and Taylor, 1990).

First beginning with Gordon 1954 and Scott (1954) economists have identified the over exploitation of marine fisheries as an unregulated common property problem. Then the thrust has been on 'optimal' management models for the ocean fisheries in which socially optimal or efficient policies for resource exploitation are derived (Carlander,1969). Achieving rational management in the ocean fishery had become more difficult with the mounting competition among fishermen for this valuable yet limited marine resource.

2.1.7 Fisheries management

A fishery management plan can be carried out through allocation of property rights, regulation of catch composition, regulation of the catch size and the adoption of extension fishing programs (Anderson, 1977). Under open access, many developed fisheries of the world were overexploited, Over capitalized and generated externalities. As a result, many of the developed nations implemented different approaches to allocate property rights (Griffin *et al.* 1976, Hector 1979, Hilborn Ray and Waltrs 1992, Jayawardane *et al.* 2002).

Fishery resources could be subjected to four different property regimes: state, private, common and open access. The relevant concepts analyzed by Bromley (1991) to characterize each regime are as follows: If resource users had the duty to observe rules and norms of use/access determined by a government institution that has the right of its management, then the fishery was state property. Under state property conditions, the management agency established the norms of use and access to the fish stock. Rights of allocation included the regulation of the amount and composition of the catch. (Lallemand *et al.* 1989, Lleonart *et al.* 2003 an d Rajali 2006).

If the fishers had the right to decide on socially acceptable uses of the resource, even though they have the duty to abstain from destructive uses, the exploitation regime was deemed private property. In a private property regime, fishery regulations can be focused either on the control of input or output from the system (Murawski, 2007). Input control implied the regulation of effort, *viz.* the number of boats, days at sea, size of gears and power of engines operating in a fishery. On the other hand, output control meant the regulation of the product extracted, *viz* catches, from the system and was commonly made by defining catch quotas, or TAC (Total Allowable Catch). Total allowable catch was the total regulated catch from a stock in a given time period, usually a year. (Ahmed *et al.*. 2007).

The allocation of private property rights had been explored since the 80^{s} by setting Individual Transferable Quotas (Morgan, 1997). Quota referred to a portion of a Total Allowable Catch (TAC) allocated to an operating unit, such as a vessel class or size or a country. Among output limited strategies, Individual

Transferable Quotas (ITQs) had replaced Total Allowable Catches and were increasingly favored as the fishery management strategy worldwide. In an Individual Transferable Quota system, each license was allocated a fraction of the total catch quota for each controlled species. These individual transferable quotas may be traded or sold among fishers. The ITQs were self regulated by letting the market establish the value at which quota may be bought or sold. (Mc Garvey, 2003). Leal *et al.* (2005) considers the institution of Individual Transferable Quotas (ITQs), or Individual Fishing Quotas (IFQs) as the most significant solution to the wide spread economic and environmental problems due to over fishing.

If the State had allocated property rights to a well-defined group of fishers who have specific rights and duties with respect to the rates of resource use, then the exploitation regime was of common property. Under a common property regime, exclusive rights were given to groups of fishers (having the right to exclude others), generally organized into cooperatives or fishing communities (Seijo, 1993). Common property regimes considered exclusion of non-participant and specific duties to resource users, who cannot by themselves make decisions that lead to the collapse of the fishery. (Conrad and Clark 1995, Cunnighan *et al.* 1980, Defeo and Seijo 1999, Dubey *et al.*, 2003, Sharma *et al.*, 2006) The efficiency of alternative management actions imposed by the management authority, and the clear specification of rights and duties for the owners, were critical to avoid fishery collapse.

In open access conditions, the resource as property does not exist, and thus any member of society could harvest the resource. This regime fails to lead to optimal resource allocation, and thus results in resource overexploitation (Anderson, 1977 and Hannesson, 1993). The Indian marine fisheries sector is characteristically an open access, that is, with free and common property rights.

2.1.8 Maximum Sustainable Yield (MSY) and Maximum Economic Yield (MEY)

Sustainable development is the management and conservation of natural resources base and the orientation of technological and institutional changes in such a manner as to ensure the attainment and continued satisfaction of human needs for the present and future generations. Such development (in agriculture, forestry and fisheries sectors) conserves land, water, plant and animal genetic resources; is environmentally non-degrading, technically appropriate, economically viable and socially acceptable. (Billingsley 1965 and Bjorndal 1989) Thus, considerations on the sustainability issue in capture fisheries development will naturally involve biological, ecological, environmental, social, economic, legal and institutional parameters. It therefore follows that such exercises will be very complex, dealing with resources, ecosystems, society, economic indications, environmental degradation, bio-diversity etc (FAO, 1995 and Datta and Choudhury (1999) in their paper on property rights and policies for sustainable management of marine fisheries in India, considered sustainability not merely as economic viability but also in terms of ecological and social compatibility.

Sustainable yield is the number or weight of fish in a stock that can be taken by fishing without reducing the stock biomass from year to year, assuming that environmental conditions remain the same. Maximum Sustainable Yield is the yield produced by applying the optimal level of effort that can be sustained without affecting the long-term productivity of the stock. It can also be defined as the largest average catch or yield that can continuously be taken from a stock under existing environmental conditions. (For species with fluctuating recruitment, the maximum might be obtained by taking fewer fish in some years than in others). This is also referred as maximum equilibrium catch or maximum sustained yield or sustainable catch (United States National Marine Fisheries Service website, www.nmfs.noaa.gov).

Managing fisheries at its biological maximum or Maximum Sustainable Yield may not prove to be economically efficient. Integrating economic considerations like fishery input and output prices with the biological and technical aspects become essential in order to maximize fishery net returns. (Fax 1990, Frot and Niels 1995, and Gonzalez *et al.* 2007) In open access fisheries fishermen will increase their fishing effort as long as that is profitable. The open access equilibrium occurs where total revenue equals total cost and hence resource rent becomes zero (Ahmed *et al.,* 2007). Optimum Yield (OY) is the yield from a fishery which provides the greatest overall benefit to the nation with particular reference to food production and recreational opportunities; it is based on MSY as modified by economic, social or ecological factors (United States National Marine Fisheries Service website, www.nmfs.noaa.gov and www.fao.org).

In the simple economic model developed by Gordon (1954), fishery input and output values are expressed in terms of total cost and total revenue and as functions of fishing effort. The fixed cost consists of costs required before any direct fishing effort is made. The operational costs consist of costs of labour, fuel and food. Hence the cost per unit of fishing effort is constant. In the steady state condition of the Schaefer model, the sustainable catch curve is the long run production function of the fishery from an economic point of view (Coelli *et al.* 1999, Dong and Pascoe 205, Garcia 1996). The average and marginal catches are defined as the ratio between total sustainable catch and fishing effort and the change in sustainable catch due to a change in fishing effort, respectively.

2.1.9 Trade Liberalization

A variety of concepts of trade liberalisation exist, as well as views of its design. In the traditional policy literature of the 1960s and 1970s, trade liberalisation was defined in a very general way; what economists usually meant was some relaxation of trade and exchange controls.

In the NBER studies on trade regimes conducted by Bhagawati (1978) and Krueger (1978) a liberalisation episode was defined as a more extensive use of the price mechanism that would reduce the anti-export bias of the trade regime. Krueger (1986) reaffirmed the above general definition and argued that even a (real) devaluation in the presence of quantitative restrictions constituted a liberalisation episode. He defined liberalisation as any policy action that reducing the restrictiveness of controls or reduced the scarcity premium attached to those controls. Thus, a regime with no quantitative restriction but very high tariffs could still be considered fully liberalized, but biased.

Bhagawati (1988) emphasized neutrality as the central aspect of liberalisation. In an import-substituting regime, incentives are biased against exports and in favour of domestic sales. The introduction of incentives to exporters (e.g., rebates for duties on imported inputs) into such a regime would be viewed as a move towards liberalisation because it reduces bias against exports. (Bharucha, 1997, Edwards (1989) proposed a definition that will allow for a continuum with recognizing different degrees of liberalisation. He referred to the earlier definition by Krueger/ Bhagawati as "mild liberalisation" and he opined that a move to neutrality would be a more intensive liberalisation. Finally a reduction in levels of intervention (increased liberality) would constitute a more drastic form of liberalisation.

The studies by Papageorgiou *et al.,* (1991) and Thomas and Nash (1991) included both neutrality and liberality in their definitions of trade liberalisation. Liberalisation encompasses not only a reduction in the anti-export bias of the trade regime, and an increase in reliance on the price mechanism, but also a reduction in the level of intervention. Inclusion of these concepts in the definition of trade liberalisation means that a large number of policy changes like lowering average nominal tariffs, narrowing the range of nominal and effective tariffs, a shift from QR's to tariffs, a real devaluation, a unification of multiple exchange rates, removal of export taxes, removal of export Quantitative Restrictions (QR's), implementation of export subsidies, rebates or compensation schemes form part of liberalisation. (Chand 2002, Chimmini 2002, Diakosauvas 1995, Fosu 1990, Gardner *et al.* 1990, Gulati and Anil 1998).

According to Greenaway and Sapsford (1994), trade liberalisation could mean one of atleast three things: a reduction in import barriers with no change in export incentives; a movement of relative prices towards neutrality via a reduction in import barriers and/or an improvement in export incentives; the substitution of less costly for more costly instruments of protection, i.e. tariffs for quotas.

Goldar (1994) defined trade liberalisation as the removal of quantitative restrictions on imports and their replacement by tariffs, followed by reduction in the general level of nominal tariffs, move towards a more uniform tariff structure and a more appropriate exchange rate policy. Edwards (1997) defined trade liberalisation as an elimination of Quantitative Restrictions coupled with a severe reduction of import tariffs to a uniform level of around 10 per cent.

In India agricultural trade liberalisation consisted of three components, abandoning of channeling of trade except for few commodities, dismantling of most of the quantitative restrictions and some reduction in tariffs (Balla 1995).

2.1.10 Growth and Instability

Growth rates are measures of performance of economic variables. They exhibit the nature of changes in the variables in the long run They are not developed to predict; but describe the trends in variable over time. Hence, they are commonly used as indicators of trends in the time series data. Price indices, productivity indices and output series are usually discussed in terms of the changing growth rates over a period of time. Policy decisions are often based on such growth rates, which depend on nature and structure of the data. According to Dayal (1986) agricultural growth rates could be simple or geometric .The arithmetic growth rates could be expressed in absolute terms, whereas the compound growth rates should be expressed in percentage terms.

Dattatreyulu (2000) found that agricultural exports over the years increased in value terms, but their share in the total exports declined since 1960-61.Exports over the years had grown but the growth in export had shown a very modest trend. Kumar (2000) found that in general overall agriculture and allied products have shown 14 per cent growth rate for the period 1990-91 to 1997-98. Rath (1980) had examined the agricultural production by working out the growth rates of area, production and productivity of major crops. The use of growth rates of area production and productivity of various crops was also found in the study of Singh and Kaul (1982) while analysing the performance of Agriculture in Punjab. Rajagopalan (1983) measured the compound growth rates in area, yield and production of principal crops to determine agricultural growth in Tamil Nadu.Bhowmick and Kalita (2001) worked out annual compound growth rates in the case of livestock population using the following formula:

$$P_t / P_o = (1 + r)^t / 100$$

Where, P_t is population in the t^{th} period, 'P_o' is population in the base period and 'r' is the compound growth rate.

Lathika and Ajith kumar (2005) studied the growth trend in area, production and productivity of coconut using three trend equations: semilog ($LnY_t = a+bt+ut$), log quadratic ($LnY_t = a+bt+ct^2+ut$), and a log quadratic model with transformations on t (t-(n+1)/2).

Instability index is defined as the standard deviation of the residuals from the trend (Massell, 1970). Pradhan (1988) used the terms variability, volatility and fluctuation to describe the instability or movements (both expected and unexpected) in exchange rates in different time periods.

Singal and Kaur (1986) studied the destination wise instability of exports from India using Coppock's instability index. The commodities selected for the study were jute, tea, cashew kernels, engineering goods, handicrafts and iron ore that contributed about 42 per cent of exports of India from 1979-80. They found that Canada and Australia had more of destabilizing effect on India's trade. In the case of Japan, USSR, USA, UK, the trade relations helped India to achieve stability in her external economy which in turn stabilized the domestic economy.

Jessy and Sundaresan (1996) studied the instability in export of cardamom from India. The results showed that there was high instability in the quantum of exports with an instability index of 68.5 and the co-efficient of variation of 60.47 per cent.

Mahesh (2001) studied the instability in export quantity, value and unit value of Indian tea during the period from 1979-80 to 1998-99 and found that the instability index for the export quantity was found to be 9.19 per cent whereas the export value and export unit value instability indices were 24.88 and 36.82 per cent respectively.

2.1.11 Structural Changes in Exports

The structural changes in exports helps us to know the trend in sustaining existing market over last decades but also to know the shift in shares from one country to another for a period of time. The first order finite Markov model is a stochastic process (X) which describes the finite number of possible outcomes S1 (I = 1.2….r) and is a discrete random variable X_t (t = 1, 2, 3…… t). This is said to have the first order Markovian property if the conditional probability distribution of X is dependent only on the state the system is in at Step 1 (Dent, 1967; Gullant 1969 and Gillet, 1976).

2.1.12 Export Demand and Supply

Nurul Islam (1990) opined that the assessment of accurate export demand and supply of commodities is a vital pre-requisite for effective policy making. The price and income elasticities indicate whether commodities enjoy a competitive advantage and market opportunities in terms of higher price and income elasticities (Ragnar and Placent 1997). The import demand elasticity is the percentage change in the quantity demanded of the import good divided by the percentage change in the relative price. The elasticity of supply of exports is the percentage change in the quantity of exports supplied divided by the percentage change in the relative price of exports. The income elasticity of demand for import is the percentage change in imports divided by the percentage change in national income. Which can usually be transformed into a series without trend by taking first or second differences of the data.

2.1.13 Competitiveness

Porter (1990) and Illangovan (1994) argued that a theory of international trade must move beyond the comparative advantage to the competitive advantage. The concept of competitive advantage is more comprehensive involving segmented markets, differentiated products, technology differences, economies of scale etc. Thus price–cum–cost comparisons are the preliminary indicators of competitiveness.

2.1.14 Nominal Protection Coefficient

The nominal protection coefficient (NPC) of a commodity is defined as the ratio of its domestic price to its border price (Tweeten, 1992).

Pursell and Gupta (1998) defined NPC of a commodity as the ratio of that commodity's domestic price to its international reference price and referred to it as an estimate of the extent to which its price has been affected by government interventions in the country's international trade. NPC determines the degree of export/import competitiveness of commodities by measuring the divergence of domestic price from the international or border price.

2.2 Review of fast studies

2.2.1 Multiple stock effort distribution

In a free access fishery consisting of a number of separable grounds, stocks or stock complexes, those yielding higher rents tend to draw effort, disproportionately, at the expense of those yielding lower rents (Anderson, 1977). This results in a non-optimal distribution of effort from the stand point of rent maximization. The prawn fishery of some of the centres in the Indian Coast illustrates this phenomenon well. The rich prawn stocks are heavily fished during the high season when the prawns are spawning. But relatively little interest has been shown in the less rich mixed stock of the *top* end (George, 1969; Kuthalingam *et al.,* 1978; James, 1981; Muthu, 1988). They have been inadequately explored and only lightly fished. The reason given by the fishermen is simple; as long as there are dense stocks in these centres they have little interest in the sparser stocks of the top end. The result now is that the prawn fishery has expanded to the point of open entry equilibrium, dissipating the rent that the rich prawn stock could yield. Meanwhile the stocks of the top end have remained largely under exploited. (Carlsan 1973, Castro Luiz *et al.* 2001, Clark 1985 & 1990).

It may also be speculated that the best returns will be earned only if the fishery is conducted at a high enough level of effort to utilize available scale economies *(e.g.* in prawn searching, vessel servicing and processing). Fishing units are attracted to the higher rent stocks (prawns) as long as average returns (catch per unit of effort-CPUE) from those stocks are greater than from less rich stocks (Gordon, 1954, Halls *et al.* 2006 and Hollowed *et al.* 2000).Yet, to the fishery as a whole, marginal returns per unit of effort on the richer stocks may have fallen to zero or have turned negative, while marginal returns from less rich stocks remain positive. (Nguyen Viet Thanch 2006).

In analytical terms, each boat operator chooses to join the trawl fishery, because average returns (CPUE) are higher than in the other techniques of fishing (Rijinsdrop *et al.* 2000). But considering the fishery as a whole, marginal returns in prawn fishery are lower than what they would be in other fisheries, so that aggregate returns for the units do not achieve, their potential maximum.

2.2.2 Economics of Fishing Operations

Singh *et al.*. (1987) analysed the economic feasibility in the operation of mechanized boats at Nizamapatanam in Andrapradesh. They fitted a Cobb-Douglas production function to analyse the extent of various factors influencing the returns. Labour costs and variable costs were positive and statistically significant in mechanized boats. Rosaleena Shanthy (1988) found that the fishing for squids and cuttlefishes with non-mechanised crafts showed a higher benefit cost ratio than fishing with mechanised boats. The study also showed that illiterate fishermen lacked price information and were exploited by the cartels formed by traders.

Devaraj and Paralkar (1988) studied the economic performance of mechanised trawlers in Kerala State. A second degree curve was fitted in which the average operational costs and revenue per trawler per day for individual years (1971-82) were used as a function of fishing effort.

Rajasenan and Sankaranarayan (1990) found that one third of the total catch on the value of mechanised sector was spent on diesel and in order to improve the economic efficiency of the boats, the number of trips had to be increased in the peak landing seasons.

Panikkar *et al.* (1994) worked out the costs and earnings of operation of different motorised crafts in Kerala. The average revenue per day of ring seine units with a length of more than 500 meters operating with two engines of 40 hp and 25 hp worked out at ₹ 6,100 and the operating cost at ₹ 4,131. The fixed costs which included the interest on investment, depreciation and annual insurance premium amounted to ₹ 937 per day. The net profit after deducting all fixed and variable costs worked out to ₹ 1,032 per day. The net profit in the case of other motorised units like, mini trawls, gillnets and hooks and lines were ₹ 157, ₹ 110 and ₹ 56 per day respectively.

Sekar *et al.* (1996) analysed the pattern of marine fish production in East Coastal region of Tamil Nadu, which showed that mechanised catches were contributing around 59 per cent of the total catches. Among the gears, gillnets accounted for 39 per cent followed by trawl nets (31 per cent of the total fish catch). Month wise analysis showed that July, August and September months were the peak periods of fishing activity. Senthilathiban *et al.* (1998) found that among the factors determining fishing costs in mechanised fishing, fishing time and horsepower of the marine diesel engine were positive and significant at five per cent level of profitability, where as labour cost was significant at one percent level. Among the factors determining the net profit in fishing, the quantity of fish landings and fishing time were positive and significant at one per cent level, where as the number of species, percentage of choice varieties, depth of operation and horse power of the marine diesel engine were positive and significant at five per cent level.

The project on strategies and options for increasing and sustaining fisheries and aquaculture to benefit poor households in Asia investigated the economics of major types of mechanized fishing units including small trawlers, purse seiners, dolnetters, gillnetters, pair trawlers and sona boats operating in the inshore waters in India. Initial investments for small trawlers varied from ₹ 4.20 to 6.00 lakhs. The operations of trawlers and gillnetters were carried out widely all along the Indian coast while the operations of purse seiners, dolnetters, pair trawlers and sona boats were confined to certain regions only. Purse seiners were found more profitable among all these gears with an annual net earning of ₹ 3.14 lakh. The annual operating cost was about ₹ 5.80 lakhs and the fixed cost was ₹ 3.06 lakhs. The gillnetters had the smallest net income, ranging from ₹ 34,000 per annum in Maharashtra to ₹ 70,000 per annum in Tamil Nadu (NCAP, 2004).

Unnithan *et al.*(2005) studied the fuel consumption pattern of mechanised fishing vessels in Kerala. Stratified random sampling revealed that the fuel consumption at 97,204 KL by 3,823 crafts with an expenditure of ₹ 204 crores at 2002 prices. The study stressed the need for optimum fuel utilization measures and appropriate management of fishing operations.

An analysis of the status of bottom trawl fishing in Kerala by Madhusoodana Kurup and Radhika Rajasree (2007) showed that vessels in the 40-50’ OAL (overall length) size class dominated among the trawlers followed by 31-40’. The bottom trawl landings were quantified as 2,46,116 tonnes which accounted for 46 per cent of the total marine fish landings in 2000-01. Hakan (1998) in his review on recent developments in bioeconomic analysis and different management strategies in fisheries expressed the need to expand the analysis to multispecies fisheries management. Significant gains could be made if the interdependencies between species and /or jointness in inputs for many fisheries were identified. Both common property resource management and Individual Transferable Quotas (ITQs) were thought of as fruitful strategies in different settings (Clark 1982).

Datta and Choudhury (1999) analysed the various types of negative externalities arising out of a lack of clearly defined ‘property rights’ regime, both from within and outside the fisheries sector. A future policy perspective was developed through a critical examination of the Code of Conduct for Responsible Fisheries and the famous Supreme Court Judgement of December 1996 on coastal aquaculture. The Common Fisheries Policy was compared in respect of their capabilities in striking the necessary balance between economic needs and socio-ecological requirements.

2.2.3 Fisheries Management Models

Fisheries management based on multiple objectives including biological, economic and social criteria requires several policy instruments. Qasim (1972) indicates that if the ocean harvest is to be realized fairly rapidly to meet the increasing demand for protein food, some radical changes are necessary in developing a complex technology by which the cost of marine protein to the consumers is substantially reduced. Reviewing the status and role of small scale fisheries, Bapat and Kurien (1981) pointed out that land is definitely going to be a limiting factor in increasing food production Saxena(1983) stressed the need for more widespread use of economic tools in formulating the Indian fishery policies. However, the size of investment in marine fisheries has been so modest that it can be said to be insignificant as compared to other sectors (Kalawar *et al.* 1985 and Brajgeet Bhathal 2005).

Several industrialized countries including European Union and members of the Organisation for Economic Cooperation and Development (OECD) have pursued policies to benefit people and coastal areas depending on fisheries and related industries. One of the regional policy instruments used in Norway is a conditional limited entry license of trawlers. Ola Flaaten (2004) investigated the economic effects of a commonly used fisheries policy instrument on economic performance of Norwegian wet fish trawlers. The average landing prices, gross revenue, net profit and some other economic indicators were compared for three groups of trawlers: A) vessels that had local link license obligations and complied with them, B) vessels that had such obligations but did not comply and C) vessels without local linked obligations. Average operating profit was the highest for group C. Group B vessel's operating profit was just above that of group A, despite significantly high revenues. Group C vessels received higher prices for all species of fish with the exception of red fish.

Christie *et al.* (2007) documented the reasons for emerging interest in Ecosystem Based Fisheries Management (EBFM) while evaluating the current status of an ongoing EBFM initiative in Philippines. The study explored one of the challenging aspects of EBFM in the tropical context- development of supportive Institutional frame works. The conclusions presented were relevant to other tropical contexts also.

The bio economic model of the Finnish Herring fishery observed two optimal management issues: an ITQ (Individual Transferable Quota) system and an Individual Quota system with non transferable individual quotas. The qualitative part of the study consisted of personal interviews of surveyed fishermen of Herring. The findings showed that the current management of the Finnish Herring fishery was far from being biologically and economically sound. According to the simulation results, an Individual Transferable Quota system was a viable alternative to current Total Allowable Catch based management. The results of the interviews suggested that an ITQ system would likely be supported by fishermen (Kulmala *et al.*, 2007 and Brodersen *et al.* 1998).

2.2.4 Marketing scenario of marine fish

Resource development alone cannot be sufficient for the growth of fishing unless it is coupled with infrastructure and marketing development. Discussing the marine food industry in Kanyakumari and Thirunelveli Districts of Tamil Nadu, Leela Nayar (1973) indicated the tremendous employment potential and it was estimated that nearly 100 man days will be required to process and distribute one tonne of the finished product. Supply and demand projections of marine fish upto 1980-81has been made by Shambu Dayal (1973) and it was helpful for formulating policies of production and marketing during the last one and a half decades.

Studies conducted on marine fish marketing pointed out that the transportation of fish is very inefficient in India (Singh and Gupta, 1973; Srivastava and Kulkarni, 1985; Sathiadhas and Panikkar, 1988, Narayanakumar R and R Sathiadhas 2005).Due to inadequate transportation, no fresh fish is available in larger and needy markets located away from the landing centres, but at the same time surplus fish at harbours is being sent to fishmeal plants. Further it has been observed that the catches of certain varieties like sardines and mackerel are landed in large quantity in fishing season which results in the glut at producing centres.

Singh and Gupta (1983) examined the prevailing marketing system for different forms of fish in domestic markets. They in addition analysed costs, returns and risks of various market intermediaries. Mammen (1983) analyzed the existing fish marketing system with a view to suggest some alternative channels to provide better quality fish to consumers and higher returns to producers.

Panikkar and Sathiadhas (1985) studied the marketing system and price spread of some of the commercially important marine fish in Kerala State. The analysis indicated that fishermen's share of consumers rupee varied from 31 to 68 per cent. The fishermen get a better share for quality fishes having high consumer preference than for cheaper varieties. They suggested a fast and efficient transportation system for the improvement of marketing of fish. They also made another detailed study on marine fish marketing trend in Kerala and observed marked improvements in the system. The average annual prices for almost all varieties of fish showed a continuous increase during the decade starting from 1980. Fishmarketing in Kerala has been transformed in a modern stage despite the infrastructure constraints and inherent complications in the marketing system. The fishermen' share in consumers rupee showed an increase over the years in spite of increasing marketing costs.

Sathiadhas and Panikkar (1988) studied the market structure and price behaviour of marine fish in Tamil Nadu and concluded that fish marketing in Tamil Nadu is still under the clutches of middlemen. Of the 25varieties of fish covered under the study, the percentage of marketing margin in consumers price of 20varieties which constitute 90 percent of landings worked out to be more than 40 per cent. Abdul Hakim (1979) indicated that the Indian sea food export growth was stimulated by heavy demand from abroad. As a result, Indian products were never "marketed" but only "passively supplied". Because of heavy demand and vast markets existed for Indian shrimps abroad, the importing country or agency offered higher prices than those existed within the country. The Indian exporters attracted by this price differences have been contributing their share to the various world markets. They fail to exploit the demand structure to their advantage.

Saxena (1970) analysing the price behaviour of Indian frozen shrimps in US markets narrated that the price we realized for our shrimps was only one third to one half of the value on a pound basis when compared to what other countries realized for their exports. Studying on the scope for diversification of marine products for exports, Ganapathy (1978) indicated that apart from prawns there were number of other rich fishery resources available in our waters which were yet to be tapped for export purposes. The excessive dependence on shrimp and few other items alone may result in closure of factories, once the export market crashes. So there is urgent need for diversification of marine products (Narayanakumar R. and R. Sathiadhas, 2006). Analyzing the exports of marine products in different forms, Rao (1983) also suggested alternative forms of fish exports should be explored to sustain the past rate of growth in view of decline in shrimp landings.

The scrutiny of literature reveals that studies relating to economic aspects of the marine fisheries of our country are not many and most of them were conducted at selected centres and at micro level. They could not help much in deriving policy perspectives either at state or national level. The noteworthy macro level studies carried out in our country was the economics of artisanal and mechanized fisheries in Kerala by Kurian and Willmann (1982) in the production sector and a fish marketing study covering all maritime States of India by IIM, Ahmedabad.

2.2.5 Trade Liberalisation

The net effect of liberalizing the agricultural policies of all industrial countries would be to raise the international food prices by 8 per cent during the late 1980s and these policies as a whole contributed about one third of the instability. Regarding the domestic producer prices, they found that if industrial countries were to liberalize their food policies simultaneously, international prices would rise by more than if only one or a subset of a countries were to liberalize and as a consequence the required fall in domestic prices in a liberalizing country was less the larger the extent of simultaneous liberalisation in other countries (Tyers and Anderson, 1986).

Capros *et. al.,* (1990) based on a study on Greece using Computable General Equilibrium (CGE) analysis argued that the liberalisation of foreign trade had negative impacts on exports by way of increasing the supply potential and reducing the market prices. The labour market clearing wage rate decreased, but at a rate lower than that of consumption prices. The interactions with production, in which capital was replaced by labour, contributed to the formation of positive changes in the real wage and to further lessening of production prices. The outcome of this process was favourable for the real income of employees, but less favourable for the real income of non-employees. Total savings increased, which had positive effects in the following years.

Salvatore and Hatcher (1991) used the classification of developing countries according to their trade orientation by World Bank as strongly outward oriented, moderately outward oriented, moderately inward oriented and strongly inward oriented to evaluate the economic performance of twenty-six countries with different orientations. They found partial support for the hypothesis that international trade benefited most developing countries and that an outward orientation leads to more efficient use of resources and growth. However, their conclusion was based on non-stationary data. When data are non-stationary the standard critical values used in determining the significance of estimated coefficients may not yield valid results.

Substantial literature using a range of methodologies supports an association between exports and growth. However, this association tends only to hold in cross-section analysis, there being nothing like the same degree of agreement in time series work. Many of the earlier results were the output of bivariate models or loosely specified aggregate production functions. Levine and Renelt (1992) used extreme bound analysis to investigate the robustness of a range of explanatory variables, which were typically incorporated in growth model. They found a relatively small number of variables to be robustly related to cross-country growth rates. Exports were one such variable. However, two nuances were emphasized. Imports or total trade substituted very well for exports. It served to emphasize that it is perhaps not exports *per se* which was important, but openness to trade, for which exports acted as a proxy. Second, the relationship between exports and growth was strong only when investment was included, there being a robust and positive link between exports and investment. This suggested that the link between exports and growth operated through improved resource accumulation rather than via improved resource allocation.

IMF (1993) compared trade orientation with average per capita growth for the period 1986-92 and obtained the same result as the World Bank study.

The cross-country studies by Whalley (1991) and Papagerogiou, Michaely and Choksi (1990) offered some support for the view that liberalisation and exports are related. According to these studies liberalisation reduces anti export bias, thereby facilitating an increase in exports.

Various studies (UNCTAD/WIDER, 1990), FAPRI (1993), Brandao and Martin (1993), Goldin and Kundsen (1995) which worked out the simulated effects of Uruguay round of trade liberalisation on world prices of agricultural commodities do not give very encouraging situation in the post–GATT/period from the point of view of the developing countries. Maximum rise in prices was expected for temperate crops such as rice, meat, sugar and dairy products but tropical products were expected to experience a minimum rise. Wheat was expected to gain in its prices between 5 and 7.5 per cent, rice between -1.9 and 18.3 percent, fish and meat 0.5 and 13 percent, sugar 5 and 10.6 per cent and dairy products between 6.9 and 7.2 per cent. Thus the expected change was not uniform and generally was moderate to low level.

Subramanian (1993) found that higher world agricultural prices had little effect if India's agricultural trade was not liberalized because trade shares in agriculture were small so that the degree of price transmission was also small. India is a net exporter of agricultural commodities and according to him the country gain from higher world price and GDP increases in the long run under liberalised agricultural trade. Gulati *et al.* (1994) found the prices of various agricultural commodities in India to be below their international levels. India being competitive in the international market with diverse agro–climatic conditions and low labour costs, they argued that the conditions were favourable for exports. The implication of this was that liberalisation would increase exports and domestic agricultural prices (Ajjan *et al.*, 1998).

Chadha *et. al.* (1996) made an attempt to evaluate the comparative static effects of selected trade and domestic policy reforms, undertaken since 1991, on trade, output, domestic prices, economic welfare and inter-sectoral allocation of resources. The major reforms analyzed in this study related to reduction in tariff and non-tariff barriers to trade along with rationalization of the tax regime. The results indicated that the import liberalisation enhances the welfare of the economy but the effect got further enlarged when exports were also liberalized simultaneously. This was particularly true of the agricultural sectors. The freeing of prices in the sectors that have been under some form of administered price controls in the base year (1989-90) greatly intensified the welfare effect. The economy became more efficient through better allocation of land, labour and capital across different production sectors with distinct increase in the returns to each of these factors of production.

Chand (1997) argued that impact of trade liberalisation on domestic prices will depend on reduction in aggregate measure of support to agriculture. Due to reduction in protectionism as proposed in WTO agreement, the prices in member countries were expected to move closer to international prices, leading to a rise in prices, which are below the international level, and fall in prices where they are above international prices.

Parekh *et. al.* (1997) reported that trade liberalisation would cause substantial changes in relative prices in the Indian economy with an upward pressure on prices of several agricultural products and downward pressure on prices of non agricultural products and some agricultural products. For wheat, meat, dairy products, other animal products and non-food agriculture, the price rise ranged from 11 to 18 percent. On the other hand, tradable non-agricultural as well as other food prices would decline by 26 to 29 percent because of high initial protection levels. They concluded that the overall effect would be to shift the terms of trade in favour of agriculture.

The underlying philosophy of WTO agreement is to correct the distortions in world trade of agricultural commodities with a view to promote efficient allocation and use of world resources. The direct and indirect subsidies, which have flowed into the agricultural sector, manifested themselves into distorted world prices of agricultural commodities. These distorted world prices resulted into a situation of deceptive comparative advantage that led to inefficient use of world resources and ultimately efficiency and welfare loss around the World. Panda and Quizon (1998) found that an increase in the degree of agricultural openness following trade liberalisation was bound to increase domestic prices in absolute terms and would lead to relative price changes, which hurt the lower income groups more than the higher income groups.

While quantifying the effect of trade liberalisation at the farm level Chand (1999) reported that free trade would lead to increase in farm harvest prices of exportable like paddy and maize, whereas, it would result in decrease in price of importable like rape seed and mustard. Along with free trade, when subsidies were removed then gross returns as well as net return without liberalisation were higher than those under free trade. This showed that reduction in income due to removal of high level of input subsidies in rice production would not be compensated by access to international prices under free trade.

A study by Bhattacharya and Pal (1999) suggested that export restrictions kept internal prices low thereby reducing the farm incentives and they argued that liberalisation will increase prices and provide better incentives. But, Desai and Namboodiri (1999) found that liberalisation through prices will not have major effects on production since the aggregate supply response was small. However, even if the aggregate supply response was low the cropping pattern changes might bring important contributions to agriculture through comparative advantages.

2.2.6 Growth of Exports

Raveendaran and Aiyasamy (1982) analysed the export growth of turmeric in India and reported that the production, export price and promotional efforts had a significant influence on the export of turmeric.

Retna and Narayanan (1992) attempted to examine the performance of India's agricultural exports during the two and a half decades (1960-85) and found that even though the share of agricultural exports had been declining over the period, the trade policies made us to depend on traditional export crops like tea and tobacco mainly due to internal factors like production and per capita availability rather than external factors like prices and foreign exchange rate which appeared to be less important.

Sharath (1993) analysed the growth in exports of cardamom from India using exponential function of the form $Y = a\, b^t e^u$. A comparative performance was attempted splitting the time period into two, the first period from 1970-71 to 1979-80 and the second from 1980-81 to 1989-90. In the first period, the quantity of Indian exports registered a growth rate of 4.63 per cent while the value of exports grew at the rate of 27.9 per cent. These were mainly attributed to a 23 percent increase in unit value realisation in contrast to a 17.05 per cent decline during the second period. According to Prabirjit (1997), the growth in exports in the liberalisation period was actually a continuation of that of the earlier period.

Though the share of agricultural exports in total exports of India in recent years declined, the contribution of fishery, a component of agricultural exports markedly increased for the same period. The share of fishery in total export earnings was 0.16 per cent in 1960-61, which increased to 2.02 per cent in the year 1970-71 and it became 2.95 per cent in the year 1990-91 and 3.7 per cent in 1997-98. These figures clearly show that fishery sector's share is growing at a faster rate than the rest of the economy. Moreover, this growth was also more stable compared to the other agricultural exports (Ravisankar *et. al.*, 1995). Mani and Chacko (1996) examined the trends in export of cardamom in India during the period from 1979-80 to 1993-94 and concluded that even though the share of Kerala state in the total exports of cardamom remained at as high as 70.55 per cent over the years, the percentage of export to total production in Kerala state alarmingly came down from 69.27 per cent in 1979-80 to mere 8.04 per cent in 1993-94.

Vani and Krishnaiah (1998) examined the export growth and potential of chillies in Guntur district of Andhra Pradesh and concluded that the quantity and value of chilly exports increased at the rate of 20.16 and 38.42 per cent respectively for a period of 10 years from 1987-88. Kumar (2000) found that in general, overall agriculture and allied products export had shown 14 per cent growth rate while rice and coffee came up as the most promising exportable commodities with compound growth rates of 27.72 and 26.55 per cent respectively for the period 1990-91 to 1997-98.

The economic growth of a country depends on the performance of its different sectors. The performance of the export sector, depending on its size, will have a direct impact on the performance of the economy of a country. The expansion of export sector helped to integrate India into the world economy as a supplier of cheap agricultural commodities and raw materials (Kaushik and

Paras, 1999). The growth rate in the exports of agricultural product was 19.90 per cent, the exports from rice registered the highest annual growth rate (28.49 per cent) followed by sugar export (27.68), oil cakes (24.31), meat and meat preparations (22.57), and fish and fish preparations (22.25).

2.2.7 Export Instability

Volatility of prices of primary commodities has been one of the issues continuously debated. Being exporters of primary commodities, the developing countries have substantially higher export earning instability than the developed countries. (Pal and Sirohi, 1989, Parekh *et al.* 1983, Krishnan *et al.* 1999, February Gobinath *et al.* 1993 and Delgado *et al.* 2003) The volatility of prices in the international market and the trend of prices also will affect the competitiveness of agricultural commodities. It was argued that fluctuations in export earnings of developing countries generated domestic instability, complicated the task of development planning and reduced the efficiency within which investment resources were used (Massell, 1970; Glezakos, 1973; Sarvides, 1984 and Love, 1992).

Alternate measurements of instability have been proposed in literature, all which depend on a measure of the deviation between actual and normal outcomes (Demeocq and Guillaumont, 1985 and Scandizzo and Diakosawas, 1987). Harmans (1984) studied the export price instability and producer price instability for the main coffee exporting countries. The method of disaggregating instability, based on the variance of the logarithm of income terms of trade data was used. Clearly, a lower instability of producer prices than of export prices became obvious, especially for African countries. The export price instability and the producer price instability, for Brazil were 29.5 per cent and 24.1 per cent respectively. Columbia recorded 29.4 per cent for export prices and 19.6 per cent for producer prices respectively.

Singhal and Kaur (1986) studied the destination wise instability of exports from India using Coppock's instability index. The commodity selected for the study were jute manufactures, tea, cashew kernels, engineering goods, handicrafts and iron-ore that contributed about 42 per cent of exports of India from 1979-80. They found that Canada and Australia had more of destabilizing effect on India's trade. In the case of Japan, USSR, USA, UK, the trade relations helped India to achieve stability in her external economy which in turn stabilized the domestic economy.

Hazell *et. al.* (1987) found that the world prices of agricultural commodities had coefficients of variation in excess of 20 per cent during the period 1949–87 and nearly all the variability in world prices were transmitted to developing countries in the dollar value of their export unit values (EUV's). However the variability in EUV's were not fully transmitted to average producer prices due to the buffering role played by real exchange rate and also domestic marketing arrangement and government intervention (Rajaram 1992).

Habeck *et. al.,* (1988) adopted a portfolio analysis to examine the contribution of commodities to variability and growth in export earnings. Instability indices were calculated for twenty commodities, more than half of them agricultural in 27 countries using 1962-83 data. Hazell *et al.,* (1990) studied the instability of Sri Lankan tea exports by using co-efficient of variation for the period from 1961 to 1987.. Jaganathan (1992) estimated the instabilities of the export earnings of selected groups (agricultural and allied products, ores and minerals and manufactured goods) and selected commodities (cashew kernels, coffee, fish, oil cakes, rice, tea and mate, mica, iron ore, engineering goods, chemicals, jute manufactures and precious stones), of rest of the commodities and all commodities for the period 1974 -75 to 1989-90. It was found that instability in export earnings was caused mainly by unit price in rice, cashew kernels, fish preparations, coffee, mica, iron ore, tea and jute; whereas in case of oil cakes the source of instability index was lower than instability index of the rest of the commodities.

Nayyar and Sen (1994) reported that the world prices were more volatile than Indian prices. The rationale underlying agricultural trade policy in India had been the concern about domestic prices, particularly for exportable and importable which are wage goods or inputs for wage goods, because the majority of the poor in India do not have incomes that are index linked. The trade policy sought to maintain domestic prices at absolute levels that are commensurate with average income levels and also to impart stability to domestic prices in the interest of both producers and consumers. Mamatha (1995) identified the sources of instability in export earnings of the selected spices of India. Jessy and Sundaresan (1996) studied the instability in export of cardamom from India. The results showed that there was high instability in the quantum of exports with an instability index of 68.5 and the co-efficient of variation was high as 60.47 per cent.

Chand (1997) argued that price instability because of supply side factors was much higher in India compared to global market. It was only due to government interventions that the observed instability in prices of agricultural commodities turned out to be lower in India than what it would have been otherwise. The domestic prices would have turned more volatile had they been left to the internal market forces. Trade with the global market was an important instrument of reducing volatility in domestic market. According to him the impact of freeing imports on domestic price instability by way of transmission of price instability would depend on domestic policies to check dumping when there is glut at international level and speculative buying when there are shortages.

Nagaraja (1997) studied the instability in export of mango from India. A comparative performance was attempted by splitting the time period into two. The first period was 1970-71 to 1981-82, which was termed as pre-development period and the other period from 1982-83 to 1992-93 as the development period. The study revealed that increase variability during the later period over the first period; 90.09 per cent was attributed to the changes in interaction term in case of mango exports, while the change in mean quantity exported and change in the residual component accounted for 2.45 per cent and 2.59 per cent respectively.

Vyas (1999) studied the sources of instability in export earnings of selected spices of India. It was found that fluctuations in production of these spices in other producing countries and increased value of Indian Spices in the world market contributed widely to instability in export earnings.

Mahesh (2001) studied the instability in export quantity, value and unit value of Indian tea during the period from 1979-80 to1998-99 and found that the instability index for the export quantity was found to be 9.19 per cent whereas the export value and export unit value instability indices were 24.88 and 36.82 per cent respectively.

2.2.8 Structural Change in Exports

Markovian analysis can be employed to find the structural changes in any system whose progress through time can be measured in terms of single outcome variable. By using transitional probability matrix, one can predict the demand for future years also. Billingsley1965 used the first order Markov process for the structural estimation and prediction. The major conclusion derived by their was that the quadratic programming techniques appeared to offer an efficient basis for obtaining restricted least squares of the traditional probability matrix for a finite market process, when only aggregated data relating to the proportion of the sample in each state over a sequence of trials were known.

Dent (1967) observed that the possibility of improving the predicted future share patterns of any exporters existed simply by altering the appropriate transition probabilities. He concluded that the ability of the model to explain the buying pattern rested heavily on the assumption that the transition probabilities were constant over time and then the quadratic programming techniques yielded accurate estimated probabilities.

Atkin and Blandford (1982) studied structural changes in import market shares for apples in U.K. The changes in composition of U.K. apple imports during the period from1963 to1974 were analysed using a first order Markov model. The study indicated that changes in market share had been systematic, stable and of long duration. The estimated transitional probability matrix could explain the nature of change by indicating the relative competitive strength of different exporters. Fialor (1985) analysed the market share of Ghanaian cocoa exports for the period from 1951 to 1981 using the Markov model. He decomposed the total change in export into the overall market share effect, the direction of trade effect, and the individual market effect.

Srivastava and Ahmed (1986) analysed the direction of exports from India for the period from 1960-61 to 1983-84. The countries such as U.S.A., former U.S.S.R,, U.K., Japan and erstwhile West Germany had greater share in India's export and import trade. India's exports to the above-mentioned five major trading countries declined over the period under study. The U.K remained no more as the principal destination of Indian trade as it was in the pre-independence period. In 1983-84, U.S.A. emerged as one of our major trading partners.

Gemtessa (1991) analysed the direction of trade using Markov model. Veena (1992) analysed the direction of trade of Indian coffee exports using Markov chain model. It was observed that India could not retain its previous market share to U.S.A., Netherlands, Yugoslavia and other importers. However, the actual quantity exported to all these countries had increased which was due to increased quantity of Indian coffee exports.

Jeromi and Ramanathan (1993) noticed significant changes in the direction of pepper exports from India for the period of 1975-90. It was observed that nearly 44 percent were directed to former U.S.S.R, which constituted about 82 per cent of the total pepper imports of that country. On the other hand, India not only failed to increase its exports to U.S.A. in tandem with increased consumption in that country but could not sustain the quantity exported in the past years. Instability in exports was low for U.S.S.R., Italy and Canada and higher for Poland, U.S.A. and Czechoslovakia.

Sreenivasamurthy and Subrahmanyam(1999) analysed the direction of onion trade by using Markov chain model during the years 1980-81 to 1994-95. The major gainer among importers of Indian onion over the period of time was Malaysia which was having a transitional probability of 0.6459 from Saudi Arabia and 0.3488 from U.A.E., Sri Lanka in addition to having high probability of retention of its own share, was also likely to gain from Saudi Arabia with a moderate probability and gain of 0.3488. On the other hand, Saudi Arabia which was having zero probability of retention of own share of exports of fresh onion was likely to gain to some extent from Bangladesh and other countries.

Pillai (2002) advanced a Markov chain model for price movements and inflation in India, based on the general as well as a selected set of sectional wholesale prices and three consumer price indices for the period 1981-2001 (pre liberalisation and post liberalisation).It was found in general that the state of inflation persists with a high probability and much shorter return period in India.

2.2.9 Export Demand and Supply

Sparks and Ward (1983) estimated the export demand and export supply elasticities of vegetables by using simultaneous equation model for eight countries. The vegetable demand, for Latin America, the Middle East, and the Far East had statistically significant price elasticities. The U.S. demand for Latin American vegetables was inelastic, and demand for Middle Eastern and Far Eastern vegetables was unitary elastic. This indicated that price did not play a stronger role in determining levels of U.S. vegetable demand. The export supply price elasticities were all positive and statistically significant except those for the United States and the Middle East. Africa, the EC, and Canada had inelastic export supply responses to price. This indicated that these regions would show small increase in export supplies with increase in the prices they received.

Bond (1987) estimated export demand as well as export supply functions for five commodity groups (food, beverages and tobacco, agricultural raw materials, minerals and energy) in five developing country regions (Asia, Africa, Europe, Middle East and Western Hemisphere) for the period 1963-1980. The results showed the inelastic income responses in the demand for food, beverages and tobacco and agricultural raw material exports from developing countries. Moreover, price elasticity of supply was lower than corresponding price elasticity of demand in the short-run. Nurul (1990) estimated the demand and supply elasticities for fruits and vegetable exports using two-stage least squares for the period 1965-1985. The estimated price elasticity of export demand of fruits and vegetables were negative and significantly different from zero at the five per cent level. Kapur (1991) analysed the structure and competitiveness of the India's export using the Constant Market Share Model and reported that the India's exports at market levels are competitive in some markets, for example in Italy, Belgium ,Netherlands and Germany.

Krishnan *et al.* (l994) examined the structure, conduct and performance of Indian marine products export and concluded that the consumer resistance to high shrimp price as a semi-luxurious or status food in the traditional market strongholds especially Japan are showing up. The rapid pace at which aquaculture is growing in South East Asia will soon ensure a buyers market. Thus there is an immediate need to regulate the entry of new firms into the seafood export market and creation of demand for convenience foods by more value added processing is required. Jayaraman(1994) opined that the low purchasing power of the average Indian consumer checks him from taking advantage of shrimps in the Indian domestic ,market because of its high unit cost.

Nilanjan Banik (1998) estimated the demand and supply elasticities of Indian exports to Sri Lanka for the period 1987 to 1994. The estimated export price and income elasticities were elastic for most of the export commodities from India to Sri Lanka. Low supply response has however highlighted the need for diversification from traditional Indian exports to non-traditional Indian exports and also towards unexplored pockets of Sri Lankan market.

Latika Sharma and Tiwari (2001) estimated the export demand and supply elasticities of India's tea exports using Two Stage Least Squares model

(2SLS) for the period 1966 – 1999. The results suggested that the export price and world price affected the export demand of tea. The elasticity coefficient of –0.5 suggested that with 1 per cent decrease in export price of tea, the demand for tea export increase by 0.5 per cent.

2.2.10 Market Integration

The market integration concept explains the relationship between two markets that are spatially or temporally separated. A study on integration of different markets can suggest to the producers as to where, when and how much to sell, which in turn will have a bearing on their production strategies and hence resource allocation. Cummings (1967) opined that integration implied the association of prices between markets. Association of prices over time shows seasonal integration of prices and association of prices between markets show spatial integration of prices.

According to Lele (1971) market integration was the interrelationship between price movements in the two markets. The degree of correlation can be taken as an indicator to which the markets were integrated. Rao and Subbarao (1976) considered that the markets were integrated over space when the territorial price differences do not exceed the transport costs plus the remuneration for the service of the traders.

Brorsen *et al.* (1984) illustrated the use of univariate and multivariate time series analysis in the investigation of dynamic relationship among selected weekly import prices of rice of the European Community. EC imported rice from the USA, Thailand and Argentina. The results showed that Argentinean and United States prices moved together. The European market react quickly to changes in Thailand prices influenced these two prices. Thailand prices responded slowly to Argentinean and US prices. The most recent time series investigations on export and economic growth which have used the econometric methodology of co-integration have not been able to establish unequivocally that a robust relationship existed between these variables in the long term, namely the variables are co-integrated (Jin, 1995 and Islam, 1998).

Many authors used Phillips-Peron Unit root test and Augmented Dickey Fuller tests to test for stationarity of series (Van den Berg and Schmidt, 1994). In order to test for the existence of a long run or trend relationship between GDP and exports, the theory of co-integration developed by Engle and Granger (1987) and Johansen (1988) were applied by many authors. The error correction mechanism developed by Engle and Granger was also used as a means of reconciling the short run behaviour of an economic variable with its long-run behaviour. Indira (1988) studied the extent of price relationship for coffee between three pool sale centers, Bangalore, Coimbatore and Vijayawada. It was assumed that prices were set at Bangalore auction centre and information passed from Bangalore to other centres. The results indicated that Bangalore prices were showing positive relationship both with Coimbatore and Vijayawada prices. Coimbatore and Vijayawada prices were also showing positive relationship with each other. Eighty four percent of the variation in the pool sale prices at Coimbatore auction was explained by the variations at the Bangalore auctions, 88 percent was explained in Vijayawada prices. It indicated relatively lower influence of Bangalore prices on Coimbatore prices than on Vijayawada prices.

Arshad and Ghffar (1990) studied the applicability of the Ravallion method and causality tests in measuring market integration and ascertaining the nature of price relationships in the Malaysian crude palm oil market and found a highly integrated market in short-run. Gemtessa (1991) analysed the integration of Ethiopian coffee prices with world prices using the correlation co-efficient. The correlation co-efficient of the monthly average prices secured at domestic and world markets for 12 months lag were calculated. The bivariate correlation co-efficient between the two market prices of coffee revealed that they moved together in the same direction. The results or the period 1979-80 to 1987-88 indicated that the world prices of coffee had a stronger influence on the domestic prices, than that of domestic price influence on world prices of coffee.

Kugler (1991) used the multivariate co-integration approach proposed by Johansen (1988) and Johansen and Juselius (1990) using Maximum Likelihood Estimation (MLE) for testing a long run relationship between GDP, consumption and investment on the one hand and exports on the other hand. This method was based on a Vector Auto Regressive (VAR) representation. There was only weak empirical evidence supporting export-led growth hypothesis. According to Taddesse (1992), market integration was the interrelation between the prices of the concerned commodities over time and it mostly relied on the nature and the extent of the competition of the market.

Baharumshah and Habibullah (1994) employed the co-integration technique to analyse the long-run relationship between weekly pepper prices in six different markets in Malaysia for the period 1986-1991. The empirical findings of the study indicated that regional pepper markets in Malaysia were highly co-integrated and the prices of pepper tended to move uniformly across markets indicating competitive pricing behaviour. Dittok and Breth (1994) used the Ravallion type model to test the market integration of dry season vegetables in Nigeria using weekly price data. The results indicated that there were little and a low degree of integration of markets in the study area. The results also indicated that good access to roads were more important for markets to be integrated than the distance between the markets. Goletti and Babu (1994) studied the extent of market integration of maize markets in Malawi in order to understand how the markets had been affected by market liberalisation.

Silvapulle and Jayasuriya (1994) demonstrated the use of multiple co-integration technique as a test for spatial market integration. They argued that this technique would overcome many of the limitations of previous methods. Sinharoy and Nair (1994) used the co-integration analysis to estimate the long run equilibrium relationships between international pepper prices. The results pointed out that , prices had moved synchronously due to the open trade status for pepper, indicating integration of world pepper markets.

Mamatha (1995) used the co-integration analysis for examining the market integration of selected spices between Indian and New York prices. The results indicated that the coefficient were found to be negative and significantly different from zero in case of Indian and New York prices of pepper, chillies, turmeric and ginger confirming the stationarity of the series. It also revealed that both the Indian and New York price series for selected spices had the same order of integration. Jin (1995) and Henriques and Sadorsky (1996) using the technique of co-integration and VAR found no long run relationship between exports and GDP growth. Bhat (1995), Begum and Shamsuddin (1998), Onafowora and Owoya (1998), Ghirmay *et al.* (2001) and Smith (2001) found that export growth and real GDP are cointegrated. Taylor (1996) used the co-integration analysis to address the pricing and informational efficiency of United States and Thai rice markets for the period from 1987 to 1991. The findings of the study indicated that the Thai, Texas and future markets influenced the long-run equilibrium in the international rice markets.

Mallick (1996) applied co-integration and error correlation models to examine the nature and causation between exports and economic growth in India. The results revealed the existence of strong correlation and Granger feed back between income and exports growth. Further the error correction models provided the consistent evidence of unidirectional causation running from income growth to export growth. According top Baharumshah *et.al* (1997) there existed a stable equilibrium relationship between the price series whose linear combination was stationary even though they may be individually non stationary. But the non co-integrated time series did not move together in the long run and were consistent with the law of one price.

Ling *et al.* (1998) analysed the behaviour of the price transmission process for the leading cultured shrimp species, Black Tiger Shrimp (Peneaus *monodon*) in both forward and backward direction between the Thai and Indonesian shrimp packers in Japanese Tokyo wholesale market. Bivariate Co-integration using Engle-Granger 2 stage estimation procedure was applied and the results indicated that the Tokyo wholesale market appear to have a stronger backward influence on the formation of overseas control prices used by Japanese shrimp importers in the Thai and Indonesian shrimp packer markets. In addition there is a tendency for the speed of price transmission in the long run to increase with increasing size class (26-30, 21-25, and 16-20 counts per pound) of black tiger shrimp, regardless of the estimation specification in the direction of price transmission and the shrimp country of origin.

Behura and Pradhan (1998) analyzed the relationship between prices of marine fishes for six markets in Orissa by using co-integration model. The results revealed that out of all the six markets, the price series between Cuttack and Paradip were co-integrated due to good communication facilities Dhawan and Biswal (1999) using Johansen maximum likelihood method of co-integration found evidence of one long run equilibrium relationship between real GDP, real exports and terms of trade for India. They found causality from exports to GDP as a short run phenomenon and concluded that the recent export promotion strategies adopted in India have the potential of bearing growth in the future.

The results revealed the existence of strong co-integration and Granger feedback between income and exports growth. Further the error correction models provided consistent evidence of unidirectional causation running from income growth to exports growth. Expansion of productive capacity through income growth could raise exports and the increased profitability of exporting could induce increased saving and thereby capital emplacement, which gave rise to high economic growth.

2.2.11 Global Competitiveness

Jamal (1987) examined the cotton pricing policies pursued by the Pakistan Government and the nature of its intervention in the cotton trade and quantified the effects of price distortion over the period 1977-78 through 1982-83. Support prices were found to be closer to revenue maximization prices than to the border prices adjusted to farm gate level. Two distinct phases in the trends of Net Protection Coefficient (NPC) indicated the government's divergence in maximising foreign exchange in earlier years to revenue maximisation in later years.

Gulati *et al.* (1990) calculated nominal protection coefficients for six rice growing states (Andhra Pradesh, Bihar, Madhya Pradesh, Orissa, Punjab, and Uttar Pradesh) under exportable and importable hypotheses for the period 1978 to1986. The NPC under importable hypothesis for six states were 0.69, 0.65, 0.67, 0.65, 0.74 and 0.06 respectively, and under exportable hypothesis only Punjab was considered and it had a NPC of 0.97. The results showed that the rice cultivation was more heavily taxed on the pricing front under import competitive hypothesis. Herrmann *et al.* (1991) and Ram Mohan Rao and Vijaya Prakesh 1999 investigated how measurement issues were important when agricultural protection was analysed. They found that the computed protection levels were strongly affected by using normal rather than the actual world prices in the nominal protection coefficient calculation and also argued that if the more realistic framework of imperfect substitution was considered, welfare gains of liberalisation becomes less.

Umapathi (1994) estimated export competitiveness of DCH-32 cotton in Chitradurga district by computing NPC for the period 1983-84 to 1991-92, under exportable and importable hypotheses. Gulati *et al.* (1994) found that grapes, litchi, onion and tomato were highly export competitive whereas wheat, mango and potato were moderately competitive and maize, apple and mango pulps were borderline cases. However, Gill and Brar (1996) asserted that when costs involved in taking rice and wheat from the farm gate to f.o.b. destination was included for the surplus state of Punjab then rice and wheat did not remain competitive and called for an increase in productivity and efficiency to make them internationally competitive. Bhatia (1994) observed that the Indian prices were growing at a faster rate than the international prices and the existing comparative advantage for exports would not exist without an exchange rate adjustment.

Datta (1996) calculated NPC and Domestic Resource Cost (DRC) of Indian Basmati and Non-Basmati rice. The results revealed that India had very slender competitive strength in export of Basmati rice. Reddy (1997) worked out the NPC for groundnut, maize, jowar and sunflower in Karnataka. The NPC's of jowar and maize under importable scenario was less than one indicating that jowar and maize were efficient import substitutes. The NPC's under exportable scenario was greater than one. Chand (1997) reported that imports to India would not be attractive in the case of rice, tea, sunflower oil and cotton and the situation could turn favourable for imports of wheat and maize depending upon domestic and international supply positions.

Based on a comparison of domestic and international prices, Chand (1997) reported that imports to India would not be attractive in the case of rice, tea, sunflower oil and cotton and the situation could turn favourable for imports of wheat and maize depending upon domestic and international supply positions. There was a strong possibility of rise in imports of sugar and edible oils after removal of QRs, which would exert downward pressure on the domestic prices of these commodities. Pursell and Gupta (1998) found very large changes in the nominal protection of sugar and sugarcane production in India, which were due to fluctuations in international market prices.

The commodities which possessed export competitiveness included fine cereals, coffee, oil cakes, fresh fruits – processed fruits and vegetables, spices, processed dairy products and marine products (Balassa, 1965). The commodities, which did not possess comparative and competitive advantage, included tea, sugar and edible oil. Suratha Nayak (2000) studied the export competitiveness and determinants of India’s agricultural exports during 1970–71 to 1996–97. The official exchange rate is concerned; it was found that India possessed both comparative and competitive advantage than in exporting non traditional commodities. It has also been observed that annual compound growth rate of agriculture export was lower during the 80s (10.5 per cent) than in the 70s (18.9 per cent). A significant growth of 26.3 per cent was observed during 1993-94 and 1994-95 but 16.7 per cent till 1996-97. The analysis brought out clearly that the share of the agriculture export has declined over the period, which may be attributed to the stagnant output, low yield rates and no much competitiveness in the world market.

Naik and Chaturvedi (2002) computed the NPC for rice under the exportable hypothesis for the period 1992–93 to 2000. They examined the total cost of delivering (including the price) rice for India and the competitor (Thailand) to a common port of an importing country, Ivory Coast. The export competitiveness was assessed for Parmal variety in Delhi market and international prices of Thai white rice. Wholesale price was considered as domestic price. The NPC values remained well below one till 1998–1999 and after that it was marginally higher than one.

2.2.12 WTO and Fisheries Exports

Nayyar and Sen (1994) inferred that the dismantling of the trade barriers on imports would increase volatility of the Indian prices and farm incomes, and that majority of the small and marginal farmers would not be able to withstand such price shocks. Chand (1997) reported that the impact of freeing of imports on the volatility of the domestic prices will depend upon a number of factors .the foremost among these is the incidence of dumping .Therefore, the extent of impact of variations in the world prices on Indian prices will depend on the domestic policies to check dumping, when there is glut at the international level.

Pawiro (2000) and Shuping (2001) suggested that China, the largest fish producing country in the worlds, access to the WTO is expected to enjoy a wider market base and a bigger share in the international seafood share. However non-tariff barriers will be a major threat to the expansion of the Chinese fish production and trade. Issues like quality, environment, anti-dumping campaigns and quarantine procedures will be the major limiting factors which will have to be dealt with the for the development and expansion of the Chinese fishery industry. In addition the currency control, abolition of duty free seafood import quotas and import duty further serves as impediments for the imports of fishery products into China. Chand (2001) opined that the post WTO period has turned out to be adverse for the Indian agricultural exports and favourable to imports. The main reason for this unusual behaviour is due to the international prices, which turned quite low after 1996 and delay or lack of using WTO consistent options to regulate trade.

Anant (2001) suggested that the consequence of the governments approach to the WTO and to trade negotiations is to create a self -fulfilling prophecy. The flawed rejectionist approach to negotiations, with the absurd threats to leave, imply that we are unable to address our immediate trading concerns, and ends up with agreements which do not meet our concerns and which we are ill-equipped to implement. Deodhar (2001) opined that the trade liberalisation hoped to achieve through the WTO agreement on agriculture, is expected to lead to export promotion and import substitution for the Indian food sector. He stressed the need for the two important agreements - SPS and TBT for which the safety, quality and import monitoring mechanisms need to be strengthened.

In the present WTO agreement, anti dumping duty is as a "measures against the import of a product at an export price below its normal value (usually price of the product in the domestic market of the exporting country) if such dumped cause injury to the domestic industry in the territory of the import competing party" (Article VI of GATT). Mruthyunjaya (2001) suggested that the issue of containing domestic support to the agricultural sector has been triggered mainly because developed countries like US, Japan and member countries of the European Union have been heavily subsidizing their farmers in order to have price advantage and gain a larger share of the international fisheries trade.

Most of the fish workers in India are in the artisanal sector and are dependent on fisheries for their life and livelihood. The artisanal sector is often at a disadvantage because of its inability to compete with the subsidized fleets of large-scale fisheries, which are in a better position to sell at a cheaper price in the international market. Reduction in domestic support by developed countries will be beneficial for developing countries, as they will be in a better position to compete with them. Venkateshwarlu and Shyam (2001) suggested that as per the WTO agreement, developed countries would reduce subsidies and tariff. So, better overseas markets will be available for Indian fish products. It is important to note that the subsidy reduction requirement under WTO is not applicable to India. The countries having less than $1,000 per capita income annually does not fall under this category. In view of the provisions for removal of QR's and reductions in tariff, there will be greater opportunities to India to export its fish products to all the member counties of WTO and earn more foreign exchange (Chekkutty, 2006).

Datta and Chakrabarti (2001) suggested that although India is quite versatile in terms of fishery resources and the prices of our fish are quite competitive in the international market, the export performance of Indian fish has left much to be desired. Not only is the country confronting rapidly rising quality standards of products demanded in international markets in the wake of WTO Agreements on SPS (Sanitary & Phyto-Sanitary) and TBT (Technical Barriers to Trade) measures, but also the fisheries sector is reeling under a number of domestic mismanagement problems – mainly due to absence of a suitable domestic policy framework with respect to this sector. He suggested that the competitive buffer, India possesses, can be wisely used not only to promote apparently less competitive but less predatory type technologies in the largely unexplored brackish water segment, especially in the interest of the coastal fisher folk, but also to convert a part of this potential surplus to build up uniform and even aggressive quality standards for Indian fish products.

The anomalous clauses in the WTO Agreements can be looked upon as a compulsion and opportunity to set our domestic policy in order. It argues that a participatory approach to fisheries policy with the fisher folk and their local bodies and organizations at the helm of control, as prevalent in the EU under the banner of Common Fisheries Policy (CFP), is a crying need of today (Srinivasa and Jalajakshi, 1994, Rao, 1995 & 2001, Narayana *et al.* 1997, Mohanty *et al.* 1996, Kurian and Paul 2000 and Kurian 2006. Maya *et.al* (2001) reported that apprehensions and anxiety regarding the removal of Quantitative Restrictions (QR's) on 714 items on April 1,2001 .The perception varies among the different clientele-like fishermen, exporters and consumers. Apprehensions of the farmer include crash in the fish prices under large-scale import raising livelihood questions. The exporters will be benefited with the regular supply of raw material, which would effectively help the processing plants in its capacity utilisation during the lean season. The consumers will by and large be definitely benefited by the inflow of foreign fish products.

The different stakeholders had conflicting opinions on the removal of QR's. India being a developing country should judiciously use the tariff rates to protect the domestic industry. In the emerging post WTO world economic order it is certain that the imports can't be prevented. The only probable solution now is to focus on the changed scenario and gear up to utilise the full benefit. Emami and Tarzi (2002) concluded that the net effect of higher tariffs is to transfer wealth from consumers to producers and government. In contrast the lowering of tariffs permits the efficient use of the resources within and across national borders, and improves the availability of more products at lower prices, thereby enhancing public welfare. The policy implication is that the revenue losses to the treasury from lowered tariffs can be compensated by the additional non tariff revenue generated from an expanded societal wealth enriched by free trade.

Cyriac (2003) revealed that the cursorial analysis of the export figures for the first seven years since the birth of WTO revealed that the Indian seafood export has been heading towards the expected levels. Of all the seven years there was a decline only in 2001. The decline in export during 2001 cannot be attributed to impacts of WTO agreements related to international trade in fish but to market forces prevailing in the different importing countries in 2001.

2.2.13 Constraints and Potential for Exports

The seafood exports from India traditionally caters to two types of countries (i) Developed countries like Japan, USA, European countries and Middle East who buy for their own consumption and (ii) Developing countries like Taiwan, Thailand, China, Indonesia and other South East Asian countries who process the raw materials imported from India and export those as value added products to the developed countries and making huge profits. Behura and Naik(1994) opined that the invasion of farm fresh shrimps from Thailand ,China, Taiwan, Indonesia, the Philippines and Vietnam in the Japanese market had declined our exports. Therefore to increase the exports the research and development on marketing should be based upon quality, processing and packing for attracting international consumers.

The major reasons for the setback for the seafood industry in 1995-96 was attributed to the restriction and embargos imposed by the FDA authorities from time to time with regard to import of shrimp from India, EU restriction due to the incidents of detention of seafood due to the *Salmonella* contamination and the sluggish market condition as a result of the appreciation of the Yen vis-à-vis US dollar and after effect of the Kobe earthquake (Anonymous,1996) Hempel (1997) cautioned that the supply bottlenecks in the shrimp market was mainly due to the disease problems in South East Asian and Latin America which are having a major effect in the shrimp production with the results that the supplies will be even tighter and prices higher. In addition he also opined that the shrimp aquaculture has come under sever criticism due to the adverse social and environmental impacts, questionable sustainability because of disease pandemics and irresponsible development objectives and irresponsible practices.

Further low productivity and high price of raw material made our export commodities non competitive in the international markets. Sakthivel (1998) viewed that the slow progress of export front could be attributed to the lack of infrastructural facilities. Rao and Prakash (1999) assessed the scenario of Indian seafood export and opined that even though the world's seafood trade has expanded at a rapid pace; India's progress has been very slow despite rich potentials. India, by and large remains as a bulk supplier of raw materials to the re-processors in foreign countries and 90 per cent of the exports goes in bulk packs. There is extreme dependency on one product (shrimp) and one market (Japan). Also India's predominant position in the shrimp market is being eroded due to the recent spurt in farmed shrimp production in China, Thailand, Indonesia Vietnam etc The export of these countries has gone up to each earning around one to three billion US$ and India is trailing behind because of slow growth in production of exportable varieties.

Apart from ensuring high quality standards, promotional efforts, cordial bilateral relationship and branding of commodities are very much needed to boost the overseas market for Indian marine products.The European Commission strict adherence to the quality aspects would prove to be an impediment in the fisheries export due to the delay in the governmental implementation. The lack of initiative from the government in improving the common infrastructure facilities like fish landing and water supply amidst huge private investment to upgrade quality within the export factories and processing plants.

The slow down in the seafood production is expected in the Asian region due to the increasing population .As a result, the need for imported seafood's will most probably increase in future. And in that regard the European region can be considered as a significant supplier of different kind of seafood products including small pelagic species mainly in whole frozen form. Sathiadhas and Kumar (2002) stressed the need for the diversification of the finfish culture instead on concentrating on shrimps alone. They cautioned the need for the export of Value Added Products (VAP) which at present is a meager share of less than ten per cent. They suggested that due consideration should also be given to the domestic market as it caters to millions of people. In finfish exports substantial quantity of seer fish, tuna, pomfrets are available in major commercial centers only leaving domestic consumers devoid of them. The lifting of the quantitative restrictions on imports as per the guidelines of WTO will boost the domestic seafood industry.

Banik (2001) analyzed the Indian exports during the 1990s and concluded that the decline in the Indian exports during 1996-97 was due mainly to a fall in the growth rate of export volumes. The nature of the demand side and the bottlenecks in the supply side have constrained the growth of exports and suggested the easing of supply side constraints (procedural delays, poor infrastructure) would have aided the revival of export growth.

Ghosh (2001) studied the economics of the Indian ports as one of the important mechanism of the Indian economic geography and its relationship with the regional development under the free market economy. The port performance index developed with the help of eight individual port performance indicators revealed that the overseas traffic intensity is the most significant determinant of performance. The increasing openness of the economy and absence of an integrated policy towards export transport network, there is a decline in export intensity and rising domestic coastal traffic in Indian ports. Siegel (2001) examined the appreciation of dollar over the 1997-99 has affected the US exports to three of the major trading partners in seafood: France, Japan and the United Kingdom. The threats of re-exports from the importing countries necessitate value addition of fish and fish products from India. The re-exports of foreign products are commodities which have entered the import market as imports and not sold, which, at the time of re-export, are in substantially the same condition as when imported. As a result of which a product of foreign origin is transformed into a domestic good when the imported item loses its foreign identity through further substantial manufacture. (Anonymous, 2001).

The global shrimp market in the first half of the 2002 had been characterized by the ongoing concern regarding the drug rsssesidue as well as weak price levels. Chloramphenicol continued to be an issue following the detection of the substance in Asian shrimp samples in Canada and the US. The EU policy of zero tolerance of the drug reportedly led to a switch by certain Asian suppliers from the EU markets to the US markets with the results that the prices in the US markets had been under downward pressure since the second half of 2001.(Anonymous, 2002) Shyam (2002) reported that the most important constraints which exists in the seafood industry includes too many players in the export trade, cut throat competition for the raw material, lack of supply of quality raw material and marketing tie up (Co- packing, joint ventures etc), need for additional investment on machinery, equipment etc, lack of market and product information, fear of heavy financial loss due to rejection, non- availability of ingredients, suitable packing materials etc within the country, higher cost of production and low margin of profit, lack of trained workers, lack of research and development and poor image of Indian seafood in some importing countries.

Prasad (1991) reported that the various processing plants available in the country procure mostly the raw material mostly from the daily boats and catches out of ice boats, deep sea trawlers and prawn farms. With better practices of quality control at the raw material stage and by proper preservation handling methods, the quantum of exports can be easily increased by around 30 per cent. He concluded that most of the plants are not operating to its full capacity and also because of its seasonal nature of the raw material availability, whereby the procurement costs are becoming very high due to the cut throat competition for the raw material and the export prices not matching the production costs.

A country should concentrate on the development of the sector in which it has a comparatively greater production advantage. This is more true with respect to the fishery sector in India especially the marine sector as it satisfy almost all the requirements of being an ideal export oriented product. It has an established market whose contribution to the total exports of agriculture and allied products from the country has been consistently around 25-30 per cent (Gobinath *et. al.*, 1993).

The industry will mature only when value added products are exported rather than semi-finished raw material for value addition in the import countries. Value added products would bring in more income than export of raw material. The new policy would enable the export of tuna. Since tuna prices are high in the Indian market, exporters do not enjoy a comfortable margin. The situation will change dramatically once cheaper tuna is imported into the country. (Anonymous, 1991). Balakrishnan (1992) opined that the Hazard Analysis Critical Control Points (HACCP) concept initiated by USA has come as a panacea to solve the knotty problems of the industry. It is an easily adaptable system wherein with an adequate training imparted to the personnel with regard to hygiene, sanitation, rapid methods of testing, measurement of pH and Chlorine and about Good Manufacturing Practices (GMP), if it is possible to ensure product safety which is an essential requirement especially for exports to advanced countries who always looks for safe, wholesome, dietary and environmentally acceptable food products so that health hazards can be averted.

Export Credit Insurance provided by the Export Credit Guarantee Corporation of India (ECGC) Ltd. has played a pivotal role in promoting India's export trade in the face of international competition and the risk and uncertain global trade environment. The Corporation undertakes to make good any loss which exporters taking its policies sustain due to commercial risks, caused by insolvency/default of foreign buyers and political risks such as war, imposition of new control order or exchange regulation in the buyers and delays in externalization of funds to India. The protection accorded enables exporters to undertake exports in the risky international markets in addition to liberal credits from the commercial banks which maximizes the export turn over. (Anonymous, 1993)

The rapid pace at which aquaculture is growing in South East Asia will soon ensure a buyers market. Krishnan *et. al.* (l994) examined the structure, conduct and performance of Indian marine products export and concluded that the consumer resistance to high shrimp price as a semi-luxurious or status food in the traditional market strongholds especially Japan are showing up. Thus there is an immediate need to regulate the entry of new firms into the seafood export market and creation of demand for convenience foods by more value added processing is required.

Yogamoorthi and Sivashankar (1994) while reviewed the status and future pulse of the industry found that the share of the shrimp export to total seafood export has come down to 45.56 per cent in 1990from a higher level of share *ie*. 73.14 per cent in 1970. This indicated the diversification of the Indian seafood export and stability in Indian export earnings. The important reasons for this paradigm shift in the export composition had been due to the development of low cost unconventional items and the addition of new items in the list of seafoods. They suggested that the cephalopod resources like squid and cuttlefish (both frozen and fillets) are emerging as major items receiving good demand in international market and India by virtue of its cephalopod resources, can go for intensive fishing and marketing by converting them to value added products.

The removal of the quantitative restrictions in fisheries import was welcomed with the view that at present the seafood industry uses only 25 per cent of its installed capacity and remains idle for three months due to the monsoon and fishing holidays. Thus it is required that like other Asian neighbours like Thailand, China and Malaysia, India too can import seafood material for reprocessing and export He concluded that the import of seafood raw material should be put on Open General License (OGL) and permitted duty free to all registered seafood factories.

The exporters suggested that due to bumper production in the non-traditional shrimp exporting countries like Argentina to the European Union (EU) seafood from the Third World countries was being subjected to severe testing for antibiotics. Industry sources said that a host of South-East Asian countries were already on the "red alert list" of the EU and each and every consignment from these countries were subjected to antibiotics tests. Hence there was no wonder that the goods from India had also got rejected under this category. In 2000-01, the total numbers of rejections were 16 compared to 32 during 2001-02, and a majority of them were for detection of antibiotics in shrimp exports.

The increased demand from China for Indian sea food more than offset losses due to the ban on imports by the European Union (EU) and helped the country's marine products sector avert disaster. The EU ban, which was eventually lifted, had brought about a drop in marine exports to the region by 48 per cent. But the rise in demand from China earned the sector Rs 47 billion in 1997-98. Ferdouse (1999) opined that international trade for fresh and frozen shrimp in the range of US$ 8.5-9 billion per year. Nearly 50 per cent of this is generated from seven Asian markets which are Japan, Malaysia, Singapore, China Hongkong, Taiwan and Thailand.

In 1998, nearly four lakh tonnes of fresh and frozen shrimp were imported into these countries, despite the economic recession that affected the region since late 1997. Access to the supplies has been good for the Asian markets as the region is the largest producer of farmer and wild caught tropical shrimp. High economic growth in the region, the expansion of the middle class, increase in supplies, abolition of import restrictions and duty free access to certain markets encourage the usage of shrimp in Asia. Patil *et.al* (2000) opined that that with the advent of liberalized economic policy of the GOI since mid 1991 the prospects of the export sector had been very bright.

The emphasis on export led growth has enabled the country to stabilize BOP position and to build a reasonably a good buffer of exchange during 1984-85 to 1995-96. India during the period registers a growth of 19.19 per cent annually as against world export growth of 9.98 per cent. Also the marine export grew at 35.44 per cent as against the general export rate of 27.38 per cent. Feioidi (2000) stressed the importance of aquaculture production, which is growing rapidly in bridging the gap between the fish and fish product demand and supply, and concluded that the contribution of the capture fisheries will depend upon the effectiveness of fisheries management and other developments. Improved management of the currently overfished stocks could provide an increase of between five and ten million metric tonnes whereas the continued overfishing will lead to declining production, as reflected in the pessimistic scenario. Ling *et. al.* (1996) concluded from the study on the export performance of major cultured shrimp producers in the Japanese and US market that vertical product differentiation concerning different varieties in terms of both quality and price plays an important role on the relative export competition of shrimp producers among major shrimp exporting countries. As a result of geographical advantage Asian-Pacific producers enjoy comparative advantage in the japans imported shrimp market.

Kuzebski (2001) reported the increased opportunities that would be possible due to the expansion of the European Union by virtue of numerous countries awaiting entry into the European Union to boost their economies. Nevertheless there exists certain concerns, like whether the European Union will be able to supply new member markets with as much fish they need due to decrease in fish landings characterized during the past years and also the shortcomings in the purchasing powers of the new members to reach the level of the other existing countries. Shyam and Goswami (2001) reported that in view of the depletion of capture fishery catch sustainable exploitation of this sector is very much essential.

The Indian seafood industry depends on the traditional and non-traditional fishing sectors, which together contribute 86 per cent of the exports. Even though the industry is in the process of modernization induction of advanced technology in the production of diversified value added product is to be adopted to maintain international market standard (Anonymous ., 1996). Feioidi (2001) analysed the fish consumption in the Arab region and concluded that the consumption is largely influenced by the marketing, distribution and transport systems and to a minor extent, tribal, traditional and social attitudes. The consumption rate thus ranges greatly between countries and within different areas in the same country or area. Inorder to meet the challenges in the Arab fisheries better management of marine and fresh water resources, expansion of aquaculture, improvements in post harvest utilisation and attending to the constraints in trade are very much necessary.

Sathiadhas and Hassan (2002) opined that fish and fishery products recorded the highest increase in price both in the domestic and export markets in the recent years compared to any other food items. However the growth and development of fisheries sector is presently dependent completely on the export performance. Globalization has further intensified competition among the countries to capture the lucrative market. Product differentiation coupled with the stringent quality control and promotion of value added products might immensely help us to face the severe competition and retain our position. Further the enormous potential of our domestic demand should be explored and exploited through the parallel development of the internal fish marketing system for maintaining sustainable growth.

Mukundan (2002) suggested that the different varieties and species of aquatic organisms by virtue of their genetic make up or food habit are found to contain toxic substances like ciguatoxin, paralytic poison, shellfish poison, and histamine, lead, cadmium and mercury accumulation. In addition to these chemicals, the concentration of environmental contaminants and aquaculture drugs like antibiotic and pesticide residue poses various kinds of health risks to consumers. As a result quality standards like CODEX standards, USFDA standards, BIS, HACCP, QMP norms and TQM are in practices which are aimed to ensure safety and quality of fish and fish products. Total Quality Management attempts to consolidate systematically all necessary steps to prevent/eliminate the health risks from all possible sources in a processing industry.

The world demand for the seafood is expected to grow due to the increasing demand for protein rich food and the changes in the preferences from red meat to white meat for health reasons Bojan (2003). Seafood has been acclaimed as one of the fastest moving commodity in the world market with high unit value. The world market for seafood has doubled within the last decade reaching US $ 58 billion mark. The share of Indian seafood in the global trade of all commodities is 3.12 per cent whereas the Indian share in the world seafood market is only 2.31 per cent.

Cyriac (2003) stressed the need for the creation of a brand image for our marine products in the major overseas markets and resolving the complaints made by the importing countries with regard to the WTO trade agreements. This can be achieved by exporting atleast 50 per cent of the products in value added form and an average unit value realization of US$ 5.0 per kg. He opined that while considering the vast untapped and under utilized fishery resource potentials both capture and culture, in the country, the ever increasing demand for the fishery products in the global markets and the state of art of production infrastructural facilities available in the country, it is not difficult to achieve an export turn over of US$3 billion within the next five years.

The extensive review of literature relating to supply – demand dimensions of marine fish at macro level in India and their implications on domestic and international trade reveals exhaustive scope to enhance our fish production and improve our market performance. Strategic management both in the harvesting of open access resources integrated with efficient domestic marketing and exports is the immediate need for the growth and development of fishery sector in India. Studies integrating both production and marketing aspects together with policy prescription are very limited and some of them available also pertains to micro level case studies Hence, the present study of "Strategic Management of Indian Seafood Trade" is a pioneering attempt. It provides a sound concrete conceptual frame work for empirical economic analysis of marine fishing industry.

2.3 Theoretical Framework

Trade plays a vital role for the economic development of any nation and the overall welfare of people. Trade theories and policies were evolved and developed over centuries by rulers, administrators and economists mainly for accumulating wealth and achieving prosperity. Several authors reviewed the trade theories and principles advocated by mercantilists of 16th century to the modern international trade theories (Wilson,1949; Heckscher,1950; McKenzie, 1954; Price,1961; Parry, 1967; Friedman,1970; Coase,1976; Bergstrand,1985; Edwards, 1985; Stewart,1989; Fieldhouse,1992; Blang, 1992; Trefler,1995; Smith,1998; Samuelson, 2001;Cheng,2001; Cain, 2007; Shiozawa, 2007) and a brief review is given here for comparison. Sea food trade also now transferred from the initial comparative advantage stage advocated by the classical economists to the modern day competitive stage.

2.3.1 Mercantilism

Mercantilism is an economic theory practice, commonly used in Europe from the 16th to the 18th century that promoted governmental regulation of a nation's economy for the purpose of augmenting state power at the expense of rival national powers. It was the economic counterpart of political absolutism. It includes a national economic policy aimed at accumulating monetary reserves through a positive balance of trade, especially of finished goods. Mercantilism dominated Western European economic policy and discourse from the 16th to late-18th centuries. Mercantilist theory varied in sophistication from one writer to another and evolved over time. Hightariffs, especially on manufactured goods, are an almost universal feature of mercantilist policy. Other policies have included:

- Building a network of overseas colonies;
- Forbidding colonies to trade with other nations;
- Monopolizing markets with staple ports;
- Banning the export of gold and silver, even for payments;
- Forbidding trade to be carried in foreign ships;

- Export subsidies;
- Promoting manufacturing with research or direct subsidies;
- Limiting wages;
- Maximizing the use of domestic resources;
- Restricting domestic consumption with non-tariff barriers to trade.

Mercantilism in its simplest form was bullionism, but mercantilist writers emphasized the circulation of money and rejected hoarding. Their emphasis on monetary metals accords with current ideas regarding the money supply, such as the stimulative effect of a growing money supply. Special concerns have since been rendered moot by fiat money and floating exchange rates. Mature neo mercantilist theory recommends selective high tariffs for "infant" industries or to promote the mutual growth of countries through national industrial specialization.

The term "mercantile system" was used by its foremost critic Adam Smith but "mercantilisme" had been used earlier by Mirabeau. While many nations practised it, one leading example was France, the economically most important state, where King Louis XIV followed the guidance of Jean Baptiste Colbert, his controller general of finances (1662-83). They were determined that the state should rule in the economic realm as it did in the diplomatic, and that the interests of the state as identified by the king were superior to those of merchants and everyone else. The goal of economic policies was to build up the state, especially in an age of incessant warfare, and the state should look for ways to strengthen the economy and weaken foreign adversaries.

Mercantilism was the dominant school of thought in Europe throughout the late Renaissance and early modern period (from the 15th to the 18th century). Mercantilism encouraged the many intra-European wars of the period and arguably fueled European expansion and imperialism – both in

Europe and throughout the rest of the world – until the 19th century or early 20th century. Evidence of mercantilistic practices appear in early modern Venice, Genoa, and Pisa regarding control of the Mediterranean trade of bullion. However, as a codified school, mercantilism's real birth is marked by the empiricism of the Renaissance, which first began to quantify large-scale trade accurately.

England began the first large-scale and integrative approach to mercantilism during the Elizabethan Era (1558–1603). An early statement on national balance of trade appeared in *Discourse of the Common Weal of this Realm of England*, 1549: "We must always take heed that we buy no more from strangers than we sell them, for so should we impoverish ourselves and enrich them". The period featured various but often disjointed efforts by the court of Queen Elizabeth to develop a naval and merchant fleet capable of challenging the Spanish stranglehold on trade and of expanding the growth of bullion at home. Queen Elizabeth promoted the Trade and Navigation Acts in Parliament and issued orders to her navy for the protection and promotion of English shipping. A systematic and coherent explanation of balance of trade was made public through Thomas Mun's argument *England's Treasure by Forraign Trade, or the Balance of our Forraign Trade is The Rule of Our Treasure.* It was written in the 1620s and published in 1664.

These efforts organized national resources sufficiently in the defence of England against the far larger and more powerful Spanish Empire, and in turn paved the foundation for establishing a global empire in the 19th century. The authors noted most for establishing the English mercantilist system include Gerard de Malynes and Thomas Mun, who first articulated the Elizabethan system, which in turn was then developed further by Josiah Child. Numerous French authors helped to cement French policy around mercantilism in the 17th century. This French mercantilism was best articulated by Jean-Baptiste Colbert, though policy liberalised greatly under Napoleon.

In Europe, academic belief in mercantilism began to fade in the late 18th century, especially in Britain, in light of the arguments of Adam Smith and the classical economists. The repeal of the Corn Laws by Robert Peel symbolised the emergence of free trade as an alternative system.

Neomercantilism is a 20^{th}-century economic policy that uses the ideas and methods of neoclassical economics. The new mercantilism has different goals and focuses on more rapid economic growth based on advanced technology. It promotes such policies as substitution state taxing, subsidizing, spending, and general regulatory powers for tariffs and quotas, and protection through the formation of supranational trading blocs. The bulk of what is commonly called "mercantilist literature" appeared in the 1620s in Great Britain. Smith saw English merchant Thomas Mun (1571–1641) as a major creator of the mercantile system, especially in his posthumously published *Treasure by Foreign Trade* (1664), which Smith considered the archetype or manifesto of the movement. Perhaps the last major mercantilist work was James Steuart's *Principles of Political Economy* published in 1767.

"Mercantilist literature" also extended beyond England. Italy and France produced noted writers of mercantilist themes including Italy's Giovanni Botero (1544–1617) and Antonio Serra, France's, Jean Bodin, Colbert and other physiocrats. Themes also existed in writers from the German historical school from List, as well as followers of the "American system" and British "free-trade imperialism," thus stretching the system into the 19th century.

The Austrian lawyer and scholar Philipp Wilhelm von Hornick, in his *Austria Over All, If She Only Will* of 1684, detailed a nine-point program of what he deemed effective national economy, which sums up the tenets of mercantilism comprehensively:

- That every little bit of a country's soil be utilized for agriculture, mining or manufacturing.
- That all raw materials found in a country be used in domestic manufacture, since finished goods have a higher value than raw materials.
- That a large, working population be encouraged.
- That all export of gold and silver be prohibited and all domestic money be kept in circulation.
- That all imports of foreign goods be discouraged as much as possible.
- That where certain imports are indispensable they be obtained at first hand, in exchange for other domestic goods instead of gold and silver.
- That as much as possible, imports be confined to raw materials that can be finished [in the home country].
- That opportunities be constantly sought for selling a country's surplus manufactures to foreigners, so far as necessary, for gold and silver.
- That no importation be allowed if such goods are sufficiently and suitably supplied at home.

Other than Von Hornick, there were no mercantilist writers presenting an overarching scheme for the ideal economy, as Adam Smith would later do for classical economics. Rather, each mercantilist writer tended to focus on a single area of the economy. Only later did non-mercantilist scholars integrate these "diverse" ideas into what they called *mercantilism*. Some scholars thus reject the idea of mercantilism completely, arguing that it gives "a false unity to disparate events". Smith saw the mercantile system enormous conspiracy by manufacturers and merchants against consumers, a view that has led some authors, especially Robert E. Ekelund and Robert D. Tollison to call mercantilism "a rent-seeking society". To a certain extent, mercantilist doctrine itself made a general theory of economics impossible. Mercantilists viewed the economic system as a zero-sum game, in which any gain by one party required a loss by another. Thus, any system of policies that benefited one group would by definition harm the other, and there was no possibility of economics being used to maximize the "commonwealth", or common good. Mercantilists' writings were also generally created to rationalize particular practices rather than as investigations into the best policies.

Mercantilist domestic policy was more fragmented than its trade policy. While Adam Smith portrayed mercantilism as supportive of strict controls over the economy, many mercantilists disagreed. The early modern era was one of letters patent and government-imposed monopolies; some mercantilists supported these, but others acknowledged the corruption and inefficiency of such systems. Many mercantilists also realized that the inevitable results of quotas and price ceilings were black markets. One notion mercantilists widely agreed upon was the need for economic oppression of the working population; laborers and farmers were to live at the "margins of subsistence". The goal was to maximize production, with no concern for consumption. Extra money, free time, or education for the "lower classes" was seen to inevitably lead to vice and laziness, and would result in harm to the economy.

The mercantilists saw a large population as a form of wealth which made possible the development of bigger markets and armies. The opposing doctrine of physiocracy predicted that mankind would outgrow its resources. The idea of mercantilism was to protect the markets, but it also helped to maintain the agriculture and those who were dependent upon it.

Scholars debate over why mercantilism dominated economic ideology for 250 years. One group, represented by Jacob Viner, sees mercantilism as simply a straightforward, common-sense system whose logical fallacies remained opaque to people at the time, as they simply lacked the required analytical tools.

The second school, supported by scholars such as Robert B. Ekelund, portrays mercantilism not as a mistake, but rather as the best possible system for those who developed it. This school argues that rent-seeking merchants and governments developed and enforced mercantilist policies. Merchants benefited greatly from the enforced monopolies, bans on foreign competition, and poverty of the workers. Governments benefited from the high tariffs and payments from the merchants. Whereas later economic ideas were often developed by academics and philosophers, almost all mercantilist writers were merchants or government officials.

Monetarism offers a third explanation for mercantilism. European trade exported bullion to pay for goods from Asia, thus reducing the money supply and putting downward pressure on prices and economic activity. The evidence for this hypothesis is the lack of inflation in the British economy until the Revolutionary and Napoleonic wars when paper money came into vogue. A fourth explanation lies in the increasing professionalisation and technification of the wars of the era, which turned the maintenance of adequate reserve funds (in the prospect of war) into a more and more expensive and eventually competitive business.

Mercantilism developed at a time of transition for the European economy. Isolated feudal estates were being replaced by centralized nation-states as the focus of power. Technological changes in shipping and the growth of urban centres led to a rapid increase in international trade. Mercantilism focused on how this trade could best aid the states. Another important change was the introduction of double-entry bookkeeping and modern accounting. This accounting made extremely clear the inflow and outflow of trade, contributing to the close scrutiny given to the balance of trade. Of course, the impact of the discovery of America cannot be ignored. New markets and new mines propelled foreign trade to previously inconceivable heights. The latter led to "the great upward movement in prices" and an increase in "the volume of merchant activity itself".

Prior to mercantilism, the most important economic work done in Europe was by the medieval scholastic theorists. The goal of these thinkers was to find an economic system compatible with Christian doctrines of piety and justice. They focused mainly on microeconomics and on local exchanges between individuals. Mercantilism was closely aligned with the other theories and ideas that began to replace the medieval worldview. This period saw the adoption of the very Machiavellianrealpolitik and the primacy of the *raison d'état* in international relations. The mercantilist idea of all trade as a zero-sum game, in which each side was trying to best the other in a ruthless competition, was integrated into the works of Thomas Hobbes. The dark view of human nature also fit well with the Puritan view of the world, and some of the most stridently mercantilist legislation, such as the Navigation Ordinance of 1651, was enacted by the government of Oliver Cromwell.

Jean-Baptiste Colbert's work in seventeenth century France came to exemplify classical mercantilism. In the English-speaking world its ideas were criticized by Adam Smith with the publication of *The Wealth of Nations* in 1776 and later David Ricardo with his explanation of comparative advantage. Mercantilism was rejected by Britain and France by the mid-19th century. The British Empire embraced free-trade and used its power as the financial centre of the world to promote the same. The Guyanese historian Walter Rodney describes mercantilism as the period of the world-wide development of European commerce, which began in the fifteenth century with the voyages of Portuguese and Spanish explorers to Africa, Asia and the New World.

Mercantilist ideas were the dominant economic ideology of all of Europe in the early modern period, and most states embraced it to a certain degree. Mercantilism was centred in England and France, and it was in these states that mercantilist polices were most often enacted. Mercantilism arose in France in the early 16th century soon after the monarchy had become the dominant force in French politics. In 1539, an important decree banned the importation of woolen goods from Spain and some parts of Flanders. The next year, a number of restrictions were imposed on the export of bullion.

Over the rest of the sixteenth century further protectionist measures were introduced. The height of French mercantilism is closely associated with Jean-Baptiste Colbert, finance minister for 22 years in the 17th century, to the extent that French mercantilism is sometimes called Colbertism. Under Colbert, the French government became deeply involved in the economy in order to increase exports. Protectionist policies were enacted that limited imports and favored exports. Industries were organized into guilds and monopolies, and production was regulated by the state through a series of over a thousand directives outlining how different products should be produced.

To encourage industry, foreign artisans and craftsmen were imported. Colbert also worked to decrease internal barriers to trade, reducing internal tariffs and building an extensive network of roads and canals. Colbert's policies were quite successful, and France's industrial output and economy grew considerably during this period, as France became the dominant European power. He was less successful in turning France into a major trading power, and Britain and the Netherlands remained supreme in this field.

In England, mercantilism reached its peak during the Long Parliament government (1640–1660). Mercantilist policies were also embraced throughout much of the Tudor and Stuart periods, with Robert Walpole being another major proponent. In Britain, government control over the domestic economy was far less extensive than on the Continent, limited by common lawand the steadily increasing power of Parliament. Government-controlled monopolies were common, especially before the English Civil War, but were often controversial.

With respect to its colonies, British mercantilism meant that the government and the merchants became partners with the goal of increasing political power and private wealth, to the exclusion of other empires. The government protected its merchants – and kept others out – by trade barriers, regulations, and subsidies to domestic industries in order to maximize exports from and minimize imports to the realm. The government had to fight smuggling – which became a favorite American technique in the 18th century to circumvent the restrictions on trading with the French, Spanish or Dutch. The goal of mercantilism was to run trade surpluses, so that gold and silver would pour into London. The government took its share through duties and taxes, with the remainder going to merchants in Britain. The government spent much of its revenue on a superb Royal Navy, which not only protected the British colonies but threatened the colonies of the other empires, and sometimes seized them. Thus the British Navy captured New

Amsterdam (New York) in 1664. The colonies were captive markets for British industry, and the goal was to enrich the mother country.

British mercantilist writers were themselves divided on whether domestic controls were necessary. British mercantilism thus mainly took the form of efforts to control trade. A wide array of regulations was put in place to encourage exports and discourage imports. Tariffs were placed on imports and bounties given for exports, and the export of some raw materials was banned completely. The Navigation Acts expelled foreign merchants from England's domestic trade. The nation aggressively sought colonies and once under British control, regulations were imposed that allowed the colony to only produce raw materials and to only trade with Britain. This led to friction with the inhabitants of these colonies, and mercantilist policies (such as forbidding trade with other empires and controls over smuggling) were a major irritant leading to the American Revolution.

Over all, however, mercantilist policies had a positive impact on Britain helping turn it into the world's dominant trader, and the global hegemon. One domestic policy that had a lasting impact was the conversion of "waste lands" to agricultural use. Mercantilists felt that to maximize a nation's power all land and resources had to be used to their utmost, and this era thus saw projects like the draining of The Fens.

The other nations of Europe also embraced mercantilism to varying degrees. The Netherlands, which had become the financial centre of Europe by being its most efficient trader, had little interest in seeing trade restricted and adopted few mercantilist policies. Mercantilism became prominent in Central Europe and Scandinavia after the Thirty Years' War (1618–1648), with Christina of Sweden, Jacob Kettler of Courland, Christian IV of Denmark being notable proponents. The Habsburg Holy Roman Emperors had long been interested in mercantilist policies, but the vast and decentralized nature of their empire made implementing such notions difficult.

Some constituent states of the empire did embrace Mercantilism, most notably Prussia, which under Frederick the Great had perhaps the most rigidly controlled economy in Europe. During the economic collapse of the seventeenth century Spain had little coherent economic policy, but French mercantilist policies were imported by Philip Vwith some success. Russia under Peter I (Peter the Great) attempted to pursue mercantilism, but had little success because of Russia's lack of a large merchant class or an industrial base.

2.3.2 Wars and imperialism

Mercantilism was economic warfare and was well suited to an era of military warfare. Since the level of world trade was viewed as fixed, it followed that the only way to increase a nation's trade was to take it from another. A number of wars, most notably the Anglo-Dutch Wars and the Franco-Dutch Wars, can be linked directly to mercantilist theories. Most wars had other causes but they reinforced mercantilism by clearly defining the enemy, and justified damage to the enemy's economy.

Mercantilism fueled the imperialism of this era, as many nations expended significant effort to build new colonies that would be sources of gold (as in Mexico) or sugar (as in the West Indies), as well as becoming exclusive markets. European power spread around the globe, often under the aegis of companies with government-guaranteed monopolies in certain defined geographical regions, such as the Dutch East India Company or the British Hudson's Bay Company (operating in present-day Canada).

2.3.3 Criticisms

Adam Smith and David Hume were the founding fathers of anti-mercantilist thought. A number of scholars found important flaws with mercantilism long before Adam Smithdeveloped an ideology that could fully replace it. Critics like Hume, Dudley North, and John Locke undermined much of mercantilism, and it steadily lost favor during the 18th century.

In 1690, John Locke argued that prices vary in proportion to the quantity of money. Locke's *Second Treatise* also points towards the heart of the anti-mercantilist critique: that the wealth of the world is not fixed, but is created by human labor (represented embryonically by Locke's labor theory of value). Mercantilists failed to understand the notions of absolute advantage and comparative advantage (although this idea was only fully fleshed out in 1817 by David Ricardo) and the benefits of trade.

For instance, if Portugal was a more efficient producer of wine than England, yet in England cloth could be produced more efficiently than it could in Portugal. Thus if Portugal specialized in wine and England in cloth, *both* states would end up *better off* if they traded. This is an example of the reciprocal benefits of trade due to a comparative advantage. In modern economic theory, trade is *not* a zero-sum game of cutthroat competition because both sides can benefit.

Hume famously noted the impossibility of the mercantilists' goal of a constant positive balance of trade. As bullion flowed into one country, the supply would increase and the value of bullion in that state would steadily decline relative to other goods. Conversely, in the state exporting bullion, its value would slowly rise. Eventually it would no longer be cost-effective to export goods from the high-price country to the low-price country, and the balance of trade would reverse itself. Mercantilists fundamentally misunderstood this, long arguing that an increase in the money supply simply meant that everyone gets richer.

The importance placed on bullion was also a central target, even if many mercantilists had themselves begun to de-emphasize the importance of gold and silver. Adam Smith noted at the core of the mercantile system was the "popular folly of confusing wealth with money," bullion was just the same as any other commodity, and there was no reason to give it special treatment. More recently, scholars have discounted the accuracy of this critique. They believe Mun and Misselden were not making this mistake in the 1620s, and point to their followers Josiah Child and Charles Davenant, who, in 1699, wrote: "Gold and Silver are indeed the Measure of Trade, but that the Spring and Original of it, in all nations is the Natural or Artificial Product of the Country; that is to say, what this Land or what this Labour and Industry Produces."The critique that mercantilism was a form of rent-seeking has also seen criticism, as scholars such Jacob Viner in the 1930s point out that merchant mercantilists such as Mun understood that they would not gain by higher prices for English wares abroad.

The first school to completely reject mercantilism was the physiocrats, who developed their theories in France. Their theories also had several important problems, and the replacement of mercantilism did not come until Adam Smith published *The Wealth of Nations* in 1776. This book outlines the basics of what is today known as classical economics. Smith spends a considerable portion of the book rebutting the arguments of the mercantilists, though often these are simplified or exaggerated versions of mercantilist thought.

Scholars are also divided over the cause of mercantilism's end. Those who believe the theory was simply an error hold that its replacement was inevitable as soon as Smith's more accurate ideas were unveiled. Those who feel that mercantilism was rent-seeking hold that it ended only when major power shifts occurred. In Britain, mercantilism faded as the Parliament gained the monarch's power to grant monopolies. While the wealthy capitalists who controlled the House of Commons benefited from these monopolies, Parliament found it difficult to implement them because of the high cost of group decision making.

Mercantilist regulations were steadily removed over the course of the Eighteenth Century in Britain, and during the 19th century the British government fully embraced free trade and Smith's laissez-faire economics. On the continent, the process was somewhat different. In France, economic control remained in the hands of the royal family and mercantilism continued until the French Revolution. In Germany mercantilism remained an important ideology in the 19th and early 20th centuries, when the historical school of economics was paramount.

Adam Smith rejected the mercantilist focus on production, arguing that consumption was paramount to production. He added that mercantilism was popular among merchants because it was what is now called "rent seeking". However John Maynard Keynes argued that encouraging production was just as important as consumption, and he favoured the "new mercantilism". Keynes also noted that in the early modern period the focus on the bullion supplies was reasonable. In an era before paper money, an increase for bullion was one of the few ways to increase the money supply. Keynes said mercantilist policies generally improved both domestic and foreign investment. Domestic because the policies lowered the domestic rate of interest. And it increased investment by foreigners in the nation by tending to create a favorable balance of trade.

Keynes and other economists of the 20th century also realized the balance of payments is an important concern. Keynes also supported government intervention in the economy as necessity, as did mercantilism.

As of 2010, the word "mercantilism" remains a pejorative term, often used to attack various forms of protectionism. The similarities between Keynesianism, and its successor ideas, with mercantilism have sometimes led critics to call them neo-mercantilism. Indeed, Paul Samuelson, writing within a Keynesian framework, defended mercantilism, writing: "With employment less than full and Net National Product suboptimal, all the debunked mercantilist arguments turn out to be valid."

Some other systems that do copy several mercantilist policies, such as Japan's economic system, are also sometimes called neo-mercantilist. In an essay appearing in the 14 May 2007 issue of Newsweek, business columnist Robert J. Samuelsonargued that China was pursuing an essentially mercantilist trade policy that threatened to undermine the post-World War II international economic structure.

Murray Rothbard, representing the Austrian School of economics, describes it this way:

Mercantilism, which reached its height in the Europe of the seventeenth and eighteenth centuries, was a system of statism which employed economic fallacy to build up a structure of imperial state power, as well as special subsidy and monopolistic privilege to individuals or groups favored by the state. Thus, mercantilism held exports should be encouraged by the government and imports discouraged.

In one area economists rejected Smith well before Keynes: in the use of data. Mercantilists, who were generally merchants or government officials, gathered vast amounts of trade data and used it extensively in their research and writing. William Petty, a strong mercantilist, is generally credited with being the first to use empirical analysis to study the economy. Smith rejected this, arguing that deductive reasoning from base principles was the proper method to discover economic truths. Today, many schools of economics accept that both methods are important.

In specific instances, protectionist mercantilist policies also had an important and positive impact on the state that enacted them. Adam Smith himself, for instance, praised the Navigation Acts as they greatly expanded the British merchant fleet, and played a central role in turning Britain into the naval and economic superpower from the 18th Century onward. Some economists thus feel that protecting infant industries, while causing short-term harm, can be beneficial in the long term.

Nonetheless, the publication of *The Wealth of Nations* in 1776 had a profound impact on the end of the mercantilist era and the later adoption of free-market policy. By 1860, England removed the last vestiges of the mercantile era. Industrial regulations, monopolies and tariffs were withdrawn.

2.3.4 Adam Smith's model

In economics, the principle of **absolute advantage** refers to the ability of a party (an individual, or firm, or country) to produce more of a good or service than competitors, using the same amount of resources. Adam Smith first described the principle of absolute advantage in the context of international trade, using labor as the only input.

Since absolute advantage is determined by a simple comparison of labor productivities, it is possible for a party to have no absolute advantage in anything; in that case, according to the theory of absolute advantage, no trade will occur with the other party.It can be contrasted with the concept of comparative advantage which refers to the ability to produce specific goods at a lower opportunity cost.

The main concept of absolute advantage is generally attributed to Adam Smith for his 1776 publication *An Inquiry into the Nature and Causes of the Wealth of Nations* in which he countered mercantilist ideas. Smith argued that it was impossible for all nations to become rich simultaneously by following mercantilism because the export of one nation is another nation's import and instead stated that all nations would gain simultaneously if they practiced free trade and specialized in accordance with their absolute advantage. Smith also stated that the wealth of nations depends upon the goods and services available to their citizens, rather than their gold reserves. While there are possible gains from trade with absolute advantage, the gains may not be mutually beneficial. Comparative advantage focuses on the range of possible mutually beneficial exchanges.

Example

Party	Widgets per hour	Number of Employees
A	5	3
B	10	3

Party B has the absolute advantage.

- Party A can produce 5 widgets per hour with 3 employees.
- Party B can produce 10 widgets per hour with 3 employees.

Assuming that the employees of both parties are paid equally, Party B has an absolute advantage over Party A in producing widgets per hour. This is because Party B can produce twice as many widgets as Party A can with the same number of employees.

Adam Smith displays trade taking place on the basis of countries exercising absolute advantage over one another.

2.3.5 Ricardian model

Comparative advantage refers to the ability of a party to produce a particular good or service at a lower marginal and opportunity cost over another. Even if one country is more efficient in the production of all goods (absolute advantage in all goods) than the other, both countries will still gain by trading with each other, as long as they have different relative efficiencies.

For example, if, using machinery, a worker in one country can produce both shoes and shirts at 6 per hour, and a worker in a country with less machinery can produce either 2 shoes or 4 shirts in an hour, each country can gain from trade because their internal trade-offs between shoes and shirts are different. The less-efficient country has a comparative advantage in shirts, so it finds it more efficient to produce shirts and trade them to the more-efficient country for shoes. Without trade, its opportunity cost per shoe was 2 shirts; by trading, its cost per shoe can reduce to as low as 1 shirt depending on how much trade occurs (since the more-efficient country has a 1:1 trade-off). The more-efficient country has a comparative advantage in shoes, so it can gain in efficiency by moving some workers from shirt-production to shoe-production and trading some shoes for shirts. Without trade, its cost to make a shirt was 1 shoe; by trading, its cost per shirt can go as low as 1/2 shoe depending on how much trade occurs.

The net benefits to each country are called the gains from trade.

The idea of comparative advantage was first mentioned in Adam Smith's Book *The Wealth of Nations*: "If a foreign country can supply us with a commodity cheaper than we ourselves can make it, better buy it of them with some part of the produce of our own industry, employed in a way in which we have some advantage." But the law of comparative advantages has been formulated by David Ricardo who investigated in detail advantages and alternative or relative opportunity in his 1817 book *On the Principles of Political Economy and Taxation* in an example involving England and Portugal. In Portugal it is possible to produce both wine and cloth with less labor than it would take to produce the same quantities in England. However the relative costs of producing those two goods are different in the two countries. In England it is very hard to produce wine, and only moderately difficult to produce cloth. In Portugal both are easy to produce. Therefore while it is cheaper to produce cloth in Portugal than England, it is cheaper still for Portugal to produce excess wine, and trade that for English cloth. Conversely England benefits from this trade because its cost for producing cloth has not changed but it can now get wine at a lower price, closer to the cost of cloth. The conclusion drawn is that each country can gain by specializing in the good where it has comparative advantage, and trading that good for the other.

Classical comparative advantage theory was extended in two directions: Ricardian theory (Gottfried Haberler's work reformulating the ideas based on the principles of opportunity cost) and Heckscher–Ohlin–Samuelson theory (HOS theory). In both theories, the comparative advantage concept is formulated for 2 country, 2 commodity case. It can easily be extended to the 2 country, many commodity case or many country, 2 commodity case.[5][6] But in the case with many countries (more than 3 countries) and many commodities (more than 3 commodities), the notion of comparative advantage loses its facile features and requires totally different formulation. In these general cases, HOS theory totally depends on Arrow-Debreu type general equilibrium theory but gives little information other than general contents. Ricardian theory was formulated in Jones' 1961 paper, but it was limited to the case where there are no traded intermediate goods. In view of growing outsourcing and global procuring, it is necessary to extend the theory to the case with traded intermediate goods. This was done in Shiozawa's 2007 paper. Until now, this is the unique general theory which accounts for traded input goods.

2.3.6 Effects of trade costs

Trade costs, particularly transportation, reduce and may eliminate the benefits from trade, including comparative advantage. Paul Krugman gives the following example.

Using Ricardo's classic example:

Unit labor costs		
	Cloth	**Wine**
Britain	100	110
Portugal	90	80

In the absence of transportation costs, it is efficient for Britain to produce cloth and for Portugal to produce wine as, assuming that these trade at equal price (1 unit of cloth for 1 unit of wine), Britain can then obtain wine at a cost of 100 labor units by producing cloth and trading, rather than 110 units by producing the wine itself, and Portugal can obtain cloth at a cost of 80 units by trade rather than 90 by production.

However, in the presence of trade costs of 15 units of labor to import a good (alternatively a mix of export labor costs and import labor costs, such as 5 units to export and 10 units to import), it then costs Britain 115 units of labor to obtain wine by trade – 100 units for producing the cloth, 15 units for importing the wine, which is more expensive than producing the wine locally, and likewise for Portugal. Thus, if trade costs exceed the production advantage, it is not advantageous to trade.

Krugman proceeds to argue more speculatively that changes in the cost of trade (particularly transportation) *relative* to the cost of production may be a factor in changes in global patterns of trade; if trade costs decrease, such as with the advent of steam-powered shipping, trade should be expected to increase, as more comparative advantages in production can be realized. Conversely, if trade costs increase or if production costs decrease faster than trade costs (such as via electrification of factories), then trade should be expected to decrease as trade costs become a more significant barrier.

As the markets change over time, the ratio of goods produced by one country versus another variously changes while maintaining the benefits of comparative advantage. This can cause national currencies to accumulate into bank deposits in foreign countries where a separate currency is used.

Macroeconomic monetary policy is often adapted to address the depletion of a nation's currency from domestic hands by the issuance of more money, leading to a wide range of historical successes and failures.

The theory of comparative advantage, and the corollary that nations should specialize, is criticized on pragmatic grounds within the import substitution industrialization theory of development economics, on empirical grounds by the Singer–Prebisch thesis which states that terms of trade between primary producers and manufactured goods deteriorate over time, and on theoretical grounds of infant industry and Keynesian economics. In older economic terms, comparative advantage has been opposed by mercantilism and economic nationalism. These argue instead that while a country may initially be comparatively disadvantaged in a given industry (such as Japanese cars in the 1950s), countries should shelter and invest in industries until they become globally competitive. Further, they argue that comparative advantage, as stated, is a static theory – it does not account for the possibility of advantage changing through investment or economic development, and thus does not provide guidance for long-term economic development.

Much has been written since Ricardo as commerce has evolved and cross-border trade has become more complicated. Today trade policy tends to focus more on "competitive advantage" as opposed to "comparative advantage". One of the most in depth research undertakings on "competitive advantage" was conducted in the 1980s as part of the Reagan administration's Project Socrates to establish the foundation for a technology-based competitive strategy development system that could be used for guiding international trade policy.

Ricardo explicitly bases his argument on an assumed immobility of capital: " ... if capital freely flowed towards those countries where it could be most profitably employed, there could be no difference in the rate of profit, and no other difference in the real or labor price of commodities, than the additional quantity of labor required to convey them to the various markets where they were to be sold."

He explains why, from his point of view (anno 1817), this is a reasonable assumption: "Experience, however, shows, that the fancied or real insecurity of capital, when not under the immediate control of its owner, together with the natural disinclination which every man has to quit the country of his birth and connexions, and entrust himself with all his habits fixed, to a strange government and new laws, checks the emigration of capital."

Some scholars, notably Herman Daly, an American ecological economist and professor at the School of Public Policy of the University of Maryland, have voiced concern over the applicability of Ricardo's theory of comparative advantage in light of a perceived increase in the mobility of capital: "International trade (governed by comparative advantage) becomes, with the introduction of free capital mobility, interregional trade (governed by absolute advantage)."

Adam Smith developed the principle of absolute advantage. The economist Paul Craig Roberts argues that the comparative advantage principles developed by David Ricardo are undermined where the factors of production are internationally mobile. Limitations to the theory may exist if there is a single kind of utility. Yet the human need for food and shelter already indicates that multiple utilities are present in human desire. The moment the model expands from one good to multiple goods, the absolute may turn to a comparative advantage. The opportunity cost of a forgone tax base may outweigh perceived gains, especially where the presence of artificial currency pegs and manipulations distort trade.

Karl Marx's *A Contribution to the Critique of Political Economy* (1859) is mainly an analysis of capitalism, achieved by critiquing the writings of the leading theoretical exponents of capitalism at that time: these were the political economists, nowadays often referred to as the classical economists; Adam Smith (1723–90) and David Ricardo (1772–1823) are the foremost representatives of the genre. Much of *the Critique* was later incorporated by Marx into the first volume of his magnum opus, *Das Kapital* (1867).

Economist Ha-Joon Chang criticized the comparative advantage principle, contending that it may have helped developed countries maintain relatively advanced technology and industry compared to developing countries. In his book *Kicking Away the Ladder*, Chang argued that all major developed countries, including the United States and United Kingdom, used interventionist, protectionist economic policies in order to get rich and then tried to forbid other countries from doing the same. For example, according to the comparative advantage principle, developing countries with a comparative advantage in agriculture should continue to specialize in agriculture and import high-technology widgets from developed countries with a comparative advantage in high technology. In the long run, developing countries would lag behind developed countries, and polarization of wealth would set in. Chang asserts that premature free trade has been one of the fundamental obstacles to the alleviation of poverty in the developing world. Recently, Asian countries such as South Korea, Japan and China have utilized protectionist economic policies in their economic development.

2.3.7 Heckscher–Ohlin model

In the early 1900s a theory of international trade was developed by two Swedish economists, Eli Heckscher and Bertil Ohlin. This theory has subsequently been known as the Heckscher–Ohlin model (H–O model). The results of the H–O model are that countries will produce and export goods that require resources (factors) which are relatively abundant and import goods that require resources which are in relative short supply.

In the Heckscher–Ohlin model the pattern of international trade is determined by differences in factor endowments. It predicts that countries will export those goods that make intensive use of locally abundant factors and will import goods that make intensive use of factors that are locally scarce. Empirical problems with the H–O model, such as the Leontief paradox, were noted in empirical tests by Wassily Leontief who found that the United States tended to export labor-intensive goods despite having an abundance of capital.

The H–O model makes the following core assumptions:

- Labour and capital flow freely between sectors
- The amount of labour and capital in two countries differ (difference in endowments)
- Technology is the same among countries (a long-term assumption)
- Tastes are the same

2.3.8 Applicability

In 1953, Wassily Leontief published a study in which he tested the validity of the Heckscher-Ohlin theory. The study showed that the United States was more abundant in capital compared to other countries, therefore the United States would export capital-intensive goods and import labour-intensive goods. Leontief found out that the United States' exports were less capital intensive than its imports.

After the appearance of Leontief's paradox, many researchers tried to save the Heckscher-Ohlin theory, either by new methods of measurement, or by new interpretations. Leamer emphasized that Leontief did not interpret H-O theory properly and claimed that with a right interpretation, the paradox did not occur. Brecher and Choudri found that, if Leamer was right, the American workers' consumption per head should be lower than the workers' world average consumption. Many textbook writers, including Krugman and Obstfeld and Bowen, Hollander and Viane, are negative about the validity of H-O model. After examining the long history of empirical research, Bowen, Hollander and Viane concluded: "Recent tests of the factor abundance theory [H-O theory and its developed form into many-commodity and many-factor case] that directly examine the H-O-V equations also indicate the rejection of the theory."

In the specific factors model, labour mobility among industries is possible while capital is assumed to be immobile in the short run. Thus, this model can be interpreted as a short-run version of the Heckscher-Ohlin model. The "specific factors" name refers to the assumption that in the short run, specific factors of production such as physical capital are not easily transferable between industries. The theory suggests that if there is an increase in the price of a good, the owners of the factor of production specific to that good will profit in real terms.

Additionally, owners of opposing specific factors of production (i.e., labour and capital) are likely to have opposing agendas when lobbying for controls over immigration of labour. Conversely, both owners of capital and labour profit in real terms from an increase in the capital endowment. This model is ideal for understanding income distribution but awkward for discussing the pattern of trade.

2.3.9 New Trade Theory

New Trade Theory tries to explain empirical elements of trade that comparative advantage-based models above have difficulty with. These include the fact that most trade is between countries with similar factor endowment and productivity levels, and the large amount of multinational production (i.e., foreign direct investment) that exists. New Trade theories are often based on assumptions such as monopolistic competition and increasing returns to scale. One result of these theories is the home-market effect, which asserts that, if an industry tends to cluster in one location because of returns to scale and if that industry faces high transportation costs, the industry will be located in the country with most of its demand, in order to minimize cost.

Although new trade theory can explain the growing trend of trade volumes of intermediate goods, Krugman's explanation depends too much on the strict assumption that all firms are symmetrical, meaning that they all have the same production coefficients. Shiozawa, based on much more general model, succeeded in giving a new explanation on why the traded volume increases for intermediate goods when the transport cost decreases.

2.3.10 Gravity model

The Gravity model of trade presents a more empirical analysis of trading patterns. The gravity model, in its basic form, predicts trade based on the distance between countries and the interaction of the countries' economic sizes. The model mimics the Newtonian law of gravity which also considers distance and physical size between two objects. The model has been proven to be empirically strong through econometric analysis.

2.3.11 Ricardian theory of international trade (modern development)

The Ricardian theory of comparative advantage became a basic constituent of neoclassical trade theory. Any undergraduate course in trade theory includes a presentation of Ricardo's example of a two-commodity, two-country model. A common representation of this model is made using an Edgeworth Box.

This model has been expanded to many-country and many-commodity cases. Major general results were obtained by McKenzie and Jones, including his famous formula. It is a theorem about the possible trade pattern for N-country N-commodity cases.

2.3.12 Contemporary theories

Ricardo's idea was even expanded to the case of continuum of goods by Dornbusch, Fischer, and Samuelson this formulation is employed for example by Matsuyama and others. These theories use a special property that is applicable only for the two-country case.

2.3.13 Neo-Ricardian trade theory

Inspired by Piero Sraffa, a new strand of trade theory emerged and was named neo-Ricardian trade theory. The main contributors include Ian Steedman (1941–) and Stanley Metcalfe (1946–). They have criticized neoclassical international trade theory, namely the Heckscher-Ohlin model on the basis that the notion of capital as primary factor has no method of measuring it before the determination of profit rate (thus trapped in a logical vicious circle). This was a second round of the Cambridge capital controversy, this time in the field of international trade.

The merit of neo-Ricardian trade theory is that input goods are explicitly included. This is in accordance with Sraffa's idea that any commodity is a product made by means of commodities. The limitation of their theory is that the analysis is restricted to small-country cases.

2.3.14 Traded intermediate goods

Ricardian trade theory ordinarily assumes that the labour is the unique input. This is a great deficiency as trade theory, for intermediate goods occupy the major part of the world international trade. Yeats found that 30% of world trade in manufacturing involves intermediate inputs. Bardhan and Jafee found that intermediate inputs occupy 37 to 38% of U.S. imports for the years 1992 and 1997, whereas the percentage of intra-firm trade grew from 43% in 1992 to 52% in 1997.

McKenzie and Jones emphasized the necessity to expand the Ricardian theory to the cases of traded inputs. In a famous comment McKenzie (1954, p. 179) pointed that "A moment's consideration will convince one that Lancashire would be unlikely to produce cotton cloth if the cotton had to be grown in England." Paul Samuelson coined a term *Sraffa bonus* to name the gains from trade of inputs.

2.3.15 Ricardo-Sraffa trade theory

Economist John S. Chipman observed in his survey that McKenzie stumbled upon the questions of intermediate products and postulated that "introduction of trade in intermediate product necessitates a fundamental alteration in classical analysis". It took many years until Shiozawa succeeded in removing this deficiency. The Ricardian trade theory was now constructed in a form to include intermediate input trade for the most general case of many countries and many goods. Chipman called this the Ricardo-Sraffa trade theory.

Based on an idea of Takahiro Fujimoto, who is a specialist in automobile industry and a philosopher of the international competitiveness, Fujimoto and Shiozawa developed a discussion in which how the factories of the same multi-national firms compete between them across borders. International *intra-firm competition* reflects a really new aspect of international competition in the age of so-called *global competition*.

2.3.16 International Production Fragmentation Trade Theory

Fragmentation and International Trade Theory widens the scope for "application of Ricardian comparative advantage". In his chapter entitled *Li & Fung, Ltd.: An agent of global production* (2001), Cheng used Li & Fung Ltd as a case study in the international production fragmentation trade theory through which producers in different countries are allocated a specialized slice or segment of the value chain of the global production. Allocations are determined based on "technical feasibility" and the ability to keep the lowest final price possible for each product.

An example of fragmentation theory in international trade is Li and Fung's garment sector network with yarn purchased in South Korea, woven and dyed in Taiwan, the fabric cut in Bangladesh, pieces assembled in Thailand and the final product sold in the United States and Europe to major brands. In 1995 Li & Fung Ltd purchased Inchcape Buying Services, an established British trading company and widely expanded production in Asia. Li & Fung supplies dozens of major retailers, including Wal-Mart Stores, Inc., branded as Walmart.

Trade or business needs to be managed with the timely application of need based competitive strategies for reaching the goals and successfully achieving the targets. Several trade policies and practices adopted over the yesteryears reviewed above clearly reveals the need for strategic management of any business or trade for achieving maximum benefit, both for buyers and sellers of any product.

.....ℰℛ.....

Chapter 3

FISHERY BUSINESS AND ITS CONTRIBUTION TO ECONOMIC DEVELOPMENT

Contents

Fisheries form an important sector of the Indian economy. Both as a nutritive food item for internal consumption and as a commodity that can earn foreign exchange, its importance is well known. The fish output comes from marine and inland sources and the growth of fish production is highly dependent on an efficient fish marketing system. Fishery sector in India gradually transformed as a commercial business enterprise in recent years with its large resource base and subsequent internal and external marketing potential. The importance of fishery business in India can be further assessed from the involvement of large number of people in production and marketing segments.

In the marine sector, fish are procured from about 2244-2251 landing centers located all along the 8129 km of coastline. The supply chain from inland sector is also scattered which is obtained from 27,000 km of rivers 1,13,000 km of canals, 1.75 million hectare of lakes, ponds and derelict water spread area. Fish production in the country has increased from 3.84 million tonnes in 1990-91 to 5.39 million tonnes during 1998-99, 6.4 million tonnes during 2008-09 and 9.45million tones during 2012-13 registering an average annual growth rate of 4.12 per cent during the period.

3.1 Fisheries in GDP

The fisheries sector contributed ₹ 33655 million to the Gross Domestic Product (GDP) during 2008-09 which was 0.81 per cent of the total GDP. forming about 5.17 per cent of agricultural GDP

Table 3.1 Contribution of fisheries sector to GDP of India (Current price)

Year	Total GDP	GDP from		Share in Total GDP (%)	Share in agricultural GDP(%)
		Agriculture (₹In million)	Fisheries ₹ In million)		
1970-71	39708	16821	245	0.62	1.46
1975-76	71,201	26551	567	0.80	2.13
1980-81	122,421	42466	921	0.75	2.17
1985-86	233799	69964	1974	0.84	2.82
1990-91	475604	135162	4556	0.96	3.37
1995-96	1103238	312791	12729	1.15	4.07
2000-01	1902998	423522	22535	1.18	5.32
2005-06	2616101	467984	23594	0.90	5.04
2006-07	2871118	487010	23594	0.85	4.99
2007-08	3129717	511274	25416	0.81	4.97
2008-09	4154973	650461	33655	0.81	5.17

Source: Economic Survey 2009- 10.

The contribution of fisheries in the GDP of India has shown a steady increase over the years (Table-3.1). The percentage contribution in total GDP as well as agriculture GDP by fisheries shown a steady increase indicating the emergence of fishery as a business enterprise in the Indian economy. In the last 25 years unlike agriculture, the contribution of fisheries sector to gross GDP continued to grow at a rapid pace because of expansion of culture fisheries enterprise. The share of agriculture and allied activities in the total GDP is constantly declining, it was 34.69 per cent in 1980-81 and declined gradually to become 15.65 per cent in 2008-09. In contrast, the contribution of fisheries sector to the total GDP has gone up from 0.75 per cent in 1980-81 to 0.81 per cent in 2004-05 (at current prices) similarly, the share of fisheries in agriculture GDP (Ag GDP) has increased robustly from 1.46 per cent in 1970-71 to 5.17 per cent in 2008-09. This sector is in fact pushing the agricultural growth upward for the past 5 and half decades

3.2 Marine and Inland fish production

Total fish production from the marine and inland sectors during the last five decades is presented in Table 3.2

Table 3.2 Fish Production in India from 1950-51 to 2008-09 (Lakh tonnes)

Sl.No	Year	Marine	Inland	Total
1	1950-51	5.34	2.18	7.52
2	1960-61	8.80	2.80	11.60
3	1970-71	10.86	6.70	17.56
4	1980-81	15.55	8.87	24.42
5	1990-91	23.00	15.36	38.36
6	2000-01	28.11	28.45	56.56
7	2004-05	27.79	35.26	63.05
8	2005-06	28.16	37.56	65.72
9	2006-07	28.00	38.00	66
10	2007-08	29.00	42.00	71.00
11	2008-09	29.00	47.00	76.00

Source: Department of Annual Husbandry, Dairying & Fisheries2011, Annual Report 2010-11, Ministry of Agriculture, Government of India.

The fish production in India witnessed a spectacular growth since independence. It rose from a mere 0.75 million tonnes in 1950-51 to over 6.57 million tonnes in 2005-06 and 7.6 million tonnes in 2008-09. In the initial years, marine sector used to contribute more to total fish production than inland sector. In 1950-51 marine production contributed about 71.01 per cent, which fell gradually to 42.77 per cent in 2005-06 and 38.5 per cent in 2008-09 while inland sector started contributing from 28.99 per cent in 1950-51 to about 57.23 per cent in 2005-08 and 61.5 per cent in 2008-09. In fact, by the year 2000, its share crossed 50 per cent and continues to improve its share further in the coming years.

Expansion of fleet capacity, technological innovation, and increases in investment all led to explosive growth in the exploitation of marine fisheries through the 1960s 1970s, and 1980s. But from the late 90s onwards, the marine fisheries production has reached a plateau and it seems that it can register only marginal increase in the near future. With most wild fisheries near maximum sustainable exploitation levels capture, fisheries will most likely to grow slowly.

On the other hand, inland fish production was on constant rise. The inland fisheries include both capture and culture fisheries. The capture fisheries have been the major sources of inland fish production till mid 1980s. But the fish production from natural waters like rivers, lakes etc followed a declining trend, primarily, due to proliferation of water control habitat degradation (Katiha and Datta, 2002). The depleting resources, energy crisis and resultant high cost of fishing etc. have led to increased realization of the potential and versatility of aquaculture on a sustainable and cost effective alternative to capture fisheries.

In the last 25 years, total fish production has been growth at an annual growth rate of about 4.60 per cent in which marine sector was growing at a rate of 3.24 and inland sector was growing at a rate of 6.20 per cent.

Table 3.3 Compound Growth rate of fish production, 1980-81 to 2005-06

Year	Marine	Inland	Total
1980-81 to 1989-90	3.80	5.28	4.39
1990-91 to 1999-00	2.33	6.55	4.13
2000-01 to 2005-06	-.21	5.37	2.75
1980-81 to 2005-06	3.24	6.20	4.60
1980-81 to 1980-91 (Pre-WTO)	4.35	5.43	4.78
1991-92 to 2005-06 (Pre-WTO)	0.84	5.71	3.18

Source: *Department of Animal Husbandry, /Dairying and Fisheries.*

In all Inland sector fared better in all the periods, voz, 1980-81 to 1989-90, 1990-91 to 1999-00 and 2000-01 to 2005-06. There seem to be lower pace in growth of this sector in the recent times, In contrast, marine sector is witnessing a negative growth rate in the period 2000-01 and 2005-06, which indicates the exhaustion of marine resources especially in the inshore and near shore water, where maximum harvest has happened. About 90 per cent of the present production from the marine sector is within a depth range of up to 50-70 m and the remaining 10 per cent from depth extending up to 200m.

The growth rates in pre and post WTO periods were also estimated. It is noticed that the pre WTO period witnessed an impressive growth rate of about 4.78 as compared to post WTO period (Table 3.3). This trend was mainly due to the marine sector, which is understandable by the fact that the country's fish export basket was dominated by marine species and buoyancy of marine export might have propelled the growth of marine catch, and vice versa. The post-WTO period imposed many quality regulations in items of SPS measures on developing countries like India, which couldn't create huge investment in the infrastructures required to produce export quality marine products that are acceptable to our trading partners, especially EU, USA and Japan. In contrast to the marine sector, inland sector continued to grow better in the post –WTO period also, which is possible because of enhanced public and private investment for inland fisheries sector especially through different development programmes and research by the Government of India since IV plan onwards that started delivering results continuously

3.3 Allocation under Five Year Plans

Allocation of funds to a particular sector is an indication of a push given for development of the sector. The outlay for fisheries sector was about 5.13 corers in the I Five Year Plan and it went up to to ₹ 2060-54 crore in the X plan.

Table 3.4 Plan outlay with share to agriculture & fisheries (₹ In crore)

Plan	Total	Agricultural	Fisheries
I	1960	294	5.13
II	4600	529	12.26
III	7500	1068	28.27
IV	15902	2728	82.68
V	36322	4302	151.24
VI	97500	6609	371.14
VII	218730	12793	546.54
VIII	434100	22467	1232.82
IX	859200	42462	2070.00
X	1525639	58933	2060.54

Source: Economic Survey 2010-11.

Its share in the total plan outlay was hovering from 0.26 per cent in I Plan to 0.52 per cent in IV Plan and decreasing thereafter continuously and it received only 0.14 per cent of total outlay in X plan In spite of that the sector has been growing at an annual growth rate of about per cent In the last 21/2 decades. Similarly, its share in agricultural outlay has increased form 1.74 per cent in I plan to 5.62 per cent in VI Plan and it is slowly declining since then and is about 3.50 per cent in X Plan.

However, the status of fisheries sub-sector is better, when compared to that of agricultural sector as a whole, because, the percent allocation to agricultural sector in the total plan outlay started decline from IV Five Year Plan onwards and is continuously decreasing further, which is a great concern for the sector's overall growth. It's share in I Plan was about 15.00 per cent and it went upto 17.16 per cent in IV Plan and is now only 3.86 per cent in X Plan. Considering the general importance given to agricultural sector, the preference received by the fisheries sub-sector in the plan outlays is still reasonable.

3.4 Growth of Fishing Fleets and Private Investment

The fishery sector of India has steadily grown over the years in terms of its production, investment, annual turn over, employment and exports. Besides the public investment, the private investment also contributed significantly for the growth of fisheries as a multi crore rupee industry. In the marine fishery sector, the private investment is incurred mainly for crafts and gears.

At present (2012-13) there are 2251 traditional landing centres, 33 minor and 6 major fishing harbours in the marine fisheries sector of India. About 2.39 lakh of fishing crafts are in operation comprising 104270 traditional non-mechanised fishing crafts, 75591 motorized crafts and 58911 mechanized crafts operating different gears as shown in Table 3.5.

Table 3.5 Growth rate of marine fishing fleets in India (1961-62 to 2003)

Year	SECTOR							
	Non-mechanised		Motorised		Mechanised		Total	
	Number	Growth Rate (%)	Number	Growth Rate (%)	Number	Growth Rate (%)	Number	Growth Rate (%)
1961-62	90424	---	---	---	---	---	90424	---
1973-77	106480	18	---	---	8086	---	---	---
1980	137000	29	---	---	19013	135	156013	73
1997	160000	17	32000	---	47000	147	239000	53
2003	76596	-52	50922	59	49070	4	176588	-26
2005	104270	+36.12	75591	48.44	58911	16.70	238772	+35.21

Source: CMFRI, 2005.

There is a definite trend of decline in the number of non-mechanised boats in recent years. As non-mechanised fleets are decreasing, there is a clear increase in motorized and mechanized boats due to their better technical efficiency and comparative economic advantage. In mechanized sector itself, growth rate of trawlers is increasing at a faster rate; especially boats with 15 m and more OAL which are capable for multi-day fishing. Many of our existing mechanized boats have now started operating even beyond 100 m depth resorting to multi-day fishing and the current trend is to go for higher OAL fitted with engines of higher horsepower. The trends in the growth rate of fishing units indicate the possible phasing out of non-mechanised Canoes at least in certain regions, which ultimately reflected a negative growth of 52 per cent by them during 1997-2003. This downtrend is compensated in the motorised sector implying large-scale motorisation of existing traditional crafts. Mechanised crafts displayed a major boom during 1980s and 1990s. The growth rates were 135 and 147 per cents respectively in 1980 and 1997, due to diversification and extended area of operation.

While mechanized trawlers and Gillnetters are common all over Indian coast, Dolnetters are popular in Gujarat and Maharashtra coasts, Purseseines in Goa, Kanataka and Kerala coasts, pair trawling in Tamil Nadu and Sona boats in Orissa coasts, depending on the regional and seasonal abundance of resources. When the technical efficiency of a particular gear is better than the other, automatically the lesser efficient gears are gradually replaced from the operation.

There are many fishing crafts, which are older up to 20 years, operating along the Indian coasts. The gross investment ranges from about ₹ 5, 000 for a small non-mechanised catamaran unit to ₹ 55 lakh for a trawler in the small-scale fisheries sector. There is drastic structural change in fishing fleets and capital investment in mechanised, motorised and non-mechanised sector of marine fisheries in 2003 (Table 3.6). The fishing fleets as well as capital investment witnessed significant growth rates in mechanised and motorised sectors. The capital investment has increased more than proportionate to the increase in fleet size not only due to increase in price level and consequent increase in capital requirements but also diversification of fishing units opting for bigger OAL boats with high HP and other accessories.

The gross capital investment on fishing units in Indian marine fisheries sector during 2008-09 works out at ₹13392 crore in which mechanised sector constitutes about ₹11439 crore, more than a three-fold increase of over 1996-97. The increase in investment on mechanised trawlers and gill-netters are comparatively higher than other sectors. The capital investment on motorised sector also more than doubled from ₹456 crore during 1996-97 to ₹1265 crore during 2008-09. However, as expected, the non-motorised sector has shown a decline in investment from ₹923 crore during 1996-97 to ₹688 crore during 2003-04 in tune with their decline in production and diminishing returns. Further, substantial numbers of these units were converted into motorised units. It may be noted that out of the total capital investments on fishing equipments, during 2008-09 85.42 per cent is constituted by mechanised sector, 9.45 and 5.14 per cents respectively by motorised and non-mechanised sectors.

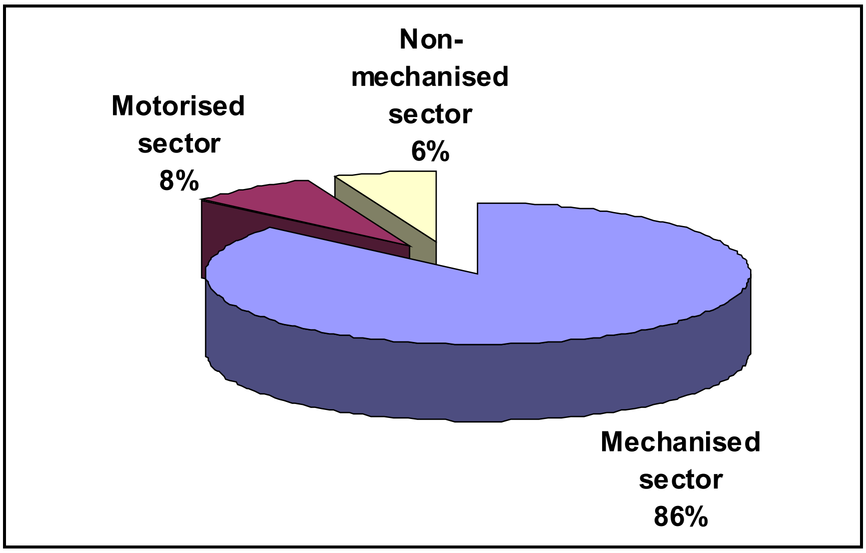

Fig. 3.1 Sector – Wise Share of Capital Investments in crafts & Gears (2003)

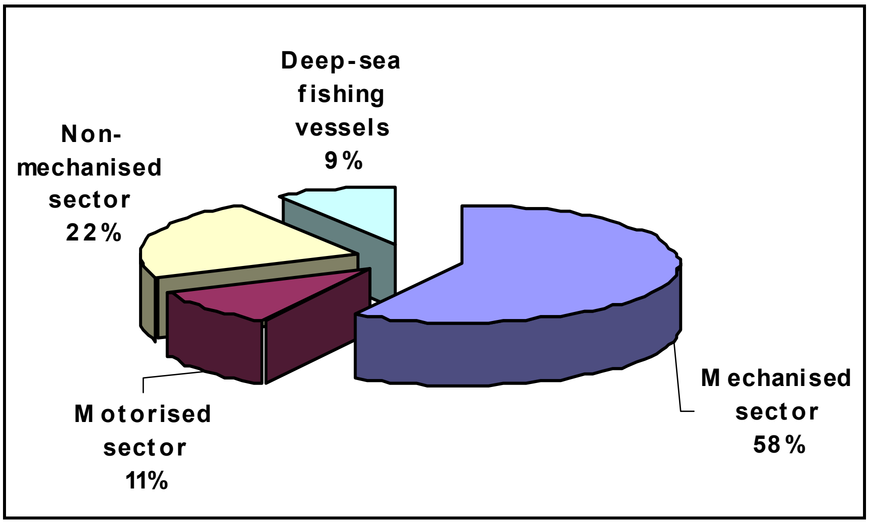

Fig. 3.2 Sector – Wise Share of Capital Investments in crafts & Gears (1997)

Table 3.6 Estimated Capital Investment in Crafts and Gears (1996-97,2003-04 and 2008-09)

Category	Investment (₹ Crore)		
	1996-97	**2003-04**	**2008-09**
a) Mechanised sector			
Trawlers	1879	**7875**	**9751**
Purse-seiners	134	181	222
Gillnetters	255	**724**	**853**
Dolnetters	49	**172**	**304**
Others	72	97	309
Sub total	**2388**	**9049**	**11439**
b) Motorised sector			
Dugout canoes	31	196	16
Catamarans	48	86	112
Plank-built boats	188	428	570
Others	188	151	567
Sub total	**456**	**861**	**1265**
b) Non-mechanised			
Dugout canoes	218	107	53
Catamarans	236	104	163
Plank Buit Boats	4192	401	458
Others	49	10	14
Sub total	**923**	**622**	**688**
TOTAL	**4117**	**10532**	**13392**

Source: *R. Sathiadhas, 2009.*

The overall per capita investments of an active fisherman in 2003-04 was ₹86,290 ranging from ₹17,024 in the non-mechanised sector to ₹ 2,19,319 in the mechanised sector. During 1996-97, the overall per capita investment was ₹40,363, where the investment per head in mechanised sector was ₹ 1,25,689, motorised and non-mechanised sectors invested ₹ 26,835 and ₹13,979 respectively per active fisherman in India. Currently (2008-09) the average percapita investment was ₹107172 per active fisherman ranging from ₹ 16496 in the non-mechanized sector to ₹265449 in the Mechased sector Further, fishing intensity is directly related with capital investment *vis-à-vis* number and type of nets they are possessing. A catamaran owner having different types of nets can have more number of fishing days. If he is having only one type of net, he will be having only lesser number of fishing days. In India, most of the non-mechanised fishermen are having one or two fishing nets, which are not sufficient for efficient operation for the whole year.

Table 3.7 Per Capita Investment on Fishing Equipments Per Active Fishermen in India – 1996-97, 2003-04 and 2008-09 (₹)

Sector	1996-97*	2003-04	2008-09
Mechanised	1,25,689	2,19,319	2,65,449
Motorised	26,835	19,454	31,501
Non-mechanised	13,979	17,024	16,496
Overall	**40,363**	**86,290**	**1,07,172**

Source : R. Sathiadhas, 2009.

In the open access marine fisheries, mode of ownership on means of production by fisherfolk greatly influences the occupational pattern and socio-economic status. The type and number of fishing implements owned is the yardstick to measure the economic well being of a fisher household. In India, hardly 13 per cent of the active fishermen in the marine fisheries sector have ownership on craft and gear in 2008-09 and another 3 per cent possess only gears. The proportion of owner operators in marine fisheries declined over the years with the increasing capital requirement for possessing motorized and mechanized fishing units.

The proportion of catch by mechanised sector as a whole increased from 40 per cent during 1980 to 68 per cent in 1997 and 74 per cent in 2008-09. At the same time, the number of active fishermen depending on mechanised fisheries increased from 1.14 lakh to 2 lakh and again increased to 4.3 lakh respectively during the same period. It should be noted that the annual per capita production of active fisherman during the period has increased from 5260kg in 1980 to 8130 kg in 1997 and drastically declined to 5432 kg in 2009

This clearly indicates the high prevalence of disguised unemployment in the mechanised fisheries sector.

3.5 Employment Scenario in Marine Fisheries Sector

The fisheries sector contribute the livelihood of a large section of economically underprivileged population in our country. More than 200 million people worldwide are fish workers which is just 3 percent of the global work agricultural labour force. Over 90 percent live in developing countries working in small –scale household based or artisanal fish enterprises. In India, about 14 million people are employed in this sector either directly or indirectly (FAO, 2007)

The pressure for employment in active fishing is increasing more than proportionate to the harvestable yield in the open access marine fisheries. The fishermen involved in active fishing is more than the absorbing capacity of the fisheries sector and has led to lower per capita production, increased pressure on fishing which results in juvenile fishing, large level discards and thus ultimately causing serious threats to resource sustainability and environmental stability.

In India, marine fisheries sector employs around three million people of which 12.47 lakh people arc in active fishing, 14.97 lakh in secondary sector avocations and two lakhs in tertiary sector. Out of the total employed, 59 percent of them hail from the coastal fishing villages alone. It is observed that some of the sea faring fishers also live in the nearby coastal villages. Seventy one percent of those employed in primary sector reside in coastal fishing villages (Table 3.8). Similarly, 51 percent of secondary sector workers and 42 percent of tertiary sector workers are from the coastal villages. The export orientation of marine fisheries sector has led to mushrooming of seafood export units doing varied activities like peeling, curing, preprocessing, processing and packing. These units have high employment potential and employ women in large numbers. Women living adjoining villages of fishing areas also are attracted to such jobs that have resulted in overcrowding effect leading to low wage rate. In secondary sector, around 30 percent are women workers of which 81 percent are residents of fishing villages in the coastal belt. The tertiary sector undertakes fishery allied activities in which no fishermen dominate.

Table 3.8. Employment pattern in marine fisheries and coastal fishing villages (2005)

Marine fisheries sector		Coastal fishing villages	
	Total number of people employed (Lakh)	Number of people Employed (Lakh)	Percent to total
Primary	12.47	8.89	71
Secondary	14.97	7.56	51
Tertiary	2.00	0.83	42
Total	29.44	17.28	59
Women in secondary sector	4.49	3.65	81

Source: Sathiadhas R. and Sangeetha, 2009

The state wise break up of the total people employed in primary and secondary sector in marine fisheries is given in Table 3.9. Fisher folk from the coastal fishing villages form a part of the total labour employed in marine fisheries. The primary sector workforce in marine fisheries was estimated on the basis of average employment pattern in the fishing crafts in the respective states. More than 90 percent of people from coastal villages are involved in active fishing in the states of Orissa, Andhra Pradesh, and Tamil Nadu and rest comes from adjacent villages and even from other states. In states like Karnataka, Goa, Maharashtra, and Gujarat less than half of the active fishermen are from fishing villages.

Table 3.9 State wise employment pattern in marine fisheries and coastal fishing villages

State	(A) Total employed in marine fisheries		(B) Inhabitants of coastal fishing villages		Percent of (B) to (A)	
	Primary	Secondary	Primary	Secondary	Primary	Secondary
West Bengal	1, 12,144	1,34,573	70,750 57,	54741	63	43
Orissa	1,34,669	1,61,603	1,21,282	1,52,534	90	94
A.P	1,47,289	176,747	1,38,614	1,52,892	94	87
Tamil Nadu	2,25,102	2,70,122	2,06,908	1,04,509	92	39
Pondichery	18,461	22,153	10,341	10,095	56	46
Kerala	1,94,816	2,33,779	1,40,222	71,074	72	30
Karnataka	1,05,721	1,26,865	37,632	45,699	36	36
Goa	16,237	19,484	2,515	3,382	15	17
Maharashtra	1,36,628	1,63,954	72,074	81,780	53	50
Gujarat	1,56,753	1,88,104	83,322	75,082	53	40
Total	**12,47,820**	**14,97,384**	**8,89,528***	**7,56,391**	**71**	**51**

** Total includes figures for Daman and Diu*
Source: CMFRI, 2005.

There are lots of people in the adjacent coastal transects and interior regions who find employment in fishing related fields, as the share of inhabitants of fishing villages to total secondary employment in marine fisheries ranges from 17 to 94 percent. It was found that Tamilnadu employs maximum people in the primary and secondary sector in marine fisheries. The estimated primary and secondary employment in marine fisheries does not incorporate the employment in Andaman & Nicobar Islands, Lakshadweep, and Daman and Diu. Hence, the actual employment in marine fisheries is likely to be more than the current estimate.

The overall dependency ratio of marine fisher folk in India is estimated to be 2.04 denoting that every person working in marine fisheries sector supports two persons. It varies across the states from 1.56 (Orissa) to 3.88

(Daman and Diu). Among those employed in marine fisheries, most of them are active fishermen while 43.75 percentage in secondary sector occupations and 4.80 percent are involved in other activities including tertiary sector (Table 3.10). However, majority of those employed in marine fisheries are in secondary sector in the states of Orissa, Andhra Pradesh on the East Coast and Karnataka, Goa, Maharashtra, and Gujarat on the West coast. Coupled with the intensity of marine fishing more people are involved in active fishing in

Table 3.10 State wise occupational pattern of coastal fisher folk in India (2005)

State	*Number of fisherfolk engaged in*			
	Primary Sector	**Secondary Sector**	**Other Sectors**	**Total**
West Bengal	70,750 (54.23)	57741 (44.26)	1,968 (1.51)	*130,459 (100)*
Orissa	121,282 (41.94)	152,534 (52.75)	15,359 (5.31)	*289,175 (100)*
Andhra Pradesh	138,614 (46.17)	152,892 (50.92)	8,727 (2.91)	*300,233*
Tamil Nadu	206,908 (63.81)	104,509 (32.23)	12,817 (3.95)	*324,234 (100)*
Pondichery	10,341 (46.72)	10,095 (45.61)	1697 (7.67)	*22,133 (100)*
Kerala	140,222 (62.43)	71,074 (31.64)	13,310 (5.93)	*224,606 (100)*
Karnataka	37,632 (41.43)	45,699 (50.31)	7,500 (8.26)	*90,831 (100)*
Goa	2,515 (39.30)	3,382 (52.85)	502 (7.84)	*6,399 (100)*
Maharashtra	72,074 (43.79)	81,780 (49.69)	10725 (6.52)	*164,579 (100)*
Gujarat	83,322 (49.36)	75,082 (44.48)	10,390 (6.16)	*168,794 (100)*
Daman and Diu	5,868 (77.73)	1,603 (21.23)	78 (1.03)	*7,549 (100)*
Total	*889,528 (51.45)*	*756,391 (43.75)*	*83,073 (4.80)*	*1,728,992 (100)*

**Figures in parenthesis denote percentage to total*
Source: CMFRI, 2005.

Tamil Nadu, Kerala, Andhra Pradesh, and Orissa. The quality concerns after the WTO, wide spread consumer preference and increased price for value added products in the international markets have increased the scope of secondary sector in fisheries. These developments have led to improvement in handling and processing facilities adjacent to export units adding to the employability. The fisher folk employment in other sectors ranged from l.03 (Daman and Diu) to 8.26 percent (Karnataka) in different states.

Table 3.11. State wise employment pattern in secondary sector in coastal villages (2005)

State	Marketing of fish	Making/ repairing net	Curing/ Processing	Peeling	Labourers	Others	Total
W.B	5237 (9.07)	15326 (26.54)	4705 (8.15)	478 (0.83)	26151 (45.29)	5844 (10.12)	57741 (100)
Orissa	31691 (20.78)	40252 (26.39)	27849 (18.26)	3167 (2.08)	37781 (24.77)	44794 (7.73)	52534 (100)
A.P	34337 (22.46)	23926 (15.65)	28319 (18.52)	2996 (1.96)	55372 (36.22)	7942 (5.19)	152892 (100)
T.N	36126 (34.57)	19051 (18.23)	6250 (5.98)	2107 (2.02)	25657 (24.55)	15318 (14.66)	104509 (100)
Pondi	6393 (63.33)	630 (6.24)	364 (3.61)	5 (0.05	714 7.07)	1989 (19.70)	10095 (100)
Kerala	17976 (25.29)	9560 (13.45)	3881 (5.46)	8057 (11.34)	17242 (24.26)	14358 (20.20)	71074 (100)
Karnataka	14327 (31.35)	7876 (17.23)	3342 (7.31)	581 (1.27)	14043 30.73)	5530 (12.10)	45699 (100)
Goa	1688 (49.91)	479 (14.16)	0	0	515 (15.23)	700 (20.70)	3382 (100)
Mahara	43822 (53.59)	9086 (11.11)	9209 (11.26)	1439 (1.76)	81780 14.14)	11565 (8.14)	6659 (100)
Gujarath	14885 (19.82)	13452 (17.92)	3212 (4.28)	4310 (5.74)	31366 (41.78)	7857 (10.46)	75082 (100)
D and D	880 (54.90)	80 (4.99)	II (0.69)	3 (0.19)	256 (15.97)	373 (23.27)	1603 (100)
Total	207362 (27.41)	139718 18.47)	87142 (11.52)	23143 (3.06)	220662 (29.17)	78364 (10.36)	756391 (100)

**Figures in parenthesis denotes percentage to total*
Source: Sathiadhas and Sangeetha 2009

The state wise break up of the secondary sector activities in marine fisheries is given in Table 3.11. In West Bengal, Andhra Pradesh, and Gujarat majority employed in secondary sector are engaged as contract labourers at landing centres to retail points. The major occupation of fisher folk engaged in secondary sector is marketing of fish in Maharashtra (53.59 percent), Goa (49.91 percent), Tamil Nadu (34.57 percent) and UT's Pondichery (63.33 percent) and Daman and Diu (54.90 per cent). Both marketing of fish and contract labourers are predominant in Orissa (20.78 percent, 24.77percent), Kerala (25.29 percent, 24.26 percent) and Kamataka (31.35 percent, 30.73 percent). In Orissa, Andhra Pradesh, and Maharashtra, curing/processing was taken up by significant portion of workforce within the secondary sector. In Kerala peeling work was predominantly undertaken in the secondary sector, mostly by women, due to the existence of more number of export units.

Employment in fisheries sector has undergone rapid structural changes during the last few decades. Among those engaged in the mechanized sector, 75 per cent work in trawl fisheries and the rest 25 per cent in other sectors. In the case of motorized sector, 50 per cent are engaged in ring seine fishery alone. There is a wide disparity in income between those engaged in different sectors. It may be noted that still non-mechanized sector is providing about 30 per cent of the employment in active fishing, yet harvesting hardly 7 per cent of the annual landings. Marginalisation of the indigenous non-motorised sector by the motorized and mechanized sectors frequently creates conflicts among fishers. The number of annual fishing days per worker reveals that the level of employment for hired labourers as well as those not having sufficient equipment is low and they are very much underemployed.

Till the end of 1960, export of Indian marine products mainly consisted of dried items like dried fish and dried shrimp. Although frozen items were present in the export basket from 1953 onwards in negligible quantities, it was only since 1961 the export of dried marine products was overtaken by export of frozen items leading to a steady progress in export earnings (MPEDA, 1991-99). With the devaluation of Indian currency in 1966 the export of frozen and canned items registered a significant rise. Frozen items continued to dominate the trade. Markets for Indian products also spread fast to developed countries from the traditional buyers in neighboring countries.

Before 1960, the markets of Indian marine products were largely confined to neighbouring countries like Sri Lanka, Myanmar (formerly Burma), Singapore etc. when our exports were dominated by dried items. This situation changed with the development of technology/modernization; dried products gave way to canned and frozen items. The product shift also resulted in market shift. More sophisticated and affluent markets viz. Japan, USA, Europe, Australia, etc. became our important buyers (MPEDA, 2005. Several seafood processing units with modern machinery for freezing and production of value added products were set up at all important centers in the country for export processing.

For a long time USA was the principal buyer for our frozen shrimp but after 1977, Japan emerged as the principal buyer of the product, followed by the West European countries. Japan retained its position till 2001-02 as the single largest buyer for our marine products accounting for about 31 per cent in the total export value (www.mpeda.com). During the year 2002-03 and 2003-04 USA emerged as the single largest market for our marine products. During the year 2004-05, the European Union has collectively become the largest importer of Indian marine products and it retained its position since 2005-06. During 2008-09 European Union (EU) continued as the largest market with a percentage share of 32.6 per cent in $ realization followed by China 14.8 per cent, Japan 14.6 per cent, USA 11.9 per cent, South East Asia 10 per cent, Middle East 5.5 per cent and Other Countries 10.6 per cent. The export of marine products has steadily grown over the years - from a mere ₹3.92 crore in 1961-62 to ₹8607.94 crore in 2008-09(MPEDA, 2010-11). Marine products account for approximately 1.1 per cent of the total exports from India.

Thus the subsistence fishery industry of yester years has transformed into a multi-crore rupee industry in India with marine and inland sectors providing enormous employment opportunities, investment options in production and marketing including exports. The export of marine products enabled the fast growth of fishery related infrastructure over the years. The ever increasing internal marketing and exports made fishery as an attracting business with wide ranging options for small as well as big entrepreneurship. The parallel development of domestic fish marketing system along with export marketing attracted more investment both in the production and marketing segments of fisheries. Besides the public investment, the huge private investment also contributed significantly for the growth of Indian fisheries and consequent economic development.

…..ꕥ…..

Chapter 4

SUPPLY – DEMAND DIMENSIONS OF MARINE FISHERIES

Contents

4.1 Production and Supply Trend

The fish production in the country is from marine and inland fish sectors. The fish production (which is the supply of fish) increased from about 0.752 mt in 1950-51 to 7.6 mt in 2008-09 (Table 4.1)

Table 4.1 Fish production & growth rate 1950-51 to 2008-09

	Fish production (mt)			Avg. annual growth rate (%)		
Year	**Marine**	**Inland**	**Total**	**Marine**	**Inland**	**Total**
1950-51	0.534	0.218	0.752			
1960-61	0.880	0.280	1.160	5.12	2.53	4.43
1970-71	1.086	0.670	1.756	2.13	9.12	4.23
1980-81	1.555	0.887	2.442	3.65	2.85	3.35
1990-91	2.300	1.536	3.8	3.99	5.64	4.62
2000-01	2.800	2.800	5.6	1.99	6.19	3.86
2003-04	3.0	3.400	6.4	2.33	6.69	4.55
2004-05	2.8	3.500	6.3	-6.67	2.94	-1.56
2005-06	2.8	3.800	6.6	0	8.57	4.76
2006-07	3.0	3.800	6.8	7.14	0	3.03
2007-08	2.9	4.200	7.1	-3.3	10.53	4.41
2008-09	2.9	4.700	7.6	0	11.90	7.04

Note: The growth rate prior to 1992-93 represents average compound growth rate

Source: 1. CMFRI Annual Reports

2. MPEDA 2010-11.

During the last six decades the fish production has gradually increased from 0.752 mt in 1950-51 to 7.6 mt in 2008-09 nearly a ten fold increase. Between the two major sectors of supply marine and inland, the marine fish production increased from 0.51 mt in 1950-51 to 2.9 mt in 2008-09, reaching a peak landing of 3.0 mt in 2006-07. The marine fish production is almost fast approaching the maximum harvestable potential of 3.934 mt, which indicates that further increase in fish production from marine capture fisheries limited.

In the mean time the inland fish production recorded a sustained gradual increase from 0.218 mt in 1950-51 to 4.7 million tonne in 2008-09 (ie twenty fold increase) during the last six decades. The average annual growth rate in marine fish production showed a continual decline from 1980-81 to 2004-05 and became negative in 2004-05. the negative growth rate may be attributed to the “tsunami” of 2004, which left the fishing activities stranded till the middle of 2005 in states of Tamil Nadu, Pondicherry, a portion of Andhrapradesh and Kerala.

4.2 Marine Fish Landings in India

Indian fishery is multi species with about 83 groups of fishery (CMFRI, 2014). The species-wise marine fish landing in India from 2000 to 2009 is presented in Table 4.2 (actual landing figure in t) and Table 4.3 (percentage share of different resource groups).

Among the different species of fish varieties, oil sardines, croakers, ribbon fishes, Indian mackerels, penaid prawns and non penaid prawns consistently contributed above 2.1 million tonnes of the total marine fish landing during 2000-09 with oilsardine topping the list with a share of 11.68 per cent to - 17.21 per cent.

Table 4.2 Species wise Landing of Marine From During 2008-09

Species wise All-India Marine fish landings 2000-2009											
sp_code	**sp_name**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
1	ELASMOBRANCHS	0	0	0	0	0	0	0	0	0	0
2	Sharks	47048	33703	36877	29277	35215	26139	29094	26598	26710	29129
3	Skates	2538	2164	2579	2543	3378	3249	3018	2822	3530	3742
4	Rays	21788	20074	19516	25023	19990	16940	18566	16696	18219	19906
5	Eels	9165	8198	9249	10232	7998	8548	10265	12789	10804	12408
6	Catfishes	57061	49139	57612	53469	52137	45422	56540	65337	92357	107573
7	CLUPEIDS	0	0	0	0	0	0	0	0	0	0
8	Wolf herring	12277	13425	16548	14521	14330	14652	15519	15490	23241	22137
9	Oil sardine	367537	267790	344103	403952	381448	334862	394598	496988	444613	414767
10	Other sardines	77720	73182	99693	99202	87065	69129	89041	95096	116101	101054
11	Hilsa shad	10747	16756	23758	37897	62925	32004	37372	52905	58875	52051
12	Other shads	10076	3204	4305	4643	4288	5781	10720	11398	7560	6103
13	Anchovies	0	0	0	0	0	0	0	0	0	0
14	Coilia	34405	31956	39759	37950	33455	33760	27607	28760	31270	30518
15	Setipinna	4601	3445	6556	5371	5055	5090	3596	9441	10040	13036
16	Stolephorus	44276	43157	42675	40526	47773	27860	32704	51681	87723	56824
17	Thrissina	31	1	0	0	75	0	0	0	5	0
18	Thryssa	29672	28851	31038	26703	25249	41262	32000	34950	36263	38204

19	Other clupeids	45792	43539	43609	38068	36494	39944	41786	65031	69951	83024
20	BOMBAYDUCK	96684	85836	123029	130391	112954	122353	118507	112273	104972	112279
21	LIZARD FISHES	26798	24331	26490	29863	35911	30543	30311	28526	52439	59497
22	HALF BEAKS& FULL BEAKS	6570	3955	5499	5226	3371	2553	4070	6062	6552	6308
23	FLYING FISHES	3631	5692	6204	4849	2566	917	949	2117	1559	1458
24	PERCHES	0	0	0	0	0	0	0	0	0	0
25	Rock cods	24878	25885	25539	16890	18213	18468	22168	23261	19608	17586
26	Snappers	6271	4004	4966	6000	6974	5732	4451	4916	8598	7676
27	Pig-face breams	11097	13205	11395	10537	11264	9569	11009	10612	11821	17004
28	Threadfin breams	116691	114410	110388	104925	118899	88367	111317	93160	127728	130728
29	Other perches	55288	43893	48140	37764	37903	34609	45595	53361	83985	50819
30	GOATFISHES	15799	10411	12007	12459	16295	17053	16394	16494	22251	30031
31	THREADFINS	8527	6767	9471	9814	8827	8839	8316	9203	10003	11767
32	CROAKERS	171787	121234	123142	122397	120186	115537	119405	169494	181838	195934
33	RIBBON FISHES	182666	175364	196633	147998	131002	114115	235045	131733	145489	138592
34	CARANGIDS	0	0	0	0	0	0	0	0	0	0
35	Horse Mackerel	22178	18982	21230	30927	25718	29850	24901	28285	30750	34042
36	Scads	25575	40914	38625	28493	41693	54438	39409	43400	35793	54018
37	Leather-jackets	7335	6957	6238	10545	11520	9914	8547	11606	12434	12591
38	Other carangids	54038	49214	58693	57572	54419	48754	49079	57998	69868	75000
39	SILVERBELLIES	48123	50404	59446	47134	51417	58846	64626	70978	70059	68480

40	BIG-JAWED JUMPER	6190	4913	3985	3122	3280	3281	5092	6153	8625	13626
41	POMFRETS	0	0	0	0	0	0	0	0	0	0
42	Black pomfret	12719	12731	12362	15635	17494	14812	15163	13776	18880	17959
43	Silver pomfret	24483	24748	25030	21497	19605	25969	25516	31664	29281	31733
44	Chinese pomfret	853	1147	2042	1988	2024	4001	3379	3016	3834	3478
45	MACKERELS	0	0	0	0	0	0	0	0	0	0
46	Indian mackerel	134020	88576	94014	111880	141774	125424	141918	180117	158913	185932
47	Other mackerels	0	4	19	5	0	0	1	0	14	196
48	SEER FISHES	0	0	0	0	0	0	0	0	126	0
49	S. commersoni	36148	27226	35915	33797	32804	28148	38398	40309	32889	30384
50	S. guttatus	13152	14395	15943	14985	14487	12231	10595	20302	23796	21655
51	S. lineolatus	53	39	14	0	3	0	6	177	16	16
52	Acanthocybium spp.	80	149	24	24	195	198	41	13	61	227
53	TUNNIES	0	0	0	0	0	0	0	0	0	0
54	E. affinis	20602	18204	21156	18841	17555	22186	30607	27752	32406	25590
55	Auxis. spp	7962	9632	10251	12397	6632	5786	16175	11458	8693	8062
56	K. pelamis	3076	1531	1933	1445	2123	1615	3330	3085	13088	7604
57	T. tonggol	8497	7568	5296	3362	5782	4515	6115	7036	5966	3331
58	Other tunnies	6197	3304	3813	8636	5919	5825	7779	16930	19534	16131
59	BILL FISHES	3195	3992	3751	4256	6650	2967	4397	5447	6054	9073
60	BARRACUDAS	17371	17648	16812	14069	13627	15854	17751	19478	19156	23052

61	MULLETS	5223	4698	5476	4114	6086	6542	7260	6183	8407	6824
62	UNICORN COD	492	482	891	900	808	716	639	564	801	724
63	FLAT FISHES	0	0	0	0	0	0	0	0	0	0
64	Halibut	1732	962	1171	1167	1047	1107	1328	941	1001	938
65	Flounders	171	251	148	50	122	119	32	105	156	134
66	Soles	50333	37979	40428	44592	35033	34733	37747	40841	38331	44572
67	CRUSTACEANS	0	0	0	0	0	0	0	0	0	0
68	Penaeid prawns	204277	176448	203801	214780	171641	172099	172460	195599	214795	245159
69	Non-penaeid prawns	151515	145232	137714	137229	116231	121107	170787	138983	187985	168415
70	Lobsters	2431	1389	1332	1245	1371	1201	1551	1523	1977	1872
71	Crabs	48253	29739	36051	41976	40900	37182	51067	40420	55697	47897
72	Stomatopods	46141	34944	48551	37341	32071	21187	30551	25163	30500	27379
73	MOLLUSCS	0	0	0	0	0	0	0	0	0	0
74	Bivalves	219	1395	3142	323	157	215	4583	5974	8893	2771
75	Gastropods	524	617	1617	1411	1927	1273	2373	1326	1849	1626
76	Cephalopods	111616	101270	103979	117281	112754	97069	136041	94077	160667	123639
83	MISCELLANEOUS	76733	81448	87972	75586	101996	53029	51781	90588	85747	121168
	Total	2652928	2292703	2589645	2587095	2538105	2295490	2710988	2888461	3211147	3205453

Source: CMFRI Annual Reports 2000-2009

Table 4.3. Percentage Contribution by Different Varieties

sp_code	sp_name	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1	ELASMOBRANCHS	0	0	0	0	0	0	0	0	0	0
2	Sharks	1.77	1.47	1.42	1.13	1.39	1.14	1.07	0.92	0.83	0.91
3	Skates	0.10	0.09	0.10	0.10	0.13	0.14	0.11	0.10	0.11	0.12
4	Rays	0.82	0.88	0.75	0.97	0.79	0.74	0.68	0.58	0.57	0.62
5	Eels	0.35	0.36	0.36	0.40	0.32	0.37	0.38	0.44	0.34	0.39
6	Catfishes	2.15	2.14	2.22	2.07	2.05	1.98	2.09	2.26	2.88	3.36
7	CLUPEIDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Wolf herring	0.46	0.59	0.64	0.56	0.56	0.64	0.57	0.54	0.72	0.69
9	Oil sardine	13.85	11.68	13.29	15.61	15.03	14.59	14.56	17.21	13.85	12.94
10	Other sardines	2.93	3.19	3.85	3.83	3.43	3.01	3.28	3.29	3.62	3.15
11	Hilsa shad	0.41	0.73	0.92	1.46	2.48	1.39	1.38	1.83	1.83	1.62
12	Other shads	0.38	0.14	0.17	0.18	0.17	0.25	0.40	0.39	0.24	0.19
13	Anchovies	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	Coilia	1.30	1.39	1.54	1.47	1.32	1.47	1.02	1.00	0.97	0.95
15	Setipinna	0.17	0.15	0.25	0.21	0.20	0.22	0.13	0.33	0.31	0.41
16	Stolephorus	1.67	1.88	1.65	1.57	1.88	1.21	1.21	1.79	2.73	1.77
17	Thrissina	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	Thryssa	1.12	1.26	1.20	1.03	0.99	1.80	1.18	1.21	1.13	1.19
19	Other clupeids	1.73	1.90	1.68	1.47	1.44	1.74	1.54	2.25	2.18	2.59

20	BOMBAYDUCK	3.64	3.74	4.75	5.04	4.45	5.33	4.37	3.89	3.27	3.50
21	LIZARD FISHES	1.01	1.06	1.02	1.15	1.41	1.33	1.12	0.99	1.63	1.86
22	HALF BEAKS&FULL BEAKS	0.25	0.17	0.21	0.20	0.13	0.11	0.15	0.21	0.20	0.20
23	FLYING FISHES	0.14	0.25	0.24	0.19	0.10	0.04	0.04	0.07	0.05	0.05
24	PERCHES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	Rock cods	0.94	1.13	0.99	0.65	0.72	0.80	0.82	0.81	0.61	0.55
26	Snappers	0.24	0.17	0.19	0.23	0.27	0.25	0.16	0.17	0.27	0.24
27	Pig-face breams	0.42	0.58	0.44	0.41	0.44	0.42	0.41	0.37	0.37	0.53
28	Threadfin breams	4.40	4.99	4.26	4.06	4.68	3.85	4.11	3.23	3.98	4.08
29	Other perches	2.08	1.91	1.86	1.46	1.49	1.51	1.68	1.85	2.62	1.59
30	GOATFISHES	0.60	0.45	0.46	0.48	0.64	0.74	0.60	0.57	0.69	0.94
31	THREADFINS	0.32	0.30	0.37	0.38	0.35	0.39	0.31	0.32	0.31	0.37
32	CROAKERS	6.48	5.29	4.76	4.73	4.74	5.03	4.40	5.87	5.66	6.11
33	RIBBON FISHES	6.89	7.65	7.59	5.72	5.16	4.97	8.67	4.56	4.53	4.32
34	CARANGIDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	Horse Mackerel	0.84	0.83	0.82	1.20	1.01	1.30	0.92	0.98	0.96	1.06
36	Scads	0.96	1.78	1.49	1.10	1.64	2.37	1.45	1.50	1.11	1.69
37	Leather-jackets	0.28	0.30	0.24	0.41	0.45	0.43	0.32	0.40	0.39	0.39
38	Other carangids	2.04	2.15	2.27	2.23	2.14	2.12	1.81	2.01	2.18	2.34
39	SILVERBELLIES	1.81	2.20	2.30	1.82	2.03	2.56	2.38	2.46	2.18	2.14
40	BIG-JAWED JUMPER	0.23	0.21	0.15	0.12	0.13	0.14	0.19	0.21	0.27	0.43
41	POMFRETS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

42	Black pomfret	0.48	0.56	0.48	0.60	0.69	0.65	0.56	0.48	0.59	0.56
43	Silver pomfret	0.92	1.08	0.97	0.83	0.77	1.13	0.94	1.10	0.91	0.99
44	Chinese pomfret	0.03	0.05	0.08	0.08	0.08	0.17	0.12	0.10	0.12	0.11
45	MACKERELS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46	Indian mackerel	5.05	3.86	3.63	4.32	5.59	5.46	5.23	6.24	4.95	5.80
47	Other mackerels	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
48	SEER FISHES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49	S. commersoni	1.36	1.19	1.39	1.31	1.29	1.23	1.42	1.40	1.02	0.95
50	S. guttatus	0.50	0.63	0.62	0.58	0.57	0.53	0.39	0.70	0.74	0.68
51	S. lineolatus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
52	Acanthocybium spp.	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01
53	TUNNIES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
54	E. affinis	0.78	0.79	0.82	0.73	0.69	0.97	1.13	0.96	1.01	0.80
55	Auxis. spp	0.30	0.42	0.40	0.48	0.26	0.25	0.60	0.40	0.27	0.25
56	K. pelamis	0.12	0.07	0.07	0.06	0.08	0.07	0.12	0.11	0.41	0.24
57	T. tonggol	0.32	0.33	0.20	0.13	0.23	0.20	0.23	0.24	0.19	0.10
58	Other tunnies	0.23	0.14	0.15	0.33	0.23	0.25	0.29	0.59	0.61	0.50
59	BILL FISHES	0.12	0.17	0.14	0.16	0.26	0.13	0.16	0.19	0.19	0.28
60	BARRACUDAS	0.65	0.77	0.65	0.54	0.54	0.69	0.65	0.67	0.60	0.72
61	MULLETS	0.20	0.20	0.21	0.16	0.24	0.28	0.27	0.21	0.26	0.21
62	UNICORN COD	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02
63	FLAT FISHES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

64	Halibut	0.07	0.04	0.05	0.05	0.04	0.05	0.05	0.03	0.03	0.03
65	Flounders	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00
66	Soles	1.90	1.66	1.56	1.72	1.38	1.51	1.39	1.41	1.19	1.39
67	CRUSTACEANS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
68	Penaeid prawns	7.70	7.70	7.87	8.30	6.76	7.50	6.36	6.77	6.69	7.65
69	Non-penaeid prawns	5.71	6.33	5.32	5.30	4.58	5.28	6.30	4.81	5.85	5.25
70	Lobsters	0.09	0.06	0.05	0.05	0.05	0.05	0.06	0.05	0.06	0.06
71	Crabs	1.82	1.30	1.39	1.62	1.61	1.62	1.88	1.40	1.73	1.49
72	Stomatopods	1.74	1.52	1.87	1.44	1.26	0.92	1.13	0.87	0.95	0.85
73	MOLLUSCS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
74	Bivalves	0.01	0.06	0.12	0.01	0.01	0.01	0.17	0.21	0.28	0.09
75	Gastropods	0.02	0.03	0.06	0.05	0.08	0.06	0.09	0.05	0.06	0.05
76	Cephalopods	4.21	4.42	4.02	4.53	4.44	4.23	5.02	3.26	5.00	3.86
83	MISCELLANEOUS	2.89	3.55	3.40	2.92	4.02	2.31	1.91	3.14	2.67	3.78
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Compiled from CMFRI Annual Reports 2000-2009

Resources like cat fishes, other sardines. Bombay duck, thread fin breams, other perches, other carangids, and cephalopods shared consistently 24 per cent of the total marine fish landing during 2000-09 with cephalopods heading the list with a share of 4.21 per cent to 5.02 per cent

4.3 Sectoral Contribution of Marine Fish Landings

The Indian EEZ of 2.02 million sq.km houses a sustainable harvestable potential of 3.394 million tonnes of fishery resources. This resource potential is harvested by about 2.38 lakh fishing craft comprising mechanized, motorized and traditional or non-mechanised fishing craft.

The contribution of mechanized, motorized and non- mechanized craft during 1999-2000 is presented in Table 4.4. It is seen from the Table that the mechanized landing increased from 1.57 million tonnes (65 per cent to total marine fish landings) in 1999 to 2.34 mt (74.1) in 2009 indicating the intrinsic characteristics of the mechanized fishing units.

Table 4.4 Sector wise marine fish production in India (1999-2009)

Year	Mechanised Landings (mt)	Motorised Landings (mt)	Non mechanized Landings (mt)	Total Landings (in mt)
1999	1.57	0.63	0.22	2.42
2000	1.78	0.70	0.22	2.7
2001	1.56	0.58	0.19	2.33
2002	1.79	0.66	0.19	2.64
2003	1.76	0.72	0.19	2.66
2004	1.73	0.64	0.18	2.54
2005	1.57	0.59	0.11	2.28
2006	1.92	0.65	0.14	2.71
2007	1.96	0.81	0.12	2.88
2008	2.38	0.71	0.12	3.21
2009	2.34	0.70	0.13	3.16

Source: Compiled from CMFRI Annual Report, 2000-2009

Similarly the motorised landings also increased from 0.63 mt (26 per cent) in 1999 to 0.70 mt (22 per cent), though the actual landings increased their share in the total landings declined.

Table 4.5 Sector wise marine fish production in India (1999-2009) (percent share)

Year	Mechanised Landing (mt)	Motorised Landing (mt)	Non mechanized Landing (mt)
1999	65	26	9
2000	66	26	8
2001	67	25	8
2002	68	25	7
2003	66	27	7
2004	68	25	7
2005	69	26	5
2006	71	24	5
2007	68	28	4
2008	74	22	4
2009	74	22	4

Source: Compiled from CMFRI Annual Report 2000-2009

The landing of non-mechanised craft declined both in terms of actual landings and also in terms of their share from 0.22 mt (9 per cent) in 1999 to 0.13 mt (4) in 2009. This can be due to the gradual phasing out of the traditional or non-mechanised fishing units in favour of motorized units during the last decade.

Table 4.6 Average catch per trip

(in kg/trip)

Year	Mechanised	Motorised	Non-mechanised
1991	461	190	57
1992	363	180	52
1993	364	139	48
1994	508	126	54
1995	307	189	51
2004	722	113	45
2005	682	130	35
2006	740	118	43
2007	803	139	44
2008	938	133	54

Source: Compiled from CMFRI Annual Report 2000-2009

Table 4.7 Catch per unit trip

Year	Mechanised	Motorised	Non-mechanised
1991	461	190	57
1995	307	189	51
2004	722	113	45
2005	682	130	35
2006	740	118	43
2007	803	139	44
2008	938	133	54

Source: Compiled from CMFRI Annual Report 2000-2009

Table 4.8 Catch per actual fishing hour

Year	Mechanised	Motorised	Non-mechanised
2004	55.3	32.0	2.5
2005	57.8	35.5	1.6
2006	58.3	41.2	1.8
2007	56.9	48.0	1.5
2008	68.6	56.4	1.6

Source: Compiled from CMFRI Annual Report 2000-2009

4.4 Demand for Fish

Fish is an important source of animal protein to the malnourished Indian population. It is comparatively cheaper source of animal protein for the vulnerable section of the Indian population.

The awareness of the Indian population on the nutritive value of fish and the increase in health consciousness of the high income group has led to an increased demand for fish. Now the domestic market for fish has extended up to 500-600 km away fro the landing centre

With such a development, an attempt has been made to estimate the demand for fish in India in 2020. The total fish production during 2008-09 was 7.6 mt (Economic survey, 2009-10) comprising 2.9 million tonnes from marine and 4.7 mt from inland sector. The population of India was projected at 160,813,000 (1.2 billion) by 2009. The per capita availability of fish including seafood exports was estimated at 6.57kg $\frac{76{,}00{,}000{,}000}{1{,}160{,}813{,}000} = 6.45 = 6.57)$.

Assuming that 12 per cent of the total fish production by live weight being exported, the available fish for domestic consumption being 668,80,00,000 kg

ie 76,00,000,000 – 91,20,00,000 =668,80,00,000

Thus the per capita fish availability excluding exports for the total population would be 5.7 kg

$$\frac{668{,}80{,}00{,}000}{1{,}160{,}813{,}000} = 5.68 = 5377$$

Presently the fish eating population of the country is estimated to be 56 per cent (MPEDA, 2006) and thus the per capita fish consumption for the fish eating population is 10.28kg

Ie 56 per cent of the 2009 census population = 650055280

Fish available for fish eating population = 6688000000

Per capita fish consumption = $\frac{668{,}80{,}00{,}000}{650055280} = 10.149$

= 10.28

4.5 Population and fish food scenario in 2020

The census of India has projected the Indian population by 2020 at 1,326,155,000 ie 1.326 billion (www.census of India.gov.in) considering the per capita nutritional requirement at 15 kg, the total quantity of fish production to be attained to meet this requirement will be 19.89 mt (1,326,155,000 x 15/10,00,000). However, the fish eating population of the country which is now at 56 per cent is assumed to reach 60 per cent by 2020AD. Hence the to quantity of fish to be produced to meet their nutritional requirement will be 11.94 million tonne.

Calculation

Population by 2020 AD = 1,326,155,000

Fish eating population (60 per cent) by 2020 = 79,56,93,000

Nutritional requirement = 15 kg/per capita

Total requirement $= \frac{79,56,93,000}{10,00,000} \times 15 = 11.94 \text{ mt}$

The supply of fish to meet this requirement is far below the estimated figures of 19.89 mt or 11.94 mt respectively for both the whole population and fish eating population. The projected fish production from marine sector is 4.01 mt at and assured 3 per cent growth rate and from inland sector is 7.24 per cent at and assured 4 per cent growth rate. Hence the total fish production by 2020 is estimated at (4.01 + 7.24) = 11.25 mt, which again falls short of 11.94 mt, the quantity demanded for the fish eating population by 2020. With limited scope for the expansion of increasing production from capture fisheries, programmes like open sea cage farming, fish aggregating devices, breeding programme of premium species should be launched throughout the Indian EEZ.

…..ഇൽ…..

Chapter 5

ECONOMICS OF FISHING OPERATIONS IN KERALA COAST

Contents

The comprehensive Marine Fishing Policy announced by the Government of India in 2004, aims to (i) augment marine fish production of the country up to the sustainable level in a responsible manner so as to boost export of seafood from the country and also to increase per capita fish protein intake of the masses, (ii) ensure socio-economic security of the artisanal fishermen whose livelihood solely depends on this vocation, and (iii) ensure sustainable development of marine fisheries with due concern for ecological integrity and biodiversity. It is well known that several technological options with varying investment ranges are available to the marine fishermen. Each type of craft-gear combination has its own merits and demerits. The co-existence of these innumerable techniques are imperative due to the seasonal nature of marine fishes(Anderson 1984). Detailed information on the costs and earnings and comparative economic efficiency of different methods of fishing are very essential for the investors and stake holders to decide the appropriate technology (Babu Paul, 1982). The options of different technologies are mostly based on profitability. Further the production sector of marine fisheries consist of (i) mechanized (ii) motorized (iii) artisanal sub sectors and the balanced growth of all these sectors should be taken care of in the development process

5.1 Technological Advances in Fishing Craft and Gear in Kerala

A wide array of fishing gears and practices ranging from small-scale artisanal to advanced mechanized systems are used for fish capture. Over the years, traditional fishing gears have been upgraded and newer more efficient fishing systems have been introduced (Ammini, 1999). Most important among these fish harvesting systems are trawls, seines, lines, gillnets and entangling nets and traps. Among the most significant developments which affected the historical evolution of fishing gear and practices around the world have been (i) developments in craft technology and mechanization of propulsion, gear and catch handling(ii) introduction of synthetic gear materials (iii) developments in acoustic fish detection and satellite-based remote sensing techniques (iv) advances in electronic navigation and position fixing equipment (v) awareness of the need for responsible fishing to ensure sustainability of the resource, protection of the biodiversity and environmental safety and energy efficiency.

The erstwhile Indo-Norwegian Project which was formed as a result of a tripartite technical co-operation agreement signed in 1952 between India, the USA and the United Nations for fisheries development, has made important contributions in traditional crafts motorization and mechanization (CMFRI, 1987). Central Institute of Fisheries Technology (formally Central Fisheries Technological Research Station) was established in Cochin in 1957, with the objectives of development of fishing industry in India. The programme for mechanization of the existing traditional crafts began with the posting of FAO naval Architects to the Research Station. In 1955 experimental shrimp trawling was conducted with 6.6 m LOA 10 hp open motor boat, off Malabar coast using a

Gulf of Mexico type flat trawl of 9.6m head line and consistently impressive catches of shrimp was obtained from the shallow coastal waters of 4-18 m depth (Balakrishnan Nair 1991, Balan & Andrews 1995) This finding gave a major fillip in commercial shrimp trawling in India and an increasing demand for shrimps for the processing industry caused rapid development of the otter trawling in Indian waters. This was soon followed by various technological developments including offshore expansion in the area of operation. At present the focus is to expand the fisheries into even deeper water and diversification of fishing to areas such as tuna long lining.

Major technological changes that have taken place in the capture fisheries have been:

- Introduction and popularization of synthetic fishing gear materials
- Introduction of trawling in mid-1950s.
- Continuous expansion in mechanized fleet in terms of numbers and capacity.
- Improvement in efficiency and diversification of trawls, purse seines, gillnets and lines, for mechanized sector.
- Expansion of fishing grounds for harvesting deep sea prawns, lobsters and cephalopods.
- Continuous improvement in size, endurance, installed engine power, winch capacities, fish-hold, freshwater and fuel capacities of mechanized trawlers to enable multi-day fishing, since, mid1980s.
- Continuous improvement in size , endurance, installed engine power, fish-hold freshwater and fuel capacities of mechanized gill-netters /liners to enable multi-day distant water fishing.

- Adoption of modern technologies such as echo sounder and GPS on a wider scale.
- Chartering and joint venture schemes under New Deep Sea fishing Policy (1991).
- Motorization of traditional fishing crafts in 1980s and expansion of fishing grounds of traditional motorized fleet.
- Continuous improvement of traditional fishing units, in terms of craft modernization, gear materials, gear efficiency and gear dimensions.
- Introduction of ring seines in commercial fishing in 1986.
- Displacement of traditional boat seine by ring seines.
- Rapid expansion of ring seine units in terms of numbers, continuous increase in size of crafts horsepower of OBM, changes in cats materials, continuous increase in overall dimensions of the ring seines and introduction of mechanized purse line hauling.
- Introduction of mini-trawling in mid-1987 and its subsequent proliferation, targeting near-shore shrimp and fish resource.
- Introduction of ring seines with inboard engines and purse line haulers in 1999 and continuous increase in numbers.

5.2 Craft -Gear Combinations

Majority of the vessels in the mechanized sector were trawlers targeting shrimps, followed by gill-netters and a few purse seines (Edwin & Haridayanthan, 1998). About 18 different craft-gear combinations were under operation in the traditional sector, including (i) canoe-cotton shore seine; (ii) canoe-encircling gillnet; (iii) dugout canoe-boat seine; (iv) dugout canoe-boat seine; (v) dugout canoe-cast net; (vi) dugout canoe-hook and line; (vii) dugout canoe-large mesh drift gillnet; (viii) dugout canoe-lobster gillnet; (ix) dugout canoe-sardine gillnet; (x) dugout canoe-shrimp gillnet; (xi) katturmaram-hook and line; (xii) katturmaram-large mesh gillnet; (xiii) katturmaram-shrimp gillnet; (xiv) katturmaram –anchovies gillnet; (xv) katturmaram-sardine gillnet; (xvi) plank canoe-hook and line; (xvii) plank canoe nylon shore seine and (xviii) plank canoe –small mesh drift gillnet (Kurien and Willman)

Major craft-gear combination which are currently in operation in marine fisheries of Kerala, are listed in Table 5.1

Table 5.1 Major craft – gear combinations in Kerala coast

	Craft	Fishing gear
	Mechanized fleet	
1	Mechanized Trawler Small (8.5 - 9.7m LOA; 90HP Medium (9.7-16.7 m LOA; 100 HP Large (16.7-21 m LOA; 177 HP	Shrimp trawls - 5 types Fish trawls - 3 types Cephalopod trawl – 1 type Gastropod trawl - 1 type
2	Mechanized Gillnetter-liner (9.7 – 21m LOA; 110-140 HP	Gillnets; long lines; hand lines
3	Mechanized Purse seiner (15.2-16.7m LOA; 110-156 HP	Large mesh (45mm) purse seines for tuna, seer fish, mackerel and carangids
	Traditional fleet with IBM or OBM	
4	Craft with inboard engine (steel or wood hull; 18.3-25.8 m LOA; 90-140 HP)	Ring seines(18 mm mesh) for sardines and mackerel
5	Crafts with OBM (wood, steel, fiberglass hull);12.2-21.3 m; 22+22 HP, 40+22 HP,40+22+22 HP or 40+40+40 HP)	Ring seines (18 mm mesh size) for sardines and mackerel
6	Craft with OBM (wood and fiberglass hull; 9.9-22HP	Ring seines for anchovies ; Mini trawls; gillnets; Hooks and lines; encircling nets; Boat seines; Shore seines
	Non-motorized traditional fleet	
7,	Katturmaram Plank canoe Dugout canoe FRP canoes	Encircling nets; Boat seines; shore seine; gillnets; Hooks and lines; Cast nets

Source: Primary Data

Costs and earnings of sample units of different craft-gear combinations per trip was estimated separately across different seasons (**Pre-monsoon**: January, February, March, April and May; **Monsoon**: June July, August; **Post-Monsoon**: September, October, November and December) for the year 2007, to demarcate variations in gross revenue generation, net operating profit, labour income and operational efficiency. The indicative economics of operation of sample units in mechanized, motorized and non-mechanized units operating in Kerala is given in this section. The data on operational cost catch and price of fish at primary level were collected from selected major centres such as Cochin Fisheries Harbour, Munambam, Sakthikulangra, Valanjavazhi, Omanappuzha and Arthungal on sample days during 2007. The analysis has been confined into pre-monsoon and post monsoon periods alone as there was mechanized fishing units ban during most part of monsoon months.

5.3 Economics of Mechanized Trawlers (Single-Day Fishing)

The single-day trawlers are usually small crafts of overall length (OAL) of less than 36 ft and most of these units are very old. Average initial investment in this unit values to about ₹ 2.5 lakh for hull and engine and one lakh rupees for gears. Annual fixed cost works out to ₹ 87,500 after provisioning for depreciation on craft and gears and interest charges.

Major expense items in operational costs include fuel, wages, auction charges and bata for the crew. The average operating expense per trip in pre monsoon and post monsoon worked out to ₹ 4666 and ₹ 7591, respectively (Table 5.2). The variation in operational expenses was mainly due to change in wages and auction charge that is a proportion of gross revenue. The gross revenue during both the seasons varied highly. Immediately after the monsoon season the quantity caught increased to 399 kg and average gross revenue per trip worked out to ₹ 11,241 being the best of the seasons. Threadfin breams,

Table 5.2 Season-wise average costs and earnings of trawlers (single-day fishing) per trip (2007)

Particulars Operating expenses	Pre-monsoon	Post-monsoon	Annual
Fuel (₹)	2117.5	2117.5	2117.5
Wages (₹)	1496	3622.3	2558.6
Auction charges (₹)	504.9	335.5	674.3
Repairs and maintenance (₹)	136	105.6	127.6
Batalfood (₹)	453.2	938.3	695.2
Ice (₹)	30.8	41.8	36.3
Other charges (₹)	82.5	92.4	88
Total operating Cost (₹)	4666.2	7591.1	6129.2
Catch and Value Realized			
Anchovies			
Catch (kg)	41.4	0	20.7
Value (₹)	1271.6	0	635.8
Oil sardine			
Catch (kg)	72.9	90	81
Value (₹)	444.4	770	607.2
Lizard fishes			
Catch (kg)	7.2	41.4	24.3
Value (₹)	165	612.7	388.3
Threadfin breams			
Catch (kg)	54	2.7	27.9
Value (₹)	1320	48.4	684.2
Ribbonfish			
Catch (kg)	0	161.1	81
Value (₹)	0	3121.8	1560.9
Penaeid prawns			
Catch (kg)	18	18	18
Value (₹)	1452	1320	1386
Cephalopods			
Catch (kg)	1.8	45	23.4
Value (₹)	176	4675	2426.6
Other fishes			
Catch (kg)	45	40.5	43.2
Value (₹)	770	693	731.5
Total catch	241.2	398.7	319.5
Gross revenue (₹)	5599	11240.9	8420.5
Net operating income (₹)	932.8	3649.8	2291.3
Operating ratio	0.913	0.748	0.803
Average crew size	5.5	5.5	5.5
Per capita labour income (₹)	299.2	724.9	511.5

penaeid prawns and cephalopods accounted for the increase in catches. The size of fishes was also large which may be considered as the effect of not fishing in the monsoon seasons. The lowest catch per trip was in pre monsoon season and so was the gross revenue.

The operating ratio of the single-day trawlers in post-monsoon season was found less (0.75) indicating efficiency of operations. This indicates that after apportioning towards the operating expenses, 25 per cent is left out for servicing fixed cost. This is because of the increase in gross revenue during post monsoon periods. The per capita earnings of labourer for a single day trawler was estimated as ₹ 299 during pre monsoon and ₹ 725 during post monsoon season. The net operating profit of this unit is also high in the post monsoon season (₹ 3650/trip) compared to overall annual net operating profit of ₹ 2291/trip. It is observed that the catch and revenue per trip was comparatively very high immediately after lifting the ban on post monsoon period.

5.4 Economics of Trawlers (Multi-Day Fishing)

Trawlers that go for multi day fishing, categorized according to number of fishing days (2-5 days and 6 days and above) have more OAL and carrying capacity. The engines used in multi day trawlers are having more horsepower (102 to 120 hp) and fuel efficiency enabling longer fishing trips (Ahmed 2000). Capital investment in multi day fishing units going for 2-5 days ranges from ₹ 15 to 20 lakh and those going for 6days and above range from ₹ 30 to ₹ 35 lakh. These units are equipped with modern electronic devices like GPS, Eco Sounder, Wireless set, mobile phones etc. The annual average fixed cost servicing charges works out to ₹ 3.87 lakh to 5.87lakh per unit for MDF (2-5 days) and MDF (6 days and above) respectively.

Table 5.3. Season-wise average operational costs and earnings of multiday (2-5 days) trawlers per trip (2007)

Particulars Operating Expenses	Pre- monsoon	Post- monsoon	Annual
Fuel (₹)	18876	21780	20328
Wages (₹)	9222.4	12811.7	11017.6
Auction Charges (₹)	2385.9	3160.3	2773.1
Repairs and maintenance (₹)	634.7	348.7	491.7
Bata/Food (₹)	1963.5	1906.3	1934.9
Ice (₹)	1956.9	2242.9	2099.9
Other Charges (₹)	119.9	273.9	196.9
Total Operating Cost (₹)	35159.3	42523.8	38841
Catch and Value Realized			
Lizardfishes			
Catch (kg)	90	108	117
Value (₹)	1430	1951.4	1999.8
Threadfin breams			
Catch (kg)	97.2	87.3	117
Value (₹)	2376	2776.4	2944.7
Ribbonfishes			
Catch (kg)	5.4	81	111.6
Value (₹)	149.6	896.5	2829.2
Barracudas			
Catch (kg)	23.4	9	20.7
Value (₹)	850.3	206.8	745.8
Penaeid prawns			
Catch (kg)	37.8	45	44.1
Value (₹)	3095.4	4400	4042.5
Non-penaeid prawns			
Catch (kg)	0	0	7.2
Value (₹)	0	0	348.7
Deep sea prawns			
Catch (kg)	147.6	94.5	88.2
Value (₹)	6779.3	4794.9	4211.9
Cephalopods			
Catch (kg)	187.2	253.8	252
Value (₹)	23322.2	29547.1	29686.8
Others			
Catch (kg)	72	72	78.3
Value (₹)	1760	1848	2302.3
Total catch	661.5	942.3	801.9
Gross revenue (₹)	39762.8	52671.3	46217.6
Net operating income (₹)	4603.5	10147.5	7375.5
Operating ratio	0.968	0.891	0.924
Average crew size	6.6	6.6	6.6
Per capita labour income (₹)	1536.7	2135.1	1835.9

In case of multi-day trawlers (2-5 days), the gross revenue was highest in the post monsoon season due to increase in catch (Quantity: 942 Kg, Value: ₹ 52671 (Table 5.3). The increase in catch was mainly on account of better landings of cephalopods and other varieties like lizard fish, threadfin breams, ribbon fish and penaeid prawns. The net operating profit per trip of multi-day trawlers (2-5 days)increased during post-monsoon season (₹ 10147). This shows that ban in monsoon period has considerably enhanced the resource' base leading better catches immediately after lifting of ban resulting in better returns compared to other seasons. This is reflected in the operating ratio also where higher efficiency *is* seen in trips conducted during post monsoon period. The overall average operational cost worked out to ₹ 38841 of which about 80 per cent was accounted by wages and fuel. Annual percapita labour earnings worked out to ₹ 1836 per trip, which went up to ₹ 2135 per trip in post-monsoon season.

In case of multi-day (6 days and above) trawlers also the catch quantity and gross revenue was highest during the post-monsoon season (Quantity: 1387 kg Value: ₹ 80378) (Table 5.4). Varieties like cephalopods, lizardfish, threadfin breams, deep sea prawns etc contributed to the increase in catch quantity.

Table 5.4. Season wise average operational costs and earning per trip of multi-day (6 days and above) trawlers (2007)

Particulars Operating Expenses	Pre- monsoon	Post-monsoon	Annual
Fuel (₹)	35735.7	36465	36100.9
Wages (₹)	15549.6	22328.9	18939.8
Auction charges (₹)	3494.7	4420.9	3957.8
Repairs and maintenance (₹)	706.2	548.9	628.1
Batalfood (₹)	2783	2931.5	2856.7
Ice (₹)	2886.4	3567.3	3226.3
Other charges (₹)	409.2	378.4	393.8
Total Operating Cost (₹)	61564.8	70640.9	67191.3
Catch and value realized			
Lizardfishes			
Catch (kg)	90	135	112.5
Value (₹)	1650	2805	2227.5
Threadfm Breams			
Catch (kg)	141.3	177.3	159.3
Value (₹)	3454	5060	4257
Ribbonfishes			
Catch (kg)	36	25.2	30.6
Value (₹)	1040.6	1171.5	1105.5
Barracudas			
Catch (kg)	28.8	86.4	57.6
Value (₹)	958.1	2797.3	1877.7
P naeid prawns			
Catch (kg)	153	162	157.5
Value (₹)	19277.5	13662	16470.3
Deep sea prawns			
catch (kg)	90	225	157.5
Value (₹)	4180	13200	8690
Cephalopods			
Catch (kg)	81	378	319.5
Value (₹)	33550	43428	38489
Other fishes			
Catch (kg)	135	126	166.5
Value (₹)	5775	4004	6033.5
Total catch	935.1	1386.9	1161
Gross revenue (₹)	69885.2	88415.8	79150.5
Net Operating Income (₹)	75640	17774.9	11959.2
Operating ratio	0.968	0.88	0.935
Average crew size	8.8	8.8	8.8
Per capita labour income	1943.7	2790.7	2367.2

It is observed that these units earn maximum revenue from cephalopods in all seasons. Since these units are mostly operating at deeper regions they get good quantity of deep sea prawns. The annual operating cost per trip worked out to ₹ 67191 of which more than half is accounted by fuel requirement (53 percent). The annual net operating profit worked, out to ₹ 11959 per trip which increased steeply to ₹ 17775 during post- monsoon season. The operating efficiency also improved during post monsoon season compared to other seasons. Annual per capita labour income per trip worked out to ₹ 2367 per trip which increased to ₹ 2790 during post monsoon. As a whole, these units are running on profit for all the seasons, but the maximum profit per trip is obtained during the post monsoon period

5.5 Economics of Mechanized Gillnetters

Gillnetters vary in overall length (OAL) from 36 ft to more than 52 ft in length. Average initial investment in craft and gears ranges between ₹ 15 to 20lakh, depending on size of boat, engine make and accessories. Annual fixed cost works out to ₹ 5.12 to ₹ 5.30 lakh after provisioning for depreciation on craft and gears and interest charges. Gillnetters are usually migratory units and conduct fishing trips more than one month in distant waters. The economics of season wise operations of multi-day (2-5 days) and (6 days and above) gillnet units per trip are given in Table 5.5 and 5.6 respectively.

Table 5.5 Season wise average operational costs and earnings per trip of multi-day(2-5 days) Gillnetters, 2007

Particulars Operating Expenses	Pre-monsoon	Post-monsoon	Annual
Fuel (₹)	13427.7	12922.8	13174.7
Wages (₹)	1877.7	5031.4	3455.1
Auction Charges (₹)	1191.3	1069.2	1129.7
Repairs and maintenance	330	110	220
BatalFood (₹)	660	374	517
Ice (₹)	1595	1518	1556.5
Other Charges (₹)	298.1	935	616
Total Operating Cost (₹)	19378.7	21960.4	20669
Catch and Revenue			
Sharks			
Catch (kg)	63	162	112.5
Value (₹)	3850	7700	5775
Rays			
Catch (kg)	0	135	67.5
Value (₹)	0	4950	2475
Mackerel			
Catch (kg)	28.8	22.5	26.1
Value (₹)	541.2	687.5	614.9
Tunnies			
Catch (kg)	144.9	252	198.9
Value (₹)	9278.5	12320	10799.8
Other fishes			
Catch (kg)	153.9	157.5	155.7
Value (₹)	8526.1	3850	6188.6
Total Catch	358.2	571.5	480.6
Gross Revenue (₹)	22195.8	29507.5	25852.2
Net operating income (₹)	2817.1	7547.1	5182.1
Operating ratio	0.957	0.814	0.88
Average Crew Size	5.5	5.5	5.5
Per capita labour income (₹)	375.1	1006.5	690.8

Gross revenue generated by multi-day (2-5 day) gillnet units per trip in a year was ₹ 25852 from the catch quantity of 481 kg (Table 5.5). In the post monsoon season increase in catch (571 kg) and consequent increase in gross revenue was observed. The presence of species like sharks, rays and tunnies in larger quantities led to increase in catches during post monsoon period. The net operating income per trip in a year was estimated as ₹ 5182 per trip and during post monsoon it was ₹7547 per trip. The operating ratio shows that units are operating with utmost efficiency during post-monsoon season. The annual operating ratio per trip works out to 0.88 indicating that only 12 per cent of the gross revenue remaining after apportioning for the operational expenses. . The average percapita labour income per trip works out to ₹ 691, while in the post monsoon period it is as high as ₹ 1006.

Table 5.6: Season-wise average operational costs and earnings per trip of multi -day(6 days and above) Gillnetters, 2007

Particulars Operating Expenses	Pre-monsoon	Post- monsoon	Annual
Fuel (₹)	27171.1	29040	27171.1
Wages (₹)	12898.6	20545.8	16680.4
Auction Charges (₹)	2800.6	3636.6	3218.6
Repairs and maintenance (₹)	511.5	467.5	489.5
BatalFood (₹)	2223.1	4950	3586
Ice (₹)	2010.8	5720	3865.4
Other Charges (₹)	457.6	242	228.8
Total Operating Cost (₹)	48072.2	64601.9	57025.1
Catch and Revenue			
Sharks			
Catch (kg)	71.1	211.5	141.3
Value (₹)	4297.7	16802.5	10550.1
Rays			
Catch (kg)	0	112.5	56.7
Value (₹)	0	4125	2062.5
Snapper			
Catch (kg)	165.6	140.4	153
Value (₹)	10255.3	7208.3	8731.8
Tunnies			
Catch (kg)	756	990	873
Value (₹)	27720	48400	38060
Barracudas			
Catch (kg)	0	23.4	11.7
Value (₹)	0	1129.7	564.3
Other fishes			
Catch (kg)	225	61.2	143.1
Value (₹)	13750	3639.9	8695.5
Total catch	1217.7	1538.1	1377.9
Gross revenue (₹)	56021.9	72726.5	64374.2
Net operating income (₹)	7949.7	8124.6	7349.1
Operating ratio	0.946	0.979	0.979
Average crew Size	5.5	5.5	5.5
Per capita labour income (₹)	2579.5	4109.6	3336.3

Gillnet units fishing for 6 days and above, harvested on an average 1378 kg per trip earning revenue of ₹64,374 per trip (Table 5.6). The catch and revenue per trip during the post monsoon seasons was the highest during the year (1538 kg realizing revenue of ₹ 72,726). The increase in catch was mainly on account of increase in varieties like sharks, rays and tunnies. Tunnies contribute the major catch and earn more than 50 per cent of the revenue generated by the multi day Gillnetters. The average operating expenses per trip was estimated as ₹ 57025. The operating ratio indicated better efficiency of operations during pre monsoon period. The labour earnings was highest during post monsoon period (₹ 4109). Fishing ban in the monsoon periods will deprive the labour, of the opportunity to earn income, which can be managed with the savings or even migration to motorized sector for employment. This is eventually regained by the increased income realized immediately after lifting the ban.

5.6 Economics of Motorized Fishing Units

In Kerala, different types of motorized units are in operation that includes mini trawlers, Gillnetters, ring seiners, hooks and lines etc. An indicative economics of ring seines and mini-trawl units in this category are presented in this section.

5.6.1 Motorised Ring Seine Units

Ring seine units are labour intensive fishing units that can carry 25-35 persons on board. The initial investment in these units varies from ₹ 4 to 5 lakh for craft and gears. Annual fixed cost per unit of operation works out to ₹ 1.5 lakh per annum. The economics of operations of motorized ring seiners are presented in Table 5.7. The annual average gross revenue generated per trip was ₹ 23976 from a catch quantity of 1010 kg. In the monsoon season the catch quantity increased to1199 kg with consequent increase in revenue due to increased catch of species like oil sardine, mackerel and penaeid prawns. The average operating expenses per trip was ₹ 21,180. The average net operating income per trip was estimated to ₹ 2795 while it increased to ₹ 5667 during monsoons. The operating ratio also indicated better efficiency during monsoon seasons. The average labour earnings per trip worked out to ₹ 416, while it was as high as ₹ 624 during the monsoons.

Table 5.7 Season-wise average operational costs and earnings per trip of motorized ring seine units, 2007.

Particulars Operating Expenses	Pre- monsoon	Monsoon	Post monsoon	Annual
Fuel. (₹)	3267	2722.5	3339.6	3109.7
Wages (₹)	10043	21885.6	11768.9	14566.2
Auction charges (₹)	867.9	1736.9	991.1	1199
Repairs and maintenance	212.3	212.3	303.6	242
Data/food (₹)	1074.7	1181.4	1147.3	1134.1
Ice (₹)	0	0	0	0
Other Charges (₹)	491.7	1331	683.1	834.9
Total operating cost (₹)	15956.6	29069.7	18233.6	21180.5
Catch and Revenue				
Oil sardine				
Catch(kg)	720	900	710.1	776.7
Value (₹)	10560	14300	12150.6	12336.5
Ribbonfishes				
Catch(kg)	0	2.7	72.9	25.2
Value (₹)	0	41.8	3564	1202.3
Mackerel				
Catch(kg)	130.5	135	90	118.8
Value (₹)	4466	5082	2970	4172.3
Penaeid prawns				
Catch(kg)	2.7	103.5	0	35.1
Value (₹)	271.7	13025.1	0	4431.9
Otherfishes				
Catch(kg)	67.5	58.5	36	54
Value (₹)	2062.5	2288	1144	1831.5
Totalcatch(kg)	920.7	1199.7	909	1009.8
Gross Revenue (₹)	17360.2	34736.9	19828.6	23975.6
Net operating income (₹)	1403.6	5667.2	1595	2795.1
Operating ratio	1.012	0.924	1.012	0.968
Average crew Size	38.5	38.5	38.5	38.5
Per capita labour income	287.1	624.8	336.6	415.8

5.6.2 Motorized Mini-Trawl Units

Mini-trawl units are small crafts with OAL of 27 to 30 ft that can have 2-4 persons as crew. These units are fitted with engine of 9.9 hp. Initial investment in these units varies from ₹ 1.25 to ₹ 2.5 lakh. The average annual gross revenue of mini trawler works out to ₹ 3940 from a catch of 137 kg per trip (Table 5.8). The, catch quantity was highest during pre monsoon period, but the gross revenue realized was lower being low value species. In monsoon season, the catch quantity was dominated by varieties like penaeid prawns, soles and crabs fetching higher gross revenue of ₹ 5055. The net operating profits during the monsoon season was higher than the annual average. The operating efficiency also increased in the monsoon period as a result of increase in earnings denoted by declining operating ratio. The annual average per capita labour income was estimated as ₹ 467 per trip. The labour earnings was highest during monsoons (₹ 649/crew) and lowest in pre monsoon period (₹ 300/crew).

Table 5.8 Season wise average operational costs and earnings per trip of mini-trawl units, 2007

Particulars Operating Expenses	Pre Monsoon	Monsoon	Post Monsoon	Annual
Fuel (₹)	762.3	796.4	861.3	806.3
Wages (Rs)	899.8	1945.9	1364	1403.6
Auction charges (₹)	151.8	253	194.7	199.1
Repairs and maintenance	64.9	151.8	110	108.9
Bata/food (₹)	107.8	110	82.5	100.1
Ice (₹)	6.6	5.5	33	15.4
Other charges (₹)	16.5	0	0	5.5
Total Operating cost (Rs)	2010.8	3261.5	2645.5	2638.9
Catch and Revenue				
Oil Sardine				
Catch (kg)	170.1	0	0	84.6
Value (₹)	1062.6	0	0	531.3
Soles				
Catch (kg)	18	110.7	10.8	46.8
Value (₹)	237.6	1116.5	198	517
Penaeid prawns				
Catch (kg)	24.3	41.4	33.3	33.3
Value (₹)	1567.5	3491.4	3327.5	2795.1
Non Penaeid Prawns				
Catch (kg)	2.7	0	0	0.9
Value (₹)	25.3	0	0	8.8
Crab				
Catch (kg)	4.5	10.8	11.7	9
Value (₹)	81.4	184.8	286	183.7
Others				
Catch (kg)	15.3	5.4	9	9.9
Value (₹)	3.3	264	88	199.1
Total catch	178.2	167.4	64.8	136.8
Gross revenue (₹)	2865.5	5055.6	3899.5	3940.2
Net Operating Income (Rs)	854.7	1794.1	1254	1301.3
Operating ratio	0.77	0.715	0.748	0.737
Average crew size	3.3	3.3	3.3	3.3
Percapita labour income	300.3	649	454.3	467.5

5.7 Economics of Non-mechanised fishing units

The non-mechanized fishing units operating in Kerala coast includes country craft/canoes/catamarans using shore seines, driftnet gillnets and other local gears. These units have average overall length of 15 to 18 ft operating along Kerala coast with average number of three sea faring persons. The initial investment in this type of unit is around ₹ 15,000. An average fixed cost including depreciation on craft (10 per cent) and gear (20 per cent) and interest (15 per cent) works out to ₹ 5225 per annum. The indicative economics of non mechanized units on the basis of quarter wise sectoral production per unit of operation given in (Table 5.9).

Table 5.9. Season-wise average operational costs and earnings per trip of nonmechanised units, 2007.

Operating Expenses	Pre-monsoon	Monsoon	Post-monsoon	Annual
Fuel (₹)	0	0	0	0
Wages (₹)	345.4	528	321.2	398.2
Auction charges (₹)	25.3	41.8	23.1	29.7
Repairs and maintenance (₹)	27.5	27.5	27.5	27.5
Bata/food (₹)	55	55	55	55
Ice (₹)	0	0	0	0
Other charges (₹)	11	11	11	11
Total Operating Costs (Rs)	464.2	663.3	437.8	521.4
Catch and Revenue				
Clupeids				
Catch (kg)	5.4	4.5	5.4	5.4
Value (₹)	136.4	133.1	144.1	137.5
Oil Sardine				
Catch (kg)	5.4	2.7	3.6	3.6
Value (₹)	94.6	48.4	67.1	70.4
Croakers				
Catch (kg)	0.9	1.8	0.9	0.9
Value (₹)	31.9	72.6	22	41.8
Carangids				
Catch (kg)	0.9	5.4	0.9	2.7
Value (₹)	31.9	212.3	49.5	97.9
Mackerels				
Catch (kg)	1.8	0	0.9	0.9
Value (₹)	44	16.5	39.6	33
Other fishes				
Catch (kg)	4.5	5.4	2.7	4.5
Value (₹)	170.5	345.4	141.9	218.9
Total catch	18	19.8	14.4	17.1
Gross revenue (₹)	508.2	828.3	465.3	600.6
Net operating income (₹)	44	165	27.5	78.1
Operating ratio	0.847	0.825	0.858	0.957
Average crew size	2.2	2.2	2.2	2.2
Per capita labour income (₹)	115.5	264	160.6	199.1

The gross revenue was highest in the monsoon period owing to the increase in quantity of high valued species in the catch. The catch composition includes clupeids, mackerel, carangids, croakers .etc. The annual average operating cost per trip is only ₹ 521 where there are no expenses on fuel. The only major expense item is wages. The net operating profit works out ₹ 78 per trip and it is highest during monsoon period (Table 5.9). This may be due the abundance of quality fish varieties during monsoon and partially due to the ban on fishing by mechanized units (Kurup and Devaraj, 2000). The operating efficiency is also found to increase in the monsoon period compared to other seasons. The labour income per trip is also highest during monsoon period (Nair, 1989). In total, all types of fishing units operating in Kerala were found to have benefited from monsoon ban on trawling in terms of increased catch and revenue in the succeeding season resulting in better operating income, labour earnings and operational efficiency (Kurian 1995 & 2000).

From the above analysis of costs and earnings of different craft –gear combination, it is evident that the percapita contribution to output by various factors of production in the harvesting sector is declining in spite of the increase in the aggregate total catch. There are innumerable technological options available in the capture fisheries. The non-mechanised fishing techniques are slowly vanishing due to diminishing returns. The comparative and competitive advantage of mechanized craft-gear combinations led the fisher folk towards the choice of capital-intensive technologies. However the catch rates of all types of craft–gear combinations in the capture fisheries recorded a declining trend due to stiff competition among them to catch the limited open access resources. But the ever increasing price of almost all varieties of fish ensures the profitability of all technological options in marine fisheries.

…..ꙮ…..

Chapter 6

DOMESTIC FISH MARKETING SYSTEM: PRICE SPREAD, PROBLEMS AND PROSPECTS

Contents

Development of fisheries sector and increase in fish production largely depend on an efficient marketing system. Market intelligence and information on price of fish in different markets adds to the efficiency of fish marketing. Fish marketing system may be defined as all those functions and activities involved from the point of catching of fish to the point of final consumption. In fish marketing, the general hypothesis is that conditions of monpsony and oligospony characterize the fish marketing structure in India at various stages and hence fishermen do not get advantage of the high price prevalent always in the consumer markets. It is well known that large number of intermediaries are involved before fish reaches the hands of ultimate consumer. The pricing efficiency is concerned with improving the operation of buying, selling and other connected aspects of marketing so that it will remain responsive to consumer behaviour

Demand and price of marine fish are continuously increasing in our domestic and export markets. Fish marketing system in India is rapidly changing in recent years due to the vast improvement in handling technology, transportation and consequent market penetration. The supply of fish to the consumers are in the form of fresh, frozen, dried or canned in the local as well as in the international markets. In India, fish marketing has not developed fully on modern lines. There is a gradual transformation from traditional to modern method of marketing with the advent of improved transport, processing and storage facilities at micro level (Ammini, 1999). There are large number of small merchants. At macro level, few organizations have undertaken the whole distribution of fish. At landing centres, fish are disposed by auctioning. This provides maximum competition among buyers and enable quick disposals. Fish at the landing centres are not sold in weight because of the practical difficulties involved in the handling of such a highly perishable commodity. Hence the sales are carried out by measures of heaps or lots of different size. However for exportable varieties like prawns, the price per kg of fish is fixed by auction and weighed before delivery. Generally the auctioning is done by traditional auctioneer or middlemen on commission basis who take up the responsibility of realising the sale proceeds from the traders. The auctioneers at the landing centre take 5-10. per cent of fish auctioned by them as commission. Since many of the auctioneers advance loans to the fishermen, they take a portion of share towards the interest for the loan given.

6.1 Price behaviour of selected varieties over the years

The fluctuation in prices of fish is very high because of the uncertain nature of production, perishable nature and variation in short run supply. Because the supply of fish is highly inelastic, a bumper catch on any day will slash down the fish prices and a small catch will boost the prices to very high levels

Table 6.1 Wholesale price behaviour of selected varieties of marine fish in India (1973-74 to 2003)

(Value in ₹ *kg)*

Name of fish	1973-74	1984-85	1989-90	1993-94	2003
1. Sharks	1.50	11.25	13.85	26.00	68.00
2. Rays	1.00	6.00	6.40	12.00	19.00
3. Catfishes	1.00	7.75	13.00	20.00	23.00
4. all sardine	1.00	4.00	6.90	13.00	21.00
5. Ribbon fishes	2.00	5.00	6.15	10.00	18.00
6. Pomfrets	2.00	17.50	15.20	35.00	134.00
7. Mackerel	2.00	6.25	9.00	23.00	34.00
8. Seer fishes	4.00	19.00	28.90	58.00	146.00
9. Tunnies	2.00	10.00	13.45	30.00	25.00
10.Whltebalts	2.00	5.00	5.85	15.00	20.00
11.Barracudas	2.00	11.25	5.20	30.00	43.00

Source : Sathiadhas et al, 2013.

Table 6.2. Retail price behaviour of selected varieties of marine fish in India(1973-74 to 2003)

(Value In ₹ kg-I)

Name of fish	1973-74	1984-85	1989-90	1993-94	2003
I. Sharks	2.50	17.00	17.00	31.00	88.00
2. Rays	2.00	10.00	10.75	15.00	31.00
3. Catfishes	2.50	11.00	16.50	30.00	40.00
4. all sardine	2.00	6.70	10.00	16.00	48.00
5. Ribbon fishes	2.50	8.50	10.00	19.00	33.00
6. Pomfrets	2.50	22.80	29.50	40.00	205.00
7. Mackerel	3.00	9.85	12.50	25.00	48.00
8. Seer fishes	9.00	27.00	35.50	66.00	195.00
9. Tunnies	3.00	16.50	18.50	39.00	39.00
10.Whlte Baits	3.00	8.00	9.00	18.00	30.00
11. Barracudas	2.50	15.35	21.00	35.00	65.00

Source: Sathiadhas et al, 2013.

The wholesale price of high quality fishes like sharks, pomfrets and seer fish increased from an average price of ₹ 3 in 1973 - 74 to ₹116 in 2003. The wholesale price of low quality fishes like rays and oil sardine, which fetched hardly one rupee in 1973 - 74 has witnessed a steady increase recording ₹ 19 and ₹ 21 respectively in 2003. A proportionate increasing trend is visible in the retail price behaviour also. On an average, the retail price of high quality fishes (sharks, pomfrets and seer fish) was 40 per cent higher than the wholesale prices in 2003, where as, the average retail price of low quality fishes like rays and oil sardine recorded an increase of 100 per cent over the wholesale price during the same period.

6.2 Marketing channel

Marketing channel refers to the path through which the product passes from the producer to the hands of ultimate consumer. In case of marine fish marketing, fish travels long distances from coastal areas to the interior parts of the country. The flow chart indicating the path of movement of fish from the producer to the consumer is given in Figure 6.1. The usual marine fish marketing channels prevailing can be obtained from the flow chart. They are,

1) Fishermen – Auctioneer - Agents of freezing plants - Exporters.
2) Fishermen – Auctioneer - Processor (Dry fish) – Wholesaler – Retailer - Consumer.
3) Fishermen – Auctioneer - Wholesaler (primary market) - Wholesaler (Retail market) – Retailers - Consumers.
4) Fishermen – Auctioneer - Commission agents – Wholesaler – Retailer - Consumers.
5) Fishermen – Auctioneer – Retailer - Consumer.
6) Fishermen – Auctioneer - Consumer.

The major portion of the internal fish marketing takes place through 3-6th channels. The auctioneers of the primary market and commission agents of the secondary market are also involved in the process without taking possession of the fish. The fish marketing in India can be divided into two groups as, domestic fish marketing and export marketing.

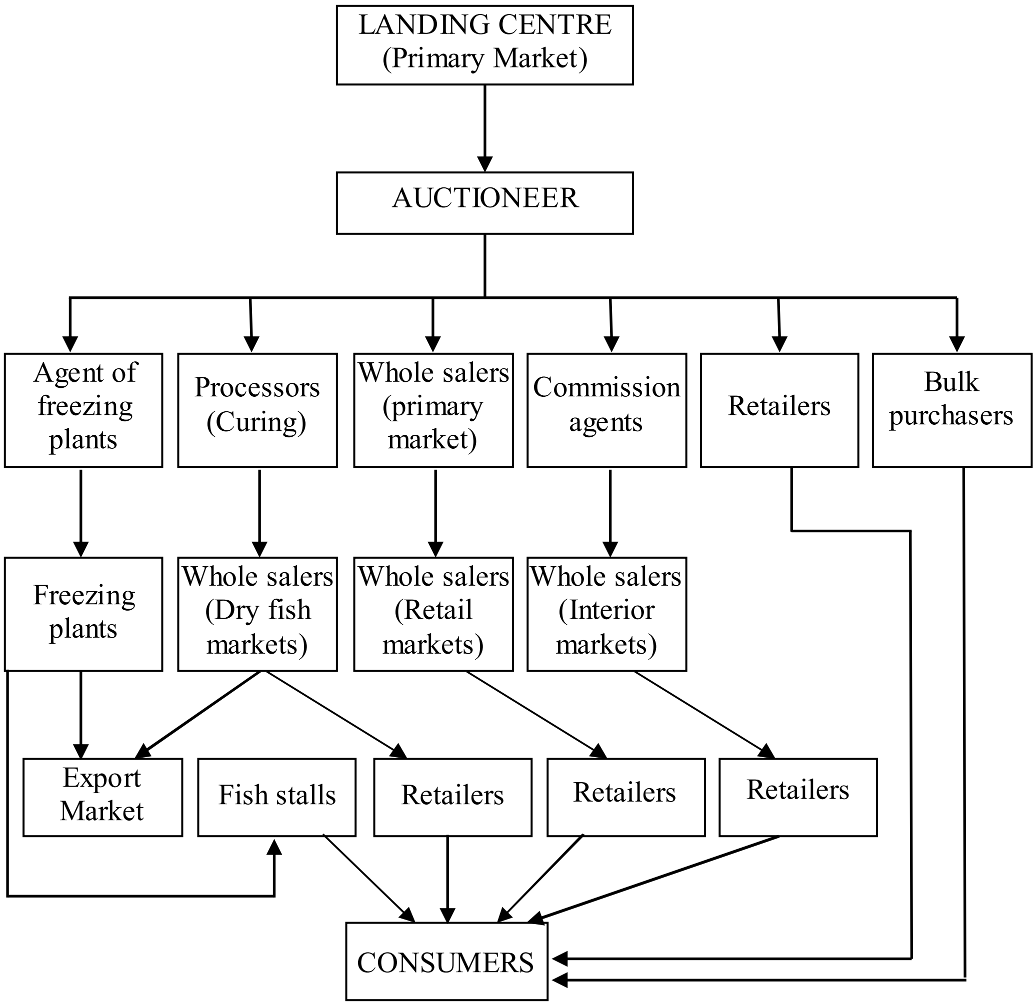

Fig. 6.1: Flow chart showing the fish marketing channels

6.3 Price spread

Price spread connotes gross margin in the marketing of commodities and is measured as absolute or percentage difference in the price paid by the consumer (retail price) and price received by the farmer

$$TPS = R_d - F_g$$

Where,

TPS = Total price spread or gross margin

R_d = Price at retail level

F_g = Price prevailing at the producer level

6.4 Marketing cost

Marketing cost is actual expenses incurred in bringing the goods and services from the producer to the consumer. Marketing cost would normally include handling charges at local point, assembling charges, transport charges by wholesalers and retailing charges to the customers. Total cost of marketing was calculated as under:

$$C = CF + Cm1 + Cm2 + \ldots\ldots\ldots.. + Cmm$$

Where,

C = Total cost of marketing

CF = Cost borne by the fisher in marketing his produce

$Cm1$ = Cost incurred by the i^{th} middlemen in the process of buying and selling.

6.5 Marketing margin

$$\text{Marketing margin} = PR_i - (P_{pi} + Cm_i)\, PR_i$$

Where,

PR_i = Total value of receipts (sale price)

P_{pi} = Total purchase value of goods (Purchase price)

Cm_i = Cost incurred in marketing.

6.6 Seasonal price behaviour of marine fishes (Kerala, Maharashtra, Tamil Nadu and Andhrapradesh)

The prices of almost all the varieties have shown an increasing trend in quarters II & III compared to other quarters due to the impact of fishing ban from June 15 to July 30 in Kerala. The quarterly average landing center price of fish in Kerala during 2007 is given in Table 6.3 Fishermen received the highest average price of ₹ 220 per kg for seerfish and lowest average price of ₹19 per kg for oil sardines. The average price of seerfish varies from ₹ 200 to ₹ 235 between different seasons and the price of oil sardines vary from ₹ 15 to ₹ 23 at the landing centers between different seasons. The lowest price of seerfish (₹ 200 per kg) was recorded during January – March period and oil sardine (₹ 15 per kg) during October December period.

Average Quarter wise wholesale fish prices of Kerala in 2007 are given in Table 6.4. The wholesale price behaviour is also in tune with the primary market prices. The wholesale traders received maximum price for seerfish (₹ 285 per kg) followed by penaeid prawns (₹ 276 per kg) and pomfrets (₹ 228 per kg) in wholesale market of Kerala. In this market wholesalers received minimum price for oil sardines (₹ 30 per kg) followed by lizard fish (₹ 44 per kg). The quarterly variation in wholesale prices was very wide for rock cods and sharks.

The quarterly average retail price of different varieties of fish in Kerala state during 2007 is given in Table 6.35. The quarterly variation in retail prices was very wide for sharks and rock cods similar to that of the whole sale price. It was observed that marketing margin was maximum in case of penaeid prawns (₹ 106 per kg) followed by seerfish (₹ 91 per kg). The marketing margin was the lowest for catfishes (₹ 21 per kg) followed by rays and oil sardine (₹ 22 per kg each). During Ist and IVth quarters, prices of almost all fish varieties observed to be lower on account of increased landings.

Table 6.3. Primary market (landing centre) price structure of different varieties of marine fishes of Kerala in 2007 (Rs/Kg)

Species Name	Landing centre price of Kerala				Year- 2007
	Ist Qtr	IInd Qtr	IIIrd Qtr	IVth Qtr	Avg.
1. Elasmobranches					
a. Sharks	65	70	75	75	**71**
b. Rays	30	38	28	45	**35**
2. Catfishes	40	48	55	58	**50**
3. Clupeids					
a. Oil sardine	20	23	16	15	**19**
b. Anchovies	47	50	45	37	**45**
4. Bombayduck	0	0	0	0	**0**
5. Lizard fish	29	28	27	30	**29**
6. Half and full beaks	25	35	40	35	**34**
a. Rockcods	115	125	82	52	**94**
b. Snappers	60	72	67	70	**67**
c. Pig-face breams	60	67	75	55	**64**
d. Threadfin breams	33	30	35	45	**36**
e. Other perches	30	22	15	20	**22**
7. Goat fishes	0	0	0	0	**0**
8.Threadfins	0	0	0	0	**0**
9. Croakers	47	45	27	30	**37**
10. Ribbon fishes	35	32	22	33	**31**
11. Carangids					
a. Horse mackerel	48	45	30	38	**40**
b. Leather-jackets	40	32	37	42	**38**
c. Other carangids	45	50	20	57	**43**
12. Silverbellies	30	35	24	30	**30**
13. Big-Jawed jumper	75	90	80	75	**80**
14. Pomfrets	185	195	175	200	**189**
15. Mackerel	50	58	45	45	**50**
16. Seerfish	200	225	235	220	**220**
17. Tunnies	38	44	30	43	**39**
18. Barracudas	43	50	55	60	**52**
19. Mullets	70	75	70	80	**74**
20. Flat fishes	34	30	38	45	**37**
21. Prawns					
a. Penaeid prawns	165	178	225	240	**202**
b. Non penaeid prawn	25	32	27	38	**31**
22. Crab	38	42	40	46	**42**
23. Miscellaneous	20	25	25	40	**28**

Table 6.4. Whole sale price structure of different varieties of marine fishes of Kerala in 2007 (₹/Kg)

Species Name	Whole sale price of Kerala				Year- 2007
	Ist Qtr	IInd Qtr	IIIrd Qtr	IVth Qtr	Avg.
1. Elasmobranches					
a. Sharks	70	105	120	128	**106**
b. Rays	50	49	37	40	**44**
2. Catfishes	57	50	72	35	**54**
3. Clupeids					
b. Oil sardine	32	35	27	25	**30**
c. Anchovies	70	80	68	54	**68**
4. Lizard fish	42	40	50	44	**44**
5. Half and full beaks	38	50	60	49	**49**
6. Perches					
a. Rockcods	138	145	100	79	**116**
b. Snappers	85	92	79	87	**86**
c. Pig-face breams	79	87	100	70	**84**
d. Threadfin breams	45	50	55	75	**56**
e. Other perches	45	40	35	45	**41**
7. Goat fishes	0	0	0	0	**0**
8.Threadfins	0	0	0	0	**0**
9. Croakers	65	60	50	48	**56**
10 Ribbon fishes	55	50	45	50	**50**
11. Carangids					
a. Horse mackerel	70	67	50	59	**62**
b. Leather-jackets	60	50	55	60	**56**
c. Other carangids	80	85	45	72	**71**
12. Silverbellies	45	48	35	45	**43**
13. Big-Jawed jumper	92	125	120	105	**111**
14. Pomfrets	225	235	210	240	**228**
15. Mackerel	75	80	70	65	**73**
16. Seerfish	255	290	300	295	**285**
17. Tunnies	63	78	48	60	**62**
18. Barracudas	68	70	75	87	**75**
19. Mullets	92	98	100	108	**100**
23. Flat fishes	48	45	54	70	**54**
20. Prawns					
a. Penaeid prawns	250	265	290	300	**276**
b. Non penaeid prawn	32	50	35	52	**42**
21. Crab	60	75	60	77	**68**
22. Miscellaneous	32	37	38	55	**41**

Table 6.5. Retail price structure of different varieties of marine fishes of Kerala in 2007

Species Name	Retail price of Kerala				Year- 2007
	Ist Qtr	**IInd Qtr**	**IIIrd Qtr**	**IVth Qtr**	**Avg.**
1. Elasmobranches					
a. Sharks	78	130	145	157	**127**
b. Rays	58	65	58	50	**58**
2. Catfishes	68	70	88	58	**71**
3. Clupeids					
a. Oil sardine	44	48	35	33	**40**
b. Anchovies	82	97	83	65	**82**
4. Lizard fish	55	55	62	55	**57**
5. Half and full beaks	49	68	75	62	**64**
6. Perches					
a. Rockcods	160	167	125	88	**135**
b. Snappers	90	115	90	95	**98**
c. Pig-face breams	95	98	125	110	**107**
d. Threadfin breams	56	74	70	115	**79**
e. Other perches	58	58	47	58	**55**
7. Goat fishes	0	0	0	0	**0**
8.Threadfins	0	0	0	0	**0**
9. Croakers	73	72	68	62	**69**
10. Ribbon fishes	80	70	55	75	**70**
11. Carangids					
a. Horse mackerel	83	80	65	77	**76**
b. Leather-jackets	70	65	70	78	**71**
c. Other carangids	97	100	70	100	**92**
12. Silverbellies	55	65	52	65	**59**
13. Big-Jawed jumper	110	150	165	140	**141**
14. Pomfrets	250	268	238	268	**256**
15. Mackerel	95	100	110	80	**96**
16. Seerfish	275	320	340	310	**311**
17. Tunnies	88	92	70	77	**82**
18. Barracudas	30	88	98	108	**81**
19. Mullets	110	120	132	140	**126**
20. Flat fishes	62	60	70	90	**71**
21. Prawns					
a. Penaeid prawns	285	300	310	335	**308**
b. Non penaeid prawn	45	64	48	64	**55**
22. Crab	76	96	78	95	**86**
23. Miscellaneous	44	48	50	67	**52**

Quarterly average landing prices of fish in Kerala during 2008 is given in Table 6.6. Pomfrets and seerfish fetched highest prices of ₹ 245 and ₹ 217 per kg respectively in primary market of Kerala and lowest prices for oil sardines and lizard fish of ₹ 24 and ₹ 27 per kg respectively. Marketing margin was found to be maximum in case of threadfin breams, pomfrets and non penaeid prawns. Highest price of pomfret in the landing center was recorded in the III rd quarter of 2008 and of oil sardine in the IInd quarter.

The average wholesale fish price in Kerala during 2008 is given in Table 6.7. Pomfrets, penaeid prawns, seerfish and thread fin breams realized prices of ₹ >100 per kg in this market. The quarterly variation in wholesale prices was very wide for penaeid prawns. Traders share of landing center price was maximum in case of seerfish, clupids and rock cods in wholesale market. Wholesale prices of Kerala in 2008 are almost in tune with the primary market prices. Pomfrets fetched the highest prices of ₹ 270 per kg and lizardfish fetched lowest prices of ₹ 27 per kg. Lowest price of pomfrets was recorded in Ist quarter and of lizardfish in IIIrd quarter.

In retail market of Kerala, retailers received maximum price for seerfish (₹ 309 per kg) followed by pomfrets (₹ 306 per kg) and penaeid prawns (₹ 239 per kg). In this market retailers received minimum price for big-jawed jumper (₹ 30 per kg) followed by leather jackets (₹ 37 per kg). It was observed that marketing margin was maximum in case of seerfish (₹ 192 per kg) followed by carangids (₹ 77 per kg). The marketing margin was the lowest for threadfins (₹ 6 per kg) followed by anchovies (₹ 10 per kg). The quarterly variation in retail prices was very wide for threadfin and seerfish. (Table 6.8)

Table 6.6. Landing price structure of different varieties of marine fishes of Kerala in 2008 (₹/Kg)

Species Name	Landing Centre Price of Kerala				Year 2008
	I^{st} Qua.	II^{nd} Qua.	III^{rd} Qua.	IV^{th} Qua.	An.l Ave.
1. Elasmobranches					
a. Sharks	43	58	33	30	**41**
b. Rays	36	50	25	25	**34**
2. Catfishes	38	55	37	30	**40**
3. Clupeids					
a. Wolf herring	47	47	43	63	**50**
b. Oil sardine	18	35	23	20	**24**
c. Anchovies	29	28	25	30	**28**
d. Other clupeids	37	43	27	93	**50**
4. Bombayduck					
5. Lizard fish	26	33	18	30	**27**
6. Half and full beaks	45	50	35		**43**
7. Perches					
a. Rockcods	42	53	73	50	**54**
b. Snappers	112	125	73	80	**97**
c. Threadfin breams	27	30	23	30	**28**
8. Goat fishes	27	30	23	30	**28**
9.Threadfins	163	95	150	125	**133**
10. Croakers	35	48	28	35	**36**
11. Ribbon fishes	52	60	25	35	**43**
12. Carangids					
a. Horse mackerel	31	45	24	30	**32**
b. Leather-jackets					
c. Other carangids	31	45	24	40	**35**
13. Pomfrets	242	250	252	238	**245**
14. Mackerel	75	83	35	48	**60**
15. Seerfish	235	208	220	205	**217**
16. Tunnies	50	60	48	45	**51**
17. Barracudas	37	45	25	40	**37**
18. Mullets	40		25		**33**
19. Flat fishes	35	55	25	20	**34**
20. Prawns					
a. Penaeid prawns	158	213	160	140	**168**
b. Non penaeid prawn	25	33	25	30	**28**
21. Crab	28	45	25	35	**33**
22. Miscellaneous	23	28	23	25	**25**

Table 6.7. Whole sale price structure of different varieties of marine fishes of Kerala in 2008 (₹/Kg)

Species Name	Whole sale price of Kerala				Year 2008
	Ist Qua.	IInd Qua.	IIIrd Qua.	IVth Qua.	Avg.
1. Elasmobranches					
a. Sharks	53	72	52	45	**55**
b. Rays	43	65	43	35	**46**
2. Catfishes	45	70	48	43	**51**
3. Clupeids					
a. Wolf herring	56	68	60	53	**59**
b. Oil sardine	24	41	25	22	**28**
c. Anchovies	34	42	32	29	**34**
d. Other clupeids	43	83	122	86	**83**
4. Bombayduck					
5. Lizard fish	32	43	8	26	**27**
6. Half and full beaks	51	61	36	48	**49**
7. Perches					
a. Rockcods	66	85	91	103	**86**
b. Snappers	120	139	103	128	**122**
c. Threadfin breams	33	43	63	32	**43**
d. Other perches	0	0	0	0	**0**
8. Goat fishes	33	39	22	32	**31**
9.Threadfins	171	148	154	161	**159**
10. Croakers	41	60	41	36	**44**
11. Ribbon fishes	56	71	42	45	**53**
12. Carangids		13			**13**
a. Horse mackerel	38	60	46	33	**44**
b. Leather-jackets	52	35	22	28	**34**
c. Other carangids	40	50	44	15	**37**
13. Big-Jawed jumper		28	35	21	**28**
14. Pomfrets	258	271	288	264	**270**
15. Mackerel	92	99	68	59	**79**
16. Seerfish	147	179	150	140	**154**
17. Tunnies	55	65	55	50	**56**
18. Barracudas	43	29	33	39	**36**
19. Mullets	28	45	33	41	**37**
20. Flat fishes	43	66	30	39	**45**
21. Prawns					
a. Penaeid prawns	268	177	111	131	**172**
b. Non penaeid prawn	31	48	30	27	**34**
22. Crab	38	63	34	38	**43**
23. Miscellaneous	29	38	23	26	**29**

Table 6.8. Retail price structure of different varieties of marine fishes of Kerala in 2008 (₹/Kg)

Species Name	Retail price of Kerala				Year 2008
	Ist Qua.	IInd Qua.	IIIrd Qua.	IVth Qua.	Avg.
1. Elasmobranches					
a. Sharks	63	81	59	43	**62**
b. Rays	53	57	62	67	**60**
2. Catfishes	54	80	88	105	**82**
3. Clupeids					
a. Wolf herring	67	69	75	85	**74**
b. Oil sardine	35	48	52	55	**48**
c. Anchovies	42	50	36	25	**38**
d. Other clupeids	54	62	138	51	**76**
4. Bombayduck					
5. Lizard fish	40	53	28	35	**39**
6. Half and full beaks	48	74	80	90	**73**
7. Perches					
a. Rockcods	77	138	124	145	**121**
b. Snappers	134	160	190	217	**175**
c. Pig-face breams	50	65	72	78	**66**
d. Threadfin breams	40	52	71	83	**61**
8. Goat fishes	40	45	50	58	**48**
9.Threadfins	161	175	193	130	**165**
10. Croakers	51	70	49	66	**59**
11. Ribbon fishes	63	79	51	40	**58**
12. Carangids					
a. Horse mackerel	48	73	53	70	**61**
b. Leather-jackets					
c. Other carangids	50	64	48	145	**77**
13. Big-Jawed jumper	25	35	28	30	**30**
14. Pomfrets	280	293	314	335	**306**
15. Mackerel	103	114	79	35	**83**
16. Seerfish	250	285	330	370	**309**
17. Tunnies	65	76	63	78	**70**
18. Barracudas	52	56	60	65	**58**
19. Mullets	38	95	40		**58**
20. Flat fishes	53	58	72	85	**67**
21. Prawns					
a. Penaeid prawns	210	225	240	280	**239**
b. Non penaeid prawn	40	48	38	25	**38**
22. Crab	47	55	75	88	**66**
23. Miscellaneous	35	45	37	50	**42**

Quarterly average landing prices of different varieties of fish in Maharashtra during 2007 is given in Table 6.9. Fishermen realized lowest price for the following fish species viz., snappers, rock cods, pomfrets, penaeid prawns and threadfins. In 2007, in primary markets of Maharashtra fishermen received maximum price for penaeid prawns (₹ 309 per kg) and pomfrets (₹ 183 per kg) lowest price for oil sardines (₹ 17 per kg) followed by lizard fish (₹ 22 per kg). penaeid prawns fetched lowest prices during January-March and oil sardine during October- December period at the landing centers of Maharashtra.

In the wholesale markets of Maharashtra (Table 6.10), traders share of landing center price was highest for penaeid prawns (₹ 80 per kg). During January-March, wholesale prices found to be lowest compared to other quarters on account of increased landings. Price realization of penaeid prawns was found to be maximum during October-December period. Traders received maximum price for penaeid prawns (₹ 389 per kg) followed by pomfrets (₹ 226 per kg) and thread fin breams (₹ 164 per kg). In this market wholesalers received minimum price for lizard fish (₹ 32 per kg) followed by anchovies (₹ 33 per kg).

The quarterly average retail price of different varieties of fish in Maharashtra during 2007 is given in Table 6.11. Fishermen received maximum price of ₹ 415 per kg for penaeid prawns followed by pomfrets (₹ 244 per kg) and thread fin breams (₹ 182 per kg). In this market retailors received minimum price for oil sardines and lizard fish (₹ 32 per kg) in retail market of Maharashtra. It was observed that marketing margin was maximum in case of penaeid prawns (₹ 106 per kg) followed by pomfrets (₹ 60 per kg). The marketing margin was the lowest for oil sardines (₹ 14 per kg) followed by Bombay duck and anchovies and (₹ 16 per kg). The quarterly variation in retail prices was very wide for penaeid prawns and snappers.

Table 6.9 Landing price structure of different varieties of marine fishes in Maharashtra in 2007 (₹/Kg)

Species Name	Landing Centre Price of Maharashtra				Year 2007
	I^st Qtr	II^nd Qtr	III^rd Qtr	IV^th Qtr	Avg.
1. Elasmobranches					
a. Sharks	44	61	28	33	**42**
b. Rays	25	41	20	19	**26**
2. Catfishes	37	55	25	28	**36**
3. Clupeids					
a. Wolf herring	55	71	30	37	**48**
b. Oil sardine	12	29	19	9	**17**
c. Anchovies	22	41	24	12	**25**
d. Other clupeids	32	57	67	70	**57**
4. Bombayduck	30	58	30	15	**33**
5. Lizard fish	19	35	20	12	**22**
6. Half and full beaks	31	35	39	42	**37**
7. Perches					
a. Rockcods	120	130	135	142	**132**
b. Snappers	100	127	135	142	**126**
c. Threadfin breams	23	44	23	19	**27**
8. Goat fishes	23	44	23	19	**27**
9.Threadfins	125	135	148	163	**143**
10. Croakers	27	44	45	26	**35**
11. Ribbon fishes	34	43	23	31	**33**
12. Carangids	0	0	0	0	**0**
a. Horse mackerel	25	37	23	20	**26**
b. Leather-jackets	30	36	42	47	**39**
c. Other carangids	25	50	25	20	**30**
13. Big-Jawed jumper	35	41	45	48	**32**
14. Pomfrets	187	250	145	152	**183**
15. Mackerel	55	85	38	42	**55**
16. Seerfish	127	177	90	97	**123**
17. Tunnies	45	57	38	32	**43**
18. Barracudas	29	35	39	23	**32**
19. Mullets	35	45	35	47	**41**
20. Flat fishes	28	46	23	29	**31**
21. Prawns					
a. Penaeid prawns	272	315	325	325	**309**
b. Non penaeid prawn	25	43	20	18	**27**
22. Crab	30	42	35	24	**33**
23. Miscellaneous	23	28	15	15	**20**

Table 6.10 Wholesale price structure of different varieties of marine fishes in Maharashtra in 2007 (₹/Kg)

Species Name	Whole sale price of Maharashtra				Year 2007
	Ist Qtr	IInd Qtr	IIIrd Qtr	IVth Qtr	Avg.
1. Elasmobranches					
a. Sharks	52	64	66	43	**56**
b. Rays	29	35	44	32	**35**
2. Catfishes	44	57	58	42	**50**
3. Clupeids					
a. Wolf herring	62	72	73	53	**65**
b. Oil sardine	16	28	39	15	**24**
c. Anchovies	26	38	41	26	**33**
d. Other clupeids	38	68	75	85	**67**
4. Bombayduck	35	58	59	28	**45**
5. Lizard fish	22	29	50	25	**32**
6. Half and full beaks	42	58	65	75	**60**
7. Perches					
a. Rockcods	135	145	166	177	**156**
b. Snappers	117	143	168	170	**150**
c. Threadfin breams	29	57	42	29	**39**
8. Goat fishes	29	58	42	29	**40**
9.Threadfins	145	157	172	183	**164**
10. Croakers	32	57	69	35	**48**
11. Ribbon fishes	40	52	44	37	**43**
12. Carangids					
a. Horse mackerel	34	49	44	32	**40**
b. Leather-jackets	48	55	63	70	**59**
c. Other carangids	29	66	48	32	**44**
13. Big-Jawed jumper	52	59	60	68	**60**
14. Pomfrets	205	278	206	215	**226**
15. Mackerel	62	85	70	57	**69**
16. Seerfish	139	198	153	132	**155**
17. Tunnies	57	72	52	47	**57**
18. Barracudas	44	55	62	35	**49**
19. Mullets	48	65	46	70	**57**
20. Flat fishes	33	58	41	45	**44**
21. Prawns					
a. Penaeid prawns	325	400	410	420	**389**
b. Non penaeid prawn	29	52	39	27	**37**
22. Crab	39	55	58	35	**47**
23. Miscellaneous	27	35	23	25	**27**

Table 6.11. Retail price structure of different varieties of marine fishes of Maharashtra in 2007 (₹/Kg)

Species Name	Retail price of Maharashtra				Year 2007
	Ist Qtr	IInd Qtr	IIIrd Qtr	IVth Qtr	Avg.
1. Elasmobranches					
a. Sharks	60	82	76	51	**67**
b. Rays	36	51	52	40	**45**
2. Catfishes	51	69	64	48	**58**
3. Clupeids					**0**
a. Wolf herring	67	81	84	60	**73**
b. Oil sardine	19	40	44	24	**32**
c. Anchovies	29	50	49	35	**41**
d. Other clupeids	48	75	85	96	**76**
4. Bombayduck	38	61	65	32	**49**
5. Lizard fish	34	35	30	27	**32**
6. Half and full beaks	45	76	82	88	**73**
7. Perches					**0**
a. Rockcods	152	165	175	195	**172**
b. Snappers	123	150	175	182	**157**
c. Threadfin breams	30	68	54	37	**47**
8. Goat fishes	30	70	60	36	**49**
9.Threadfins	170	180	185	194	**182**
10. Croakers	34	68	78	45	**56**
11. Ribbon fishes	42	62	55	39	**50**
12. Carangids					**0**
a. Horse mackerel	42	58	52	38	**48**
b. Leather-jackets	59	70	75	82	**72**
c. Other carangids	33	78	55	61	**57**
13. Big-Jawed jumper	65	68	75	84	**73**
14. Pomfrets	239	289	222	225	**244**
15. Mackerel	70	100	88	63	**80**
16. Seerfish	147	215	172	141	**169**
17. Tunnies	61	88	67	76	**73**
18. Barracudas	54	72	75	45	**61**
19. Mullets	62	78	57	84	**70**
20. Flat fishes	43	76	58	58	**59**
21. Prawns					**0**
a. Penaeid prawns	344	425	440	450	**415**
b. Non penaeid prawn	33	59	45	39	**44**
22. Crab	48	60	65	53	**56**
23. Miscellaneous	31	42	35	32	**35**

Quarterly average landing prices of Maharashtra for different varieties of fish during 2008 is given in Table 6.12. The quarterly variation in landing center prices was very wide for clupeids and mullets. Price spread was found to be maximum in case of horse mackeral and mullets. In 2008, in primary markets of Maharashtra fishermen received maximum price for pomfrets (₹ 245 per kg) followed by penaeid prawns (₹ 243 per kg). Higherst prices for pomfrets was realized during July-August period at the landing center.

In wholesale market of Maharashtra (Table 6.13), marketing margin of traders at the landing center price was found to be maximum in case of penaeid prawns. It showed that non penaeid prawns, pomfrets and thread fins accounted maximum price spread in the fishermen-wholsaler channel. Traders realized maximum price for penaeid prawns (₹ 284 per kg) followed by pomfrets (₹ 278 per kg) and seerfish (₹ 170 per kg). In this market wholesalers received lowest price for non penaeid prawns (₹ 31 per kg) followed by oil sardines and goat fishes (₹ 42 per kg). The quarterly variation in wholesale prices was very wide for seerfish and penaeid prawns .

Quarterly average retail prices of Maharashtra for different varieties of fish during 2008 is given in Table 6.14. During Ist and IVth quarter, prices appeared to be lowest in retail market of Maharashtra on account of increased landings. The quarterly variation in retail prices was very wide for seerfish and mackeral. In the retail markets of Maharashtra, retailers received maximum price for penaed prawns (₹328 per kg) followed by pomfrets (₹ 304 per kg) and lowest price for oil sardines (₹ 23 per kg) followed by anchovies and non penaeid prawns (₹ 38 per kg).

Table 6.12 Landing price structure of different varieties of marine fishes in Maharashtra in 2008 (₹/Kg)

Species Name	Retail price of Maharashtra				Year-2008
	I^{st} Qtr	II^{nd} Qtr	III^{rd} Qtr	IV^{th} Qtr	Ave
1. Elasmobranches					
a. Sharks	43	58	33	30	41
b. Rays	36	50	25	25	34
2. Catfishes	38	55	37	30	40
3. Clupeids					
a. Wolf herring	47	47	43	63	50
b. Oil sardine	18	35	23	20	24
c. Anchovies	29	28	25	30	28
d. Other clupeids	37	43	27	93	50
4. Bombayduck	40	45	26	25	34
5. Lizard fish	26	33	18	30	27
6. Half and full beaks	45	50	35	60	48
7. Perches					
a. Rockcods	42	53	73	50	54
b. Snappers	112	125	73	80	97
c. Threadfin breams	27	30	23	30	28
8. Goat fishes	27	30	23	30	28
9.Threadfins	163	95	150	125	133
10. Croakers	35	48	28	35	36
11. Ribbon fishes	52	60	25	35	43
12. Carangids					
a. Horse mackerel	31	45	24	30	32
b. Leather-jackets	48	40	35	33	39
13. Big-Jawed jumper					
14. Pomfrets	242	250	252	238	245
15. Mackerel	59	68	45	58	58
16. Seerfish	135	108	135	140	142
17. Tunnies	50	60	48	45	51
18. Barracudas	47	55	55	50	52
19. Flat fishes	35	55	25	20	34
20. Prawns					
a. Penaeid prawns	258	213	260	240	243
b. Non penaeid prawn	25	33	25	30	28
21. Crab	28	45	25	35	33
22. Miscellaneous	23	28	23	25	25

Table 6.13. Whole Sale Price Structure of Different Varieties of Marine Fishes in Maharashtra in 2008 (₹/Kg)

Species Name	Retail price of Maharashtra				Year-2008
	Ist Qtr	IInd Qtr	IIIrd Qtr	IVth Qtr	Ave
1. Elasmobranches					
a. Sharks	53	65	72	85	69
b. Rays	43	52	63	76	59
2. Catfishes	45	70	48	43	51
3. Clupeids					
a. Wolf herring	56	68	75	83	71
b. Oil sardine	24	41	48	55	42
c. Anchovies	34	42	54	69	50
d. Other clupeids	72	83	95	110	90
4. Bombayduck	46	58	65	74	61
5. Lizard fish	32	43	48	66	47
6. Half and full beaks	51	61	52	65	57
7. Perches					
a. Rockcods	66	85	91	103	86
b. Snappers	120	139	145	158	140
c. Thre. breams	33	43	63	72	53
8. Goat fishes	33	39	45	52	42
9.Threadfins	131	148	154	161	149
10. Croakers	41	57	65	72	59
11. Ribbon fishes	36	52	61	70	55
12. Carangids					
a. Horse mackerel	38	60	76	83	64
b. Leather-jackets	28	35	50	58	43
c. Other carangids					
13. Big-Jawed jumper					
14. Pomfrets	258	271	288	295	278
15. Mackerel	75	83	82	85	81
16. Seerfish	145	175	210	150	170
17. Tunnies	50	55	67	55	57
18. Barracudas	43	59	68	82	63
19. Flat fishes	43	66	30	39	45
20. Prawns					
a. Penaeid prawns	268	255	281	280	284
b. Non penaeid prawn	27	30	30	35	31
21. Crab	38	53	55	55	50
22. Miscellaneous	23	26	28	36	28

Table 6.14. Retail price structure of different varieties of marine fishes in Maharashtra in 2008 (₹/Kg)

Species Name	Retail price of Maharashtra				Year-2008
	Ist Qtr	IInd Qtr	IIIrd Qtr	IVth Qtr	Ave
1. Elasmobranches					
a. Sharks	63	81	59	43	62
b. Rays	53	74	50	35	53
2. Catfishes	54	80	58	65	64
3. Clupeids					
a. Wolf herring	67	80	69	58	69
b. Oil sardine	30	48	32	20	33
c. Anchovies	42	50	36	25	38
d. Other clupeids	54	62	138	51	76
4. Bombayduck	55	68	48	25	49
5. Lizard fish	40	53	28	35	39
6. Half and full beaks	48	74	50	90	66
7. Perches					
a. Rockcods	77	138	104	35	89
b. Snappers	134	160	217	150	165
c. Thread breams	40	52	71	63	56
8. Goat fishes	40	45	36	35	39
9.Threadfins	193	161	176	150	170
10. Croakers	51	70	49		57
11. Ribbon fishes	63	79	51	40	58
12. Carangids					
a. Horse mackerel	48	73	53	49	56
b. Leather-jackets	56	56	52	52	54
13. Big-Jawed jumper					
14. Pomfrets	280	293	314	330	304
15. Mackerel	103	104	99	85	98
16. Seerfish	165	198	240	180	196
17. Tunnies	65	76	73	70	71
18. Barracudas	82	96	80	85	86
19. Flat fishes	53	74	48	58	58
20. Prawns					
a. Penaeid prawns	296	313	323	380	328
b. Non penaeid prawn	40	48	38	25	38
21. Crab	47	73	50		56
22. Miscellaneous	35	45	37		39

Quarterly average landing fish prices of Tamil Nadu during 2007 is given in Table 6.15. The prices of almost all the varieties have shown a increasing trend in quarters II compared to other quarters due to the impact of fishing ban from April 15 to May 30 in Tamil Nadu. Seerfish and penaeid prawns have shown high price compared to other fishes in primary market of Tamil Nadu. The quarterly variation in landing center prices was very wide for penaeid prawns and rock cods. Fishermen realized maximum price of ₹ 315 per kg for penaeid prawns followed by big jawed jumper (₹ 131 per kg) and seerfish (₹ 124 per kg) in primary market of Tamil Nadu and minimum price for silver bellies (₹ 15 per kg) followed by flying fishes (₹ 19 per kg).

In wholesale market of Tamil Nadu (Table 6.16), the fishes which realized the price of more than ₹100 were penaeid prawns, pomfrets, seerfish and big jawed jumper during 2007. The wholesaler obtained maximum margin of ₹43 per kg for penaeid prawns. During January to March almost all the fish prices found to be lowest on account of increased landings. Trader received maximum price for penaeid prawns (₹ 358 per kg) followed by seerfish (₹ 156 per kg), big jawed jumper and pomfrets (₹ 155 per kg) and minimum price for silver bellies (₹ 21 per kg) followed by ribbonfishes (₹ 24 per kg). The quarterly variation in wholesale prices was very wide for penaeid prawns.

Quarterly average landing fish prices of Tamil Nadu during 2007 is given in Table 6.17. The quarterly variation in retail prices was very wide for penaeid prawns and lizard fish. Retail price behaviour is also in tune with the primary and wholesale markets of Tamil Nadu. Retailers received maximum price for penaeid prawns (₹ 385 per kg) followed by seerfish (₹ 203 per kg). In this market retailers received minimum price for silver bellies (₹ 28 per kg) followed by oil sardines (₹ 38 per kg). The average price of penaeid prawns varies from ₹ 358 to ₹ 435 between different seasons and the price of silver bellies varies from ₹ 17 to ₹ 36 in the retail market.

Table 6.15. Landing price structure of different varieties of marine fishes in Tamil Nadu in 2007 (₹/Kg)

Species Name	Landing Centre Price of Tamil Nadu				Year 2007
	I^{st} Qtr	II^{nd} Qtr	III^{rd} Qtr	IV^{th} Qtr	Avg.
1. Elasmobranches					
a. Sharks	55	57	64	50	**57**
b. Rays	21	25	27	23	**24**
2. Catfishes	25	38	36	33	**33**
3. Clupeids					
a. Wolf herring	42	51	65	48	**52**
b. Oil sardine	14	19	21	25	**20**
c. Anchovies	45	58	65	68	**59**
4. Lizard fish	13	30	33	50	**32**
5. Half and full beaks	40	48	57	63	**52**
6. Flying fishes	11	20	20	23	**19**
7. Perches					
a. Rockcods	31	114	105	107	**89**
b. Snappers	29	44	47	38	**40**
c. Pig-face breams	47	79	76	84	**72**
d. Threadfin breams	41	50	46	50	**47**
e. Other perches	55	60	40	50	**51**
8. Goat fishes	43	55	59	53	**53**
9. Croakers	24	42	42	43	**38**
10. Ribbon fishes	18	24	20	20	**21**
11. Carangids					
a. Horse mackerel	22	25	22	25	**24**
b. Leather-jackets	19	25	36	30	**28**
12. Silverbellies	11	14	18	17	**15**
13. Big-Jawed jumper	125	140	100	160	**131**
14. Pomfrets	105	145	109	125	**121**
15. Mackerel	31	34	30	37	**33**
16. Seerfish	117	128	135	115	**124**
17. Tunnies	40	43	40	50	**43**
18. Barracudas	48	59	66	75	**62**
19. Mullets	34	48	52	48	**46**
20. Flat fishes	19	14	23	30	**22**
21. Prawns					
a. Penaeid prawns	285	290	300	385	**315**
b. Non penaeid prawn	48	23	25	20	**29**
22. Crab	73	51	73	77	**69**
23. Miscellaneous	15	20	30	15	**20**

Table 6.16. Whole sale price structure of different varieties of marine fishes in Tamil Nadu in 2007 (₹/Kg)

Species Name	Whole sale price of Tamil Nadu				Year 2007
	Ist Qtr	IInd Qtr	IIIrd Qtr	IVth Qtr	Avg.
1. Elasmobranches					
a. Sharks	73	82	88	72	**79**
b. Rays	24	30	35	26	**29**
2. Catfishes	30	49	52	47	**45**
3. Clupeids					
a. Wolf herring	65	65	77	64	**68**
b. Oil sardine	21	27	30	38	**29**
c. Anchovies	57	74	81	85	**74**
d. Other clupeids	30	37	43	38	**37**
4. Lizard fish	15	45	55	70	**46**
5. Half and full beaks	52	64	74	83	**68**
6. Flying fishes	19	33	35	40	**32**
7. Perches					
a. Rockcods	43	137	126	112	**105**
b. Snappers	42	58	62	52	**54**
c. Pig-face breams	68	92	83	90	**83**
d. Threadfin breams	43	53	50	53	**50**
8. Goat fishes	58	72	75	68	**68**
9. Croakers	35	57	60	58	**53**
10. Ribbon fishes	20	30	23	23	**24**
11. Carangids					
a. Horse mackerel	34	39	35	40	**37**
b. Leather-jackets	28	45	48	42	**41**
12. Silverbellies	13	18	27	25	**21**
13. Big-Jawed jumper	145	165	125	183	**155**
14. Pomfrets	140	175	145	160	**155**
15. Mackerel	42	48	43	49	**46**
16. Seerfish	140	165	167	150	**156**
17. Tunnies	55	60	65	70	**63**
18. Barracudas	65	85	90	100	**85**
19. Mullets	54	72	75	75	**69**
20. Flat fishes	29	24	36	45	**34**
21. Prawns					
a. Penaeid prawns	320	335	365	410	**358**
b. Non penaeid prawn	57	35	45	32	**42**
22. Crab	90	68	95	98	**88**
23. Miscellaneous	20	25	38	25	**27**

Table 6.17. Retail price structure of different varieties of marine fishes in Tamil Nadu in 2007 (₹/Kg)

Species Name	Retail price of Tamil Nadu				Year 2007
	Ist Qtr	IInd Qtr	IIIrd Qtr	IVth Qtr	Avg.
1. Elasmobranches					
a. Sharks	84	95	105	87	**93**
b. Rays	35	44	41	41	**40**
2. Catfishes	44	62	48	58	**53**
3. Clupeids					
a. Wolf herring	65	80	83	80	**77**
b. Oil sardine	28	36	39	47	**38**
c. Anchovies	62	88	92	97	**85**
4. Lizard fish	37	64	68	88	**64**
5. Half and full beaks	57	75	81	97	**78**
6. Flying fishes	28	39	42	51	**40**
7. Perches					
a. Rockcods	55	152	153	148	**127**
b. Snappers	53	69	75	70	**67**
c. Pig-face breams	81	112	101	110	**101**
d. Threadfin breams	49	59	56	58	**56**
8. Goat fishes	69	85	89	79	**81**
9. Croakers	48	69	74	69	**65**
10. Ribbon fishes	25	36	28	28	**41**
11. Carangids					
a. Horse mackerel	42	48	43	48	**45**
b. Leather-jackets	35	56	59	55	**47**
12. Silverbellies	17	23	36	36	**28**
13. Big-Jawed jumper	175	182	136	200	**173**
14. Pomfrets	165	199	175	184	**171**
15. Mackerel	51	60	57	66	**88**
16. Seerfish	184	220	204	202	**203**
17. Tunnies	68	78	80	85	**109**
18. Barracudas	81	102	115	120	**105**
19. Mullets	64	87	88	90	**82**
20. Flat fishes	38	34	48	58	**45**
21. Prawns					
a. Penaeid prawns	358	368	380	435	**385**
b. Non penaeid prawn	68	48	55	42	**53**
22. Crab	108	85	115	120	**107**
23. Miscellaneous	28	29	47	39	**53**

Average landing prices of different varieties of fish of Tamil Nadu during 2008 is given in Table 6.18. It was observed that price spread of penaeid prawns, seerfish and pomfrets found to be more when compared to other fishes in the primary market s of Tamil Nadu. In 2008, the quarterly variation in landing center prices was very wide for penaeid prawns and seerfish. In the primary markets of Tamil Nadu, fishermen received maximum price for seerfish (₹ 174 per kg) followed by penaeid prawns (₹ 154 per kg) and rock cods (₹ 123 per kg) and minimum price for oil sardines and silver bellies (₹ 21 per kg). The price of seerfish varies from ₹ 124 to ₹ 215 between different seasons and price of oil sardine varies from ₹ 13 to ₹ 25 in the primary market.

In wholesale market of Tamil Nadu (Table 6.19), the fishes, which realized the price of more than ₹ 100, were seerfsih, penaeid prawns, pomfrets, crabs, barracudas, pigface breams and rock cods. Fishermen – wholesaler – retailer - consumer channel observed to be more efficient almost for all the fish species in Tamil Nadu. Wholesalers received maximum price for seerfish (₹ 207 per kg) followed by penaeid prawns (₹ 193 per kg) and rock cods (₹ 147 per kg). In this market traders received minimum price for silver bellies (₹ 30 per kg) followed by oil sardines (₹ 34 per kg). The quarterly variation in wholesale prices was very wide for penaeid prawns and pomfrets.

The quarterly average retail prices of different varieties of fish of Tamil Nadu during 2008 is given in Table 6.20. The quarterly variation in retail prices was very wide for penaeid prawns. In retail market of Tamil Nadu, retailers received maximum price for seerfish (₹ 236 per kg) followed by penaeid prawns (₹ 224 per kg) and rock cods (₹ 168 per kg). The price of serfish varies from ₹ 207 to ₹ 270 during different quarters. In this market retailers received minimum price for silver bellies and oil sardines (₹ 42 per kg). It was observed that marketing margin was maximum in case of penaeid prawns (₹ 70 per kg) followed by seerfish (₹ 63 per kg) and pomfrets

(₹60 per kg). The marketing margin was the lowest for threadfins (₹ 9 per kg) followed by silver bellies and rock cods (₹ 13 per kg).

Table 6.18. Landing price structure of different varieties of marine fishes in Tamil Nadu in 2008 (₹/Kg)

Species Name	Landing Centre Price of Tamil Nadu				Year- 2008
	I^{st} Qtr	II^{nd} Qtr	III^{rd} Qtr	IV^{th} Qtr	Avg.
1. Elasmobranches					
a. Sharks	55	94	42	45	**59**
b. Rays	26	31	34	35	**32**
2. Catfishes	38	53	40	42	**43**
3. Clupeids					
a. Wolf herring	70	60	68	70	**67**
b. Oil sardine	13	22	25	25	**21**
c. Anchovies	66	40	53	55	**54**
4. Lizard fish	15	20	23	35	**23**
5. Half and full beaks	58	75	72	78	**71**
6. Flying fishes	20	25	23	25	**23**
7. Perches					
a. Rockcods	118	128	120	127	**123**
b. Snappers	45	69	55	57	**57**
c. Pig-face breams	72	99	83	84	**85**
d. Threadfin breams	58	35	45	50	**47**
8. Goat fishes	59	63	65	68	**64**
9. Croakers	43	46	45	48	**46**
10. Ribbon fishes	38	40	35	40	**38**
11. Carangids					
a. Horse mackerel	30	33	35	38	**34**
b. Leather-jackets	25	43	40	38	**37**
12. Silverbellies	14	26	25	17	**21**
13. Pomfrets	130	93	115	80	**105**
14. Mackerel	47	67	55	37	**52**
15. Seerfish	124	215	165	190	**174**
16. Tunnies	40	48	40	42	**43**
17. Barracudas	83	102	75	75	**84**
18. Mullets	49	48	55	58	**53**
19. Flat fishes	25	20	28	30	**26**
20. Prawns					
a. Penaeid prawns	138	134	140	205	**154**
b. Non penaeid prawn	25	33	30	25	**28**
21. Crab	72	93	82	88	**84**

Table 6.19. Wholesale price structure of different varieties of marine fishes in Tamil Nadu in 2008 (₹/Kg)

Species Name	Whole sale price of Tamil Nadu				Year 2008
	Ist Qtr	IInd Qtr	IIIrd Qtr	IVth Qtr	Avg.
1. Elasmobranches					
a. Sharks	68	117	58	65	**77**
b. Rays	32	43	47	49	**43**
2. Catfishes	49	65	55	58	**57**
3. Clupeids					
a. Wolf herring	82	73	85	90	**83**
b. Oil sardine	20	34	40	40	**34**
c. Anchovies	79	48	67	70	**66**
4. Lizard fish	25	32	37	48	**36**
5. Half and full beaks	63	89	88	105	**86**
6. Flying fishes	30	43	38	40	**38**
7. Perches					
a. Rockcods	138	155	146	150	**147**
b. Snappers	63	90	69	72	**74**
c. Pig-face breams	89	118	107	99	**103**
d. Threadfin breams	75	48	62	75	**65**
8. Goat fishes	82	89	92	97	**90**
9. Croakers	54	60	68	75	**64**
10. Ribbon fishes	40	45	45	52	**46**
11. Carangids					
a. Horse mackerel	48	52	55	58	**53**
b. Leather-jackets	38	67	60	62	**57**
12. Silverbellies	21	37	35	25	**30**
13. Pomfrets	155	118	134	105	**128**
14. Mackerel	65	85	70	55	**69**
15. Seerfish	179	240	189	220	**207**
16. Tunnies	58	68	60	65	**63**
17. Barracudas	96	125	90	87	**100**
18. Mullets	68	65	72	75	**70**
19. Flat fishes	37	35	45	48	**41**
20. Prawns					
a. Penaeid prawns	165	160	190	258	**193**
b. Non penaeid prawn	35	45	42	38	**40**
21. Crab	88	120	110	122	**110**

Table 6.20. Retail price structure of different varieties of marine fishes in Tamil Nadu in 2008 (₹/Kg)

Species Name	Retail price of Tamil Nadu				Year 2008
	Ist Qtr	IInd Qtr	IIIrd Qtr	IVth Qtr	Avg.
1. Elasmobranches					
a. Sharks	90	135	72	87	**96**
b. Rays	44	49	55	60	**52**
2. Catfishes	59	78	70	75	**71**
3. Clupeids					
a. Wolf herring	91	83	98	108	**95**
b. Oil sardine	30	41	48	50	**42**
c. Anchovies	88	60	79	85	**78**
4. Lizard fish	33	45	49	63	**48**
5. Half and full beaks	70	98	102	121	**98**
6. Flying fishes	42	58	55	60	**54**
7. Perches					
a. Rockcods	154	172	168	178	**168**
b. Snappers	81	106	85	90	**91**
c. Pig-face breams	110	134	128	120	**123**
d. Threadfin breams	88	68	76	98	**83**
8. Goat fishes	98	107	110	120	**109**
9. Croakers	63	78	86	95	**59**
10. Ribbon fishes	56	59	68	76	**69**
11. Carangids					
a. Horse mackerel	59	68	74	75	**69**
b. Leather-jackets	53	85	80	85	**74**
12. Silverbellies	34	49	47	36	**42**
13. Pomfrets	179	155	168	155	**164**
14. Mackerel	77	98	87	72	**84**
15. Seerfish	207	270	210	258	**236**
16. Tunnies	67	85	78	85	**79**
17. Barracudas	121	155	91	101	**117**
18. Mullets	85	90	88	95	**90**
19. Flat fishes	51	48	58	64	**55**
20. Prawns					
a. Penaeid prawns	196	185	225	289	**224**
b. Non penaeid prawn	48	63	55	49	**54**
21. Crab	97	137	128	146	**127**

Average landing price for different fish varieties of Andhra Pradesh during 2007 is given in Table 21. Prices of almost all the fish varieties appeared to be very low in the Ist quarter when compared to other quarters. In 2007, in primary markets of Andhra Pradesh, fishermen received maximum price for seerfish (₹ 163 per kg) followed by penaeid prawns (₹ 153 per kg) and pomfrets (₹ 141 per kg). Price realization of seerfish varies from ₹ 163 to ₹ 247 during different seasons. In this market fishermen received minimum price for oil sardines (₹ 23 per kg) and silver bellies (₹ 27 per kg).

Quarterly average wholesale price for different fish varieties in Andhra Pradesh during 2008 is given in Table 6.20. Fishermen attained 70 per cent of the prices of wholesalers for almost all the fish species in Andhra Pradesh. In wholesale market of Andhra Pradesh, wholesalers received maximum price for penaeid prawns (₹ 213 per kg) followed by seerfish (₹ 208 per kg) and pomfrets (₹172 per kg). The average price of penaeid prawns varies from ₹ 175 to ₹ 239. In this market traders received minimum price for oil sardines (₹ 33 per kg) followed by rays (₹ 35 per kg). (Table 6.22)

Average retail price for different fish varieties fish in Andhra Pradesh during 2007 is given in Table 6.23. The quarterly variation from the market prices was very wide for penaeid prawns and seerfish. Retailers received maximum price for seerfish (₹ 247 per kg) followed by penaeid prawns (₹ 240 per kg) and pomfrets (₹ 193 per kg) in retail markets of Andhra Pradesh. Retailers received minimum price for oil sardines (₹ 42 per kg) and rays (₹44 per kg).

Table 6.21. Landing price structure of different varieties of marine fishes in Andhra Pradesh in 2007 (₹/Kg)

Species Name	Landing Centre Price of Andhra Pradesh				Year 2007
	Ist Qtr	IInd Qtr	IIIrd Qtr	IVth Qtr	Avg.
1. Elasmobranches					
a. Sharks	66	69	72	80	**72**
b. Rays	19	23	27	35	**26**
2. Catfishes	35	39	42	47	**41**
3. Clupeids					
a. Wolf herring	32	38	46	54	**43**
b. Oil sardine	19	22	25	25	**23**
c. Anchovies	35	40	47	52	**44**
d. Other clupeids	37	39	45	49	**43**
4. Lizard fish	35	38	47	52	**43**
5. Half and full beaks	26	32	39	48	**36**
6. Perches					
a. Rockcods	69	75	84	89	**79**
b. Snappers	65	69	77	82	**73**
c. Threadfin breams	35	38	45	49	**42**
7. Goat fishes	30	35	43	53	**40**
8.Threadfins	45	51	57	65	**55**
9. Croakers	32	38	45	48	**41**
10. Ribbon fishes	25	30	37	42	**34**
11. Carangids					
a. Horse mackerel	30	33	39	44	**37**
b. Other carangids	36	42	51	55	**46**
12. Silverbellies	19	25	28	35	**27**
13. Big-Jawed jumper	37	42	49	56	**46**
14. Pomfrets	125	135	146	158	**141**
15. Mackerel	35	40	47	50	**43**
16. Seerfish	135	160	165	190	**163**
17. Tunnies	29	35	38	45	**37**
18. Barracudas	38	42	50	60	**48**
19. Mullets	41	48	55	62	**52**
20. Flat fishes	34	37	42	45	**40**
21. Penaeid Prawns	125	134	149	205	**153**
22. Crab	35	39	45	52	**43**

Table 6.22. Wholesale price structure of different varieties of marine fishes in Andhra Pradesh in 2007 (₹/Kg)

Species Name	Whole sale price of Andhra Pradesh				Year 2007
	Ist Qtr	IInd Qtr	IIIrd Qtr	IVth Qtr	Avg.
1. Elasmobranches					
a. Sharks	113	116	116	121	**117**
b. Rays	32	34	35	38	**35**
2. Catfishes	52	55	51	59	**54**
3. Clupeids					
a. Wolf herring	51	53	55	62	**55**
b. Oil sardine	32	32	32	35	**33**
c. Anchovies	59	62	69	73	**66**
d. Other clupeids	46	49	50	55	**50**
4. Lizard fish	42	45	57	63	**52**
5. Half and full beaks	42	43	49	63	**49**
6. Perches					
a. Rockcods	110	117	119	125	**118**
b. Snappers	95	102	105	111	**103**
c. Threadfin breams	57	61	67	72	**64**
7. Goat fishes	48	49	55	66	**55**
8.Threadfins	76	65	69	78	**72**
9. Croakers	52	50	54	62	**55**
10. Ribbon fishes	42	48	52	58	**50**
11. Carangids					
a. Horse mackerel	44	42	48	55	**47**
b. Other carangids	57	62	65	73	**64**
12. Silverbellies	32	35	37	48	**38**
13. Big-Jawed jumper	49	55	59	67	**58**
14. Pomfrets	155	169	175	187	**172**
15. Mackerel	59	52	53	65	**57**
16. Seerfish	153	215	222	240	**208**
17. Tunnies	49	55	55	67	**57**
18. Barracudas	54	65	69	77	**66**
19. Mullets	62	65	63	74	**66**
20. Flat fishes	57	54	58	68	**59**
21. Penaeid Prawns	175	216	221	239	**213**
22. Crab	55	56	61	70	**61**

Table6.23. Retail price Structure of Different Varieties of marine Fishes in Andhra Pradesh in 2007 (₹/Kg)

Species Name	Retail price of Andhra Pradesh				Year 2007
	Ist Qtr	IInd Qtr	IIIrd Qtr	IVth Qtr	Avg.
1. Elasmobranches					
a. Sharks	127	129	135	87	**120**
b. Rays	45	43	47	41	**44**
2. Catfishes	68	68	72	40	**62**
3. Clupeids					
a. Wolf herring	63	65	73	74	**69**
b. Oil sardine	41	42	44	41	**42**
c. Anchovies	72	73	77	81	**76**
d. Other clupeids	65	52	61	66	**61**
4. Lizard fish	55	63	69	72	**65**
5. Half and full beaks	64	56	65	82	**67**
6. Perches					
a. Rockcods	125	142	145	148	**140**
b. Snappers	116	122	130	138	**127**
c. Threadfin breams	68	68	73	79	**72**
7. Goat fishes	62	58	63	79	**66**
8.Threadfins	85	78	84	92	**85**
9. Croakers	63	58	66	75	**70**
10. Ribbon fishes	56	55	61	72	**62**
11. Carangids					
a. Horse mackerel	56	55	59	69	**60**
b. Other carangids	74	68	75	88	**76**
12. Silverbellies	39	39	42	59	**45**
13. Big-Jawed jumper	68	67	75	85	**74**
14. Pomfrets	179	189	198	205	**193**
15. Mackerel	67	68	75	77	**72**
16. Seerfish	207	254	265	260	**247**
17. Tunnies	59	65	74	79	**69**
18. Barracudas	76	73	84	95	**82**
19. Mullets	74	72	77	87	**78**
20. Flat fishes	63	64	69	82	**70**
21. Penaeid Prawns	210	235	248	265	**240**
22. Crab	69	64	75	88	**74**
23. Miscellaneous	0	0	0	0	**0**

Quarterly average landing prices of Andhra Pradesh for different varieties of fish during 2008 are given in Table 6.24. Fishermen received maximum price of ₹ 259 per kg for penaeid prawns followed by seerfish (₹ 230 per kg) and pomfrets (₹ 168 per kg) and minimum price for oil sardines (₹ 30 per kg) and rays (₹ 33 per kg) in primary markets of Andhra Pradesh. During January to March the fish prices observed to be low when compared to other seasons.

Quarterly average wholesale prices of Andhra Pradesh for different varieties of fish during 2008 are given in Table 6.25. In wholesale market of Andhra Pradesh, fishermen received maximum price for penaeid prawns (₹ 323 per kg) followed by seerfish (₹ 299 per kg) and pomfrets (₹ 208 per kg). In this market fishermen received minimum price for oil sardines (₹ 43 per kg) followed by rays (₹ 46 per kg). The average price of penaeid prawns varies friom ₹ 225 to ₹ 285 and for oil sardine ₹ 28 to ₹ 32 during different seasons. Lowest price of penaid prawn was recorded in the Ist quarter.

Quarterly average retail prices of Andhra Pradesh for different varieties of fish during 2008 are given in Table 6.26. In retail markets of Andhra Pradesh, the quarterly variation from all the market prices was very wide for penaeid prawns and seerfish. Fishermen obtained maximum price of ₹ 356 per kg for penaeid prawns followed by seerfish (₹ 316 per kg) and pomfrets (₹236 per kg) in the retail market. In this market fishermen received minimum price for oil sardines (₹ 48 per kg) and rays (₹58 per kg).

Table 6.24. Landing price structure of different varieties of marine fishes in Andhra Pradesh in 2008 (₹/Kg)

Species Name	Landing Centre Price of Andhra Pradesh				Year- 2008
	Ist Qtr	IInd Qtr	IIIrd Qtr	IVth Qtr	Avg.
1. Elasmobranches					
a. Sharks	78	85	88	96	**87**
b. Rays	25	30	35	40	**33**
2. Catfishes	40	48	52	57	**49**
3. Clupeids					
a. Wolf herring	38	41	46	56	**45**
b. Oil sardine	28	30	30	32	**30**
c. Anchovies	35	40	47	52	**44**
d. Other clupeids	40	47	52	55	**49**
4. Lizard fish	40	45	47	58	**48**
5. Half and full beaks	32	37	44	50	**41**
6. Perches					
a. Rockcods	92	95	100	107	**99**
b. Snappers	85	92	98	105	**95**
c. Threadfin breams	52	55	60	60	**57**
7. Goat fishes	57	60	64	69	**63**
8.Threadfins	65	68	70	75	**70**
9. Croakers	50	50	56	61	**54**
10. Ribbon fishes	45	49	50	50	**49**
11. Carangids					
a. Horse mackerel	45	48	50	55	**50**
b. Other carangids	55	58	60	60	**58**
12. Silverbellies	35	38	42	45	**40**
13. Big-Jawed jumper	62	68	75	80	**71**
14. Pomfrets	160	168	170	175	**168**
15. Mackerel	58	62	65	65	**63**
16. Seerfish	210	225	240	245	**230**
17. Tunnies	48	50	58	65	**55**
18. Barracudas	65	72	78	85	**75**
19. Mullets	68	76	84	95	**81**
20. Flat fishes	45	48	55	60	**52**
21. Penaeid Prawns	225	255	270	285	**259**
22. Crab	55	62	70	80	**67**

Table 6.25. Wholesale price structure of different varieties of marine fishes in Andhra Pradesh in 2008 (₹/ Kg)

Species Name	Whole sale price of Andhra Pradesh				Year 2008
	I st Qtr	II nd Qtr	III rd Qtr	IV th Qtr	Avg.
1. Elasmobranches					
a. Sharks	125	140	145	155	**141**
b. Rays	37	42	48	55	**46**
2. Catfishes	55	62	69	75	**65**
3. Clupeids					
a. Wolf herring	55	60	65	68	**62**
b. Oil sardine	36	42	45	48	**43**
c. Anchovies	59	62	69	73	**66**
d. Other clupeids	52	59	70	77	**65**
4. Lizard fish	51	59	65	73	**62**
5. Half and full beaks	45	50	58	65	**55**
6. Perches					
a. Rockcods	130	138	140	145	**138**
b. Snappers	115	123	131	142	**128**
c. Threadfin breams	75	82	89	92	**85**
7. Goat fishes	75	80	88	92	**84**
8.Threadfins	82	89	95	105	**93**
9. Croakers	68	70	78	80	**74**
10. Ribbon fishes	63	69	75	80	**72**
11. Carangids					
a. Horse mackerel	60	70	76	85	**73**
b. Other carangids	75	78	85	88	**82**
12. Silverbellies	50	55	60	67	**58**
13. Big-Jawed jumper	79	89	102	115	**96**
14. Pomfrets	190	205	215	222	**208**
15. Mackerel	75	82	90	95	**86**
16. Seerfish	275	285	310	325	**299**
17. Tunnies	73	80	92	100	**86**
18. Barracudas	85	95	105	118	**101**
19. Mullets	85	100	115	135	**109**
20. Flat fishes	70	75	88	95	**82**
21. Penaeid Prawns	275	320	335	360	**323**
22. Crab	78	95	115	125	**103**

Table 6.26. Retail price structure of different varieties of marine fishes in Andhra Pradesh in 2008 (₹/Kg)

Species Name	Retail price of Andhra Pradesh				Year- 2008
	Ist Qtr	IInd Qtr	IIIrd Qtr	IVth Qtr	Avg.
1. Elasmobranches					
a. Sharks	140	169	178	168	**164**
b. Rays	49	55	58	68	**58**
2. Catfishes	70	75	80	89	**79**
3. Clupeids					
a. Wolf herring	68	75	80	92	**79**
b. Oil sardine	45	47	48	50	**48**
c. Anchovies	72	73	77	81	**76**
d. Other clupeids	65	75	85	94	**80**
4. Lizard fish	62	67	72	84	**71**
5. Half and full beaks	64	69	76	82	**73**
6. Perches					
a. Rockcods	155	160	168	172	**164**
b. Snappers	142	150	159	170	**155**
c. Threadfin breams	88	95	107	110	**100**
7. Goat fishes	89	95	99	100	**96**
8.Threadfins	95	102	110	120	**107**
9. Croakers	80	88	95	105	**96**
10. Ribbon fishes	78	84	90	95	**88**
11 Carangids					
a. Horse mackerel	78	85	92	98	**65**
b. Other carangids	94	95	102	105	**99**
12. Silverbellies	65	72	75	82	**74**
13. Big-Jawed jumper	98	110	120	132	**115**
14. Pomfrets	218	235	242	250	**236**
15. Mackerel	82	95	105	110	**98**
16. Seerfish	290	300	325	350	**316**
17. Tunnies	88	95	105	125	**103**
18. Barracudas	105	110	125	132	**118**
19. Mullets	98	120	130	150	**125**
20. Flat fishes	85	92	105	115	**99**
21. Penaeid Prawns	310	350	375	390	**356**
22. Crab	95	110	135	143	**121**
23. Miscellaneous	0	0	0	0	**0**

Data on the seasonal and annual price behaviour of different varieties of fish at landing wholesale and retail levels for Kerala, Maharashtra, Tamil Nadu and Andhrapradesh for two years collected under this study is presented from Table 6.3 to 6.26. This information is not only useful to estimate the valuation of different varieties of fish at micro and macro levels but also to estimate the gross marketing margins and fishermen's share on consumers rupee, the most crucial yardstick to measure the marketing efficiency and thereby the fishery business.

6.7 Gross marketing margins and fishermens' share in consumer's rupee

Gross margins denote the difference between the producers prize and consumers price including the marketing cost. The marketing margins are shared by wholesalers, retailers and other intermediaries involved in marketing. Based on the price data, marketing margins and percentage share of fishermen on consumer's rupee during 2007 and 2008 for Kerala is worked out and given in Table 6.27.

The marketing margins in Kerala varies from ₹17 per Kg for non penaeid prawns to ₹ 92 per Kg for seerfish during 2007 and 2008. It may be seen that fishes like seerfish and penaeid prawns provides marketing margins of ₹ 92 and ₹ 89 per Kg respectively. Fishes having high consumer preferences such as pomfrets, big-jawed jumper, snappers and rockcods get more that ₹50/- per Kg as average marketing margins in Kerala. Low quality fishes like non penaeid prawns, goat fishes, lizard fishes provide less than ₹ 20 per Kg as marketing margins.

Table 6.27 Estimated gross marketing margins & Fishermens' share in consumers rupee in Kerala during 2007 & 2008

Species Name	Marketing Margins (Rs/Kg)			Fishermens' share in consumer's rupee (%)		
	2007	2008	Average	2007	2008	Average
1. Elasmobranches						
a. Sharks	56	21	39	56	**66**	61
b. Rays	23	26	25	60	**57**	59
2. Catfishes	21	42	32	70	**49**	60
3. Clupeids						
a. Wolf herring		24	24		**68**	68
b. Oil sardine	21	24	23	48	**50**	49
c. Anchovies	37	10	24	55	**74**	65
d. Other clupeids		26	26		**66**	66
4. Bombay duck						
5. Lizard fish	28	12	20	51	**69**	60
6. Half and full beaks	30	30	30		**59**	59
7. Perches						
a. Rock cods	41	67	54	70	**45**	58
b. Snappers	31	77	54	68	**56**	62
c. Threadfin breams	43	33	38	46	**46**	46
8. Goat fishes		20	20		**58**	58
9. Threadfins		32	32		**80**	80
10. Croakers	32	23	28	60	**61**	61
11. Ribbon fishes	39	15	27	44	**74**	59
12. Carangids						
a. Horse mackerel	36	29	33	53	**52**	53
b. Leather-jackets	33		33	54		54
c. Other carangids	49	42	46	47	**45**	46
13. Silver bellies	29		29	51		51
14. Big-Jawed jumper	61		61	57		57
15. Pomfrets	67	61	64	74	**80**	77
16. Mackerel	46	23	35	52	**72**	62
17. Seerfish	91	92	92	71	**70**	71
18. Tunnies	43	19	31	48	**73**	61
19. Barracudas	39	21	30	64	**64**	64
20. Mullets	52	25	39	59	**57**	58
21. Flat fishes	34	33	34	52	**51**	52
22. Prawns						
a. Penaeid prawns	106	71	89	66	**70**	68
b. Non penaeid prawn	24	10	17	56	**74**	65
23. Crab	44	33	39	49	**50**	50
24. Miscellaneous	24	17	21	54	**60**	57

The average fishermens' share in consumer's rupee was above 70 percent for varieties like threadfins, pomfrets and seerfish. It may be seen that for fishes like oil sardine, threadfin breams and other carangids, fishermen receives less than 50 percent of the price paid by the consumers in Kerala.

The estimated gross marketing margins and percentage share of fishermens' share in consumer's rupee for all major varieties of fish in Maharashtra during 2007 and 2008 is given in Table 6.28. The average marketing margins varies from ₹ 12/- per Kg for oil sardine to ₹ 96 per Kg for penaeid prawns. Average marketing margins are as high as above ₹ 50 per Kg for snappers, pomfrets, seerfish and penaeid prawns and less than ₹ 15 per Kg for varieties like oil sardines, anchovies, lizard fish and non penaeid prawns. The average fishermens, share in consumer's rupee varies from 53 percent for other carangids to 78 percent for pomfrets. Fishermen received more than 70 percent of the consumer price for varieties like penaeid prawns, seerfishes, pomfrets, ribbon fishes, threadfins and other clupeids in Maharashtra.

The gross marketing margins and fishermen share in consumers rupee for Tamil Nadu during 2007 and 2008 was worked out and presented in Table 6.29. The annual average marketing margins varies from ₹ 17/- per Kg for silver bellies to ₹ 71/- per Kg for seerfishes. Fishermen receives more than 65 percent of the consumers price for varieties like penaeid prawns, barracudas, seerfishes, pomfrets, big-jawed jumper, crockers, threadfin breams, pigface breams, rockcods, half and full beaks, anchovies and wolf herring. In Tamil Nadu fishermen receives 38 to 76 percent share of consumer,s rupee for different varieties of fishes.

Table 6.28 Estimated gross marketing margins & Fishermens' share in consumer's rupee in Maharashtra during 2007 & 2008

	Marketing Margins (Rs/Kg)			Fishermens' share in consumer's rupee (%)		
	2007	**2008**	**Average**	**2007**	**2008**	**Average**
1. Elasmobranches						
a. Sharks	25	27	26	63	**61**	62
b. Rays	19	19	19	58	**64**	61
2. Catfishes	22	24	23	62	**63**	63
3. Clupeids						
a. Wolf herring	25	19	22	66	**72**	69
b. Oil sardine	15	09	12	53	**73**	63
c. Anchovies	16	10	13	61	**74**	68
d. Other clupeids	19	26	23	75	**66**	71
4. Bombayduck	16	15	16	67	**69**	68
5. Lizard fish	10	12	11	69	**69**	69
6. Half and full beaks	36	18	27	51	**73**	62
7. Perches						
a. Rockcods	40	35	38	77	**61**	69
b. Snappers	31	68	50	80	**59**	70
c. Threadfin breams	20	28	24	57	**50**	54
8. Goat fishes	22	11	17	55	**72**	64
9.Threadfins	39	37	38	79	**78**	79
10. Croakers	21	21	21	63	**63**	63
11. Ribbon fishes	17	15	16	66	**74**	70
12. Carangids						
a. Horse mackerel	22	24	23	54	**57**	56
b. Leather-jackets	33	15	24	54	**72**	63
c. Other carangids	27		27	53		53
13. Pomfrets	61	59	60	75	**81**	78
14. Mackerel	25	40	33	69	**59**	64
15. Seerfish	46	54	50	73	**72**	73
16. Tunnies	30	20	25	61	**72**	67
17. Barracudas	29	34	32	52	**60**	56
18. Mullets	21		21	59		59
19. Flat fishes	28	24	26	53	**59**	56
20. Prawns						
a. Penaeid prawns	106	85	96	74	**74**	74
b. Non penaeid prawn	17	10	14	61	**58**	60
21. Crab	23	23	23	59	**59**	59
22. Miscellaneous	15	14	15	57	**64**	61

Table 6.29 Estimated gross marketing margins & Fishermens' share in consumer's rupee in Tamil Nadu during 2007 & 2008

Species Name	Marketing Margins (Rs/Kg)			Fishermens' share in consumer's rupee (%)		
	2007	2008	Average	2007	2008	Average
1. Elasmobranches						
a. Sharks	36	37	37	61	**61**	61
b. Rays	16	20	18	60	**62**	61
2. Catfishes	20	28	24	62	**61**	62
3. Clupeids						
a. Wolf herring	25	28	27	68	**71**	70
b. Oil sardine	18	21	20	53	**50**	52
c. Anchovies	26	24	25	69	**69**	69
4. Lizard fish	32	25	29	50	**48**	49
5. Half and full beaks	26	27	27	67	**72**	70
6. Flying fishes	21	31	26	48	**43**	46
7. Perches						
a. Rockcods	38	45	42	70	**73**	72
b. Snappers	27	34	31	60	**63**	62
c. Pig-face breams	29	38	34	71	**69**	70
d. Threadfin breams	09	36	23	84	**57**	71
8. Goat fishes	28	45	37	65	**59**	62
9. Croakers	27	13	20	58	**78**	68
10. Ribbon fishes	20	31	26	51	**55**	53
11. Carangids						
a. Horse mackerel	21	35	28	53	**49**	51
b. Leather-jackets	19	37	28	60	**50**	55
12. Silverbellies	13	21	17	54	**50**	52
13. Big-Jawed jumper	42		42	76		76
14. Pomfrets	50	59	55	71	**64**	68
15. Mackerel	35	32	34	38	**62**	50
16. Seerfish	79	62	71	61	**74**	68
17. Tunnies	66	36	51	39	**54**	47
18. Barracudas	43	33	38	59	**72**	66
19. Mullets	34	37	36	56	**59**	58
20. Flat fishes	23	29	26	49	**47**	48
21. Prawns						
a. Penaeid prawns	70	70	70	82	**69**	76
b. Non penaeid prawn	24	26	25	55	**52**	54
22. Crab	38	43	41	64	**66**	65
23. Miscellaneous	33		33	38		38

Table 6.30 Estimated gross marketing margins & Fishermens' share in consumers rupee in Andhrapradesh during 2007 & 2008

Species Name	Marketing Margins (Rs/Kg)			Fishermens' share in consumer's rupee (%)		
	2007	2008	Average	2007	2008	Average
1. Elasmobranches			0			0
a. Sharks	48	77	63	60	**53**	57
b. Rays	18	25	22	59	**57**	58
2. Catfishes	21	30	26	66	**62**	64
3. Clupeids						
a. Wolf herring	26	34	30	63	**57**	60
b. Oil sardine	19	`18	19	55	**63**	59
c. Anchovies	32	32	32	58	**58**	58
d. Other clupeids	18	31	25	70	**61**	66
4. Lizard fish	22	23	23	66	**68**	67
5. Half and full beaks	31	32	32	54	**56**	55
6. Perches						
a. Rockcods	61	65	63	56	**60**	58
b. Snappers	54	60	57	57	**61**	59
c. Threadfin breams	30	43	37	58	**57**	58
7. Goat fishes	26	33	30	61	**66**	64
8. Threadfins	30	37	34	65	**65**	65
9. Croakers	29	42	36	69	**56**	63
10. Ribbon fishes	28	39	34	55	**56**	56
11. Carangids						
a. Horse mackerel	23	15	19	62	**77**	70
b. Other carangids	30	41	36	66	**55**	61
12. Silverbellies	18	34	26	60	**54**	57
13. Big-Jawed jumper	28	44	36	62	**62**	62
14. Pomfrets	52	68	60	73	**71**	72
15. Mackerel	29	35	32	60	**64**	62
16. Seerfish	84	86	85	66	**73**	70
17. Tunnies	32	48	40	54	**53**	54
18. Barracudas	34	43	39	59	**64**	62
19. Mullets	26	44	35	67	**65**	66
20. Flat fishes	11	47	29	84	**53**	69
21. Penaeid prawns	37	97	67	64	**73**	69
22. Crab	31	54	43	58	**55**	57
23. Miscellaneous						

In Andhrapradesh the marketing margins vary from ₹ 11/- per Kg for flat fishes during 2007 to ₹86/- per Kg for seerfishes during 2008 (Table 6.30). However the average marketing margins for 2007 and 2008 together indicate the variations from ₹19/- per Kg for oil sardine to ₹85/- per Kg for seerfishes. The average marketing margins are more than ₹60/- per Kg for varieties like sharks, rockcods, pomfrets, seerfish and penaeid prawns indicating vast scope for improvement in the marketing system. As a whole Fishermens; share in consumer's rupee in Andhrapradesh varies from 54 percent for tunnies to 72 percent for pomfrets.

The gross marketing margins worked out for the four states indicate that a number of fish varieties still command a very high margin of ₹ 50 per Kg and above in the internal marketing system. As a whole gross marketing margins vary from ₹10 /- per Kg for Anchovies and non penaeid prawns in Kerala and Maharastra during 2008 to ₹106/- per Kg for penaeid prawns in 2007. Fishermen share in consumer's rupee vary from 38 percent for mackeral to 84 percent for threadfin breams in Tamil Nadu during 2007. A critical analysis of fishermen share in consumer,s rupee clearly indicate, still for a number of varieties, the producers are receiving less than 60 percent of consumer's price warranting improvements in the domestic marketing system.

6.8 Price relationship of different varieties of marine fishes

Correlation coefficient is the commonly used measures for assessing pricing efficiency and market integration. The correlation of prices between different markets for the commercially important selected varieties of fishes has been worked out for 2007 and 2008 and the correlation matrices are given in Table 6.31 to 6.41. The inter relationship of landing price (LP), wholesale price (WP) retail price (RP) between different states and different varieties have been found to be linear.

1. SHARKS

In 2007, all the market prices were positively correlated in selling sharks. In Tamil Nadu and Maharashtra, wholesale and retail prices were significantly correlated at 5 per cent level. In Andhra Pradesh, there was 1 per cent significant and high correlation between landing and wholesale prices compared to other states. In 2008, all the market prices except Maharashtra were positively correlated. In Tamil Nadu, landing & wholesale prices and wholesale & retail prices were high and significantly correlated at 1 per cent level.

Table 6.31.Correlation matrices for sharks

2007

Kerala			
	LP	*WP*	*RP*
LP	1		
WP	0.98	1	
RP	0.96	0.99	1

Maharashtra			
	LP	*WP*	*RP*
LP	1.000	.257	.463
WP	.257	1.000	.966(*)
RP	.463	.966(*)	1.000

TN			
	LP	*WP*	*RP*
LP	1.000	.930	.878
WP	.930	1.000	.975(*)
RP	.878	.975(*)	1.000

AP			
	LP	*WP*	*RP*
LP	1.000	.977(*)	-.842
WP	.977(*)	1.000	-.848
RP	-.842	-.848	1.000

2008

Kerala			
	LP	*WP*	*RP*
LP	1.000	.957(*)	.944
WP	.957(*)	1.000	.962(*)
RP	.944	.962(*)	1.000

Maharashtra			
	LP	*WP*	*RP*
LP	1.000	-.592	.944
WP	-.592	1.000	-.647
RP	.944	-.647	1.000

TN			
	LP	*WP*	*RP*
LP	1.000	.992(**)	.984(*)
WP	.992(**)	1.000	.990(**)
RP	.984(*)	.990(**)	1.000

AP			
	LP	*WP*	*RP*
LP	1.000	.988(*)	.695
WP	.988(*)	1.000	.796
RP	.695	.796	1.000

2. SEERFISH

In 2007, wholesale and retail prices of Andhra Pradesh and Maharashtra were significantly correlated. In Maharashtra, there was high correlation between wholesale and retail prices compared to other states. In 2008, all the market prices except Kerala and Maharashtra were positively correlated. There was significant correlation between landing & wholesale prices and wholesale & retail prices of Tamil Nadu and Andhra Pradesh market. In Andhra Pradesh, there was high correlation in wholesale and retail prices at 1 per cent significant level.

Table 6.32 Correlation matrices for seerfish

2007

Kerala			
	LP	***WP***	***RP***
LP	1		
WP	0.94299	1	
RP	0.999241	0.930727	1

Maharashtra			
	LP	***WP***	***RP***
LP	1.000	.830	.758
WP	.830	1.000	.992(**)
RP	.758	.992(**)	1.000

TN			
	LP	***WP***	***RP***
LP	1.000	.889	.529
WP	.889	1.000	.835
RP	.529	.835	1.000

AP			
	LP	***WP***	***RP***
LP	1.000	.942	.822
WP	.942	1.000	.962(*)
RP	.822	.962(*)	1.000

2008

Kerala			
	LP	***WP***	***RP***
LP	1.000	-.491	-.427
WP	-.491	1.000	-.417
RP	-.427	-.417	1.000

Maharashtra			
	LP	***WP***	***RP***
LP	1.000	-.397	.121
WP	-.397	1.000	.810
RP	.121	.810	1.000

TN			
	LP	***WP***	***RP***
LP	1.000	.955(*)	.908
WP	.955(*)	1.000	.984(*)
RP	.908	.984(*)	1.000

AP			
	LP	***WP***	***RP***
LP	1.000	.968(*)	.941
WP	.968(*)	1.000	.993(**)
RP	.941	.993(**)	1.000

3. POMFRETS

In 2007, all the market prices were positively correlated in selling pomfrets. In Tamil Nadu and Andhra Pradesh all the prices were significantly correlated. In Tamil Nadu, there was high correlation between landing and wholesale prices at 1 per cent significant level compared to other states. In 2008, all the market prices except Kerala and Maharashtra were positively and significantly correlated. In Andhra Pradesh, there was high correlation in wholesale and retail prices at 1 per cent significant level. There was significant correlation between all the prices of Tamil Nadu and Andhra Pradesh market.

Table 6.33 Correlation matrices for pomfrets

2007

Kerala			
	LP	*WP*	*RP*
LP	1		
WP	0.994334	1	
RP	0.981946	0.977255	1

Maharashtra			
	LP	*WP*	*RP*
LP	1.000	.894	.988(*)
WP	.894	1.000	.950
RP	.988(*)	.950	1.000

TN			
	LP	*WP*	*RP*
LP	1.000	.997(**)	.981(*)
WP	.997(**)	1.000	.986(*)
RP	.981(*)	.986(*)	1.000

AP			
	LP	*WP*	*RP*
LP	1.000	.987(*)	.993(**)
WP	.987(*)	1.000	.989(*)
RP	.993(**)	.989(*)	1.000

2008

Kerala			
	LP	*WP*	*RP*
LP	1.000	.811	-.278
WP	.811	1.000	.287
RP	-.278	.287	1.000

Maharashtra			
	LP	*WP*	*RP*
LP	1.000	-.072	-.217
WP	-.072	1.000	.989(*)
RP	-.217	.989(*)	1.000

TN			
	LP	*WP*	*RP*
LP	1.000	.991(**)	.965(*)
WP	.991(**)	1.000	.969(*)
RP	.965(*)	.969(*)	1.000

AP			
	LP	*WP*	*RP*
LP	1.000	.985(*)	.995(**)
WP	.985(*)	1.000	.996(**)
RP	.995(**)	.996(**)	1.000

4. BARRACUDAS

In 2007, all the market prices were positively correlated. In Tamil Nadu and Maharashtra all the prices were significantly correlated. In Maharashtra, there was high correlation between landing and wholesale prices at 1 per cent significant level compared to other states. In 2008, all the market prices except Kerala and Maharashtra were positively and significantly correlated. In Andhra Pradesh, there was high correlation in landing and wholesale prices at 1 per cent significant level. There was significant correlation between all the prices of Tamil Nadu and Andhra Pradesh market.

Table 6.34 Correlation matrices for barracudas

2007

Kerala			
	LP	*WP*	*RP*
LP	1		
WP	0.919811	1	
RP	0.93527	0.738855	1

Maharashtra			
	LP	*WP*	*RP*
LP	1.000	.999(**)	.983(*)
WP	.999(**)	1.000	.986(*)
RP	.983(*)	.986(*)	1.000

TN			
	LP	*WP*	*RP*
LP	1.000	.983(*)	.974(*)
WP	.983(*)	1.000	.982(*)
RP	.974(*)	.982(*)	1.000

AP			
	LP	*WP*	*RP*
LP	1.000	.949	.956(*)
WP	.949	1.000	.815
RP	.956(*)	.815	1.000

2008

Kerala			
	LP	*WP*	*RP*
LP	1.000	-.069	-.132
WP	-.069	1.000	-.125
RP	-.132	-.125	1.000

Maharashtra			
	LP	*WP*	*RP*
LP	1.000	-.084	.609
WP	-.084	1.000	-.534
RP	.609	-.534	1.000

TN			
	LP	*WP*	*RP*
LP	1.000	.993(**)	.981(*)
WP	.993(**)	1.000	.951(*)
RP	.981(*)	.951(*)	1.000

AP			
	LP	*WP*	*RP*
LP	1.000	.998(**)	.976(*)
WP	.998(**)	1.000	.977(*)
RP	.976(*)	.977(*)	1.000

5. RIBBONFISH

In 2007, all the market prices were positively correlated. In Tamil Nadu, all the prices were significantly correlated at 1 per cent level and there was high correlation between landing and wholesale prices compared to other states. In 2008, all the market prices except Maharashtra were positively correlated. There was significant correlation between landing and wholesale prices of Kerala and wholesale and retail prices of Andhra Pradesh.

Table 6.35 Correlation matrices for ribbonfish

2007

Kerala			
	LP	*WP*	*RP*
LP	1		
WP	0.914677	1	
RP	0.983959	0.944911	1

Maharashtra			
	LP	*WP*	*RP*
LP	1.000	.554	.311
WP	.554	1.000	.962(*)
RP	.311	.962(*)	1.000

TN			
	LP	*WP*	*RP*
LP	1.000	.999(**)	.997(**)
WP	.999(**)	1.000	.999(**)
RP	.997(**)	.999(**)	1.000

AP			
	LP	*WP*	*RP*
LP	1.000	.989(*)	.895
WP	.989(*)	1.000	.890
RP	.895	.890	1.000

2008

Kerala			
	LP	*WP*	*RP*
LP	1.000	.950(*)	.843
WP	.950(*)	1.000	.932
RP	.843	.932	1.000

Maharashtra			
	LP	*WP*	*RP*
LP	1.000	-.651	.843
WP	-.651	1.000	-.646
RP	.843	-.646	1.000

TN			
	LP	*WP*	*RP*
LP	1.000	.386	.019
WP	.386	1.000	.913
RP	.019	.913	1.000

AP			
	LP	*WP*	*RP*
LP	1.000	.884	.884
WP	.884	1.000	1.000(**)
RP	.884	1.000(**)	1.000

6. MACKERAL

In 2007, all the market prices were positively correlated. There was significant correlation between landing and retail prices of Andhra Pradesh and wholesale and retail prices of Maharashtra. In 2008, all the market prices except Maharashtra were positively correlated. In Tamil Nadu and Andhra Pradesh all the prices were significantly correlated. In Tamil Nadu, there was high correlation in landing and wholesale prices at 1 per cent significant level.

Table 6.36 Correlation matrices for marckeral

2007

Kerala			
	LP	*WP*	*RP*
LP	1		
WP	0.925547	1	
RP	0.184663	0.464758	1

Maharashtra			
	LP	*WP*	*RP*
LP	1.000	.793	.637
WP	.793	1.000	.974(*)
RP	.637	.974(*)	1.000

TN			
	LP	*WP*	*RP*
LP	1.000	.930	.861
WP	.930	1.000	.912
RP	.861	.912	1.000

AP			
	LP	*WP*	*RP*
LP	1.000	.318	.975(*)
WP	.318	1.000	.424
RP	.975(*)	.424	1.000

2008

Kerala			
	LP	*WP*	*RP*
LP	1.000	.908	.714
WP	.908	1.000	.941
RP	.714	.941	1.000

Maharashtra			
	LP	*WP*	*RP*
LP	1.000	-.764	.714
WP	-.764	1.000	-.917
RP	.714	-.917	1.000

TN			
	LP	*WP*	*RP*
LP	1.000	.993(**)	.989(*)
WP	.993(**)	1.000	.979(*)
RP	.989(*)	.979(*)	1.000

AP			
	LP	*WP*	*RP*
LP	1.000	.958(*)	.984(*)
WP	.958(*)	1.000	.992(**)
RP	.984(*)	.992(**)	1.000

7. TUNA

In 2007, all the market prices were positively correlated. There was high correlation between landing and wholesale prices of Maharashtra at 1 per cent significant level. In 2008, all the market prices except Maharashtra were positively correlated. In Andhra Pradesh all the prices were significantly correlated. In Tamil Nadu, there was high correlation in landing and wholesale prices at 1 per cent significant level.

Table 6.37 Correlation matrices for tuna

2007

Kerala			
	LP	***WP***	***RP***
LP	1		
WP	0.834479	1	
RP	0.68119	0.917539	1

Maharashtra			
	LP	***WP***	***RP***
LP	1.000	.991(**)	.484
WP	.991(**)	1.000	.591
RP	.484	.591	1.000

TN			
	LP	***WP***	***RP***
LP	1.000	.739	.725
WP	.739	1.000	.959(*)
RP	.725	.959(*)	1.000

AP			
	LP	***WP***	***RP***
LP	1.000	.966(*)	.969(*)
WP	.966(*)	1.000	.880
RP	.969(*)	.880	1.000

2008

Kerala			
	LP	***WP***	***RP***
LP	1.000	.979(*)	.219
WP	.979(*)	1.000	.258
RP	.219	.258	1.000

Maharashtra			
	LP	***WP***	***RP***
LP	1.000	-.652	.931
WP	-.652	1.000	-.781
RP	.931	-.781	1.000

TN			
	LP	***WP***	***RP***
LP	1.000	.895	.647
WP	.895	1.000	.898
RP	.647	.898	1.000

AP			
	LP	***WP***	***RP***
LP	1.000	.987(*)	.984(*)
WP	.987(*)	1.000	.966(*)
RP	.984(*)	.966(*)	1.000

8. OIL SARDINES

In 2007, Kerala and Tamil Nadu market prices were positively and significantly correlated. In Tamil Nadu, there was high correlation between landing and retail prices at 1 per cent significant level. In 2008, Tamil Nadu and Andhra Pradesh market prices were positively and significantly correlated. In Tamil Nadu, there was high correlation between landing and wholesale prices at 1 per cent significant level.

Table 6.38 Correlation matrices for oil sardines

2007

Kerala			
	LP	*WP*	*RP*
LP	1		
WP	0.995618	1	
RP	0.994202	0.996917	1

Maharashtra			
	LP	*WP*	*RP*
LP	1.000	.628	.772
WP	.628	1.000	.943
RP	.772	.943	1.000

TN			
	LP	*WP*	*RP*
LP	1.000	.990(*)	.998(**)
WP	.990(*)	1.000	.996(**)
RP	.998(**)	.996(**)	1.000

AP			
	LP	*WP*	*RP*
LP	1.000	.522	.492
WP	.522	1.000	-.471
RP	.492	-.471	1.000

2008

Kerala			
	LP	*WP*	*RP*
LP	1.000	.970(*)	.228
WP	.970(*)	1.000	-.009
RP	.228	-.009	1.000

Maharashtra			
	LP	*WP*	*RP*
LP	1.000	.128	.891
WP	.128	1.000	-.294
RP	.891	-.294	1.000

TN			
	LP	*WP*	*RP*
LP	1.000	.999(**)	.980(*)
WP	.999(**)	1.000	.988(*)
RP	.980(*)	.988(*)	1.000

AP			
	LP	*WP*	*RP*
LP	1.000	.956(*)	.981(*)
WP	.956(*)	1.000	.984(*)
RP	.981(*)	.984(*)	1.000

9. GOAT FISHES

In 2007, all the market prices were positively correlated. There was significant correlation between all the prices of Tamil Nadu in which there was high correlation between landing and wholesale prices. In 2008, all the market prices except Kerala and Maharashtra were positively correlated. In Tamil Nadu all the prices were significantly correlated at 1 per cent level and there was 100 per cent correlation between landing and wholesale prices.

Table 6.39 Correlation matrices for goat fishes

2007

Kerala			
	LP	***WP***	***RP***

Maharashtra			
	LP	***WP***	***RP***
LP	1.000	.920	.761
WP	.920	1.000	.954(*)
RP	.761	.954(*)	1.000

TN			
	LP	***WP***	***RP***
LP	1.000	.995(**)	.985(*)
WP	.995(**)	1.000	.995(**)
RP	.985(*)	.995(**)	1.000

AP			
	LP	***WP***	***RP***
LP	1.000	.977(*)	.862
WP	.977(*)	1.000	.950
RP	.862	.950	1.000

2008

Kerala			
	LP	***WP***	***RP***
LP	1.000	.884	.164
WP	.884	1.000	-.299
RP	.164	-.299	1.000

Maharashtra			
	LP	***WP***	***RP***
LP	1.000	.105	.398
WP	.105	1.000	-.685
RP	.398	-.685	1.000

TN			
	LP	***WP***	***RP***
LP	1.000	1.000(**)	.991(**)
WP	1.000(**)	1.000	.990(**)
RP	.991(**)	.990(**)	1.000

AP			
	LP	***WP***	***RP***
LP	1.000	.982(*)	.919
WP	.982(*)	1.000	.964(*)
RP	.919	.964(*)	1.000

10. ANCHOVIES

In 2007, all the market prices were positively correlated. In Tamil Nadu and Andhra Pradesh all the prices were significantly correlated. There was very high correlation between landing and wholesale prices of Tamil Nadu at 1 per cent significant level. In 2008, all the market prices except Kerala and Maharashtra were positively correlated. In Andhra Pradesh all the prices were significantly correlated and there was high correlation in landing and wholesale prices at 1 per cent significant level.

Table 6.40 Correlation matrices for anchovies

2007

Kerala			
	LP	*WP*	*RP*
LP	1		
WP	0.985318	1	
RP	0.964523	0.993342	1

Maharashtra			
	LP	*WP*	*RP*
LP	1.000	.645	.665
WP	.645	1.000	.953(*)
RP	.665	.953(*)	1.000

TN			
	LP	*WP*	*RP*
LP	1.000	.999(**)	.979(*)
WP	.999(**)	1.000	.988(*)
RP	.979(*)	.988(*)	1.000

AP			
	LP	*WP*	*RP*
LP	1.000	.996(**)	.977(*)
WP	.996(**)	1.000	.985(*)
RP	.977(*)	.985(*)	1.000

2008

Kerala			
	LP	*WP*	*RP*
LP	1.000	-.111	-.234
WP	-.111	1.000	.938
RP	-.234	.938	1.000

Maharashtra			
	LP	*WP*	*RP*
LP	1.000	.101	-.234
WP	.101	1.000	-.861
RP	-.234	-.861	1.000

TN			
	LP	*WP*	*RP*
LP	1.000	.986(*)	.940
WP	.986(*)	1.000	.982(*)
RP	.940	.982(*)	1.000

AP			
	LP	*WP*	*RP*
LP	1.000	.996(**)	.977(*)
WP	.996(**)	1.000	.985(*)
RP	.977(*)	.985(*)	1.000

11. LIZARD FISHES

In 2007, Tamil Nadu and Andhra Pradesh market prices were positively correlated. In Tamil Nadu all the prices were significantly correlated at 1 per cent significant level. There was very high correlation between landing and wholesale prices of Andhra Pradesh at 5 per cent significant level. In 2008, all the market prices except Maharashtra were positively correlated. In Andhra Pradesh and Tamil Nadu all the prices were significantly correlated.

Table 6.41 Correlation matrices for lizard fishes

2007

Kerala			
	LP	*WP*	*RP*
LP	1		
WP	-0.47809	1	
RP	-0.7746	0.92582	1

Maharashtra			
	LP	*WP*	*RP*
LP	1.000	.065	.801
WP	.065	1.000	-.221
RP	.801	-.221	1.000

TN			
	LP	*WP*	*RP*
LP	1.000	.978(*)	.995(**)
WP	.978(*)	1.000	.991(**)
RP	.995(**)	.991(**)	1.000

AP			
	LP	*WP*	*RP*
LP	1.000	.999(**)	.954(*)
WP	.999(**)	1.000	.945
RP	.954(*)	.945	1.000

2008

Kerala			
	LP	*WP*	*RP*
LP	1.000	.908	.826
WP	.908	1.000	.954(*)
RP	.826	.954(*)	1.000

Maharashtra			
	LP	*WP*	*RP*
LP	1.000	.142	.826
WP	.142	1.000	-.352
RP	.826	-.352	1.000

TN			
	LP	*WP*	*RP*
LP	1.000	.991(**)	.981(*)
WP	.991(**)	1.000	.994(**)
RP	.981(*)	.994(**)	1.000

AP			
	LP	*WP*	*RP*
LP	1.000	.962(*)	.994(**)
WP	.962(*)	1.000	.976(*)
RP	.994(**)	.976(*)	1.000

The estimated correlation matrices of different varieties establishes the inter relationship of LP, WP and RP of different varieties of fishes and it is evident that any small change in the landing centre prices has shown proportionate reflection in the wholesale and retail prices.

There is rapid development in the fish marketing system in India during the last few decades. Several technological innovations in preservation and processing of perishable products and improved transportation led to enormous improvements in the supply chain management of marine products. Hence fish could be now available almost all nook and corner of India in the domestic marketing system. Similarly there is considerable progress in the quantity of shrimps and other varieties of fish exported from India over the years. Market expansion has its impact on the price behaviour of all varieties of fish and made the increase in price of fish more than that of the increase in prices of all other food items in recent years.

…..෴…..

Chapter 7

INTERNATIONAL FISH TRADE

Contents

International trade plays an increasingly important role in connecting food producers to food consumers. Seafood commodities have been preserved and traded since the Bronze Age (Thompson 1995) Historians have pointed out that changes in the salting technologies at the end of the fifteenth century were an important factor in the expansion of the words system through the growth of trade. Fish was one of the vitally important items in the diets of sailors who carried commodities across the sea (Brandel 1979). The invention in the early nineteenth century (1810) of iron containers plated with tin to protect against corrosion, gave a fillip to canned seafood that remained affordable to the industrial workers. From 1960 to the late 1970s, just under a third of the fish globally harvested and marketed entered international trade. Fishery products were among the most traded primary food products over the past two decades (Subbarao 1990). The standards of quality, safety, packaging and delivering of such product were in many respects more typical of modern manufacturing than traditional agriculture products including basic food commodities.

Liberalization and globalization of Indian economy has been initiated to promote competitiveness in all spheres of production and trade mainly for the elimination of monopoly profit. The *laissezfair policy* of the country paved the promotion of export trade and forex earnings leading to comfortable balance of payments position. The seafood export trade is also not an exception to this phenomenon and it increased both in terms of volume and value. The export promotion measures coupled with the devaluation of rupee has enhanced the forex earnings of marine products which has crossed one billion dollar for the fourth consecutive time during 1998-99. Though the country's share in the global seafood export is just 1.5 per cent now, the scope for its expansion is high. The global fish eating population has enhanced to about 40 per cent by new and the consumer preference for fish and fishery products, being in an increasing trend year after year. Diversified product development and market penetration are very essential for the growth of internal and external sea food trade (Subbarao 2000).

7.1 International trade of Fish Products

The international trade in fish and fishery products has been growing steadily, the primary stimulus being the rising trend of consumption in Europe and America and build-up in Asia and other developing regions. The growing demand of fishery product across the world during the recent years is attributed to a change in the dietary habits towards fish due to its health enhancing features. Moreover the establishment of a number of processing industries in the countries like China, Thailand and Vietnam also resulted in the boosting up of fishery trade in processed form.

Table 7.1 World exports and Imports of fisheries products (2006)

Country	Exports	Imports	Total
	US$million		
E.U.	21600	37500	59100
China	10800	6700	17500
USA	4100	13300	17400
Japan	1400	14000	15400
India	1800	100	1900
World	**85900**	**89600**	**175500**

Source:*FAO,2008*

The total world export of fishery products was estimated to be USD 85900million in 2006 (Table 7.1). The EU was the largest exporter of fish and fish products with a gross share of 25 percent of the total world exports. The EU is also the largest fish importer of the world and its prime status of being the largest fish exporter and importer of fish in the world can be attributed to the significant intra-regional dynamics. However it is important to note that exports from developing countries account for close to 50percent of the total world trade in fish and fishery products. Among them, China adores the position of world's single largest exporting country with an estimated export of USD 10800 million in 2006.

In the recent years, China's imports are also growing due to its increasing involvement in out sourcing raw fish from all over the world for subsequent processing and re-export. The rising domestic consumption in China also contributed to its rising import bills. Contrary to this, the domestic consumption in Japan is on a downfall owing to a long term trend away from fish consumption, leading to a reduction in its imports. As of 2006, Japan contributes to 15 per cent of the total global imports nearly equaling United States.

7.2 India's exports of fish and fishery products

India's share of world fish exports comes merely 2 percent only. India hardly imports any fish products and hence India's contribution in the global fish trade is negligible. However among the various agricultural commodities exported from India fishery product especially marine products holds a prime status. It is clear that around 13percent of the total agricultural exports from India in 2005 comprise of marine products. Other major exported commodities are rice, Oil meals, spices, meat, cashew fresh and vegetables, tea, coffee etc.

Export market of Indian seafoods has grown rapidly from a mere 15 crore rupees in the 60s to ₹ 8608 crore rupee during 2008. The decadal growth of marine exports from India during 1960s onwards is given in Table 7.2.

Table 7.2 Decadal growth of marine exports from India (1961-70 to 2001-08}

Period	Qty(tonnes)	Value (₹ 000)	Unit Value (₹/Kg)
1961-70	21722.50	152650.00	7.03
1971-80	59291.60	1320761.60	22.28
1981-90	92209.90	4722029.70	51.21
1991-00	299940.00	36573795.20	121.94
2001-08	502782.13	71693200.00	142.59

Source: MPDEA 2008

The unit value realization of our export also recorded phenomenal increase of ₹7.03 per kg during the 1960s to ₹142.59 during 2001-08 indicating excellent scope to enhance further our marine product exports.

Exports from India in terms of quantity almost doubled during the last 10 years from 3,13,503 tonnes in 1998 to 6,03,825 tonnes in 2008. The increase in the fin fish exports is mainly responsible for the boost in our exports. The increase in terms of quantity in our exports coupled with the steady increase in the unit value realized had led ₹8608 crores from our marine product exports during 2008.

7.3 Commodity Composition

The marine products are exported in various forms, viz. live, fresh/ chilled, frozen, dried/salted in brine, cooked and frozen cooked and smoked prepared /preserved. However, majority of the lots are dispatched in frozen form. Frozen shrimp was the largest exported item, both in terms of quantity and value, among the various marine products exported from India during the period 1995-96to 2006-07. A major source of India's shrimp exports is the *Penaeid* shrimps from Maharashtra and Kerala coasts. *Penaeumsondon*c commonly known as *Jumbo tiger shrimp* is a highly demanded and priced commodity in International market, prominent are of which is exported to Japan and European Union cultured Black tiger shrimp mainly from West Bengal and Andhra Pradesh is, another major source of exports which faces a crisis in recent years in the wake of outbreak of viral diseases.

The shrimp export industry in India is also facing severe threat from the *Vennamel* shrimp exports originating mainly from the Central and South American countries. Even though the quantity of shrimp exports have increased fairly in the last decade the comparative reduction in the share of shrimp exports, both in quantity and value terms is notable. This can be attributed relative liftoff export towards low value alternative like finfish and diversification in the export basket.

The important finfish which are exported are Yellow fin tuna, Sardine, Mackerel, Pomfrets, Seerfish etc. which find their market mainly in the South East and Middle East Asian countries The share of fin fish increased from 33.8 percent in 1995-96 in terms of quantity to 44.2 percent in 2006-07. In value terms this has been from10.6percent to17.4 percent over the same period.

However there was a reduction in export of frozen squid and Cuttlefish. The share of dried items, live items and chilled items were comparatively lesser The share of other production has also increased uUnderscoring greater diversification and value addition.

Table 7.3 Commodity-wise performance of Marine Product Exports from India

	EXPORT Qty in tonnes & value ₹ in Crores				SHARE (%)			
	1995-96		2006-07		1995-96		2006-07	
	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
Frozen shrimp	95724	2356.8	137397	4506.0	32.3	67.3	22.4	53.9
Frozen finfish	100093	372.2	270751	1452.8	33.8	10.6	44.2	17.4
Frozen squid	45025	319.5	55701	797.3	15.2	9.1	9.1	9.5
Frozen cuttlefish	33845	260.8	47252	568.3	11.4	7.5	7.7	6.8
DriedItems	7415	44.2	24293	183.1	2.5	1. 3	4.0	2.2
Live items	1756	31.3	2478	64.0	0.6	0.9	0.4	0.8
Chilled items	2773	26.0	7200	117.3	0.9	0.7	1.2	1.4
Others	9646	89.9	67571	674.3	3.3	2.6	11.0	8.1
Total	296277	3501.11	612841	8363.53	100.0	100.0	100.0	100.0

Source: *MPEDA, 2008*

Even though a change in composition of the fishery exports has taken place, all the exported Commodities registered positive growth rates during 1995-96 to 2006-07. While frozen shrimp, frozen squid and frozen cuttle fish exhibited moderate growth rates, the grow in dried items and chilled Item were in double digits. The growth in exports of frozen finfish was found to be higher than that of frozen Shrimp which hints a change in demand pattern in the importing countries However the export of frozen fin fish was also associated with high rates of instability meaning greater inter-year fluctuations in the quantity exported. High levels of instability were also observed in case of dried, live and chilled Items exports (Table 7.3).

7.4 Market Composition

South East Asia was the largest market for Indian marine products during 2006-07. Around 33percent of the total exported quantity of marine products from India found market in various South East Asian countries.

However it is interesting to note that, European Union claimed the largest share in terms of the value of exported commodities This clearly indicate that, even though a huge bulk of exports is directed towards South East Asia, they are mostly low value products The export basket consists mainly of frozen finfish, frozen squid, dried and live items etc. Most of the high value products are exported to EU followed by USA and Japan mainly because of high repurchasing power of the consumers in these developed economies.

It is also worth mentioning that, over the last decade Japan's status as a supreme market for Indian marine products suffered a jolt as indicated by the alteration of relative markets shares. The share of Japan as destination market of India's fishery exports has reduced from 45percet to 16.2 percent in value terms and from17.5 percent to 11.0 percent in terms of quantity exported between1995.96 and 2006-07. The prominent reason for this is the drastic reduction of shrimp exports to Japan due to various reasons like slump in domestic production of shrimp, gradual erosion in preference among Japanese consumers etc. Another associated causes Japan's greater preference for shrimp Imports from Thailand and China, the figures for the recently years indicate such a gradual shift, the reason for which is a matter of a thorough investigation. A similar recent study also cautioned against the higher comparative advantage of these two countries for marine exports as compared to India. The share of Middle East for all marine exports has slightly improved while that of Hong Kong and China has reduced in quantity terms during the same period.

Table 7.4 Market-Wise Performance of Marine Product Exports from India

	EXPORT Qty tones & value Rs. Crores				SHARE (%)			
	1995-96		2006-07		1995-96		2006-07	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Japan	51789	1576.7	67437	1353.4	17.5	45.0	11.0	16.2
USA	26008	366.3	43758	1347.8	8.8	10.5	7.1	16.1
EU	86023	900.2	149773	2760.3	29.0	25.7	24.4	33.0
South East Asia	41954	264.6	203513	1157.0	14.2	7.6	33.2	13.8
China & Hong	69387	232.1	67650	616.7	23.4	6.6	11.0	7.4
Middle East	8800	77.6	23585	371.1	3.0	2.2	3.8	4.4
Others	12315	83.6	56924	757.3	4.2	2.4	9.3	9.1
Total	296277	3501.1	612641	8363.5	100.0	100.0	100.0	100.0

Source: MPEDA 2008

7.5 Shrimp Exports

Almost half of the forex earnings of our marine products are coming from our exports of frozen shrimps. The decadal growth of frozen shrimps exports from India is given in Table 7.5.

Table 7.5. Decadal growth of Frozen shrimp exports from India

Period	Qty(tonnes)	VALUE (₹ crores)	Unit Value(₹/kg)
1972-80	43924.89	130.80	29.78
1981-90	54320.20	380.22	70.00
1991-00	94701.20	2544.13	268.65
2001-08	134172.83	4210.96	313.85

Source: www.mpeda.com

Frozen shrimp fetched an unit value of ₹30 per kg during 1972-80 has gone up to ₹314 per kg during 2001-2008. The phenomenal growth of frozen shrimp exports after 1991 is mainly due to supplementation of aquaculture production.

The unit value realized for our frozen shrimp was maximum of ₹385.93 per kg during 2000. The quantity of frozen shrimp exported has more than doubled from 59487 tonnes during 1990 to 138971 tonnes during 2008. The variation in unit value was observed mainly due to the size composition of frozen shrimp exports during the last two decades.

7.6 Frozen Fish Exports

Frozen fish exports from India recorded maximum growth in terms of quantity over the years (Table 7.6). The decadal growth in terms of quantity was 5663 tonnes per annum during 1972-80 which increased to 149429 tonnes per annum during 2001-08, an increase of about 26 times

Table7.6. Decadal Growth of Frozen fish exports from India

Period	Qty (tonnes)	Value (₹ crores)	Unit Value (₹/kg)
1972-80	5663.00	3.88	6.84
1981-90	15315.10	28.23	18.43
1991-00	120284.20	452.44	37.61
2001-08	149429.33	665.81	44.56

Source: MPEDA 2008

The product diversification, market promotion and high price are responsible for the growth of fin fish exports from India. During 2008-09 fin fish exports accounted about ₹1315.79 crores of the marine product exports

7.7 Growth of squid Exports

The decadal growth of frozen squid exports from India is given in Table7.7

Table 7.7. Decadal growth of frozen squid exports from India

Period	Qty(tonnes)	VALUE (₹ crores)	Unit Value(₹/kg)
1972-80	2143.00	2.66	12.39
1981-90	6842.70	14.30	20.90
1991-00	33937.10	234.54	69.11
2001-08	43227.20	426.44	98.65

Source: MPEDA 2008

Average quantity of frozen squid exported from India was 2143 tonnes pr annum during 1978-80 period which increased to 43,227 tonnes per annum during 2001-08, the unit value realized recorded manifold increase from ₹12.39 per kg during 1970s to ₹ 98.65 per kg during 2001-08 period.

The annual exports of frozen squids from India during 1990-2008 is given in Table 7.8.

The value of squids in our exports was ₹ 37.8 crores during 1990 with our exports of 14836 tonnes. The quantity of squids exported during 2008 increased to 53217 tonnes fetching forex value of ₹625 crores. This increase in the quantity of exports along with the increase in unit value from ₹25.47 per kg to ₹117.38 per kg was responsible for the significant increase of ₹624.66 crores in forex earrings of frozen squid exports.

Table 7.8. Annual exports of frozen squids from India during 1990-2008

Year	Qty(tonnes)	Value(Lakhs)	Unit value ₹/ Kg
1990	14836	3779	25.47
1991	16667	4500	27.00
1992	26289	12873	48.97
1993	36038	19448	53.97
1994	38192	24014	62.88
1995	39859	28687	71.97
1996	44560	30490	68.42
1997	34742	26154	75.28
1998	32081	26997	84.15
1999	34451	28781	83.54
2000	36492	32593	89.32
2001	39990	32167	80.44
2002	37838	38437	101.58
2003	37832	37292	98.57
2004	48124	47726	99.17
2005	52352	57600	110.02
2006	50848	58251	114.56
2007	51875	60320	116.28
2008	53217	62466	117.38

Source: MPEDA 2008

7.8 Growth of frozen cuttlefish exports from India

The annual exports of cuttle fish was about 854 tonnes during 1970s fetching a revenue of ₹1.8 crores per annum. The quantity of cuttle fish exports and the forex earning increased to 40988 tonnes and ₹ 429 crores per annum respectively during the period of 2001-08. Annual exports of frozen cuttle fish from India during 1990-2008 is given in Table 7.9.

Table 7.9 Decadal growth of frozen cuttle fish exports

Period	Qty(tonnes)	VALUE (₹ crores)	Unit Value(₹/kg)
1972-80	853.75	1.80	21.10
1981-90	5802.90	17.16	29.57
1991-00	27970.70	219.63	78.52
2001-08	40988.20	429.27	104.73

Source: MPEDA statistical of exports various issues

Table 7.10 Exports of frozen cuttle fish from India during 1990-2008

Year	Qty(tonnes)	Value(₹ Lakhs)	Unit value (₹/ Kg)
1990	12624	458900	36.35
1991	11596	453000	39.07
1992	17561	1048900	59.73
1993	21255	1463800	68.87
1994	27045	2106000	77.87
1995	29386	2332300	79.37
1996	34080	2812300	82.52
1997	35097	2971400	84.66
1998	35946	3029100	84.27
1999	33772	2852500	84.46
2000	33969	2894000	85.20
2001	30060	2710800	90.18
2002	41381	4170900	100.79
2003	39610	4351800	109.87
2004	44239	4740100	107.15
2005	49651	5490000	110.57
2006	50158	5730552	114.25
2007	49421	5846504	118.30
2008	51248	6136948	119.75

Source: MPEDA 2008, www.mpeda.com

The cuttle fish exports was in the tune of about 12624 tonnes with an unit value of ₹ 36.35 per kg during 1990 which increased to 51248 tonnes with an unit value of ₹119.75 per kg during 2008. The gross forex earnings of frozen cuttle fish exports increased from ₹459 to ₹614 crores during the same period.

7.9 Lobster Exports

Lobster is one of the highly demanded marine products in international market commanding comparatively higher price than all other marine products. During the 1970s our exports was about 518 tonnes of frozen cuttle fish per annum fetching less than ₹ 3 crores per annum Table 7.11.

Table 7.11 Decadal growth of frozen lobster exports from India

Period	Qty(tonnes)	VALUE (₹ crores)	Unit Value (₹/kg)
1972-80	517.78	2.77	53.52
1981-90	1282.70	15.96	124.46
1991-00	1425.10	50.16	351.98
2001-08	1950.61	90.83	465.73

Source: MPEDA 2008, www.mpeda.com

Product diversification was maximum for lobsters especially after 2000. The unit value realized for frozen lobsters increased from ₹352 per kg during 1990s to ₹466 per Kg during 2001-08.

7.10 Fin fish export and impact on domestic prices

Finfish export from India is growing rapidly since 90^{s} and the frozen fin fish exports increased from a mere 93,219 tonnes in 1993 to 3, 09,172 tonnes in 2010-11. Until nineties, our exports were dominated by frozen shrimp which was overtaken by finfish in terms of trade volume and there is a gradual diversification from dried and canned items to frozen fish and live items (Sathiadhas and Narayanakumar.2002).Though frozen fish occupies first position in terms of quantity, its share in the total value is only 20.38 per cent showing low unit value realisation (84.16 per kg) when compared to shrimps (MPEDA,2011). With an overall quantity of 1,18,972 tonnes of fish worth 692.41 crores, China leads in the imports of fish from India in terms of both quantity and value followed by Thailand, Tunisia and Malaysia. Out of the total foreign exchange earnings of 2,602 crores from exports of finfishes, China accounted 41 per cent,Thailand,10 per cent,Tunisia,5 per cent and Malaysia,4 percent (MPEDA, 2008). Chaina mainly imports ribbon fish, croakers, seer fishes and pomfrets from India. Malaysia is the major importer of Indian pomfrets and frozen mackerel. Thailand imports tuna, mackerel and sardines from India.

Even though the share of finfish in the total quantity of exports remained almost same during the period 1996-2008, its share in the total value increased from 15.08 per cent to 25.63 per cent. (Table 7.12). This might be due to the increased demand and soaring prices in the domestic markets.There was diversification of exports from high value fishes like ribbon fishes, pomfrets and seerfishes to low value fishes like tunnies, mackerels, croakers and sardines.This has far reaching impact on the domestic prices of almost all varieties of finfish and the domestic and export prices of finfishes is compared for the period 1997-98 to 2007-08. Nearly 90 per cent of the fin fishes are exported in frozen form.

Table 7.12. Fin fish and total marine products exports from India

Years	Total Fin fish Export (tonnes)	Value (₹crores)	Total marine product exports (tonnes)	Value (₹crores)	Share of fin fish in total marine product exports	
					Quantity (%)	Value (%)
1996	1,53,214	600.39	3,53,676	3,980.02	43.32	15.08
1997	2,07,668	850.77	3,98,977	4,661.58	52.05	18.25
1998	1,30,238	601.16	3,13,503	4,709.55	41.54	12.76
1999	1,35,264	605.54	3,27,205	4,757.39	41.34	12.73
2000	1,99,919	885.52	4,21,075	6,396.57	47.48	13.84
2001	1,94,447	857.07	4,24,320	5,917.03	45.83	14.48
2002	2,28,154	1029.35	4,97,963	7,011.35	45.82	14.68
2003	1,55,714	752.69	4,09,728	6,021.86	38.00	12.50
2004	1,63,544	872.57	4,50,568	6,522.39	36.30	13.38
2005	1,89,929	1128.02	5,02,597	7,137.47	37.79	15.80
2006	2,72,523	1583.10	6,03,148	8,299.38	45.18	19.07
2007	2,40,607	1583.48	5,38,997	7,624.89	44.64	20.77
2008	2,66,080	2152.64	5,95,821	8,398.26	44.66	25.63

7.11 Production and export trends of major items of finfish

High value fishes like ribbon fish, pomfrets, seerfishes, yellow fin tuna, fresh water fish and reef cods were the major ones that were exported during the 90^0,which gave way to low value fishes like tunnies, mackerels, threadfin breams and croakers. Ribbon fish still ranks first both in quantity and value followed by pomfrets. Though ribbon fish ranks first in volume and value, pomfrets fetch high per unit price compared to ribbon fish, tuna and fresh water fish. The unit value realisation of different varieties has generally shown an increasing trend between 1996 and 2008 (Table 7.13).

Table 7.13 Major items in the Indian frozen finfish exports (2007-08)

Name of fish	Exports		
	Quantity (tonnes)	Value (₹ crores)	Unit value (₹ /kg)
Pomfret (White)	191	4.35	227.75
Pomfret (Chineese)	467	15.12	323.77
Pomfret (Black)	1,042	13.23	126.75
Pomfret (Silver)	7,793	215.65	276.72
Pomfaet (IQF)	25	0.49	196.00
Ribbon Fish	71,261	369.71	51.88
Frozen Croakers	18,098	91.29	50.44
Frozen Croakers (Silver)	9,883	47.75	48.32
Frozen Croakers (Yellow)	12,830	56.13	43.75
Reef Cod	3,818	23.21	60.79
Yellow fin Tuna	7,684	59.85	77.89
Skipjack Tuna	7,442	42.79	57.50
Mackerel	11,662	74.22	63.64
Sardine	8,566	17.91	20.91
Seer fish	1,106	14.69	132.82
Snapper	712	9.41	132.16
Barracuda	712	4.79	67.28
Lizard Fish	84	0.26	30.95
Frozen Fish (Total)	2,31,181	0.26	30.95

Source: Compiled from various issues of MPEDA Reports

More than 50 per cent of the ribbon fishes landed are exported in frozen, chilled and dried forms. Its unit value in the export market has increased from ₹23.45 in 1996 to ₹ 52.09 in 2008. More than 90 per cent of Indian ribbon fishes are exported to China. At the domestic market, its average price varied from ₹ 27/kg at landing centre to ₹ 50/kg at retail level. India had exported 62 per cent of the ribbon fish landings in 1996 which had come down near to 50 percent in 2008 (Table 7.14).

The exports of tunnies had increased from less than one per cent in 1996 to 35 per cent in 2008 with an increase in landings from 33.247 tonnes in 1996 to 79,660 tonnes in 2008 (Table 7.15). Its unit value in the export market increased from 26.70/kg in 1996 to 82.35/kg in 2008 with diversified products like frozen yellow fin, skipjack, long tail, whole, tonggol, loins, belly flaps gutted, roe, whole round, steaks, cubes, tuna chunks in brine, IQF products and chilled items. The export price of reef cods more than doubled during the period 1996-2008 and the exports increased from 3,272 tonnes to 5,146 tonnes (Table 7.16).

Table 7.14 Production and export of ribbon fishes from India

Years	Exports			Total Landings (tonnes)	% to total Landings
	Quantity (tonnes)	Value (crores)	Unit value (₹ /kg)		
1996	77,849	182.55	23.45	1,26,431	61.57
1997	1,27,560	340.50	26.69	1,74,271	73.20
1998	54,408	138.34	25.43	1,13,408	47.98
1999	60,832	150.16	24.68	1,24,536	48.85
2000	1,11,669	302.47	27.09	1,82,668	61.13
2001	1,05,263	277.01	26.32	1,75,364	60.03
2002	1,42,793	418.75	29.33	1,95,392	73.08
2003	81,719	222.42	27.22	1,47,998	55.22
2004	90,172	303.16	33.62	1,31,002	68.83
2005	89,335	320.73	35.90	1,14,115	78.29
2006	1,42,599	518.73	36.38	2,35,045	60.67
2007	76,599	276.58	36.11	1,31,733	58.15
2008	73,017	380.38	52.09	1,45,398	50.22

Source : 1) CMFRI, 2014 2) MPEDA – 2011.

Table 7.15 Production and export of tunnies from India

Years	Exports			Total Landings (tonnes)	% to total Landings
	Quantity (tonnes)	Value (crores)	Unit value (₹ /kg)		
1996	195	0.52	26.70	33,247	0.59
1997	784	2.84	36.20	39,338	1.99
1998	1,572	7.56	48.09	32,011	4.91
1999	98	0.23	23.01	40,787	0.24
2000	94	0.38	40.12	46,334	0.20
2001	642	2.18	33.97	40,239	1.59
2002	3,708	13.15	35.45	42,449	8.74
2003	6,339	23.40	36.91	44,681	14.19
2004	6,186	24.32	39.31	38,011	16.27
2005	14,607	59.04	40.42	39,927	36.58
2006	19,520	98.38	50.40	64,006	30.50
2007	30,847	177.07	57.40	66,261	46.55
2008	27,684	227.98	82.35	79,660	34.75

Source: 1) www.mpeda.com 2) CMFRI 2014

Table7.16 Production and export of reefcods from India

Years	Exports			Total Landings (tonnes)	% to total Landings
	Quantity (tonnes)	Value (crores)	Unit value (₹ /kg)		
1996	3,272	16.02	48.97	14,688	22.28
1997	3,166	15.43	48.74	15,396	20.56
1998	1,883	10.14	53.85	18,570	10.14
1999	3,670	17.19	46.83	15,153	24.22
2000	4,198	20.00	47.64	24,878	16.88
2001	5,403	27.72	51.30	25,885	20.87
2002	5,485	26.06	47.52	25,539	21.48
2003	4,622	23.66	51.20	16,890	27.36
2004	3,423	18.65	54.48	18,213	18.80
2005	3,110	19.89	63.95	18,468	16.84
2006	6,237	38.85	62.29	22,168	28.14
2007	7,190	40.15	55.84	23,261	30.91
2008	5,146	46.62	90.59	19,517	26.37

Source : 1) MPEDA 2010-11 2) CMFRI 2014

Even though there was an increase in the estimated landings of seer fishes and pomfrets, their exports declined during 1996-2008 with the sharp increase in domestic prices (Table 7.17 and 7.18) .Seer fishes and pomfrets are a delicacy in the star hotels and restaurants in India and the huge demand both from domestic and export sectors pushed its price over the years. In the case of seer fishes, even though the landings increased from 36,624 tonnes in 1996 to 56,888tonnes in 2008, the exports declined from 7,103 tonnes in 1996 to 4,777 tonnes in 2008 recording a decline in the share of exports to total landings from 19.39 per cent to 8.4 percent during 1996-2008. The landings of pomfrets increased from 35,436 tonnes in 1996 to 51,995 tonnes in 2008, but the share of export in total landings declined from 38.02 per cent to 21.29 per cent during 1996-2008.

Table7.17 Production and export of pomfrets from India

Years	Exports			Total Landings (tonnes)	% to total Landings
	Quantity (tonnes)	Value (crores)	Unit value (₹ /kg)		
1996	13,474	165.99	123.19	35,436	38.02
1997	13,421	186.62	139.05	45,473	29.51
1998	12,166	161.34	132.61	49,022	24.82
1999	11,754	167.47	142.48	34,077	34.49
2000	11,322	184.88	163.29	38,055	29.75
2001	10,072	164.54	163.37	38,626	26.08
2002	11,623	212.70	183.00	39,434	29.47
2003	9,668	195.37	202.09	39,120	24.71
2004	9,185	189.35	206.16	39,123	23.48
2005	12,364	260.38	210.60	44,782	27.61
2006	14,021	326.93	233.17	44,058	31.82
2007	13,216	308.15	233.16	48,456	27.27
2008	11,068	290.91	262.84	51,995	21.29

Source : 1) www.mpeda.com   2) CMFRI 2014

Table7.18 Production and export of seerfishes fron India

Years	Exports			Total Landings (tonnes)	% to total Landings
	Quantity (tonnes)	Value (crores)	Unit value (₹ /kg)		
1996	7,103	41.54	58.49	36,624	19.39
1997	8,302	53.46	64.40	41,120	20.19
1998	7,149	52.42	73.33	54,107	13.21
1999	5,391	33.12	61.43	44,149	12.21
2000	4,990	40.23	80.63	49,433	10.09
2001	6,711	52.72	78.56	41,809	16.05
2002	3,723	24.65	66.19	51,896	7 .17
2003	2,880	18.36	63.76	48,806	5.90
2004	3,903	29.28	75.03	47,489	8.22
2005	8,817	80.06	90.80	40,577	21.73
2006	6,514	61.87	94.98	49,040	13.28
2007	4,642	48.96	105.47	60,801	7.63
2008	4,777	70.60	147.79	56,888	8.40

Source : 1) www.mpeda.com 2) CMFRI 2014

7.12 Comparison of domestic and export prices of fin fishes in India

Analysis of domestic and export prices in India during the period 1997-98 to 2007-08 shows that the price increase in domestic retail sector was more than the price increase in export market causing a decline in the export of high valued items like seerfishes and pomfrets. The domestic retail prices of seerfishes and ribbon fishes increased more than 200 per cent, while that of tunnies, pomfrets and mackerels almost doubled. In the export market, the price of snappers recorded 159per cent increase from that of 1997-98, whereas the price of oil sardines declined by 38.5 per cent (Table 7.19).

The reduction in the exports of high value fishes like seerfishes, pomfrets even with increase in the landings show the competitiveness of the domestic market and the affordability of these fishes to the affluent domestic consumers. The rising prices of high value fishes like pomfrets and seerfishes are making the exporters to shift to other low valued items like tunnies, mackerels and oilsardiners. This has serious implications in the food security and domestic fish trade in the country. Species like sardine, mackerel, ribbon fish, tunnies etc farm part of the staple diet of the coastal population and the diversion of large quantities of exports will affect their nutritional security. Substantial increase in the exports of these low value items may raise their prices in the domestic market in the future which may make these items dearer to the domestic consumers. Further, there is a need to remove the market imperfections in the value chain of high value fishes where huge margins are cornered by the middlemen and to transfer the benefits to the fishermen community.

Table 7.19 Average export and domestic retail prices of selected fin fishes in India (1997-98 and 2007-08 - ₹/kg)

Name of fish	Export price			Domestic price		
	1997-98	2007-08	%increase	1997-98	2007-08	%increase
Ribbon Fish	27	52	92.59	16	50	212.50
Pomfrets	172	228	32.56	120	248	106.67
Tuna	38	58	52.63	25	49	96.00
Mackerel	40	64	59.10	30	59	96.67
Sardine	34	21	-38.50	25	42	68.00
Seerfish	67	133	98.51	73	265	263.01
Snappers	51	132	159.14	38	62	63.16

Source : www.mpeda .com

Indian marine products export sector has been performing well despite global meltdown and challenges under international trade regulations. Our landing centres need to be modernised to cater to the international quality standards. Our seafood exports at present mainly conprise frozen raw materials and value added products are only 10 per cent, which should be further increased. Further, the increase in the exports of low value finfishes like tunnies, croakers, threadfin breams, mackerels and sardines may have serious implications in the food security and domestic fish trade in the country in the coming years. Hence there is immense need for parallel development of internal marketing system and implementation of rational export policies to protect the interests of our domestic consumers.

7.13 Sea food export-challenges and policy issues

India exports frozen shrimp, squids, finfish, dried items, live items and chilled items to different destinations. Among the different items exported, frozen shrimp and frozen fin fish accounted for about 75 per cent of the total value of sea food exports from India during the last three and a half decade. It is seen that the share of frozen shrimp in quantity terms declined from 70.08 per cent of the total export in 1970-80 to 19.24 per cent in 2009-10 whereas in terms of value its share declined from 70 per cent to 41-62 per cent during the same period. At the same time, the share of frozen finfish increased from 8.49 per cent to 38.47 per cent. It is important to note that, the share of frozen squid and cuttle fish also increased providing good scope for product diversification and reducing the risk of market failure due to loss in shrimp yield.

In the light of HACCP regulations, the government as well as industrialists has been increasingly complying with the quality standards of the export products. The trade measures having implications for Indian seafood export sector relate to the Non-agricultural Market Access (NAMA) measure, which include tariffs as well as non-tariff barriers like Sanitary and Pyto-sanitary measures (SPS Measures) and Technical Barriers to Trade Measure (TBT Measures). For complying with the sanitary and phyto sanitary measures imposed by most of the importing countries, strict adherence to the seafood safety norms is essential. The following measures need to be undertaken for ensuring proper quality of seafood products.

- Fish and shellfish should be preserved properly immediately after catch. The fish should be sorted species wise, shrimps should be graded, behead, peeled and de-veined as soon as possible.
- Proper drainage should be provided in markets and landing centres and fish should be protected from flies, rodents, birds and animals.
- Handling area and containers should be properly disinfected and use good quality ice in appropriate proportion.
- Catalogue pharmaceutically important marine products and their utilization strategies.
- Promote market prospects for commercially important non-edible products and byproducts.
- Diversification of destinations of export is required to ensure the export competitiveness and check the risks.
- The emergence of value added products are accelerated by the current demand pattern of the major seafood markets to exporting countries and hence development of improved value added products catering to the needs of diverse consumers in different importing countries is also necessary.
- In addition, strategic policies for the sea food exports is necessary under the WTO regime to stabilize the domestic marketing system and to protect the interests of domestic consumers and producers.

…..ꙮꙮ…..

Chapter 8

SUMMARY OF FINDINGS AND CONCLUSION

Fish from the oceans have been an important source of food from very ancient time onwards. Most of the countries in the world depend on fisheries as source of nutrition rich protein food. But those who catch or harvest fish from the sea cannot live by it alone. Further fish is perishable, which cannot be stored for long time and hence there is need to barter or exchange. Thus fish has an inherent tendency to trade, is thus more innate to a fishery than to livestock or agriculture. Several studies on production to marketing and various aspects has been made by many international and national agencies and individual research workers. The marine fishery in India has a long history. Although evolved as livelihood activities along the coastal habitats over hundreds of years, marine fishery has made rapid changes since the advent of mechanization in early 1950s transferring itself to the present status of an industrialized multimillion rupees worth industry. From an initial small scale artisanal activity with hand made craft, gear and simple tackle, the advent of mechanization and subsequent modernization in capture, handling processing and by product development transformed marine fisheries in to a diversified commercial activity with many ancillary industries dependent directly or indirectly on fish. Considering the prime importance of marine fisheries for the socio-economic improvement of the fisherfolk in the coastal area and thereby overall development of Indian economy, the present study on "Strategic Management of Indian Sea Food Trade" is taken up setting forth the following objectives.

1) To review the current status of fishery business and its contribution to economic development of India,
2) To assess the costs and earnings of different types of fishing units in Kerala state,
3) To evaluate supply-demand dimensions of marine fisheries with special emphasis on technological options, investment structure, earnings, and employment for sustainable development,
4) To analyze the price behaviour of domestic and international marketing of marine products
5) To assess the inter-relationship of primary-wholesale-retail prices of selected varieties of fish.
6) To give policy suggestions for strategic management of sea food trade for reaping optimum benefits and integrated development of the coastal zone

The hypotheses to be tested under the present study are 1. The growth and development of open access marine fisheries and aquaculture in India are almost entirely dependent on exports, 2. There is a steady decline in catch rates of all types of fishing methods which made marine fishing operation uneconomic over the years, 3. There is tremendous development in the market system of marine products in India over the years, 4. The scope for product diversification and increasing quality control needs preservation and processing techniques coupled with state of modern supply chain management of processing plants and cold storage, 5. Excess capacity of fishing fleets and processing plants in fisheries sector is inevitable due to seasonality of production.

The proposed study was based on secondary as well as primary data. The primary data collection was done from selected sample landing centers on costs and earnings of different craft-gear combinations and price information on identified marketing channels using appropriate interview schedules. Data on costs and earnings of different craft gear combinations have been collected from selected centeres of Kerala such as Vizhinjam, Neendakara, Valanjavazhi, Arthungal and Munambam, continuously for one year during 2007 covering selected sample mechanized, motorized and non-mechanized fishing units.

Fish and fishery products, both fresh and frozen, move in the marketing chain through different channels, domestic or export, as the case may be. The marketing channels are distinguished from each other on the basis of market functionaries involved in carrying the produce from the producers to the ultimate consumers. The length of the marketing channel depends on the size of market, nature of the commodity and the pattern of demand at the consumer level. Since maximum marine fish is distributed and sold through the fish marketing channel consisting of fishermen – auctioneer – wholesaler and retailer, this channel have been purposely selected for detailed data collection on fish marketing. In the West coast, Kerala and Maharasthra and in the East Coast Tamil Nadu and Andharapradesh are identified as representative states for collecting price information from landing, wholesale and retail level from the marketing channel. Price data from selected marketing channels of these states for each quarter have been collected for two years (2007 and 2008). Simple tabular analysis and appropriate statistical tools were used for tabulation, analysis and interpretation of data.

The fisheries sector contributed ₹ 33655 million to the Gross Domestic Product (GDP) during 2008-09 which was 0.81 per cent of the total GDP, forming about 5.17 per cent of agricultural GDP. The percentage contribution in total GDP as well as agriculture GDP by fisheries shown a steady increase indicating the emergence of fishery as a business enterprise in the Indian economy. Similarly the fish production in India witnessed a spectacular growth since independence. It rose from a mere 0.75 million tonnes in 1950-51 to over 6.57 million tonnes in 2005-06 and 7.6 million tonnes in 2008-09. In the last 25 years, total fish production has been grown at an annual growth rate of about 4.60 per cent in which marine sector was growing at a rate of 3.24 and inland sector was growing at a rate of 6.20 per cent. Currently (2014) India is one among the top ten fish producing countries in the world contributing 9.45 million tones, 3.78 million tonnes from marine and the rest from inland sector. The export of marine products enabled the fast growth of fishery related infrastructure over the years. The ever increasing internal marketing and exports made fishery as an attracting business with wide ranging options for small as well as big entrepreneurship. Thus the subsistence fishery industry of yester years has transformed into a multi-crore rupee industry in India with marine and inland sectors providing enormous employment opportunities, investment options in production and marketing including exports.

Analysis of the sectoral trend indicates that the mechanized sector accounted for 68 per cent, motorized 25 per cent and artisanal 7 per cent of yield. The artisanal sector has lost its significance in the production sector and is being increasingly marginalized. While there is little scope for increasing fishing pressures in the coastal area up to 80m depth zone, there are a few deep-sea resources, which are presently under exploited? The inshore waters are under heavy or exhaustive fishing pressure. Most of the resources are optimally exploited and a few are marginally over exploited. The coastal fishery has a high level of over capacity in terms of fishing effort.

A wide array of fishing gears and practices ranging from small-scale artisanal to advanced mechanized systems are used for fish capture. The indicative economics of operation of mechanized, motorized and non-mechanized units operating in Kerala is studied The economics of fishing operations of different craft-gear combinations revealed that on an average all type of units are running on profit. But the comparative advantage and efficiency is more on mechanized fishery units. It was seen that in spite of profitability, the per capita contribution to output by various factors of production in the harvesting sectors is declining although there is increase in the aggregate total catch.

Fish is an important source of animal protein to the malnourished Indian population. It is comparatively cheaper source of animal protein for the vulnerable section of the Indian population. The awareness of the Indian population on the nutritive value of fish and the increase in health consciousness of the high income group has led to an increased demand for fish. However the total fish production during 2008-09 was 7.6 million tonnes (Economic survey, 2009-10) comprising 2.9 million tonnes from marine and 4.7 million tonnes from inland sector. The population of India is 1.2 billion by 2009 and the per capita availability of fish including seafood exports is estimated at 6.57kg However, the fish eating population of the country which is now at 56 per cent is assumed to reach 60 per cent by 2020 AD. Hence the quantity of fish to be produced to meet their nutritional requirement will be 11.94 million tonnes for the per capita availability of 15 kg for the fish eating population.

The supply of fish to meet this requirement is far below the estimated demand of 11.94 million tonnes for the fish eating population. The projected fish production from marine sector is 4.01 million tonnes at assured 3 per cent growth rate and from inland sector is 7.24 per cent at assured 4 per cent growth rate. Hence the total fish production by 2020 is estimated at 11.25 million tonnes, still a deficit of 0.69 million tonnes.

The present study focused the primary, wholesale and retail price behavior of different varieties of marine fish in the states of Kerala, Maharastra, Tamil Nadu and Andhrapradesh. Quartely/seasonel price behavior of all varieties of fish for two years (2007 and 2008) in all the four states are discussed and there is considerable inter and intra seasonal and regional variation in the price level of fish at all transactions. High marketing margins ranging from ₹10/ per Kg to ₹106/ per Kg for different varieties of fish shows the greater role of intermediaries in the movement of fish from the point of production to consumption. Fishermen's share on consumers rupee ranges from 38 % to 84 % for different varieties indicating vast scope for introduction and implementing improvements in the domestic fish market system of India for easing out middle men as much as possible from the marketing channel and to ensure fair price to fisher folk.

It was seen that the fish marketing system in India has rapidly changed in recent years due to vast improvements in handling technologies and transportation facilities. Price behavior of different varieties of marine fish revealed that the increase in price of fish is more than that of any other agricultural products during the last few decades. There is wide variation in the landing, whole sale and retail prices of different varieties of fish.

The inter relationship of landing wholesale and retail prices of selected varieties of fishes in the domestic market were worked out through correlation matrices. The relationship shows that an increase in the landing centre prices of any variety of fish leads proportional increase in wholesale and retail prices.

The export promotion measures coupled with the devaluation of rupee has enhanced the forex earnings of marine products which has crossed one billion dollar for the fourth consecutive time during 1998-99. Export market of Indian seafoods has grown rapidly from a mere 15 crore rupees in the 60s to ₹ 30,213.26 crore rupee during 2012-13. The unit value realization of our export also recorded phenomenal increase of ₹ 7.03 per kg during the 1960s to ₹159.12 during 2010 indicating excellent scope to enhance further our marine product exports. The prices prevailing in the International markets and their differentials with respect to the domestic prices are important factors which govern external trade. A common feature was that in all cases, the international market prices were much higher than the domestic market prices and the differential explains their exportability. Though the country's share in the global seafood export is just 1.5 per cent now, the scope for its expansion is high. The global fish eating population has enhanced to about 40 per cent during 1996-97, the consumer preference for fish and fishery products, being in an increasing trend year after year. Diversified product development and market penetration are very essential for the growth of internal and external sea food trade.

The present study clearly indicates that the first hypothesis of "the growth and developments of open access marine fisheries and aquaculture in India are almost entirely depends on exports" is not found correct. Demand for fish and price of fish and fishery products are drasticaly increased over the years both in domestic and international markets. The supply-demand gap indicates the need for enhanced production from aquaculture and open access fisheries even to cater the demand of domestic population. No doubt the export demand and high international price for shrimps has initially stimulated intensive targeted shrimp trawling in our open access marine fisheries and also promoted aquaculture in India. But there is almost parallel development of infrastructure both in domestic and export marketing channel and comparatively competitive price for most varieties of fish are prevalent in our domestic marketing system. The higher disposable income in the hands of fish eating domestic consumers also keep the demand for fish high in India. Although the export marketing contributed significantly for the development of fishery in India, attributing the growth and development of marine fisheries and aquaculture in India entirely on export is not correct.

The study establishes that there is a decline a catch rates of almost all types of craft – gear combinations, but the economics of different type of fishing units operating in Kerala has shown reasonable net operating income and profit. The non-machanised fishing units are slowly vanishing due to diminishing returns and lower per capita income to the labourers, although they also run as profitable family enterprises in the near shore regions. In spite of declining catch rates due to competitive fishing by motorized and machanised units, the ever increasing price of almost all varieties of fish ensure the profitability of all technological options. Hence the second hypothesis "there is a steady decline in catch rates of all types of fishing methods which made marine fishing operations uneconomic over the years" is not true.

The supply – demand dimensions, analysis of domestic fish marketing system and export marketing of fish dealt in the present study clearly reveals vast improvement in handling, preservation, processing, storage, quality control and distribution of fish and fishery products. Therefore the third hypothesis "there is tremendous development in the marketing system of marine products in India over the years" and the fourth hypothesis " the scope for product diversification and increasing quality control needs modern supply chain management of processing plants and cold storage" are found to be correct.

The study reveals that the post-monsoon season brings maximum catch and higher returns for almost all type of fishing units. Investment on fishing fleets and processing plants were made to cater the needs of peak season. Unlike other food grains fish and fishery products cannot be kept under storage for a long period or round the year due to quality control aspects and its perishable nature. So there will be excess capacity in fisheries during the lean season. Hence the fifth hypothesis "excess capacity of fishing fleets and processing plants in fisheries sector is inevitable due to seasonality of production" is true.

Technological advancements in marine fishing industry has facilitated the transformation of the sector to a multibillion dollar industry. However the benefits of these transformations are not fully transferred to the fisherfolk in the country due to defects in the fish marketing and distribution system. Even though the fishermen received higher percentage share (more than 70 per cent) in the consumers' rupee for varieties like seerfishes, mackerels and crabs, it ranged from 50-60 per cent for most of the varieties indicating the huge margin grabbed by the intermediaries. The lack of institutional support for fishing operations results in exploitation of fishermen by middlemen, which needs corrective measures through proper inclusiveness of fisherfolk in the institutional credit mechanism of the country. Infrastructure facilities and basic amenities for hygienic handling, transport, preservation and sale of fish are still lacking even in the major fishing harbours and fish markets in the country. The selling of fishes in unhygienic conditions in the local markets and street vendors and the non availability of cleaned precut fish are other problems associated with the sector. Our fishing harbours and markets need to be modernized in tune with the developed nations so as to supply quality products to both domestic and overseas consumers.

Fish supply-demand projections and rising prices pose a disappointing situation to the domestic consumers. In addition, greater emphasis on export trade for finfish and the resultant scarcity of quality products in the internal marketing system necessitates the need for developing institutional sales channels and implementation of strategic policies in the fish marketing system in the country. Our future thrust areas which require immediate policy interventions include development and promotion of institutional sales channels including cooperative marketing, creation of primary infrastructure facilities and modernization of fishing harbours and retail markets, supply of cleaned, hygienic and quality products to the domestic consumers, processed value added products from low value fishes, prevention of discards and post harvest losses and promotion of a responsible fish marketing system in the country.

References

Abdul Hakim 1979, V.M.1979. Export oriented growth of fisheries. An appraisal. Seafood Export Journal, 21 (3): 23-27.

Ahmed, M., 2000. "FAO/FISHCODE Report of a Bio-Economic Modelling Workshop and a Policy Dialogue Meeting on the Thai Demersal Fisheries in the Gulf of Thailand". FAO/Norway Programme of Assistance to Developing Countries for the Implementation of the Code of Conduct for Responsible Fisheries. (FISHCODE).FI: GCP/INT/648/ NOR: Field Report F-16. FAO, Rome. p. 104.

Ahmed, M., Pongpat Boonchuwongse, Waraporn Dechboon and Dale Squires, 2007. "Overfishing in the Gulf of Thailand: Policy Challenges and Bioeconomic Analysis". Environment and Development Economics, Cambridge University Press, 12: 145–172.

Ajjan, N., S.S.Vaseeharan, C. Loganathan and N. Raveendran., 1998 "An Economic Analysis of Export Performance of Senna and Periwinkle in India", Indian Journal of Agricultural Marketing, Vol.12 (1-2): pp.89-99.

Ammini, P.L., 1999. "Status of Marine Fisheries in Kerala with Reference to Ban on Monsoon Trawling". Marine Fisheries Information Service Technical and Extension Series, No.160: 24-36.

Anant,T.C.A.,2001, "India and the WTO-Flawed Rejectionist Approach", The Economic and Political Weekly Vol.35 No.20 pp 4243-45,2001(in).

Anderson, L.G., 1984. "Uncertainty in Fisheries Management Process". Marine Resource Economics, 1: 77-87.

Anderson, Lee, G., 1977. The Economics of Fisheries Management. Baltimore, The John Hopkins University Press, p.12.

Anonymous,1991, "Raising Seafood Exports", Indian Seafood Industry" Vol.10(5),p-7.

Anonymous, 1993, "The Export Credit Guarantee Corporation of India for Promotion of India's Export" Seafood Export Journal, No, pp 4-6, September, 1993.

Anonymous, 1996, "1995-96 A Year of Setback for the Seafood Industry" Seafood Export Journal, Decemeber, 1996.

Anonymous,1996, "Action plan to increase Seafood Exports" Seafood Export Journal, Decemeber,1996.

Anonymous, 1999, "Indian Seafood Faces Danger of Another EU Ban", Fisheries World, No, pp 4-5, February, 1999.

Anonymous, 2001, "Imports and Exports of Fishery Products" Seafood Export Journal, No, pp 27-29, September, 2001.

Anonymous., 2002, "Downward Pressure Continues", Seafood Export Journal, No. pp 31-40.

Arshad, M. and Ghaffar, R.A., 1990, “Malaysia's Primary Commodities: Constant Market Share Analysis in Malaysian Agricultural Policy: Issues and Directions”. World Agricultural Economics. Rural Sociology Abstracts, 32(7): 605.

Atkin, M. and Blandford, D., 1982,. “Structural Changes in Import-Shares for Apple and in the U.K.”. European Journal Agricultural Economics., 9(1):313-326.

Babu Paul, D., 1982. Reports of the Committee to Study the Need for Conservation of Marine Fishery Resources During Certain Seasons of the Year and Allied Matters, Submitted to Government of Kerala, Thiruvanthapuram.

Baharumshah, A.Z. and Habibullah, M.S, 1994, “Price Efficiency in Pepper Markets in Malaysia: A Co-integration Analysis”. Indian Journal of Agricultural Economics. 49(2) : 205-216.

Baharumshah, Ahmed. Zubaidi, tan Hui Boon and Muzafar Shah Habibullah (1997) "The Law of One Price and Malaysian Exports", Asian Economic Review,Vol.39,No.2,pp.304-217.

Balakrishnan Nair, 1991. Reports of the Expert Committee on Ban on Monsoon Trawling in Kerala. Government of Kerala, Thiruvanthapuram.

Balakrishnan, S., 1992, "Significance of Hazard Analysis Critical Control Points (HACCP) Concept in Indian Export Scenario" Seafood Export Journal, No, pp 12-13, 1992.

Balan, K. and J. Andrews. 1995. “Marine Fish Production in Kerala-Estimation Procedure and Present Trend”. In P.U. Varghese (Eds), Proceedings on Fish Resources in Indian EEZ and Deep Sea Fishing, Cochin, pp. 32-40.

Balassa,B.A, 1965, “Trade Liberalization and Revealed Comparative Advantage” The Manchester School of Economic and Social Studies,33,pp 99-124.

Banik, Nilanjan. 2001, “An Analysis of the India’s Export during the 1990s”, The Economic and Political Weekly No., pp 4222- 4230.

Bapat, S.V. and Alexander Kurian 1981. Present status and role of small-scale fisheries of India. Proceedings of the seminar on the role of small-scale fisheries and coastal aquaculture in Integrated rural Development. CMFRI Bulletin,30-A:13.21.

Barber, W.E. and J.N. Taylor, 1990. The importance of Goals, Objectives management process and organization – a review North American Journal of Fisheries Management, 10(4): 365-373.

Begum, S. and A.F.M. Shamsuddin, 1998, "Exports and Economic Growth in Bangladesh", Journal of Development Studies, 35(1): 89-114.

Behura, Debdutt and Dibakar Naik, 1994, "Pattern of Indian Shrimp Export" Export Potential of Indian Agriculture, pp.359-369.

Behura Debdutt and Durga Charan Pradhan, 1998, Co-integration and Market integration. An application to the marine-fish markets in Orissa. Indian Journal of Agricultural Economics, 53(3) : 319-350.

Bergstrand, Jeffrey H.,1985, "The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence." The Review of Economics and Statistics, Vol. 67, No. 3. pp. 474–481.

Bhagwati, J., 1978, "Anatomy and Consequences of Exchange Control Regimes". (Cambridge, MA.: Ballinger Publishing Co. for National Bureau of Economic Research, 1978).

Bhagwati, J., 1988, "Export Promoting Trade Strategy: Issues and Evidence", World Bank Research Observer, 3: 27-58.

Bhalla, G.S.,1995, "Economic Liberalization and Indian Agriculture", Edited by Institute for Studies in Industrial Development, New Delhi, 398.

Bharucha,Vasantha, 1997, "The Impact of Environmental Stanadards and Regulations Set in Foreign Markets for Indian Exports " in Jha *et al* eds),op cit, pp 341-43(in).

Bhat, K.S., 1995, "Export and Economic Growth in India", Artha Vijnana, 37(4): 350-358.

Bhat M. G. and R. Bhatta, 2001. "An Economic Analysis of Sustainability of Marine Fish Production in Karnataka". Marine Ecosystems and Sustainability EERC Working Paper Series: MES-1.

Bhatia, M.S., 1994, "Agricultural Pricing, Marketing and International Trade under New Economic Environment", Indian Journal of Agricultural Economics, 49(3): 403–416.

Bhattacharya, B. and B. Pal.,1999, "Uruguay Round: Impact on India's Food Security and Environment". Indian Institute of Foreign Trade, New Delhi.

Bhowmick, B.C. and D. C. Kalita, 2001. "Performance of Livestock and Fishery: Constraints for Agricultural Development and Prioritization of Strategies". Proceedings on Prioritization of Strategies for Agricultural Development in Northeastern India, pp.34-41.

Billingsley,P., 1965, "Statistic Methods in Markov Chains", Annual Mathematical Statistics, Vol.32, 12-40.

Bjorndal, T., 1989. "Production in a Schooling Fishery: The Case of the North Sea Herring Fishery". Land Economics, 65(1), 49-56.

Blaug, Mark 1992. *The methodology of economics, or, How economists explain*. Cambridge University Press. p. 286. ISBN 0-521-43678-8.

Blyn George 1973. "Price serious correlations as a measure of marketing integration". *Indian Journal of Agricultural Economics, 28(2):56-59.*

Bojan, J., 2003, "Current Status and Prospects of Seafood Export". India International Seafood Show Souvenir., pp 13-15, 7-9 February 2003

Bond, E. Marine.,1987, "An Economic Study of Primary Commodity Exports from Developing Country Regions to the World, International Monetary Fund Staff Paper, 34(2): 191-227.

Brain J. Rothfehild, 1983. Global fisheries perspectives for 1980s. Springer series on environmental management, New York-10010:1-170.

Brajgeet Bhathal*,* 2005, "Historical Reconstruction of Indian Marine Fisheries Catches, 1950-2000 as a Basis for Testing the 'Marine Trophic Index". FCRR, Vol. 13(5).

Brandao, A. and W. Martin., 1993, "Implications of Agricultural Trade Liberalization for Developing Countries", Agricultural Economics, 8(4): 313-343.

Brandel F. 1979. The structure of everyday life, harper & Row, New York

Brodersen C.M., H.F. Cambell and C.H. Hanf, 1998. “Adjusting Fleet Size and Structure to Catch Quotas: A Mathematical Programming Model of the German North Sea and Baltic Fisheries”. In Arne Eide and Terje Vassdal (Eds.), IIFET'98 Tromsø Proceedings.

Bromley, D. W., 1991. “Environment and Economy: Property Rights and Public Policy”. American Journal of Agricultural Economics, 74(3): 836-837.

Brorsen, B.W., Chavas, J.P. and Grand, W.R., 1984, “Dynamic Relationships of Rice Import Prices in Europe”. European Review of Agricultural Economics., 11(1) : 29-42.

P. J. Cain, 2007 "Capitalism, Aristocracy and Empire: Some 'Classical' Theories of Imperialism Revisited," *Journal of Imperial and Commonwealth History,* pp 25-47.

Capros, P., P. Karadeloglou and G. Mentzas., 1990, "An Empirical Assessment of Macro Econometric and CGE Approaches in Policy Modeling". Journal of Policy Modelling, 12(3): 557-585.

Carlander, K.D. 1969. An operational functional classification of fishery management techniques. International vereinigung fur theoretische and angewandte Linnologie, Verhandlungen, 17: 636-640.

Carlson, E.W., 1973. “Cross Section Production Functions for North Atlantic Ground fish and Tropical Tuna Seine Fisheries”. In A.A. Sokoloski (Ed.), NOAA Technical Report NMFS CIRC-371, Ocean Fishery Management: Discussions and Research, pp.42-56.

Castro Luiz Arnaud Britto De ., Miguel Petrere, Jr. and Antonio Evaldo Comune, 2001. “Sensitivity of the BEAM4 Fisheries Bioeconomic Model to the Main Biological Input Parameters”. Ecological Modeling, 141(1-3): pp.53-66.

Chadha, R., S. Pohit, A.V. Deardorff and R.M. Stern., 1996, "The Impact of Trade and Domestic Policy Reforms in India: A Computable General Equillibrium Modelling Approach", Mimeo (NCAER-Univesity of Michigan, 1996).

Chand, Ramesh., 1997, "Import Liberalization and Indian Agriculture–The Challenge and Strategy", Policy Paper 6, National Centre for Agricultural Economics and Policy Research, New Delhi.

Chand, Ramesh, 1999, "Liberalization of Agricultural Trade and Net Social Welfare A Study of Selected Crops", The Economic and Political Weekly, 34(52): A–153–159.

Chand, Ramesh., 2001, "India's Agricultural Trade and WTO - Reflection on Domestic Policy and New Trade Round", Paper presented at National Seminar on "Implication of WTO on Agriculture in India", Tamil Nadu Agricultural University, Coimbatore.

Chand,Ramesh, 2002, "Trade Liberalisation, WTO and Indian Agriculture: Experience and Prospects" Mittal Publications.

Chatfield, C., 1984, "The Analysis of Time Series. An Introduction" London: Chapman and Hall.

Chekkutty, N.P., 2006. "Fishing Communities: The Economics of Impoverishment". Infochange News and Features (www.infochangeindia.org).

Chimini,B.S.,2002, "WTO and Environment-Shrimp- Turtle and EC-Hormone Cases", The Economic and Political Weekly Vol.35 No.20 pp 1752-1761,(INCOMP)ET-170.

Christie Patrick, David L. Fluharty, Alan T. White, Liza Eisma-Osoriod and William Jatulanc, 2007. Assessing the Feasibility of Ecosystem-Based Fisheries Management in Tropical Contexts. Marine Policy, 31(3):239-250.

Clark, C.W and G. Munro, 1975. “The Economics of Fishing and Modern Capital Theory: A Simplified Approach”. Journal of Environmental Economics and Management, 2:92-106.

Clark, C. W., 1982. “Models of Fishery Regulation”. Essays in the Economics of Renewable Resources, North-Holland Publishing Company.

Clark, C.W., 1985. Bioeconomic Modelling and Fisheries Management. John Wiley and Sons, New York, p. 291.

Clark, C.W., 1990. Mathematical Bioeconomics. John Wiley and Sons, New York.

CMFRI, 1987. An Appraisal of Marine Fisheries of Kerala. Special Publication No.35, CMFRI, Kochi.

CMFRI, 2005. Marine Fisheries Census, Part II. Government of India, Ministry of Agriculture, Department of Animal Husbandry, Dairying and Fisheries, Krishi Bhavan, New Delhi and Central Marine Fisheries Research Institute, Kochi, pp.6-15.

CMFRI, 2005. Marine Fisheries Census, Part III(6)-Kerala. Government of India, Ministry of Agriculture, Department of Animal Husbandry, Dairying and Fisheries, Krishi Bhavan, New Delhi and Central Marine Fisheries Research Institute, Kochi, pp.5-10.

CMFRI, 2007. Annual Report-2006-07. Central Marine Fisheries Research Institute: Kochi, pp.20-26.

CMFRI, 2014. Marine Fish landings in India – 2013. Central Marine Fisheries Research Institute, Kochi.

Coase, R.H. 1976. "Adam Smith's View of Man". *The Journal of Law and Economics* 19 (3): 529–546.

Coelli, T., Prasada Rao, D.S. and Battese, G.E., 1999. An Introduction to Efficiency and Productivity Analysis. Kluwer Academic Publishers.

Conrad, John M. and Clark, C. M., 1995. Natural Resource Economics. Cambridge University Press.

Cummings,W, 1967, " Pricing Efficiency In Indian wheat market", Impact India, New Delhi.

Cunningham, S., Dunn, M.R. and Whitmarsh, D., 1985. Fisheries Economics: An Introduction. Mansell Publishing Limited.

Cyriac,Jose.K., 2003, "Pressures and challenges of WTO Agreements on Export of Marine Products from India". India International Seafood Show Souvenir., pp 1-6, 7-9 February 2003.

Datta, Samar, K,. 1996, "India's Trade Prospects for Rice"., Vision of India's Rice Trade, NCAEP, New Delhi, 14-35.

Datta Samar, K and Choudhury Mukut Roy, 1999. "Property Rights and Policies for Sustainable Management of Marine Fisheries: The Indian Scenario". No 1999-05-01, IIMA Working Papers. Indian Institute of Management, Ahmedabad, Research and Publication Department.

Datta,K,Samar and Milindo Chakrabarti, 2001, "A Perspective on Global Competitiveness of Indian Fish – The Case of Shrimp" Proceedings of the National Conference on Fisheries Economics Research and Education in India: An Overview, Edited by Shyam S Salim,R.S. Biradar and S.N.Ojha, held at CIFE, Mumbai, pp 85-93.

Dattatreyulu, M.,2000, "Agricultural Exports from India: Scenarios and Directions", Financing Agriculture, Vol 32, No.4 pp 15-25.

David Cushing, 1975. "Fisheries Resources of the Sea and their management" Oxford University Press, pp 1-75.

Dayal, R., 1986. "Agricultural Growth Rates and Their Components". Indian Journal of Agricultural Economics, 29(3):273.

Defeo, O and J.C.Seijo, 1999. “Yield–Mortality Models: A Precautionary Bioeconomic Approach”. Fisheries Research, 40(1):7-16.

Dehadrai, P.V., 2006. “Missing Opportunities in Marine Fisheries”. National Seminar on Sustainability of Seafood Production: Reflections, Alternatives and Environmental Control. National Institute of Oceanography, Dona-Paula, Goa-403004.

Delgado, C.L., Nicholas Wada, Mark.W.Rosegrant, Siet Meijer and Ahmed, M., 2003. “Outlook for Fish to 2020-Meeting Global Demand”. A 2020 Vision for Food, Agriculture and the Environment Initiative. International Food Policy Research Institute, Washington DC, USA and World Fish Centre, Penang, Malaysia.

Demeocq, M. and P. Guillamont., 1985, "Export Instability and Economic Development", A Study for the World Bank, Washington, D.C., World Bank.

Dent, W.T., 1967, “Application of Markov Analysis to International Wool Flows”. Review of Economics and Statistics, Vol:49, No.2, :May 613-616.

Deodhar, Y, Satish., 2001, “WTO Pacts and Food Quality Issues”, The Economic and Political Weekly, No., pp 2813-2816.

Department of Animal Husbandry Dairying and Fisheries, Annual Report 2007-08, Ministry of Agriculture, Government of India.

Department of Animal Husbandry Dairying and Fisheries, Annual Report 2010-11, Ministry of Agriculture, Government of India.

Desai, B.M. and N.V. Namboodiri., 1999, "Farmer's Response, Prices and Government Expenditure Analysis under WTO Framework for Developing Agriculture". Indian Institute of Management, Ahmedabad.

Devaraj, M. and Paralkar Smita 1988. “Economic Performance of Mechanised Trawlers in the State of Kerala, India”. Fisheries Research, 6 (3): 271-286.

Dhawan, U. and B. Biswal., 1999, "Re-examining export-led growth hypothesis: A multivariate co-integration analysis for India" Applied Economics, 31:525-530.

Diakosauvas,D., 1995, “How Integrated are World Beef Markets? The Case of Australian and U.S.Beef Markets”, Agricultural Economics, 12, No.1, 37-53, 1995.

Dittok,S and S.A.Breth. 1994, “Market Integration: The Case of Dry Season Vegetables in Nigeria” Issues in African Rural Development, 2, 89-101.

Dong-Ryul Chae and Sean Pascoe, 2005. “Use of Simple Bioeconomic Models to Estimate Optimal Effort Levels in the Korean Coastal Flounder Fisheries”. Aquatic Living Resources, 18:93-101.

Dubey, B., Peeyush Chandra and Prawal Sinha, 2003. “A Model for Fishery Resource with Reserve Area”. Non Linear Analysis : Real World Application, 4(4): 625-637.

Durairaj, N., 1980. “Growth Trends in Marine Fish Production in Tamil Nadu”. Southern Economist, XV (1): 30.

Economic Survey, 2009-10, Ministry of Finance, Government of India.

Economic Survey, 2010-11, Ministry of Finance, Government of India.

Economic Survey, 2012-13, Ministry of Finance, Government of India.

Edwards, Chris 1985, "The Fall of The Hecksher-Ohlin Theory", *The fragmented world: competing perspectives on trade, money, and crisis*, London and New York: Methuen, pp. 29–40, ISBN 0-416-73390-5.

Edwards, Sebastain, 1989, "Openness, Outward Orientation, Trade Liberalization and Economic Performance in Developing Countries"., World Bank Paper, Working Paper No. 191.

Edwards Sebastian, 1997, “Openness, Outward Orientation, Trade Liberalization and Economic Performance in Developing Countries” Working Paper, Trade Policy Division, World Bank.

Edwin, L. and C. Hridayanathan, 1998. "Catch Per Unit Effort (CPUE) of Ring Seines of South Kerala Coast". Symposium on Advances and Priorities in Fisheries Technology. Society of Fisheries Technologists (India), Cochin, India, pp. 11-13.

Emami, Aristotle and Tarzi, M.Shah.,2002, "Globalization, Trade and LDCs: Reflections on the Consequences and Opportunities of Trade Liberalisation", Asian Economic Review, Vol.44,No.2, pp 177-192.

Engle, F.E. and Granger W J., 1987, "Co-integration: Estimation and Testing". Econometrica, 55(2): 251-276.

FAO, 1995. Code of Conduct for Responsible Fisheries. Food and Agriculture Organization of the United Nations, Rome, p. 41.

FAO, 1998. The State of World Fisheries and Aquaculture. Food and Agriculture Organization of the United Nations, Rome.

FAO, 2003. The State of World Fisheries and Aquaculture. Food and Agriculture Organization of the United Nations, Rome.

FAO, 2007. The State of World Fisheries and Aquaculture, 2006. Food and Agriculture Organization of the United Nations, Rome.

FAPRI, 1993. "World Agricultural Outlook", Food and Agricultural Policy Research Institute, Staff Report No.2–93, Iowa State University and University of Missouri, Columbia.

February Gobinath M, Krishnan.M and Ravishankar.T, 1993, "Trends in Agro and Agro based Products from India" In Proceedings, First National Conference on Policy, Division of Agricultural Economics, Indian Agricultural Research Institute, New Delhi., p24-25.

Feioidi, H.Izzat, 2001, "Fish Consumption and Trade in the Arab World"., INFOFISH International, Vol. 7(9) No.4, pp 16-22, January, 2001.

Feioidi, H.Izzat, 2000 "International Seafood Production and Trade-Towards 2010"., INFOFISH International, Vol. 7(9) No.4, pp 22-27.

Ferdouse, Fatima., 1999, "Japanese and Other Asian Markets for Shrimp : An Overview" INFOFISH International, No., pp 23-28.

Fialor, S. 1985, "An Analysis of the Production Pattern and Marketing of Cocoa in Ghana". An unpublished M.Sc. (Agri) Thesis, submitted to University of Agricultural Sciences, Bangalore.

D. K. Fieldhouse, 1992 "Imperialism": An Historiographical Revision," *South African Journal of Economic History,* pp 45-72.

Fosu, A.K., 1990, "Exports and Economic Growth: The African Case", World Development, 18(6): 379-399.

Fox, W. W. Jr., 1970. "An Exponential Surplus-Yield Model for Optimizing Exploited Fish Populations". Transactions of the American Fisheries Society, 99: 80-88.

Friedman, Milton1970. "A Theoretical Framework for Monetary Analysis". *Journal of Political Economy* 78 (2): 193–238.

Frost, Hans and Niels Vestergaard, 1995. "An Operational Approach to Assess Management Regulation Subject to Different Management Objectives". ICES C.M. (ICES Conference Paper). South Jutland University Centre, DIFER, Working Paper WP5/96, (DG14.A-94/03).

Ganapathy, R. 1978 Socpe for diversification of marine products for export. Seafood Export journal, 10 (7): 11-22.

Ganesh Kumar B, Datta K.K., P.K. Ravisankar, T. Parik, N.K. Ananthan, P.S. Suresh, R. Ramachandra Bhatta, Ravindranath, K. Shinoj, P. Shyam Salim and G. Vidhyasagar Reddy, 2008 "Exploring market opportunities for fisheries sector in India". Report of the Research study National Centre for Agricultural Economics and Policy Research (NCAP), New Delhi pp 426.

Garcia, S.M. 1996. "The Precautionary Approach to Fisheries and Its Implications for Fishery Research, Technology and Management: An Updated Review". In: Precautionary Approach to Fisheries. Part 2: Scientific Papers, FAO Fisheries Technical Paper, (350/2): 1–75.

Gardner, R., Elinor Ostrom and James Walker, 1990. "The Nature of Common Pool Resource Problems". Rationality and Society, 2(3): 335-358.

Gemtessa, K., 1991, "An Analysis of the Structure of Ethiopian Coffee Exports". An unpublished M.Sc. (Agri) Thesis, submitted to University of Agricultural Sciences, Bangalore.

Ghirmay, T., R. Grabowski and S.C. Sharma., 2001, "Exports, Investment, Efficiency and Economic Growth in LDC: An Empirical investigation", Applied Economics, 33: 689-700.

Ghosh,Buddhadeb and Prabir, De., 2001, "Indian Ports and Globalistion Grounding Economics in Geography", The Economic and Political Weekly, No.,pp 3271-3283.

Gill, S.S. and J.S. Brar., 1996, "Global Market and Competitiveness of Indian Agriculture–Some Issues", The Economic and Political Weekly, 30(32): 2167–2177.

Gillet, B.E. 1976, "Introduction of Operation Research: A Computer Oriented Algorithmic Approach". MaGraw Hill Inc. New York.

Glezakos, C., 1973, "Export Instability and Economic Growth: A Statistical Verification", World Development, 15(5): 713–740.

Gobinath M, Krishnan.M and Ravishankar.T, 1993, "Trends in Agro and Agro based Products from India" In Proceedings, First National Conference on Policy, Division of Agricultural Economics, Indian Agricultural Research Institute, New Delhi., February, p24-25.

Goldar, B., 1994, "Trade Reforms in India" in S.P. Gupta, Garry Pursell and John Nash, eds; Trade Policy Reforms, (New Delhi: Indian Council for Research on International Economic Relation).

Goldin, I. and O. Knudsen., 1995, "Agricultural Trade Liberalisation - Implications for Developing Countries", OECD, The World Bank.

Goletti,F. and S.Babu, 1994, "Market Liberalization and Integration of Maize Markets in Malawi", Agricultural Economics, 11, 311-324.

González, R.A., Maite A. Narvarte and Guillermo M. Caille, 2007. "An Assessment of the Sustainability of the Hake *Merluccius Hubbsi* Artisanal Fishery in San Matías Gulf, Patagonia, Argentina". Fisheries Research, 87(1):58-67.

Gordon, H. Scott, 1954. "The Economic Theory of a Common Property Resource". Journal of Political Economy, 62:124-142.

Greenaway, D. and D. Sapsford. 1994, "Exports, Growth and Liberalization", , 16(2): 165-186.

Griffin, Wade L., Ronald D. Lacewell, and John P. Nichols, 1976. "Optimum Effort and Rent Distribution in the Gulf of Mexico Shrimp Fishery". American Journal of Agricultural Economics, 58(4):644-652.

Gulati, A., James, H. and Gracy, P., 1990, "Effective Incentives in India's Agriculture the Case of Wheat, Rice, Cotton And Groundnut". Research working Paper, World Bank, New Delhi.

Gulati, A., A. Sharma, K. Sharma, S. Das and V. Chhabra, 1994, "Export Competitiveness of Selected Agricultural Commodities", (New Delhi: National Council of Applied Economics Research, New Delhi).

Gulati, Ashok and Anil, Sharma., 1998, "Agricultural under GATT : What it Holds for India", The Economic and Political Weekly, 29(29): 1857-1863.

Gulland, J.A., 1969. Fisheries Management and the Limitation of Fishing. FAO Fisheries Technical Paper No.92, FRS/T92 (En.). Fishery Management, Food and Agriculture Organization of the United Nations, Rome.

Habeck, M., Brown, D.J. and Abbolt, P., 1988, “Sources of Export Earnings Instability: The Role of Agriculture”. Journal of Agricultural Economics., 39(1) : 69-80.

Hakan, E., 1998. “Bioeconomic Analysis and Management”. Environmental and Resource Economics, 11(3-4): 399-411.

Halls, A.S., Welcome, R.L. and Burn, R.W, 2006. “The Relationship between Multispecies Catches and Effort among Fishery Comparisons”, Fisheries Research, 77: 78-83.

Hanley, Nick, Jason F. Shogren, and Ben White, 2004. Environmental Economics in Theory and Practice. Oxford University Press, Oxford and New York.

Harmans, R., 1984, “World Trade in Coffee, Cocoa and Tea". Quarterly Journal of International Agriculture, 22(2) : 514-522.

Hazell, P., J. Mauricio and A. Williamson., 1987, "How has Instability in World Markets Affected Agricultural Export Producers in Developing Countries?" Policy Research Working Paper No. 263, World Bank.

Hazell, P.R.R., Jaramillo, M. and William Son, A., 1990, “The Relationship Between World Prices Instability and the Prices Farmers Receive in Developing Countries”. Journal of Agricultural Economics., 41(2) : 227-256.

Heckscher, Eli F. 1950, "Multilateralism, Baltic Trade and the Mercantilists," *Economic History Review* (2nd series) vol. 3, no. 2 (May), pp. 219-28.

Hector, M., 1979. “Overfishing: An Economic Analysis”. Journal of Agricultural Economics, 30(2): 108.

Hempel, Erik., 1997, "Supply Problems in the Shrimp Market, "Seafood International", No, pp 23-26.

Henriques, I. and P. Sadorsky, 1996, "Export - Led Growth or Growth - Driven Exports? The Canadian Case", Canadaian Journal of Economics, 29(3): 541-555.

Herrmann, Roland,; Patricia Schenk and Manfred Wiebelt, 1991, "On the Measurement of Agricultural Protection :How Price Certainty and Limited Substitution Matter", Oxford Agrarian Studies, Vol.19, No.1, pp.21-40.

Hilborn Ray and Carl Walters, 1992. Quantitative Fisheries Stock Assessment: Choice, Dynamics and Uncertainty. Chapman and Hall, New York, pp.104-154.

Hollowed, A.B., Nicholas Bax, Richard Beamish, Jeremy Collie, Michael Fogarty, Patricia Livingston, John Pope and Jake C. Rice, 2000. "Are Multispecies Models an Improvement on Single-Species Models for Measuring Fishing Impacts on Marine Ecosystems?". ICES Journal of Marine Science, 57(3):707-719.

ICES, 2003. Code of Practice on the Introductions and Transfers of Marine Organisms (Http://www.ices.dk/Pubs/Itmo.Pdf.).

Illangovan R, 1994, "Problems in Sea Food Export". The Hindu, July 2,1994.

Indira, M. 1998, "An Economic Analysis of Coffee Marketing in India". An unpublished Ph.D. Thesis submitted to Institute of Social and Economic Change, Bangalore.

International Monetary Fund(IMF), 1993, "Trade as an Engine of Growth" in World Economic Outlook: 70-80.

Islam, M.N., 1998, "Exports Expansion and Economic Growth: Testing for Co-integration and Causality", Applied Economics, 30(3): 415-425.

Jaganathan, N., 1992, "Export Instability, Foreign Exchange Reserves and External Borrowings", Monthly Commentary on Indian Economic Conditions, Vol.34 (2): 1-8.

Jamal, H, 1987, “Support Prices in the Context of Iinternational Trade : The Core of Cotton in Pallirthan”. Bangladesh Development Studies, 15(1) : 143-156.

James, P.S.R.B.1981.Exploited and potential capture fishery resources in the inshore waters of India, proceedings of the seminar on the role of small-scale fisheries and costal aquaculture in integrated rural development CMFRI., Cochin March 1981, pp 72-156.

Jayaraman,.R, 1994, “Exports of Marine Products does not affect domestic consumption”. Seafood Export Journal, Vol.XXV(16), June, pp.23-29.

Jayawardane, P.A.A.T., D.S. Mclusky and P. Tytler, 2002. “Estimation of Population Parameters and Stock Assessment of *Penaeus Indicus* in the Western Coastal Waters of Sri Lanka”. Asian Fisheries Science, 15 :155-166.

Jeromi, P.D. and Ramanathan, A., 1993, “World Market and India. An Analysis of Growth and Instability”. Indian Journal Agricultural Economics, 48(1): 88-97.

Jessy Thomas and R. Sundaresan, 1996. “Export Performance of Cardamom in India”. The Bihar Journal of Agricultural Marketing, 4(1):29-34.

Jin, J.C., 1995, "Exports-Led Growth and the Four Little Dragons", Journal of International Trade and Economic Development, 4(2): 203-215.

Johansen, S. and K. Juselius., 1990, "Maximum Likelihood Estimation and Inference on Cointegration with Applications to the Demand for Money", Oxford Bulletin of Economic and Statistics, 52(2): 169-210.

Johansen, S., 1988, "Statistical Analyse of Cointegration Vectors", Journal of Economic Dynamics and Control, 12: 231-254.

Jones S. and Banerji S.K., 1973, A review of the living resources of the Central Indian Ocean, In: Proceedings of the Symposium on living resources of the seas around India, Mandapam Camp, pp 100-120.

Kalawar, A.G., M.Devaraj and A.K.Parulekar, 1985. Report of the Expert Committee on Marine Fishery Management in Kerala. CIFE, Bombay, India. p.432.

Kapur, S,N., 1991, "The Structure and Competitiveness of India's Exports", Indian Economic Review, Vol XXVI, No.2, pp 221-237.

Kaushik, K.K. and Paras., 2000, "Trade Liberalisation and Export Performance in India : A Statistical Verification", Foreign Trade Review.,2(1),12-16.

Khorshid M, and G.R. Morgan 1990. A modeling framework for fisheries development planning. Ocean and shoreline management 14(1990) 11-33.

Krishnan M., P.S.Birthal, T.Ravisankar, K.Ponnusamy, M.Kumaran and Harbir, 1999, "HACCP Guidelines and the Economics of Seafood Processing. An Impact Analysis", Indian Journal of Agricultural Marketing, 13(2): 122-128.

Krishnan.M and Ravishankar.t and Sharma. B.M, 1994, "Development Prospects of Marine products export from India". Indian Journal of Agricultural Marketing, Conference Number, October,1994.

Krueger, A., 1978, "Foreign Trade Regimes and Economic Developments Liberalization Attempts and Consequences", (Cambridge, MA: Ballinger Publishing Co. for NBER).

Krueger, A., 1986, "General Issues in Economic Liberalisartions" in A. Choski and D. Papageorgious eds., Economic Liberalization in Developing Countries, (Oxford : Blackwell).

Kugler, P., 1991, "Growth, Exports and Cointegration: An Empirical Investigation", Weltwirtschaffliches Archiv, 127(1): 73-82.

Kulmala, S., H. Peltomaki, M. Lindroos, P.Soderkultalahti and S.Kuikka, 2007, "Individual Transferable Quotas in the Baltic Sea Herring Fishery-A Socio Bioeconomic Analysis". Fisheries Research, 84: 368-377.

Kumar Ranjit, 2000, "Export Performance of Agricultural Commodities in India", Yojana, 44(7):41-43.

Kurien, John and Rolf William, 1982. Economics of artisanal and mechanized fisheries in Kerala- a study on costs and earnings of fishing units small-scale fisheries promotion in South Asia. FAO/UNDP paper No34 publication of Bay of Bengal programme pp.1-112.

Kurien, J., 1995. "Joint Action against Joint Ventures: Resistance to Multinationals in Indian Waters". The Ecologist, 25(2/3): 115-19.

Kurien, J., 1998. "Kerala's Marine Fishery: Evolving Towards Unsustainability - A Personal Statement Spanning Three Decades". Discussion Paper 15. Centre for Development Studies, Thiruvanathapuram.

Kurien, J. and Paul, A., 2000. "Net for Social Safety; An Analysis of the Growth and Changing Composition of Social Security Programmes in the Fisheries Sector of Kerala State, India". Samudra Monograph. ICSF, Chennai.

Kurien, J., 2000. "Community Property Rights: Re-Establishing Them for a Secure Future for Small-Scale Fisheries". In R. Shotton, (Ed.), Use of Property Rights in Fisheries Management, Proceedings of the Fish Rights 99 Conference, Freemantle, Western Australia, pp. 288–296.

Kurien, J., 2006. "Untangling subsidies, supporting fisheries: The WTO subsidies debate and developing country priorities". ICSF occasional paper. International Collective in Support of Fish Workers (www.icsf.net).

Kurup and Devaraj, 2000. "Estimates of Optimum Fleet Size for the Exploited Indian Shelf Fisheries". Marine Fisheries Information Service Technical and Extension Series, No.165, pp: 2-11.

Kuthalingam, M.D.K., P. Livingston and P.S.S. Sarma 1978. Observation on the catches of the mechanized boats at Neendakara. Indian, J, Fish,25(1&2); 98-108.

Kuzebski,Emil, 2001, "Expansion of the EU: New Opportunities for Export"., INFOFISH International, Vol. 7(9) No.4, pp 30.32,April,2001.

Lallemand, P., Gates, J.M., Dirlam J and Cho, H., 1999. The Cost of Large Trawlers in the North East". Final Report, Cooperative Marine Education and Research Programme. Department of Environmental and Natural Resources Economics, University of Rhode Island.

Latika Sharma and S. K. Tiwari., 2001, "India's Tea Export Demand and Supply - A Simultaneous Equations Approach", Indian Journal of Agricultural Marketing, 15(2): 2-7.

Lathika, M and Ajith Kumar, C.E., 2005. "Growth Trend in Area, Production and Productivity of Coconut in India". Indian Journal of Agricultural Economics, 10(4):686-697.

Leal, D.R., De Alessi M. and Baker, P., 2005. The Ecological Role of IFQs in U.S. Fisheries: A Guide for Federal Policy Makers (www.ifqsforfisheries.org)

Leela Nayar K.P, 1973. Marine food industry in Kanyakumari, Thirunelveli district of Tamil Nadu, Sea food export Journal 5(1): 103-106.

Lele.J. Uma, 1971, "Food Grain marketing in India: Private Performance and Public Policy", Cornell University Press, New York.

Levine, R. and D. Renelt, 1992, "A Sensitivity of Cross Country Growth Regressions", The American Economic Review, 82: 946-963.

Lindebo, E., 2004. "FAO International Plan of Action for the Management of Fishing Capacity: Review of Progress in ASEAN Countries". Information Paper Presented at the Technical Consultation to Review Progress and Promote the Full Implementation of the IPOA to Prevent, Deter and Eliminate IUU Fishing and the IPOA for the Management of Fishing Capacity, Rome, Italy.

Ling Hong Birth, Leung Pingsun and Yung,C Shang., 1996,"Export Performance of Major Cultured Shrimp Producers in the Japanese and US Market", Aquaculture Research, Vol.27, pp 775-785.

Ling Hong Birth, Leung Pingsun and Yung,C Shang., 1998, "Behaviour or Price Transmissions in Vertically Co-ordinated Markets : The Case of Frozen Black Tiger Shrimp (*Peneaus monodon*), Aquaculture Economics and Mangement, Vol.2, pp 119-128.

Lleonart, J., F. Maynou, L. Recasens and R. Franquesa, 2003. "A Bioeconomic Model for Mediterranean Fisheries- The Hake of Catalonia (Western Mediterranean) as a Case Study". Scientia Marina, Vol. 67, No S1.

Love, J., 1992, "Export Instability and Domestic Economy: Questions of Causality", The Journal of Development Studies, 28(4): 735–742.

Lundal, M. and Erling Peterson 1983. "Price series correlation and market integration. Some further evidence". *Indian Journal of Agricultural Economics, 37(2): 184-190.*

Madhusoodana Kurup, B and Radhika Rajasree, 2007. "Status of Bottom Trawl Fishery in Kerala (South India)". Fishery Technology, 44(1): 99-108.

Mahesh, N., 2001. Economic Constraints Facing the Indian Tea Industry: Strategies for Post WTO Era. Unpublished Ph.D Thesis, UAS, Bangalore.

Mallick, Sushantakumar, 1996, "Causality between Exports and Economic Growth in India: Evidence from Co-integration based Error Correction Models" Indian Journal of Economics, Vol.76, No.302, pp307-320.

Mamatha, B.G., 1995, "Export Trade of Selected Spices in India: An Economic Analysis". An unpublished M.Sc. (Agri) Thesis, submitted to University of Agricultural Sciences, Bsangalore.

Mammen. T.A. 1983. Joint ventures in fisheries. The Indian Experience. Fisheries Development in India – some aspects of policy management. Arbor science Publishers inc., Michigan 48106:pp 293-312.

Mani,K.P., and P.J. Chacko, 1996, "Trends in the Export of Cardamom: Problems and Prospects", Agricultural Situation in India, Vol.LIII(8): pp.547-548.

Mardle, S., Pascoe, S., Tamiz, M. and Jones, D., 1999. “Resource Allocation in the North Sea: An Application of Multi-Objective Programming”. Annals of Operations Research, 94:321-324.

Mardle, S.J., Pascoea, S and M. Tamizb, 2000. “An Investigation of Genetic Algorithms for the Optimization of Multi-Objective Fisheries Bioeconomic Models”. International Transactions in Operational Research, 7: 33-49.

Massel, B.F., 1970. “Export Instability and Economic Structure”. American Economic Review, 60(4): 618-630.

Maya. R. J, Shyam S. Salim, John Josephraj, S. and G. Venkateshwarlu, 2001, "Quantitative Restrictions and Indian Fisheries Sector - Facts and Fears", Proceedings of the National Conference on Fisheries Economics Research and Education in India: An Overview, Edited by Shyam S Salim,R.S.Biradar and S.N.Ojha, held at CIFE, Mumbai, pp 85-93.

Mc Garvey, R., 2003. “Demand Side Fishery Management: Integrating Two Forms of Input Control”. Marine Policy, 27(3):207-218.

McKenzie, Lionel W. 1954. "Specialization and Efficiency in World Production". *The Review of Economic Studies* 21 (3): 165–180.

Mithra, G.N., 1970. “Section II, Fisheries Resources of the Indian Ocean and Economics of Operation of Fishing Vessels from the Indian Coast”. Symposium on Development of Deep Sea Fishing Industry, (New Delhi: Ministry of Food and Agriculture, Community Development and Cooperation, Government of India), pp.80-98.

Mohan Joseph Modayil, R.Sathaidhas and G.Gopakumar, 2006. “Marine Farming-Country Analysis: India”. Central Marine Fisheries Research Institute, Ministry of Agriculture, Government of India.

Mohanty, Smarendu , ; Darnell B Smith,; E Wesley, F Peterson , and William H Meyers, 1996, "Law of One Price in International Commodity, Markets : A Fractional Co integration Analysis", Working paper 96 Center for Agricultural and Rural Development, Iowa State University, Iowa.

Morgan, G.R. 1997. “Individual Quota Management in Fisheries: Methodologies in Determining Catch Quotas and Initial Quota Allocation”. FAO Fisheries Technical Paper No. 371. FAO, Rome, p.41.

MPEDA, Marine Product Exports Review, 1991-99, Marine Products Export Development Authority, Cochin.

MPEDA, 2005. Statistics of Marine Products Exports, Marine Products Export Development Authority, Ministry of Commerce and Industry, Government of India, pp.1-29.

MPEDA, 2006, MPEDA Newsletter. Marine Products Export Development Authority, Ministry of Commerce and Industry, Government of India.

MPEDA, 2008, Marine Product Exports Review, Marine Products Export Development Authority, Cochin.

MPEDA, 2010-11, Marine Product Exports Review, Marine Products Export Development Authority, Cochin.

Mruthyunjaya, 2001. “WTO Agreement and Fishery Sector:Impact and Concerns Beyond Doha", Brainstorming on WTO and Fisheries, Central Institute of Fisheries Education, Mumbai, 7-8 December,2001.

Mukundan,M.K., 2002, "An Approach to Total Quality Management in Seafood Industry". India International Seafood Show Souvenir., pp 13-15, 7-9 February 2002.

Murawski, S.A., 2007. “Ten Myths Concerning Ecosystem Approaches to Marine Resource Management”. Marine Policy, 31(6):681-690.

Muthu, M.S. 1988. Some thoughts on conservation of marine prawn resources I India. symposium on Tropical marine living resources. Abstracts, 198.

Nagaraja, H., 1997, "Export Performance and Prospects of Selected Fruits, Vegetables and Processed Fruits in India; An Economic Analysis". An unpublished Ph.D. Thesis, submitted to University of Agricultural Sciences, Bangalore.

Naik, G and V.P.S. Arora 1986. "Marketing pattern and pricing efficiency of Indian Aracanut marketing". *Indian Journal of Agricultural Economics. 41(2) : 171-182.*

Naik, G. and T. Chaturvedi., 2002, "Competitiveness of Indian Agriculture", Mimeo, Indian Institute of Management, Ahmedabad.

Nair, N.B., 1989. Summary Report of the Expert Committee on Marine Fishery Resources Management in Kerala, Submitted to Government of Kerala, Thiruvanthapuram.ri District, Andhra Pradesh Ind. Jour. Agrol. Mktg. (conf. Spl.) 19(2) : 19-29.

Narayana S.S., M. Panda, A.G. Kumar., "Agricultural Trade Liberalisation: Growth Welfare and Large Country Effects". Agricultural Economics, 17(1): 1-20, 1997.

Narayanakumar, R. and R. Sathiadhas, 2005, An Economic Analysis of price behavior and efficiency of marine fish marketing systems in East Godav.

Narayanakumar, R and Sathiadhas, R, 2006, Domestic Fish marketing opportunities for marine fisheries sector in India. National Workshop on Post harvest Methods and Domestic Fish Marketing Opportunities. Pp. 59-67.

Nayyar, Deepal and Abhijit Sen., 1994, "International Trade and Agricultural Sector in India", In: G.S.Bhalla (Ed.)., Economic Liberalization and Indian Agriculture, Institute for Studies in Industrial Development, New Delhi.

NCAP, 2004. “Strategies and Options for Increasing and Sustaining Fisheries and Aquaculture Production to Benefit Poor Households in India”. In N. Mruthyunjaya (Ed.), ICAR-ICLARM Project Report.

Nguyen Viet Thanh, 2006. Bioeconomic Analysis of the Shrimp Trawl Fishery in Tonkin Gulf, Vietnam. M.Sc. Thesis, University of Tromso, Norway pp.3-33.

Nilanjan Banik, 1998, “Indo-Sri Lankan Trade with Special Reference to India Exports”, Asian Economic Review, 30(2): 186-201.

Nurul Islam, 1990, “Horticultural Export of Developing Countries: Past Performance, Future Prospects and Policy Issues”, Report No. 80 of International Food Policy Research Institute.

Ola Flatten, 2004. “Fishing Vessel Profitability and Local Economic Link Obligations - The Case of Norwegian Trawlers”. Marine Policy, 28(6):451-457.

Onafowora, O.A. and O. Owoye., 1998, "Can Trade Liberalization Stimulate Economic Growth in Africa", World Development, 26(3): 497-506.

Pal, Suresh and A.S Sirohi, 1989, Instability in Indian Crop Production: Its Magnitude and Sources", Artha Vijnana, Vol.31,No.3,pp241-256.

Panda, M. and J. Quizon., 1998,"Growth and Distribution under Trade Liberalisation in India". Mimeo, Indira Gandhi Institute of Development Resaerch, Mumbai.

Panikkar, K.K.P and R. Sathiadhas 1985. Fishermen, share in consumer’s one rupee-a case study proceeding of the symposium on Harvest and post harvest technology of fish. Society of fisheries Technologists, Cochin, India 1985, pp.704-707.

Panikkar, K.K.P., K.S.Scariah and Joseph Andrews, 1994. “Structural Change in the Traditional Fishery of Kerala and Its Socio-Economic Implications”. In Shahul Hameed, M and B.Madhusoodana Kurup (Eds.),Technological Advancements in Fisheries, pp.529-539.

Papageorgiou, D., A.M. Choksi and M. Michaely., 1991, "Liberalizing Foreign Trade in Developing Countries the Lessons of Experience", The World Bank, Vol. 7.

Parekh, J. K and Parekh, K. S., 1997. Environmental Accounting and Valuation Vol.1-A Premier for Developing Countries. Economic and Social Commission for Asia and Pacific Region, New York.

Parekh, K, Sjikha Jha and P.V.Srinivasan., 1993, "Economic Reforms and Agricultural Policy", Economic and Political Weekly, 28(29-30):17-24.

Parry, J.H. 1967, "Transport and Trade Routes," in E.E. Rich and C.H. Wilson, eds, *The Cambridge Economic History of Europe*, Vol. IV, *The Economy of Expanding Europe in the Sixteenth and Seventeenth Centuries*, Cambridge: Cambridge University Press, pp. 155-219.

Pascoe, S., Grebovl, D., Kirley, J and Lindebo, E., 2004. "Measuring and Appraising Capacity in Fisheries: Framework, Analytical Tools and Data Aggregation". FAO Fisheries Circular. No. 994. FAO, Rome, p.39.

Patil, H,N., Jadhav,S,T. and K, V, Deshmukh, 2000, "Indian Marine Products Scenario", Proceedings of the National Conference on Fisheries Economics extension and Management, Edited by Sathiadhas, R and K Venakataeswaran, held at CIFE, Mumbai, pp 124-130.

Pawiro, Sudari,., 2000, "Issues affecting the Import of Fishery Products into China"., INFOFISH International, Vol. 7(9) No.4, pp. 22-26, June, 2000.

Pillai, N, Vijayamohanan., 2002, "A Markov Chain Model of Inflation in India", Indian Economic Review,Vol.37,No.1, pp 91-116.

Porter, M.E., 1990, "The Competitive Advantage of Nations", The Fress Press, Macmillan, Inc., New York.

Prabirjit Sarkar, 1997, "Foreign Grade and Local Exchange Rate Behaviour,. The Economic and Political Weekly, 32(20) : 1133-1139.

Pradhan, H.K., 1988. “Exchange Rate Variability of the Rupee and Indian Exports”. Margin, 20(2):28-47.

Prasad, K, A, A, R., 1991, "Role of Marine Products in India's Export Trade," Seafood Export Journal, No, pp 31-32.

Price, Jacob M. 1961, "Multilateralism and/or Bilateralism: the Settlement of British Trade Balances with 'the North', *c*.1700," *Economic History Review* (2nd series) vol. 14, no. 2 (December), pp. 254-74.

Pursell, G. and A. Gupta., 1998, "Trade- Policies and Incentives in Indian Agriculture' – Methodology, Background Statistics and Protection and Incentive Indicators, 1965–95", Background Paper No. 1, Sugar and Sugarcane, Planning and Research Working Paper, No. 1172. The World Bank.

Qasim, S.Z. 1972. Production of living matter in the sea, Mahasagar, 5(2):59-69.

Ragnar, A and Placenti, V., 1997. “Bio-Economic Fisheries Computer Models: An Overview of Existing Models”. Report from the Project: FAIR-CT95-0561 Multi-Species Bio-Economic Models. IREPA, Salerno, Italy.

Rajagopalan, V., 1983. “Deceleration of Rates of Agricultural Growth in Tamil Nadu-Trends and Explanatory Factors”. Indian Journal of Agricultural Economics, 38(3): 568-584.

Rajali, H.B., 2006. The Bioeconomics sof the Tiger Shrimp Brood stock Fishery of Kuala Baram, Sarawak. Fisheries Research Institute Sarawak Branch Kuching, Sarawak.

Rajaram, A.,1992, "Tariff and Tax Reform-Do World Bank Recommendations Integrade Revenue and Protection Objectives?". World Bank Policy Research Working Paper No. 1018.

Rajasenan, D and Sankaranarayanan, K.C., 1990. “Cost Benefit Analysis of Mechanised Fishing: A Case Study”. Margin, 21(3):80-91.

Rama Mohan Rao.D and D Vijaya Prakash, 1999, "Indian Seafood Exports", INFOFISH International.

Rao, Hanumantha and K Subbarao, 1976, " Marketing of Rice in India", Indian Journal of Agricultural Economics, April-June, pp. 87-96.

Rao. P.S. 1983. Fishery Economics and management in India. Pioneer publishers and distributors, pp.1-353

Rao, Hanumantha, C.H., 1995, "Liberalization of Agriculture in India: Some Major Issues", Indian Journal of Agricultural Economics, Vol.50(3): pp. 468-472.

Rao, D, Rama Mohana and Vijaya Prakas,D., 1999, "India Seafood Export, " Seafood Export Journal, No, pp 19-25.

Rao, C.H.H., 2001, "Why Farm Protection Won't Work any more", The Economic Times, 16 June, 2001.

Rath,N., 1980. "A Note on Agricultural Production in India During 1955-78". Indian Journal of Agricultural Economics, 35(2):94-103.

Rath, N., 1996, "Poverty in India Revisited", Indian Journal of Agricultural Economics, Vol.51(1&2): pp. 76-108.

Raveendaran, N. and P.K.Aiyasamy, 1982, "An Analysis of Export Growth and Export Prices of Turmeric in India", Indian Journal of Agricultural Economics, Vol.37(3): pp 323 -325.

Ravishankar,T Krishnan. M and.B.M Sharma, 1995, "Export performance and Plan allocation: Review of fishery sector in India", Agriculture situation in India.

Reddy Ramesha, B., 1997, "Global Competitiveness of Sunflower in Karnataka". An unpublished M.Sc. (Agri) Thesis, submitted to University of Agricultural Sciences, Bangalore.

Retna,R.V and K.B. Narayanan, 1992, “Trade Experience of Indian Agriculture: Behavior of Net Export, Supply Functions for Dominant Commodities”, Indian Journal of Agricultural Economics, 47(1), 48-61.

Rijnsdorp, A.D.,Van Mourik, Broekman, P.L and Visser, E.G., 2000. “Competitive Interactions Among Beam Trawlers Exploiting Local Patches of Flatfish in the North Sea”. ICES Journal of Marine Science, 57:894-904.

Rosaleena Shanthi, P.S., 1988. An Economic Analysis of Production and Export of Squids and Cuttlefishes from India. Unpublishesd M.Sc.(Ag) Thesis, Department of Agricultural Economics, Tamil Nadu Agricultural University, Coimbatore, p.28.

Royce, W.F., 1972. Introduction to Fisheries Science. Academic Press, London, p.232.

Sakthivel, M., 1998, "Strategies to Incresase Export of Fish and Fish Products from India",Current Science,Vol.76,No;10.

Sakthivel, M.,2000, "Aquaculture to have Bright Prospects in the Next Millennium"., Aqua International.Vol. 7(9) No.4,2000(ADD).

Salvatore, D. and T. Hatcher., 1991, "Inward and Outward Oriented Trade Strategies", Journal of Development Studies, 27(3): 7-25.

Samuelson, Paul 2001. "A Ricardo-Sraffa Paradigm Comparing the Gains from Trade in Inputs and Finished Goods". *Journal of Economic Literature* 39 (4): 1204–1214.

Sarvides, A., 1984, "Export Instability and Economic Growth: Some New Evidence", Economic Development and Cultural Change, 32(2): 607–614.

Sathiadhas R, and K.K.P Panicker 1988, A study on marketing structure and price behavior of marine fish in Tamil Nadu, Sea Food Export Journal, 20(12) : 5-29.

Sathiadhas. R. and K.K.P. Panikkar, 1988. Socio economics of small scale fishermen with emphasis costs and earnings of traditional fishing units along Trivandrum coast, Kerala- a case study. Sea food Export Journal, 20(1):21-36.

Sathiadhas, R. and Femeena Hassan, 2002, "Product Diversification and Promotion of Value Added Seafood Products" Seafood Export Journal, No. pp 27-48.

Sathiadhas, R. and Narayan Kumar.R, 2002, "Export of Fin Fish-Impact on Domestic Trade and Production" Seafood Export Journal, No. pp 442-450.

Sathiadhas R, 2009, Inter Sectoral disparity and marginalization in marine fisheries in India. Asian Fisheries Science 22 : 773 – 786.

Sathiadhas R. and Sangeetha K, Prathap, 2009, Employment Scenario and labour migrations in marine fisheries. Asian Fisheries Science 22: 713 – 727.

Sathiadhas R., Narayanakumar R, and Aswathy, 2013 Marine Fish Marketing in India, CMFRI, pp - 1-276.

Saxena,B.S. 1970 Price behaviour of Indian frozen shrimps in U.S. market. Seafood Export journal, 2 (10). 17-28.

Saxena,B.S. 1983. Uses of economic tools in formulation and executing, Indian fishery policy. Fisheries development in India-some aspects of policy management, Concept publishing company, new Delhi, pp.1-220.

Scandizzo, P.L. and D. Diakosawas., 1987, "Instability in the Terms of Trade of Primary Commodities, 1900–1982", Rome, Food and Agriculture Organization.

Scott, 1979. "Development of Economic Theory on Fisheries Regulation". Journal of the Fisheries Research Board of Canada, 36: 725-41.

Seijo, J.C. 1993. "Individual transferable grounds in a community managed artisanal fishery". Marine Resource Economics, 8:78–81.

Seijo, J.C., Defeo, O. and Salas, S., 1998. Fisheries Bioeconomics: Theory, Modeling and Management. FAO Fisheries Technical Paper No. 368. FAO, Rome, p.108.

Sekar, C., S.Senthilnathan and G.Swaminathan, 1996. “Status of Marine Fish Landings in Tamilndu”. Agricultural Marketing, 39(1):35-37.

Senthilathiban, R., K.Venkataramanujam, P.Selvaraj and G.Sanjeevaraj, 1998. “Determinants of Costs and Profit in Mechanised Fishing in Tuticorin Fishing Harbour, Tamil Nadu”. North American Journal of Fisheries Management, 18 : 422-431.

Shambu Dayal 1973. Projections for demand of fish in India. Seafood Export Journal 5 (4) : 13-22

Sharath, B.T., 1993, “An Analysis of India’s Export Trade in Cardamom”. An unpublished M.Sc. (Agri) Thesis, submitted to University of Agricultural Sciences, Bangalore.

Sharma, R.P., Verma, S.A., Kumar, A.T., Pradhan, S. (Eds.), 2006. Handbook of Fisheries and Aquaculture. Indian Council of Agricultural Research, New Delhi (India), ICAR, pp.85-134.

Shiozawa, Y. 2007. "A New Construction of Ricardian Trade Theory: A Many-country, Many-commodity with Intermediate Goods and Choice of Techniques". *Evolutionary and Institutional Economics Review* 3 (2): 141–187.

Shupinng, Chen., 2001, "Chinas Access to the WTO-Possible Impacts on the Fishery Industry"., INFOFISH International, Vol. 7(9) No.4, pp 14-19,May, 2001.

Shyam S.Salim and Mukunda Goswami, 2001, "Opportunities and Policy Implication for Fisheries Development in India", Proceedings of the National Conference on Fisheries Economics Research and Education in India: An Overview, Edited by Shyam S Salim,R.S.Biradar and S.N.Ojha, held at CIFE, Mumbai, pp 85-93.

Shyam.S.Salim,2002 "International Trade and Export", Fisheries Economics and Marketing –An Introduction, pp.255-266.

Siegel,A, Robert., 2001, "US Seafood Exports and the Exchange Rate", INFOFISH Marketing Digest No. 4, pp 25-29.

SIFFS(South Indian Federation of Fishermen Societies), 1992. A Census of the Artisanal Marine Fishing Fleet of Kerala State. SIFFS Publications, Thiruvananthapuram.

Silvapulle,P and S.Jayasuriya, 1994, "Testing for Philliphines Rice Market Integration: A Multiple Cointegration Approach", Journal of Agricultural Economics, 45(3), 369-380.

Singal, K.C., and Narendar Kaur, 1986. "Destination- wise Export Instability in India", Margin, 18(3):61-70.

Singh, B., R.G.Upadyay and S.P. Upadyay, 1987. "Economic Feasibility of Different Methods of Marine Fishing at Nizamapatanam". Sea Food Export Journal, 19(6): 12.

Singh, G. and J.L. Kaul, 1982. "Performance of Punjab Agriculture since Green Revolution-A district-wise Analysis". Agricultural Situation in India, 37(11):699-704.

Singh. A and V.K. Gupta 1983. Marketing of marine fish: some policy issues fisheries development India- Some aspects of policy management. Concept publishing company New Delhi, pp. 101-138.

Sinharoy, S. and S.R. Nair, 1994, "International Trade and Pepper Price Variations: A Cointegration Approach", Indian Journal of Agricultural Economics, 49(3), 417-425.

Smith, E.M.J., 2001, "Is the Export-Led Growth Hypothesis Valid for Developing Countries? A Case Study of Costa Rica", Policy issues in International Trade and Commodities, Study Series No. 7, UNCTAD, Geneva.

Smith, George H. 2008. "Mercantilism". In Hamowy, Ronald. The Encyclopedia of Libertarianism. Thousand Oaks, CA: SAGE; Cato Institute. pp. 326–8. ISBN 978-1-4129-6580-4.

Smith, Vernon L. 1998. "The Two Faces of Adam Smith". *Southern Economic Journal* 65 (1): 2–19.

Sparks,A.l. and R.W.Ward, 1983, "A Simultaneous Econometric Model of World Fresh Vegetable Trade, 1962-82: An Application of Non Linear Simultaneous Equations", The Journal of Agricultural Economics Research, 44(2):15-26.

Sparre, P and Siebren C. Venema, 1998. "Introduction to Tropical Fish Stock Assessment - Part 1: Manual". FAO Fisheries Technical Paper 306/1 Rev. 2. Food and Agriculture Organization of the United Nations, Rome.

Sreenivasa Murthy, D. and Subramaniam, K.V., 1999, "Structural Change and Instability in Onion Exports". Agricultural Economics Research Review, 12(2) : 118-128.

Srinivasa,M,V and Jalajakshi,C.K,. 1994, "Growth, Demand Elasticities and Competitiveness of Indian Shrimp Exports", Export Potential of Indian Agriculture, pp. 371-381.

Srivastava. U.K. and G.R. Kulkarni, 1985. Systems approach to marine foods industry. A system frame work of the marine foods industry in India. Concept publishing Company, New Delhi, pp.3-44.

Srivastava, R.K. and Ahmed, T., 1986, "Some Recent Trends in India's Exports-Fact or Fantasy". Indian Journal of Marketing, 16(6):3-8.

Stewart, Frances 1989, "Recent Theories of International Trade: Some Implications for the South", in Kierzkowski, Henryk, *Monopolistic Competition and International Trade*, Oxford: Clarendon Press, pp. 84–108, ISBN 0-19-828726-7.

Subba Rao, 1990, "Exports of Fish and Fishery Products from India:Trends and Prospects.The Industrial Fisheries Association Journal 90.7: pp.81-86.

Subbarao,N., 2000, "Indias Foreign Trade in Seafood sin the Third Millenium-Challenges and Opportunities", Proceedings of the National Conference on Fisheries Economics extension and Management, Edited by Sathiadhas, R and K Venakataeswaran, held at CIFE, Mumbai, pp 283-297.

Subramanian, S., 1993, "Agricultural Trade Liberalisation", (Paris: Organisation of Economic Co-operation and Development).

Sudarsan, D., John, M.E. and Somvanshi, V.S., 1990. "Marine Fishery Potential in the Indian Exclusive Economic Zone - An Update". Bulletin of Fishery Survey of India, 20: 1-27.

Sulthan, M and P.I.Chako, 1967. "Survey of Fishery Grounds in the Inshore Waters of Bey of Bengal near Madras During 1965-66". Madras Journal of Fisheries, (IV):21.

Suratha Nayak., 2000, "Trade Liberalization and India's Agricultural Export", Third Concept, 14(165): 39 – 43.

Tadasse Mekonen, 1992, "The Ethiopian Economy : Structure, Problems and Policy Issues", Addis Ababa University Printing Press, Addis Ababa.

Taylor,E,L, 1996, "Dynamic Relationship Between US and Thai Rice Prices", Agricultural Economics, 14(2), 123-133.

Thomas, V. and J. Nash., 1991, "Best Practices in Trade Policy Reform", (Oxford : Oxford University Press).

Thompson S.J. 1995. Double Food production and consumption in the world-Economy In MC Michael P(ed) food and Agrarian orders in the world economy pralger, Londom.

Trefler, D. 1995. "The Case of Missing Trade and Other HOV Mysteries". *The American Economic Review* 85 (5): 1029–1046.

Tweeten, L., 1992, “Agricultural Trade - Principles and Policies” London: IT Publications.

Tyers, R. and K. Anderson., 1986, 'Liberalising OECD Agricultural Policies in the Uruguay Round: Effects on Trade and Welfare', The Institute for International Economic Studies, Stockholm.

Umapathi, T.S., 1994, “An Analysis of Supply and Demand of Gravity Characteristics of Cotton in Davanagere Market”. An Unpublished M.Sc. (Agri) Thesis*,* submitted to University of Agricultural Sciences, Bangalore.

UNCTAD WIDER, 1990, "Agricultural Trade Liberalization in the Uruguay Round: Implications for Developing Countries", United Nations, New York.

United States National Marine Fisheries Service. Definition of Fisheries Technical Terms (www.nmfs.noaa.gov website).

Unnithan, G. R., Nikhitha Gopal, V. Radhakrishanan Nair and M. Nasser, 2005. “Fuel Consumption Pattern by the Mechanised Fishing Sector in Kerala”. Fishery Technology, 42(1): 77-82.

Van den Berg, H. and J.R. Schmidt., 1994, "Foreign Trade and Economic Growth: Time series evidence from Latin America", Journal of International Trade and Economic Development, 3(3): 121-130.

Vani,A and J. Krishnaiah, 1998, “Export Potential of Chillies in Guntur district of Andhra Pradesh”, Bihar Journal of Agricultural Marketing, 6(3), 340-346.

Veena, U.M., 1992, “An Econometric Analysis of Indian Coffee Exports”. An unpublished M.Sc. (Agri) Thesis*,* submitted to University of Agricultural Sciences, Bangalore.

Venkateshwarlu, G and Shyam S. Salim, 2001, "Possible impact of WTO on Indian Fisheries" Proceedings of the National Conference on Fisheries Economics Research and Education in India: An Overview, Edited by Shyam.S. Salim, R.S. Biradar and S. N. Ojha, held at CIFE, Mumbai, pp 85-93.

Vladimir Baum 1973, Editorial, Ocean Management 1(1) : 1-3, March 1973.

Vito Blmo, Wade L. Giriffin and John P. Nichols 1978, Catch effects and price trends in the Gulf of Mexico shrimp fisheries : Implementations of Mexico's extended jurisdiction, MFR paper 1322, Marine Fisheries Review, 40(8).

Vivekanandan, E., 2006. CMFRI Newsletter No.112. Central Marine Fisheries Research Institute, Kochi, p.4.

Vyas, M, 1999,"Export of Indian Spices: An Analysis", Monthly Public Opinion Surveys, Vol.44 (7): pp. 7-12.

Whalley, J., 1991, "Recent Trade Liberalisation in Developing countries: What is Behind it and Where. Is it Headed? "in David Green away *et al.,* (edns.), Global Protection, London, 225-252.

White and Carvalho, 1997, " Poverty Reduction Handbook", World Bank.

William, T. Burke 1983. Extended fisheries jurisdiction and the new law of the sea Global fisheries perspectives for the 1980s. Springer-Veriag, New York, pp 7-49.

Wilson, Charles 1949, "Treasure and Trade Balances: The Mercantilist Problem," *Economic History Review* (2nd series) vol. 2, no. 2 (May), pp. 152-61.

World Bank., 1987, The World Development Report, Oxford University Press.

www.dahd.nic.in (Department of Animal Husbandry, Dairying and Fisheries, Govt. of India)

www.fao.org

www.mpeda.com

Yogamoorthi, A. and Sivashankar, A., 1994, "India Seafood Export and its Future Prospects by 2000 AD, " Seafood Export Journal, No, pp 19-33.

…..ജൽ…..

Cochin University of Science and Technology
Department of Applied Economics
Schedule A: Operating cost per trip
Craft : Mechanized/Motorized/Non-mechanized

Landing Centre : .... Distt. .... State: ....   Type of fishing : SDF/MDF (2-5)/MDF (6 and above)

In case of motorized and non-mechanized : Use separate sheets for each craft gear combination   p   Page 1 of 3

Particulars	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10
OAL (ft)										
Engine Hp										
Crew size										
Fuel (K)Q										
Fuel(D)Q										
Fuel(K)V										
Fuel(D)V										
Starter oils										
Crew wages										
Crew bata										
Salary of drivers										
Food										
Ice										
Jetty rent										
Salt										
Auction charges										
Water charges										
Others (Specify) (a)										
(b)										
Total operating cost										
Gross Rev.										
Catch/trip										
Net operating income										

Cochin University of Science and Technology

Department of Applied Economics

Schedule B : Revenue per trip (Qty: kg; Value in Rs.)

Craft : Mechanized/Motorized/Non-mechanized

In case of motorized and non-mechanized : Use separate sheets for each craft gear combination **Page 2 of 3**

Particulars	Unit 1		Unit 2		Unit 3		Unit 4		Unit 5		Unit 6		Unit 7		Unit 8		Unit 9		Unit 10	
	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val
1.																				
2.																				
3.																				
4.																				
5.																				
6.																				
7.																				
8.																				
9.																				
10.																				
11.																				
12.																				
13.																				
14.																				
15.																				
16.																				
17.																				
18.																				
19.																				
20.																				
21.																				
22.																				

Socio Economic Evaluation and Technology Transfer Division

Cochin University of Science and Technology

Department of Applied Economics

Schedule B : Revenue per trip (Qty: kg; Value in Rs.)

Craft : Mechanized/Motorized/Non-mechanized

In case of motorized and non-mechanized : Use separate sheets for each craft gear combination **Page 3 of 3**

Particulars	Unit 1		Unit 2		Unit 3		Unit 4		Unit 5		Unit 6		Unit 7		Unit 8		Unit 9		Unit 10	
	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val
1.																				
2.																				
3.																				
4.																				
5.																				
6.																				
7.																				
8.																				
9.																				
10.																				
11.																				
12.																				
13.																				
14.																				
15.																				
16.																				
17.																				
18.																				
19.																				
20.																				
21.																				
22.																				

Appendix - II

Cochin University of Science and Technology
Department of Applied Economics
Schedule B : Price Behaviour of Marine Fish Varieties

Name of the landing Centre :
Name of the wholesale or retail market :
Distance from the landing centre :
Time of Market Arrival : Time of disposal :

Prince per kg of the fish varieties traded (Please give the price range from Min. to Max.)

Sl. No.	Varieties	L.C.	WS Market	Retail Market -1	Retail Market -2	Price of dried fish*
1.	Sharks					
2.	Rays					
3.	Eels					
4.	Catfish					
5.	Wolf-herrings					
6.	Oil sardines					
7.	Anchovies					
8.	Other clupoids					
9.	Lizard fishes					
10.	Half and full beaks					
11.	Rock cods					
12.	Snappers					
13.	Threadfin breams					
14.	Goat fish					
15.	Threadfins					
16.	Crokers					
17.	Ribbon fish					
18.	Horse mackerels					
19.	Leather jackets					
20.	Other carangids					
21.	Silver bellies					
22.	Big jawed jumper					

23.	Pomfrets (F.niger)					
24.	Pomfrets (p.argen)					
25.	Mackerel					
26.	Seerfish					
27.	Tunnies					
28.	Barracudas					
29.	Mullets					
30.	Flat fishes					
31.	Peneaid prawn (Big)					
32.	Peneaid-small (local)					
33.	Non penaied					
34.	Crabs-sanguinolentus					
35.	Crabs-pelagicus					
36.	Cephalopods-Sepia					
37.	Psenus indicus					
38.	Other Cephalopods					
39.	Others					
40.	Others					

Note : * For whatever species available in the market (both wholesale and retail)

Date : Signature of the enumerator

Place :