POST-HARVEST FISHERIES OVERVIEW

EAST COAST OF INDIA

DFID

INFORMATION BULLETIN – 1

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Information Bulletin 1

POST-HARVEST FISHERIES OVERVIEW OF THE EAST COAST OF INDIA

Post-Harvest Fisheries Project,
Department for International Development
Chennai, India

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This "Overview study" of post-harvest fisheries on the east coast of India was produced by the Department For International Development's Bay of Bengal Post-Harvest Fisheries Project (DFID-PHFP). It was prepared by R J Cambell and K M George of Integrated Marine Management Ltd., UK and updated by the project's partner organisations and local staff.

This Overview study could serve as a planning tool and a source of reference for organisations active in post-harvest fisheries who seek interventions to solve specific problems. The Overview will be useful to policy makers, government and non-governmental organisations, the private sector and other agencies, informing them of the constraints and options within this sector.

This study of post-harvest fisheries on the east coast of India supercedes the previous Information Bulletins 1 to 5.

The project works with small-scale artisanal fishing communities to reduce post-harvest losses of fish; develop low-cost improvements in handling, processing and marketing; and provide technical support, advice and training to government and non-governmental organisations, fisherfolk associations and women's groups.

The project is funded by the Government of the United Kingdom and covers three countries within the Bay of Bengal region — India, Bangladesh and Sri Lanka.

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ABBREVIATIONS AND ACRONYMS

APFC	-	Andhra Pradesh Fisheries Corporation
AFCOF	-	Andhra Pradesh Fishermen Co-operatives Federation
BFFDA	-	Brackishwater Fisheries Development Agency
BLC	-	Beachlanding craft
BOBP	-	Bay of Bengal Programme
CIBA	-	Central Institute of Brackishwater Aquaculture
CICEF	-	Central Institute of Coastal Engineering for Fisheries
CICFRI	-	Central Inland Capture Fisheries Research Institute
CIFA	-	Central Institute of Freshwater Aquaculture
CIFE	-	Central Institute of Fisheries Education
CIFNET	-	Central Institute of Fisheries Nautical and Engineering Training
CIFT	-	Central Institute of Fisheries Technology
CMFRI	-	Central Marine Fisheries Research Institute
CPUE	-	Catch Per Unit Effort
DFID	-	Department For International Development. Formerly, ODA (Overseas Development Administration, UK)
DOF	-	Department of Fisheries
EIA	-	Export Inspection Agency
EPCG	-	Export Promotion Capital Goods
EU	-	European Union
FAD	-	Fish Attracting Device
FFDA	-	Fish Farmers Development Agency
FSI	-	Fishery Survey of India
GDP	-	gross domestic product
ha	-	hectares
IBE	-	inboard engine
ICAR	-	Indian Council for Agricultural Research
IFP	-	Integrated Fisheries Project
IIFT	-	Indian Institute of Foreign Trade
IIP	-	Indian Institute of Packaging
IMFDP	-	Integrated Marine Fisheries Development Project
IPQC	-	In-process quality control
ITDG	-	Intermediate Technology Development Group
KDFSF	-	Kanyakumari District Fishermen Sangams Federation
KSS	-	Kottar Social Services
MPEDA	-	Marine Products Export Development Authority
mt	-	metric tonnes
NABARD	-	National Bank for Agriculture and Rural Development
NBFGR	-	National Bureau of Fish Genetic Resources
NCDC	-	National Co-operative Development Corporation
NFF	-	National Fishermen's Forum
NGO	-	Non-governmental organisation
NRCCWF	-	National Research Centre on Coldwater Fisheries
NRI	-	Natural Resources Institute (UK)
PIB	-	Permanent ice-box
Rs	-	Indian Rupees
TNFDC	-	Tamil Nadu Fisheries Development Corporation
UNDP	-	United Nations Development Programme

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1. INTRODUCTION AND REPORT STRUCTURE

1.1 INTRODUCTION

1.1.1 Background to Project

The DFID Post-Harvest Fisheries Project is funded by the British Government's Department for International Development, and is based in Chennai, with a satellite office in Kakinada, Andhra Pradesh. The project carries out a range of activities addressing the needs of a wide target group amongst the rural coastal poor. It also supports a general raising of awareness of post-harvest needs in the region and of promoting increased regional co-operation and communication. The focus is on identifying solutions to post-harvest problems and on assisting local institutions, such as fishermen's organisations, to overcome these problems. Three countries within the Bay of Bengal region participate in this project: Bangladesh, India and Sri Lanka, but the majority of funding is focussed on the four eastern coastal states of India. The principal objectives of the project are :

- To enhance the incomes of artisanal fishing communities and petty fish traders in India, Bangladesh and Sri Lanka;
- To identify and develop the potential for increasing the diversity of fish products marketed by these communities; and
- To strengthen the ability of agencies working in the fisheries sector and of fisherfolk associations to replicate and secure sustainable benefits from project activities.

The project focusses on working with small-scale fishing communities in the marine artisanal fisheries sector. These communities traditionally suffer from natural disasters, environmental degradation, over-fishing and population pressures. Climatic changes and rising sea levels associated with global warming will also lead to an increasing instability in the coastal areas.

Over the years, fishery capture and production-oriented practices have placed an enormous strain on the common pool of resources in the sea. Therefore, it is essential that these resources are sustainably managed and the usage of such resources is maximised. The project has pursued this aim by improving the efficiency of post-harvest handling, processing and marketing of sustainably produced products. However, the project has always taken a much broader approach in working with coastal communities by addressing issues that affect their lives and has been working towards sustainable livelihood strategies.

The project has always followed a process approach by developing, demonstrating and promoting new techniques, technologies or ideas to help improve the conditions of small-scale fisherfolk communities. The project has limited its field work to the areas where post-harvest were considered particular priorities by the member states at that time, that is in India, Bangladesh and Sri Lanka. In India only the east coast states were involved.

The approach adopted by the project has been flexible, reactive and catalytic. Flexible in the sense that it was very openly defined at the design stage, allowing the project to adopt a process approach to activity planning. The project had the scope to identify, design and appraise a series of sub-projects within a broad project framework. *Reactive* in that its function was to respond to the needs of coastal communities, or to the needs expressed by other agencies as and when post-harvest problems became apparent. *Catalytic* in that the project aimed to find solutions to problems, develop methodologies for resolving them, and then to mobilise local institutions to implement and disseminate ideas. The project then took the essential lessons and methodologies from the localised situation and made them regionally available. In that way the benefits from project activities could reach a wider audience across the region.

The project started in 1987. and is currently in its Third Phase, which ends 3 1 March 1998. The project operated on the principle that it was at best a temporary mechanism to raise awareness on post-harvest fisheries: but ultimately local institutions would have to take up the project's role.

The project has operated over a large geographical area in trying to address a wide diversity of development problems. An important element of the project has been the strong partnerships formed between the project, other donor projects. government departments and non-governmental organisations in the three countries. Government staff have played a vital role in identifying key problem areas to be addressed and in facilitating solutions.

The partnerships with NGOs have also been crucial to the project's success. They have provided a vital mechanism for close interaction with the communities, especially those NGOs that have their origins in the fishing communities themselves. The project has placed considerable emphasis in recent years on forging strong partnerships between NGOs

and government. This is important for the sustainability of work with coastal communities once the project closes.

As part of the effort in the post-harvest sub-sector, an Overview study has been completed with the following objectives:

- To serve as a source of reference to enable interventions concerning key problems in the post-harvest sub-sector
- To serve as a planning tool to other organisations active in post-harvest fisheries in the region.

The Overview study does not limit its concerns to areas within the specific mandate of the project. This has enabled most post-harvest issues to be addressed, and has allowed the project to support a wider process of development through other institutions within the post-harvest sub-sector.

1.1.2 The Scope of the Overview

The Overview attempts as wide a perspective of the sector as possible. This allows both macro and micro-level problems and possibilities to be identified in broad terms and related to each other.

1.1.3 The Intended Audience of the Overview

The Overview will be published and distributed widely to representatives of governments, the private sector, NGOs and fisherfolk community organisers.

1.1.4 Information Sources

As the section on Key Constraints (cf.7) points **out,** there are large gaps in information on various issues related to post-harvest fisheries. In fact, this problem exists for fisheries as a whole.

Fish Production:

There are three sources of data on fish production. In all the states, the Department of Fisheries collects data on fish production. It is put out in annual publications. In many states, the data is often collected as a matter of routine, and is not very reliable. The Central Marine Fisheries Research Institute (CMFRI) collects catch data for the entire country, up to SO m depth; its system of data collection is considered to be good. The fact that the CMFRI has continuous data for the last 40 years is also a reason for preferring it over the DOF data. The Fishery Survey of India (FSI), collects data on resources beyond SO m depth.

The fact that the fishing industry rarely keeps records, makes available data suspect. Further, the data collected is rarely presented in a user-friendly format. It is not known if the data has been found useful for any purpose by fishers.

Fishermen, fishing craft and tackle:

While the information on the mechanised sector available with the DOF is reliable (because all mechanised crafts have to register themselves and obtain a licence for fishing), the information on traditional fishing craft and gear is not so exhaustive. For obtaining information on the numbers and descriptions of particular traditional craft, one perhaps has to visit all landing centres where the craft are operating, and gather first-hand information.

For information on the numbers of fishermen, there are three sources: the CMFRI, the DOF and the livestock census. However, data is not collected regularly by all three agencies. Further. the data provided by the agencies often fails to tally. Anomalies abound in the data as presented. Within the Department of Fisheries, the data available at various levels does not tally. Disaggregation of data into active and part-time fishermen or marine and inland fishermen is not always possible. Data on women and their involvement in the sector is sparse.

Fish marketing, credit and post-harvest fisheries:

This is a much neglected area not only in terms of the attention it has received from any agency, **but also** in terms of how little is known about it. The project has brought **out** many reports dealing with these issues. However, the information contained therein is qualitative rather than quantitative. Urgent efforts are required to gather quantitative information on these issues.

Various schemes available for fisherfolk:

Again, there is no single source of information on the various development programmes targeted at fisherfolk. The DOF does have a number of schemes, but no effort has been made to present the information in a publication. The project brought out a publication on the development schemes available to fisherfolk in various states on the east coast of India.

1.2 THE STRUCTURE OF THE OVERVIEW

Post-harvest fisheries encompasses activities between the time the fish is landed at the point of capture (either on a vessel or on the shore depending on the harvesting method and the level of investment or the type of technology used), to the time the fish is consumed. This does not limit *post-harvest fisheries* to technologies associated with processing and

preservation as it is sometimes narrowly thought of. It includes the policy, environmental, economic, institutional, socio-cultural and technological aspects of demand, supply and transformation of product.

The driving force behind the expansion of fish supply, and the associated innovations in its transformation from the point of landing to consumption, is that of demand. Without a demand for the product there would be little point in attempting to catch it, preserve and process it, or distribute it. This is often forgotten while considering post-harvest fisheries development and the factors that constrain it.

This Post-Harvest Overview is demand-ltd. It takes the perspective that demand, within the limits of the available resources, skills and finance, determines which fish is landed, when and where, and how it is transformed (changed in quantity, quality, form, price and location) before it is consumed.

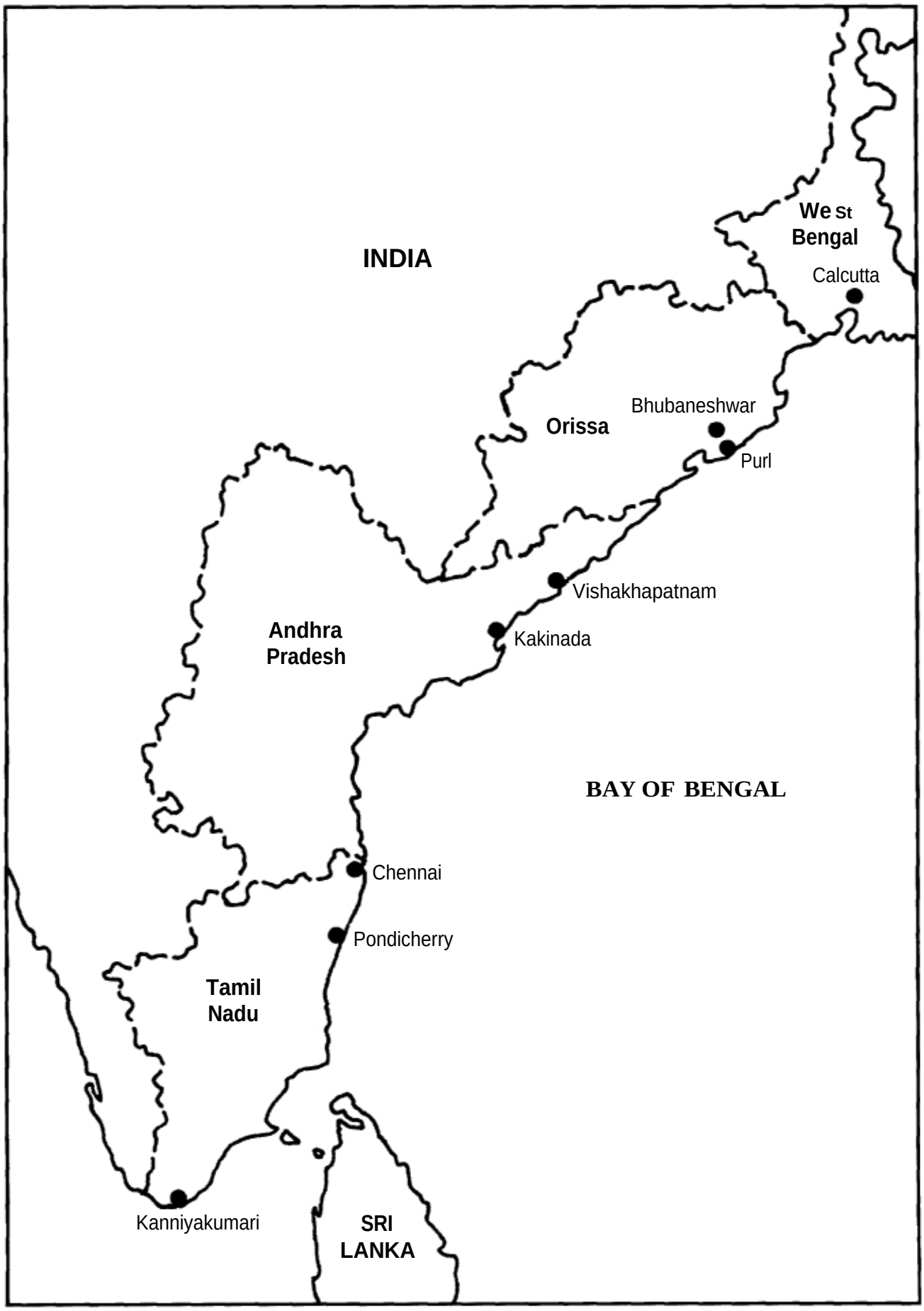
The Overview is organised in three distinct sections related to:

- Demand
- Supply
- Transformation

Each of these sections considers the characteristics, sources and factors affecting them, and current interventions.

The Overview study for India starts with a review of the post-harvest sector in India, followed by an overview of the four east coast states -Tamil Nadu, Andhra Pradesh. Orissa and West Bengal.

MAP OF EAST COAST OF INDIA



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2. BACKGROUND TO POST-HARVEST ACTIVITIES IN INDIA

2.1 FISHERIES IN THE NATIONAL ECONOMY

Fisheries has been an important part of the national economy for many years as a source of domestic food nnd rural employment. With the declaration of Exclusive Economic Zones in the 1970s the potential of these resources became more apparent. Successive day elopment plans of the Central Government have emphasised the importance of increasing production from both inland and marine resources. These have resulted in India becoming the seventh largest producer of fish in the world by 1990 The Government strategy was to increase the level of mechanisation and motorisation of the fleet, introduce new fishing technologies, improve infrastructural development and organise fish transport. storage and marketing. In later plans there was an increased focus on export markets, on improving the lives of fishing communities and expanding aquaculture to supplement capture fisheries.

An estimated nine million people in India depend on the fishing industry. Of these, over six million are actively involved in fishing. Fisheries contributes about 2.4% of the GDP that originates from agriculture, forestry. logging. fishing, mining and quarrying. In 1995/96, 796.300 nit of marine products valued at Rs 35,000 million were exported from India.

The potential to expand production. for both domestic and export consumption, is believed to be considerable. Increases in marine production will come mainly from deep water resources and brackishwater aquaculture. The inland fisheries expansion will come mainly from more intensive aquaculture.

2.2 THE POST-HARVEST SUB-SECTOR

The past emphasis on the expansion of production has meant that post-harvest fisheries has received less attention than it deserves. The main post-harvest focus has been on distribution and marketing systems. Goods handling and processing have been accorded less priority. This has changed in recent years with the growth of the export market and the emphasis on the quality of exported products. This emphasis is. however, limited to a small part of the total production.

As for the domestic markets. there is still considerable scope to improve the way fish is handled. processed, distributed and marketed The distribution of opportunities to traditional producers and processors to benefit from such development can also be improved. Given the limited scope for expanding inshore catches in the tong-term. a greater emphasis on post-harvest value-added production is needed at the community level. The scope for this in India is considerable

2.3 NATIONAL GOVERNMENT INSTITUTIONS INVOLVED IN POST-HARVEST FISHERIES

The responsibility for development of the fisheries sector ties with both the Union and State governments. A variety of institutions have been set up over the years to provide a strong base for development of fisheries in India. Most of these have some influence on post-harvest issues. either directly or indirectly.

Over time there have been numerous changes in the identity and the responsibilities of some institutions. Only, those that are currently functional are listed below. They mainly operate under four different bodies:

- **Indian Council for Agricultural Research (ICAR)**

  Central Marine Fisheries Research Institute (CMFRI)

  Central Inland Capture Fisheries Research Institute (CICFRI)

  Central Inxtitute of Freshwater Aquaculture (CIFA)

  Central Institute of Brackishwater Aquaculture (CIBA)

  Central Institute of Fisheries Technology (CIFT)

  Central Institute of Fisheries Education (CIFE)

  National Bureau of Fish Genetic Resources (NBFGR)

  National Research Centre on Coldwater Fisheries (NRCCWF)

- **Ministry of Agriculture**

  Central Institute of Fisheries Nautical and Engineering Training (CIFNET)

  Central Institute of Coastal Engineering for Fishcries (CICEF)

  Integrated Fisheries Project (IFP)

- **Ministry of Commerce**

  Marine Products Export Development Authority (MPEDA)

  Export Inspection Agency (EIA)

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- **Ministry of Food Processing Industries**
  Fishery Survey of India (FSI)
- **Ministry of Environment and Forest**
  Regulations relating to usage of coastal zones and enforcement
- **Department of Ocean Development**
  Development of Living and Non-living Resources
  National Institute of Oceanography (NIO)

In addition to these institutions, many states have their own training centres for fishermen and extension workers.

The following is a brief summary of the different institutions indicating, where possible, when they were formed, their main objectives and activities.

Central Marine Fisheries Research Institute (CMFRI)

This was formed in 1974 and has its headquarters based in Cochin.

Objective:

The primary objective of the institution is to conduct investigations into marine fishery resources. Increasing emphasis is placed on increasing production from inshore regions, deep sea areas and the development of sea farming.

Activities:

- The assessment of present levels of resource exploitation including a survey on fish landings and biological aspects of fisheries.
- Gathering information on species of commercial importance including analysis of data on distribution. abundance, habitats and migrations.
- Studying environmental factors affecting fishery resources.
- Recent activities include education, training, extension and transfer of technology programmes.

Central Inland Capture Fisheries Research Institute (CICFRI)

Originally part of Central Inland Fisheries Research Institute (CIFRI), but separated in 1985, the CICFRI is in Barrackpore (Calcutta).

Objective:

The effective development, management and conservation of inland fishery resources.

Activities.

- Investigations directed towards the appraisal of inland fishery resources and the development of effective management measures. This includes research on capture fisheries in rivers, reservoirs and estuaries as well as their management and conservation.

Central Institute of Freshwater Aquaculture (CIFA)

This was originally a part of Central Inland Fisheries Research Institute (CIFRI) but was established independently in 1985. It is located in Bhubaneswar. Assistance was provided by two UNDP projects in 1980.

Objective:

To contribute to the effective development of freshwater aquaculture in India.

Activities:

- Undertaking studies within each of nine research divisions: Production Technology; Breeding and Genetics; Nutrition and Feed Technology *(Involved) in the development of cheap and balanced diets for different cultivable species during different stages* of *growth);* Fish Physiology; Fish Disease; Soil and Water Environment; Economics and Statistics; Aquaculture Engineering; and Aquaculture Extension.

Central Institute of Brackishwater Aquaculture (CIBA)

Established in 1985, CIBA is located in Chennai, with centres at Kakdwip (West Bengal) and Puri (Orissa).

Objective:

To develop appropriate technologies for the aquaculture of organisms in estuaries, brackishwater and salt-intrusion areas.

Activities:

- Research programmes in: seed production of important cultivable species; nutritional aspects of prawn and finfish in hatchery and grow-out *(studies include the evolution of suitable artificial feed formulation);* monitoring the health of cultured animals; genetic engineering; soil and water criteria for brackishwater aquaculture; micro-level surveys to locate suitable farm sites; land-use planning and coastal zone management.

Central Institute of Fisheries Technology (CIFT)

Reorganised under ICAR in 1967, CIFT has headquarters in Kochi (Kerala).

Objective:

The coordination of research in various fields of fishery technology for the development of the fisheries sector in India.

Activities:

- There are two main branches under which activities are carried out, namely 'craft and gear' and 'processing'.
- The craft and gear branch is involved with (a) gear materials; (b) fishing methods; (c) boat design; (d) craft materials; and (e) mechanical engineering.
- The processing branch is concerned with (a) bacteriology and microbiology; (b) processing and engineering; (c) byproducts, and (d) quality control and inspection. The main areas of focus are:
- Utilisation of deep sea prawns, lobsters and squid (range of products include frozen prawns, peeled and deveined prawns, frozen squid and cuttle fish, frozen octopus).
- Utilisation of tuna (range of products include canned tuna, dried tuna and frozen tuna chunks).
- Utilisation of new deep sea resources.
- Utilisation of mesopelagics for fishmeal.

Central Institute of Fisheries Education (CIFE)

Established in 1961, CIFE has headquarters in Mumbai.

Objective:

To train district level fisheries officers so as to equip them with the necessary technical know-how to identify problems and arrange for their solution independently or with expert guidance.

Activities:

- The institute runs a two-year post-graduate course in fishery science, a two-year master's degree programme on fishery management and a nine-month training course in selected aspects of inland fisheries.
- Candidates may be nominees from the different states, nominees from neighbouring countries or private individuals. The institute now has the status of a university.

National Bureau of Fish Genetic Resources (NBFGR)

Established under ICAR in 1983, NBFGR attained independent status in 1985. It has four centres in Allahabad (freshwater resources), Chennai (brackishwater resources), Kochi (marine resources) and Haldwani (coldwater resources).

Objective:

A statement of the objective was unavailable.

Activities:

- The activities include (a) the collection and classification and evaluation of information on fish genetic resources; (b) cataloguing of genotypes; (c) maintenance and preservation of genetic material; (d) introduction of exotic species in Indian waters, and (e) conservation of endangered species.

National Research Centre on Coldwater Fisheries (NRCCWF)

Established in 1985, NRCCWF is located at Haldwani (Uttar Pradesh).

Objective:

To conduct investigations on coldwater fisheries of rivers and lakes.

Activities:

- Research on indigenous coldwater species such as mahseer, *Schizothorax* spp. and exotic trout.

Central Institute of Fisheries Nautical and Engineering Training (CTFNET)

Established in 1963 in Kochi, CIFNET has two further units in Chennai (1968) and Visakhapatnam (1981).

Objectives:

- Provide technical manpower for ocean-going vessels, infrastructural establishments and fishermen's training centres.
- To accelerate advancement in fishery technology.
- To help developing nations in Southeast Asia, Middle East and African regions to create technical manpower for development of marine fisheries.

Activities:

- Provision of a consultancy service related to technical manpower requirements.
- Undertake studies on fishing craft, gear and equipment and the provision of extension training.
- Running training courses to meet the needs of the fishing industry.

Central Institute of Coastal Engineering for Fisheries (CICEF)

CICEF is located in Bangalore (Kamataka).

Objective:

To assist the development of brackishwater aquaculture for the production of fish and prawns.

Activities.

- Feasibility studies for selecting sites and conducting site surveys.

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- Developing designs and operational procedures, as well as economic viability studies, for coastal shrimp farms and hatcheries.
- Preparation of guidelines for design and operation of shrimp farms and hatcheries.
- Training of personnel for the above activities.

Integrated Fisheries Project (IPF)

Established in 1972 in Kochi, IPF has other centres in Chennai and Visakhapatnam.

Objectives:

- To propagate diversified fishing methods for the optimum exploitation of known fishery resources.
- To introduce and promote diversified fishery products in rural and urban markets.
- To train personnel in diversified fishing methods, processing technology and refrigeration techniques.

Activities:

- Feasibility studies and demonstrations of different types of fishing craft and gear.
- Research into consumer reaction to new products and the promotion of new fish products.
- Training in fishing methods. processing technology and refrigeration techniques.
- Consultancy service in fishing, fish processing and marketing.
- The IFP at Cochin consists of a modern fisheries complex dealing with fishing gear, processing, marketing and training.

Marine Products Export Development Authority (MPEDA)

Established in 1972, MPEDA has its headquarters in Kochi.

Objective.

Promote the export of fish and fisheries products.

Activities:

- Registration and licensing of fishing craft, gear, processing plants and exporters.
- Regulation of processing capacity and promotion of diversification of processing facilities.
- Arrange financial assistance to shrimp fishing and processing units.
- Assess manpower requirements in the fishing and processing sectors.
- Promote raw material availability by encouraging exploitation of offshore and deep sea shrimp resources.
- Development of marketin g strategies to access overseas markets and encourage group marketing under limited brand names.
- Drawing up and enforcement of norms and standards for processing facilities.
- Promotion of fishing and processing operations in any region of the Indian coast.

Export Inspection Agency (EIA)

EIA took over the role of export fish inspection in 1969.

Objective:

To ensure the quality of marine products exported from India.

Activities:

- To carry out pre-shipment inspection of export consignments to ensure their compliance with the prescribed minimum quality standards.
- In-process quality control (IPQC) was introduced in 1977 and the role of the EIA officials is to assist and guide processors to meet minimum quality standards for export.
- The issue of statutory certificates for export.

Indian Institute of Packaging (IIP)

IIP is located in Bombay. Established under the Ministry of Commerce, the institute has a mandate to undertake investigations on packaging in order to meet the needs of processors targeting the domestic and export markets.

Indian Institute of Foreign Trade (IIFT)

Under the Ministry of Commerce, the institute carries out market surveys, studies on trade and tariffs, export costs, shipping and transport.

Fishery Survey of India (FSI)

Ten operational bases of the FSI have been established in Mumbai. (headquarters). Porbandar, Goa, Mangalore, Kochi. Tuticorin. Chennai, Visakhapatnam. Roychowk and Port Blair.

Objective:

The assessment and monitoring of the marine fishery resources in the Indian EEZ.

Activities:

- Survey of resources and charting of fishing grounds as well as monitoring of resources for regulation and management purposes.
- Training for fishing operatives (re: CIFNET).
- Dissemination of information on resources.

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National Institute of Oceanography (NIO) NIO has its headquarters at Dona Paula, Goa.

It conducts research on marine resources and their exploitation. It also sponsors research expeditions to the Antarctic from time to time.

National Remote Sensing Agency (NRSA) (Department of Space. Government of India)

Located at Hyderabad, NRSA is the nodal agency for satellite data acquisition. processing, dissemination and application in various resource areas, such as forecasting fishing grounds.

2.4 ISSUES THAT AFFECT POST-HARVEST FISHERIES

Post-harvest fisheries, being closely linked to production, is obviously affected by any issue that affects production. There are a number of critical issues — technical, environmental, social and economic which the fisheries sector, including post-harvest, is grappling with. A few of these issues are briefly touched upon here.

2.4.1 Shrimp Aquaculture on the East Coast of India

From the mid-'80s onwards. Government agencies promoted shrimp aquaculture with a view to improving the country's foreign exchange earnings and to augment marine prawn production which had reached its potential limits. The success of aquaculture in some South East Asian countries also gave shrimp culture an impetus. Farmers shifted from paddy culture to prawn culture, converting paddy fields to prawn farms. Shrimp seed collection became the major activity in many fisherfolk villages, with the women and children joining in. A series of shrimp hatcheries came up on the coast. and imported high energy feeds for shrimp came into widespread usage.

The negative effects of the proliferation of aquaculture farms became evident almost immediately. Traditional access to the sea by coastal fisherfolk communities was severely reduced; ground water got contaminated with salt water; water pollution resulted from dumping of effluents; paddy fields and salt pans got converted into prawn farms; destruction of mangroves and other plant varieties was common. All these factors created serious problems for fisherfolk communities.

In the early '90s, a movement was started, mostly by NGOs working with coastal fisherfolk, against the spread of aquaculture. Public interest litigations were filed in the Supreme Court in 1994. The petitions sought the enforcement of Coastal Zone Regulation Notification issued by the Government of India, stoppage of intensive and semi-intensive type of prawn farming in ecologically fragile coastal areas, prohibition from use of the wastelands/wetlands for prawn farming, and the constitution of a National Coastal Management Authority to safeguard the marine life and coastal areas.

The Supreme Court, in its order of 11 December 1996, directed the demolition of all prawn farms set up within 500 m of the high tide line and alongside creeks, backwaters, estuaries and rivers and within 1000 m of Chilka lake in Orissa and Pulicat lake in Tamil Nadu by 31 March 1997. The Court further directed the setting up of a Special Authority to protect the coast. This Authority alone would licence all aquaculture industry outside this area and would be empowered to assess the loss caused to the ecology and to the villagers and collect damages from the prawn farms. Apart from the CRZ areas, the Court also banned the conversion to shrimp farms of agricultural land, salt pans, mangroves, wetlands forest lands, land for village commons and land meant for public purposes.

The deadline of 3 1 March 1997 was revised later, in view of the plea made by the enforcement agencies for more time to demarcate the existing aquafarms into those falling within the CRZ (hence to be destroyed), and those falling outside. Meanwhile, a bill for bringing into existence a regulatory body to be called Aquaculture Authority of India, is currently being drafted for parliamentary sanction.

2.4.2 Traditional vs Mechanised Fishing

The conflicts between the mechanised and traditional fishing fleets have a bearing on the fisherfolk's access to resources, and thereby on the amount of catches they bring to the shore. The traditional fisherfolk are negatively affected by the mechanised fleet, which often fishes in the inshore waters, destroys fishing nets, sweeps the sea floor clean capturing all species of all sizes whether targeted or otherwise, and in general reduces the traditional fisherfolk's access to commercially important varieties of fish.

2.4.3 Deep Sea vs Traditional Fishing

Deep-sea fishing is not exactly detrimental to the interests of traditional fishers. However, Government regulations and enforcement mechanisms being inadequate, fisherfolk fear that deep-sea fishing vessels might not confine their activities to the depths they were permitted to fish in. The fishing areas of the deep-sea fishing vessels to some extent, coincide with

those of the mechanised fleet. and the latter is not very happy at the prospect of sharing the resources with the more powerful deep-sea fleet. The government's decision to stop proceeding any further on this issue may have temporarily solved the problem, but the issue remains to be studied further. because the deep-sea resources in the Bay of Bengal region are reportedly quite substantial.

2.4.4 EEC Ban on Fish Exports from India

The lax quality-control systems in the seafood industry have been a matter of grave concern for a long time. With stricter quality-control regimes like HACCP and IS0 9000, being enforced by an increasing number of countries, it was a matter of time before Indian products faced problems. The ban on seafood from India by the European Union in 1997 brought the issue of quality control in India into sharp focus. Many processors have started strengthening quality control, and efforts are under way to improve the quality of the seafood being exported from India.

However, quality control cannot be enforced by individual agencies or processing plants. Considering that quality deterioration starts immediately after capture (by both traditional and mechanised fleets), attention needs to be given to ensure quality at every stage: onboard, at the landing centres; while transporting to the processing unit: at the time of processing and: during the post-processing. This not only means that all fishing units, traditional or mechanised, and fish landing centres, have to be equipped to ensure quality, but that the necessary infrastructure which is necessary to keep the quality — such as provision of clean potable water, electricity, ice plants, ice-carrrying mechanisms onboard, good roads and communication facilities — are made available to the industry. This can only be done by the government, with the active participation of the industry. So long as the necessary infrastructure for ensuring quality is not made available, traditional fisherfolk will continue to be adversely affected by issues such as the ban by the EU.

2.4.5 Natural Disasters

Natural disasters such as cyclones affect the productive capacity of fishermen for a long time, besides taking a toll on their assets and even their lives. On the east coast of India. cyclones are a frequent phenomenon, and they are quite destructive. Cyclones destroy infrastructural facilities such as roads, and this has an impact on the prices that fishermen get from traders.

Erosion is another important problem faced by many villages on the east coast of India. Erosion reduces the breadth of the beaches. which are generally used for fish landing, marketing and fish drying. It encroaches on the living space available in the villages, forcing the villages to move backwards — not always a harmonious process.

Besides the issues raised, a number of other factors — such as industrialisation; credit policies of the government and of banks; changing market profiles for various kinds of fish and fishery products, and migrations — affect post-harvest fisheries.

3. WEST BENGAL POST-HARVEST OVERVIEW

3.1 FISHERIES AND THE STATE ECONOMY

3.1.1 Background

West Bengal is one of the nine maritime states of India, with an area of 87,853 km?; less than 3% of the area of the country. It has a population of 68 million (199 I), of whom 72.6% live in rural areas. Calcutta, the main urban centre, is the largest city in India with a population of 11 million.

West Bengal's 157 km coastline makes it the second shortest of all coastal states (GOI statistics). The state has a complex river system which enters the sea via a wide delta interspersed with islands. The associated continental shelf is wide and productive and mainly muddy. It has an area of 17,000 km^2. These features confer on the state an extensive marine, estuarine and freshwater fisheries resource-base which has long influenced its economic development and culture. Fisheries development in the past has focussed on the freshwater environment where most of the fish was produced. It is only since the 1950s that the marine sector has developed.

3.1.2 Domestic Food Security

Traditionally fish has been an important part of the diet in West Bengal. The sector has focussed on domestic food supply. West Bengal attracts fish from other states in India and has one of the biggest fish markets in Asia (Howrah). In recent years the export of high-value products has developed.

3.1.3 Employment

Fisheries contributes very significantly to rural employment, particularly of the poorest groups. Data on the exact numbers in each sub-sector of the fishery were not available at the time of the study. The number of active fishermen is reported to be 8 1,223.

3.1.4 Income

Fish production, supply and consumption in the state is high relative to other states and clearly contributes very significantly to the state economy. During 1995-96 the total fish production in the state was 893,000 mt. In 1990/9 1, West Bengal was the highest producer of inland fish in India but ranked seventh in marine production.

3.1.5 Foreign Exchange

In 1991/92 the export value of fisheries products from West Bengal was over Rs 3,809.28 million, most of which was shrimp. Post-harvest fisheries encompasses activities from the time the fish is landed until it is consumed and is a major segment of the sector as a whole. Post-harvest activities are discussed below:

3.2 DEMAND FOR FISHERIES PRODUCTS

3.2.1 Demand Characteristics

The characteristics of the demand for fish and fisheries products can be looked from the following perspectives:

Current quantitative demand

The total demand for fish in West Bengal at current prices, is 1.15 million. The consumption rate is believed to be one of the highest in India. Given that the state production in 1995/96 was 893,000 mt, that very little went out of the state and that many products from other states entered West Bengal, we must assume that the consumption rate is much higher. The Government of West Bengal estimates a consumption of some 900,000 mt.

Current export demand is determined by the international market. West Bengal's contribution to that will depend on its production, quality and price. Export of shrimp in 1996197 amounted to 17,745 mt.

Product type, species composition and quality demanded

The different types of fish, the species composition and the quality are discussed below:

Fresh fish

There is a pronounced consumer preference for freshwater fish, especially carp, in West Bengal, particularly in the urban inland areas. Good distribution networks enable access to consumers in coastal areas too to fresh fish. The ideal weight for carp is reported to be 2.5kg. Local carp commands a higher price than that imported from other states. Seasonally, some fish are in strong demand, particularly hilsa, parshe (Liza *par-sea),* and topse *(Polynemus paradisens).*

It is only in the coastal areas and the Darjeeling hills that there is a preference for marine species. Some marine fish do, however, command high prices. *Bhekti* (sea perch) is highly regarded as are hilsa, mullet and pomfret. Low-value species include sardines, anchovy, eel and shark. Tunas are not preferred species.

There is reported to be a strong preference for good quality fish.

Frozen fish

Most frozen fish — this tends to be either prawn or pomfret — is exported.

Salted fish

The greatest demand for salted fish is ex-state and is for shark meat.

Dried fish

Dried fish may be preferred over fresh fish in areas where easy access to fresh fish is lacking and fresh fish quality is poor. Some of the buyers export dried products to distant markets in other states.

Fishmeal

Demand variability for fishmeal for poultry and brackishwater fish/prawn culture hinges on price. Any increase in price will have a very significant impact on demand. The protein composition of the product also affects demand.

Canned fish

No canned fish is produced locally. Information available about the consumption of this product within the state indicates some demand in hill resort towns up north and at metropolitan Calcutta for supply to ships through the stevedores of shipping companies.

Live fish/prawn fry

There is some demand for live carp, but to what extent it commands high prices is unknown. Aquarium fish are also exported live, and information on species would be available with MPEDA in Calcutta.

Penaeus monodon are the main fry demanded live for the hatchery trade.

Vallue-added products

In Hogg Street Market, Calcutta, substantial quantities of fish are processed into value-added products for the higher-income urban market segment. There is demand for fish that are gutted, filleted and cut into thin slices for particular needs, also for prawns that are deveined, shelled and headed.

Variability in demand

Fish is consumed all the year round, but different species may be demanded at different times of the year. For example *Bhekti* and carp are in great demand during Hindu religious festivals, particularly the Puja and wedding seasons, (December to March) when fish demand in general goes up. The details of such variations and the impact of other sources of protein are not well documented. Other religious festivals and observances may also affect the consumption of fish on a daily, weekly or monthly basis.

3.2.2 Demand Segmentation

In trying to define segments of the West Bengal fish market, it is necessary to define groups which have sufficiently significant differences in their demand characteristics to be meaningful, and for members of each segment to be sufficiently similar in their demand characteristics to allow generalisation.

The segmentation of demand at the retail level in West Bengal depends to a large extent on income distribution and location. This relates in the main to the segmentation of customers (i.e., those who buy the fish) rather than segmentation of consumers. The buying patterns of the customers are ultimately influenced by the demands of the consumers they serve. Some buyers cater to consumers who live outside the state or the country.

The method of segmentation also depends, to some degree, on whose perspectives the segmentation is carried out for. Our primary concern is for small-scale traders and thus our segmentation should reflect, but not be restricted to, that group. Segmentation of demand should not, however, reflect only segments of the market supplied by the small-scale trader, but rather those segments which influence their operations. Here market segmentation is based on those points at which the fish is removed from the sphere of influence of, or access by, the small-scale traders, or is converted into something else.

Demand can be segmented in the following ways:

Coastal retail

The retail trade within the coastal communities prefers fresh marine/estuarine species. Many of the coastal communities are poor and this may be reflected in the species demanded. Some communities are predominantly Bangladeshi and their tastes may be significantly different from that of the local population.

Calcutta retail

The Calcutta retail market is extremely varied, reflecting both income disparities and the cultural diversity of consumers. The main preference is for freshwater fish. Marine fish consumers go for *Bhekti* and pomfret. Carp is the preferred freshwater species. Some value-added products are in demand as discussed earlier.

Inland retail

The inland retail market mainly prefers freshwater species. Some areas prefer dried products.

Institutional

Institutional fish buyers include:

- The Army
- The Navy

- The Police
- Prisons
- Hospitals
- Hotels/restaurants
- Schools/colleges

Institutional buyers tend to be in urban areas and rely on large quantities and consistency of supply. They would not generally patronise small-scale traders. But they affect overall demand for fish and thus the availability and price of fish for small-scale traders. They tend to buy their fish by tender and mix fish with other forms of protein. Very little data is available about the institutional demand segment.

Industrial

The industrial segment includes those operators who wish to make fishmeal out of trash fish and small species from the bagnet fisheries. Several such operators distributed in the coastal belt, buy their fish directly from fishermen or from village fish processors.

Exports to other states

Exporters buy mainly dried and salted fish. They may hail from the importing state. Others may be locally based and sell to traders in other states. The main ex-state species is salted shark.

Overseas exporters

These are mainly large-scale prawn exporters who either buy processed products from commercial processors or from fishermen/fish farmers and do the processing themselves.

Some exporters also export aquarium fish, fresh fish, frozen fish, dried shark fin, fish maws and live mud crab. The export of fish products from West Bengal is shown in Table 3. I.

Prawn farms

Prawn farms buy live juvenile prawn for on-growing. They interact directly with small-scale seed collectors.

3.2.3 Factors Affecting Demand

These are outlined below:

Macro-economic policies

Demand is in large part determined by income levels. population and fish price (particularly in relation to other forms of animal protein). The macro-economy can influence all of these areas by changes in fiscal, monetary, exchange rate, trade and development policy. Within India wider macro-economic issues emanate from both the central government and the state government.

The benefits of eating fish are promoted in schools as part of a wider nutrition education programme.

Sectoral policy and legislation

Sectoral policies at the national level have always identified the domestic consumption of fish as an important component of various development plans, although there has not been an active programme to promote demand. Likewise, at the state level the domestic consumption of fish has always been high and the problem has been perceived as one of supply rather than demand.

The central government, through MPEDA, has promoted demand for Indian products overseas. This has directly benefited West Bengal's growing prawn farming industry and, to a lesser extent, its fish export business.

Environment

The perception of fish among the educated class as a healthy food should but increase demand as education levels rise.

The European Union (EU)'s import restrictions on fish and prawn products from India did not have a significant impact till recently. European communities tightened the curbs after the 1997 visit of the Emergency Mission to Indian seafood industries. Import regulations of Japan, USA and Singapore are also becoming more stringent. Their perception of Indian products will influence future demand.

Micro-economic factors

Price

The price elasticity of demand will vary between different segments of the market and for different species. Poiesz (1989) attempted to look at the price elasticities of demand but concluded that data was insufficient to derive any conclusions. Likewise, variations in supply were so great on a day-by-day basis that trends in prices were difficult to determine.

Recent changes in transport costs in India will doubtless have a significant effect on demand.

Changes in the price and availability of substitutes

Poiesz was able to collect data on the relative prices of fish, meat and eggs. This indicated that while relative prices of fish and meat have stayed fairly constant over the period 1972 to 1987, the price of eggs has fallen.

From the perspective of exports, the demand for products from West Bengal will depend in part on

the availability, quality and prices of alternative supplies of fisheries products and of attitudes to alternative protein sources.

Changes in taste

The growing perception of fish as a healthy food source can only have a positive impact on demand.

Changes in income

No information on changes in income was available at the time of the study.

Institutional influences

One of the main factors affecting any perception of demand is the institutional capacity to monitor and analyse changes in that demand. Without such capacity it is possible that policy influences on demand may inadvertently constrain demand. Within West Bengal, institutions to monitor and analyse domestic demand are not well developed. However, the newly formed West Bengal University of Animal and Fisheries Sciences would meet this need quite well.

Technological influences

The major technological influence on demand is that of electrification. This has affected the distribution of refrigerators in homes and in local stores. In West Bengal, 73.7% of the rural villages have been electrified, but the extent of the use of refrigerators to store fish is unknown.

Social, cultural and demographic factors

Population increases are likely to be the most significant factor affecting demand in the medium and long-term. Growth rates in India are high (2.62% per year for the period 1978/9- 1988/9), and dense populations mean little land available for other forms of animal protein. This in turn means high demand for cheap animal protein from the aquatic environment.

Different religions make different demands on animal protein as a food source. Nationally, 82.6% of the population are Hindus, 11.4% are Muslims, 2.4% Christians, 2.0% Sikhs, 0.7% Buddhists and 0.5% Jains. The relative importance of fish to the diet of these different groups has a bearing on demand.

Different festivals call for different species of fish to be consumed in large quantities.

3.2.4 Current Intervention

Non-governmental sector

There appears to be no intervention by NGOs to promote or understand demand.

Private sector

Given the already high demand for fish there is little need for the private sector to promote demand. Export promotion by the private sector may have stimulated demand but this could not be determined during the study.

Government

MPEDA is the main body concerned with demand but it has an export focus. MPEDA's local office in Calcutta can cater to the immediate needs of the state's exporters, while MPEDA's central office monitors overseas market prices regularly. The government also promotes products from West Bengal overseas.

The PHFP has also done some preliminary market research in West Bengal.

3.3 SUPPLY OF FISHERIES PRODUCTS

3.3.1 Availability and Sources of Supply

The total supply of fish within West Bengal is made up of both local production and imports from other states. The estimated landings for West Bengal for the period 1990/9 1- 1995/96 are shown in Table 3.2. These figures are supplied by the DOE The estimated total landings amounted to some 893,000 mt in the year 1995/96 of which 82.8% came from inland or estuarine sources.

As far as the inflow of products from other states is concerned, large quantities of fish arrive from Andhra Pradesh, Tamil Nadu, Orissa and Gujarat. Most of this fish is from freshwater sources.

Fish from within the state comes from both marine and freshwater environments and from both capture and culture fisheries. The species, size, and quality reaching the market depend on the origin of supply.

Freshwater supplies

West Bengal is the highest producer of freshwater fish in India. responsible for over a third of the country's production. Freshwater fish also constitutes the bulk of the landings in West Bengal. far exceeding marine landings.

Pond/tank fishing is the main source of inland fish which are extensively cultured and periodically harvested. The state has some 276,202 ha of pond resources of which over 70% are operational. Other sources include lakes, rivers and beels, as shown in Table 3.4. The total inland water area is some 770,000 ha. Freshwater fish farming is an ancient practice in the state but has recently undergone major improvement through the use of stocking, extension and investment.

Sewage-fed aquaculture on the edge of Calcutta is a growing area of fish production. The current area is in excess of 4,000 ha and the potential for expansion is believed to be considerable. There is no record of any health hazard due to consumption of sewage-fed fisheries. The department has set up two sewage-fed fisheries projects in the municipal towns of Nabadwip and Serampore.

Marine and estuarine supplies

Marine and estuarine fish are caught by a range of fishing methods including gillnets, bagnets. seines. longlines and trawls. Vessel types range from small non-motorised inshore craft. used mainly in the estuarine waters, to large offshore trawlers. The *sandheads* or offshore trawling grounds attract a wide range of trawlers from Andhra Pradesh and Orissa but few of them land in West Bengal. The fishing trawlers of West Bengal (23 m and above OAL) normally operate in sandheads based from Roychowk harbour and land the catches at Roychowk, though the infrastructure facilities are not very good. As per the statistics of the DOF during 1996, 7.434 crafts were operating from some 300 coastal bases in West Bengal. The marine vessels landing into West Bengal are mainly 15-17m long gillnetters although some trawlers also operate.

There are over 65 main fish landing centres in West Bengal. Different centres supply different species of fish or in different proportions depending on the following points:

- The type of gear/vessel/techniques used locally
- The prevailing weather conditions and local geography
- The availability of different species in local waters
- The landing and shore facilities available to attract vessels from further afield bringing catches from offshore

The variable weather conditions and access to resources necessitate fishermen moving closer to the resources at certain times of the year. This results in temporary fishing camps being established and changes in supply patterns to the market.

Roullot and de Mautort (1989) identify 15 major landing centres as outlined below:

Digha

This is a big trawling and gillnetting centre with a fish market. Large vessels land offshore catches here. Many small mechanised and non-mechanised boats also operate from this site.

Sankarpur

This is one of the two main fishing harbours of West Bengal. It has a large jetty and a range of support facilities for larger vessels but suffers from silting problems.

Jalda and New Jalda

These support large bagnet fisheries and are important areas for drying fish.

Junput

Landings from bagnet and gillnet fishing fleets are landed here and much fish drying is carried out. There was once a government shark liver oil factory and a fishmeal plant. These are believed to be no longer operational.

Rovchowk

This was the main harbour for West Bengal. It was capable of supporting industrial vessels but has been avoided in the past because of serious silting problems.

Nagendrabar (Diamond Harbou I.)

This is one of the main fish landing sites with good onshore support facilities. Several hundred mechanised vessels operate from this site. many of which are the larger gillnetters.

kakdwip

This is a big centre for gillnetting and bagnetting. It has extensive shore facilities including ice plants. There is a small auction hall.

Namkhana

In spite of limited onshore facilities this is an important landing site for the smaller vessels. It is the furthest point south that boats can travel from Calcutta and so attracts many boats from the grounds to the south of the town. Ice is locally produced.

Fraserganj

This has limited shore facilities and difficult connections with the mainland but was undergoing rehabilitation in 1991 with the development of improved landing and shore facilities. It is an important longlining centre and is involved in shark processing.

Sagar

This is seasonally important as a landing site. Fish drying used to be a significant activity in the past. Gillnetters and bagnetters land here. The collection of prawn fry is also very important. Fish is transported from Sagar by boat to Kakdwip. Calcutta of Nagendrabar.

Jamboo

Seasonally important for the large bagnet fishery, this landing centre is well known for fish drying.

Raidighi

A lot of freshwater fish is landed here and some marine catches are transported by boat from other centres.

Hasnabad

This is a freshwater fish landing site although reportedly important for crabs also.

Canning

This is an estuarine fishing site with an active bagnet and shore seine fishery. It also acts as a landing site for fish transported from other centres.

West Bengal has a long history of extensive bhery culture in the estuarine and brackishwater environment. The type of aquaculture used in the estuarine areas is mainly extensive and is often paddy-cum-fish culture producing carp. There are also some experimental semi-intensive farms focusing on both carp and freshwater prawn, *Macrobrachium* rosenbergii. The main area of brackishwater culture is in the district of 24 Parganas South. The brackishwater areas have very high potential for expanding aquaculture and an estimated potential area of production. in 1988. of 85,000 ha. The brackishwater culture is focussed on tiger prawn. P.monodon, mullet and milkfish.

Imports from other states

Howrah market handles large quantities of fresh fish from other states in India. Supplies come from Orissa. Andhra Pradesh, Gujarat and Tamil Nadu. Much of this is freshwater carp from the fish farms of Andhra. Total quantities of imports represent very sizeable proportions of the total fish consumed.

3.3.2 Supply Characteristics

Species composition of supply

Inland

The inland species landed consist mainly of different types of carp and tilapia. The main carp species are rohu *(Labeo rohita)* and katla *(Catla catla).* There is trade in aquarium fish although little information was available on this fishery.

Marine

The DOF figures show that catfish make up the largest group of marine species landed. Hairtails, ribbon fish and clupeids are also important. Bombay duck, hilsa shad, pomfret, sharks, skate, croakers and perch make up the bulk of the remainder. Mackerels and sardines are also important. The names of important species of fish are shown in Table 3.3. Marine aquaculture supplies mainly *P.monodon.* This is particularly important to the many small-scale producers who supply the fry to the farms.

Ex-state

The bulk of the extra-state supplies is carp although some marine fish is also brought in.

Quality of supply

The freshwater fish from other states arrives in Howrah market in very good condition, being well iced and insulated. Marine fish from out of state is in lower condition but still of medium quality. Fish from freshwater and estuarine farms within West Bengal also reaches the market very shortly after harvesting and is thus in good condition. Some fish are reported to arrive at the market alive.

Most of the local vessels operating out of West Bengal go to sea for less than fourteen days. Those smaller craft on day trips do not use ice but land their catch in good condition. Vessels on longer trips tend to use ice and most is reported to be landed in reasonable condition. Vessels staying at sea for longer periods experience quality control problems and this is to some extent determined by the season. From February to September the weather varies from high rolling seas to cyclones and fishing trips tend to be of short duration.

The quality of estuarine hilsa seems to vary greatly with the stage in the spawning cycle.

Some of the inland fish. and those intended for the aquarium trade are supplied to the market in live form.

The juvenile prawns supplied to prawn farms are said to be of variable quality due to poor handling.

Variability of supply

There is both geographical and seasonal variation in the supply of fish. Geographical variation. in terms of the sources of supply, is discussed in section 3.3.1 above. Geographical variation has a range of effects on the quality of the product placed on the market. its cost and timing.

The main marine fishing season in West Bengal is from October to February although this is being extended as improved vessels allow fishing to continue off-season. This seasonality has some impact on the availability of the supply and species reaching the market but little information is available on this. During other months the fishing tends to focus on the estuarine resources. Inland fish catches are

not as weather dependent. and can supply the market all year round.

Roullot and de Mautort (1989) indicate the main marine gear used and species caught during the different months of the year. The most consistently used gear is the surface gillnet which targets catfish, hilsa, pomfret, threadfins, croakers. ribbon fish, rays, spanish mackerel and wolf herring. Estuarine gear such as bagnets, and shore seines are also used during most of the year.

The influx of freshwater supplies from other states is less affected by the weather. The supplies do, however, change with the seasons in response to the rising demand in the wedding season.

3.3.3 Losses in Supply

A major source of supply loss in West Bengal is the dumping of trash fish, generally from larger commercial vessels targeting high value species such as prawn. The cost of operating such vessels is high and there is little benefit in bringing back low value non-target species. It is estimated that the vessels operating in the waters adjacent to the state dispose of some 100,000 mt per year. It must be noted, however, that most of these vessels are not based in the state.

3.3.4 Participants in Supply

Ex-state suppliers

Ex-state suppliers are generally larger freshwater fish farms, particularly those in Andhra Pradesh, or wholesalers who buy from fish farmers or fishermen.

Inland producers

Inland fishermen in West Bengal are mainly fishermen who harvest rivers. reservoirs, beels or tanks, or fish farmers. The latter are mainly small-scale operators although some larger fish farms are now established. Many of the producers are part-time, either for subsistence purposes or for cash sales. Others are engaged in full-time commercial production.

Marine producers

The coastal fishing population is estimated to be about l,95,787 fishermen, many of whom are active only part-time. They may also engage in commercial and subsistence activities outside of the sub-sector, such as agriculture. Some fishermen also process their catch. Their vessels vary from very small craft powered by sail or oar up to medium sized commercial trawlers and gillnetters.

Most of these fishermen belong to scheduled castes (including Jalia Kaibarta, Jhalo Halo, Ma1 and Rajbhansi) and most join the fishery because their fathers were fishermen. This pattern is, however, changing as pressure grows for outsiders to enter the fishery. Many fishermen have, in the past, migrated from Bangladesh and subsequently settled in West Bengal.

Women, as in most fishing communities in India, are active in the supply side of the sector only to a limited extent. Some use cast nets in inshore and pond waters whilst others catch crabs with lures. An important role of women is, however, that of catching fry for prawn farming. This is, unusually for India, sometimes done from small fishing vessels. Poorer women harvest with nets from the shallows on foot.

Fish farming is undertaken in the coastal regions. Many of these farms are larger-scale producers.

Ancillary participants

In addition to the fish producers themselves there is a wide range of other participants in the sector who contribute indirectly to the supply side. These include financiers of vessels, suppliers of credit, gear, fuel and ice, boat builders and gear repairers.

Women are particularly active in the making and repair of nets.

3.3.5 Factors Affecting Supply

Macro-economic policies

Policy choices at the macro-economic level may have a very direct impact on the development of the supply side of fisheries in West Bengal. Some of these are outlined below:

- Regional support to West Bengal relative to other states
- Support for urban or rural development
- Support for large-scale or small-scale operations
- Promotion of private sector or public sector growth
- Focussing on primary production growth or other growth in other manufacturing and services
- Support for export or domestic market growth
- The use of fiscal or monetary policy instruments

Choices made between these policy areas and within each one, at both the national and state levels, have a significant impact on how the supply side of fisheries develops and who has access to the benefits from and opportunities in the sector. The Central Government provides guidance to the state on these choices and directs development efforts to some extent through the allocation of funds.

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Sectoral policy and legislation

Sectoral policy at the state and national government levels also affect the supply side of the industry. Common policy choices include:

. Support for large-scale enterprise or small operations
- Promoting export production or domestic food security
- Promoting inland fisheries expansion or marine
- Promoting capture or culture fisheries

The promotion of large-scale export oriented industries removes support opportunities from the small-scale sector and thus adversely affects the smaller producers. Likewise, a focus on export industries tends to promote those particular species which have an export market, thus opening opportunities for those people focussing on them. The promotion of capture or culture fisheries changes the species available and the target market.

Again. sectoral policy is formulated at both the national and state levels. The various Central Government development plans have progressively changed the emphasis of development efforts between the various options noted above. In the early post-independence years the emphasis was on industrial growth within the sector, especially in the first two plan periods. Later plans focussed more on the provision of employment and domestic food security. In the late 1970s product export was expanded and in the 1980s there was a growing emphasis on the scientific basis of aquaculture to increase production. In the late 1980s there was greater effort directed towards the expansion of offshore exploitation of the Exclusive Economic Zone and towards improving the quality of landed and marketed products.

Associated with these different plans has been the availability of development funds and credit from Central Government. These have strongly influenced sectoral plans at the state level. The past government support for aquaculture has provided a strong industry which supplies both domestic inter-state markets and exports markets alike.

Current plans for fisheries at the state level include the expansion of prawn and inland culture and the upgrading of fish landing centres.

Macrobrachium culture is a new source of income to fish farmers throughout the state. Instead of depending only on natural prawn seed collection, 14 *Macrobrachium* hatcheries have been set up in the state and 4 P. *Monodon* hatcheries are being set up in the coastal areas of the state.

The state is plannin g to develop 470 ha of brackishwater area at four sites,- Canning and Dighirpar in South 24-Parganas and Digha and Dadanpatrabar in Midnapore district — under the World Bank aided shrimp culture project.

A pilot project is being started to set up an artificial reef in the Bay of Bengal with a view towards fish aggregation in the coastal area.

Environment

Environmental factors affect the availability of supply over time. Seasonal weather changes as discussed above affect both species and quantities available. Cyclones can destroy fishing craft and gear and floods can damage fish ponds or cause the death or release of stock. Drought may also significantly constrain fish farming.

The local geography and oceanography also affect supply. West Bengal is fortunate in having expansive freshwater, brackish and marine resources and a wide continental shelf to exploit. The conditions are good for wild capture and for expansion of culture. This natural legacy will enable supply to be expanded in the future as aquaculture production is increased.

The sustainability of fish supply to the market is directly related to the condition of the environment. Degradation of the aquatic environment takes the following forms:

- Depletion of resources
- Loss of biodiversity
- Destruction of habitats

. Pollution

. Loss of amenity

From the perspective of supply, depletion of resources can result in fewer fish reaching the market: loss of biodiversity can result in fewer species available; destruction of habitats can result in a change in both species and quantity landed; pollution can result in reduction of the carrying capacity of the environment and thus resource depletion; and loss of amenity can pose a threat to the fishing communities themselves.

In general, the main factors affecting the environment are:

The small-scale fisheries sector

This sector directly contributes to environmental degradation by over-exploiting the resources. Inshore resources may be over-exploited by the use of destructive fishing techniques such as poisons or fine meshed nets which may harvest juvenile species.

The level of exploitation relative to the available resources is not well understood or documented either

in the marine and estuarine waters adjacent to West Bengal or in inland waters.

In the past, Hindu socio-religious regulations prohibited the consumption of hilsa from September/ October to January/February. This may well have reflected traditional knowledge of the spawning migration of these fish and acted as a resource conservation measure. This tradition is no longer observed. It is unknown if other traditional resource conservation measures are, or were, in place. There was no report of the existence of property rights over the fishery at the time of the study.

The small-scale harvesting of juvenile prawn is believed to be under intense pressure. This is fuelled by the poverty of the participants, their growing numbers and the demand for export products from the commercial prawn farming industry. The long term survival of these stocks must be sustained if this area of employment is to continue. The interaction of small-scale operators, mechanised boats, offshore trawlers and prawn seed collectors is poorly understood but expansion of fishing effort in all of these areas is bound to eventually place excessive pressure on the resources.

The large-scale fishing sector

The large-scale sector fishing in waters adjacent to the state is not well monitored in West Bengal as much of the fish caught in adjacent waters is taken by trawlers and landed in other states. In the future, growth of the trawler sector, stimulated by government export-oriented policies, could increase the threat to the sustainability of future resources for the vessels which do land fish into the state. The uncontrolled use of small-mesh nets also poses a potential problem for juveniles of important inshore stocks.

The continued dumping of trash fish by the large-scale vessels represents a major loss of supply. If this can be overcome the supply situation would be dramatically changed. This, however, seems unlikely in the short-term.

Aquaculture

Aquaculture can, and has increased the supply of fish. The government of West Bengal has proposed to take over Meendwip, an island near Haldia, for aquaculture. This project will be partly funded by NCDC. It is expected that after completion, it will be the biggest shrimp farm area in the country. This, no doubt, would tremendously increase the supply. In a state where demand for fish at current prices is so high, this has been a vital development for the consumer.

Aquaculture can, however, damage the aquatic environment through habitat destruction (land drainage and clearing or through mangrove cutting); the introduction of genetic changes in the wild stocks; pollution, and introduced disease. Given the importance of aquaculture to West Bengal, this is clearly an area which will require monitoring in the future, especially as the estuarine waters of the coast are the nursery grounds of so many important species. Salinisation of paddy fields adjacent to prawn culture ponds poses a potential problem which may affect future supplies of either rice or prawns. A government scheme to develop aquaculture as silvipisciculture activity within the Sundarbans without damaging the existing ecosystem (with which BOBP was involved in the planning and operational stages) failed after a year or two mainly due to lack of inter-departmental coordination/cooperation. Aquaculture can also affect the biodiversity of wild stocks through the introduction of new or changed breeds into the wild stock or by displacing wild species altogether.

Other human interactions

Other human interactions include forestry, agriculture and livestock, industry, infrastructural development, tourism, shipping, urbanisation and mineral extraction. West Bengal is the most densely populated state in India with 764 people /km'. Human activities are thus concentrated and have an increasingly negative impact on the environment. Much of India is deforested and this leads to increased water run-off, flooding and soil erosion. Soil erosion and the resultant increased aquatic sediment loads reduce light penetration in rivers, lakes and coastal areas, choke up lagoons and rivers, and affect filter feeders, sea grasses and coral reefs. There is already considerable siltation of coastal landing sites although the cause of this is unknown. Flooding can also adversely affect aquaculture. Agricultural activity also contributes to soil erosion and the extensive use of pesticides and fertilisers contribute to pollution of the aquatic environment. Such pollution not only threatens the survival of the fish resource but also greatly reduces the amenity of the fishing communities.

Industrial development is a major threat to the resource. Karpagam (1993) states: "*The Hooghly estuary is choked with industrial wastes from more than 150 majorfactories which include 87jute mills, 12 textile mills, 7 tanneries and 5 paper and pulp factories,* " although studies carried out on the impact of pollution in the estuary suggest that the high tidal flushing removes much of the pollution. Such industrial activity must be considered a significant factor in the future supply of fish to all demand

segments of the market. Infrastructural development. such as the construction of roads and dams, is particularly damaging where it interrupts the natural flow of water or migrations of fish. Pramanik (1993) quotes local fishermen as saying that the Farakka barrage has disrupted the migration of Hilsa in the Hooghly river.

Urbanisation of the coastal area of West Bengal poses both a threat and an opportunity for future supplies. The production of sewage can have a very significant effect on the carrying capacity of the aquatic environment. The use of sewage in the increased productivity of aquaculture can, however. be a significant benefit.

Natural causes

One of the main environmental factors affecting the supply of fish is the weather. During the monsoon, offshore fishing is limited to the type of vessels which can withstand the weather. There is a distinct shift in the composition of species landed, away from marine and more towards estuarine species. and a fall in overall availability during the monsoon.

A wide range of factors may affect the supply of fish from other states. Local weather conditions including localised droughts affect inland fish production.

Micro-economic factors

Growth opportunities

If no growth opportunities for increased production exist then there is little scope for expansion of supply beyond improved use of available resources. Unfortunately with the expanding populations there is growing pressure for increased harvesting of existing resources and this can lead to declining returns to current users. Fish are probably more available offshore than in inshore and estuarine areas (see environment above). More trawlers of 23 m and above and other fishing vessels targetting oceanic fish can operate from West Bengal if suitable infrastructure and catch handling facilities are established in the harbours. Growth opportunities do exist in aquaculture and possibly in inland aquarium fish production.

Credit availability

Perhaps the most important micro-economic factor affecting the potential distribution of opportunities on the supply side of fisheries is the availability of finance to different groups within the sector. Although growth opportunities exist, access to them may be restricted or biased towards certain groups. This causes changes in access, between groups. to the available resources and to any growth opportunities on the supply side. The availability of credit and the conditions under which it is supplied to the small-scale sector directly influence its ability to take up supply growth opportunities.

The government has been particularly active in supplying credit potential buyers of mechanised boats and those wishing to initiate or expand aquaculture production.

Smaller vessel operators. who may not own their own boat, obtain credit less easily. The low levels of education amongst many fishermen limit their access to formal credit sources. This is compounded by their lack of collateral. Women have little or no access to credit. Some fishermen do, however, obtain shore-term credit in the form of advances from commission agents and other loans from boat owners. Other sources of credit include pawn shop owners in adjacent villages.

Credit provision and implementation to the small-scale prawn fry producers has, however, been less successful.

Small-scale enterprise skills

The best use may not be made of growth opportunities due to a lack of micro-enterprise skills. This is particularly so in poor communities with limited access to education. Most of the fishing communities in West Bengal are poor and many of the participants are illiterate. The extent of their business management skills could not be determined by the study but it is likely that they are generally low.

Opportunity cost of labour and capital

Where the supply does offer opportunities for increased activity and where the small-scale operators have the ability to access those resources, the benefits may be dissipated by surplus levels of labour and capital expanding into the fishery. Where few other opportunities exist. income from the sector, no matter how low, may encourage increased entry to the fishery if exploitation levels are not controlled. This will lead to the dissipation of benefits. reduced viability of capital and resource depletion. This is much more likely to happen in the coastal fisheries where access to resources is less controlled by tenure systems. Pramanik (1993) notes that many people would leave the coastal fishery of West Bengal if alternative income earning opportunities existed.

Market opportunity, access and information

Market opportunities in West Bengal are extremely good given the high demand for fish. Access to markets is, however, restricted in the coastal region by poor roads and fragmented communities. This limits the market knowledge available to the poorer producers and thus their ability to negotiate realistic

selling prices for their products. Likewise, the lack of capital accumulation by fishermen necessitates their entering to debt relationships to provide appropriate levels of capital. Their isolation from formal credit mechanisms increases their dependence on informal systems of borrowing. which may be particularly expensive.

The growth of world demand for fish and the static supply from many countries is liable to raise world prices and encourage countries to export more. This could affect supplies reaching the West Bengal domestic market in the future.

Institutional influences

The level of institutional organisation within different groups of the supply side of fisheries greatly influences their ability to coordinate actions. communicate needs and aspirations, and achieve economies of scale in selling produce and buying inputs.

The degree of organisation of small-scale producers in West Bengal is believed to be poor and this has a direct impact on their well being.

Political influences

The close proximity of the resources to Bangladesh and to the harvesting activities of fleets from that country present intergovernmental resource management problems which could affect future resource supplies. Likewise, the shared resources which migrate in the waters between West Bengal and neighbouring states pose management problems unless states can cooperate on management regulations and their enforcement. Regulations imposed by one state on its fishermen will be of limited value unless vessels of other states fishing in the same waters operate under similar restrictions.

In the medium term, resource harvesting capacity will have to be controlled and important and difficult decisions will have to be made regarding the distribution of catching opportunities between various harvesting/culture groups. These decisions will ultimately affect who participates in the fishery.

Technological factors

The technology of the capture side of the fishery allows different participants to access different resources. Small craft have limited range and tend to focus on the inshore and estuarine resources. Motorised vessels can go further offshore. The larger vessels are the only ones which can venture far during the period of poor weather.

The changes in the construction of nets as neu techniques are developed and new materials arc introduced will affect the opportunities available for women engaged in the production of nets.

Different levels of technology within the aquaculture sub-sector also affect the quantity and quality of the fish produced.

Access to infrastructure affects the ease with which product is supplied to the market under different weather conditions. The poor quality of access roads in the coastal and estuarine areas of South and North 24 Parganas, is a major constraint.

Social, cultural and demographic factors

Differences in education levels within communities and households, social systems, and levels of power and wealth influence access to development opportunities and determine who suffers most from changes in resource availability. The involvement of different groups in the fishery also affects the species of fish entering the market and their quality. The relative roles of men and women are particularly important in this regard. The education, extension. and health services which the state supplies affect the ability of different groups to contribute to the supply side. The role of women in looking after the home and raising children limits their input\ to the sector. Social and cultural prohibitions may also reduce women's roles. and restrictions on their behaviour limits their access to extension services.

In the past, the supply side of fisheries has been dominated by a few castes. This may have limited entry into the fishery and acted as both a constraint to development and an inadvertent resource management measure. The growth of the market. changes in technology and population pressure in areas adjacent to resources have changed this situation. Indebtedness of fishermen to outsiders has also resulted in the transfer of capital assets out of traditional castes and into the hands of traders and money lenders. The expansion of export markets has prompted an inflow of capital, from outside traditional castes, into the capture side of tishery and aquaculture. The availability of hight cost technology, beyond the means of traditional producers, has prompted changes in capital ownership patterns and the relationships between producers and traders. Such developments have also resulted in changes in the relative role of women in the sector, especially with the growth of the aquaculture sub-sector.

Changes in the micro-economic factors affecting the supply side affect different groups in different ways. Social and cultural biases at the community or household levels can change the access which different groups have to benefits. A changing micro-

economic environment can have particularly negative effects on the role which women play in the sector.

At present these factors are poorly understood in West Bengal.

3.3.6 Current Intervention

Non-governmental sector

There is reported to be considerable intervention by NGOs in the supply side of the sector in aquaculture but very little in the capture side. The NGO SANLAAP, with support from FAO-BOBP, has provided support to women prawn fry producers and community education.

The Ramakrishna Mission also works with fisheries, both capture and culture, mainly in the form of loan dissemination. Asha Welfare Society is involved in freshwater aquaculture development and social and economic development of fishing communities. Padmashri is involved in women's and wider community development of fishing villages.

The Lutheran World Service (India) is also reported to be working with the aquaculture sector and providing cyclone relief to the coastal communities.

In addition to these support bodies the fishermen themselves have a series of cooperatives within a three tier system. The primary societies are concerned with the supply of the product. Secondary level cooperatives at the district levels are concerned with the supply of inputs. The third level or apex body is the West Bengal State Fishermen's Cooperative Federation Ltd which acts as a coordination unit.

Private sector

The private sector refers here to all those entrepreneurs and employees engaged in the capture of fish, or its promotion, outside of the public service. The majority of fish producers are private sector operators and thus most of the supply is controlled by the private sector. Commercial banks and money lenders also provide the bulk of the finance for the capital development and operational expenditure in the sector.

Government

Past government support has strongly focussed on inland fish production. This partly reflected the preferences for inland fish within the state. In more recent years there has been growing emphasis on the marine and **estuarine** sub-sectors.

Government support for motorisation of the fishing fleet began in the 1970s. This allowed vessels to fish further offshore and thus increased the quantity of fish landed and the range of species. There has also been considerable support for the expansion of shore-based facilities and for improving access to markets through the cooperative movement.

The various state-based agencies and departments associated with support to the supply side of fisheries are outlined below:

Directorate of Fisheries

The Directorate is the key government body responsible for the formulation and implementation of policy and plans. It provides direct support in the expansion of supply from both capture and culture fisheries. It monitors and promotes improved management of the resources, and actively promotes the involvement of small-scale and poorer participants in the sector.

State Fisheries Training Centre and Freshwater Fisheries Research Station, Kulia

This Centre trains fish farmers, government staff and bank officials. It also carries out aquaculture research.

State Fisheries Development Corporation Ltd

This is the development arm of the state fisheries and is empowered to engage in fishing activities, fish farming and the promotion of these activities.With a view to transferring innovative technology from laboratory to land, a few off-campus demonstrations in farmer's ponds are being carried out by the officers of the research station.

West Bengal Fish Seed Development Corporation Ltd

This body was incorporated in 1980 as part of the World Bank assisted Inland Fisheries Project to promote the artificial breeding of cultivatable species of fish, set up hatcheries. market fish seed, and lease water bodies for farming purposes.

Benfish

Benfish is the only apex body of Fishermen's Cooperative Societies of the state. Almost all the NCDC assisted projects in the fisheries sector are being implemented by Benfish, for socio-economic upliftment of the poor fishermen. Ice plants and cold storages have already been set up in some places in the state and transport vehicles have been purchased for procurement of raw fish from different centres. It has a fleet of 250 mechanised fishing boats. Benfish has set up one modem processing plant at Salt Lake. **Calcutta** for preparation of different fish products with the help of modem machines.

Sunderhan Development Board

This Board was formed in 1973 and its activities include brackishwater fish culture development.

The Marine Products Export Development Authority

MPEDA is a statutory body under the Ministry of Commerce, Government of India. Its function is to promote the export trade of marine products and it operates an office in Calcutta. In addition to promotion of exports it actively supports the development of prawn farm production.

The Central Inland Fisheries Research Institute

This institute, located in Barrackpore, is aimed at developing optimal and sustainable utilisation of inland fisheries resources.

The Central Institute of Brackishwater Aquaculture

This institute operates a centre for brackishwater research at Kakdwip.

The Central Marine Fisheries Research Institute

The objective of this body is to collect and analyse marine resource data of commercially important species. It has established a unit at Junput to monitor landings.

The Anthropological Survey of India

The Anthropological Survey of India is based in Calcutta and carries out a wide range of anthropological research. In the past it has done some detailed research on fishing communities in West Bengal.

Landless Employment Guarantee Programme

This aims to create alternative income generating opportunities for the rural poor, especially during the lean season.

FAO-BOBP

The BOBP has been actively involved with the government in the past in the promotion of improved fish farming and prawn fry handling.

3.4 TRANSFORMATION OF FISHERIES PRODUCTS

After the initial supply of fish, it is transformed in several ways before finally being consumed. Transformation leads to changes in the product itself (processing and preservation), its location (distribution), its image in the eyes of consumers, and its price.

The transformation process is carried out by a range of operators, many of whom are in the small-scale sector. The process is subject to a wide range of factors which affect it and which cause problems. These are described below.

3.4.1 Types of Transformation

A. Product transformation

Product transformation occurs mainly to add value to fish or to preserve it, and can take many forms. The most common methods in West Bengal include icing, drying, salting, freezing, and fishmeal production. Packaging of fish is also a method of product transformation.

The various methods of physically transforming the products are discussed below:

Gutting andfilleting

There is very limited gutting of fish before sale. Fish are generally not filleted although larger fish are cut into steaks for retail purposes. In Howrah market some of the fish is gutted and cut into steaks after being sold. More developed gutting and filleting occurs in the higher value markets such as New Market (Hogg Street Market as it was earlier known).

Icing

Most of the fish landed by the smaller vessels in West Bengal is not iced as it is produced by vessels which have been at sea for a short period. Vessels going to sea for more than a day generally take ice. Fish which is transported from other states is well iced.

The majority of the fish (75%) from the marine environment is reported to be sold to consumers fresh. Much of the smaller estuarine fish is dried, except in the wet season. Fresh fish landed by the smaller boats is stored in ice at the landing site prior to auction or transportation.

There are130 ice factories in the coastal districts of West Bengal.

Freezing

There is freezing capacity but it is mainly targeted at export quality prawns, lobster tail and fish. Prawn producers sell their produce to processors who may then sell to exporters or export directly. Most of the product reportedly goes to Japan. There are some 30 plants registered with MPEDA for export, many of which retain their own quality control staff. However, as per the statistics of DOF, there are 32 processing plants with a processing capacity of 269 MT/day in the state. The state also has 28 cold storages with the capacity of 2468 MT. Some frozen fish does enter the market but this is generally frozen onboard the larger fishing vessels.

Salting

The main fish salted are shark. This is done in a few centres such as Kakdwip and Fraserganj and is mainly targeted at the ex-state markets, particularly Kerala.

Salting is usually done by brining in tanks, the product is then sun dried.

Drying

In the past, drying of fish was a common practice, mainly using the product from the bagnet fisheries. Due to the rising level of demand for fish the need to dry has reportedly decreased and less fish is now dried. Drying is usually carried out near the site of landing. Fish is dried for two main purposes: human consumption and fishmeal. Fish for human consumption takes many forms, including Bombay Duck. The drying of bhola or jewfish has great potential. This is currently exported from Bangladesh to Hong Kong, Singapore and Taiwan and represents an important export earner in that country. Production in West Bengal is either very low or not practised.

Drying is done in all three coastal districts. In Midnapore, where most of it is done, it is concentrated around Junput and Jalda. In 24 Parganas South it is centred in Fraserganj, Jamhoo island and Kalishthan.

The fish is dried on racks, hanging vertically (in the case of Bombay duck) or on the ground on mats. Fish for fishmeal is dried directly on the sand.

Shark fins are also dried in the sun, usually on sacks on the ground.

Fishmeal production

Fishmeal is used as poultry feed. Roullot and de Mautort estimated that there were some 40 units in Midnapore alone and others in 24 Parganas. These units. which appear to have reduced in numbers in recent years. consist of a large storage plant and a grinding machine. They utilise the dried product.

Crustacean drying also occurs, particularly of acctes prawn. Information available indicates that some quantities of dried acetes are exported as pet feed to European and Gulf countries.

Canning

There is no canning of fish in West Bengal.

Packaging

There is no substantial packaging of fish for the domestic market except during the process ot distribution. Packaging for export is carried out. The packaging of' fish betwaeen states or between distant landing sites **and** markets, is by bamboo baskets. The fish arc very neatly packed, often by species, and layers of fish are interspersed with layers of ice. The sides of the basket are often extended by woven leaves and the top covered with a gunny sack. The basket is then bound with rope. Fish may also be packed in tea chests with insulated packing.

Live fish

Some fish undergo no product tranformation but remain alive. Two main groups of live product are handled: aquarium fish and prawn fry. There are also reportedly some aquaculture species which arrive live at the market.

Value-added products

There is some value-addition in products for the markets targeting higher income consumers. The fish is gutted, filleted and then cut into thin slices. Prawns are shelled. deheaded and deveincd. A modern processing centre for drying different varieties of low value fish has been set up in Junput in Midnapore district. A large number of modern machines have been installed at Junput for production of fisheries by-products from raw fish. A team of scientists attached to Jadavpur University has manufactured special machines for the production of tasty and hygienic dry fish.

Others

Various attempts have been made by the private and public sectors to extract oil from shark on a commercial basis. It is unknown if oil extraction is currently practised in the state.

B. Place transformation

Fish is also transformed in terms of its location. It is moved from the fishing ground to the point of landing then undergoes a series of relocations until it reaches the final consumer.

Marine fresh fish

After harvesting. the fish is transported to the landing site. In places where the shore is easily accessible it is unloaded directly onto the beach. In other cases it **may** be necessary to transfer the product to smaller craft which carry the fish ashore. The fish is transported in bamboo baskets and may be carried to the godown of a trader or commission agent by a headloader or. if some distance from the landing site. by a rickshaw operator. Some fish may be directly sold by the fishermen to retail traders. The retail traders may then take the fish by headload or bicycle to their customers in neighbouring villages. Most fish is, however, sold through commission agents (aratders) or to traders. Sometimes there is a trading or debt linkage between the boat and the agent and thus fish will go preferentially to that person. In some cases the trader owns the boat and thus gains preferential access to the fish. If the producer has no obligation link then he may sell or auction through any trader. If the fish is not landed at the producer's normal landing site, perhaps because of tides or weather, hc may sell to, or through. an *aratder* at another site.

After landing fish is taken for processing, retailed locally or transported to one of the main wholesale markets. Most of the landing sites are connected to the outside markets by road. Some of these roads become impassable during the wet season. Where roads do not exist or are unusable, fish is transported hy water. At Diamond Harbour the fish is landed directly into the wholesale market.

Women catching fish in the shallows or in small boats may take their fish to neighbouring villages where they sell directly to consumers. Women and children catching prawn fry hold them in small containers or in pits in the ground until a buying agent arrives. Fry can be kept for up to 12 hours in this way but high mortalities are observed.

The main destination for fish is Calcutta where there are several large markets including Howrah, Chhaglhate. Sealdah and BK Pal. Namkhana and Diamond Harbour are important wholesale markets outside Calcutta. In addition. there are some 120 retail markets around Calcutta. Sealdah handles mainly cultured and estuarine fish from within the state, it receives fish from smaller markets such as Namkhana and Chhaglhate. BK Pal is a smaller market which tends to handle brackishwater fish. Diamond Harbour is one of the main marine fish markets.

Fish taken to the Howrah wholesale market is handled by commission agents who on-sell for the wholesalers. Fish traders in the other markets tend to be wholesalers rather than commission agents although some commission agents do operate, in Diamond Harbour for instance. After the fish is sold, it is carried by headloaders to the buyers' vehicle and is transported to retail markets in Calcutta or inland. Within Calcutta, fish is distributed to the urban retail markets from the main wholesale markets. Most of these markets (75%) are under the control of the Calcutta Municipal Authority. The rest are owned by the private sector. Fish is also retailed by headloaders and bicycle traders operating in their own communities.

Howrah market is the main market for fish from outside the state, it also handles large quantities of carp from the inland fisheries.

Freshwater fresh fish

This is either harvested from open water bodies on a continuous basis or periodically harvested from culture tanks. When fish is caught from open water bodies it is usually sold by the fishermen directly to local retailers such as cycle traders or headloaders.

When it is time to harvest from a culture area the farmer informs a trader who agrees on a price and arrives on the day of harvest with a truck and ice. The fish is packed in ice and taken by the trader ot commission agent to Howrsh or one of the other markets. It then follows the same route as above.

Ex-state fish

Fish from outside the state enters West Bengal by train and truck. Commission agents are contacted by suppliers from other states who agree to send certain quantities to the main wholesale markets in West Bengal. Supplies are secured with advances paid by the commission agent to the supplier. These are of two types: the first secures the initial relationship and is gradually discounted over time; the second is on a consignment by consignment basis and represents part payment. The fish is then packed in ice in trucks (either in plastic trays or baskets) and sent to West Bengal. Fish from the west coast arrives by train, mainly in tea chests.

From the train the fish is transported by rickshaw porters. Once in the market the fish follows the same route as above.

Frozen fish

Frozen fish is purchased from wholesalers. frozen by fish processors and then sold to exporters who ship the product by refrigerated ship containers to the destination port. Some fish is landed frozen from the trawlers.

Salted fish

Salted fish is sold by the processor to specialist salted fish traders who ship the product to distant markets, generally in Kerala.

Dried fish

After processing the dried fish for human consumption is packed in gunny sacks and transported by road or rail to the wholesale markets in Calcutta. Specific markets exist for dried fish including Territy Bazaar in Calcutta. which receives most of the dried fish from the 24 Parganas districts, and Uluberia in Howrah district which receives most of the produce from Midnapore. Dried fish is sold mainly in the hilly areas of West Bengal, Assam, Nagaland, Kerala, Orissa and Tripura.

Fishmeal

Fishmeal is produced in the village, packed in gunny bags and taken by the fishmeal plant agent to the plant for processing.

Live fish/prawn fry

The movement of aquarium fish in West Bengal was not studied. Prawn fry is sorted in pots and then sold to agents who sell them to prawn farms.

Value-added products

These are generally sold directly to the customer by the processor.

No information was available on smoked fish, canned fish and other products.

C. Image transformation

The image of fish can be changed through active promotion programmes of the government, NGOs and the private sector.

The government may promote fish as a healthy source of protein through education programmes on radio, television or in the press. Such education may also be channelled through school curricula or community extension programmes. Government poverty alleviation programmes may also promote fish through subsidised distribution: for example, through school meals. NGOs may likewise promote the consumption of fish through health and nutrition programmes.

Private sector traders and businesses generally promote fish in order to increase sales or selling price. They may use messages similar to those used by the government and NGOs but their motives for doing so differ.

Image transformation is not attempted on a large scale in West Bengal because of the continuous and traditional high demand for fish.

D. Price transformation

The main features of price transformation for each type of product are outlined below:

Fresh fish

The isolation of the fisherfolk, compounded by the often weak road linkages, means that fish producers have poor market information and are potentially subject to price manipulation by the traders.

In many cases, fish producers are indebted to godown owners (aratders) at the beginning of the fishing season as a result of the lending of capital or operating costs necessary to start fishing. Fishermen may thus be bound into a relationship with the aratder over that or subsequent seasons. This relationship may appear exploitative in that fish producers may receive low prices for their catch, but the prices paid often incorporate loan repayment, interest and other services provided by the aratder. During auction the price paid to the fish producer also varies according to the selling system and how the commission paid to the auctioneer is deducted. These systems varies between locations within West Bengal and these various transaction costs must be considered in the price transformation process.

Likewise, as the fish moves along the marketing chain various inputs are made by transporters, traders, storage agents and commission agents which all contribute to increasing the price. Understanding the relative benefits accruing at different stages is often difficult and, in West Bengal, little studied.

Dried fish

The dried fish trade appears to be dominated by a few traders and it is likely that they also exert considerable control over the price paid to fishermen. Again, the traders or commission agents are likely to input various services during product, place and image transformation of the fish which is reflected in the returns which each receives. The degree to which one stage manipulates or exploits other stages in the chain is not known.

Fishmeal

Prices are kept very low for this product as there is competition from other protein sources.

Frozen fish, salted fish, live fish/prawn fry and value-added products were not studied. No information was available on smoked fish, canned fish and other products.

3.4.2 Participants in Transformation

The main participants in the transformation of fish are men. Women appear to play only a limited role in this operation. This might, partly, be because men often migrate to fishing camps for the fishing season and leave the women behind. Poorer rural communities in West Bengal also tend to isolate their women from wider social contact. In some fisheries they are hired to participate in the sorting and drying of fish although the extent of this participation is unknown. They also play a role in fish marketing, particularly at the retail end of the chain. The actual extent of their input is poorly documented.

Distributors

There are many small-scale people engaged in the transfer of fish between vessels and the shore and between shore and markets. Within markets there are also headloaders who move fish between traders or to and from trucks.

The initial point of transformation, after the producer, is the aratder who stores the fish, buys it from the producer or acts as a commission agent for the producer. In some cases he may also be involved in the processing of fish.

The participants in the fresh fish marketing chain outside of the village are mainly of the castes Kaibarta, Rajbanshi, Dhibar, Bagdi and Tiyor, although Muslims constitute a major component of

fish sellers in certain markets. The actual selling of fish is predominantly controlled by Bengali people but others are involved in the transportation of product. Most appear to sell fish as their principal occupation.

The distributers of fish are from a wide range of backgrounds. They have close ties with the fishermen and often provide funds in advance at the beginning of the fishing season. Fish may be transported by truck, bus, cycle or by headload.

Women play a minor role in the wholesale distribution and sale of fish and are more involved in the retail.

Processing agents

There appear to be differences from area to area in the people who dry fish. In the 24 Parganas districts the fishermen reportedly dry their own bagnet-caught fish before selling it. In Digha there is greater division of labour with the fish processors being different from the producers.

The fishing camps involved in the seasonal bagnet fishery in 24 Parganas sell their dried fish to aratders. These agents transfer the product to dadandars or wholesalers mainly in Tenity Bazaar. The dadandars are reported to be mostly of the mopla caste from Kerala.

Ancillary Participants

Ancillary participants involved in the supply of ice, salt and fuel are generally the larger operators. Women make bamboo baskets and cycle operators provide transport. Local bus services are also often used to transport fish.

3.4.3 Factors Affecting Transformation

Macro-economic policies

Policy choices at the macro-economic level may have a very direct impact on the development of the supply side of fisheries in West Bengal. Some of these are outlined below:

- Regional support to West Bengal relative to other states
- Support for urban or rural development
- Support for large-scale or small-scale operations
- Promotion of private sector or public sector growth
- Focussing on primary production growth or other growth in other manufacturing and services
- Support for export or domestic market growth
- The use of fiscal or monetary policy instruments

Choices made between these policy areas and within each one, at both the national and state levels, have a significant impact on how the supply-side of the fisheries sector develops and who has access to the benefits from, and opportunities in, the sector. The Central Government provides guidance to the state on these choices and directs development efforts, to some extent, through the allocation of funds.

Sectoral policy and legislation

Sectoral policy can have a significant effect. Sectoral policy formulated at the state and national government levels influences the transformation of fish. The main policy options include:

- Support for large or small-scale operations
- Promotion of export or domestic consumption
- Promoting inland or marine fisheries expansion
- Promotion of capture or aquaculture operations

Policies relating to the transformation of the product have always been implicit in Central Government policy but the past emphasis has tended to be on increased production, particularly in the earlier plan periods. Later the focus on post-harvest transformation increased, especially in line with the drive for increased export. This emphasis has also manifested itself at the state level where improved landing facilities, roads and markets have long been a thrust of development.

In addition to improvements in the distribution and marketing of products, sectoral policy has also aimed at distributing the benefits of that transformation process across as wide a range of beneficiaries as possible, with emphasis on the poorer segments. Support for private sector growth has been an important policy of government, although state-run institutions have also played an important role in the development of the sub-sector and commercial participation in its growth.

In more recent years there has been a move towards adding value to the products produced by the sector, especially those aimed at the export market. This has had limited success but will be a growth area in the future.

Environment

Variations in the supply side of the sub-sector as a result of seasonal changes in the environment and environmental degradation can also affect the transformation side of the sector. Seasonal supply changes affect the availability of fish and affect the price structure within the market. This changes the relative importance of different processing techniques. Changes in the weather can also affect

the transformation process itself. In the rainy seasons very little fish drying can be carried out. Roads may also be impassable and product may have to be moved by sea or be delayed in reaching market, to the detriment of its quality.

The degradation of the environment may also lead to changes in species composition, the average size of fish or its quality. The quality of handling of products affects their appearance and this may affect the price along the different stages of the transformation process.

Fish retains its image of a healthy food source. For this to continue, it is necessary for the environment in which it grows to be free of pollutants and pathogens. There is clearly a need to ensure that the image of fish remains attractive to the consumer.

Micro-economic factors

The main micro-economic factors affecting the transformation side of the sub-sector are:

Growth opportunities

Growth opportunities are largely a reflection of the supply-side of the sub-sector and emphasise the interconnections of the areas. Without increases in supply, few opportunities for increased transformation will arise. There are, however, some opportunities for increased value-adding for the export market and for reducing losses in quality due to poor handling and processing.

It is likely that some fish will move from one market segment to another as demand changes over time. One important shift may be away from domestic consumption and towards greater exports, which will have significant implications for transformation.

Credit availability

Those who can access finance to make use of expansion opportunities will benefit most from them. This will focus opportunities into the hands of a few wealthier people, most of whom will be men.

Small-scale enterprise skills

Those most able to benefit from transformation changes on a sustainable basis will be those who manage their finances and businesses best. Given the lack of education of the poorer community members, they will tend to be exposed to higher risks than the more educated and established traders.

Market opportunity, access and information

The successful transformation of the products depends on transforming in the right way, at the right time and place, and at the right price. This requires good market knowledge and access to the markets. As markets become more sophisticated and market chains become longer, access to timely accurate information becomes essential.

Institutional influences

Some of the participants in the transformation within the private sector have institutional strength. This is particularly so for the larger traders/commission agents. In Howrah, for instance, there are three associations which include many of the commission agents. It is likely that such organisations confer on their members considerable power over the transformation process. The smaller traders at the retail end of the marketing trade are less organised and thus more likely to suffer from changes in the operating environment.

At the government level, past emphasis on the production side of the sector has limited the growth of institutional capacity and experience on the transformation side.

NGOs have also tended to focus on the production or community development aspects of the sector and they appear to lack skills in the post-harvest sub-sector.

Technological influences

Access to technology greatly influences product transformation and may also reduce the cost of certain transformation processes.

Of particular importance are access to the following levels of technology:

Onboard storage facilities

The availability of on-board technology for the storage of fish affects the quality of the fish landed. In many cases there is insufficient space onboard to handle the icing of fish or the less valuable parts of the catch.

Shore landing facilities

One of the key technological elements in the transformation process is the provision of adequate shore facilities. The government, at both state and national levels, has emphasised this in the past, and now there are appropriate landing facilities for most of the mechanised and larger vessels. These are affected to some degree by siltation.

The type of landing facility affects the employment opportunities for different groups. Where landing and road facilities are well developed, employment will be of specialist groups only, but when the facilities are more limited, a wide array of carriers (small boats, headloaders and cycle traders) are involved in moving the fish. This generates much local employment and

changing infrastructure should consider what alternatives exist for these displaced people.

A programme has been taken up for creation of infrastructural facilities for landing and berthing of catch from the sea estuaries and rivers. Apart from the 53 existing temporary and seasonal landing centres in South 24-Parganas, Midnapore and North 24-Parganas, 12 more with permanent structures with cemented landing jetty, covered fish washing platform, community hall and tube well have been set up and a few more are expected to come up in the districts of Midnapore, South 24-Parganas and Nadia.

Onshore processing facilities

The processing of fish requires certain types of technology which reflect the needs of the market and the capacities of the users. The drying of fish is done using very basic methods and these may well reflect the price which the market will pay and possibly, a lack of market information. Improved technology may improve the product but may not necessarily improve the returns to the processor. The benefits could accrue further up the marketing chain.

Transport and storage

The roads connecting the landing sites to market play an important part in attracting traders and allowing access to public transport systems. At certain times of the year the roads may become impassable due to the weather.

Fish is carried in bamboo baskets between the landing sites and godowns, between godown and trucks and between different stages in the wholesale market. These are also used on the backs of cycles and as headload carriers. The quality of these baskets will affect the keeping quality of the fish over time and affect the prices paid to the traders.

Marketing facilities

The handling and trading facilities at the wholesale and retail markets affect the quality of the fish. In general the markets have limited cleaning facilities and working conditions. The surfaces are poorly drained and often not sealed. Dirt, debris and waste material are often not cleared properly.

Ancillary facilities

These provide services such as the supply of ice. Their frequency, production and location greatly affect the availability of ice to fishermen and traders. In the interior Sunderban areas, availability of ice is negligible, if not absent.

Social, cultural and demographic factors

The growing population in West Bengal is likely to increase demand for fish in the short to medium term. Given the limited supplies, prices will tend to rise. It is likely that this will affect the availability of fish being processed as fishmeal or dried for human consumption. Likewise the increasing demand for fish in other states may also reduce the availability of fish for transfer to West Bengal.

3.4.4 Current Intervention

Non-governmental sector

There is little involvement of the NGO sector in the transformation process. SANLAAP, as mentioned above, has, with FAO-BOBP support, provided inputs to the improved handling of prawn fry. An NGO, INSS, supported by the project, introduced some iceboxes for onshore and onboard usage in South 24 Paraganas district.

The cooperative movement deals with the production of ice and to a limited extent the marketing of fish.

Private sector

The private sector is the main driving force in the transformation process and it responds to the needs of the market as required.

Government

The main inputs from government on the transformation side are from the bodies discussed in 3.3.5 above. The Directorate of Fisheries has a Monitoring, Evaluation, Marketing and Statistics Wing which monitors the transformation process and provides data for planning purposes. MPEDA also plays an important role in the transformation of fish for the export market. The Central Government and most of the state governments in India together established an organisation — Central Fisheries Corporation — to channelise the ex-state inflow of fish to West Bengal for the benefit of all concerned — producers, traders and consumers of other states and West Bengal. After a few years it failed, for various reasons, mainly the nexus of the local wholesalers who were strongly against the government organisation entering marketing on a large scale.

The government has made attempts to improve the landing facilities and has carried out some extension activities in the improved handling of product.

The project has made inputs to West Bengal in the areas of trash fish landings, improved jewfish processing and has also supported a marketing study in West Bengal.

4. ORISSA POST-HARVEST OVERVIEW

4.1 FISHERIES AND THE STATE ECONOMY

4.1.1 Background

Located on the east coast of India, Orissa has a coastline of 480 kms. The continental shelf area of 24,000 sq km is open to marine fishing and is widest off the northern district of Balasore, narrowing toward the south. The rivers in Orissa cover approximately 1536 km, and all of them flow southeast towards the sea. The state, which covers an area of 155,707 sq kms, earlier had thirteen districts, which were split into 30 districts in 1993. The four earlier maritime districts were divided into six: Balasore. Bhadrak, Jagatsingpur, Kendrapara, Puri and Ganjam. The population of the state was estimated at 3 1,659,736 (1991). The rural population is 27,424,753 (1991). Bhubaneswar is the state capital and the official state language is Oriya.

The marine catch potential was estimated to be around 125,000 mt, which are harvested by different types of mechanised, motorised and traditional crafts. The present marine fish landing is approximately 120,000 mt, around 56% of the total fish production in the state.

The marine coastal waters of Orissa were traditionally utilised by fishermen from Andhra Pradesh and not by indigenous fisherfolk, who fished in the inland freshwater bodies. In 1958, mechanised wooden trawlers were introduced by the state government as part of the first Five-Year Plan programme. There are 458 small and medium sized trawlers in the state and 2,520 gill netters, motorised beach landing crafts and FRP catamarans.

Resources

The coastline of Orissa can be broadly classified into two distinct areas: the shallower northern coast extending northwards from Rajnagar in Jagatsingpur district to Kistania in Balasore district which has a broad shelf, gradual slope and greater tidal effect; and the southern coast extending southwards from Paradeep in Jagatsingpur district to Pattisonapur in Ganjam district, which is narrower with broad sandy beaches and open surf-beaten shores.

The southern coast, from Bahutia estuary to the mouth of Lake Chilka is considered the deepest region with a rocky bottom. The coastal waters from the mouth of this lake to Dhamra, although comparatively shallow, are rich with demersal and pelagic fish. The off-shore region from Dharnra to the mouth of the Subarnarekha is much shallower and has commercial pelagic fisheries.

Present Level of Exploitation

Based on the nature of the beaches, Orissa fisheries can be broadly divided into two zones: north and south. The two zones host distinct types of craft, most of the displacement craft being operated in the north and the raft type catamarans confined to the southern surf-beaten areas. The estuaries in the north allow the operation of plank-built displacement crafts like the cheat, patia, salti, donga and lingu and also the sabado boats. The common catamarans locally known as teppa, podhua and nava are the other crafts operated in the south.

Most FRP catamarans on the coast have been motorised by outboard motors and inboard engines have been installed in country boats. The predominant fishing method is gillnetting, though shore- and beach-seines, boat-seines, encircling nets, small longlines and handlines are not uncommon.

There are 2978 small and medium sized mechanised fishing crafts on the coast engaged in marine fishing, mostly from Paradeep, Dhamra and Chandipur in Balasore district. The concentration of mechanised fishing crafts is maximum at Paradeep and minimum in Ganjam district, where infrastructure facilities are poor.

4.1.2 Domestic Food Security

Freshwater fish has traditionally supplemented the diet of the rural population in Orissa, who are dependent on agricultural produce. In fact, alongside West Bengal and Kerala, Orissa is another state where per capita fish consumption is very high. Marine fish has been a relatively recent addition to the diet of inland consumers.

4.1.3 Employment

With 140,629 active inland fishermen and 53,646 active marine fishermen, the fisheries sector contributes substantially to rural employment. The figures would be greater with the inclusion of employment in ancillary services.

4.1.4 Income

Fisheries has a significant impact on income in the state. It should also be noted that Orissa is a net exporter (ex-state) of marine products and therefore not only contributes to national protein requirements. but also supports sector-related employment in other regions of India.

4.1.5 Foreign Exchange

The fisheries sector is a growing source of income for the state. The total value of marine exports from Orissa was Rs I 127.785 million during 1993/94 and 1605,881 million during 1994-95.

4.2 DEMAND FOR FISHERIES PRODUCTS

4.2.1 Demand Characteristics

Current quantitative demand

There is a lack of information concerning markets and market demand for the variety of products. Qualitative information seems to suggest that, at current prices, there is still a buoyant demand for most fisheries products in the various market segments. This is often reflected by rising real prices, even when accompanied by increases in the quantity of product supplied to that market.

The Government of Orissa estimates annual per capita consumption at 7.78 kg, and total state consumption at 154,615 mt during 1993/94. Approximately 42% (43,649 mt) of the total marine production was consumed within Orissa during 1993/94. During the same period, 90% (104,734 mt) of freshwater production and 52% (6,232 mt) of brackishwater production was consumed within the state.

It is estimated that 26.4 million people in Orissa, or 80% of the total projected state population, are consumers of fish and fish products.

Product type, species composition and quality demanded

Fresh fish

There is a strong preference for freshwater species in the inland markets of Orissa. The main species consumed is carp. The fish is often of good quality when it reaches consumers, given the relatively short distances and handling techniques involved.

The rise in price of freshwater species, relative to many marine species, has increased demand for cheaper marine fish in the inland markets. There is a limited inland market for the higher value species such as seer fish, hilsa, pomfret, perch, mullets and shrimp, most of which is transferred out of Orissa to other states.

The marine fish consumed in inland markets is of variable quality and is a reflection of the variety in catching and handling techniques involved. The fish destined for low income consumers is often of lower quality, and they rarely have the ability to absorb any price increases which may result from improvingthe quality.

Frozen fish

There is no evidence of a market for frozen fish products within Orissa. There is. however, a high demand for frozen shrimp, which is destined for export markets. This product is consistently of high quality.

Salted fish

The consumption of salted products is generally greater among the lower income groups in Orissa. Shark, ribbon fish, sardines, mullets, hilsa and sciaenids are normally salted, and are usually of reasonable quality. Salted shark is not consumed within the state, and is exported to Kerala by traders in trucks.

Dried fish

Sardines, small prawns, anchovies, jewfish and ribbon fish are particularly popular as dried products. There is demand for these products amongst local consumers and those in other states. Good quality dried fish is generally not readily available (BOBP, 1992) and often contains varying quantities of salt, sand and dust.

Fishmeal

A large portion of the marine catches does not find ready consumer acceptance because of their small size, low meat yield, bony structure and poor taste. These fish, generally termed as "trash fish", are lower value species from shrimp bycatch and any other spoiled fish, and are normally utilised by tishmeal production plants in Orissa. There is an installed capacity for processing about 9 mt of fishmeal per day. A major portion of the trash fish is sent to fishmeal plants in neighbouring states, particularly Andhra Pradesh and West Bengal.

Canned fish

There are no fish canning factories in Orissa. There is no demand for canned products.

Live fish/prawn fry

There is an increasing demand in Orissa for fish and shrimp seed. The species of seed in demand is mainly carp, P.monodon, *P.indicus,* M.roserthergii and *M.malcomsonii.* Seed from hatcheries is normally of good quality, while the quality of wild seed is dependent on the method of handling after capture. The crisis in the aquaculture industry affected this trade adversely.

Value-added products

Shark is an important catch of Orissa, particularly off the Puri coast. Shark liver oil in its crude form is collected and sent to Tamil Nadu and Andhra Pradesh.

Value-addition to the traditional products in the state is almost negligible. M/s Kay Pee Exports Pvt Ltd, and Oriental Dry Fish Industries, both in Paradeep, produce and market improved quality dried fish products locally and in distant markets.

Available data indicates good demand for improved quality products. The experiences of Fishfed (the apex fishermen's cooperative body in Orissa) in preparing and marketing fresh fish fillets in sachets, etc., show that there is a good market for improved products in urban markets.

Other products

A limited market exists for smoked fish and prawns, particularly in the hinterland and tribal areas.

Variability in demand

For religious reasons fish is not eaten by certain groups on two or three days a week (Monday, Thursday and Saturday). The high occurrence of auspicious days in October-November (when fish is eaten selectively) often reduces overall consumption. Consumption of fish is said to rise during July and August as there are few auspicious days.

4.2.2 Demand Segmentation

Coastal retail

Within Ganjam and Puri districts the majority of artisanal marine fisherfolk are of Telugu origin. while in Cuttack and Balasore districts they are predominantly Oriyans. Low incomes are a characteristic of both groups. The Oriyans are traditionally not marine fish consumers. Their preference is brackishwater and freshwater species, although some marine species are also consumed. Those of Telugu origin prefer marine species.

The lower value, smaller sized fish such as sardines, anchovies, catfish, ribbon fish, mackerel and small shrimp are consumed locally. Tuna, considered a low value species, is consumed locally by poorer income groups. Dried products from low value species are also consumed locally.

Inland retail

Inland rural customers are predominantly Oriyans and generally have a greater preference for freshwater species although the consumption of marine species has increased in recent years. The poorer customers normally purchase lower value fish products in fresh or dried form.

The main markets for dried fish products in Orissa are at Bhadrak, Rambha (Humna) and Rajsunakhala. These are predominantly wholesale markets but some retailing also takes place.

Industrial

Little information is available on the demand for fishmeal in the state. There are two fishmeal plants based in Paradeep and Balasore with production capacities of I mt and 8 mt respectively. Dried fish is purchased locally.

Institutional

Institutional customers may include:

- Prisons
- Hospitals
- Hotels/restaurants
- Schools/colleges

In Orissa the armed forces and police do not purchase fish products. lnstitutional purchases are usually made by prisons, hospitals and hotels, who deal with an established wholesaler. These customers tend to be urban and reliant on relatively large quantities and consistent supplies of fresh fish. Changes in demand from this group may have a significant impact on the availability and price of fish which the small-scale-trader may have access to.

Exports to other states

The wholesale demand varies according to the final destination of the product, as it is a reflection of consumer demand in those markets. The main species purchased are the higher value species such as seer fish, perches, pomfrets, hilsa and *Bhekti*. Various wholesale markets can be identified in other states such as Tamil Nadu (Chennai), West Bengal (Calcutta), Maharashtra (Mumbai), Kerala (Alwaye, Calicut), Andhra Pradesh and Delhi. Of note are the following markets:

Calcutta (West Bengal)

Wholesalers supplying Calcutta markets often purchase large quantities of fresh fish from both marine and freshwater sources.

Chennai (Tamil Nadu)

Chennai wholesalers purchase fresh species as well as species of dried fish.

Alwaye and Calicut (Kerala)

Wholesalers supplying Kerala mainly purchase salted shark meat products, other dried fish products being traded on a smaller scale.

Andhra Pradesh

Wholesalers are involved with the supply of dried fish products to Andhra Pradesh for use in fishmeal, although some dried fish for human consumption is also traded. Dried fish producers — particularly women — take their produce to Nakkapalli market in Andhra Pradesh.

Overseas exports

Export packers purchase prawn for export. There is a strong demand for prawn within a particular size range and quality. During 1993194 annual exports of marine products from Orissa were estimated at 94,4 13 mt. There were 22 exporters registered with

MPEDA in 1993. There is also a strong export demand for dried shark fins.

Aquaculture

Orissa Fish Seed Development Corporation, headquartered at Bhubaneswar, has set up five hatcheries for the production of Indian major carp seed and supplies seeds to interested farmers. The Department of Fisheries takes up induced breeding work in government farms and arranges for supply of fish seeds.

4.2.3 Factors Affecting Demand

Macro-economic policies

The demand for fish may be influenced by fiscal, monetary, exchange rate, trade and development policies. Given the time constraint, a thorough assessment of these is beyond the scope of this study.

The recent decentralisation of the Export Promotion Capital Goods licensing scheme (EPCG) now facilitates the export of perishables through a greater number of ports (those with a deputy collector of customs). This may stimulate the export demand for fisheries products by reducing the transaction costs of exporters.

The recent increase in fuel prices will increase the shipment costs associated with fish destined for ex-state markets. The demand for certain species may be affected if these costs are transferred on to the consumers in distant markets.

Sectoral policy and legislation

Sectoral policies at the national level have always identified the domestic consumption of fish as an important component of its various development plans, although there has not been an active programme to promote demand. Likewise at the state level the domestic consumption of fish has always been high and the problem has been perceived as one of supply rather than demand.

The Central Government, through MPEDA, has promoted demand for Indian products overseas and this has directly benefitted Orissa's growing prawn farming industry and, to a lesser extent, its fish export business.

Environment

The import regulations of many nations are becoming more stringent. This may influence the type and quality of product exported from Orissa.

The excessive demand for a certain species can often affect the sustainability of the resource if effective management measures are not introduced. This may be the case with the mud crab resources in the Chilka lake area.

The perception of fish as a healthy food product is prevalent amongst the wealthier and/or better educated groups of consumers.

Micro-economic factors

Micro-economic factors affecting demand may include:

Price

No information was available on the price elasticities of demand for the various fish products.

No information was available on cross price elasticities for the various fish products.

Changes in taste

There is little information on changes in the tastes of consumers in Orissa.

Changes in income

No information was available on the income elasticities of demand for the various fish products.

Institutional influences

There are no institutions in Orissa which actively participate in the monitoring and assessment of demand for fish in the various domestic markets.

Technological influences

The major technological influence on demand is that of electrification. This has affected the distribution of refrigerators in households and local stores. In Orissa 68.9% of the rural villages have electricity although the extent of use of refrigerators for the storage of fish is unknown.

Social, cultural and demographic factors

Population increases are likely to be the most significant factor affecting demand in the medium and long-term. Growth rates in India are high (2.62% per year for the period and 1978/9-1988/9) and already dense populations will mean that less land is available for other forms of animal protein. This will in turn increase the demand for cheap animal protein from the aquatic environment.

Different festivals call for different species of fish to be consumed in larger quantities.

4.2.4 Current Intervention

Intervention in demand promotion and understanding can take place at three levels:

Non-governmental sector

No information was available.

Private sector

The private sector has developed very well in the marketing of fresh fish and exportable varieties. In the small-scale processing sector, initiatives by agencies such as Fishfed, Oriental Dry Fish Industries and Kay Pee are in the initial stages.

Government

Under the Ministry of Commerce, MPEDA is active in the promotion of exports of marine products from India. **One** of its main activities is the development of marketing strategies to access overseas markets and encourage group marketing under brand names. The extent to which specific activities have been established in Orissa is unknown.

4.3 SUPPLY OF FISHERIES PRODUCTS

4.3.1 Availability and Sources of Supply

The total supply of fish from the state of Orissa during 1996-97 was 276,952 mt. Supplies are made from freshwater, brackishwater and marine fisheries. During 1996-97 the supply was:

Fresh water	-	127,293 mt	45.96%
Brackishwater	-	16,197 mt	5.85%
Marine Fisheries	-	133,462 mt	48.19%
Total		276,952 mt	

There has been a steady increase in fish production from both capture and culture sources. The total catch from all sources from 1993-94 to 1996-97 is given in an annexure. Besides the above. 35,000 mt of fish was imported from other states during 1996-97.

Freshwater supplies

Orissa has 1,14,125 ha of tanks and ponds, 1,80,000 ha of lakes and swamps and 2,56,000 ha of reservoirs, besides a network of rivers and canals which has a total area of 1,55,400 ha. Thus the total area is 7,06,222 ha.

There are 1441 reservoirs in the state in all districts. The present level of production in the reservoirs is less than 4 kg/ha in big reservoirs and 40 kg/ha in small reservoirs. Recently the Irrigation Department has allocated the fishing rights of 79 reservoirs for development of fisheries through cooperatives which account for 45.96% of the total production of Orissa. The total area under production is 114,822 ha. The main cultured species is carp. The seed production from the departmental, private and public sector carp hatcheries was approximately 2117.72 lakh during 1996/97.

Brackishwater supplies

Brackishwater production was 12,903 mt during 1995-97. This increased to 16,197 mt during 1997-98. The source of these supplies consists of the lagoons and estuaries, which cover an area of 405,950 ha. Prawn production during 1995-96 from brackishwater areas was 6957 mt, whereas during 1996-97 it came down to 6627 mt. The total area developed for brackishwater prawn culture is 12439.07 ha. The total prawn production from culture sources was 6957.33 mt during 1995-96 and decreased to 6626.79 mt during 1996-97. During 1996-97 prawn catch from the sea was 5565.36 mt which was 4.17% of the total marine production. The fish production of Chilka lake was 1269 mt during 1995-96. This increased to 1633 mt during 1996-97.

Marine supplies

There are 329 fishing villages in the six coastal districts of Orissa. The distribution of marine craft and gear in the state is related to the differences in marine ecology between northern and southern districts. This has implications in terms of the sources of fish supply.

The predominant fishing method throughout the coastline is gillnetting. The other types of fishing gear in use include trawl nets, gillnets, fixed bagnets, beach-seines, encircling nets, boat-seines and liftnets. Orissa has a fishing fleet of approximately 12,900 crafts, 66% of which are traditional craft and 34% mechanised and motorised fishing boats. The main characteristics of the fisheries in the six coastal districts are described below:

Ganjam district

There are 26 'fishing villages in this district. Traditional fishing vessels with surf-crossing ability (catamarans. bar boats and navas) are dominant and operate at depths of O-20 m with hook and line, shore seines or gillnets. In 1996-97 the total marine production from the district was estimated at 6009 mt.

Puri district

There are 24 marine fishing villages in the district. Catamarans, bar boats and navas are active along with the smaller motorised boats. A few large trawlers and beach landing craft also operate. The total marine production in 1996/97 was estimated at 26,569 mt.

Cuttack district

38 marine fishing villages exist in this district, the coastal area of which is now divided into two districts — Jagatsingpur and Kendrapara. Traditional

dinghies, small motorised craft and large trawlers arc the dominant operators in the fishery. The total marine production in 1996/97 was estimated at 35,085 mt for Jagatsingpur district and 20,405 mt for Kendrapara.

Balasore district

The district has been divided into two districts — Balasore and Bhadrak both of which have coastal areas. There are 241 marine fishing villages. Mechanised wooden gillnetters and smaller inboard-engine (IBE) motorised boats dominate the mechanised fleet. The non-mechanised fleet is made up of dinghies, patia and choats. The total marine production in 1996/97 was estimated at 35,491 mt for Balasore district and 9903 mt for Bhadrak.

Imports from other states

There are no marine fish imports from other states.

4.3.2 Supply Characteristics

Species composition of supply

Inland

Freshwater supplies are predominantly carp from aquaculture, although a wide range of other freshwater species constitute the landings from the capture fishery.

Marine

Brackishwater supplies are mainly *P.monodon,* but also include *P.indicus* and other brackishwater fish species.

Generally. pelagics account for approximately 39% of the total landings. demersals for 49.5% and miscellaneous species for 11.5%.

Ex-state

Supplies that leave Orissa for other states in India are mainly of dried products from smaller marine fish species. Freshwater fish, mainly carp and some quantity of marine fish catch — Hilsa and trawler bycatch (small fish) — are packed in ice and sent by trucks to the Calcutta markets of Howrah and Sealdah in West Bengal.

Quality of supply

Freshwater supplies of fish are iced when harvested from farms or caught from the wild. These supplies enter the market in good condition.

Brackishwater supplies from aquaculture are of good quality as they are iced and/or frozen within a short period. The quality of brackishwater capture supplies is variable, depending on the location and method of fishing operations. The quality of seed collected from brackishwater is of variable quality and is dependent on handling techniques.

Most of the mechanised and motorised gillnet operations involve relatively short trips (one-day or overnight) and the fish is landed in fairly good quality on a daily basis. Ice is normally used onboard, maintaining the quality until it is re-iced once landed or after auctioning. Traditional vessels use ice less frequently.

Prawn from trawlers is of good quality and is iced in boxes onboard. The bycatch often tends to be of poorer quality due to the practice of relatively long hauls and the lack of ice-use on short voyages. Some non-mechanised vessels do not use ice onboard and there is evidence of poor handling which results in variable quantities of poor quality fish. The use of ice and handling techniques have reportedly improved as fishermen are receiving price premiums for better quality fish.

Variability of supply

In Orissa, there is both seasonal and geographical variation in the supply of marine fish.

The whole coastline is subject to cyclonic conditions from March to September. The fishing season lasts for six months from September to March. Fishing activity peaks durin g September/October in the northern districts (Balasore and Jagatsingpur) and during December/January in the southern districts (Puri and Ganjam). Fishing activity in all districts is restricted by rough seas between June and August. Supply is also variable on a daily basis, given the nature of the resource and the highly localised occurrence of cyclones during this period.

The highest landings are recorded in the northern district of Balasore and quantities decline progressively towards the south. During 1996/97 the fish landing percentage in different districts was:

Balasore	:	26.6%
Bhadrak	:	7.4%
Kendrapara	:	15.3%
Jagatsingpur	:	26.3%
Puri	:	19.9%
Ganjam	:	3.5%

4.3.3 Losses in Supply

A major cause of losses in supply is the dumping of trash fish from larger mechanised vessels normally targeting prawn species. There are qualitative reports of this occurring in Orissa but no quantitative data were available during this study.

4.3.4 Participants in Supply

The participants in the supply of fish in Orissa are discussed under the following categories:

Ex-state suppliers

Women are active in the import of dried fish. When local prices rise, some groups of women are reported to migrate to Andhra Pradesh from where they produce and transport supplies of dried fish back to Orissa.

Inland producers

Freshwater capture fishermen are small-scale operators who are predominantly Oriyans. These fishermen are usually part-time operators who may also be employed in agriculture. Women do not usually take part in this activity.

Freshwater fish culturists are both extensive and semi-intensive producers. The extensive producers harvest from a range of sources and often use aquaculture as a subsistence food source or to complement other economic activities such as farming. The semi-intensive farmers are usually wealthier individuals or small companies who have specialised in the culture of fish species. Men are taken on as part-time employees when the need arises. during harvesting for example.

Marine producers

There are an estimated 50,207 active marine fishermen in Orissa, 44,709 of which are full-time, 4,060 part-time and 1,438 occasional fishermen. The number of part-time and occasional fishermen was found to be greatest in the northern district of Balasore. where greater alternative employment opportunities are reported to exist.

Brackishwater fishermen are usually small-scale operators who may also be engaged in agriculture or fish transformation activities on a part-time basis. Women sometimes participate in the collection of prawn seed.

Fishermen in northern Orissa are predominantly Oriyans and Bengalis, whereas those in the south are predominantly Telugu.

Brackishwater aquaculture producers are usually wealthy individuals, industrialists and national or multi-national companies with substantial financial hacking. Full-time specialist and non-specialist labour is employed. Local non-specialist labour may also be employed on a part-time basis. Women are usually not employed. The recent ban imposed by the Supreme Court has affected this sector seriously. Around 40% of the tanks within the CRZ area have been closed and no stocking is done.

Ancillary participants

Participants include employees or individual operators involved in vessel, engine and gear supply and repair, salt. ice and fuel supply. basket-making and other support activities. Men dominate most of these activities. although women are often active in the assembly and repair of nets and baskets. (It should be noted that the baskets used are manufactured by individuals outside the fishing communities).

4.3.5 Factors Affecting Supply

Macro-economic policies

Policy choices at the macro-economic level may have a direct impact on the development of the supply side of fisheries in Orissa. Some of these are outlined below:

- Regional support to Orissa
- Urban or rural support
- Support for large or small-scale operations
- Promotion of public or private sector growth
- Focussing on primary production growth or other growth in manufacturing and services
- Support for export or domestic market growth
- The use of fiscal or monetary policy instruments

Choices made between these policy areas and within each one, at both the national and state levels, have a significant impact on how the supply side of fisheries develops and on who has access to the benefits from, and opportunities in, the sector. The Central Government guides the state on these choices and directs development efforts to some extent through the allocation of funds.

Sectoral policy and legislation

Sectoral policy formulated at the state and national government levels also influence the supply side of fisheries.

Environment

Environmental factors affect the availability of supply over time. Seasonal weather changes affect both species and quantities available. Cyclones can destroy fishing craft and gear and floods can damage fish ponds or cause the death or release of stock. Drought may be a significant constraint to fish farming potential. The local geography and oceanography also affect the supply.

The sustainability of supply of fish into the market is directly related to the condition of the environment. The maximum sustainable yield (MSY) for total marine production as estimated by the Fishery Survey of India (FSI) for the Orissa coast marine production, 125,600 mt/year. has been exceeded during 1996/97, when the reported production was 133,402 mt.

The main factors affecting the environment are:

The small-scale fisheries sector

The level of exploitation relative to the available resources is not well understood in the marine and estuarine waters of Orissa. The levels of exploitation in inland waters is likewise poorly documented. There is some suggestion that the mud crabs of Chilka Lake may also be locally over-exploited. Crab fattening has been introduced recently.

The large-scale fishing sector

It is widely held that there are signs of inshore resource depletion which has resulted in a reduction in the size of species captured and overall quantities landed. The cause of this is unknown but excessive fishing pressure seems to be a contributing factor.

Aquaculture

Salinisation of paddy fields adjacent to brackishwater prawn culture ponds may contribute to the reduction in productivity of the agricultural land in some parts of Orissa.

Other human interactions

Other human interactions include forestry, agriculture and livestock, industry, infrastructural development, tourism, shipping, urbanisation and mineral extraction. Little is known about these possible problem areas and their impact on the supply side of the fishery in Orissa.

Concentrated human activity in some villages has had a polluting effect on many small water bodies which are used for cleaning fish. The impact of these products on the health of the consumers is not yet fully understood.

Natural causes

One of the main environmental factors affecting the supply of fish is the weather. During the monsoon the offshore fishing is limited to the type of vessels which can withstand the rougher seas. There may be a shift in the composition of species away from marine and more towards estuarine species and a fall in overall availability during the monsoon.

Micro-economic factors

The main micro-economic factors affecting the supply side of the sector are:

Growth opportunities

If no growth opportunities exist for increased production, there is little scope for expansion of supply beyond improved use of available resources. Unfortunately, with the expanding population there is growing pressure for increased harvesting of existing resources and this can lead to declining returns to current users. The possibilities for expansion of capture fisheries in Orissa are not well known. They are probably more available offshore than in the inshore and estuarine areas (see environment above). Growth opportunities do exist in aquaculture.

Credit availability

Although growth opportunities exist. access to them may be restricted or biased towards certain groups. Perhaps the most important micro-economic factor affecting the potential distribution of opportunities on the supply-side of the sector is the availability of finance to different groups within the sector. This causes changes in access, between groups, to the available resources and to any growth opportunities identified on the supply-side. The availability of credit, and the conditions under which it is supplied to the small-scale sector, directly influence its ability to take advantage of supply growth opportunities. The government has been particularly active in supplying credit to potential buyers of mechanised boats and those wishing to initiate or expand aquaculture production.

For the smaller vessel operators, who may not own their own boat, credit is less easily obtained. Within the last 6 years advances have been granted for fibre-reinforced plastic catamarans and engines with good response, but this is not sufficient. The low levels of education amongst many fishermen limit their access to formal credit sources. This is compounded by their lack of collateral. Women have little or no access to credit. Some fishermen do, however, obtain short-term credit in the form of advances from commission agents and other loans from boat owners.

Small-scale enterprise skills

The best use may not be made of existing growth opportunities because of a lack of micro-enterprise skills. This is particularly so in poor communities which have limited access to education. Most fishing communities in Orissa are poor and many of the participants are illiterate. The extent of their business management skills could not be determined by the study but it is likely that they are generally low.

Opportunity cost of labour and capital

Where the supply does offer opportunities for increased activity and where the small-scale operators have the ability to access those resources, the benefits may be dissipated by surplus levels of labour and capital expanding into the fishery. Where few other opportunities exist. income from the sector. no matter how low, may encourage increased entry to the fishery if exploitation levels are not controlled. This

will lead to the dissipation of benefits, reduced viability of capital and resource depletion. This is likely to be much more pervasive in the coastal fisheries where access to resources is less controlled by tenure systems.

Market opportunity, access and information

Orissa makes good use of the market opportunities in adjacent states, particularly in West Bengal where demand is very high. Some of the mechanised boat associations are well informed about product prices on the international markets and are in a strong position to bargain with traders and commission agents. It was reported that this has also had a beneficial impact on the smaller traditional producers, although the extent of this is unknown.

Institutional influences

The level of institutional organisation amongst the different suppliers greatly influences their ability to coordinate actions, communicate needs, and achieve their aspirations.

In the marine fisheries in Orissa there is some evidence of organisation among the mechanised operators, although the smaller non-mechanised operators are often adversely affected by a lack of organisation.

The aquaculture producers in Orissa often have a higher level of organisation which is reflected in their method of operation and market position.

Political influences

The shared resources which migrate in the waters between West Bengal and neighbouring states pose management problems unless states can cooperate on management regulations and enforcement. Likewise, regulations imposed by one state on its fishermen will be of limited value unless vessels from other states fishing the same stocks have similar restrictions imposed.

In the medium-term. resource harvesting capacity will have to be controlled and important and difficult decisions will have to be made regarding the distribution of catching opportunities between different harvesting/culture groups. These decisions will ultimately affect who participates in the fishery.

Technological influences

The type of technology employed in capture fisheries influences different participants' access to different resources. The quantities and quality of supplies are also affected by technology.

The emphasis on mechanisation in capture fisheries has been responsible for an increase in the quantity of fish landed in Orissa. The increasing investment in aquaculture will increase production. although most of this is destined for ex-state or export markets.

Social, cultural and demographic factors

At the time of the study, little information was available on the influence of these factors on supply.

4.3.6 Current Intervention

Non-governmental sector

The current intervention by NGOs in the supply side of fisheries is related to increasing production from offshore resources. Project Swarajya is an NGO which has provided funds for the development of fish aggregating devices (FADs) in a 40 m depth zone off the coast of Orissa.

Rural Development Society (Cuttack) excavated ponds in several villages for the culture of freshwater fish. Several ponds and canals were leased from the Government.

The People's Rural Education Movement (Berhampur) and the United Artists' Association (Ganjam) have been training fishermen and women in new technologies associated with fish production and fish products.

Private sector

The introduction of new vessels to the marine capture fleet is a continuous process. Increases in under-utilised resource exploitation will increase the total supply of fish landed.

The large private sector investment in aquaculture has had an impact on the quantity of freshwater and brackishwater species produced in Orissa.

Government

Government support in Orissa has tended to focus on the expansion of mechanised fish production from marine sources. The following is a list of recent government interventions associated with the supply side of the sector.

- Introduction of Improved Beach Landing Craft (IND-25) for small-scale fishermen in Orissa under the National Cooperative Development Corporation (NCDC) programme
- Mechanisation/motorisation of traditional fishing craft
- Reimbursement of central excise duty on certain oils for mechanised fishing vessels below 20m length
- Development of fishing harbours, jetties and infrastructural facilities at various landing centres
- Introduction of inboard icebox and fish drying racks developed by the DFID

The introduction of FADs to encourage the exploitation of offshore resources was a planned intervention by the DOF in 1994/95.

4.4 TRANSFORMATION OF FISHERIES PRODUCTS

After its initial supply, fish is transformed in several ways before finally being consumed. Transformation refers to the changes which take place between the time of capture or harvest, and the time when the fish is consumed.

4.4.1 Types of Transformation

There are four general ways that transformation can occur:

A. Product transformation

Product transformation occurs mainly to preserve the fish or to enhance its value.

Gutting and filleting

Fish is rarely gutted or filleted before sale. Larger fish are sometimes cut into chunks or steaks before retailing.

Icing

Fish landed from smaller vessels is often not iced onboard due to the short time at sea and limited hold capacity. The fish from this source is normally iced at the landing site after auction. Vessels at sea for more than one day usually carry ice onboard.

Icing practices associated with fish marketed within the state are often poor and the quantity of ice used to chill the catch is often inadequate. Prawns are iced effectively, and strict procedures are adhered to. It should be noted that the availability of ice is adequate in the majority of the landing sites.

There are cold storage (total capacity of 50 mt) and ice making plants (total capacity of 20 mt/day) owned by the DOF at Puri (2) Balasore (3) Koraput (1) and Kalahandi (1). In the private sector, three processing plants have a total ice making capacity of 50 mt/day.

Fresh fish is normally packed in woven bamboo baskets, lined with leaves and covered with hessian sacks. Insulated tea chests are also used and in some cases, mainly with aquaculture products, plastic fish trays are used. The icing techniques are often good, with layers of fish interspersed with crushed ice.

Freezing

There are approximately 15 processing companies for dealing with prawn exports with a prawn handling facility of 16.3 mt/day. All the prawn destined For overseas markets is graded, peeled, frozen and packed before shipping. Plate freezers are normally used. The total freezing capacity is estimated at 94 mt/day with an associated cold/freezer storage capacity of 1380 mt.

Smoking

Small quantities of smoked fish are produced in the villages in the Chilka Lake area and in some tribal areas. Most of the smoked products are prepared for personal consumption.

Salting

Salting is normally carried out in association with drying. Fish are soaked in brine for 24 hours. The main species associated with salting is shark. Shark destined for the Kerala market is cut into small pieces, washed with fresh water and soaked in brine for approximately three days. It is subsequently sun dried. Shark is sometimes salted onboard the vessel while it is still at sea.

Drying

There are some species, such as anchovy, sardines and ribbon fish, which are purchased specifically for drying. Small prawn and shark are also exclusively processed to create a dried product. These dried products are destined for human consumption.

Ribbon fish is normally hung from lines whereas other species are dried on coir mats or directly on the sand. Shark fins are sun dried on coir mats for approximately three days to form a specialist product for the overseas market.

Spoiled fish and the poorer quality trash fish which cannot be sold for human consumption are often dried and used in the production of fishmeal or agricultural manure.

Dried fish products are normally packed in hessian sacks, whether destined for human consumption or fishmeal. Wicker baskets are used for the packaging of dried shark fins.

Fishmenl production

The two fishmeal plants in Orissa are in Balaramgadi and Paradeep. The combined capacity of both plants is estimated at 9 mt/day.

Canning

There are no fish canning operations in Orissa.

Live fish/prawn fry

Prawn seed collection involves storage in drums, tanks and pots before collection by traders. Specially designed containers are used to hold the live seed during transport. Aeration of the water is carried out in most cases with compressed air.

B. Place transformation

Fish is transformed in terms of its location. Given the variety of fishing activities in Orissa, it should be noted that the distribution channels may differ amongst the different landing sites. An outline is provided below:

Marine fresh fish

Once the vessel returns to the port or landing site, the fish is normally transferred from it to a trader's godown by headloaders or cycle trollies, where it is graded and auctioned by the fishermen. The godown owner receives a fee for this service and may also participate in the auction along with small-scale retail traders (headloaders, cycle merchants etc.), urban retailers and wholesalers. Sometimes fishermen may send the fish directly to a commission agent in an ex-state market to be wholesaled or retailed on his behalf.

Fish purchased by small-scale retail traders is normally retailed fresh in the local area and in neighbouring villages up to 50 km inland. The fish is transferred to these markets by headload, cycles and public transport (normally buses). These small-scale retail traders may also purchase fish directly from the trader after the first auction. In some cases, small-scale fishing operators may land their catch on the beach, leaving it for the women of household to retail in neighbouring villages using headloads or public transport.

Fish purchased by the godown owner/traders may be retailed to local small-scale retail traders, urban retailers, wholesalers, commission agents and export packers. Urban retailers within Orissa often use jeep trailers or trucks to transport the fish to inland urban centres where it is retailed or wholesaled to small-scale retail traders. Wholesalers usually transport fish by truck to inland urban markets in Orissa or to distant ex-state markets.

Most of the fish is sold in bulk to local traders or through commission agents to wholesalers in distant markets. From the local auction the fish is normally transported by road to inland markets or those outside the state, although smaller shipments are often sent by rail.

It has been estimated that over 60% of the total catch is transferred to markets outside Orissa. Traders transfer their fish to commission agents in the major markets such as Calcutta, Chennai, Delhi, Mumbai, Hyderabad and other urban centres in Andhra Pradesh. The trader normally receives a sum of money from the commission agent to promote 'goodwill' and secure consistent supplies.

Brackishwater aquaculture producers may be vertically integrated with export packing plants. In such cases, prawn harvests are transferred directly from the ponds to the plants by their own personnel.

Freshwater fresh fish

Freshwater aquaculture producers normally sell their fish harvests to wholesalers who transfer it to urban retailers or ex-state markets. Commission agents in ex-state markets may also be used.

Relatively small quantities of fish are landed at dispersed landing sites. The fish is either retailed in the local area by the fishermen themselves or is collected by nearby small-scale retail traders who also operate in the local area using head baskets and cycles. Urban retailers purchase freshwater fish from the fishermen and use jeep trailers to transport fish back to urban markets.

Frozen fish

Frozen fish is not sold in Orissa. Frozen shrimp, which could not be exported sometimes finds its way to the markets.

Smoked fish

Some quantity of smoked shrimp comes from Andhra Pradesh for consumption in the tribal areas.

Salted fish

Shark is normally landed and sold to traders on the beach. Traders transfer it to a nearby location where it is processed and shipped to distant markets in Kerala and Tamil Nadu. The product is normally transported by truck once a sufficient quantity has been processed.

Dried shark fins are usually purchased by traders supplying the Chennai export houses.

Dried fish

Fish for drying is most often purchased from prawn bycatch. Once auctioned, the fish is transferred. by cycle trolley or headload, to nearby villages where it is processed and dried. The dried products are destined for either human consumption or fishmeal production.

The dried products for human consumption are usually transported to neighbouring villages by headload vendors, cycle vendors or public transport. If large quantities of dried fish are produced, it is normally sold to traders. Open trucks are used to transport dried fish to inland markets in Orissa (Humna. Bhadrak and Rajsunakhala) or to distant ex-state markets in Andhra Pradesh, Kerala and Chennai. The dried fish for fishmeal production follows the same route to ex-state markets in Andhra Pradesh.

Fishmeal

No information was available for the distribution of fishmeal in Orissa.

Canned fish

No canned fish is produced in Orissa.

Live fish/prawn fry

Prawn fry is usually purchased by traders who visit the various landing sites. The live seed is transferred to farms, either local or in other areas of the state. The larger farms often have their own vehicles to collect live seed from the landing sites and the seed collectors sell directly to the farms. Collection of prawn seed from natural sources has been banned in the state.

Value-added products

Fishfed has tested the marketing of fresh fillets, and Oriental Dry Fish Industries tried marketing a range of fish products including, pickles, wafers, smoked shrimp, etc., but the response is too uneven to make a judgement.

C. Image transformation

Some NGOs and private entrepreneurs participate in the promotion of fish or fish products in Orissa, although efforts are yet to fructify. The Government of Orissa was involved in the provision of educational material on fisheries as part of the school curriculum for about 40 non-formal fishing community schools. The material did contain an element of promotion for fish and fish products.

D. Price transformation

There is a limited amount of documented information on price movements along the marketing chain and only qualitative information is provided below:

Fresh fish

Movements in price are usually upward as the fish moves along the marketing chain from producer to consumer, although the actual increments in price at each stage may be influenced by the relationship between buyer and seller.

In the first-hand sale of fish there is often evidence of indebtedness and exploitation which tends to lower the price increment. Some cooperative groups (for example, Orissa Marine Fish Producers' Association) have managed to raise first-hand sales prices to both traders and export processors. Through access to market price information they are able to fix sales prices for the major export species. These prices are revised accordingly every 15 days. The smaller producers in the area of Paradeep (Jagatsingpur district) have also managed to benefit from this access to price information.

The price transformation after the first sale is dependent on the number of middlemen involved, the distance to market, the purchasing power of the consumer and the quantities supplied to the market.

Smoked fish

No information is available.

Salted fish

No information is available.

Dried fish

The dried fish trade is characterised by a large number of small-scale producers and a relatively small number of traders who appear to control the purchase price of dried fish products. The price transformation after the first sale is dependent on the number of middlemen involved as well as the distance to market, the purchasing power of the consumer and the quantities supplied to the market.

4.4.2 Participants in Transformation

The main participants in the transformation process are men, although women may dominate certain activities. Participants are active in either the processing, distribution or ancillary services supporting the sector. These are described below:

Distributors

There are a variety of participants in the distribution of fish from landing sites to the various markets. Small-scale buyers of fish are predominantly men. However, women often participate in fish auctions to purchase fish for their drying operations. Cycle traders and cycle trolley operators are usually men. Both women and men are involved with the distribution of fish by head baskets.

Processing agents

The main processing activity in Orissa is that of drying. Women often dominate this activity. They are also employed by the prawn peeling sheds as their dexterity often reduces both time taken and losses incurred.

Ancillary participants

Ancillary services such as the supply of ice, salt and fuel are normally undertaken by large-scale operators. Women outside the fishing communities are the main suppliers of bamboo baskets, which are used extensively within the sector. Cycle trollies are often used for the transport of goods and passengers within small-scale fishing communities. Limited information was available concerning these participants.

4.4.3 Factors Affecting Transformation

Macro-economic policies

Policy choices at the macro-economic level may have a very direct impact on the development of the supply-side of the sector in Orissa. Some of these are outlined below:

- Regional support to Orissa relative to other states
- Support for urban or rural development
- Support for large-scale or small-scale operations
- Promotion of private sector or public sector growth
- Focusing on primary production growth or other growth in other manufacturing and services
- Support for export or domestic market growth
- The use of fiscal or monetary policy instruments

Choices made between these policy areas and within each one. at both the national and state levels, have a significant impact on how the supply-side of fisheries develops and who has access to the benefits from, and opportunities in, the sector. The Central Government provides guidance to the state on these choices and directs development efforts to some extent through the allocation of funds.

Sectoral policy and legislation

Sectoral policy formulated at the state and national Government levels also influences the transformation of fish. Some policy options are outlined below:

- Support for large or small-scale operations
- Promotion of export or domestic consumption
- Promoting inland or marine fisheries expansion
- Promotion of capture or aquaculture operations

Given the time constraint, an assessment of the influence of sectoral policy and legislation on transformation is beyond the scope of this study.

Environment

Variations in the supply side of the sub-sector as a result of seasonal changes in the environment and environmental degradation can also affect the transformation side of the sector. Seasonal supply changes affect availability and the price structure in the market. This changes the relative importance of different processing techniques. Changes in the weather can also affect the transformation process itself. In the rainy seasons very little fish drying can be carried out. Roads may also be impassable and the product may have to be moved by sea or be delayed reaching market, to the detriment of its quality.

The degradation of the environment may lead to changes in species composition, the average size of fish or its quality. The quality of handling also affects appearance and this in turn may affect price during the different stages of the transformation process.

Fish retains its image as a healthy food and for this to continue it is necessary for the environment in which it grows to be free of pollutants and pathogens. There is clearly a need to ensure that the image of fish remains attractive to the consumer.

Micro-economic factors

Growth *opportunities*

Growth opportunities are constrained by the quantities of fish supplied and the prevailing price. This, to a large extent. influences the type of product transformation. As the price of a particular species changes it may no longer be suitable for drying because of weight loss and associated product prices. In Paradeep, when bycatch is purchased for drying, it is often sorted into that which may be sold fresh and that which will be dried.

Credit availability

The availability of credit often influences the type of product produced by small-scale operators. It was not possible to determine the levels of credit availability to small-scale transformers at the time of the study.

Small-scale enterprise skills

A lack of enterprise management skills may often influence the type of product, place and price transformations. Proper management of operations may create opportunities for expansion in each of these areas. It is likely that the participants in small-scale transformation, given their poverty and lack of education, are not well endowed with business management skills.

Market opportunity, access and information

The successful transformation of the products depends on transforming in the right way, at the right time and place, and at the right price. This requires good market knowledge and access to the markets. As markets become more sophisticated and market chains become longer, access to timely, accurate information becomes essential.

The extent to which most of these factors affect the post-harvest transformation sub-sector in Orissa are poorly documented.

Institutional influences

Greater organisation amongst participants in the transformation processes can have a significant effect on their incomes and on the sustainability of operations. Economies of scale in transport and processing of fish may increase incomes. The role of women in the transformation side of the sector is particularly influenced by their levels of organisation.

The organisation of the mechanised vessel owners and their resultant control over prices for prawn and fish has demonstrated the importance of institutional reform in accruing benefits.

Changes in the understanding of transformation processes within the government and the capacity to translate that understanding into support for the private sector is of vital importance.

Technological influences

Access to technology strongly influences product transformation and may also reduce the cost of certain transformation processes.

Onboard storage facilities

The availability of onboard technology for the storage of fish greatly affects the quality of the fish landed. In many cases there is insufficient space onboard to handle the icing of fish or the storage of the less valuable part of the catch.

Shore landing facilities

One of the key technological elements in the transformation process is the provision of adequate shore facilities. The governments at both state and national levels have emphasised this in the past and now most of the mechanised and larger vessels have appropriate landing facilities. These are affected by siltation to some degree.

The type of landing facility affects employment opportunities for different groups. Where landing and road facilities are more limited, a wide array of carriers (small boat, headloaders and cycle traders) are employed in moving the fish. This generates much local employment and changing infrastructure should consider opportunities for alternative employment for these displaced people.

Onshore processing facilities

The processing of fish requires certain types of technology which reflect the needs of the market and the capacities of the users. The drying of fish is achieved using very basic methods and these may reflect the price which the market will pay. They may also reflect a lack of market information. Improved technology may improve the product but this may not necessarily improve the returns to the processor. The benefits may be accrued further up the marketing chain. The increase in price may not cover the additional costs.

Transport and storage

The roads connecting the landing sites to market play an important part in attracting traders and allowing access to public transport systems. At certain times of the year the roads may become impassable because of the weather.

Fish is carried in bamboo baskets between the landing sites and godowns; between godown and trucks and between different stages in the wholesale market. It is also used on the backs of cycles and as headload carriers. The quality of these baskets affects the keeping quality of the fish over time and the prices paid to the traders.

Marketing facilities

The handling and trading facilities at the wholesale and retail markets affect the quality of the fish.

Ancillary facilities

These provide services such as the supply of ice. Their frequency, production and location greatly affect the availability of ice to fishermen and traders.

Social, cultural and demographic factors

Given the limited supplies of fish from Orissa, the population of the state may reduce the exports from the state or increase the imports of cheaper fish products into the state. Cultural factors may limit the range of products which are accepted by the consumers within the state.

4.4.4 Current Intervention

Non-governmental sector

The Orissa Marine Fish Producers' Association (Paradeep) has obtained accurate market information on the prices of exportable species from MPEDA bulletins. This has assisted them in fixing sales prices and stabilising incomes. These benefits have also been passed on to the non-mechanised producers operating in the region.

Project Swarajya, a Cuttack-based NGO is concentrating on research and documentation of new technologies in the fishing villages. Its activities included introduction of FADs, studies and conservation programmes for Horseshoe crabs, training programmes for women groups on income generating programmes like net weaving and production of value-added products with low cost varieties of fish.

United Artists' Association, an NGO based in Ganjam district, has undertaken community-building activities for fisherfolk communities, and plans to introduce post-harvest activities as a means of increasing incomes for petty fish processors and traders.

People's Rural Education Movement (Berhampur) has been assisting women fish vendors. More than 250 women are supported for fresh fish vending and dry fish marketing.

Private sector

There is some evidence that private sector operators are experimenting with new products such as shark liver oil. However, development of the product and success in finding market outlets has been limited.

Government

MPEDA provides advice on quality standards, regulations and packaging requirements for fish products destined for export. It also monitors product transformation within Orissa, identifying fresh, frozen, dried and salted product types and respective quantities.

Orissa State Fishermen's Cooperative Federation Ltd. is involved in the marketing of fish in Orissa.

The Orissa Marine and Chilka Area Development corporation(OMCAD) proposes to establish three ice plants at Dhamara, Gopalpur and Paradeep to improve handling facilities for its members. Diesel outlets are also proposed.

The project carried out a general fish marketing research study in Orissa, and more recently, commissioned a market research study with emphasis on processed dry/salt dried fish products in Orissa. This study was brought out as a publication.

Iceboxes and drying racks promoted by the project through the DOF in Orissa, have yielded positive results.

5. ANDHRA PRADESH POST-HARVEST OVERVIEW

5.1. FISHERIES AND THE STATE ECONOMY

5.1.1 Background

Andhra Pradesh is one of eight maritime states of India, and has an area of 275,000 km^2. It has a population of some 66.5 million people (1991) of which 73.3% are rural. Hyderabad, the main urban centre, is the sixth largest city in India with a population of about 5 million.

The state has a coastline some 974 km long; 12.5% of India's coastline. The continental shelf area out to a depth of 200 m is 33,247 km^2. The inland waters consist of 20,05 1 tanks, 102 reservoirs, two large lakes (Kolleru and Pulicat), and two large rivers (Godavari and Krishna). The state has 23 revenue districts of which nine are coastal.

5.1.2 Domestic Food Security

Traditionally fish has been an important part of the diet in Andhra Pradesh. The sector has focussed on domestic food supply both within the state and to domestic markets outside of the state. In more recent years the export of high value products, especially prawn, has developed.

5.1.3 Employment

Fisheries contributes very significantly to rural employment, particularly of the poorest groups. There are 87 1,709 fishworkers in the state of whom some 485,155 are reported to be actually engaged in fishing.

5.1.4 Income

The total contribution of the sector to the state economy is unknown, however the value of marine fish landings during 1996/97 was estimated at Rs 4,350 million. Some 11,492 mt of marine fish (valued at Rs 19 1 million), 5,750 mt of prawn (valued at Rs 1737 million) and an unknown quantity of fresh water fish were exported to other states.

5.1.5 Foreign Exchange

In 1996/97, 18,544 mt of marine products were exported to overseas markets from Andhra Pradesh. This was worth over Rs 5220 million.

The post-harvest sub-sector of the fisheries covers those activities from the time the fish is landed until it is consumed and is thus a major segment of the sector as a whole. Post-harvest activities are discussed below under three headings:

- Demand
- Supply
- Transformation

5.2 DEMAND FOR FISHERIES PRODUCTS

The demand for fisheries products can be looked at from the following perspectives:

5.2.1 Demand Characteristics

Current quantitative demand

The total demand for fish, at current prices, in Andhra Pradesh is not known. There is a shortage of appropriate data. The availability of fish for consumption in the state in 1996/97 was approximately 323,570 mt. This gives a conservative estimate of 4.1 kg/person/year which is higher than the national average of 4.8 kg/person/year. It is likely that consumption rates of non-vegetarians are much higher. This level of consumption is reported to be well below that which is considered nutritionally desirable.

The different types of fish demanded are discussed below:

Fresh fish

The main demand for fish is in the fresh form but poor communications in the past have restricted the flow of marine fresh fish to inland markets.

There is a pronounced consumer preference for freshwater fish in urban centres although some marine species do command high prices. The preferred freshwater species include carp and murrel. The preferred marine species include pomfret, seer, and catfish. Urban markets like Chennai, Hyderabad, Bhubaneswar, Cuttack and Calcutta account for a large share of the quality fish landed. Pomfrets find a good market in Mumbai.

The export demand is mainly for prawn although lobsters and fish are also important. There is a growing export demand for cuttlefish. The main export markets are Japan, USA and the EU.

There is little quantitative information on the demand variability for quality, but there is reported to be a strong preference for good quality fish.

Frozen fish

Most frozen fish, either prawn or lobster, is exported. Some frozen fish is also demanded by the domestic urban markets although this is believed to be a small quantity.

Salted fish

There is demand for salted fish both ex-state and in the state. In the past much of the fish has been cured because of poor transport services, and some interest in this continues. Most of the ex-state demand is for shark meat, which is exported to Kerala. Wet salted sardines are also a preferred item. Mackerels, when glut landed, are wet-cured.

Dried fish

Dried fish may be preferred over fresh fish in areas where easy access to fresh fish is lacking and quality is poor. Some of the buyers specifically target dried product for distant markets in other states. Bombay duck, ribbon fish, anchovies, croakers, and non-penaied shrimp (like acetes) are preferred dried varieties. Salt-dried varieties of quality fish like mackerel, seer and sea perch have a good market in the delta areas of the Krishna and Godavari, where lack of proper transport and preservation facilities restrict the disposal of catches in fresh condition. The salt content in salt-dried fish varies significantly from area to area.

Smoked fish

There is a small. but good demand for smoked fish and prawn. Smoking is confined to the Godavari delta, and to some extent the Krishna delta. Demand for smoked fish is restricted to the delta areas. Small quantities of smoked prawn are sent to the hinterland of Orissa. Around 500 tonnes of smoked fish and prawns are produced and marketed in the Godavari delta area.

Fishmeal

Fishmeal demand is high in the state because of the high investment in poultry factories. There was no information on actual demand.

Canned fish

Demand for canned fish is considered negligible.

Live fish/prawn fry

Carp is the main fish species demanded live as fry for farming. *P. monodon* and *P indicus* are the main prawn fry demanded live for brackishwater aquaculture, although the quantities have come down significantly in recent times, after the hatcheries came into existence.

Value-added products

There is some demand for value-added products in Chennai, Hyderabad, Delhi and Bangalore. Shark fins and air-bladders of eels are exported. Production of value-added items, such as fish pickles, wafers and powders, using low-value fish, has been attempted on a pilot scale by government and non-governmental agencies, and the demand for the products is reportedly high in urban centres like Hyderabad and Vijayawada.

Variability in demand

Fish is consumed all the year round but different species may be demanded at different times of the year. The multi-species nature of the fishery decides the availability of various species from time to time. The details of such variation and the impact of other sources of protein are not well documented. Religious festivals and observances may also affect the consumption of fish on a daily, weekly or monthly basis.

5.2.2 Demand Segmentation

In trying to define segments of the Andhra Pradesh fish market it is necessary to define groups which have sufficiently significant differences in their demand characteristics to be meaningful and for members of each segment to be sufficiently similar in their demand characteristics to allow generalisation.

The segmentation of demand is based on that used in West Bengal, in the absence of appropriate market segmentation data. This segmentation includes the customers of the small-scale producers, processors and traders and also reflects the wider demands on fish entering the market, which affects overall supply available to small-scale participants.

Coastal retail

The retail trade in the coastal communities has a preference for fresh marine/ estuarine species. Many of the coastal communities are poor and this may be reflected in the species demanded. This demand is met by petty-fish traders: women-headloaders and cycle traders.

Urban retail

The main urban centres in the state include Hyderabad, Visakhapatnam, Vijayawada, Rajamundry and Warangal. Traders purchase fish at the landing centres and send them packed in ice to urban wholesale markets by road or rail.

Inland retail

The inland markets are basically of two types. Markets which have good transport linkages receive large quantities of fresh fish, both from capture and culture sectors. Towns like Warangal, Vijayawada, Tirupati fall under this category. The hinterland, 'agency' areas which have poor transport linkages, has traditionally been dependent on processed fish,

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consequently the demand for it continues to be high in these areas. The fact that people in the upland areas are generally poor also reduces the quantity of fresh fish reaching the area. However, the upland areas account for a significant amount of processed fish products, although information is lacking on this.

Another significant source of inland retail trade are the cycle traders, who purchase the less-valuable varieties of fish at the landing centres and carry them to markets up to 50 km inland. Often, the cycle traders who come from the interior areas for purchase of fish are not fishermen by caste.

Institutional

Institutional fish buyers include:

- The Army
- The Navy
- The Police
- Prisons
- Hospitals
- Hotels/restaurants
- Schools/colleges

They tend to be in urban areas and rely on large quantities and consistency of supply. They would not generally be customers of small-scale traders but could have a very significant impact on them by affecting overall demand and thus the availability and price of fish which the small-scale trader may have access to.

They tend to buy their fish by tender and mix it with other forms of protein. Very little is recorded on the institutional demand segment. The Integrated Fisheries Project (IFP) reportedly supplies canned and other value-added fish products to the naval base in Visakhapatnam.

Industrial

Andhra Pradesh is the main centre for the production of poultry. Poultry feed factories are a significant source of demand for low-value species. Bycatch from trawlers. and the glut landings of small pelagics are all converted into fishmeal by drying them on the beaches. These are then sold to traders. The poultry units tend to have their own feed manufacturing units, and purchase fishmeal either directly from landing centres or from wholesale suppliers. The fishmeal is then mixed with other ingredients to make poultry feed. Consequently, little data is available on actual demand and supply.

Exports to other states

The demand for fish from Andhra Pradesh lies in Calcutta. Chennai, Cuttack, Bhubaneswar and other urban centres. Many of these buyers are commission agents acting on behalf of suppliers in Andhra Pradesh, and many of the commission agents at the village-level represent traders in distant markets. The marketing chain for these products is more disintegrated than that of the export market with fish being moved over long distances and through multiple markets in order to supply large urban markets. The credit-trader nexus is particularly visible in this sector.

Overseas exports

Much of the prawn which is landed is exported. This is purchased by processing and packaging plants, then exported directly or through specific exporters. The main markets are USA and Japan. The high demand and prices for these products have stimulated an efficient marketing and transport system.

Aquaculture

Prawn farms buy seed from collectors for on-rearing for export. More than 70,000 ha of brackish water area was developed into prawn farms by the public and private sectors. The Supreme Court's strictures against prawn farming, disease and resistance from local communities are some of the problems besetting this industry. Numerous hatcheries have come up along the coast, and face the problem of lack of demand, in addition to those cited.

52.3 Factors Affecting Demand

Macro-economic policies

Changes in fiscal, monetary, exchange rate, trade and development policy by central and state governments can influence demand determined by income levels, population and fish price.

Sectoral policy and legislation

Sectoral policies at the national level have always identified the domestic consumption of fish as an important component of its various development plans although there has not been an active programme to promote demand. At the state level the domestic demand for fish has always been high and the problem has been perceived as one of supply rather than demand.

The Central Government, through MPEDA, has promoted demand for Indian products overseas and this has directly benefitted Andhra Pradesh's trawler and prawn farming industries.

For information on the Supreme Court's ruling on aquaculture and its impact on the sector, please refer to 2.4 (Issues affecting the post-harvest sub-sector).

Environment

Perceptions of fish as healthy food are prevalent amongst the more educated consumer groups.

The Japanese, US and EU import regulations on fish and prawn products have an impact on export. These regulations demand specific health and hygiene standards, product quality and product types. The ban by EU for nearly 6 months during 1997 on import of products from the sub-continent has been influential. Many processing industries now take quality control seriously. International standards like the HACCP and IS0 9002 are being implemented in many processing and export units.

Micro-economic factors

Price

The price elasticity of demand varies between different segments of the market. for different species and for different products. There is no agency which monitors the markets, and very little information is available on the prices. Considering the nature of the fisheries — multi-species, seasonality of fishing, large variation in quantity from season to season — it is considered a difficult task.

Changes in the pricr of substitutes

No information was available on the price of alternative protein sources in the markets of Andhra Pradesh. Given the large supply of eggs from local poultry farms it is likely that this form of protein has a significant impact on fish demand. A study made for the project has indicated that the demand for fish is next only to that of milk and eggs.

Changes in taste

There is little information on changes in taste for fish, although with growing awareness of the need to eat nutritious food and the availability of good-quality fish products. there appears to be an increase in demand for fish, particularly in the urban areas. The rising cost of other food items, compared to the steady prices of fish because of increased availability through inland aquaculture, has also influenced the shift towards fish. One indicator of the growing preference for fish is the fact that it is increasingly being served as a main dish at functions, unthinkable in the past.

Changes in income

While the traditional processed products have retained their predominantly lower-class orientation to a large extent, the markets for fresh fish have opened up significantly with middle classes demanding quality fish at higher prices. This also shows demand for value-added, 'ready-to-eat' and 'ready-to-cook' products, which are displayed in the supermarkets in Visakhapatnam and Hyderabad. Again, hard data is lacking on the impact of changes in income on the consumption of fish.

Institutional influences

Any quantification of demand is dependent on the institutional capacity to monitor and analyse changing consumption patterns. Within Andhra Pradesh, there is no agency which monitors the market demand for various fish and fishery products. This has been recognised by the Department of Fisheries as one of the major lacunae in the post-harvest sub-sector, although action to offset this is yet to be taken.

Technological influences

The major technological influence on demand is that of electrification. This has affected the distribution of ice plants, cold storages and refrigerators all over the coastal districts. In Andhra Pradesh all the rural villages have electrification although the extent of the accessibility of ice to villages is not clearly documented. Improved transportation facilities to distant and often inaccessible villages has made it possible to send fish in ice to distant markets, rather than process them in the village.

Social, cultural and demographic factors

Population increase is likely to be the most significant factor affecting demand in the medium and long-term. Growth rates in India are high (2.62% per year for the period and 1978/9- 1988/9) and already dense populations will mean that less land is available for other forms of animal protein. This will in turn increase the demand for cheap animal protein from the sea.

Different festivals call for different species of fish to be consumed in larger quantities.

52.4 Current Intervention

Non-governmental sector

There have been very few interventions by the NGO sector in promoting or understanding demand, although this seems to be changing. Action for Food Production (AFPRO) has promoted the concept of undertaking post-harvest fisheries activities as a means of income-generation/enhancement, and many NGOs working with fisherfolk have now undertaken some pilot-scale activities to produce and market improved quality products.

Private sector

Given the high demand for fish, there is little need for the private sector to promote demand.

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Government

MPEDA is the main body involved in the analysis of demand but it has an export focus. MPEDA has local offices which can cater to the immediate needs of the state's exporters and its central office monitors overseas market prices on a regular basis.

Universities and colleges in the state have Departments of Commerce and Fisheries Science, which have touched on the area of fish demand from time to time. The project has also been involved in market research in Andhra Pradesh, and published the findings as a report.

The apex fisheries cooperative body, the Andhra Pradesh Fishermen Cooperatives' Federation (AFCOF) is involved in marketing fresh fish and has been planning to start small-scale value-addition and marketing. The two regional cooperative bodies — Telengana Fishermen's Central Coop Society and the Andhra Fishermen's Central Cooperative Society — produce and market value-added products on a small-scale.

5.3 SUPPLY OF FISHERIES PRODUCTS

53.1 Availability and Sources of Supply

Andhra Pradesh caters to most of its own needs and exports some surplus to other states and overseas. The total fish supply is estimated at 359,359 mt, the majority being from local freshwater and marine sources. In the past the majority of fish has come from inland sources and in the year 1996/97 the marine production was about 75% that of the inland sources.

Data on the inflow of fish from other states is very weak. Such flows are believed to be low.

Freshwater supplies

Freshwater fish has until recently constituted the majority of the supply. In 1996/97 the quantity of fish harvested from freshwater sources was 207,3 12 mt. Pond/tank fishing is the main source of inland fish. These water bodies are extensively cultured and periodically harvested. The state has some 372,000 ha of pond resources, 234,000 ha of reservoirs, and two lakes with an area of 136,000 ha, suitable for fisheries development. In addition, there are numerous rivers including the Godavari, Krishna, Nagavali, Vamsadhara, Sarada and Pennar.

There are approximately 7,400 traditional inland craft in Andhra Pradesh, mainly in Nizamabad, Medak, Nalgonda and Adilabad districts. Less than 5% of these are motorised.

Much of the inland fish comes from fish culture, both extensive and semi-intensive. Wild capture from lakes, rivers and reservoirs is also important.

Marine and estuarine supplies

Andhra Pradesh has 508 marine fishing villages and 419 marine landing centres. Different centres supply different species of fish or different proportions depending on the following:

- The prevailing weather conditions and local geography
- The availability of different species in local waters
- The landing and shore facilities available to attract vessels from further afield bringing catches from offshore

The continental shelf area off Andhra Pradesh is narrow in the south of the state and widens slightly towards the north. This tends to cause migrations of fishermen further north into Orissa, where the continental shelf is wider.

Marine fish are caught using an array of gear from both non-mechanised and mechanised craft. The marine catch in 1996/97 was 152,047mt. In 1996/97,73% was harvested by the non-mechanised sector of the fishery. The gear used consists of trawls, shore seines, boat seines, gillnets, dragnets, cast nets and traps.

Whilst the non-mechanised fleet is distributed throughout the coast, variations in the design of the vessels and the fishing methods used do occur between and within districts.

Andhra Pradesh has the largest fleet of traditional craft in India, but relatively few mechanised boats. Non-mechanised vessels are both motorised and non-motorised. There are some 43,000 traditional craft in the coastal waters of Andhra Pradesh with most occurring in Visakhapatnam (7,302), East Godavari (6,5 17) and Srikakulam (8,820) districts. These districts are in the north of the state. Only 3% of these craft are motorised, mainly those in East Godavari. These vessels are mostly engaged in day fishing trips although some two-day trips are carried out. Motorised longliners undertake longer trips of 2-3 days, capturing shark in offshore waters.

The main sites for the mechanised boats and deep sea trawlers are Visakhapatnam, Kakinada and Nizamapatnam harbours where adequate shelter and shore facilities exist. There are approximately 1,738 mechanised boats in the state. These vary in size from 10m to over 20m in length. The smaller vessels go to sea for l-8 days fishing mainly in the inshore coastal

area of Andhra Pradesh or as far north as Paradeep in Orissa. The 14m Sona type trawlers go to sea for 12-20 days, mainly in the area north of Paradeep. The 16- 19m twin rigged trawlers fish on the sandheads off West Bengal and voyage for about 2 1 days. The larger, greater than 20m trawlers also fish mainly on the sandheads and voyage for 30-50 days.

Within the nine coastal districts there are some 64,000 ha where brackishwater aquaculture is practiced, mainly in East Godavari and Krishna districts.

5.3.2 Supply Characteristics

Species composition of supply

Inland

The inland species landed consist mainly of different types of carp, murrels, barbus and prawn. The freshwater fish and fish seed production in the state is repotedly the third highest in the country. Andhra Pradesh also leads in freshwater aquafarming, and the bulk of supplies to West Bengal and Orissa come from this state.

Marine

The largest group of fish landed during 1996/97 were prawns, totalling 2 1,600 mt. Other important species were mackerels (3500 mt), shark and rays (10102 mt), sardines (7059 mt), ribbon fish (4369), catfish (4676 mt), perches (2803 mt), pomfret (42 1.5 mt) and seer (4788 mt).

The main species from brackishwater aquaculture are the prawn species *P. monodon* and *P. indicus.*

Ex-state

The supply of ex-state species is unknown.

Quality of supply

In the past poor communication and a lack of shore facilities have limited the quality of fish reaching market. For inland fish this problem is less important as tanks are harvested when the traders are available with ice and packaging. The quality of marine fish depends largely on onboard and onshore handling, the preservation techniques used, and on the time between capture and consumption. These vary between different vessels. The predominance of non-motorised traditional craft in the fleet necessitates designing different varieties of ice boxes for different systems.

The project has been instrumental in designing and promoting suitable insulated ice boxes to be carried onboard different fishing systems, including one for catamarans. MPEDA too reportedly promoted the use of ice boxes in traditional fisheries, although the extent and details of this programme in Andhra Pradesh are not known. A total of more than 2,000 insulated ice boxes are currently used by fisherfolk aboard fishing craft.

For processed fish, quality is not of major importance to the trade. Better quality products do not necessarily command a premium. However, as the product nears the consumer, quality assumes greater importance. Packaging in the conventional sense is near absent for processed products, only some products made by agencies such as the IFP and the AFCCS are marketed in packages.

Variability of supply

There is both geographical and seasonal variation in the supply of fish. Geographical variation has a number of effects on the quality of the product placed on the market, its cost and timing.

Andhra Pradesh has two distinct monsoons: the north-east monsoon from October to December, and the south-west monsoon from June to September. Cyclonic weather is common in October and November and can very significantly reduce marine catches. The calmest period, and thus the main fishing season, is between January and April. This is different from the main season in West Bengal, for instance, which is from October to February and thus has important implications for marketing of fish in Howrah market; an important destination for fish from Andhra Pradesh. It has been reported that the lowest nava catches occur from September through until the end of the year and that this is associated with salinity changes altering fish behaviour patterns.

Seasonality of the fish catches is less pronounced with the larger vessels although some of the large Andhra Pradesh-based trawlers do migrate to the west coast of India when the fishing off West Bengal is poor.

The trawlers based at Visakhapatnam reportedly close long-distance operations for 2-3 months between June and August, but continue to undertake shorter fishing trips of one or two days during the period.

Seasonality has an impact on the availability of the supply and the species reaching the market. The state Department of Fisheries maintains data on the species variability through the year which provides an indication of the availability of different species. The CMFRI too monitors the landings, and the data available with them covers the last 40 years.

5.3.3 Losses in Supply

Major sources of supply loss are the dumping of trash fish from larger commercial vessels and large scale landings of pelagics during the monsoons. The

bycatch is generally caught by vessels targeting high value species such as prawn. The cost of operating such vessels is high and bringing back low-value non-target species is of little benefit. The loss of fish by this method is considerable. It was estimated that the vessels from Andhra Pradesh, operating in the waters adjacent to the state and adjacent to West Bengal, dispose of between 99,000 · 130,000 mt per year, although the figure could have come down in recent times.

A study is being carried out by the DFID, as part of its post-harvest research programme, to examine the losses in the monsoon and possible means to overcome them.

5.3.4 Participants in Supply

Ex-state suppliers

No information was available regarding these groups.

Inland producers

Inland fishermen in Andhra Pradesh are mainly those who harvest rivers, reservoirs, lakes or tanks or fish farmers who manage their resources. They are mainly small-scale operators. There are reported to be some 3 13,000 fishworkers in inland fisheries of whom an estimated 100,000 are actively involved in catching fish.

Marine producers

The estimated coastal fishing population is about 380,403 of whom 77,700 are actively engaged in fishing. Many of these fishermen are active only part-time in the fishery. They may also engage in commercial and subsistence activities outside the sub-sector, such as agriculture. Some fishermen also process their catch. Traditionally they have belonged to some of the lowest-status social castes: Vadabalija, Jalari, Palle and Agnikulakshatriya.

This pattern may, however, be changing as pressure grows for outsiders to enter the community, as in other states. Many of the fishermen have, in the past, migrated from Andhra Pradesh and subsequently settled in southern and central Orissa on a temporary or permanent basis.

The role of women in the supply-side of the sub-sector is poorly documented. It is likely, however, that they carry out gear repair and maintenance, and the collection of prawn fry.

Some marine producers also participate in prawn production from farms.

Ancillary participants

In addition to the fish producers, there is a wide range of other participants in the sector who contribute indirectly to the supply-side. These include financiers of vessels, credit, fuel, ice and gear suppliers, gear repairers, and boat builders.

5.3.5 Factors Affecting Supply

Macro-economic policies

Policy choices at the macro-economic level may have a very direct impact on the development of the supply side of fisheries in Andhra Pradesh. Some of these are outlined below:

- Regional support to Andhra Pradesh relative to other states
- Support for urban or rural development
- Support for large-scale or small-scale operations
- Promotion of private sector or public sector growth
- Focusing on primary production growth or other growth in other manufacturing and services
- Support for export or domestic market growth
- The use of fiscal or monetary policy instruments

Choices made between these policy areas and within each one, at both the national and state levels, will have a significant impact on how the supply-side of fisheries develops and who has access to the benefits from, and opportunities in, the sector. The Central Government provides guidance to the state on these choices and directs development efforts to some extent through the allocation of funds.

Sectoral policy and legislation

Sectoral policy at the state and national government levels will also affect the supply side of the industry. Common policy choices include:

- Support for large-scale enterprise or small operations
- Promoting export production or domestic food security
- Promoting expansion of inland or marine fisheries
- Promoting capture or culture fisheries

Again, sectoral policy is formulated at both the national and state levels. Past state sectoral policy has focussed on raising production and improving producer prices. In line with this, emphasis in the marine sector has been placed on improved gear and vessels, increased landing infrastructure, brackishwater farming expansion and a more developed marketing system. In inland fisheries the emphasis has been placed on increased seed production and the rehabilitation of ponds.

Continuing this theme, current aims for the sector concern:

- Regulatory aspects of fisheries
- Improvement of the socio-economic conditions of the fishermen
- Developmental activities through extension work to promote private sector participation
- Implementing pilot projects for the introduction of new technologies

The strategies for development include providing landing and berthing facilities, improving craft and gear, developing infrastructure, establishing processing and preservation facilities, building feeder roads, improving marketing and transportation, training fishworkers, and providing emergency relief, housing and insurance.

To maximise the effectiveness of these strategies and to distribute the benefits evenly, development efforts are directed at both inland and marine fisheries, at traditional, mechanised and deep sea operations.

Environment

Environmental factors affect the availability of supply over time. Seasonal weather changes as discussed above affect both species and quantities available. The local geography and oceanography also affect the supply. Andhra Pradesh is fortunate in having extensive freshwater, brackish and marine resources and a long coastline to exploit. In addition, the vessels of the state tap the resources of adjacent states.

The sustainability of fish supply is directly related to the condition of the environment. Degradation of the aquatic environment takes the following forms:

- Depletion of resources
- Loss of biodiversity
- Destruction of habitats
- Pollution
- Loss of amenity

From the perspective of supply, depletion of resources can result in fewer fish reaching the market; loss of biodiversity can result in fewer species available; destruction of habitats can result in a change in both species and quantity landed; pollution can result in a reduction in the carrying capacity of the environment and thus resource depletion, and loss of amenity can pose a threat to the fishing communities themselves.

The main factors affecting the environment are:

The small-scale sector

The small-scale fisheries sector directly contributes to environmental degradation through the over-exploitation of resources. This may be through the over-exploitation of inshore resources by the use of destructive fishing techniques such as fine meshed nets which may harvest juvenile species. A large number of shore-seine operations take place near the mouth of the Godavari which is a fertile breeding ground for many commercially important varieties of fish and prawns. There has been a sharp increase in shore-seine activities in southern Andhra Pradesh in recent times, which could be responsible for harvesting juveniles.

The level of exploitation relative to the available resources is not well understood in the marine and estuarine waters adjacent to Andhra Pradesh. Expansion of production is clearly considered sustainable, however, as the government is supporting increased production. Likewise, the extent to which the small-scale fishery is adversely interacting with the resource is not known.

The Marine Fisheries Regulation Act (MFRA), recently formulated by the Government of Andhra Pradesh, has far-reaching significance in ensuring fishing rights of the small-scale fisherfolk over the inshore waters. The MFRA aims to resolve the conflicts between traditional fishermen and mechanised fishing boat operators, to regulate marine fishing activity in the inshore and offshore fishing grounds by patrolling, and to register the fishing crafts in operation. Lack of proper orientation to the fishermen on the benefits of implementation of MFRA has been the main obstacle to its effective implementation.

The large-scalefishing sector

The large-scale fisheries sector is well monitored in Andhra Pradesh because of the localised landings of prawn and associated bycatch in a few harbours. The impact of these vessels on the resource is, however, poorly understood. Frequent encroachments into the inshore waters, to the detriment of both the small-scale fisherfolk and the resources, has emerged as a vital area of concern in recent times. The continued dumping of non-target fish by the large-scale vessels represents another major loss of supply. If this can be overcome the supply situation would be dramatically changed.

Aquaculture

Aquaculture can, and has increased the supply of fish. In the future, both inland and brackishwater hold potential for considerable expansion of supply. Aquaculture can, however, damage the aquatic

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environment through habitat destruction (land drainage and clearing, salinisation of rice fields or mangrove cutting); the introduction of genetic changes in the wild stocks: pollution, and introduced disease. Support from the World Bank for brackishwater aquaculture has been preceded by extensive environmental impact assessments. Given the importance of aquaculture to Andhra Pradesh, environmental monitoring is clearly an activity which will need to continue. Salinisation of paddy fields adjacent to prawn culture ponds has reportedly been an endemic problem.

Aquaculture can also affect the biodiversity of wild stocks through the introduction of new or changed breeds into the wild stock or by displacing wild species altogether.

Overall, the unregulated growth, and the subsequent fall of brackishwater aquaculture has a number of lessons for all stakeholders.

The FAO-BOBP has initiated a participatory programme for devising strategies to overcome problems posed by aquaculture, involving all stakeholders.

Other human interactions

Other human interactions include forestry, agriculture and livestock, industry, infrastructural development. tourism, shipping, urbanisation and mineral extraction.

Andhra Pradesh has a population density of 241 people/km which is relatively low in comparison to some states. In spite of this there is still some cause for concern that human activities have a negative effect on the environment. Most of the pollution from factories in Andhra Pradesh comes from plants located in the central region of the coastal belt. Of all the pesticides that are used in India at present, one third is reported to be used in Andhra Pradesh, 25% of this is believed to reach the sea. For most villages located downstream of the rivers Godavari and Krishna, discharge of industrial affluents is a major problem, affecting their operations for periods of up to three weeks at a stretch.

In addition, the resources which many of the vessels based in Andhra Pradesh rely on are directly affected by the heavily polluted Hooghly river.

Information on the extent of soil erosion from agriculture and forestry is very sketchy.

Urbanisation within Andhra Pradesh. albeit less concentrated than some other states, does pose a sewage disposal problem although its effect on the fishery is unknown.

Natural causes

One of the main environmental factors affecting the supply of fish is the weather. During the monsoon offshore fishing is limited to the type of vessels which can withstand the weather. There is a shift in the composition of species and the quantities landed as discussed above.

The cyclone season in Andhra Pradesh particularly disturbs fishing activities, destroying houses, gear and boats. Flooding of the rivers Godavari and Krishna hampers fishing activities for months together in the villages abutting their banks.

Micro-economic factors

The main micro-economic factors affecting the supply side of the sector are:

Growth opportunities

If no growth opportunities for increased production exist, there is little scope for expansion of supply beyond improved use of available resources. Unfortunately with the expanding population there is growing pressure for increased harvesting of existing resources and this can lead to declining returns for current users. The possibilities for expansion in Andhra Pradesh in capture fisheries are not well known. According to a recent study, more than half the varieties of fish caught in the marine waters in the state are overexploited, and overall, the catches exceed the potential yield. Fish are probably more available offshore than in the inshore and estuarine areas (see environment above). Growth opportunities do exist in aquaculture and possibly in inland 'ornamental' fish production.

Credit availability

Although growth opportunities exist, access to them may be biased towards certain groups. Perhaps the most important micro-economic factor affecting the potential distribution of opportunities on the supply-side of the sector is the availability of finance to different groups within the sector. The government has been particularly active in supplying credit to potential buyers of mechanised boats and those wishing to initiate or expand aquaculture production.

For the smaller vessel operators, who may not own their own boats, credit is less easily obtained. The low levels of education amongst many fishermen limits their access to formal credit sources. This is compounded by their lack of collateral. The cooperatives do extend credit for boat purchase as do the state banks and the National Bank for Agriculture and Rural Development (NABARD). However, credit obtained by the small-scale

fisher-folk mostly comes from the informal sector. The project conducted a study of the credit availability to artisanal fisher-folk, and found that less than 10% of the credit requirements of the fisherfolk are being met by the formal sector, consisting of banks, development institutions and co-operatives. While the interest rates were nominal in the formal sector, at 12 per cent per annum, the transaction costs averaged 16 per cent of the loan amount.

Marine fisher-folk require credit for both production and consumption. Production credit is of three types. The first is for investment in fixed assets like the purchase of boats and nets and motorisation of traditional crafts. The second is the working capital requirement for storage of fish and raw material for drying or salting. The third is working capital required for financing fish trade. Consumption credit is for household needs, children's education, housing, etc. Production credit constitutes 70% of the total credit usage.

Small-scale enterprise skills

The best use may not be made of growth opportunities beacuse of a lack of micro-enterprise skills. This is particularly so in poor communities with limited access to education. The work being carried out by NGOs in training and motivating people to undertake simple improvements to the traditional production and processing methods, and approach their enterprises more systematically, requires more time for consolidation.

Opportunity cost of labour and capital

Where the supply offers opportunities for increased activity and where the small-scale operators have the ability to access those resources, the benefits may be dissipated by surplus levels of labour and capital. Where few other opportunities exist, income from the sector, no matter how low, may encourage increased entry to the fishery if exploitation levels are not controlled. This will lead to the dissipation of benefits, reduced viability of capital and resource depletion.

Limited alternative income generating opportunities exist in the coastal communities. These may, however, include wage labour in casuarina and coconut plantations (seasonal) or in salt production, agriculture or coir manufacture, as watchmen, and employment in the merchant navy. Some fishermen also participate in fish processing, acting as porters, cycle traders, net menders or boat builders.

Market opportunity, access and information

In Andhra Pradesh's coastal region access to markets is restricted by poor roads and fragmented communities spread over a long coastline. This limits the market knowledge available to the poorer producers and thus their ability to negotiate realistic selling prices for their products. In addition much of the fish leaves the state for distant markets in Calcutta and Chennai over which the fishermen have little control and about which they know little.

Likewise, their lack of capital accumulation and weak savings practices necessitate debt relationships to provide appropriate levels of capital. These relationships then limit marketing opportunities as the borrower may have preferential rights to the fish at agreed prices.

From an export perspective, the growth of world demand for fish and the static supply from many countries is liable to raise world prices and encourage countries to export more. This will have the effect of encouraging expansion of the trawler industry within the state.

Institutional influences

The level of institutional organisation within different groups of the supply-side of fisheries greatly influences their ability to coordinate actions, communicate needs and aspirations and achieve economies of scale in the selling of produce and purchase of inputs.

The poor organisation of small-scale producers in Andhra Pradesh has a direct impact on their well being. The project has worked towards developing strong institutional frameworks and linkages between producer groups, to enable them to undertake production and marketing activities in a more systematic manner. A few NGOs also have initiated the development of strong grass-root level institutions as necessary instruments to obtain better prices for produce.

Political influences

The shared resources which migrate between Andhra Pradesh and neighbouring states pose potential management problems unless states can cooperate on management regulations and enforcement. Likewise, regulations imposed by one state on its fishermen will be of limited value unless vessels of other states fishing in the same waters operate under similar restrictions.

In the medium-term, resource harvesting capacity will have to be controlled, and important and difficult decisions will have to be made' regarding the

distribution of catching opportunities between different harvesting/culture groups. These decisions will ultimately affect who participates in the fishery and who benefits from it.

Andhra Pradesh occupies a unique position in that on the southern coast, the menace of the trawlers operating from Chennai encroaching upon the inshore waters has had a very negative impact on the traditional fisherfolk there, while at the same time, trawlers operating from Visakhapatnam make life miserable for the traditional fishing fleet of southern Orissa. Inter-state agreements have to be made, and considerable political will is required to ensure that the depredations are stopped.

Technological influences

The technology of the capture-side of the fishery allows different participants to access different resources. Small craft have limited range and tend to focus on the inshore and estuarine resources. Motorised vessels can go further offshore. The larger vessels are the only ones which can venture far during poor weather. The two most important technological advancements in development of fishing craft in Andhra Pradesh have been the introduction of fibre-glass (FRP) as an alternative to wood for construction of fishing craft and the motorisation of traditional fishing craft.

New techniques and new materials will affect the opportunities available for women engaged in the production of nets. One of the significant developments in this sub-sector in recent times has been the introduction of trammel nets (for prawns) and longlines (for sharks).

Different levels of technology within the aquaculture sub-sector have affected the quantities and quality of the fish produced, although the overall impact of intensifying prawn-culture methods is seen to be negative.

Access to levels of infrastructure also affect the ease with which product is supplied to the market under different weather conditions. Access to proper berthing facilities, ice plants, cold-storages, ready transportation and communication systems are being given attention by the government and the private sector. There has been an overall change for the better in the infrastructural facilities available in many areas.

Social, cultural and demographic factors

In the past, the supply-side of fisheries has been dominated by a few castes. This may have limited entry into the fishery and acted as both a constraint to development and an inadvertent resource management measure. The growth of the market, changes in technology and population pressure in areas adjacent to resources have changed this situation. The expansion of export markets has prompted an inflow of capital from outside traditional castes into both the capture-side of the fishery and aquaculture. Till recently, most of the trawler fleet based at Visakhapatnam was controlled by people not belonging to the community, although the crisis facing the trawler-fleet has reportedly brought down the number of outsiders significantly. Similarly, when the aquaculture boom started in the state, it was mostly outsiders who entered the sub-sector. Again, there are reports that there has been a decline in their numbers after the current crisis started. The availability of high cost technology, beyond the means of traditional producers, has thus prompted changes in capital ownership patterns and the relationships between producers and traders.

The expansion of resource adjacent populations has increased the pressure for more people to enter the harvesting side of the sector, both from traditional castes and from outside.

Changes in the micro-economic factors affecting the supply-side affect different groups in different ways. Social and cultural biases at the community or household levels can change the access which different groups have to benefits. A changing micro-economic environment can have particularly negative effects on the role which women play in the sector even though few are active in the supply-side.

At present these factors are poorly understood in Andhra Pradesh although various detailed studies have been made on the organisation and structure of fishing communities.

5.3.6 Current Intervention

Non-governmental sector

In addition to these support bodies the fishermen themselves have a series of cooperatives within a three tier system. The primary societies are concerned with the supply of product. Secondary-level cooperatives at the district levels are concerned with the supply of inputs. The third level or state apex body is the Andhra Pradesh State Fishermen Cooperatives' Federation. This implements the schemes assisted by the NCDC, supplies inputs to the sector and acts as a coordination unit. There are 3,85 1 primary societies in Andhra Pradesh, 15 marketing societies, one federation and 22 district societies. The total membership of primary societies was 339,000 in 1996197.

Private sector

The majority of fish producers are private sector operators and thus most of the supply is controlled by the private sector. Money-lenders provide the bulk of the finance for the capital development and operational expenditure of the sector, and the forma1 sector contributes credit assistance to some extent.

Government

Past government support has strongly focussed on increased fish production. Government support for motorisation of the fishing fleet began in the 1970s. This allowed vessels to fish further offshore and thus increased the quantity of fish landed and the range of species. The various state-based agencies and departments associated with support for the supply side of the sector are outlined below:

Fisheries Department

The Department is the key government body responsible for the formulation of policy and plans and for ensuring their implementation. The administration of the sector is done through six regions each with a Deputy Director responsible to the Commissioner. The Department also operates a State Project Unit which is responsible for the implementation of World Bank project support.

The Department provides direct support in the expansion of supply from both capture and culture fisheries. It monitors and promotes improved management of the resources, and actively promotes the involvement of small-scale and poorer participants in the sector.

Andhra Pradesh Fishermen Co-operative Federation (AFCOF)

NCDC operates the Integrated Marine Fisheries Development Project through the s&ate apex cooperative body. This is aimed at increasing fisheries production and improving marketing. Through this, fleet expansion/replacement are funded, in particular Beach Landing Craft (BLCs) developed with support from the BOBP.

District Rural Development Agencies

These agencies assist in the construction of fish drying platforms, conduct training programmes for fisherfolk, provide rural women with working capita1 assistance under DWCRA and other programmes.

The Marine Products Export Development Authority

There are two offices, one in Vijayawada and the other in Visakhapatnam.

The Central Institute of Freshwater Aquaculture

This institute is based at Vijayawada.

The Central Institute of Fisheries Technology

CIFT is based at Visakhapatnam.

The Central Marine Fisheries Research Institute

There are two units of CMFRI in Andhra Pradesh, in Visakhapatnam and Kakinada.

Central Institute of Fisheries Education

Based at Kakinada and Balabhadrapuram, CIFE trains extension staff of the Department of Fisheries from all states of India, and private entrepreneurs. on improved methods of culture.

Central Institute of Fisheries Nautical Engineering and Training

This institute is based at Visakhapatnam.

Integrated Fisheries Project

Based at Visakhapatnam, IFP has a full-fledged processing plant, and is perhaps the only agency which actually produces and markets fish products to institutional buyers like the Navy, and to markets in the North East, besides selling through its own outlet in Visakhapatnam.

Fishery Survey of India

Based at Visakhapatnam, the Fishery Survey of India collects data on fishery resources of offshore and deep-sea waters.

FAO-BOBP

FAO-BOBP has been involved in a variety of projects in Andhra Pradesh. These include the introduction of new vessels and gear and support to aquaculture production. The BOBP is working on Coastal Zone Management issues in Andhra Pradesh, with reference to brackishwater aquaculture.

5.4 TRANSFORMATION OF FISHERIES PRODUCTS

Fish is transformed in several ways before being consumed. In this context transformation refers to the changes which take place between the time of capture or harvest, and the time when the fish is consumed.

5.4.1 Types of Transformation

A. Product transformation

Product transformation occurs mainly to add value to fish or to preserve it, and can take many forms. The packaging of fish is also a method of product transformation. Icing, freezing, drying, salting, and fishmeal production are common in Andhra Pradesh.

The various methods of physically transforming the products are discussed below:

Gutting and filleting

There is very limited gutting of fish before sale. Fish are generally not filleted although larger fish may be cut into steaks for retail purposes.

Icing

Most of the fish landed by the smaller vessels in Andhra Pradesh is not iced as it is caught by vessels which have been at sea for a short period. The smaller craft have very limited space and where ice is used it tends to be used for preserving prawn, not fish. Some of the beach landing crafts (BLCs) are now constructed with a built in ice box. The project has introduced ice boxes to be carried aboard fishing craft of various sizes and varieties. Vessels going to sea for more than a day generally take ice. Ice, when used, is generally for the higher value species such as seer, snapper, threadfin, croaker, carangids, pomfret, barracuda, mullet, and some flat fish. The smaller prawn trawlers may take ice to hold both the fish and the prawns.

Fresh fish transported from the beach to market is generally iced. Cycle traders and headloaders keep fish in ice before taking it to the market. The proportion of fish from Andhra Pradesh which is sold fresh is, however, low in comparison to Orissa, West Bengal and Tamil Nadu. It was estimated that 44% of the landed marine catch was made available in fresh form in the mid to late 1970s. In recent times, however, more fish are being iced and sold fresh. Freshwater fish is more likely to be marketed fresh because more predictable harvesting rates and better road communications with the farms allow wholesalers to provide timely and effective transport.

Fish which is transported from Andhra Pradesh to other states is also well iced. It may be transported in bamboo woven baskets, plastic boxes in insulated trucks, or in insulated tea chests.

There are 52 ice plants reported in Andhra Pradesh with a capacity of 519.5 mt. The majority of these plants are in Visakhapatnam, East and West Godavari.

Freezing

Some of the fish landed from the prawn trawlers in Andhra Pradesh is frozen onboard. Most of the prawn caught by the larger trawlers is landed frozen. There is also onshore freezing capacity but this too is mainly' targeted at the export quality prawns. There are 19 freezing plants with a capacity of 120.5 mt/day, and 26 cold stores with a capacity of 3,162 mt. They are mainly situated in Visakhapatnam district.

Some frozen fish does enter the market but this is generally frozen onboard the larger fishing vessels.

Smoking

The smoking of fish occurs to a very limited extent in the Godavari delta. Mostly estuarine varieties, such as mullets, eels and lesser penaied prawns are smoked. Although the demand for smoked fish is very high, it is practically confined to the Godavari delta. The project has been instrumental in developing an improved smoking method in the area.

Salting

Salting of fish is reported to be one of the main methods of preserving marine fish in Andhra Pradesh. The main fish salted are sharks and rays, sardines and, when glut landed, mackerels. Salting is usually by brining in tanks, and the product is then sun dried. Wet salted shark meat and sardines have markets of their own. Fish used for salting are generally split one way or the other, to allow rapid penetration of salt into the body.

Drying

Fish is dried for both human consumption and fishmeal. Fish for human consumption takes many forms including Bombay duck. A large proportion of fish, especially the smaller or flatter species of fish (e.g. ribbon fish, ponyfish, anchovies, sardines and smaller jewfish) are dried.

Most of the fish is dried on the ground on sand, gunny sacks or casuarina leaves. The fish destined for the use of fishmeal is generally dried on sand. Some fish is dried on racks but the process is not widespread, and only fish to be consumed by the fisherfolk themselves are rack-drived.

Shark fins are also dried in the sun, usually on sacks on the ground. Drying of prawns, particularly Acetes shrimp, is widely prevalent.

Fishmeal production

Gupta et al mention that there are no fishmeal plants in Andhra Pradesh although smaller grinding plants do exist.

Canning

A canning plant was established in Kakinada by the Fisheries Department in 1974. There was no demand for the product and the plant was closed.

Packaging

There is no substantial packaging of fish for the domestic market except during the process of distribution. Packaging for export is carried out. Integrated Fisheries Project and the Andhra Fishermen's Central Cooperative Society have tried marketing dried fish in packets with positive results.

Live fish

There is no record of live fish being marketed, although it is likely that some farmed fish reach the market alive. No information was available on ornamental fish at the time of the study.

Value-added products

FAO-BOBP (1983) mentions that there are three fish filleting and mincing plants at Visakhapatanam, Machilipatnam and Krishnapatnam. A recent development is the dressing, filleting and slicing of fish which is then sold frozen in polythene packets in Hyderabad, Chennai, Delhi and Bangalore. A private Surimi manufacturing plant operates in Visakhapatnam. Many NGOs have trained small-scale processors in the production of value-added products, such as pickles and wafers, using low-cost fish, and the market response has been positive. The project has promoted small-scale ventures in the production and marketing of value-added products among the fisherfolk and the agencies working with them, as a means of alternate income generation.

Other

Shark liver oil and the production of capsules is carried out by the Andhra Fishermen Central Cooperative Society at Kakinada. This factory, the only one of its kind on the east coast, produces and sells crude and refined shark liver oil for aquaculture and pharmaceutical industries, besides selling A&D vitamin oil capsules.

B. Place transformation

Fish is transformed in terms of its location. It is moved from the fishing ground to the point of landing then undergoes a range of relocations until it reaches the final consumer.

Marine fresh fish

Fish is often sold directly on the beach after landing, and in some places, is transferred to an auction hall or godown. Most fishermen have credit linkages with the traders, who in turn purchase the more important varieties of fish such as seer and pomfret at prefixed prices. Commercially less important fish like tuna and trawl bycatch are purchased by petty fish traders – women-headloaders and cycle traders. When good landings are expected, larger traders bring their own transport and ice.

The important varieties of fresh fish, purchased by the wholesaler or commission agent, go to the urban wholesale or retail markets, such as Chennai, Hyderabad or Calcutta. Fish destined for ex-state consumption is packed with ice in bamboo baskets, insulated tea chests or plastic boxes and sent by rail or truck to the ex-state wholesale markets. Some fish may also be sent to other urban centres within Andhra Pradesh, such as Visakhapatnam, Vijayawada and Guntur.

Freshwater fresh fish

This is either harvested continuously from open water bodies or periodically from culture tanks. When fish is caught from open water bodies it is usually sold by the fishermen directly to local retailers such as cycle traders or headloaders.

Before harvesting a culture area the farmer informs a trader who agrees on a price and arrives on the day of harvest with a truck and ice. The fish is packed in ice and taken by the trader or commission agent to one of the main urban markets in Andhra Pradesh or to Howrah in West Bengal. It then follows the same route as the marine fresh fish.

Ex-statefish

There was little information about the flows of ex-state fish into Andhra Pradesh.

Frozen fish

Much of the frozen fish is frozen on prawn trawlers before landing. Other higher quality fish is bought from harbours or wholesale markets and frozen. Little information was available on this aspect of the product transformation.

Smoked fish

Smoked fish is consumed within the Godavari river delta system itself. A small quantity of smoked fish is sold at big markets like Kakinada and Dowlaiswaram, and some reaches the upland areas within the area. Smoked shrimp is purchased in bulk and sent to the upland areas of Orissa and Andhra Pradesh.

Salted fish

Poor feeder roads and isolation from markets limit the options available to fish producers. The irregular landings at many dispersed and often inaccessible landing sites conspire to ensure that prices are low. Often only the best fish is bought for fresh fish consumption and the rest may be salted or sun dried. These activities may be carried out by the fishermen themselves or by processors who buy the fish specifically for curing. Some cure in their own homes whilst others make use of government curing yards which are established to assist in the salting of fish.

Wet salted shark meat has a good market in Kerala, traders come from Kerala to purchase it. Wet salted sardines have a good market locally, and some is sent to the upland areas of Orissa.

Dried fish

The smaller or spoiled fish is generally sun dried. Spoiled fish goes into the production of poultry feed. Fish for human consumption is sold to dried fish wholesalers. The fish is then transported by truck to dried fish wholesale markets in the main centres. It is then sold by the wholesalers or given to commission agents to sell. It is then taken to retail markets and transferred inland in the state or sent to ex-state markets. Some dried fish is also believed to enter Andhra Pradesh from other states, especially Gujarat and Maharashtra. It is reported that a large part of the dried fish sold in Hyderabad comes from outside the state.

Two types of dry fish market exist in Andhra Pradesh: regular wholesale and retail markets, and weekly markets. Nakkapalli in Visakhapatnam district is arguably the biggest dry fish market in the state. Kakinada, Dowlaiswaram, Tadepalligudem and Vijayawada are other important dry fish markets. Most of these markets operate only on a particular day of the week.

Fishmeal

Fishmeal is produced in the village and then packed in gunny bags for sale to wholesalers, who in turn sell the product to poultry farms. The poultry farms generally have their own feed manufacturing units and fishmeal is mixed with the other ingredients, as a source of protein.

Canned fish

There is no information available on canned fish distribution.

Live fish/prawn fry

At the height of shrimp farming, collection and sale of prawn fry was a lucrative activity, but after the construction of shrimp hatcheries, this activity dwindled. The current crises besetting the aqua-industry have dealt a further blow.

Value-added products

The markets for value-added products tend to be confined to urban centres, and Hyderabad, Visakhapatnam and Vijayawada have been targeted by the various producer groups. Any enterprise in this sector has to target these urban centres to make a beginning.

Other

Hospitals are generally the main consumers for shark-liver oil, and some aquaculture units in East and West Godavari and Krishna have started using shark-liver oil as an ingredient in shrimp feed. Air-bladders of eels and shark fins are dried and sent to Chennai, for export to south-east Asia.

C. ***Image transformation***

The image of fish can changed through active promotion programmes of the government, NGOs and private sector.

The government may promote fish as a health-giving source of protein through education programmes on the radio, television or in the press. Such education may also be channelled through school curricula or through community extension programmes. Government poverty alleviation programmes may also promote fish through subsidised distribution of fish, e.g., through school meals.

NGOs may likewise promote the consumption of fish through health and nutrition programmes.

The private sector traders and businesses generally promote fish in order to increase sales or selling price. They may use messages similar to those used by the government and NGOs but their motives for doing so differ.

The project has, with the assistance of the Department of Fisheries, conducted a number of awareness programmes targeting consumers to make them aware of the scope for value-addition to fishery products, and their potential benefits.

D. *Price* ***transformation***

There is little information on the transformation of price along the market chain as few statistics are collected. The main features of price transformation for each type of product are outlined below:

Fresh jish

The isolation of the fishermen and women, compounded by poor road networks, means that fish producers have poor market information. This allows exploitation by traders.

Often, fish producers are indebted to traders for capital or operating costs necessary to conduct fishing or for their consumption needs during lean periods. As a result, they are bound into a relationship with the lender over the fishing seasons. Whilst this relationship may appear exploitative in that fish producers may receive low prices for their catch, the prices paid often incorporate loan repayment, interest and other services provided by the lender. During auction the price paid to the fish producer varies according to the arrangements between the fishermen and traders. These systems vary between locations within Andhra Pradesh and the various transaction

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costs must be considered in the price transformation process.

As the fish moves along the marketing chain, various inputs are made by transporters, traders, storage agents and commission agents which all contribute to increasing the price. Understanding the relative benefits accruing at different stages is often difficult and, in Andhra Pradesh, little studied. Commission charged also varies depending on the efforts required to sell the fish and services provided. Commissions are reported to vary between 6% and 15%. Commission agents may also pay an advance to suppliers to secure fish. This may subsequently affect the commission charged.

Frozen fish

Shrimp is the most important item in this regard. It is either frozen or chilled onboard immediately after capture, and remains in-the best condition till it reaches the processing unit, where it is again frozen before export.

Smoked fish

The processor-women purchase fish from the fishermen, smoke it, take it to the market and sell directly to consumers. Consequently, there is not much price transformation involved in the transaction.

Salted fish

Information is difficult to obtain, but in general it follows the course of the dried fish (below).

Dried fish

The dried fish trade appears to be dominated by a few traders and it is likely that they also exert considerable control over the price paid to fishermen. Again, the traders or commission agents are likely to input various services during product, place and image transformation of the fish which are reflected in the returns which each of them receives. The degree to which one of them manipulates, or exploits others in the chain is not known. The trade being highly unorganised, there are no standard weights and measures, no regulation of transactions, and the market is full of unethical practices. Traders make a guesstimate of the quantity and size of the fish and decide on a purchase price.

Fishmeal

Prices are kept very low for this product because of competition from other protein sources.

Value-added products

The little information available with the few agencies which have undertaken some initial work is not sufficient to make any informed judgements.

5.4.2 Participants in Transformation

Both men and women participate in the transformation process. In Andhra Pradesh, women are much more active in the processing and marketing of fish than men.

Distributors

There are many small-scale operators in the transfer of fish between vessels and the shore and between shore and markets. Within markets there are also headloaders who move fish between traders or to and from trucks.

The initial point of transformation, after the producer, is either the godown owner who stores the fish, buys it from the producer or acts as a commission agent for the producer, or the wholesaler who buys the fish for transportation to more distant markets. In some cases he may also be involved in the processing of fish.

Another group is the headloader and cycle trader retailers who buy directly from the fishermen in the villages or who buy from the wholesale markets in the urban centres.

Processing agents

Most of the drying or salting of fish appears to be done by villagers in the community where the fish is landed, or at nearby villages where the crew live, in the case of the urban based vessels. Processing is done by both men and women, although the latter outnumber men in most cases.

Ancillary participants

Ancillary participants in the supply of ice, salt and firewood are generally the larger operators. Local bus services and cycle trollies are used for transport. Little information was available on these participants.

5.4.3 Factors Affecting Transformation

Macro-economic policies

Refer to the sections above for a discussion of general factors.

Sectoral policy and legislation

Sectoral policy can have a significant effect on fisheries. Issues relating to the transformation of the product have always been implicit in Central Government policy but the past emphasis has tended to be on increased production, particularly in the earlier plan periods. Later the focus on post-harvest transformation increased, especially in line with the drive for increased export. This emphasis has also manifested itself at the state-level where, in recent times, improved landing facilities, roads and markets have become a thrust of development. In recent years

there has been a change in the emphasis of state policy away from the development of large-scale landing infrastructure, which was seen as benefitting mainly the wealthier operators, towards increased support at the village level This manifests itself in the development of feeder roads to fishing villages to increase the distribution of fisheries products. The Ninth Five Year Plan of the Department of Fisheries envisages considerable inputs to the post-harvest sub-sector.

Environment

Variations in the supply side of the sub-sector as a result of seasonal changes in the environment and environmental degradation can also affect the transformation-side of the sector. Seasonal supply changes affect the availability of product and the price structure in the market. This changes the relative importance of different processing techniques. Changes in the weather can also affect the transformation process itself. In the rainy seasons very little fish drying can be carried out. Roads may be impassable and the product may have to be moved by sea or be delayed reaching market, to the detriment of its quality.

The degradation of the environment may also lead to changes in species composition, the average size of fish or its quality. The quality of handling of products affects its appearance and this may affect its price along the different stages of the transformation process.

Fish retains its image of a healthy food source, and for this to continue it is necessary for the environment in which it grows to be free of pollutants and pathogens. There is clearly a need to ensure that the image of fish remains attractive to the consumer. Improved and hygienic methods of fish handling and processing have to be adopted by the processors to ensure that the product obtained is free from all contaminants. The project has conducted a number of training programmes for fisherfolk, NGOs and officers from various levels of the Department of Fisheries, on improved and hygienic methods of fish handling, and processing and preservation methods.

Micro-economic factors

The main micro-economic factors affecting the transformation side of the sub-sector are:

Growth opportunities

Growth opportunities are greatly influenced by the supply-side of the sub-sector. In Andhra Pradesh, however, there appears to be considerable scope for growth in improved quality of fresh and processed product, or from reduced losses. Such growth opportunities will depend on the availability of markets, improved business skills, improved facilities and better communications. As mentioned, the interventions made by the project and several government and NGO agencies have targeted developing the necessary environment for these opportunities to fructify, although it is too early to see how they will develop.

Credit availability

Where growth opportunities exist the benefits tend to accrue to those who can access the finance to make use of the expansion options. This is affected by the supply of credit. The beneficiaries are those most able to access that credit, this in turn focusses opportunities into the hands of fewer wealthier people; most of whom are men. The savings and credit activities initiated by many NGOs, and through government programmes like DWCRA, have been yielding very positive results, in that petty fish traders in most coastal areas have access to some source of credit. The banks have developed specific programmes to assist small-scale producers and processors, by making credit accessible to them.

Small-scale enterprise skills

Those most able to benefit from transformation changes on a sustainable basis are those most able to manage their finances and businesses. Given the lack of education of the poorer community members, they tend to be exposed to higher risks than the more educated and established traders. There is a need to educate not only fisherfolk, but also the agencies working with them on issues related to managing small-scale enterprises. The project's work in this regard included bringing out a publication of guidelines to development agencies undertaking marketing initiatives.

Market opportunity, access and information

The successful transformation of the products depends on transforming in the right way, at the right time and place, and at the right price. This requires good market knowledge and access to the markets. As markets become more sophisticated and market chains become longer, access to timely accurate information becomes essential.

The extent to which most of these factors affect the post-harvest transformation sub-sector is poorly documented.

institutional influences

At the government level, past emphasis on the production-side of the sector has limited the growth of institutional capacity and experience on the transformation-side. Where this has developed, in the form of cooperatives, the success in improving the lives of the fishermen has been limited.

Some of the cycle traders have formed associations but their success in accessing government support is limited.

The formation of women's groups under DWCRA has been effective in formation and consolidation of grass-root level groups in the village. Where advisory support was forthcotning to these groups from an NGO, they seem to have fared better than when they develop on their own, although in the latter case, the sense of ownership is considerably higher. NGOs have also tended to focus on the production or community development aspects of the sector and they appear to lack skills in the post-harvest sub-sector. In recent times, there has been a change in their focus, and post-harvest does appear to be high on the agenda of many agencies.

Technological influences

Access to technology has a large influence over product transformation and may also reduce the cost of certain transformation processes.

Of particular importance are access to the following levels of technology:

Onboard storage facilities

The availability of onboard technology for the storage of fish greatly affects the quality of the fish landed. In many cases there is insufficient space onboard to handle the icing of fish or the less valuable parts of the catch. The project participatorily developed ice boxes suitable for carrying onboard, which have been accepted by the fisherfolk.

Shore lailding facilities

One of the key technological elements in the transformation process is the provision of adequate shore facilities and roads. The government at both state and national levels has emphasised this in the past and now most of the mechanised and larger vessels have appropriate landing facilities. In Andhra Pradesh the availability of access roads has been particularly poor in the past.

The type of landing facility also affects employment opportunities for different groups. Where landing and road facilities are more limited a wide array of carriers (small boat, headloaders and cycle traders) move the fish. This generates much local employment. Changing infrastructure should consider what alternatives exist for these displaced people. In many villages in Andhra Pradesh the fish is landed on the beach and very limited facilities exist for sheltered auctioning or handling of fish.

Onshore processing facilities

The processing of fish requires certain types of technology which reflect the needs of the market and the capacities of the users. The drying of fish is achieved using very basic methods and these may well reflect the price which the market will pay. They may also reflect a lack of market information. Improved technology may improve the product, but may not necessarily improve the returns to the processor if the benefits are accrued further up the marketing chain, or the increase in price does not cover the additional costs.

Transport and storage

The roads connecting the landing sites to market play an important part in attracting traders and allowing access to public transport systems. At certain times of the year the roads may become impassable due to the weather.

Fish is carried in bamboo baskets between the landing sites and godowns, between godown and trucks and between different stages in the wholesale market. Baskets are also used on the backs of cycles and as headload carriers. The quality of these baskets affects the keeping quality of fish over time and the prices paid to the traders. The poor quality of many roads also affects the longevity of such baskets and the bicycles carrying them.

Marketing facilities

The handling and trading facilities at the wholesale and retail markets affects the quality of the fish. In the main the markets have limited cleaning facilities and the working conditions are poor. Dirt, debris and waste material are often not adequately cleared.

Ancillary facilities

These provide services such as the supply of ice. Their frequency, production and location greatly affect the availability of ice to fishermen and to traders.

Social, cultural and demographic factors

Differences in education levels in communities and households, social systems, and levels of power and wealth all influence who has access to development opportunities or who suffers most from changes in

resource availability. The relative roles of men and women are be particularly important in this regard. The education, extension, and health services provided by the state affect the ability of different groups to contribute to the supply-side. The role of women in looking after the home and raising the children affects their inputs to the sector.

The growing population in Andhra Pradesh is likely to increase demand for fish in the short to medium term. Given the limited supplies, prices will tend to rise. This may increase the prices paid to producers especially if competition between traders increases. It is likely that this will affect the availability of fish going for fishmeal or being dried for human consumption.

5.4.4 Current Intervention

Interventions to address these particular problems can take place at three levels:

Non-governmental sector

The direct involvement of NGOs in post-harvest issues related to transformation is limited in Andhra Pradesh. The lack of post-harvest skills within the NGO sector limits their effectiveness in planning interventions. The project conducted training workshops on project planning and management in post-harvest fisheries for NGOs. The AFPRO has initiated many coastal NGOs to venture into post-harvest fisheries through training programmes and technical advisory support.

Private sector

The private sector is the main driving force in the transformation process and it responds to the needs of the market as required. Considering the low levels of investment, and the precarious position of the women processors, attracting large-scale investment from the private sector would need to be done cautiously.

Government

The state government is heavily involved in development of the post-harvest sub-sector. The interest is not confined only to the Department of Fisheries, but other departments like the Backward Classes Development Corporation and District Rural Development Agency too have initiated programmes related to supporting post-harvest fisheries. In more recent years the government has tried to improve the marketing of fish through the cooperative system, but this appears to have had mixed impact on the small-scale operators. Various development projects within the government have been aimed at improved services to the communities including the provision of auction halls and ice facilities.

Some Central Government institutions are also involved in the transformation side of the sector, particularly the CIFT and IFP, but the reach of these organisations seems to be limited.

The project has carried out research with some of the participants in the transformation process in Andhra Pradesh. The Project carried out research into the possibilities of more effective use of bycatch from the prawn trawlers. It also developed ice boxes for the use by various fishing crafts and gave advice on improved handling techniques. A preliminary study of fish marketing has also been carried out. The project explored the possibilities of improved use of tuna as Maldive fish for Sri Lankan markets, but decided to concentrate on improving the traditional smoking systems in the area, which had more relevance to the needs of the fisherfolk. The project has carried out some basic social and economic research on some of the cycle traders to identify their status, working conditions and problems.

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6. TAMIL NADU POST-HARVEST OVERVIEW

6.1 FISHERIES AND THE STATE ECONOMY

6.1.1 Background

Tamil Nadu is the southernmost maritime state of India and covers an area of 130,000 sq km. It has 23 administrative districts of which I I are coastal. The total population is approximately 55.64 million, of which almost 65% is rural and 35% is urban (1991 census). The official state language is Tamil.

Tamil Nadu has a coastline of 1,000 km and a continental shelf area of approximately 4 1,4 12 sq km which ranges in width from 40 km to 60 km.

During the successive plan periods. the State Government has implemented various development schemes for increasing fish production from inland and marine sources, improving the socio-economic condition of fishermen and generating employment opportunities in rural areas.

6.1.2 Domestic Food Security

Fish forms an important part of the diet in Tamil Nadu where an estimated 80% of the population consume fish.

6.1.3 Employment

Fisheries contribute significantly to rural employment within the state. There are 261.7 16 active marine fishermen and 49,685 inland fishermen. Ancillary services employ about 27,000 — 19,500 in fish marketing, seed collection and conch diving, 7,500 in other activities.

6.1.4 Income

Tamil Nadu is a net exporter of marine products. These contribute significantly to the state economy.

6.1.5 Foreign Exchange

The fisheries sector is an important and growing source of foreign exchange earnings, with the total value of exports estimated at Rs.10,756.72 million during 1996-97.

6.2 DEMAND FOR FISHERIES PRODUCTS

The demand for fish products can be looked at from the following perspectives:

6.2.1 Demand Characteristics

Current quantitative demand

There is a lack of quantitative information about consumer demand for different fish products. Qualitative information seems to suggest that, at current prices. demand for most fish products is still buoyant.

It is estimated that 45.3 million people in Tamil Nadu, or 80% of the total state population, eat fish. The annual per capita consumption of fish in Tamil Nadu is estimated at 7.5 kg. On the basis of these figures, total quantitative demand is estimated at 340,000 mt per year.

Export depends on international market demand. During 1996-97 exports reached 40,878 mt.

Product type, species composition and quality demanded

In general. what species of fish is in demand will depend, in the main. on the income levels of the end consumer in any particular market segment. Consumer information about fish and fish products in different markets of Tamil Nadu was not available; however, a survey of fish consumption in Chennai revealed the following features which may be representative of fish consumers throughout Tamil Nadu.

- Low-income groups eat varieties of cheaper fish or fish products. Familiarity and value for money influence their choice.
- Middle-income groups. less constrained by price, eat a wider range of fish and fish products regularly. These consumers often decide in advance about species they want to eat but other factors such as quality may influence their final decision. This group is regarded as the most willing to experiment with unfamiliar species.
- High-income groups are far less willing to experiment, and normally eat only a few premium fish and fish products. Quality, hygiene and ease of preparation often influence the species preferred.

A brief review of the various product types, species and associated quality is given below:

Fresh fish

Fresh fish is marketed in large quantities within the state. These marine and freshwater species may or may not be iced. Inland consumers prefer freshwater species such as carp, rohu and catla. Freshwater fish is normally of good quality

Most marine fish species are eaten in a fresh form within Tamil Nadu. The main species of higher value include seer fish, perches, pomfrets, and shrimp. The marine fish consumed within the state is normally of good quality but some fish reaching interior markets is of inferior quality.

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There is a sizeable market for frozen fish in the state, the main consumption being in large urban centres. Frozen fish is mainly of higher value species such as seer fish, pomfret, perch and prawn. There is also a high demand for frozen products for the export market. Frozen fish is consistently of high quality.

Salted fish

There is demand for salted fish among both rural and urban consumers. The main species consumed in salted form are sardines, ribbon fish and shark. The products are normally of reasonable quality.

Dried fish

There is a large demand for small, low-value dried fish such as anchovy, whitebait and small sardines. The quality of dried fish is variable and often contains varying quantities of salt, sand and dust. During a market survey conducted in 1993 (by a local marketing and research group) for improved dried anchovies in Chennai and Hyderabad, respondent users said they would like to buy the product because it tasted good, did not smell, and was reasonably priced.

Smoked fish

A review of the masmeen — cooked, smoked and dried tuna — trade indicates substantial demand for masmeen in Tamil Nadu. An estimate of the demand for masmeen is 130 tonnes/annum in three cities in Tamil Nadu, namely, Tuticorin, Trichy and Madurai. However, the quality is inconsistant and the supply irregular.

Fishmeal

Dried fish is normally utilised by fishmeal production plants. Most of these fish are lower-value species from shrimp bycatch and spoiled fish unfit for human consumption.

Canned fish

Tamil Nadu has two canning plants with a total production capacity of 7,400 cans per day. One, with a capacity of 5,000 cans per day, is in Chennai, the other in Thanjavur. The canning plant owned by the State Government is not functioning and has closed down. The products are normally of reasonable quality and are available in departmental stores and supermarkets.

Live fish/prawn fry

There is a high demand for fish and shrimp seed in Tamil Nadu. The species of seed in demand are mainly carp, rohu and catla for freshwater aquaculture, and *P.monodon* and *P.indicus* for brackishwater prawn aquaculture. Seed from hatcheries is normally of good quality, but the quality of wild seed depends on the method of handling after capture.

Value-added products

Fish and prawn pickles are consumed in limited quantities within the state.

Variability in demand

For religious reasons, fish is not eaten on two or three days a week (Tuesdays, Fridays and Saturdays). Fish consumption in October is low because of the number of auspicious days during that month. Consumption is high during July and August when there are few auspicious days.

6.2.2 Market Segmentation

In attempting to define the segments of the fish market in Tamil Nadu, it is necessary to identify groups which have significant differences in their demand characteristics. Members of each segment should be sufficiently similar to permit generalisation.

The identification of the marketing chain, from the first hand sale of fish in Tamil Nadu to the end consumer in local or distant markets, facilitates segmentation.

The following is a segmentation of customers (those who buy the fish) rather than end-consumers. This is done to facilitate discussion. It is based on the premise that the buying patterns of customers are influenced by the demands of the end-consumers they service.

The focus in this report is on small-scale traders. We are therefore concerned mainly with those segments of the market that influence the operations of small scale fish traders either directly or indirectly. In practical terms, the segmentation of the market is based on those points at which the small-scale trader no longer has access to, or influence over, the fish. The customers can be segmented thus:

Coastal retail

Demand in coastal communities is normally for marine species. These are generally poor communities with a strong tradition of fish consumption. The lower-value, smaller-sized fish such as sardines, anchovies, catfish, ribbon fish, mackerel and small shrimp are consumed locally, as are dried products from low-value species.

Chennai retail

There is a high demand for a variety of fresh fish of both marine and freshwater species and this reflects

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the variety of end-consumers. The high-income groups go for high-value marine fish. The main demand for dried fish, which is also retailed, is from middle-income and low-income groups. Frozen fish products and value-added products are retailed through department stores and small retail outlets throughout the city.

Inland retail

Inland customers prefer fresh fish, mainly freshwater species. Marine fish is also retailed in the fresh form. In some inland markets, consumers prefer marine fish which are slightly spoiled, or not iced. Dried fish is also consumed within inland markets. In general, the poorer customers normally buy lower-value fish products in fresh or dried form.

Institutional

Institutional customers may include:

- The Army
- The Navy
- The Police
- Prisons
- Hospitals
- Hotels/restaurants
- Schools/colleges

They purchase both marine and freshwater species in the fresh form although frozen or dried purchases are also reported.

These customers tend to be urban-based and rely on relatively large quantities and consistent supplies of fresh fish. Changes in demand from this group may have a significant impact on the availability and price of fish to which the small-scale trader may have access.

Industrial

The main demand for fishmeal is as poultry feed, and the main customers are located in Coimbatore and Salem districts.

Exports to other states

The wholesale demand varies according to the final destination of the product as it reflects consumer demand in those markets. Various wholesale markets can be identified outside Tamil Nadu.

For fresh marine and freshwater species, supplies are sent to West Bengal (Calcutta), Karnataka (Bangalore), Maharashtra (Bombay), Kerala and Andhra Pradesh. There are also wholesalers who supply salted and dried fish to customers in Kerala (mainly in Alwaye and Calicut) and Andhra Pradesh.

Overseas exports

Export packers normally buy marine and brackishwater species such as shrimp, lobster, cuttlefish and crab. The product is usually frozen and packed for export markets in Asia, Europe and the USA. There is a strong demand for shrimp within a particular size range and quality and for dried shark meat and fins.

Dried fish exports from Tamil Nadu, estimated at 18,792 mt during 1985-86, fell gradually to about 3500 mt during 1992-93, mainly because of non-availability of markets in Sri Lanka.

Aquaculture

Aquaculture producers of both prawns and freshwater carp purchase live seed or fry from hatcheries or wild stock.

6.2.3 Factors Affecting Demand

Macro-economic policies

The demand for fish may be influenced by fiscal, monetary, exchange rate, trade and development policies.

The recent decentralisation of the Export Promotion Capital Goods scheme (EPCG) has made possible the export of perishables through more ports than before (those with a deputy collector of customs). This may stimulate export demand for fish products by reducing the transaction costs of exporters.

The Central Government relaxing its policy on trade and convertibility of Indian Rupees to foreign currencies, has also increased export of fresh and dry fish abroad, to European and Gulf countries in particular. A thorough assessment of the impact can be made after a year or two.

The recent increase in fuel prices will raise the shipment costs associated with fish destined for ex-state markets. The demand for certain species may be affected if these costs are transferred to consumers in distant markets.

Sectoral policy and legislation

MPEDA has promoted demand for Indian products in overseas markets and this has benefited the prawn farming industry as well as other exporters of fish and fisheries products from Tamil Nadu.

Environment

The import regulations of many nations are becoming more stringent. This may influence the type and

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quality of products exported from Tamil Nadu. Processing plants are improving quality control to meet the requirements of importing countries and are having their inhouse control approved by the authorities of those countries. This is because Indian export inspection agencies no longer inspect and certify those plants.

Disapproval of many seafood processing units in the state by an Emergency Inspection Mission of European countries in mid '97 adversely affected the demand for processed seafood in the European market. This had a negative impact on the demand for fresh fish too.

The repeated outbreak of disease in farm-produced shrimp in the mid '90s may bring down the demand for fresh prawn in the domestic market and for processed prawn in international markets.

Micro-economic factors

Micro-economic factors affecting demand may include:

Price

No information was available at the time of the study to assess the price elasticities of demand for various fish products.

Changes in the price and availability of substitutes

Qualitative reports suggest that export demand for fish from Tamil Nadu may be relatively elastic with respect to the price of substitutes from other regions or countries.

Changes in taste

With an increasing consumer awareness of the attributes of fish in the diet it is possible that there will be a greater demand for fish in the future.

Changes in income

Qualitative assessment suggests that incomes influence the species or type of fish products demanded. But no information on the overall level of fish consumption was available.

Institutional influences

More "star hotels" have come up in major towns. This has pushed up demand for high-quality fish and their prices, and reduced the access of consumers in small towns to these fish.

Technological factors

The increased acceptance of iced or frozen fish by upper and upper middle classes and the recent introduction of frozen fish in ready-to-cook form in consumer packs by a prawn exporter, may increase demand for such fish. More effective preservation technology such as domestic refrigeration appliances may have had some effect on the demand for fish. However no information was available on this phenomenon.

Social, cultural and demographic factors

Population increases may raise the demand for fish products in the medium to long-term, but no qualitative data were available at the time of the study.

6.2.4 Current Intervention

Non-governmental sector

A few NGOs -Rural Organisation for Social Action (ROSA), Santhidan and Kanyakumari District Fishermen Sangams Federation (KDFSF) have tried to market various value-added products, and have had mixed results. Santhidan and ROSA diversified their range of products and obtained encouraging results.

Private sector

Various private sector operators have stimulated demand for frozen and value-added fish products. Freezer cabinets have been given to small retail shops to reach more consumers. Linkages have been set up with established retailers of products such as meat and poultry.

Government

MPEDA under the Ministry of Commerce, is active in promoting the export of marine products from India. It has helped develop marketing strategies to access overseas markets and encouraged group marketing under brand names.

Tamil Nadu Fisheries Development Corporation Ltd (TNFDC) is involved in the marketing of marine and freshwater fish. One of its major objectives is to 'popularise the consumption of unconventional varieties of fish'. At present the organisation provides retail stalls, ice boxes and freezer cabinets to increase the outlets for quality fish products.

The project helped stimulate demand for dried anchovy and other fish products produced by KDFSF and other NGOs. The project has commissioned surveys on consumer preference for fish and fishery products in Chennai, on market accetability for masmeen, improved dry fish products, pickles and other value-added products. It brought out a general book of guidelines for development agencies interested in taking up marketing in the region.

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6.3 SUPPLY OF FISHERIES PRODUCTS

6.3.1 Availability and Sources of Supply

The total supply of fish from Tamil Nadu during 1996-97 was about 4,59,790 mt. This consisted of capture and culture production from freshwater and brackishwater, as well as capture production from marine fisheries.

There has been a steady increase in fish production from both marine and inland sources between 1987 and 1997 during which time the supply from marine fisheries increased from 380,576 mt to 459,790 mt. During the same period supply from inland sources decreased from 13 1,000 mt to 109,000 mt.

Freshwater supplies

Freshwater supplies account for 24% of the total production in Tamil Nadu. Freshwater resources (including brackishwater) cover an area of 798,000 ha, of which 371,000 ha are considered suitable for freshwater aquaculture and 16,000 ha for brackishwater aquaculture.

In 1997 the main sources of inland area supply were reservoirs (1,080 mt), irrigation tanks (40,130 mt), seasonal tanks and ponds (38,500 mt), rivers and canals (9,000 mt), rice fields and swamps (1,970 mt), estuaries and backwaters (13,520 mt) and Fish Farmers' Development Agency (FFDA) (4,800 mt). The total inland production for 1997 was 109,000 mt.

Freshwater fish seed production by the Department, TNFDC Ltd and FFDA farms was approximately 22.71 million and a further 1.22 million were collected from natural sources. The main species of freshwater seed are carp, rohu, catla and mrigal.

Marine supplies

In 1997 marine fish supplies accounted for 76% of the total production in Tamil Nadu. with landings of *350.790* mt.

There are 442 marine fishing villages within the 11 coastal districts of Tamil Nadu. The number of landing centres used by all vessels is 362 of which six are exclusively for mechanised boats.

The types of fishing gear in use include trawl nets, gillnets, longlines, beachseines, and traps. Tamil Nadu has a fishing fleet of approximately 46,2 10 of which 8,991 (19.5%) are mechanised and 37,2 19 (80.5%) are non-motorised vessels. Apart from the larger trawlers and gillnetters, mechanised vessels include country craft with engines and kattumarams with OBMs. The non-mechanised vessels include masulas, vallams, dugout canoes and kattumarams. The largest concentrations of mechanised vessels are in Ramanathapuram and Thanjavur districts. Kanyakumari district has the largest number of kattumarams.

Zmports from other states

During 1986, an estimated 17,600 mt of fresh marine fish entered Tamil Nadu from Kerala, Kamataka and Andhra Pradesh. It should be noted that a percentage of these imports is normally exported to other states or to overseas markets.

6.3.2 Supply Characteristics

Species composition of supply

Inland

The inland species are predominantly barbus, rohu, catla, shrimp and tilapia. (table 3.2)

Marine

The main marine species landed are listed in Table 3.1. Pony fish are the largest group landed followed closely by sardines. Other important species include perches, anchovy, mackerel, prawn, rays, seer fish, and crabs.

Ex-state

There are reports of fresh and dried fish entering Tamil Nadu from other states. However, no information has been obtained as yet on the varieties and quantities of each.

Quality of supply

Freshwater supplies from aquaculture or capture sources normally enter the market in good condition.

Brackishwater supplies from aquaculture are of good quality as they are iced and frozen within a short period. The quality of brackishwater capture supplies varies with the location and method of fishing operations (small boats/ice used/handling practices). The quality of seed collected from brackishwater is unknown and dependent on handling techniques.

Most mechanised and motorised operations consist of relatively short trips (one-day or overnight) and the fish (of fairly good quality) is landed on a daily basis. Ice is normally used onboard, maintaining the quality until the fish is re-iced once landed and or after auctioning.

Prawn from trawlers is iced in boxes onboard and is of good quality. The smaller sized bycatch often tends to be of variable quality as the large, more valuable fish are iced in preference to smaller, lower-value fish. Some non-mechanised vessels do not use ice onboard and there is evidence of poor handling which results in poor quality fish.

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Variability of supply

In Tamil Nadu, there is seasonal and geographical variation in the supply of marine fish.

The east coast is subject to cyclonic conditions during the Northeast monsoon and the Kanyakumari district on the west coast is subject to the Southwest monsoon. The season for anchovy is from October to March along the Coromandel Coast (north to central Tamil Nadu), followed by a short season during April and May in the south. Peak landings are from September to November. However, the 1994 anchovy season was a total failure. It is difficult to generalise, the main fishing season for most species tends to be between March and October during the calmer seas after the Northeast monsoon.

The highest landings are recorded in the Palk Bay area which accounts for 36.05% of the total production.

It has been noted that there are changes in species composition and abundance along the coastline. However, no quantitative data have been found to support these qualitative accounts.

6.3.3 Losses in Supply

A major cause of supply loss is the dumping of trash fish from larger mechanised vessels normally targeting prawn species. There are qualitative reports of this occurring in Tamil Nadu but no quantitative data.

6.3.4 Participants in Supply

The participants in the supply of fish in Tamil Nadu are described below:

Ex-state suppliers

Importers are normally wholesale traders based in urban centres.

Inland producers

Freshwater capture fishermen are usually small-scale part-time operators who rarely engage in other activities. Out of a total fisherfolk population of approximately 203,000, an estimated 49,685 are considered to be actively engaged in fishing as members of Inland Fishermen Cooperative Societies. Approximately 85% of all inland fishing households are Hindus and around 95% are low-income households. Women are not usually engaged in this activity.

Freshwater aquaculture is limited because most of the water bodies are owned by the government and fishing rights rest with the DOF and / or Panchayats. Recently a few large firms have started culturing American catfish and major carp in privately owned water bodies or land-converted ponds. After the Supreme Court restrictions on brackishwater shrimp aquaculture farms, freshwater shrimp culture has increased.

Freshwater seed production and fish culture is carried out by the DOF, the FFDA and the Tamil Nadu Fisheries Development Corporation (TNFDC). Participants are employees of these agencies and/or members of fishermen cooperative societies in the case of DOF and TNFDC and selected fish farmers in the case of FFDAs.

A National Fish Seed Farm is being commissioned in Manimuthar in Tirunelveli district with a total built up water spread area of 4.06 ha.

Marine producers

Out of a total fisherfolk population of 545,978, an estimated 261,7 16 are considered to be actively engaged in fishing. Marine fishermen are normally full-time and solely dependent on fishing. Fishermen in Tamil Nadu are usually Hindus, except in Tirunelveli, VOC and Kanyakumari districts where 95% are Christian, and in Pudukottai and Ramanathapuram districts where around 40% are Muslim. Women rarely participate in this activity.

Brackishwater aquaculture production is normally undertaken by wealthier individuals or large companies with substantial financial backing. Full-time specialist and non-specialist labour is employed. Local non-specialist labour may be employed on a part-time basis. In the recent past brackishwater aquaculture, specifically shrimp culture, has been severely hampered by Supreme Court restrictions and repeated disease outbreaks. As a result many farms run by large firms have closed down.

Ancillary participants

Participants include employees or individual operators involved in vessel, engine and gear supply and repair, salt, ice and fuel supply, basket making and other support activities. Men dominate most of these activities, although women often assemble and repair nets and baskets. (The baskets used are manufactured by individuals outside the fishing communities).

6.3.5 Factors Affecting Supply

Macro-economic policies

Policy choices at the macro-economic level may have a direct impact on the development of the supply side of fisheries in Tamil Nadu. Some of these are outlined below:

- Regional support to Tamil Nadu
- Urban or rural support
- Support for large or small-scale operations
- Promotion of public or private sector growth
- Promotion of export or domestic market development

The Central Government provides guidance to the Tamil Nadu state government in the formulation of choices and development efforts are directed to some extent through the provision of funds.

Given the time constraint, an assessment of the influence of these macro-economic policy choices on supply is beyond the scope of this study.

Sectoral policy and legislation

Sectoral policy formulated at the state and national government levels influences the supply side of fisheries. Some policy options are outlined below:

- Support for large or small-scale operations
- Promotion of export or domestic consumption
- Promotion of inland or marine fisheries development
- Promotion of capture or aquaculture production

Sectoral policy has in the past focussed on increasing the production of fish from both inland and marine sources as well as improving producer incomes and providing welfare support to poorer fishworkers. This theme has been continued in current sectoral policy with an additional emphasis on fish preservation and marketing infrastructure development.

Environment

The sustainability of fish supply is directly related to the condition of the environment. Degradation of the aquatic environment may include:

- Depletion of resources
- Loss of biodiversity
- Destruction of habitats
- Pollution
- Loss of amenity

Depletion of resources can result in fewer fish reaching the markets: loss of biodiversity can result in fewer species available; destruction of habitats can result in a change in both species composition and quantities landed; pollution can result in a reduction in the carrying capacity of the environment; and loss of amenity can pose a threat to the residents of the fishing communities. The main factors affecting the environment are:

- The small-scale sector itself
- The large-scale fishing sector
- Aquaculture
- Other human interaction
- Natural causes

Industrial farming of shrimp had affected the environment in some places and rural public agitations against shrimp farming has resulted in government action to regulate the same.

Micro-economic factors

The main micro-economic factors affecting the supply side of the sector are:

Growth opportunities

With expanding population there is growing pressure on existing resources. This may lead to declining opportunities for growth in fish capture. The possibilities for the expansion of this sector in Tamil Nadu are not well known. It is likely that more opportunities exist in offshore waters than in inshore and estuarine waters. Aquaculture production and aquarium fish production may offer potential growth opportunities.

Credit availability

Although growth opportunities exist, access to them may be biased towards certain groups. Perhaps the most important micro-economic factor affecting the potential distribution of opportunities on the supply-side of the sector is the availability of finance to different groups. The government, for instance, has provided credit particularly to potential buyers of mechanised boats and those wishing to initiate or expand aquaculture production.

The low levels of education and lack of collateral amongst many small-scale fishermen limit their access to formal credit. Some fishermen's cooperatives extend credit for boat purchase. so do the state banks and NABARD.

The National Cooperative Development Corporation (NCDC) has recently introduced. through the State Government, schemes for increased marine production. These have been offered on soft credit terms through supply of craft, gear and marketing facilities to 1855 small-scale fisherfolk members of FCS in Tamil Nadu over a period of five years. This is anticipated to increase annual production by 12,000 tonnes to a total of 60,000 tonnes by the end of the project period.

Small-scale enterprise skills

The best use may not be made of growth opportunities because of a lack of micro-enterprise skills. This is

particularly so in poor communities with limited access to education.

Opportunity cost of labour and cupital

Alternative income generating opportunities in coastal communities are limited. These may include wage labour in casuarina and coconut plantations (seasonal) or in salt production, agriculture, coir manufacture, employment in the merchant navy or as watchmen. Some fishermen also participate in fish processing, acting as porters, cycle traders, net menders or boat builders.

The lack of opportunities for capital and labour outside fish capture activities often results in exploitation beyond sustainable levels, if no regulations are enforced. This may eventually lead to a reduction in fish supply. The extent to which this is relevant to Tamil Nadu is unknown.

*Market **opportunity,** access and information*

The supply of fish in Tamil Nadu is not constrained by limited access to markets. In some cases, smaller producers have limited access to market information. This often affects their ability to negotiate competitive selling prices for their products.

The KDFSF with their village level fishermen sangams have organised co-operative marketing, by collecting and pooling members' catches of export varieties (prawn, lobsters, cuttlefish), with processors/exporters, securing increased sale price over that of other non-sangam fisherfolk.

Likewise the lack of capital accumulation and weak savings practices make debt relationships unavoidable. These relationships then limit marketing opportunities as the borrower may have preferential rights to the fish at agreed prices.

From an export perspective, the growth of world demand for fish and the static supply from many countries is liable to raise world prices and encourage countries to export more. This will encourage expansion of the trawler industry in the state.

Institutional influences

The level of institutional organisation amongst the different suppliers greatly influences their ability to coordinate their actions, communicate their needs and achieve their aspirations.

Small-scale marine fishermen in Tamil Nadu are more frequently participating in community level cooperatives, and being represented on a regional and national level, through the National Fishermen's Forum (NFF) and similar organisations.

Political influences

The security problem in Sri Lanka has affected fishing in the Palk Strait and Gulf of Mannar. The extent to which fish landings have been affected is uncertain.

Technological influences

The type of technology employed in capture fisheries influences the various participants' access to different resources. The quantity and quality of supply is also affected by technology.

The emphasis on mechanisation in capture fisheries has been responsible for an increase in the quantity of fish landed in Tamil Nadu. The increasing investment in aquaculture will also raise production, although most of this is for export markets.

Social, cultural and demographic factors

Given the time constraint, an assessment of the influence of these factors on supply is beyond the scope of this study.

6.3.6 Current Intervention

Non-governmental sector

The current interventions by NGOs on the supply side of fisheries are related to increasing production from marine and inland resources. For example, the involvement of Kottar Social Services (KSS) with the Intermediate Technology Development Group (ITDG) to provide Kanyakumari fishermen a new design and material alternatives for existing fishing vessels (plywood boats). Two Project-supported NGOs — Santhidan and ROSA have assisted in production of iceboxes for onboard and onshore use, for keeping fish in different fishing systems. Santhidan has started manufacturing iceboxes locally.

Private sector

There is a large and growing interest from the private sector in investment in brackishwater aquaculture. This has affected the quantity of brackishwater species produced in Tamil Nadu.

Government

The government is providing a subsidy to entrepreneurs to set up and operate fish seed hatcheries. In addition, support is provided through a number of agencies and schemes.

The government has constituted the Tamil Nadu State Apex Fisheries Cooperative Federation Limited to implement the NCDC scheme — the Integrated Marine Fisheries Development Project — through

the constituent village level Primary Fishermen Cooperative Societies. The scheme covers the provision of fishing inputs (craft, gear, and insulated ice boxes), infrastructural and marketing facilities, training and extension. technical and promotion inputs and project management.

The government has introduced a new 20% subsidy scheme for fishermen entrepreneurs for the purchase of fishing vessels.

Fish Farmers Development Agencies

Functioning under the Chairmanship of District Collectors, the FFDA has taken over tanks and ponds from Panchayats and other Departments on long-term leases. These have been allotted to selected fish farmers who are trained and given financial assistance to begin cultivating freshwater fish species.

Aquaculture Estate

The government has approved a project to establish a brackishwater aquaculture estate with infrastructure for small to medium-scale shrimp culture. Training in scientific aquaculture practices for small-scale farmers is provided with the assistance of MPEDA.

Brackishwater Fisheries Development Agency (BFDA)

The BFDA identifies brackishwater areas suitable for culture, prepares viable projects on behalf of beneficiaries and assists implementation of prawn/ fish culture.

Motorisation of traditional vessels

The government assists fishermen to install inboard and outboard engines in existing non-mechanised vessels. Fifty percent of the cost of the motor is subsidised. Under this scheme 3,000 engines will be provided to fishermen. The government is also giving fish finding equipment to selected launches on an experimental basis.

Fishing harbours and landing facilities

The government has constructed a landing jetty at Kottaipattinam (Pudukottai District) and a major harbour at Tuticorin.

Marketing assistance

The State Government has proposed to distribute mechanised triwheelers to fisher women to assist them in marketing.

6.4 TRANSFORMATION OF FISHERIES PRODUCTS

Transformation refers to the changes which take place between the time of capture or harvest, and the time when fish is consumed.

6.4.1 Types of Transformation

A. Product transformation

Product transformation is mainly to preserve the fish or to enhance its value. In general about 65% of the total marine catch is marketed fresh, 28% is salted and dried and about 7% is frozen. The product composition for inland fish is unavailable at present.

Gutting and filleting

Fish are rarely gutted or filleted before sale. Larger fish are sometimes cut into chunks or steaks before retailing.

Icing

In 1983 all fishing operations were only day trips and the landed fish was rarely iced onboard as most vessels did not carry ice. By 1994, at Mandapam and Rameswaram in Palk Bay and Tuticorin in the Gulf of Mannar, about 200 sail and motorised boats used indigeneous ice boxes made of wood/G.I.. with thermocole insulation to store prawn and high value fish.

Bycatch from prawn trawlers is iced according to its value. Prawns take priority, followed by high value species and lastly, small fish. Thus, small fish are not iced or are iced last.

Fish is not usually iced once on shore, neither is that which is retailed in surrounding villages. However. fish destined for distant markets is iced adequately. Fresh fish destined for distant wholesale markets is normally iced and packed in woven wicker baskets lined with leaf mats. or in old tea chests. Icing is carried out effectively for shrimp, and strict procedures are adhered to.

In 1992 the estimated total ice plant and cold storage capacity was 680 mt/day and 5 130 mt/day respectively.

Freezing

High value exportable species such as prawn, lobster. squid and cuttlefish are usually iced. Other high value species such as seer fish. pomfret and perch are also being frozen mainly for domestic urban markets. Plate freezing is commonly used in Tamil Nadu.

In 1992 the total freezing capacity and frozen storage capacity was estimated at 198.25 mt/day and 4,142 mt/day respectively.

Smoking

The state's vast tuna resources are under-utilised owing to the low marketability of fresh tuna. This is attributed to its higher blood and dark meat content.

The marketability and consequently the utilisation of tuna can be vastly improved through value addition. Masmeen is one such value-added product which is produced by cooking, smoking and drying tuna (mostly skipjacks). The commercial production of masmeen has been taken up in Tamil Nadu only recently.

Salting

Salting is normally associated with drying. The fish used are usually smaller-sized seer fish, jewfish, catfish and perch, which are gutted, washed and salted before drying. Larger-sized fish are also gutted and soaked in brine for around 24 hours. The salted fish is then washed and sun-dried on cement platforms, mats or on the sand.

Drying

Smaller-sized fish species such as anchovies, silver bellies and white sardines are usually sun-dried on the beach, generally without the addition of salt. Small shrimp and shark fins are also exclusively processed as dried products destined for human consumption. Shark fins are sun-dried with or without the application of lime or salt to the exposed flesh. A few NGOs and individuals use the rack drying method to produce dry fish commercially, after the project demonstrated its viability.

Spoiled fish and poorer quality trash fish which cannot be sold for human consumption are often dried and used in fishmeal or agricultural manure.

Dried fish products are normally packed in hessian sacks, whether for human consumption or fishmeal. Wicker baskets are used for dried shark fins.

Fishmeal production

In 1983 the raw material handling capacity of fishmeal production in Tamil Nadu was estimated at 57 mt/day. With the sharp increase in prices of raw material (silver bellies, etc.), the 50 mt/day raw material handling capacity fishmeal plant of the Fisheries Department, originally established to stabilise the price of silver bellies, had closed down. At present the low quality fish bycatch of trawl boats is sun-dried and powdered to produce fishmeal of low protein content and is used mainly as an ingredient in poultry feed.

Canning

In 1983 the fish canning capacity in Tamil Nadu was estimated at 7,400 cans/day. Two plants are located at Chennai and Tanjore.

Live fish/prawn fry

There were six prawn hatcheries in the public and private sectors with a total production capacity of 100 million fry/annum.

Value-added products

Value-added products such as fish and prawn pickles and rack dried fish are produced in Tamil Nadu, although the production capacity was unavailable during the study.

B. Place transformation

Fish is transformed in terms of its location. There are a variety of fishing activities in Tamil Nadu, and the distribution channels may differ amongst the different landing sites. A generalised picture is provided below:

Marine frfish

Once the vessel returns to the landing site the fish is immediately auctioned at the beach by established auctioneers. The auctioneer takes a commission or a small portion of the catch from both the fisherman and the purchaser. In the latter case, the auctioneer may also retail fish in the local area.

Wholesale buyers participate in the auction along with small-scale retail traders (headloaders, cycle vendors, etc). In some cases small-scale fishing operators land their catch on the beach, leaving it for the women to retail in neighbouring villages using headloads or public transport. TNFDC also participates in the auctions at some of the major landing centres and fish is distributed to the 100 retail stalls located in Chennai, Madurai, Pollachi, Trichy and Coimbatore.

Fish purchased by small-scale retail traders is normally retailed as a fresh product in the local area and in neighbouring villages up to 50 km inland. The fish is transferred to these markets by headload, cycles and public transport, normally buses.

The fish purchased by the wholesalers is cleaned, graded and iced before despatch. It transported by lorry and rail to the main urban fish markets in Tamil Nadu such as those in Chennai, Madurai, Tiruchirapalli, Kumbakonam and Mayavaram. In these markets the fish is auctioned by a commission or wholesale agent who collects a commission of between 5% and 10% of the sale value. Wholesalers may sell on to retailers or to other wholesale markets in Tamil Nadu. Some fish is also sent to ex-state markets in Kerala, Karnataka and West Bengal.

Freshwater fresh fish

Relatively small quantities of freshwater fish are landed at dispersed landing sites. The fish is retailed

in the local area by the fishermen themselves or collected by nearby small-scale retail traders who also operate in the local area using head baskets and cycles. Wholesalers may purchase fish for sale in the urban wholesale markets.

Freshwater culture production is generally marketed through the TNFDC system of stalls in the major cities.

Brackishwater aquaculture producers are often vertically integrated with export packing plants. Shrimp harvests are transferred directly from the ponds to the plants by their own personnel.

Frozen fish

Frozen fish is usually produced by commercial processing plants. These organisations usually appoint a regional distributor who is in charge of supplying to retail outlets in the region. The distributor and retailer are given sales commissions of 5% and 10% respectively. Alternatively an organisation establishes its retail network through department stores and retail outlets by providing storage facilities like freezer cabinets.

Smoked fish

Smoked tuna (masmeen) is a very popular product in the southern pockets of Tamil Nadu like Tuticorin, Nagercoil, Madurai and Trichy. Large departmental stores in these cities retail masmeen. Processing of masmeen was not seriously attempted in the mainland until recently. Almost all Indian exports of masmeen came from the Laccadives and Minicoy Islands. Masmeen has been traditionally exported to Sri Lanka via Tuticorin.

Salted fish

Salted fish is produced on a small-scale basis along the entire coastline of Tamil Nadu. Larger-scale operations are found in Kanyakumari and Ramanathapuram districts. Fish is usually purchased by wholesalers who transfer the dried product to the major wholesale markets in the state. The main dry fish wholesale markets are in Chennai, Kovilpatti, Tirunelveli and Rameswaram. The dried product is usually auctioned by wholesale agents who take a commission of around 10% of the sales value. Retailers and wholesalers participate in the auction process. The product is packed in palm leaf bundles or in hessian sacks and transported by lorry.

Dried shark fins are purchased by traders supplying the Chennai export houses.

Dried fish

Dried products are either for human consumption or fishmeal production. The products for human consumption are normally transported to neighbouring villages by headload vendors, cycle vendors or public transport, where they are retailed. Larger quantities of dried fish are normally sold to traders who will transport it to the main dried fish wholesale market. Here it is auctioned in the same way as salted fish.

Dried fish for fishmeal production is sold by traders or buyers to the plants.

Fishmeal

Supply agents for poultry farms despatch fishmeal by truck to the buyers. This activity exists all along the coastline near the trawl boat landing centres.

Canned fish

Most of the canned fish is distributed to super markets in urban and metropolitan cities.

Live fish/prawn fry

Prawn fry is usually purchased by traders who visit the various landing sites and prawn hatcheries with trucks. The live seed is then transferred to farms either locally or in other areas of the state. The larger farms often have their own vehicles to collect live seed from the various landing sites and prawn hatcheries and the seed collectors sell directly to the farms.

Value-added products

The private sector produces value-added products for markets in Tamil Nadu and the rest of India. Frozen slices and fillets of many varieties of fish are individually packaged in cardboard cartons.

C. Image transformation

The larger private sector processors in Tamil Nadu are actively involved in product promotion. Attractively packaged value-added products are marketed as odourless, easy-to-use and relatively time-stable. Companies invest in periodic advertising campaigns through newspapers, magazines, posters, stickers and leaflets.

D. Price transformation

Price movements are usually upward as the fish moves along the marketing chain from producer to consumer. However, the actual increments in price at each stage may be influenced by the relationship between buyer and seller.

Fresh fish

In the first-hand sale of fresh fish there is often evidence of indebtedness to the auctioneer which tends to reduce the price the fisherman receives for his catch. In some cases, where the buyer is a regular

client or immediate payment is offered, a discount may be offered.

The price transformation after the first sale is dependent on the number of transactions involved as well as the distance to market, purchasing power of the consumer and quantities supplied to the market.

Smoked fish

The retail price for smoked tuna (masmeen) in Tuticorin was Rs 120/kg. The retailers buy their product supplies from local wholesalers for Rs 94/ kg. Masmeen gives a profit of up to Rs 20/kg to the processor.

Salted fish

In some cases large scale wholesalers advance money to fishermen who are obliged to sell selected species, usually smaller sized fish caught by trawlers, at fixed prices. Much of this fish is salted and sold in dried form.

Value-added products

Market analysis by a local marketing and research group reveals that the consumers were willing to pay a premium for value- added products such rack-dried anchovies for their accessability and hygienic packing and cleaning.

No information was available during this study regarding dried fish. frozen fish. fishmeal. canned fish, live fish/prawn fry and other products.

6.4.2 Participants in Transformation

The main participants in the transformation process are men although women dominate certain activities. Participants are active in the pro&sing, distribution or ancillary services supporting the sector. These are described below:

Distributors

There are a number of participants involved in the distribution of fish from landing sites to various markets. Women auctioneers are common in Tamil Nadu and they often also retail fish in surrounding areas. Small-scale retail traders include headload vendors, cycle vendors and retail vendors at markets. Women often dominate headload and market stall operations, whereas cycle vendors are almost exclusively men. The larger wholesalers tend to be wealthier urban operators.

Processing agents

The main processing activity in Tamil Nadu is drying. Women often dominate this activity.

Ancillary participants

Ancillary services such as the suppliers of ice, salt and fuel are normally larger operators. Women outside the fishing communities arc the main suppliers of bamboo baskets which are used extensively within the sector. Cycle trollies are often used for the transport of goods and passengers within the small-scale fishing communities. Little information was available concerning these participants.

6.4.3 Factors Affecting Transformation

Macro-economic policies

Policy choices at the macro-economic level may directly affect the transformation of fish in Tamil Nadu. Some of these are outlined below:

- Regional support to Tamil Nadu
- Urban or rural support
- Support for large or small-scale operations
- Promotion of public or private sector growth
- Promotion of export or domestic market development

Given the time constraints, an assessment of the influence of macro-economic policies on transformation in Tamil Nadu was beyond the scope of this study.

Sectoral policy and legislation

Sectoral policy formulated at the state and national government levels also influences the transformation of fish. Some policy options are outlined below:

- Support for large or small-scale operations
- Promotion of export or domestic consumption
- Promotion of capture or aquaculture operations

Environment

The condition of the environment may significantly affect the transformation processes in the sector. Degradation of the aquatic environment may include the following:

- Depletion of resources
- Loss of biodiversity
- Destruction of habitats
- Pollution
- Loss of amenity

Environmental variations affect the transformation of fish. Fluctuations in abundance, species composition and pollution levels may alter the relative price transformations of the different species. This in turn has implications for the product transformation and place transformation. Pollution may have a significant effect on consumer perceptions of the product and therefore its value.

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Micro-economic

The main micro-economic factors affecting the transformation of fish arc:

Growth opportunities

Growth opportunities arc constrained by the supply of fish and its price. This, to a large extent, intluences the type of product transformation. As the price of a particular species changes it may no longer be suitable for dryin g because of weight loss and associated product prices. In trawler landing centres, when bycatch is purchased for drying, it is often sorted into that which may be sold fresh and that which will be dried.

Credit availability

The limited availability of credit for small-scale traders in Tamil **Nadu** often restricts the type of product produced to a relatively low-value one. Quantities produced are also limited and the distance over which they are distributed is often constrained.

Small-scale enterprise skills

A lack ofenterprise management skills often influence product. and place and price transformations. Proper management of operations may create opportunities for expansion in each of these areas. The uneducated poorer community members tend to be exposed to higher risks than the more educated and established traders.

Market access and information

No information was obtained during the study.

Institutional influences

Greater organisation amongst participants in the transformation processes can have a significant effect on the incomes and sustainability of operations. Economies of scale in transport and processing of fish may increase incomes.

At the government level there is often limited growth of institutional capacity and experience in the transformation side of the post-harvest sector.

Technological influences

Access to technology intluences transformation of the product type. its price and distribution. Of particular importance is access to the following levels of technology:

Onboard storage facilities

Most non-mechanised vessels in Tamil Nadu do not have onboard facilities for storing ice. This has implications for the quality of fish landed and therefore the subsequent product and place transformation. For example, if the fish is of poor quality. it may be processed as a dried product and enter the dried fish distribution chain. The price received for the fish at first-hand sale may be lower than fish which has been iced onboard.

Shore landing facilities

Most larger mechanised vessels have adequate landing facilities. The smaller non-mechanised vessels normally land the fish onto the beach where there may be limited facilities for sheltered auctioning or handling of fish. In Tamil Nadu there are access roads to all the fish landing sites. Again the quality of the fish may be affected by reduced market outlets with possible depression in prices. The type of landing facility also affects the employment opportunities for different groups.

Onshore processing facilities

Fish is dried using very basic methods and these may reflect the price which the market will pay as well as a lack of market information. Improved technology may improve the product but this will not necessarily improve the returns to the processor if the benefits are accrued further up the marketing chain or if the increase in price does not cover the additional costs.

Transport and storage

The roads between the landing sites and markets are relatively well developed in Tamil Nadu. This attracts traders and allows access to public transport systems.

For transport over short distances -between landing site and godown, between godown and truck and between different stages in the wholesale market — fish is carried in bamboo baskets. These baskets are also used on the backs of cycles and as headload carriers. Their quality affects the keeping quality of the fish over time and the prices paid to traders. The poor quality of many roads also affects the longevity of such baskets and the bicycles carrying them.

Marketing facilities

The handling and trading facilities at the wholesale and retail markets in Tamil Nadu are often limited. The markets have limited cleaning facilities and the working conditions are generally poor. Price transformation may be affected by these factors.

Ancilliary facilities

Ancilliary services such as the supply of ice and fuel are often located some distance from the landing sites and access is sometimes problematic. This affects all those employed in the provision of access to these services (cycle trailers, headloaders).

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Social, cultural and demographic factors

Differences in education levels within communities and households, social systems. and levels of power and wealth influence who has access to development opportunities or who suffers most from changes in resource availability. The relative roles of men and women are particularly important in this regard. The education, extension and health services which the state supplies affect the ability of different groups to contribute to the supply-side. The role of women in looking after the home and raising the children affects their inputs to the sector.

Given the limited supplies of fish from Tamil Nadu. a rising population within the state may reduce the exports from the state or increase the imports of cheaper fish products into the state. Cultural factors may limit the range of products which are accepted by the consumers within the state.

6.4.4 Current Intervention

Interventions which address fish transformation constraints can be discussed at three levels:

Non-governmental sector

The KDFSF initially assisted in the auctioning of prawns to exporters/agents, on behalf of the fishermen members. The benefits to the fishermen were fair prices for their products and immediate payment. The project assisted KDFSF with the marketing of anchovy and other fish species. The project has also been involved in a genera1 fish marketing study in Tamil Nadu, besides developing a market data base. More recently KDFSF has been assisting in the marketing of high and low quality fish through the construction of a cold chain. The project undertook the construction and operation of a permanent ice box (PIB) on behalf of KDFSF.

Social Education for Development was involved in the sponsorship of public Fish Marketing Centres in selected villages in order to assist the fishermen in marketing their own catch.

Fisherwomen Cooperative Societies are involved with generating credit for the marketing of fish. 30,000 bamboo baskets were supplied to fisherwomen members (funds were raised from the government). During 1994-95 the fisherwomen cooperative societies supplied 10.000 aluminium fish containers to their members with 50% subsidy from the government.

Two NGOs — ROSA and Santhidan — have been assisting in production of rack-dried fish. fish pickles and other value-added items — an income generating venture for small-scale processors.

NGO — Rural Organisation for Social Action (ROSA)

Founded in 1990, Rural Organisation for Social Action — ROSA as it is popularly known — works for women from artisanal fishing communities who reside in 20 villages located between the towns of Tranquebar and Poompuhar in Quad-E-Millet district of Tamil Nadu.

The primary activity undertaken by the organisation is the formation of savings and credit groups in each of the villages that it operates. These groups provide the institutional base through which ROSA provides health and education services to the community. It also seeks to develop alternate sources of income through the transfer of skills in better methods of fish handling and processing. To this end ROSA has conducted training programmes in fish preservation methods through its own staff who have been provided with the requisite skill as trainers by the project.

The organisation now has the capacity and capability to undertake development programmes for these communities independently.

NGO-Santhidan

Founded in 1983. Santhidan (Gift of Peace) is located at Nagercoil, Kanyakumari district, Tamil Nadu.

Santhidan began in a small way in the village of Eraumanthurai. The first savings group was set up by a woman social worker hailing from the village. The women invited to join were mainly petty fish traders and other women in similar circumstances. Its primary activity is to pool the savings of its members and use the same to meet their credit needs. The success of the group was replicated in neighbouring villages. Expansion of the activity made possible transfer of funds between villages. To facilitate the process ofinter-village lending. a three-tier structure is adopted. The primary tier is the village-level savings and credit group. A district-level committee with two elected representatives from each village-level group facilitates the process of inter-village lending. This committee in turn elects an executive board consisting of nine members. The board oversees the actual operation of the inter-village lending programme.

The savings group members have taken up a variety of social action campaigns such as the right of fish vendors to use public transport, protected drinking water. street lights. the use of correct measures in fait- price shops. cleaning of wells and drains.

Santhidan has also organised young unmarried women. mostly teenagers, into groups. These groups discuss social. political and health issues. The primary purpose is to raise their awareness level besides giving them an opportunity for social interaction. Seminars have been conducted on structural adjustment. Christian Marriage Act. dowry, divorce and Indian Penal Code. etc. Members of these groups are expected to become the next generation members in the savings and credit groups. The group is also used in its education to enhance the literacy levels of Savings and Credit group members besides coaching school going children. Santhidan has in partnership with the Tamil Nadu Voluntary Health Association (TNVHA) organised trainers training programmes for its animators on health issues.

Santhidan has the capacity to undertake interventions including technology development with the artisanal fishing communities with which it works in Kanyakumari district.

The project has helped conducting workshops on training and handling of fish at the village-level. Project planning and post-harvest workshops have also been provided for NGOs. The project has also provided assistance to small-scale women traders in facilitating access to ice and markets for fish. In addition the project has conducted a series of awareness programmes to popularise ice boxes among the traditional fisherfolk.

Private Sector

There is some evidence that private sector operators are experimenting with new products such as shark liver oil. However, the product development and **success** in finding market outlets have been limited.

Government

Shore facilities

Government approval has been passed for providing shore facilities in Nagapattinam and Kanyakumari district. These facilities may include auction packing halls, ice plants, fish drying platforms. water and power supplies. MPEDA has constructed a godown to assist dry fish exporters in Tuticorin.

Improved handling

TNFDC assists in the management of ice plants. cold storage and processing plants at Mandapam, Chennai and Tuticorin.

During 1995-97, MPEDA has conducted 60 extension training programmes throughout the state on improved handling. covering 2.749 persons.

Fish marketing

TNFDC supplies quality fresh and dried fish through retail outlets in major urban centres in Tamil Nadu.

Market information

MPEDA provides advice on quality standards. regulations and packaging requirements for fish products destined for the export market. It also monitors product transformation within Tamil Nadu. identifying fresh, frozen, dried and salted product types and respective quantities.

The project organised a workshop in March 1995 on fish marketing, with non-governmental and government organisations participating to discuss the experiences, needs and constraints of organisations working in the small-scale fish marketing sector and to explore issues related to artisanal and small-scale production and marketing systems, including information on markets and marketing systems.

7.0 KEY CONSTRAINTS

7.1 DEMAND-SIDE

***Lack** of information*

The most important problem with the demand-side of the sub-sector is the lack of information on demand and how changes in demand affect the participants in the sector. This is particularly important in terms of how demand will affect the supply available to the poorer consumer in the future. Changes in demand will also affect the way supply is distributed and this will have a direct impact on small-scale traders.

Rising prices for poor consumers

It is likely, as discussed above. that population and export-led increases in demand will increase the price of fish. This will directly affect the poorer consumer. Given their already **Iou** health levels this could present a serious problem for them.

Export demand quality

The key problem facing demand from the export sector is quality perceptions and compliance with ever more stringent overseas import requirements. The Emergency Inspection Mission of European countries, during its visit to India in June '97 did not approve many seafood processing units. This was because of lapses in meeting the sanitary and hygiene standards in the landing centres and processing units. This has brought down the demand for fresh fish, shrimp and processed products.

7.2 SUPPLY-SIDE

Luck of supply-side information

There is a general lack of easily accessible information on the supply-side of the market in terms of where the product comes from, who produces it and the factors controlling supply. This lack of information places planners in a potentially difficult situation, particularly in relation to planning for the needs of the small-scale sector at the production, processing and marketing levels.

Low profitability of producers

Some of the smaller producers have limited control over the market as a result of weak market information and poor communications. They are thus given low prices for their produce. This increases their indebtedness and general poverty.

Limited opportunity** for **coastal aquaculture for small-scale producers

Investment in coastal aquaculture requires considerable capital from savings or borrowings. But coastal dwellers are extremely poor and have very limited education. Both these factors are obstacles to their active participation in aquaculture investment. Their lack of business skills limits their survival rate if they do become established. Satellite prawn farming involving 10 to 20 small-scale farmers. taken up by large entrepreneurs and acquaculture estates sponsored by government/public sector agencies, offers practical solutions to small-scale producers.

Loss of supplies or supply potential through environmental degradation

Env ironmental degradation (through the over-exploitation of resources. pollution from industry, increased sediment loads due to deforestation and agriculture, and urbanisation) poses a significant threat to the long-term sustainability of supplies from the marine environment and may pose a threat to inland supplies. The establishment of a large brackishwater fish/prawn culture farm at Prince Henry Island which involved large scale removal/deforestation of mangrove vegetation, could not increase the supplies of cultured fish/prawn nor compensate for the loss of the ecosystem.

Siltation of harbours

The siltation of harbours and landing sites poses a significant threat to the viability of infrastructural investments in some areas.

Lack of adequate landing facilities

Some of the landing sites suffer from siltation and a lack of physical infrastructure. The high tidal amplitude also restrict\ landing. This limits the ease with which product can be landed. handled and transported to market.

Poor onshore handling of fish

The current standards of onshore handling of fish are low. This results in physical damage and reduction in the value of the fish.

Poorly dried low-value species

The drying of low-value fish has been identified as a problem area. Fish is reported to be poorly and unhygenically dried resulting in a fall in quality and monetary value.

Poorly dried pra was

The poor drying of small prawns has been identified as a problem area. The problem lies in the mixing of acetes and penaeid species. The penaeids are believed to be capable of considerably higher returns than those currently achieved.

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Znadequate understanding of post-harvest problems

There appears to be a general lack of understanding of post-harvest issues within government and NGO sectors. This limits feedback into the formulation of policy and into sector planning.

Inadequate understanding of the needs and aspirations of the poorer porters, cycle carriers, processors and traders

As far as the small-scale traders, distributers and processors are concerned, there is very little information on who they are, or what their problems and aspirations are. These represent a large and vulnerable group who have little control over the factors affecting their lives but who depend heavily on the sector.

Insanitary conditions of market outlets

Bostock identified the lack of sanitation and size constraints of the market outlets in the region. This has been confirmed by the **current** study.

Lack of alternative income-generating opportunities

Many of the participants in the sector have access to work within the sector only on a seasonal basis. When the season is over they have to seek alternative income-generating opportunities. These are often not available and people are reduced to extreme poverty.

Cyclone damage to coastal villages and vessels

Many of the coastal communities are exposed to cyclones which destroy houses and boats. This severely limits individual access to resources and thus affects supplies.

Lack of alternative income-generating opportunities

The lack of alternative income-generating opportunities, especially in the coastal communities, reduces the opportunity cost of labour and capital to the point where it continues to be employed within the fishery in spite of very limited returns.

Lack of policy co-ordination

It is likely that there is a lack of policy co-ordination between states and connected departments within the states concerned with the management of the resource and its exploitation, and between sectors on the use or misuse of the aquatic environment.

7.3 TRANSFORMATION-SIDE

Trash jish loss

Alarge quantity of fish are lost as trash from trawlers every year. This represents a considerable loss of valuable animal protein which could enter the market. It is particularly important to the small-scale processors who depend on small fish for drying and selling.

Poor onboard handling of fish

The handling of fish onboard vessels is reported to be poor, especially on the motorised traditional craft and the larger vessels going to sea for extended periods. The quality is certainly variable and the decline is increased by the long marketing chains often involved.

8.0 FURTHER ACTION

8.1 DEMAND-SIDE ACTIONS

Improved information

There is a general lack of information on the demand-side of fisheries. This has significant implications on *both the supply and the transformation of the product.* There is clearly a need to understand the current structure of demand, the factors causing demand change, and how changes in demand may be used to benefit the small-scale producer and distributer, and the poorer consumer.

Increased monitoring of export quality needs

The changing, and ever more strict requirements of the export trade need to be closely monitored and translated into action by suppliers if demand for products from India is to be sustained and expanded. Such monitoring is being done by the Marine Products Export Development Agency (MPEDA) but the extent of its coverage could not be determined at the time of the study.

Consumer acceptance of new products

There is a need to assess the extent to which new products or improved-quality products are accepted and purchased **by** consumers. This should be investigated before interventions to improve existing products or create new products.

8.2 SUPPLY-SIDE ACTIONS

Improved supply-side information

There is clearly a need to understand the supply-side of the sub-sector in more detail and to define more clearly the factors affecting supply. This will assist in supply-side management and also in the processing, marketing and distribution of products. It will have a strong bearing on the long-term planning of post-harvest interventions.

Zmproved market information forproducers

There is a shortage of market information at the level of the fish producer for domestically consumed products. For the exported product this information is supplied by MPEDA, and there is a need to identify an appropriate mechanism for improving market information for domestic products. This lack of information has been noted by the project in the past. Current efforts by the project to monitor current market prices of important species and products constitute an important step in this direction. There is, however, a need to determine the possibility and usefulness of an Indian institution taking up the role of monitoring and disseminating market information, not only on prices but on demand, quality, contacts etc, to all participants within the sector.

Improved business management skills for small-scale producers

Business management skills are vital if small-scale production units are to **suceed.** These skills relate not only to basic financial management but also to loan management and marketing. In many fisheries the lack of such skills is considered responsible for the continued indebtedness and poor commercial viability of small-scale operators. This lack needs to be studied and analysed and appropriate support mechanisms have to be designed.

Improved credit availability for small-scale producers

Some work has been carried out by the Indian Government and the PHFP on the credit needs of producers. There is a need to identify current credit sources for the small-scale producer, determine ease of access to credit by different social and economic groups, and design appropriate interventions where necessary.

Improved understanding of the environmental factors affecting supply

The extent to which future supplies will be affected by environmental degradation is poorly understood. This is a vital area of knowledge if future supplies to the small-scale processors and traders are to be continued and domestic food supplies ensured. It is only on the basis of this knowledge that appropriate resource management strategies can be formulated and implemented. The BOBP has taken an important first step with its recent state-level environmental studies. This needs to be closely linked to the supply-side of the post-harvest sub-sector.

Alternative income-generating opportunities

In many of the inshore fisheries there is concern that over-exploitation of certain species may be occurring. The poorly managed nature of the resource (common to most capture fisheries around the world) and the excess of capital and labour in the coastal zone will tend to increase this pressure if new opportunities are created for poor producers in the same activities. The benefits which would have accrued to the existing participants are likely to be dissipated through increased inputs of labour and capital. There is a need to increase the availability of alternative income-generating opportunities for the small-scale fish producers as a complement to fishing during the

lean season and to draw out excess capital and labour from the fishery.

Improved policy co-ordination

The sustainable management of resources in the future will require improved co-ordination of inputs between states and between sectors. Greater participation by producers is required in the management process.

8.3 TRANSFORMATION-SIDE ACTIONS

Improved onboard and onshore handling of fish

There is a need to quantify the problems associated with onboard and onshore handling. to identify whether changes will result in post-harvest gains in quantity. quality or value. and. if appropriate. to design and implement a programme of intervention.

Improved landing facilities

There is a need to define the extent to which inadequate landing facilities in the states reduce the quality or value of fish. The information provided to government for future infrastructural planning purposes must be fully updated.

Improved market information for transformers

The lack of information affecting producers also affects traders and processors.

Improved market handling facilities

There is a need to assess the current status of the facilities and problem areas associated with the major fish handling retail and wholesale markets and to identify improved handling practices and facilities. On the basis of this. appropriate development advice can be provided to government for inclusion in its planning process.

Improved utilisation of low-value fish

The utilisation of low-value fish is of major importance to the poorer members of the fishing community. At present, prices received are low. There is a need to identify the extent of involvement of poor processor in low-value fish processing. how much is handled and where. what the major constraints are. and if there are ways of adding value to the products which increase the returns to the processors on a sustainable basis.

Improved understanding of the needs and aspirations of the poorer participants in the transformation process

Given their number and vulnerability to changes within the sector. there is a need to define much more accurately who these participants are, where they are based. what access they have to support, the levels of organisation. their needs and aspirations, and to design appropriate support and development mechanisms. Particular emphasis should be placed on understanding credit and business management training needs.

Improved training of NGO and government staff in post-harvest issues

The efforts towards post-harvest training in both the government and NGO sectors need to be continued and strengthened.

Improved information dissemination

The government collects a wide array of data on the sector but this is not readily available to the participants in the sector. There is a need for a detailed assessment of what information is available and for it to be made more accessible at state, national and regional levels.

lmproved policy and planning in the post-harvest sub-sector

The extent to which knowledge of the post-harvest sector is included in policy and plan formation at the state-level needs to be assessed, and where necessary support provided to government through the information gained and through training in policy formulation and plannin g of post-harvest activities. This is one of the most important areas where the Project can provide long-term benefits to the sector.

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