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Evaluation and Assessment of Economic Losses on Account of Inadequate Post-Harvest Infrastructure Facilities for Fisheries Sector in West Bengal

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Preface

The present Study entitled "Evaluation and Aassessment of Economic Losses on Account of Inadequate Post-Harvest Infrastructure Facilities for Fisheries Sector in West Bengal" is an All India Coordinated Study was undertaken at the instance of Directorate of Economics and Statistics, Ministry of Agriculture & Farmers Welfare, Government of India, New Delhi. The task of Coordination has been entrusted with AERC,Chennai.

Marine Fisheries is considered as one of the most vibrant economic activities in the country. The vibrancy of this sector can be easily visualized from the contribution and achievements made throughout the decades. Fish production in India has increased from 0.75 million tons in 1950-51 to 9.6 million tons in 2012-13 and further 8.30 million tons per annum during 2013-14. A little over 14.5 million people in India depend of Fisheries for their livelihood and the sector contributes almost 17per cent on nation's total export earnings. From an estimate it is found during 2013-14 India contributes to 5.68 per cent of global fish production and ranked second after China among all fish producing nations.

As a result of popularization and consequent expansion of mechanized fishing during the subsequent periods along with motorization of artisanal crafts, the contribution by the traditional sector declined considerably over years. The mechanized trawl fishery is now the most important among various fishing methods in India and contributes about 55 per cent to the total marine fish production in the country. Of the total marine fish production, 75 per cent comes from mechanized sector, 23 per cent from motorized sector and 2 per cent from artisanal sector' (GOI).Considering the exhaustible nature of marine fisheries resources and continuous uncontrolled harvesting the Central Government has given emphasis on continuing 'Blue Revolution' by sustainable utilization of the fisheries resources. The sustainable utilization of fisheries resources considering marine The Blue Revolution in India reinforces the 'Blue Growth Initiative (BGI)' voiced at Rio+20 meet held at Rio de Janeiro City in Brazil, 2012.

Efforts of the Government had been directed towards 'fishing effort management; fleet-size optimization; mainstreaming biodiversity conservation in production processes; species-specific and area-specific management plans, including conservation of Ecologically and Biologically Sensitive Areas (EBSAs) and Vulnerable Marine Ecosystems (VMEs).

In view of the sustainable exigencies in marine sector more attention is needed in post harvest management and also to review the availabilities of existing infrastructure including Fish harbors and Fish Landing centers. It is found that extremely limited research work has so far conducted in the direction of assessing and evaluating post harvest fish losses in marine sector. The present study,

hence at that perspective a humble attempt to assess and evaluate the losses are generated in every single activities among all stakeholders in marine fisheries in the State of West Bengal.

The task of completion of this Study was assigned to **Kali Sankar Chattopadhyay, Vivekananda Datta and Ashok Sinha.** Drafting and analysis of the report was done by **Kali Sankar Chattopadhyay** with the help of **Vivekananda Datta** and other members of the study team. During field survey they were assisted by **Dipak Mondal and Somenath Ghosh**. **Debanshu Majumder and Fazlul Haque Khan** assisted them in data entries and Table formation. Typing of the report was done by **Munsi Abdul Khaleque** and **Nityananda Maji**. Secretarial assistance was provided by **D. Mondal, D.Das, P. Mitra and A.R. Patra. B. Singh** and **S. Hansda** helped in the office maintenances.

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EXECUTIVE SUMMARY

1. Backdrop

Fish is an important item of Indian dietary schedule. Traditionally fish is an important item of Bengali dish. In West Bengal, fish-rice (machh-bhat) is considered as the only staple food to the huge masses due to its immense food value and important source of animal protein. Due to the over abundance of Rivers ,nullahs, ponds and sea water the fishermen catch fish from inland, estuarine and marine resources. Besides Rahu, Katla and other inland fish varieties, Hilsha, Pomfret and Prawn harvested from estuarine and marine sources are equally adorable to them. Among Bengal people there is a strong consumer 'preference for fresh-water fish, marine fish being mainly preferred in the coastal and tribal hill areas. But the gap between supply and demand of fresh water fish coupled with high prices has resulted in a steadily growing demand for marine fish in other parts of the state'. Prawn now a days are found both from inland and marine sources as well.

Fisheries sector is being considered as one of the most important economic activities in Indian economy as well. Considering its vast and varied resources along with huge potentials for flourishing, much attention was given for its development and more so in scientific and modern way.

A paradigm shift in operational management in fisheries is clearly visible during last five to six decades in India, from a purely traditional activity in the mid-fifties, this sector has now transformed to a commercial enterprise. 'After declaration of the Exclusive Economic Zone (EEZ) in 1976, the sea area available to India is estimated at 2.02 million sq. km. With an absolute right on the EEZ, India has also acquired the responsibility to conserve, develop and optimally harness the marine living resources within this area. In 2011 the potential yield from the Indian EEZ has been estimated as 4.412 million metric tonnes (mmt). This estimate is 12.2% higher than the previous estimate made by the Working Group (WG) in the year 2000 (3.934 mmt). Pelagic resources such as oil sardine, ribbonfish, Indian mackerel, etc. form 2.128 mmt (48.2%); demersal resources such as penaeid and non-penaeid prawns, cephalopods, perches, croakers, etc. form 2.067 mmt (46.8%) and oceanic resources such as yellow fin tuna, skipjack tuna, bigeye tuna, billfishes, pelagic sharks, barracuda, dolphin fish, wahoo, etc. form 0.217 mmt (4.9%). Depth-wise distribution of the estimated potential yield from the Indian EEZ is 3.821 mmt up to 100 m depth (86.6%), 0.259 mmt from depth between 100-200 m (5.8%), 0.115 mmt from depth betwen 200-500 m (2.6%) and the remaining 0.217 mmt is from oceanic waters (4.9%). The average marine fish catch during the last 5 years (2011-2015) was 3.707 mmt, with the maximum of 3.938 mmt, in 2012 and minimum of 3.404 mmt, in 2015. While the fisheries resources from the near-shore waters are fully utilized, the offshore waters still provide opportunities of increasing the catch. A little over 14.5 million people in India depend of Fisheries for their livelihood. According to the National Marine Fisheries Census 2010, the marine fishermen population in India is estimated at 4.0 million, of which 0.99 million are active fishermen. Among the active fishermen, 33% are employed in the mechanized sector, 62% in the motorized sector and 5% in the artisanal sector. Of the total marine fish production, 75% comes from mechanized sector, 23% from motorized sector and 2% from artisanal sector. The pattern of marine fish landings in India during the past fifty years clearly reveals that the contribution by the artisanal sector to the total production was significant up to the sixties. As a result of popularization and consequent expansion of mechanized fishing during the subsequent periods along with motorization of artisanal crafts, the contribution by the artisanal sector declined considerably over years. The mechanized trawl fishery is now the most important

among various fishing methods in India and contributes about 55% to the total marine fish production in the country' (GOI).

Besides resource utilization and bulk employment generation a hopping amount of foreign exchange during 2012-2013 earned to the tune of US$ 3.51 billion by this sector and this is about almost 17% on nation's total export earnings. From an estimate it is found during 2013-14 India contributes to 5.68% of global fish production and ranked second after China among all fish producing nations.

Considering the exhaustible nature of marine fisheries resources and continuous uncontrolled harvesting Government of India had recently in consultation with scientific institutions and fishermen and organizations contemplated the following measures. The measures include limiting fishing effort through input and output controls, fleet size, fishing days and area of operation, engine horsepower, gear size, MSY, minimum mesh size, minimum legal size etc. In the recent draft Fisheries Policy (2015-the Government of India has considered utilization of deep-sea resources in the EEZ within an ambit of infrastructural development policies elongating the domain to the extent of human capacity development.

While restructuring the fisheries sector into an optimum and modern enterprise and also keeping in view on employment generation and important source of foreign exchange earnings, the Central Government has given emphasis on continuing 'Blue Revolution' by sustainable utilization of the fisheries resources. The sustainable utilization of fisheries resources considering marine and other aquatic resources of the country aim at to improve the lives and livelihoods of fishers and their families to a meaningful extent. The Blue Revolution in India reinforces the 'Blue Growth Initiative (BGI)' voiced at Rio+20 meet held at Rio de Janeiro City in Brazil, 2012.

So far, Government of India has adopted numerous programmes and policies for exploiting the full potentials of marine fisheries. Efforts of the Government had been directed towards 'fishing effort management; fleet-size optimization; mainstreaming biodiversity conservation in production processes; species-specific and area-specific management plans, including conservation of Ecologically and Biologically Sensitive Areas (EBSAs) and Vulnerable Marine Ecosystems (VMEs), protection of endangered and threatened species; spatial and temporal measures for sustainable utilization of resources.'(GOI).

A comprehensive fisheries policy was adopted to fulfil the following objectives:-

i. To increase income and employment within the fishery sector.

ii. To improve the levels of national nutrition, especially the availability of fish protein,

iii. To maintain maximum utilization of fishery sector,

iv. To increase foreign exchange earnings; and

v. To reduce inequalities I the distribution of income and food supplies within the fishing community.

Needless to mention, all these objectives are not very ambitious enough rather they are very much in consonance with the national objectives for optimizing natural resources. In case of policy making both central government and the state governments have definite roles to play and it is clearly mentioned in the "Constitution of India".

As per the Article 246 of Constitution of India, "the entry no.21 of State List renders the powers to the provisional states to handle the subject matter of fisheries while the entry No.57 of Union List gives the power to the Union government to handle fishing and fisheries

beyond territorial water. Besides, the Territorial Waters Continental Shelf Exclusive Economic Zones and other Maritime Zone Acts 1976 (80 of 1976) of India provides the union government sovereign rights for the purpose of exploitation, exploration, conservation and management of natural resources both living and non-living as well as for producing energy from tides, winds and currents in exclusive economic zone beyond its territorial waters up to two hundred nautical miles which also includes fishing and fisheries."

Thus, on the operational part of fisheries management it is the joint responsibility of both Central and State government to frame an effective policy for exploiting the natural resources and to guide the fishermen, processors, distributors to maximize the benefit and by reducing fish losses.

Despite everything, post-harvest fish wastage is a major concern to all of the stakeholders. Post harvest losses are caused generally due to poor handling, improper method of processing, inadequate packaging and lack of suitable storage facilities and all these lead to early decomposition and rapid bio–chemical and microbiological spoilage. According to a sector-specific analysis by the Associated Chambers of Commerce and Industry 'post-harvest fish wastage leads to annual losses worth over Rs 15,000 crore in India's marine and inland fisheries sector... If all of the above constraints are addressed properly fish production in India might cross 13 million tonnes mark by 2016'.

It's also the joint responsibility of both the governments for adopting effective mechanization for improving the existing handling and distribution system. Besides policies, an effective post-harvest fishery system controlled with adequate and better infrastructure facilities could enhance net increase in production and good quality of fish and fisheries product.

Post Harvest Losses in Marine Fisheries

Fisheries sector suffer a lot owing to its improper mode of operation and lack of infrastructural facilities. Right from the harvesting of fishes to its retail distribution and in different stages of handling and processing quality of the product gradually become poor, causing serious concern to economic losses to the fishermen and fish traders. Directly or indirectly it affects the consumer also. Despite the facts that marine fisheries being a renewable natural resource caters the livelihood of hundreds of thousands of fishermen, traders and processors over the years, a little attention was given to minimize or arrest the losses during post-harvest operation so far. Thus, a coherent strategy formulation and intervention in policy recommendation seem to be more pertinent in reducing post-harvest losses in marine fisheries. An effective policy is needed in different stages of handling, distribution and processing for less reduction and making fisheries more economically viable.

Estimation of assessment of post harvest losses in marine fisheries is very difficult as such no representative data are available. Ames (1991) suggested at least 3 years representative data are required for an effective estimation. Literature relating to post-harvest losses in Marine Fisheries in India is extremely limited. One similar study in Bangladesh (Nowsad 2010) reveals that both in qualitative and quantitative terms "losses in net fish distribution chain and processed products, 20% of the marine fish landed was deteriorated up to 80% of its original quality before it was transported (BICAS, 2003) and about 28% of fish lost 60-70% of freshness quality before it reached the consumer" (Nowsad 2004). The same study reveals that a significant amount of post-harvest loss during pre-processing, processing, storage and transportation of fishery products in Bangladesh. In case of dried fish contamination ratio (by both insects and harmful insecticides) comprises almost 80% of the

total dried products. Earlier study assessed the seriousness of marketing difficulties in remote fishing communities particularly is the Bay of Bengal region, availing adequate ice and transportation. Inadequacy of these essential items put the fishermen in weak position in relation to intermediaries. “In this location much fish more processed into lower valued canned products and the process of caring involved losses through spoilage and infestation”.(Conlter and Disney1987).

Owing to the prescription of the International Fisheries Research Meeting in Paris in 1991 the physical loss assessment model was adopted on the basis of information on examine value of the fish lost at every step of distribution and activation through participatory rural appraisal method. In this study also a well structured questionnaire was canvassed among all stakeholders to assess the postharvest losses in marine fisheries as far as practicable.

Losses of fish can be categorized into two broad aspects (i) quantitative and (ii) qualitative. Yet, Cheke and Ward (1998) explained a more pragmatic explanation of fish loss as four common categories; physical loss, quality loss, nutritional loss and market force loss. “Physical loss are easily understood; quality losses are the result of mishandling coupled with lack of icing and associated high temperature leading to spoilage and quality deterioration; nutritional quality of the fish can be altered post-mortem, for example, vitamin A in the corona of small fish or essential amino acid, lysine can be damaged due to high processing temperature; while market force loss is attributed to the changes in supply and demand of fish which may lead to price fluctuation “.

Fish is the most perishable item in nature and it spoils gradually, step by step. Owing to its bio-physiological nature, fishes are highly susceptible to bacteria. It is commonly believed that, the lengthy the process of harvesting to distribution to the consumer, the higher the degree of bacterial infestation., the poorer the process of storing during transportation and handling the greater the risk of spoilage and deterioration of quality.

Quantitative loss can be assessed during harvesting when huge small and juveniles are killed, physical injury caused by melting (in case of gill melting) take place. Bottom trawling usually occur huge losses to the small and juvenile fishes and the loss is beyond accountancy.

The general hygiene condition and prevailing sanitary aspects of fishing harbours and fish markets influence the quality of marine harvest mostly in all regions in India. If all the stakeholders are sensitized for maintaining cleanliness and a more conducive atmosphere in the landing centres then the loss could be reduced significantly, not only that much alleged loss of hygiene value of fresh fish could be maintained for a pretty long duration.

At present, the landing and berthing facilities are inadequate to meet the requirements of the large fishing fleets. Not only that in number of cases siltation in estuarine areas compelled big fleets to anchor in a fairly long distance from the fish landing centres , causing transporting of harvested fishes by small vessels in number of occasions. It requires another stage of handling and icing. In many cases inadequate availability of ice or freezers or insulated boxes on board fastens the decomposition ratio of catch, inflicting an economic losses to all the stake holders also. On board facilities for proper handling of fish is very crucial in the sense, as it is the primary and most important condition for maintaining quality of high value fish and providing more fish for human consumption.

Degradation of fish qualities owing to poor post harvest facilities is directly or indirectly causing a concern to the ecological niche and balance in the fishing areas and neighbouring zones as well . In most of the cases fishers supply poor quality fishes to the feed

industry and as per the requirement of the said industry uncontrolled and overfishing of low value fish and by catch make a serious impact to level of pelagic stocks in this marine zone.

The present study attempts to examine all the technical, institutional and economic factors responsible for huge losses in marine fisheries sector. In the subsequent stages of the study we will discuss and try to asses about the physical losses of fishes during processing, transportation, storage, marketing associated with inadequate packaging etc. One comprehensive analysis of functioning of fishermen, wholesalers, retailers, consumers and all other stakeholders involved in this operation has also done to assess and evaluate the actual post harvest loss in marine fisheries sector in the state of West Bengal.

2. Objective and Methodology of the Study

The overall aim of the study is to examine the economic losses on account of inadequate post-harvest infrastructure facilities for the marine fisheries sector in India. The following are the specific objectives of the study.

- To examine the growth, composition and the contribution of the fisheries sector in India;
- To evaluate the availability of the post-harvest infrastructure facilities for marine fisheries sector in India;
- To review the Government policies and programs for the provision of post-harvest infrastructure facilities for marine fisheries sector in India;
- To evaluate and assess the economic losses on account of inadequate post-harvest infrastructure facilities for fisheries sector in India; and
- To arrive at relevant policy implications.

The study is based on both primary and secondary data. Secondary data on growth, species composition, catch disposition (Domestic, Export, Processing including traditional methods of processing like curing/smoking etc.), the market and processing infrastructure; market channels has been collected from the Department of Fisheries Govt. of West Bengal. Necessary primary data has been collected from the respondents who are involved in fishing, handling, trading, transport, processing, and marketing. The following fishing harbours have been chosen for collecting the infrastructural gap to arrest post-harvest fish losses in West Bengal viz Shankarpur, Petuaghat and Freserganj. In order to get primary information 10 fishermen with boat and 10 fishermen without boat in each harbour was interviewed. 5 numbers of wholesalers, 10 retailers and 10 numbers of consumers in each study area were taken for the study purpose. 2 numbers of processors, exporters and same number of fishery officials in each harbour were selected for having information in consonance with the objective of this present study.

S.N	States	Fishing Harbours	Sample Size			
			Category-1 FH/FJ/FLC	Category-2 Fish Market Wholesale & Retailer	Category-3 Fish Processing Centre	Category-4 Fishery Officials
I	West Bengal	Sankarpur Petuaghat Freserganj	A* 10×3=30 B* 10×3=30	Wholesaler 5×3=15 Retailer 10×3=30 Consumer 10×3=30	Exporter (2x3)= 6 Small Scale/local Processor (2x3)= 6 Total 12	2×3=6
		Total	60	75	12	6

Note:A* - Fishermen-Boat owners/crew B* - Fishermen to haul the catches

3. Fisheries Development in West Bengal (focus on Marine Fisheries)

Fisheries Resources in West Bengal---

The coastline of West Bengal spreads over two maritime districts: East Medinipur and South 24 Parganas The total number of fishing villages and fisherman families are 188 and 76,981 respectively. A number of 380138 populations are directly or indirectly engaged with marine fisheries.

West Bengal has coastline amounting of 158km of length. The area in continental shelf (upto 100 fathom depth) area in 17049 sq.km., the offshore area within 10-40 fathom depth range is 1813 sq.km., and in share area within 10 fathom depth range is 777 sq km. respectively

4. Fisheries Policies and Programmes in West Bengal

West Bengal Integrated Marine Fisheries Development Project.

This Project has been launched in 1989-90 with an idea to uplift the socio-economic condition of poor fishermen belonging to SC/ST Community engaged in marine fishing activities.

Project on Development of Marine Fish Production and Processing in the Purba Medinipur District.

This project has been implemented by Benfish with the financial assistance of NCDC, New Delhi and the Deptt. Of Fisheries, Govt. of W.B. in order to eliminate exploitation of the sea based fishermen by the middlemen as the fishermen of the coastal belt of the district are fully dependent on sea fishing.

Production of Hygienically Dried Fish and Fish Processing by Fisherwomen Co-Operative Societies Ltd. Contai Sector, Purba Medinipur

With the financial assistance of NCDC, New Delhi and the Fisheries Department Govt. of West Bengal, an amount of Rs.225.77 Lakh only for implementation of the Project by 13 nos. Marine Fisherwomen Co-operative Societies Ltd.

Project for Pre-Processing Complex and Food Park at Sultanpur, South 24 Parganas

This Project is situated on the western bank of the river Hooghly near Diamond Harbour in the district of South 24 Parganas, an important tourist spot with a view to providing a proper and hygienic infrastructure for handling and distribution of fish landed at Sultanpur Harbour.

Project for Pre-Processing Complex and Food Park at Kakdwip, South 24 Parganas

This project is located on the eastern bank of the river Hooghly at kakdwip in the district of south 24 parganas. It has been set up with an idea of providing proper and hygienic infrastructure of handling and distribution of landed fish brought at newly constructed kakdwip harbour

Centrally Sponsored Savings-Cum-Relief Scheme for the Marine Fishermen.

The fishermen who are engaged in marine fishing activities become idle from Feb to June every year. During this period, they have no avenue of income. This scheme will provide Rs.1200/- only which include their savings of Rs.600/- only.

The major infrastructures undertaken by the Corporation are shown as below:

The Corporation has been assigned with the duties of creating infrastructural facilities for both inland and marine sectors. The major infrastructures undertaken by the Corporation are shown below :

1.World Bank aided shrimp and Fish Culture Project:

2.Minor Fishing Harbours :

(i) Minor Fishing Harbour at Frasergunj

(ii) Minor Fishing Harbour at Kakdwip

(iii) Minor Fishing Harbour at Sultanpur

(iv) Minor Fishing Harbour at Shankarpur Stage - I

(v) Minor Fishing Harbourat Shankarpur Stage - II:

(vi) Minor Fishing Harbours at Petuaghat:

(vii) Minor Fishing Harbours at Mayagoalinirghat:

3.Fish Landing & Berthing Jetty at Namkhana

4. RCC Bridge at Nandichawk at Paharpur in the Purba Medinipur district

5. Inland Fish Marketing Infrastructure

6 .Fishery Faculty Centrea tChakgaria, 24-Parganas (South)

7 .Construction of Food Park at Shankarpur Fishing Harbour

(i) Execution of work of other Govt. Departments:.

(ii) Upgradation of Navigability of Shankarpur Fishing Harbour, Purba Medinipur

(iii)Construction of Marine Food Park at Shankarpur Fishing Harbour

(iv)iv) Tourism

5. Findings from Primary Survey

- The Boat owners and fishermen engaged in fisheries activities, accepted this profession as decade-long tradition as practiced by their predecessors, through a significant number of them are induced with this engagement considering the huge potential of marine resources and ponder worthy to their toil and labour. Discussed earlier, the Bangladeshi migrants involved in fisheries sector as a tool of readymade financial settlement in which they had yearlong wisdom and expertise.
- Most of the fishermen belong to SC and ST community. Majority of them have possession of APL card, 35 per cent of the fishermen are uneducated. Literacy percentage is higher in case of Boat owners. In aggregate, 50 per cent of the fishers consider agriculture or agriculture related activities as their second profession. 100 per cent of the fishermen are male and among them 90 per cent is found Hindu. Among the fishermen not a single pension holder or government employee is found in this area. Gross annual income of the Boat owners is more than Rupees 25lakh and for the

fishermen (without boat) is Rupees 3.75 lakh. Boat owners have more experiences in fishing than fishermen. Many fishermen after a yearlong experience in fishing became the owners of the fishing boats.

- Catching fishes are done by both traditional as well as mechanized boats. Mechanization and specification of modern tools for fisheries activities stated for over the decades. e- Registration of mechanized boats has taken place for more than five years. Overall 3.1 numbers of trawlers are found to be operative in these harbors. Average number of Gillnetters and Deep sea trawler are reported to have 1.3 and 2.6 respectively.
- In case of fishing crafts (by design), the number of traditional vessels in Shankarpur, Petuaghat and Fraserganj are 2.3, 2.0 and 1.9 respectively. Number of Deep-sea trawlers in this area is 6.8, 7.2, and 1.5.
- In the larger interest of the society banning of fish during seedling period or prohibiting fishermen for catching small and juvenile fish is felt with a much long experiences and economic damage. Banning is strictly maintained during the period of 15th April to 15th June i.e. 61 days.
- Overall fishing days throughout the season is 189.09 days, it is higher for the fishermen group, and the corresponding figure for them is 196.26 days. On an average, the fishers are involved 61.87 days for fishing activities per season. Overall 9.97 days are required for each fishing trip. The corresponding figure for Boat owners is 10.80 days and 12 to 14 persons are required for one fishing trip.
- Harvested fish are generally categorized as Grade-I (high value) and Grade-II (low value) considering the quality and species & variety of fishes. Overall 18.03 tons of fish landed in each trip, and among them 60 per cent are regarded as high valued quality and rest are treated as Grade-II or inferior to grade I. Major portion of harvested fish are being marketed through the wholesalers and middleman or agent by the Processing Plants or Exporting Agencies. Sometimes the wholesalers act as agent of the big fishing houses.
- Hilsha, Pompret and Prawn are regarded as Grade-I variety and Tur, Mackeroal, Bigge, Kalia etc are regarded as Grade-II variety.
- After landing, the fishermen usually receive Rs.15.9 less per kg to its actual value. Due to better icing and washing facilities on board the boat-owners receive a higher margin than the fishermen. In comparison to the fishermen, on an average they receive more than Rs.1.30 per kg. Almost 70 per cent of the fishermen have to go with pre-arranged financing agreement with the wholesalers. The figure is comparatively less for the boat-owners group.
- It is reported that cost per fishing trip for both the boat-owners and fishermen varies from Rs.1.8 lakh to Rs.2.0 lakh throughout the fishing seasons. Cost of fuel reported to have 50 per cent of the total voyage cost.
- Both boat-owners and fishermen carry ice and ice boxes on board. Almost 100 per cent of boat-owners have washing and cleaning facilities on board. These facilities availed by the fishermen much less than the boat-owners and overall 83 per cent fishermen possess such facilities on board.
- The respondents are not satisfied with the prevailing on shore fishing facilities available in three harbors. Overall 67 per cent of the respondents are unsatisfied with the condition of existing landing platform and almost 90 per cent of them reported about the poor condition of roads and other modes of communication.

- Conditions for basic civic facilities viz. availability of drinking water toilet and sanitation in all these sectors are very poor. The helpers (fishermen on board) used to live in a very hapless situation, they used to stay in the thatched hamlets with insufficient basic amenities. Hygienic condition is very poor as existence of toilets and lavatories in this area are virtually nil. In hygienic conditions of the surrounding areas of landing platforms are highly polluted and susceptible to contamination of harvested fishes.
- Both Shankarpur and Petuaghat have no auction market adjacent to the fish harbor/ fish landing centres. Owing to this the fishermen have to carry product to Digha Mohona where fish auction facilities are available. Nevertheless, in both of these two cases ice plants, ice flake plants are being set up by both private and public enterprises. In Fraserganj all these facilities are available away from the sea-shore.The respondents are not satisfied with the qualities and services rendered by the facilitators.
- Facilities for tools and implements like insulated boxes, iceboxes, van, van-rickshaw etc. for storing and preserving fish are in adequate in three harbours. Even the cold-chain facilities including cold storages and chill plants are not sufficient to cater the need of the demand. In view of that in many times they have to depend on the 'bona fide co-operation' of the middlemen or intermediaries.
- Due to poor or inadequate post-harvest infrastructure availabilities the fishers have to face a significant portion of loss of their produce both in quality and value terms. In Shankarpur, Petuaghat and Fraserganj taking together about 70 per cent of the total fish loss lies between the ranges of 5 to 15 losses of harvested fish. For fishermen within the same range of fish losses register almost 80 per cent of total loss. For the boat-owners 40 per cent of the total post-harvest loss in terms of sale value lies in the ranges within 15 per cent to 25 per cent.
- The fishers have to face numerous problems viz. occurrence of cyclones, net and rope breaking, medical related problem, availability of high-speed fleets. Communication and infrastructural amenities like drinking water, toilets, cold storages, parking lots, ice and fuel. It is reported that almost 90 per cent of the Boat-owners and 95 per cent of fishermen viewed availability of ice is a big problem. 90 per cent of the boat-owners and overall 93 per cent of fishermen reported against availability of cold storages. Moreover, almost 87 per cent of the respondents vehemently urged for improving better infrastructure facilities and to uplift the basic amenities for maintaining proper hygienic condition surrounding to the area of fish harbours and fish landing centers.
- The auction markets and the subsequent marketing chain are overwhelmingly dominated by the wholesalers. In all cases it has been reported that wholesalers charged 1 per cent (Rs.15 – Rs.20/kg.) of the total value of the fish auctioned in the market. In case of wholesalers due to poor – post harvest infrastructure overall 37 per cent of losses are registered during all seasons of fish harvesting and the loss lie within the range of 11 – 15 per cent of loss as mentioned earlier. In Shankarpur 60 per cent of post harvest losses are registered during third session and it lies within the range of 6-10 per cent of losses. The comparable figure for Fraserganj during the same season is 60 per cent.
- On time and adequate supply of ice play a crucial role in prohibiting quick decomposition of fishes. In this study overall 75.37 per cent of the wholesalers reported against availability of adequate ice and 56.7 per cent of them for in time availability. Price of ice-blocks remains almost same for these three harbors.

- As far as socio-economic characteristics are concerned 70 per cent of the retailers are women and among them literacy percentage is very nominal. On an average of 17 per cent of the female retailers are literate. Major quantity of fish purchased by the retailers is from middlemen and that amount varies to 58 per cent to 70 per cent of total purchase. 20 – 40 per cent of the quantity purchased by the retailer is directly from the fishermen. Purchase price varies along the markets and that also to the tune of Rs.40 – 100/kg. Profit may vary accordingly.
- The retailers have to face heavy loss of vendible commodities due to poor post-harvest infrastructure. It is reported that overall 30 per cent wastage of total loss in saleable fish are found within the range of 11 – 15 per cent taken together. In Shankarpur fish market within the range of 16 – 20 per cent damage in case of saleable fish, the loss estimated to 20 per cent of total value loss. In Petuaghat 50 percent of total fish loss in value terms lies between 6 – 10 per cent ranges of losses. Shankarpur within this range reflects the highest figure i.e. 60 per cent.
- Like fishers and wholesalers, the retailers also are not satisfied with the availability of ice and iceboxes. Only 23 per cent of them have reported positively about on time availability of ice – the rest are dissatisfied. Almost 80 per cent of the retailers are in dire needs of on time supply of ice and iceboxes.
- Generally, the retailers purchase bulk amount of fish from the wholesalers. In some cases, they purchase fish directly from the fishermen within a short duration of landing fish in the auction yards. No freezer boxes are available by the retailers in all three markets. 100 per cent of the purchased fish are being carried through iceboxes. Fish purchased by the retailers both in quantity and quality terms reported to have their satisfactory level. However, in case of price of fish their lower bargaining capacity affects them most. In most of the cases, they consider it as 'fait-accompli'.
- Retailers usually sell their products to the households and hoteliers. The hoteliers are situated at the radius of 5 to 20 kms from the retail market. Most of the household consumers are male. Among household consumers, only 6.7 per cent are involved in fisheries activities. Overall, 30 per cent of the female consumer taken for observation is housewives and only 3.3 per cent of them are involved in business activities. The family size of the households varies from 5.4 to 6.2 member/ household respectively. Average frequency of purchase of fish increased is 5.13. On an average, at a time the consumer purchases a little more than one kg and it is found most of the cases they are satisfied with the quality of fish. It is obvious, as they reside adjacent to the fish market, fish reaches quickly to these categories of consumers than the average number of consumers in the district or state. The consumers are of the view that average price charged by the retailers are higher than the optimum (reasonable) price.
- Among three harbours Shankarpur and Fraserganj are older than Petuaghat. Petuaghat harbor inaugurated in the year 2010. Its infrastructural facilities are yet to run in full swing but it has the largest capacity. Petuaghat is the seventh largest fish harbor in the country.
- All three harbours are running behind their optimum level. In Petuaghat capacity utilization during all seasons reported to have more than 50 per cent. Fraserganj reported to have better capacity; it varies between 56 per cent to 66 per cent. in Shankarpur the capacity utilization figure is almost same, only the Ffirst season of fishing reflects a better result.
- Most of the processing plants are situated at Benfish Complex at Chakgaria, Kolkata, almost 250km away from the fish harbours of Shankarpur and Petuaghat and 120km away from Fraserganj. During data collection, it was found that processing

management in most of the plants is reluctant to divulging the actual figure of his plant. It was presumed that capacity utilization for all plants lies between 45 – 55 per cent of their fullest capacity. 10 – 12 per cent weight loss of total purchased fish is reported by the processing plants.

- It is reported that 50 per cent of their product are purchased from the wholesalers and rest 50 per cent directly from the fishermen. In some cases, the Boat owners themselves own the processing plants. They engage agents to purchase best quality fish from the wholesalers or from the fishermen to whom they have pre-arranged financial contracts long before the fishing seasons started.
- In all cases, more than 80 per cent of the processed item is sold to the exporters. The processors generally act as exporters of their finished product.
- Mentioned earlier, transportation of raw fish is a big problem and the processing plants are not exception of that. It is reported that 70 per cent of the raw fish are being carried out through insulated van. Due to non-availability of adequate freezer, more than 50 per cent of fish are being transported through ice-boxes.
- The processing plant has to carry out specific norm and strictures of International Standards made by Export Inspection Agency (EIA) of India, Hazard Analysis and Critical Control Point (HACCP) with European Union (EU). Besides all these exporting agencies should be registered with Marine Products Export Development Authority (MPEDA). It is seen in all cases the export houses follow the above rules and regulation. Only in case of compliance of EU norms, it is found overall 43.3 per cent of the exporting house comply the usual schedule. Shankarpur and Fraserganj fish harbors comply F&D of USA norms fully.

6. Conclusions

- Marine fisheries sector in West Bengal is perceived to be at the cross roads of flourishment. A dichotomized activity of coexistence of traditional custom with modern method is visible. Post harvest operation is done both of these two methods.
- The existing infrastructural facilities available in Shankarpur, Petuaghat and Fraserganj fish harbors are seemed to be inadequate. The fish landing centres adjacent to these harbors are also in bad shape. A lot of scope and opportunities are there for its further development. Huge scopes are there for enhancing capacity utilization of the existing harbors as they are operating much below of their optimum level.
- Cleaning, washing and drainage facilities are inadequate. Supply and availability of ice, iceboxes, insulated boxes, insulated van, existence of cold storages, freezer all these basic tools and implements required for effective post harvest management of marine fisheries are found to be far from the desired level.
- The fishermen, wholesalers, retailers and particularly the sailors possess lack conception of hygiene. Application of chemicals as preservatives and use of formalin and pesticides in fish drying operation are dangerous trend indeed, unfortunately, no sense of human health and poisonous effect hardly affects into their mind. Most of them, especially sailors are interested in quantity although quality has a big role to play. They tried to compensate quality rather some time compromise with quality by over harvesting of catch.
- An indifferent attitude or lackadaisical state of mind in the minds of Fisheries officials in course of vigilance or implementation of Government policies for preservation of marine resources and sustainable development in this sector are found to be rampant. Needless to mention, shortage of staff are in all sectors of fisheries department are responsible for the poor state of vigilance.

- A sort of sensitization programme of the fishers with active help and cooperation with the Federation of Fishermen's association in the direction of scientific method of post harvest operation could lead to a success in reducing losses in marine fisheries sector.
- Government has done little in providing basic amenities to the fishers especially to those are involved in fish drying activities.
- Effective legislation of marine fisheries and its proper implementation could enable in huge foreign exchange earnings and the sector has immense potentialities to absorb the growing work force as well as to provide nutrient supplements to the countrymen to a greater extent no doubt.

7. Policy Recommendations

- The available post-harvest infrastructure in West Bengal is not sufficient to cater the huge harvesting of marine fishes and hence need more attention from the Central as well as State Government. A sort of dualism of traditional as well as modern method of post harvesting operation is co existing in this region. Considering the economic value of fish and an urge for supplying quality fish in reasonable price and that also in hygienic manner ought to be prioritized.
- In view of the above the existing infrastructure in the fish harbors and fish landing centers need to be modernized. For cleaning and washing more submersible pumps are to be bored.
- It is observed availability of ice and iceboxes are not sufficient. Ice blocks available from private sources are inferior in quality, price is high, moreover weight is much less than the scheduled one. Hence the fishers have to purchase more ice-blocks causing an increase in cost of operation. More ice factory and ice crushing plants are to be set up at the vicinity of harbors.
- Cold storages are situated at a long distances of the harbors and capacity of cold storages are not adequate enough to store the required quantity within a very short duration. Till setting up more storages, supply of insulated boxes, insulated vans for carrying and transportation of raw fish from the auction yard to the doors of storages are to be assured.
- Usually the Boat owner sans the owner of the trawler has to make a pre harvesting financial agreement with the wholesaler. Besides an exorbitant rate of interest (24 percent to 36 percent per fishing season) the wholesalers charge 1 percent of the sale value of total catch inflicting an economic loss to them. It indirectly affects the consumers 'price also. Financing of these types of fishers should be facilitated from organized banking sectors. This area lacks of these facilities.
- Of late, the traditional boats are rapidly substituted by modern mechanized boats and registration of boats is in fully operating. Introduction of e-registration has facilitated the process significantly yet, no leniency on onboard requirements for maintaining the quality of fish is to be spared. A keen vigil on part of the Government officials is solicited.
- Proper training should be imparted to the fishers who are actively associated with handling, storing, transport and processing of harvested fish.
- Setting up one dry-fish plant is utmost essential as hundreds of population is engaged in processing and trading of dry fishes.
- Dredging in the mouth way of the jetty (in Shankar pur and Digha mohona) is urgently required as siltation has created severe problem in free moving of the boats and trawlers. Due to heavy siltation the trawlers occasionally anchor at a long distance

and the fish are being carried through small boats with a larger frequency. This activity fastens the physical loss and decomposition of fish body.

- Setting up of Third Jetty in Sankarpur is most essential. At present two numbers of jetties are operating, setting up of third jetty will reduce the overcrowding of boats and facilitate the free movement of trawlers.
- Interestingly, Petuaghat harbor being the seventh largest harbor in the country has no advisory committee taking the stake holders together. Petuaghat needs one advisory committee like Sankarpur for its further development and better utilization.
- Enhancing facilities for Dry dock systems in Shankarpur and Fraserganj should facilititate the sailing and repair of damage fleets in need. The existing dilapidated dry dock at frasergang should be renovated and make it operational within a very short period..
- Auction market should be set up in Petuaghat. Apart from all facilities, non functioning of auction market at Petuaghat creates a havoc indecisiveness among the minds of the fishers. Usually, they have to carry fish to the auction market at Digha mohona which is almost 50 kms away from the fish harbors. Frequent handling and transportation of the catch are easily susceptible to physical damage of fish and for that reason they have to depend on the middleman and intermediaries or agents of the Wholesalers or Exporting firms for quick disposal of their product.
- The fishermen on sea shore live in very abject inhuman condition. Poor arrangement of drinking water and sanitation, thatched house, dilapidated schoolrooms, unavailability of roads, electricity, hospitals with no basic amenities of recreation are common phenomenon in all remote sea shore area around the harbors. Both Central and State governments should take appropriate decision for better habitation and providing basic amenities for making life more joyous, pleasurable and humane. Huge number of farmers are temporarily domiciled from the agricultural farm and engaged in dry fishing activities. They badly need an at least one childcare unit in each cluster of khuties.
- Development of infrastructure in the 'Khuties" for improved quality of edible dry fish for human consumption as well as for good quality fish meal, development of link road for facilitating the movement and transport of fishermen and catch from the seashore to main road, establishment of suitable structures for sun drying are the primary need of dry fishing clusters.
- Setting up of modern dry-fish plant is utmost essential as hundreds of population is engaged in processing and trading activities.
- The whole sale market yard and retail platform lies absolutely at the mercy of the contaminating reagents. Cleaning and washing activities are not properly done and the drainage facilities are very poor. But the most hazardous point is distinctly noticed the use of chemicals as preservatives and most of the cases formalin is used as popular item for preservation. Food Sanitary Inspectors or the Department of Health as positive role to play for precluding such hazardous chemicals used for human consumption.
- Huge quantity of juvenile and immature fish (Hilsha, pomfret,prawn, mackerel) ,despite official restriction are being harvested by many fishermen. A sense of responsibilities and sensitization among them should be imparted through proper and meaningful discourse. A strict vigil by the Government functionaries and spot fine or punishment to the guilty could be able to minimize huge economic and invaluable marine resources. In that case, Fishermen's Association also could play an active role.

- Bottom trawling within the EEZ and beyond EEZ plays havoc on ecological niche causing an irreparable damage on marine resources. That should be stopped immediately. Government should take effective measure in banning such type of suicidal measure with an immediate effect.

- Both Central and State Government over the years has adopted various measures in successive Fisheries Policies for improvement and development of this important sector. The main thrust of all fisheries policies is to sustainable development with eco-friendly fishing operation. It is saddening to note that even after successive Plan periods no concrete vigilance measure for maintaining fisheries resources in a sustainable way are found in the State of West Bengal. Policy implementation is more important than recommendation for fisheries development.
- The Fisheries Officials raised points on the issues of diversion of funds ; in number of cases funds allotted by the Department of Fisheries for marine fisheries development diverted to inland fisheries 'programme implementation keeping development of this sector at bay. That shouldn't be encouraged and allotments of funds are to be done priority wise. Besides inland sector, equal emphasis should be given to marine fisheries sector also.
- It is reported that Fisheries Officials amidst all limitations and staff constraints are trying hard to implement Government Policies; they are of the view that a huge shortage of requisite number of staff in offices and extension services create a bottlenecks for effective supervision and surveillance in marine sector. State Government should take note of this situation. And finally,
- Federation of Fishermen's Association is in great debate regarding allowing foreign vessels within the EEZ or Indian Maritime Zone. At the present situation where National security at stake more attention and careful observation are solicited from the Functionaries of Central Government before allowing foreign vessels to enter into our maritime Zone and restricted permission to the foreigners are suggested.

Chapter – I

Introduction

1.1 Introduction

Fisheries sector is being considered as one of the most important economic activities in Indian economy. Considering its vast and varied resources along with huge potentials for flourishing, planners have gave much attention for its development and more so in scientific and modern way. Fish production in India has increased from 0.75 million tons in 1950-51 to 9.6 million tons in 2012-13 and further 8.30 million tons per annum during 2013-14. Thus from this estimates it is clearly visualized an 11 fold increase in fisheries sector which aptly proves its vibrancy in national economy. A little over 14.5 million people in India depend of Fisheries for their livelihood. A hopping amount of foreign exchange during 2012-2013 earned to the tune of US$ 3.51 billion and this is about almost 17% on nation's total export earnings. From an estimate it is found during 2013-14 India contributes to 5.68% of global fish production and ranked second after China among all fish producing nations.

From the nutritional point of view, fish is recognized as one of the most important animal proteins in human world. 'Fish as food, more specifically as a protein donor, is bound to move towards focal position in view of the dwindling milk and meat resources'. A significant percentage of world's population suffers from varying degrees of malnutrition and unfortunately, India is no exception of that. Fisheries sector owing to its easy accessibility provides a chunk of dietary nutritional value to the people living on a suboptimal nutritional level. A little sense of nutritional security and as supplement of available dietary resources Fisheries sector is gaining ever-growing emphasis in local and national economy. A paradigm shift in operation is visible. Over the decades 'the fishery sector has transformed itself from a purely traditional activity into a significant commercial enterprise. Thus, it is obvious that increasing fish production will certainly help to promote growth and development but fish, particularly marine resources, are fast developing due to overexploitation of our coastal areas. Given such resource constraint, preventing the loss of fisheries,

particularly during the various post-harvest stages and gains more significance'. Introduction of modern technical know-how , method of operation and more significantly presence of foreign fleets and their mode of fisheries management with in the Indian maritime resources has brought a qualitative change in the traditional wisdom of the indigenous fishermen . Comprehensive fisheries policies were adopted to fulfil the following objectives:-

i. To increase income and employment within the fisheries sector.

ii. To improve the levels of national nutrition, especially the availability of fish protein,

iii. To maintain maximum utilization of fishery sector,

iv. To increase foreign exchange earnings; and

v. To reduce inequalities the distribution of income and food supplies within the fishing community.

Needless to mention, all these objectives are not very ambitious enough rather they are very much in consonance with the national objectives for optimizing natural resources. In case of policy making both central government and the state governments have definite roles to play and it is clearly mentioned in the "Constitution of India".

As per the Article 246 of Constitution of India, "the entry no.21 of State List renders the powers to the provisional states to handle the subject matter of fisheries while the entry No.57 of Union List gives the power to the Union government to handle fishing and fisheries beyond territorial water. Besides the Territorial Water ,continental Shelf Exclusive Economic Zones and other Maritime Zone Acts 1976 (80 of 1976) of India provides the union government sovereign rights for the purpose of exploitation, exploration, conservation and management of natural resources for both living and non-living as well as for producing energy from tides, winds and currents in exclusive economic zone beyond its territorial waters up to two hundred nautical miles which also includes fishing and fisheries."

Thus, on the operational part of fisheries management it is the joint responsibility of both Central and State government to frame an effective policy for exploiting the natural resources and to guide the fishermen, processors, distributors to maximize the benefit and by reducing fish losses. It's also the joint responsibility of both the governments for adopting effective mechanization for improving the existing handling and distribution system. Besides policies, an effective post-harvest fishery system controlled with adequate and better infrastructure facilities could enhance net increase in production and good quality of fish and fisheries product.

"Post harvest is defined as the period which begins when the food item is separated from its growth medium …… among the main post harvest losses are the large catches of small fish taken by shrimp transfer from tropical waters". Owing to the highly perishable nature of fishes, a more time consuming method in post harvest handling leads to decomposition and retardation of protein value. Thus, in terms of both quantity and quality management post -harvest operations play a crucial role in marine fisheries. The present study considering the above important issues of marine fisheries humbly attempts to find out the gamut of the problems and shed light on various aspects for reduction of losses as far as practicable in the selected areas.

1.2 Fisheries Sector in India

1.2.1 Current Status of Fish Resources of India

The vast resources of both marine and inland fisheries are indicative of its immense growth potential of this sector. India has lone coastline of about 8118 km and an Exclusive Economic Zone (EEZ) of 2.02million sq km. With the declaration of the Exclusive Economic Zone (EEZ) in 1977, an area of 2.02 million sq km (comprising of 0.86 million sq. km on the west coast, 0.56 million sq.km on the east coast and 0.60million sq. km around the A&N Islands 'has came under India's jurisdiction with absolute right of exploring, exploiting and natural utilization of living resources. The inland Fishery resource includes 1.96 lakh kms stretch of rivers and canals,29.07 lakh hectare reservoirs,24.40lakh hectares ponds and tanks,7.98 lakh hectares of beels, derelict water bodies and 12.40 lakh hectare brackish water areas.'(Handbook of Fisheries Statistics, 2014).

Table1.1: Marine Fish Resources of India (2012)

Sr.No	Particulars	Nos.
1	Length of Coast Line(km)	8118
2	Exclusive Economic Zone(EEZ) Million Sq Km	2.02
3	Continental Shelf('000km)	530
4	Number of Fish Landing Centres	1537
5	Number of Villages	3432
6	Number of Fishermen Families	874749
7	Fisher-folk Population	4056213

Handbook of Fisheries Statistics, 2014).

India is very rich in marine Fisheries resources. The Eastern, western and southern parts of India are surrounded by Bay-of-Bengal, the Arabian Sea and Indian Ocean. Each Coasts comprising with five States are covered with this seas, ocean.The States in Esatern coasts are West Bengal, Odisha, Andhra Pradesh, TamilNadu and Puducherry, and in the west the States are Kerala, Karnataka, Goa, Maharashtra and Gujarat. Besides the States, Union Territories namely Andaman and Nicobar Islands falls in Eastern Coast, Lakshadweep, and Daman & Diu in Western Coasts.

Table 1.2 : Marine Fisheries Resources Coastal States & Union Territories of India

Sl. No.	State/Union Territory	Apps. Length of Coastal Line (Kms)	Continental Shelf ('000Sq kms)	Number of Landing Centres	Number of Fishing Villages	Number of Fishermen Families	Fisher folk Population
1.	Andhra Pradesh	974	33	353	555	163427	605428
2.	Goa	104	10	33	39	2189	10545
3.	Gujarat	1600	184	121	247	62231	336181
4.	Karnataka	300	27	96	144	30713	167429
5.	Kerala	590	40	187	222	118937	610165
6.	Maharashtra	720	112	152	456	81492	386259
7.	Orissa	480	26	73	813	114238	605514
8.	Tamilnadu	1076	41	407	573	192697	802912
9.	West Bengal	158	17	59	188	76981	380138
10.	Andaman & Nicobar Island	1912	35	16	134	4861	22188
11.	Daman & Diu	27	0	5	11	7374	40016
12.	Lakshadweep	132	4	10	10	5338	34811
13.	Pondicherry	45	1	25	40	14271	54627
	Total	**8118**	**530**	**1537**	**3432**	**874749**	**4056213**

Subsequent reference to village actually means Gram Panchayats in West Bengal Extracted from Hand Book of Fisheries Statistics 2011, Ministry of Agriculture, GOI)

Table 1.2a : Potential of Fishery Resources in the Indian Exclusive Economic Zone

(Million tons)

Depth range (mts)	0-100	100-200	200-500	Oceanic	Total
Demersal	1.83	0.21	0.10	-	2.13
Neretic Pelagic	2.00	0.05	0.02	-	2.07
Oceanic Pelagic	-	-	-	0.22	0.22
Total	3.83	026	0.12	0.22	4.42
Percent to Total	**86.62**	**5.87**	**2.60**	**4.91**	**100.00**

Extracted from Hand Book of Fisheries Statistics 2011, Ministry of Agriculture, GOI

Potential of fishery resources in the Indian exclusive economic zone according to depth range has been given in Table1.2a. Depth with the 1-100 mts range contributes the major share of potential fishery resources.

Table 1.3 Inland Fisheries Resources of India

Sr.No	Inland Resources	Nos
1	Total inland water bodies	73.59
2	Rivers and Canals	195210
3	Reservoirs (Million ha)	2.916
4	Ponds and Tanks (Million ha)	2.4
5	Foodplain lakes and wetlands (Million Ha)	0.79
6	Brackish Waters(Million Ha)	1.24

Handbook of Fisheries Statistics, 2014).

1.2.2 Growth in Fish Production

Fish Production in India shows an upward trend from 1950-51 onwards. Table 1.4 reveals that there was phenomenon growth in inland and marine fish production though there were some occasional slacks in rate of growth. Annual growth rate of marine fisheries suffered fluctuation in the mid periods and in the mid year oscillation in inland fisheries also visible from the Table also.

Inland fisheries have shown a steady growth until 1980-81 and then there was a sudden fall. It decreases from 12.63 (1980-81) to -5.91 in 1982-83 and with a positive increase gained the momentum in 1983-84 with annual growth rate of 11.75per cent. Since then and after 90's we see an increasing tendency and in 2013-14 contribute almost 64 per cent of total fish production in India.

The growth in marine sector is steady though there were some occasional fluctuation, production has increased from 0.53 Million Metric Tonnes (MMT) in 1950-51 to 3.44 MMT in 2013-14. Annual growth rate in marine fisheries rose from 2.32 per cent in 1950-51 to 11.78 percent in 1983-84, after then we find a down ward tendency in marine production and it stood as high as 25.21 percent in the year 1988-89 . A negative growth rate since then was found in 1997-98,2000-01,2003-04,2004-05,2007-08 and 2012-13. In 2013-14 we find a positive growth rate (3.67 per cent) and contributes almost 36 per cent in total fish production during this year.

1.2.3 Fish Export Scenario

During 2013-14, India contributes to 5.68% of global fish production and ranked second after China among all fish producing nations. It is estimated a significant amount of foreign exchange during 2012-2013 earned to the tune of US$ 3.51 billion and this is about almost 17per cent on nation's total export earnings. The following Table depicted an estimation of value and trend in marine products from 1950-51 to 2013-14. It is clearly visible from the Table-1.5 that both in quantity and value terms there have been a significant change in export of marine fisheries. There has been a continuous increase in unit value index and annual growth rate in percentage terms and in most of the cases show a positive result. The last five years (2008-09 on wards) show comparatively a steady growth with a hopping and encouraging annual growth and enhanced unit value in 2013-14.

Table1.4 : Fish Production in India

Year	Fish Production in India ('000 Tonnes)			Average Annual Growth Rate (%)		
	Marine	Inland	Total	Marine	Inland	Total
1950-51	534	218	752	-	-	-
1955-56	596	243	839	2.32	2.29	2.31
1960-61	880	280	1160	9.53	3.05	7.65
1965-66	824	507	1331	-1.27	16.21	2.95
1970-71	1086	670	1756	6.36	6.43	6.39
1973-74	1210	748	1958	3.81	3.88	3.83
1978-79	1490	816	2306	4.63	1.82	3.55
1979-80	1492	848	2340	0.13	3.92	1.47
1980-81	1555	887	2442	4.22	4.6	4.36
1981-82	1445	999	2444	-7.07	12.63	0.08
1982-83	1427	940	2367	-1.25	-5.91	-3.15
1983-84	1519	987	2506	6.45	5	5.87
1984-85	1698	1103	2801	11.78	11.75	11.77
1985-86	1716	1160	2876	1.06	5.17	2.68
1986-87	1713	1229	2942	-0.17	5.95	2.29
1987-88	1658	1301	2959	-3.21	5.86	0.58
1988-89	1817	1335	3152	9.59	2.61	6.52
1989-90	2275	1402	3677	25.21	5.02	16.66
1990-91	2300	1536	3836	1.1	9.56	4.32
1991-92	2447	1710	4157	6.39	11.33	8.37
1992-93	2576	1789	4365	5.27	4.62	5
1993-94	2649	1995	4644	2.83	11.51	6.39
1994-95	2692	2097	4789	1.62	5.11	3.12
1995-96	2707	2242	4949	0.56	6.91	3.34
1996-97	2967	2381	5348	9.6	6.2	8.06
1997-98	2950	2438	5388	-0.57	2.39	0.75
1998-99	2696	2602	5298	-8.61	6.73	-1.67
1999-00	2852	2823	5675	5.79	8.49	7.12
2000-01	2811	2845	5656	-1.44	0.78	-0.33
2001-02	2830	3126	5956	0.68	9.88	5.3
2002-03	2990	3210	6200	5.65	2.69	4.1
2003-04	2941	3458	6399	-1.64	7.73	3.21
2004-05	2779	3526	6305	-5.51	1.97	-1.47
2005-06	2816	3756	6572	1.33	6.52	4.23
2006-07	3024	3845	6869	7.39	2.37	4.52
2007-08	2920	4207	7127	-3.44	9.41	3.76
2008-09	2978	4638	7616	1.99	10.24	6.86
2009-10	3104	4894	7998	4.23	5.52	5.02
2010-11	3250	4981	8231	4.7	1.78	2.91
2011-12	3372	5294	8666	3.75	6.28	5.28
2012-13	3321	5719	9040	-1.51	8.03	4.32
2013-14	3443	6136	9579	3.67	7.29	5.96
2014-15(P)	-	-	10069	-	-	-

Source: Hand book of Fisheries Statistics , Govt. of India 2014

Table 1.5: Trend in Exports of Marine Products 1980-81 To 2013-14

Year	Quantity (Tonnes)	Value (Rs. Crore)	Unit Value (Rs./tonnes)	Unit Value Index	Annual Growth rate (%)	
					Quantity	Value
1980-81	75591	234.84	31067.19	1246.81	-12.51	-5.62
1981-82	70105	286.01	40797.38	1637.31	-7.26	21.79
1982-83	78175	361.36	46224.50	1855.11	11.51	26.35
1983-84	92187	373.02	40463.41	1623.90	17.92	3.23
1984-85	86187	384.29	44587.93	1789.43	-6.51	3.02
1985-86	83651	398.00	47578.63	1909.46	-2.94	3.57
1986-87	85843	460.67	53664.25	2153.69	2.62	15.75
1987-88	97179	531.20	54662.02	2193.73	13.21	15.31
1988-89	99777	597.85	59918.62	2404.69	2.67	12.55
1989-90	110843	634.99	57287.33	2299.09	11.09	6.21
1990-91	137667	856.00	62179.03	2495.41	24.20	34.81
1991-92	169875	1311.60	77209.71	3098.63	23.40	53.22
1992-93	206673	1713.70	82918.43	3327.74	21.66	30.66
1993-94	242505	2461.00	101482.44	4072.76	17.34	43.61
1994-95	307337	3575.30	116331.58	4668.70	26.73	45.28
1995-96	296277	3450.10	116448.46	4673.39	-3.60	-3.50
1996-97	378198	4077.60	107816.54	4326.96	27.65	18.19
1997-98	385818	4649.70	120515.37	4836.60	2.01	14.03
1998-99	302934	4626.87	152735.25	6129.67	-21.48	-0.49
1999-00	343031	5116.67	149160.57	5986.21	13.24	10.59
2000-01	440473	6443.89	146294.78	5871.20	28.41	25.94
2001-02	424470	5957.05	140340.90	5632.25	-3.63	-7.56
2002-03	467297	6881.31	147257.74	5909.84	10.09	15.52
2003-04	412017	6091.95	147856.76	5933.88	-11.83	-11.47
2004-05	461329	6646.55	144073.97	5782.07	11.97	9.10
2005-06	512163	7245.73	141473.12	5677.69	11.02	9.01
2006-07	612643	8363.52	136515.39	5478.72	19.62	15.43
2007-08	541701	7620.93	140685.18	5646.07	-11.58	-8.88
2008-09	602834	8607.95	142791.38	5730.60	11.29	12.95
2009-10	678436	10048.53	148113.16	5944.17	12.54	16.74
2010-11	813091	12901.46	158671.78	6367.92	19.85	28.39
2011-12	862021	16597.23	192538.58	7727.08	6.02	28.65
2012-13	928215	18856.26	203145.39	8152.76	7.68	13.61
2013-14	983756	30213.26	307121.48	12325.60	5.98	60.23

Source: Marine Products Export Development Authority, Kochi

1.2.3 (a) DISPOSITION OF FISH CATCH – INDIA, 1991 – 2012

The percentage distribution of disposition of fish catch during the year 1991-2012 has been described in the Table number1.5.1. It has been observed that the percentage share of reduction over the total disposition of fish catch reduced significantly, in case of canning and curing the data show the resemblance with the

data of reduction. Percentage of frozen items have grown significantly it shows a qualitative change in disposition of fish catch as it has positive link with the increase of marketing. Marketing of marine fish during this period has increased although there are oscillation of quantum in terms of percentage distribution is clearly visible.

Table 1.5.1: Disposition of Fish Catch–India, 1991–2012 (Percentage Distribution)

YEAR	Marketing	Frozen	Curing	Canning	Reduction	Offal for reduction	Miscellaneous	Unspecified	Others	Total
1991	66.91	6.58	15.18	0.74	8.24	1.18	1.16	0.00	0.00	100.00
1992	67.06	6.82	14.14	0.62	8.53	1.69	1.14	0.00	0.00	100.00
1993	68.31	6.81	14.18	0.22	8.20	0.36	1.93	0.00	0.00	100.00
1994	68.64	6.55	13.76	0.26	8.39	0.83	1.57	0.00	0.00	100.00
1995	70.94	6.64	13.09	0.27	7.41	0.80	0.84	0.00	0.00	100.00
1996	72.74	7.55	12.29	0.21	6.02	0.43	0.76	0.00	0.00	100.00
1997	72.03	7.84	11.20	0.26	6.42	0.33	1.91	0.00	0.00	100.00
1998	73.73	7.45	10.84	0.23	5.79	0.37	1.59	0.00	0.00	100.00
1999	78.05	5.27	7.82	0.32	5.50	0.99	0.17	1.31	0.55	100.00
2000	76.38	4.93	6.05	0.89	5.66	0.02	0.62	1.24	4.21	100.00
2001	80.56	4.47	5.83	0.90	5.20	0.27	0.74	1.23	0.81	100.00
2002	81.50	5.66	6.61	0.39	4.53	0.73	0.02	0.27	0.28	100.00
2003	82.03	5.22	6.18	0.62	4.72	0.69	0.03	0.22	0.28	100.00
2004	82.67	6.03	5.17	0.70	4.22	0.03	0.64	0.27	0.27	100.00
2005	83.13	5.93	5.02	0.38	4.33	0.53	0.02	0.26	0.44	100.00
2006	83.13	5.92	5.16	0.36	4.42	0.54	0.02	0.22	0.22	100.00
2007	83.13	5.86	5.08	0.35	4.62	0.20	0.02	0.23	0.22	100.00
2008	83.60	5.45	4.83	0.45	4.51	0.65	0.02	0.26	0.22	100.00
2009	82.82	6.05	4.84	0.46	4.05	0.86	0.00	0.27	0.66	100.00
2010	76.58	9.18	5.15	0.59	3.55	0.93	0.00	1.72	2.30	100.00
2011	73.03	10.36	6.43	0.53	4.07	0.00	2.36	0.86	2.34	100.00
2012	74.24	12.12	4.25	0.54	3.85	0.00	1.93	0.91	2.15	100.00

Source: Marine Products Export Development Authority, Kochi

1.3 State wise Fish Production in India

It has been discussed earlier that in terms of global fish production India ranks second after China. In the following Table (Table 1.6) we will try to find out the contribution of different States in country's fish production. West Bengal stands second after Andhra Pradesh in terms of country's fish production. Percentage share of west Bengal is 16.06 percent preceded by Andhra Pradesh 19.50 percent. The State

of Gujarat, Karnataka, Kerala and TamilNadu is 8.04per cent, 6.09 per cent, 6.28per cent and 6.93 respectively.

Table – 1.6: State wise Fish Production in India (TE 2014-15)

States / UTs	State-wise Fish Production in India (2014-15 ('000 tonnes)			% to total 2014-15
	2012-13	2013-14	2014-25	
A & Nicobar Islands	36.62	36.95	37.18	0.37
Andhra Pradesh	1808.08	2018.42	1964.43	19.50
Arunachal Pradesh	3.71	3.63	4	0.04
Assam	254.27	266.7	282.7	2.81
Bihar	400.14	432.3	479.8	4.76
Chandigarh	0.05	0.11	0.12	0.00
Chhattisgarh	255.61	284.96	314.16	3.12
Dadra & Nagar Haveli	0.05	0.05	0	0.00
Daman and Diu	19.01	19.86	28.77	0.29
Delhi	0.69	0.88	0.67	0.01
Goa	77.88	114.06	117.85	1.17
Gujarat	788.49	798.49	809.93	8.04
Haryana	111.48	105.58	111.2	1.10
Himachal Pradesh	8.56	9.83	10.74	0.11
Jammu and Kashmir	19.95	20	20.3	0.20
Jharkhand	96.6	104.82	106.43	1.06
Karnataka	525.57	555.31	613.24	6.09
Kerala	679.74	708.65	632.26	6.28
Lakshadweep	12.37	18.72	13.19	0.13
Madhya Pradesh	85.17	96.26	109.12	1.08
Maharashtra	586.37	602.68	548.75	5.45
Manipur	24.5	28.54	30.5	0.30
Meghalaya	5.42	5.75	5.89	0.06
Mizoram	5.43	5.94	6.39	0.06
Nagaland	7.13	7.47	7.84	0.08
Odisha	410.14	413.79	439.86	4.37
Puducherry	41.07	42.08	73.5	0.73
Punjab	99.13	104.02	114.77	1.14
Rajasthan	55.16	35.1	46.31	0.46
Sikkim	0.49	0.42	0.44	0.00
Tamil Nadu	6620.4	624.3	697.61	6.93
Telangana	-	-	265.38	2.63
Tripura	57.46	61.95	63.56	0.63
Uttar Pradesh	449.75	464.48	494.26	4.91
Uttarakhand	3.85	3.89	3.94	0.04
West Bengal	**1490.02**	**1580.65**	**1617.32**	**16.06**
Deep Sea Fishing	-	-	-	-
India	**9040.36**	**9576.64**	**10072.4**	**100.0**

Source: www.indianstat.com

Table 1.7: State wise Marine Fish Production in India

Sl. No.	State/Union Territory	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15(P)
1.	Andhra Pradesh	254.89	291.159	293.151	288.637	433.278	414.349	438.25	475.40
2.	Goa	32.26	83.136	81.927	89.962	86.205	73.713	109.57	114.57
3.	Gujarat	644.53	623.055	687.445	688.930	692.488	693.560	695.58	698.45
4.	Karnataka	175.57	218.137	248.729	295.570	347.383	357.324	357.36	389.82
5.	Kerala	586.29	583.150	570.013	560.398	553.177	530.638	522.31	472.74
6.	Maharashtra	419.82	395.963	415.767	446.703	433.684	448.913	467.46	423.79
7.	Orissa	130.77	135.487	129.332	133.481	114.295	118.311	120.02	133.21
8.	Tamilnadu	393.27	365.280	401.128	424.842	426.735	428.441	432.27	457.45
9.	West Bengal	182.74	189.290	179.004	197.109	182.020	152.352	188.24	178.85
10.	Andaman & Nicobar Island	28.60	32.335	33.000	33.735	35.072	36.426	36.75	36.98
11.	Daman & Diu	26.28	140.060	15.880	16.681	17.429	18.778	18.78	28.77
12.	Lakshadweep	11.04	12.592	12.372	12.372	12.372	12.372	18.72	13.18
13.	Pondicherry	33.44	34.550	36.100	36.100	37.608	35.606	37.81	68.05
	Total	**2919.49**	**2978.194**	**3103.848**	**3224.468**	**3371.746**	**3320.783**	**3443.12**	**3444.19**

Extracted from Hand book of Fisheries Statistics, 2011, Ministry of Agriculture, GOI & TMC meeting held on 30th August 2013at Goa

Marine fish production in India has a sporadic fluctuation. During the period of 2007-08 to 2014-15 (provisional) an estimation of State/Union territory-wise marine fish production has been depicted in Table 1.7. During this period in India an increase of 17per cent of fish production is already visible though position of West Bengal remains static. Barring a few exception productions are even shown downward trend too.

1.4 Post Harvest Losses in Marine Fisheries

Fisheries sector suffer a lot owing to its improper mode of operation. Right from the harvesting of fishes to its retail distribution and in different stages of handling and processing quality of the product gradually become poor, causing serious concern to economic losses to the fishermen and fish traders. Directly or indirectly it affects the consumer also. Despite the facts that marine fisheries being a renewable natural resource caters the livelihood of hundreds of thousands of fishermen, traders

and processors over the years, a little attention was given to minimize or arrest the losses during post-harvest operation so far. Thus, a coherent strategy formulation and intervention in policy recommendation seem to be more pertinent in reducing post-harvest losses in marine fisheries. An effective policy is needed in different stages of handling, distribution and processing for less reduction and making fisheries more economically viable.

Estimation of assessment of post harvest loss in marine fisheries is very difficult as such no representative data are available. Ames (1991) suggested that at least 3 years representative data are required for an effective estimation. Literature relating to post-harvest losses in Marine Fisheries in India is extremely limited. One similar study in Bangladesh (Nowsad – 2010) reveals that both in qualitative and quantitative terms "losses in net fish distribution chain and processed products ,20% of the marine fish landed was deteriorated up to 80% of its original quality before it was transported (BICAS, 2003) and about 28% of fish lost 60-70% of freshness quality before it reached the consumer" (Nowsad – 2004). The same study reveals that a significant amount of post-harvest loss during pre-processing, processing, storage and transportation of fishery products in Bangladesh.

In case of dried fish contamination ratio (by both insects and harmful insecticides) comprises almost 80% of the total dried products. Earlier study assessed the seriousness of marketing difficulties in remote fishing communities particularly is the Bay of Bengal region, availing adequate ice and transportation. Inadequacy of these essential items put the fishermen in weak position in relation to intermediaries. "In this location much fish more processed into lower valued canned products and the process of caring involved losses through spoilage and infestation". (Conlter and Disney1987).

Estimation of post harvest loss in Marine Fisheries is very difficult. There is no homogeneous method of estimation of fish loss neither a uniform formula. Owing to the prescription of the International Fisheries Research Meeting in Paris in 1991 the physical loss assessment model was adopted on the basis of information on examine value of the fish lost at every step of distribution and activation through participatory

rural appraisal method. In this study also a well structured questionnaire was canvassed among all stakeholders to assess the postharvest losses in marine fisheries as far as practicable.

Losses of fish can be categorized into two broad aspects (i) quantitative and (ii) qualitative. Yet, Cheke and Ward (1998) explained a more pragmatic explanation of fish loss as four common categories; physical loss, quality loss, nutritional loss and market force loss. “Physical loss are easily understood; quality losses are the result of mishandling coupled with lack of icing and associated high temperature leading to spoilage and quality deterioration; nutritional quality of the fish can be altered post-mortem, for example, vitamin A in the corona of small fish or essential amino acid, lysine can be damaged due to high processing temperature; while market force loss is attributed to the changes in supply and demand of fish which may lead to price fluctuation “.

Fish is the most perishable item in nature and it spoils gradually, step by step. Owing to its bio-physiological nature, fishes are highly susceptible to bacteria. It is commonly believed that, the lengthy the process of harvesting to distribution to the consumer, the higher the degree of bacterial infestation., the poorer the process of storing during transportation and handling the greater the risk of spoilage and deterioration of quality.

Quantitative loss can be assessed during harvesting when huge small and juveniles are killed, physical injury caused by melting (in case of gill melting) take place. Bottom trawling usually occur huge losses to the small and juvenile fishes and the loss is beyond accountancy.

The general hygiene condition and prevailing sanitary aspects of fishing harbours and fish markets influence the quality of marine harvest mostly in all regions in India. If all the stakeholders are sensitized for maintaining cleanliness and a more conducive atmosphere in the landing centres then the loss could be reduced significantly, not only that much alleged loss of hygiene value of fresh fish could be maintained for a pretty long duration.

At present, the landing and berthing facilities are inadequate to meet the requirements of the large fishing fleets. Not only that in number of cases siltation in estuarine areas compelled big fleets to anchor in a fairly long distance from the fish landing centres , causing transporting of harvested fishes by small vessels in number of occasions. It requires another stage of handling and icing. In many cases inadequate availability of ice or freezers or insulated boxes on board fastens the decomposition ratio of catch, inflicting an economic losses to all the stake holders also. On board facilities for proper handling of fish is very crucial in the sense, as it is the primary and most important condition for maintaining quality of high value fish and providing more fish for human consumption.

Degradation of fish qualities owing to poor post harvest facilities is directly or indirectly causing a concern to the ecological niche and balance in the fishing areas and neighbouring zones as well . In most of the cases fishers supply poor quality fishes to the feed industry and as per the requirement of the said industry uncontrolled and overfishing of low value fish and by catch make a serious impact to level of pelagic stocks in this marine zone.

The present study attempts to examine all the technical, institutional and economic factors responsible for huge losses in marine fisheries sector. In the subsequent stages of the study we will discuss and try to assess about the physical losses of fishes during processing, transportation, storage, marketing associated with inadequate packaging etc. One comprehensive analysis of functioning of fishermen, wholesalers, retailers, consumers and all other stakeholders involved in this operation has also done to assess and evaluate the actual post harvest loss in marine fisheries sector in the state of West Bengal.

1.5 Rationale of the Study

Seldom, marine fish after harvesting is reached to the direct consumer in the natural wet form. Almost in every case, it is very rare. Usually, it takes a considerable time period to reach to the kitchen of consumers. After harvesting these catches are stored/ preserved on the decks and in most of the cases usually with traditional

wisdom. With the advent of modern technologies and use of modern tools and machineries– there has been visibly qualitative change in post-harvesting management in marine fisheries. Marketing chain coupled with modern processing industries play an important role in marketing and distribution of fisheries product in domestic and foreign market. An effective evaluation of all these activities along with the availability of post-harvest fishing inputs are needed to be studied accordingly.

1.6 Objective of the Study

The overall aim of the study is to examine the economic losses on account of inadequate post-harvest infrastructure facilities for the marine fisheries sector in India. The following are the specific objectives of the study.

- To examine the growth, composition and the contribution of the fisheries sector in India;
- To evaluate the availability of the post-harvest infrastructure facilities for marine fisheries sector in India;
- To review the Government policies and programs for the provision of post-harvest infrastructure facilities for marine fisheries sector in India;
- To evaluate and assess the economic losses on account of inadequate post-harvest infrastructure facilities for fisheries sector in India; and
- To arrive at relevant policy implications.

1.7 Data and Methodology

There is no well-established method to evaluate and assess the economic losses because of inadequate post-harvest infrastructure facilities for fisheries sector in India**.** The losses are varied in nature depending on the different stages of the supply chain from capture to consumer. The study is based on both primary and secondary data. Secondary data on growth, species composition, catch disposition (Domestic, Export, Processing including traditional methods of processing like curing/smoking etc.), the market and processing infrastructure; market channels has been collected from the Department of Fisheries Govt. of West Bengal The primary losses are physical loss,

quality loss and market force losses. The study will mainly focus on the economic losses because of inadequate post-harvest infrastructure facilities for fisheries sector in West Bengal as well as in India**.**

To evaluate the specific objectives of the study, necessary primary data has been collected from the respondents by administering a pre-tested and well structured questionnaire .General observations, interviews with take holders /interactions/discussions who are involved in fishing, handling, trading, transport, processing, marketing would also resorted to elicit information about the availability and the gap in post-harvest information which influence the fishery losses and help in addressing the objectives spelled out above.

The following fishing harbours have been chosen for collecting the infrastructural gap to arrest post-harvest fish losses in West Bengal viz Shankarpur, Petuaghat and Fresherganj.From each site, stakeholders involved in the supply chain viz. fishers, wholesalers, traders, retailers and small processors and exporters including the administrators in the States has been interviewed to collect information on the various aspects including fish quality and loss assessment data. The questionnaire has also helped us to collect detailed data on major fish landing and distribution channels as well as the post-harvest losses at the various stages of these channels.

The study has been structured in such way to address those stakeholders who are involved in the entire supply chain of fish holders. For identifying infrastructural gap at each stage of the activity, the following four groups have been addressed to infer information about the gap that exists in the Post-Harvest scenario of the fisheries sector. They are:

- Those who utilize or interact with the Fishing Harbors, Fish Landing Centres and Fishing Jetties. These are the Centres/places from where the fish caught commence their journey on shore to consuming centres.
- The market, where the fish is landed before being taken to consumers

- The processing plants, where the fish gets a transformation (physical) before being taken to the consumers/export markets.
- In order to have full information regarding post harvest operation of marine fisheries a well-structured questionnaire was canvassed among the respondents of the following Four Categories.

  Category 1 – Fishing Harbours/Fishing jetties/Fish landing centres,

  Category 2 – Fish markets (Wholesale and Retail markets)

  Category 3 – Fish Processing Centres

  Category 4 – Fishery Officials.

Category 1 – Fishing Harbours/Fishing jetties/Fish landing centres

From these centres, we deal with the stakeholders, namely, fishing crew members/wage earners, fishing harbor management authorities (may be official or fishers as the case may be) and fishery officials in charge of these centres.

The primary objective will be to elucidate information on the existing practices of fish handling (onboard and onshore), fishing seasons, fishing trips, fish landings (including species landed), the nearest markets to which the fish is transported, the storage facilities available within and outside the fishing harbours, any surplus quantum that is processed/value added etc.

Category 2 – Fish markets (Wholesale and Retail markets)

The target audience would be the wholesalers, retailers and processors. The consumers who interact with the retailers would also be roped in to infer information on the quality of the product they carry for consumption.

Category 3 – Fish Processing Centres

The target audience would be the major fish processing units who are incidentally also exporters, small processors and people who are involved in fish trade including dry fish traders.

Category 4 –Fishery Officials

The target audience would be the Director of Fisheries of respective states, senior officials and the Officials directly involved in marine fisheries and development. Objective of collecting information from the category 4 is to have an insight about the ongoing process and recent development in policies and programs in marine fisheries in West Bengal, moreover, they were asked to provide inputs for enhancing the present infrastructural facilities prevailing in their administrative domain.

The following Tables gives the details and the number of stakeholders under each of the above four categories would be interacted through the structured questionnaire. The information would be mostly sought through in personal conversation with the target groups, as they may not be willing to spare their time; some of the vital information would be obtained through observation as this method would be more a workable option when dealing with fishers.

Sl. No.	States	Fishing Harbours	Sample Size			
			Category-1 FH/FJ/FLC	Category-2 Fish Market Wholesale & Retailer	Category-3 Fish Processing Centre	Category-4 Fishery Officials
I	West Bengal	Sankarpur Petuaghat Freserganj	A* 10×3=30 B* 10×3=30	Wholesaler 5×3=15 Retailer 10×3=30 Consumer 10×3=30	Exporter (2x3)= 6 Small Scale/local Processor (2x3)= 6 Total 12	2×3=6
		Total	60	75	12	6

Note:A* - Fishermen-Boat owners/crew B* - Fishermen to haul the catches

1.8 Limitations of the Study:

Main objective of the study is to assess the post-harvest losses of marine fisheries and essentially to find out the causes for such economic losses. Main respondents are Boat owners and fishermen. Ostensibly, the fishermen have no readymade data or information for accounting the losses .The big Boat owners could

do this but in order to register a comparatively low margin in their business activity there has been a tendency to inflate the figure than they are actually have been. In many cases the researchers have to depend upon the memory of the fishermen and subjective analysis and projection of data. In number of cases they had varied opinion and difference in estimation of losses. Secondly, due to segregation of different markets and marketing channels it seems practically impossible to collect information from all the sources. It appears that estimation of losses to a significant extent depends upon the prudent and subjective perception of the researchers and Thirdly, as availability of fishes are heavily depended upon the vagaries of nature (monsoons) a concurrent study for at least three years in the same region with the same respondents may yield better result.

1.9 Organization of Report:

The Present study has been divided into Six chapters. In the Introductory chapter i.e. in the First chapter, importance of fisheries with special reference to marine fisheries along with rationale and objectives of the study have been delineated. Availability of data and methodology of the study has got special attention. The Second chapter deals with the various aspects and Development of Marine Fisheries in the state of West Bengal. Physical characteristics and availability of fisheries resources as well as infrastructural facilities are also taken into account for discussion. The Third Chapter essentially deals with the existing policies and programs of fisheries in the state of West Bengal. A critical appraisal of the policies has also been attempted to have a glimpse and assess the role of the Government for development of the fisheries sector. Present status and problems of post-harvest infrastructure in selected harbors in the state of West Bengal has been analyzed in the Fourth Chapter and in the Fifth Chapter analysis of primary data of the incidence of post-harvest losses and its causes has been done. Brief summary of the report along with conclusion and policy prescriptions have been made in the Sixth and Final Chapter.

Chapter – II

Fisheries Development in West Bengal

Special reference to Marine Fisheries

2.1 Introduction

West Bengal is one of the most densely populated States in India. In this State population density estimated as 615 people/km as compared to the national average of 216. Most of the work force is agrarian in nature and a sizable portion of Bengalee populace is actively associated with fisheries. Besides inland fisheries marine fisheries over the periods has the prominence and its contribution to fisheries sector has shown an uprising trend. These aspects of marine fisheries are well reflected from the following Tables and analyses of the study.

Traditionally fish is an important item of Bengali dish, although there is a strong consumer 'preference for fresh-water fish, marine fish being mainly preferred in the coastal and tribal hill areas. But the gap between supply and demand of fresh water fish coupled with high prices has resulted in a steadily growing demand for marine fish in other parts of the state'. Ilish (hilsha), prawn, shrimp, pomfret are equally albeit in many cases are in higher ranking in consumers' preference.

2.2 Physical Features

West Bengal is one of the maritime states in the country located within $21^0$38' - $27^0$10' N (Lat.) and $85^0$38' - $89^0$50' E (Long) with an area of 87,853 sq. Km. bestowed with all types of fisheries resources of immense potentiality spread over the State from the south in marine jurisdiction in the Bay of Bengal to the north with the cold water region at the base of the Himalayas. It has been considered the nature's best boon to provide the scope for development in the sector through different disciplines and directions of the fisheries economic activities.

(A)	Location	LATITUDE $21^0$38' - $27^0$10' N
		LONGITUDE $85^0$38'E - $89^0$50' E
(B)	Total area (Sq.km)	88551.0
(C)	Total population (As per 2011 census)	91276115
(D)	Fishermen's villages (No)	6348
(E)	Marine villages (No)	188 GP
(F)	Fishermen population (No)	Inland – 28,55,583 Marine – 3,80,138
		Total - 32,35,721

Source: Hand Book Of Fisheries Statistics 2014-15, Government of West Bengal

2.3 Fisheries Resources in West Bengal

The coast line of West Bengal spreads over two maritime districts: East Medinipur and South 24 Parganas The total number of fishing villages and fisherman families are 188 and 76,981 respectively. A number of 380138 populations are directly or indirectly engaged with marine fisheries. The influx of refugees from Bangladesh after the War in 1971 into 24 Paraganas (both North and South) and Medinipur had an important impact on the development of craft and gear. Prior to Sixth Plan period a little attention was given to improve the basic infrastructure facilities in marine fisheries. Some minor and major schemes to provide berthing, landing and post-harvest facilities were taken as an improvement measure of existing infrastructure but a significant development on these aspects actually taken into place after Seventh Plan (1985-90). Since then a development program focusing on welfare measures to the fishermen, deep sea fishing, motorization of fleet, diversification of fisheries and harboring got much attention and it continued till date albeit not up to the expected level of the fishermen and traders.

The coastline of West Bengal stretches 158 km and the continental shelf comprises 17,049 km**.** The mesh size of gill net varies between 30 and 110 mm and its length is 200-500m for all gill nets being used for fishing at 6-100 m bathymetry. Small and big bag nets are used to catch fish at 30-100 m bathymetry respectively.

A. Fishery Resources

Table 2.1: Inland Sector

Sl. No	Type of Fishery Resource	Area (in lakh ha)	Sl No.	Type of Fishery Resource	Area (in lakh ha)
A.	**Impounded water system**		**B.**	**Open water system**	
1.	Ponds/Tanks	2.88	1.	Reservoir	0.28
2.	Bell & Boar	0.42	2.	River	1.64
3.	Brackish water fishery	0.60	3.	Canal	0.80
4.	Sewage fed fishery	0.04	4.	Estuarine	1.50
	Total	**3.94**		**Total**	**4.22**

Source: Hand Book Of Fisheries Statistics 2014-15, Government of West Bengal

2.3.1. Fishermen Population

Fisheries sector in West Bengal plays a very crucial role. Fish is a very important item of daily food among the Bengali folks. Discussed earlier only two districts namely Purba Medinipur(East Midnapore) and South 24 Parganas have the coast line of Bay of Bengal and besides inland fishermen – a chunk of fishermen are also arranged in marine capture fisheries as well. More than 3 million of Bengalee people are directly or indirectly engaged with fisheries. Majority of fishermen in South 24 Parganas and Purba Medinipur(East Midnapore) district are associated with marine fisheries activities [Table 2.2 and 2.2a] and most of them belong to SC category.

Table 2.2: District wise Fishermen village & Population of West Bengal as on 31.03.2015

Sl. No.	District		No. of Fishing village/GP	No. of Fisher Folk Families	Fish Folk Population		
					Male	Female	Total
1.	Darjeeling		94	956	1898	1548	3446
2.	Jalpaiguri		282	33039	97230	53930	151160
3.	Cooch Bihar		643	28552	82499	82080	164579
4.	Uttar Dinajpur		221	11925	40447	29903	70350
5.	Dakshin Dinajpur		291	16601	30734	25146	55880
6.	Malda		55	1387	64374	49288	113662
7.	Murshidabad		109	21673	186130	168584	353174
8.	Nadia		462	57092	175996	118821	294817
9.	Birbhum		483	37162	120680	92240	212920
10.	Bardwan		540	32588	82709	72213	154922
11.	Hooghly		310	28721	76355	69765	146120
12.	Bankura		982	23638	65552	62956	128508
13.	Purulia		142	8008	84191	40000	124191
14.	Howrah	Inland	164	17694	44582	41951	86533
		Marine	23 GP	3750	8908	7342	16250
15.	North 24 Parganas	Inland	221	84132	268265	158981	427246
		Marine	30 GP	9358	21559	18647	40206
16.	South 24 Parganas	Inland	118	27456	131472	85815	217287
		Marine	68GP	40684	105905	91876	197781
17.	Purba Medinipur	Inland	35	8625	39357	16868	56225
		Marine	67 GP	23189	109853	38597	148450
18.	Paschim Medinipur		165	12550	37010	35004	72014
	Total			**528780**	**1875706**	**1360555**	**3235721**

Source: Hand Book of Fisheries Statistics 2014-15, Government of West Bengal

Table - 2.2a: Category wise Fishermen Population 2014-15

Sl. No.	District	SC	ST	General	OBC	Total
1.	Darjeeling	0	0	0	0	3446
2.	Jalpaiguri	120486	9521	21153	0	151160
3.	Cooch Bihar	119984	305	1928	42362	164579
4.	Uttar Dinajpur	0	0	0	0	70350
5.	Dakshin Dinajpur	33528	6701	8386	7265	558.80
6.	Malda	0	0	0	0	113662
7.	Murshidabad	247223	17658	52976	35317	353174
8.	Nadia	175990	27144	70232	21451	294817
9.	Birbhum	85800	2600	658.60	58660	212920
10.	Bardwan	0	0	0	0	154922
11.	North 24 Parganas	186980	37400	196322	46750	467452
12.	South 24 Parganas	0	0	0	0	415068
13.	Hooghly	78799	12656	18689	35976	146120
14.	Howrah	79441	817	12364	10161	102783
15.	Purulia	60400	36191	13400	14200	124191
16.	Bankura	28625	9638	32127	58118	128508
17.	Purba Medinipur	133038	1763	39101	30773	204675
18.	Paschim Medinipur	34500	1014	36500	00	72014

Source: Hand Book of Fisheries Statistics 2014-15, Government of West Bengal

Table 2.2b: General information about the marine fishery of West Bengal

Fishing villages	188
Fisherman families	76,981
Traditional fisherman families	52,532
Fisher folk population	380,138

Source: Marine Fisheries Census 2010 Part II, 1, West Bengal

2.3.2 Coast line of West Bengal

West Bengal has coastline amounting of 158km of length. The area in continental shelf (upto 100 fathom depth) area in 17049 sq.km., the offshore area within 10-40 fathom depth range is 1813 sq.km., and in share area within 10 fathom depth range is 777 sq km. respectively. Table (2.3).

Table2.3: Marine Sector (Resources and coast line)

Sl. No	Marine Environment	Area
1.	Inshore area (up to 10 fathom depth)	777 Sq. km
2.	Offshore area (10-40 fathom depth)	1813 Sq.km
3.	Continental shelf (up to 100 fathom depth)	17049 Sq.km
4.	Coast line	158 km

So Source: Marine Fisheries Census 2010 Part II, 1, West Bengal

2.4 Fish Production during the last Ten years

Now, if we look into the fish production during last ten years we shall find that in West Bengal in case of both inland and marine fish production has been increased sufficiently.

From Table2.4 it is found that in case of inland fisheries the fish production has been increased from 10.9 lakh tone in 2005-06 to 14.38 lakh tone in 2014-15. In case of marine fisheries, the fish production has been increased from 1.6 lakh ton in 2005-06 to 1.79 lakh ton in 2014-15. Again in case of total production, it is found that fish production has been increased from 12.5 lakh ton in 2005-06 to 16.17 lakh ton in 2014-15. Barring the year 2010(registers negative growth rate as -4.86) we find since 2004-05 there had been a steady growth in terms of total fish production. A slight increase in marine fisheries production failed to offset huge deficit in inland fisheries

during this year. In 2014-15 Inland fish production grow at 3.3 per cent over the last year but in case of marine fisheries there has been a negative growth and it amounts to -4.9 per cent than the preceding year.

Table - 2.4: Fish production (Inland and Marine) in last ten years in West Bengal

Year	Inland		Marine		Total		Fish seeds produced
	Inland ('000 tons)	Growth rate (%)	Marine ('000 tons)	Growth rate (%)	Production ('000 tons)	Growth rate (%)	In million fry
2004-05	1035.50	4.81	179.50	-1.16	1215.00	3.88	12200.00
2005-06	1090.00	5.36	160.00	-10.86	1250.00	2.88	12200.33
2006-07	1181.01	8.35	178.10	11.31	1359.10	8.73	13200.00
2007-08	1264.53	7.07	182.74	2.61	1447.26	6.49	13572.00
2008-09	1294.71	2.39	189.29	3.58	1484.00	2.54	14181.00
2009-10	1338.00	3.34	179.00	-5.44	1517.01	2.22	12566.00
2010-11	1246.15	-6.86	197.11	10.12	1443.26	-4.86	13453.00
2011-12	1290.03	3.52	182.02	-7.65	1472.05	1.99	13826.00
2012-13	1337.66	3.69	152.35	-16.30	1490.02	1.22	15002.00
2013-14	1392.40	4.09	188.24	23.55	1580.65	6.08	15890.00
2014-15	1438.00	3.3	179.00	-4.9	1617.00	2.2	-

Source: www.westbengalstat.com

2.4 .1 Species wise Marine Fish Production in West Bengal

Varieties of marine fishes are available in West Bengal, among them Hilsha, Bombay Duck, Catfishes, Eels, Prava, Silver Bellis, Pom fret and Croakers play major role in marketing, distribution and processing also. From this table we find production of Hilsa barring 2010 has a negative trend.

A separate table 2.4(b) has been constituted to have a glimpse of Hilsa production over the years. It's a failure as far as administrative mechanism is concerned, to restrict the fishermen for catching juvenile and small Hilsa fishes and using of small net for catching in the rivers' mouth. There is legislation but effective monitoring is less visible.

Table - 2.4 a: Species wise Marine Fish Production in West Bengal

Sl. No.	Species Item	2006	2007	2008	2009	2010	2011	2012
1	Hilsa (Kalee shed)	16072	9430.64	11744	10560	54930	16523	8510
2	Harpodon Nehereus (Bombay Duck)	32107	23410.234	13704	14456	9991	11390	9506
3	Sea Catfishes (Arius Sp)	30171	35115.574	40145	29172	18253	21072	16745
4	Lizard Fishes	0	0	0	0	0	0	0
5	Muraenesoxs (Eels)	98	139.031	400	236.40	199	207	109
6	Latarius (Prava)	0	0	0	0	0	0	0
7	Leionathus (Silver Bellies)	3650	3159.237	379.85	216.50	475	490	93
8	Sciaenidae (Croakers)	7239	19365.855	37385.4	25881.50	17697	27236	17876

Source: Hand Book of Fisheries Statistics 2014-15, Government of West Bengal

Table 2.4b :Hilsa Catch in West Bengal & Supply from Bangladesh during last eleven years (unit: Ton)

Year	Marine (a)	Total
2005-06	19061.00	30758.37
2006-07	16072.00	26731.40
2007-08	9430.640	17233.462
2008-09	11744.00	19694.913
2009-10	10560.00	15295.00
2010-11	54265.00	64700.565
2011-12	20949.00	29331.37
2012-13	7699.00	9332.295
2013-14	9407.00	10636.00
2014-15	8908.00	10692.00

Source: Hand Book of Fisheries Statistics 2014-15, Government of West Bengal

Table – 2.5: District wise Marine Fish Production during last years

Sl. No.	Name of the District	Fish Production(in Mt)						
		2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
1	Purba Medinipur	135271	127156	132423	129011	105503	131648	126675
2	South 24-Parganas	54019	51848	64758	53009	46849	56595	52176
	Total	**189290**	**179004**	**197208**	**182020**	**152352**	**188243**	**178151**

Source: Hand Book of Fisheries Statistics 2014-15, Government of West Bengal

Marine fish production in Purba Medinipur and South 24 Parganas are during the period 2008-09 to 2014-15 remain almost same though there are oscillation albeit very low, is found in the mid-periods. As both of the two districts are the main contributor of state marine fish production; almost a static figure is much needed to draw attention in order to address the problem and to find out the issues and causes behind this stationary situation over the long periods .

Table - 2.5a: District wise Dry Fish Production during 2014-15

Sl. No.	Name of the District	Production
1	South 24-Parganas	3259 MT
2	Purba Medinipur	8786 MT
	Total	**12045 MT**

Source: Hand Book Of Fisheries Statistics 2014-15, Government of West Bengal

A short Table has been inducted to assess the processing/dry fishing in these two districts during 2014-15 (Table2.5a).It is seen that a considerable amount of catch is being processed as dried fish for future consumption.

Shrimp is also an important item of Bengal Fisheries. Production of marine penaeid from 2007-08 to 2014-15. Though a downward trend in recent years reflects higher attention is needed to find out the causes of low production – particularly in case of shrimp and Hilsa production

2.4.2 Growth Performance of Fish Production in West Bengal(From 6th plan period to 12th plan period)

An ambitious projection of average annual growth at the rate of 5.13 per cent has been estimated during the 12th Plan period (2012-2017) in West Bengal. Growth performance of fish production in West Bengal from 6th Five Year Plan onwards to 12th Five Year Plan has been depicted in Table2.5b. It is revealed from this Table that 7th Plan Period (1985-90) shows better growth in comparison to all Five Year growth estimation. Although growth during annual plan (1991-92) estimated to be 7.64 per cent, yet average annual growth during the 11th Plan period (2007-12) estimated as 1.66 per cent i.e. very low for all the Plan periods together.

Table - 2.5b: Growth Performance of Fish Production in West Bengal (From 6th plan period to 12th plan period)

Plan Period	Fish Production at end the period (lakh ton)	Growth (percent over the plan period)	Average annual growth
6th Plan (1980-85)	4.025		
7th Plan (1985-90)	6.01	49.32	9.86
Annual Plan (1990-91)	6.80	13.14	13.14
Annual Plan (1991-92)	7.32	7.64	7.64
8th Plan (1992-97)	9.37	28.00	5.60
9th Plan (1997-2002)	11.00	17.39	3.48
10th Plan (2002-2007)	13.59	23.55	4.71
11th Plan (2007-12)	14.72	8.31	1.66
12th Plan (2012-17) (targeted)	18.50	25.68	5.13

Source: Hand Book of Fisheries Statistics 2014-15, Government of West Bengal

Table:-2.6: District wise proposed Target of Inland (using all kinds of fishery & Marine Fish Production during the year 2015-16 to 2019-20) . (unit: Ton)

Marine

Sl. No.	District	2015-16	2016-17	2017-18	2018-19	2019-20
1.	Purba Midnapore	135000	135000	135000	135000	135000
2.	South 24 Paraganas	215109	222637	231542	240804	250436
	Grand Total	1795602	1850139	1916145	1984790	2056182
	Grand Total (in lakh ton)	17.95	18.50	19.16	19.85	20.56

Source: Hand Book Of Fisheries Statistics 2014-15, Government of West Bengal

2.5 Post Harvest Infrastructures for Marine Fishing in West Bengal

In West Bengal there are 78 number of important fish landing centres/khutes of Marine(M) and estuarine(E), among them 37 numbers are situated in South 24 Paraganas and rest are in East Medinipur. As per Marine Census there are 21 number of Marine Landing Centers in the District of South 24 Paraganas and 38 numbers in Purba Medinipur(East Midnpore).

2.6 Fish Catch Disposition in West Bengal

It is found from the Table2.7 that marketing of fresh fish has gained a momentum since 2005-06. It increased from 1162502 tons in 2005-06 to 1390360 tons in 2012-13. Freezing has increased from 32000 tons in 2005-06 to 40000 tons in 2011-12 and 33000tones in 2012-13. Reduction of fish increased from 50500 in 2005-06 to 55000 tons in 2011-12 and 45420 tons in 2012-13, misc. purposes increased from 5000 tons in 2005-06 to 5150 tons in 2012-13 and total fish catch disposition has increased from 1250002 tons in 2005-06 to 1473930 tons in 2012-13 respectively.

Table 2.7: Fish Catch Disposition in West Bengal (in lakh ton)

Year	Marketing fresh	Freezing	Curing	Canning	Reduction	Misc. Purposes	Unspecified	Others	Total
2005-06	1162502	32000	-	-	50500	5000	-	-	1250002
2006-07	1162502	32000	-	-	50500	5000	-	-	1250002
2007-08	1257628	36016	-	-	60159	5300	-	-	1359103
2008-09	1371480	40270	-	-	66250	6000	-	-	1484000
2009-10	1385650	43490	-	-	69580	6300	-	-	1515020
2010-11	1335159	38500	-	-	64000	5600	-	-	1443259
2011-12	1132775	40000	-	-	55000	5000	-	-	1232775
2012-13	1390360	33000	-	-	45420	5150	-	-	1473930
2013-14	NA	NA	-	-	NA	NA	-	-	NA
2014-15	NA	NA	-	-	NA	NA	-	-	NA

Source: Hand Book of Fisheries Statistics 2014-15, Government of West Bengal

2.7 Fishing Harbors in West Bengal

There are five Fish Harbours in West Bengal namely, Shankarpur, Petuaghat in the district of East Midnapur and Kakdwip, Fraserganj and Sultanpur Hilsha Conservation and Research Centre (HCRC)) in South 24 Paraganas, out of which three harbors has been taken for this study purpose. A detailed analysis of capacity utilization and functioning of these harbors has been depicted in Chapter IV.

2.8 Fishing Fleets in West Bengal

Unaccounted fleets (boats) both mechanized and traditional had tremendous effect on streamlining fisheries activities in West Bengal. Due to non-availability of

proper data it was very difficult to assess the socio-demographic condition of the fishermen involved in marine fisheries as well as it was very difficult to chalk out proper planning in perspective of modern fisheries also and hence the necessity of registering of fishing boats are felt with an emergency basis.

Table 2.8:Fishing Crafts In West Bengal

Traditional crafts	Motorized Traditional crafts	Mechanized boats	Total
3,066	-	14,282	17,348

Source: www.westbengalstat.com

Table 2.9: No. of Boats Licensed for Operation in Sea in the Coast of West Bengal

Year	Mechanized			Non-Mechanized		
	Purba Medinipur	South24 Parganas	West Bengal	Purba Medinipur	South24 Parganas	West Bengal
2002-03	174	1015	1189	2	240	242
2003-04	395	1908	2303	9	295	304
2004-05	843	1761	2604	72	609	681
2005-06	754	1279	2033	146	341	487
2006-07	830	1490	2320	43	222	265
2007-08	989	2241	3230	47	1041	1087
2008-09	1221	1759	2980	670	552	1222
2009-10	1050	2527	3577	100	1144	1244
2010-11	1656	3045	4701	131	1362	1493
2011-12	1703	2991	4694	67	1286	1356
2012-13	1238	3380	4618	15	568	583
2013-14	1406	2482	3888	256	2922	3178
2014-15	1730	903	2633	141	470	611

Source: Hand Book Of Fisheries Statistics 2014-15, Government of West Bengal

Table - 2.9a: Registration of Boat in West Bengal

Year	Mechanized			Non-Mechanized		
	Purba Medinipur	South24 Parganas	West Bengal	Purba Medinipur	South24 Parganas	West Bengal
1998-99	-	-	-	-	-	-
1999-00	411	259	670	144	114	258
2000-01	405	1357	1762	558	512	1070
2001-02	372	806	1178	131	1404	1535
2002-03	434	956	1390	203	1252	1455
2003-04	407	922	1329	83	778	861
2004-05	413	631	1044	161	855	1016
2005-06	182	438	620	166	444	610
2006-07	216	349	565	60	293	353
2007-08	164	283	447	26	1	27
2008-09	137	326	463	1	194	195
2009-10	162	976	1138	21	1077	1098
2010-11	289	572	861	04	341	345
2011-12	1425	1052	2477	297	454	751
2012-13	95	2971	3066	0	4149	4149
2013-14	177	375	552	22	116	138
2014-15	236	928	1164	38	276	314

Source: Hand Book Of Fisheries Statistics 2014-15, Government of West Bengal

In order to make fisheries more organized and to rein on sporadic harvesting of marine fishes Government of West Bengal had taken various measures among them registration of Boats and permission of the fishermen by availing Government licenses are among the noteworthy features of such regulatory measures. Practically, registration of boats started in the year1990-91 and registration of boats both mechanized and non-mechanized are still on. Such endeavours have tried to organize fisheries activities in more disciplined manner.

After introduction internet and other modern way of communication and also to make the registration and licensing hassle free e-registration was inducted in the year 2011-12 and so far as cumulative measure a number of 7500 mechanized and 4915 number of non-mechanized boats got e-registration certificate from the Fisheries Department. Besides this over and above one lakh biometric identity cards have been

provided to the fishermen. Biometric identity cards could be used for multiple purposes but actually possession of this cards has been able to legalize rights and duties of the fishermen in a coherent and systematic order.

Table 2.9b: E-Registration of Boat in West Bengal (cumulative)

Year	Mechanized			Non-Mechanized		
	Purba Medinipur	South24 Parganas	West Bengal	Purba Medinipur	South24 Parganas	West Bengal
2011-12	1425	1052	2477	297	3121	3418
2012-13	1614	2941	4555	223	4149	4372
2013-14	1954	4382	6336	256	4345	4601
2014-15	2190	5310	7500	294	4621	4915

Source: Hand Book Of Fisheries Statistics 2014-15, Government of West Bengal

Table 2.9c: Status of Biometric Identity Card for Marine Fishermen (as on 02.06.2015)

Sl. No.	District	Card received from the CPSUs (BEL & ITI)
1	South24 Parganas	109,723
2	North 24 Parganas	9,521
3	Howrah	2,963
4	Purba Medinipur	48,472
	Total	170,679

Source: Hand Book Of Fisheries Statistics 2014-15, Government of West Bengal

2.9 Consumption of Fish in West Bengal

The Bengal people are worldwide famous for their excessive fondness of fish consumption. They gained expertise in preparing varieties of delicious dishes of fish and fish products throughout the years. Due to over abundance of Rivers ,nullahs, ponds and sea water the fishermen catch fish from inland, estuarine and marine resources. Besides Rahu, Katla and other inland fishes varieties of Hilsha, Pomfret and Prawn harvested from estuarine and marine sources are equally adorable to them. Prawn now a days are found both from inland and marine sources as well.

Besides inland and marine fishes a huge chunk of low graded fish or deteriorated high graded fish are used as Dry fish. Though the Bengalese in Bangladesh, erstwhile east Pakistan are very fond of dry fish, use and consumption of dry fish in West Bengal seemed to be very minimal. Dry fish once in west Bengal was treated as inferior foodstuffs its use even in Bengal mediocrity was more than

restricted. Now a days its use in coastal belts in West Bengal are found to be rampant though the maximum amount of dried fish exported to the North Eastern States Like , Assam, Tripura, Manipur, Nagaland Mizoram etc and far East .

Table 2.10 Monthly Per Capita Consumption of Fish

Per Capita Quantity Consumed (Value per Kg. In rupees)			Number of households per thousand households reporting consumption	
	Rural	Urban	Rural	Urban
Quantity	0.813	1.082	879	844
Value	91.25	171.40	-	-

Source: Hand Book Of Fisheries Statistics 2014-15, Government of West Bengal

Fish consumption among rural households is higher than the urban folks. It is found from Table 2.10 that in rural Bengal 879 households within per thousand rural households consume fish. The comparative figure for urban households is 844. Contrary, per capita consumption among urban people in quantity and value terms is higher than their rural counter parts.

It is evident from Table 2.10a that there is marginal deficit in demand and production of fishes in West Bengal. Fish production during the period 2009-10 to 2015-16 is lacking behind the demand of fish in this State. Though fish production registers an enhancement to the tune of 9.63 percent, demand for fishes during this period substantially increased by more than 10 percent.

Table 2.10a: Production and Demand of Fish in West Bengal (in lakh ton)

Year	Demand	Production	Deficit
2009-10	15.62	15.05	-0.57
2010-11	15.85	14.43	-1.42
2011-12	16.06	14.72	-1.34
2012-13	16.29	14.90	-1.39
2013-14	16.51	15.80	-0.71
2014-15	16.72	16.71	-0.71
2015-016	17.20	16.50	-0.70

Source: Department of Fishery, West Bengal

2.10 Exports of Marine Products from West Bengal

It has been discussed earlier that marine fisheries is one of the most important sources of foreign exchange earnings. Over the years foreign exchange earned as estimated to US 3.51 billion in 2012-13. Export of fish from Kolkata, Haldia Port & Hill land customs give an interesting picture. In the year 1999-2000 the value of exports in monetary terms was 511.70 crore and it gained momentum over the years. Over the decades there was 7 per cent increase in fish exports and it is estimated that fishery exports in monetary terms in 2014-15 in comparison to 2009-10 would have phenomenon 413per cent increase. Government attention in raising foreign exchange earnings through export of marine fisheries has boosted up the process to a significant extent, no doubt. During analyzing the item-wise exports of marine products from West Bengal we find [Table2.12] that frozen shrimp has both in value and quantity terms a significant contribution. In value terms, it contributes to almost 83 per cent of export earning and in quality term it goes to 53per cent. Contribution of dried item are gradually increasing, it reaches from 5228.58 ton to 7627.87 ton during 2008-09 to 2014-15 and there is ample scope for its prosper and betterment.

Export

Table 2.11: Year wise export of fish from West Bengal through Kolkata & Haldia Port & Hill land customs

(Quantity in Ton, Value in Crore Rs.)

Year	Quantity	Value
1999-00	16348.00	511.700
2000-01	18553.00	595.400
2001-02	17647.37	503.909
2002-03	17502.96	575.228
2003-04	18201.09	560.282
2004-05	17580.91	502.108
2005-06	18778.30	550.166
2006-07	20560.00	617.000
2007-08	27650.00	688.620
2008-09	33625.23	720.360
2009-10	46901.00	892.480
2010-11	59774.00	1322.01
2011-12	61915.00	1737.84
2012-13	66941.00	1825.12
2013-14	68751.63	3058.67
2014-15	85138.45	3687.69

Source: Hand Book Of Fisheries Statistics 2014-15, Government of West Bengal

Item wise Exports of Marine Products in West Bengal

Table 2.12 Item wise Exports of Marine Products From West Bengal

Item Name		2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Frozen Shrimp	Q.	17102.79	18574.00	22736	26566	30004	36292	45805.59
	V.	573.15	687.25	1003.27	1290.42	1336.28	2576.17	3185.25
Frozen Fish	Q.	7759.60	7637	10861	8244	8526	9386	6118.22
	V.	67.79	87.43	162.13	141.91	152.93	186.65	132.72
Fr Cuttle Fish	Q.	940.45	1588.00	3852	2614	3343	4626	4218.86
	V.	9.96	13.15	28.75	29.57	68.99	54.05	67.44
Dried Item	Q.	5228.58	4142	6524	4665	8853	7449	7672.87
	V.	23.82	23.63	36.01	46.33	82.63	79.70	98.32
Live Items	Q.	819.22	1261	1417	1382	1618	1932	2377.79
	V.	15.78	24.06	25.96	27.83	44.20	76.49	69.68
Chilled Items	Q.	1625.92	13315	13828	9329	14278	8671	18879.72
	V.	28.06	53.72	62.66	56.07	133.38	80.72	132.08
Others	Q.	148.67	384	555	247	319	395	155.41
	V.	1.80	3.24	4.24	2.37	6.71	4.89	2.91
Grand Total	**Q.**	**33625.23**	**46901**	**59774**	**61709**	**66941**	**68750**	**85138.46**
	V.	**720.36**	**892.48**	**1322.01**	**1734.32**	**1825.12**	**3058.67**	**3687.68**

Source: Hand Book Of Fisheries Statistics 2014-15, Government of West Bengal

2.11 Financing Fishery Development in West Bengal

Total allocation for the 11th plan in respect of Fisheries Department for execution of various Programmes/Schemes/projects under the Core Plan, NCDC, and RIDF & RKVY is Rs 48846.00 lakh. During the last four years of the 11th Plan period from 2007-08 to 2010-11, a total amount of Rs 35618.00 lakh, was sanctioned by the Finance Department based on the recommendation of the State Planning Board.

With a view to providing maximum benefit to the fishermen community in particular and others in general major thrust was given upon rural development and poverty alleviation programmes in the form of creation of infrastructural facilities in inland and marine fishing villages . The activities include construction of village roads, RCC bridges and culverts, boat-building units, community halls, flood-relief shelters, market complex etc. Model housing for fishermen, rural electrification, group personal accident insurance to fishermen and savings-cum-relief-schemes to fishermen with equal emphasis on construction/development of fishing harbours and

jetties, fish landing centres, fish-food processing centres, ice-plants, ornamental fisheries, sewage-fed fisheries, jhora fisheries, beel fisheries etc are also included in these activities. In addition to the ongoing programmes on development of freshwater and brackish water fisheries by FFDA, BFDA and SFDC on application of modern methods and techniques. A Deep-sea Fishing Harbour under 100 per cent Central assistance for a sum of Rs 60.00 crore at Petuaghat in the Purba Medinipur district has been constructed during the 11th Plan. (Approach Paper on 12th Five year Plan, Government of West Bengal-2015)

The Department of Fisheries proposed to fix the outlay (Rs) for 12th Five Year Plan follows as:-

	State Plan (Rs in crore)	Centrally Sponsored Schemes Central Sector Scheme
i) Core Plan :	350.00	125.00
ii) NCDC :	75.00	
III) RIDF :	200.00	
iv) RKVY :	200.00	
v) NFDB :	200.00	
Total :	1030.00	

The National Fisheries Development Board (NFDB) sanctioned a lot of money for intensive aqua culture in ponds and tanks since 2007-08 to 2010-11. A meager amount was sanctioned in 2011-12 but it significantly enhanced in the following two years i.e.in 2012-13 & 2013-14 respectively. Interestingly, a lesser amount was disbursed towards development of coastal aquaculture and not a single rupee allotted for deep-sea fishing &tuna processing except the year2011-12. Over the years, huge amount was allotted for betterment of domestic marketing purporting development of internal infrastructure for disposal of fishes in an arranged and organized manner (Table2.13).

Table 2.13: Funds availed by the Govt. of West Bengal from National Fisheries Development Board (NFDB):

(Rs. In lakh)

Name of activities	Fund released During 11th Plan					During 12th Plan	
	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Intensive aquaculture in ponds & tanks	47.78	34.90	0.00	36.33	3.30	63.17	208.73
Reservoir fisheries	314.79	136.25	51.70	130.14	15.00	13.57	19.51
Coastal aquaculture	7.70	7.60	10.74	8.95	2.90	0.00	0.00
Seaweed cultivation	8.60	0.00	0.00	0.00	0.00	0.00	0.00
Fish dressing centers & solar drying unit	4.78	47.57	0.00	0.00	0.00	0.00	0.00
Deep sea fishing & tuna processing	0.00	0.00	0.00	0.00	5.53	0.00	0.00
Domestic marketing	0.00	0.00	450.00	833.96	111.02	91.15	126.00
Other activities	0.00	1.04	6.47	17.65	0.00	71.75	5.50
Human resources development	0.00	0.00	0.00	6.31	9.96	3.62	20.26
Total:	383.65	227.29	518.91	1033.34	147.71	243.25	380.00

Source : www.westbengalstat.com

Over the Plan periods, Central Government has sanctioned a significant amount through various Central sector and Centrally Sponsored Scheme. Performance of these Schemes is depicted in following two Tables (Table2.14 and Table 2.15). A substantial amount was released for development of marine fisheries, infrastructure & Post-Harvest operation during first four years of 11th Plan period Rs 3.73 crores,Rs 10.95 crores ,15.75 crores and 9.13 crores was released in 2007-08, 2008-09,2009-10 and 2010-11 respectively . After a total stoppage in the following two years Rs 3.12 crores and 1.52 crores was allotted during 2013-14 and 2014-15 in 12th Plan period. National Fisheries Development Board (NFDB) drew a special attention and it is reflected from the figure that a substantial amount was released through this organization for implementing various social and technical aspects of fisheries

development as designed by the Central Government. A steady increase in amount is visible in the National Scheme of Welfare of Fishermen in the first phase of 11thPlan period but recently a sudden fall of amount in this direction may highlight Government's attention of clubbing other social measures of development along with this scheme. Interestingly, an upward tendency of releasing fund in Strengthening of Database& Geographic Information System of Fisheries sector over these two Plan periods justifies Government's intention for better monitoring and implementing one modern and suitable database for augmenting and developing this important sector to a coherent and organized manner.

Table 2.14: Performance of CSS & CS Schemes in West Bengal: (during 11th Plan)

(Rs. in lakh)

Name of Schemes	Funds released during 11th plan				
	2007-08	2008-09	2009-10	2010-11	2011-12
Development of Inland fisheries & Aquaculture	200.00	100.00	200.00	200.00	180.00
Development of Marine Fisheries, Infrastructure & Post Harvest Operations.	373.115	1095.22	1575.00	912.735	0.00
National Scheme of Welfare of Fishermen.	243.20	361.20	71.20	299.20	22.40
Strengthening of Database & Geographic Information System of Fisheries Sector.	6.29	9.30	92.32	314.55	110.00
National Fisheries Development Board (NFDB)	383.65	227.28	518.91	1033.34	147.71

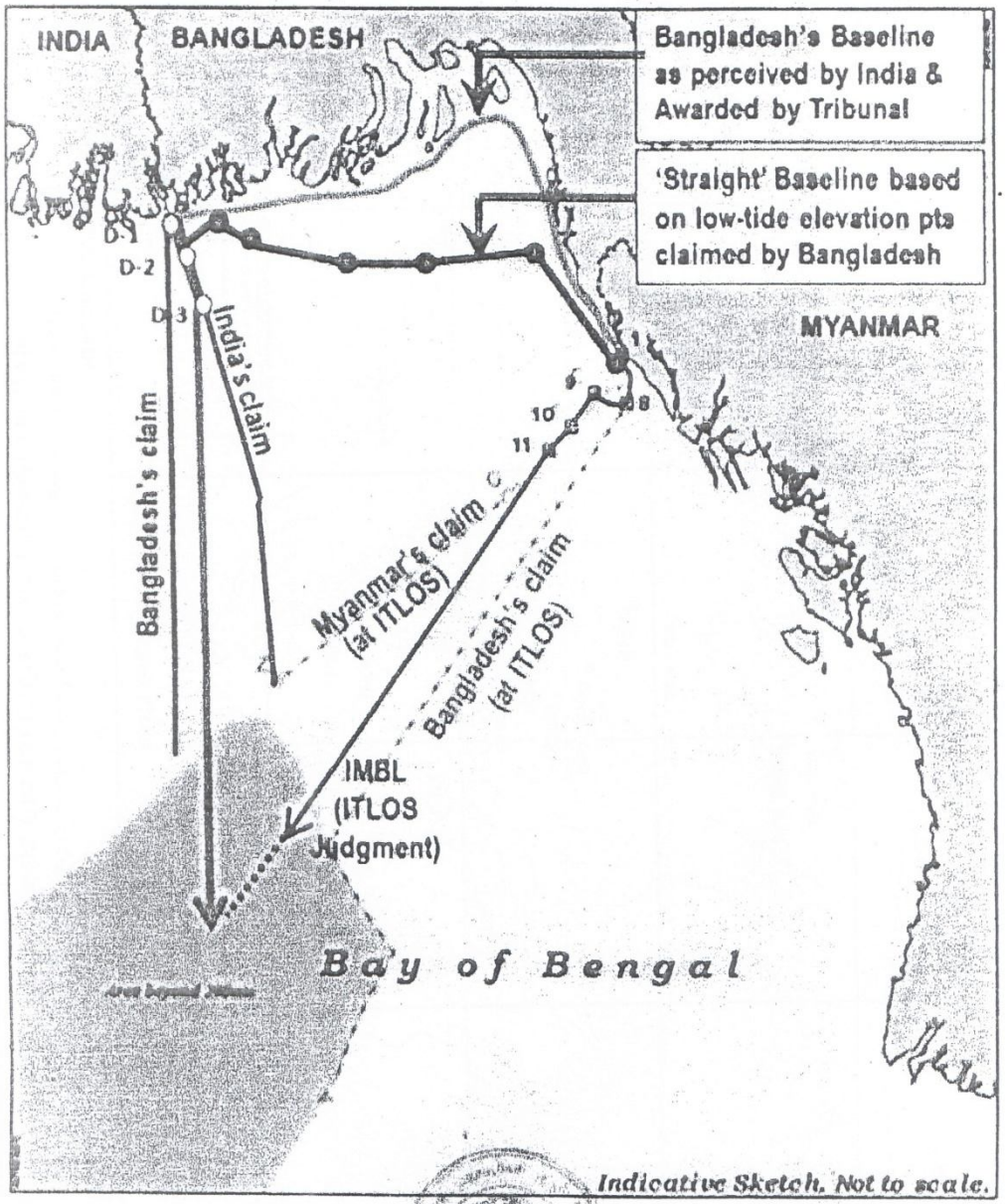
Source : www.westbengalstat.com

Table2.15: Performance of CSS & CS Schemes in West Bengal: during 12th Plan

(Rs. in lakh)

Name of Schemes	Funds released during 12th plan		
	2012-13	2013-14	2014-15
Development of Inland fisheries & Aquaculture	190.00	0.00	0.00
Development of Marine Fisheries, Infrastructure & Post Harvest Operations.	0.00	312.00	151.875
National Scheme of Welfare of Fishermen.	155.60	0.00	22.40
Strengthening of Database & Geographic nformation System of Fisheries Sector.	52.75	91.29	85.40
National Fisheries Development Board (NFDB)	243.25	380.00	760.81

Source : www.westbengalstat.com


INDIA
BANGLADESH
MYANMAR
Bangladesh's Baseline as perceived by India & Awarded by Tribunal
'Straight' Baseline based on low-tide elevation pts claimed by Bangladesh
D-2
D-3
India's claim
Bangladesh's claim
Myanmar's claim (at ITLOS)
Bangladesh's claim (at ITLOS)
IMBL (ITLOS Judgment)
Bay of Bengal
Indicative Sketch, Not to scale.

Please give your feedback to :
Director, Indian National Centre for Ocean Information Services (INCOIS), Ocean Valley, P. B. No.21, IDA Jeedimetla P.O., Hyderabad- 500 055; Phone:+91-40-23895013, Fax:+91-40-23895014, Email: ptz@incois.gov.in; web: www.incois.gov.in

Chapter – III

Review of Fisheries Policies

3.1 Fisheries Regulation and Policies

The control and regulation of fishing and fisheries are joint subjects of both the Central and State Governments. In case of marine fisheries the control and regulation within the territorial waters is the exclusive rights of the states, beyond the territorial jurisdiction of the state government, power vested on the central government who in terms of existing laws or by virtue of amendment of laws intervenes and monitor the fisheries activities. As per the Article 246 of Constitution of India, "the entry no.21 of State List renders the powers to the provisional states to handle the subject matter of fisheries while the entry No.57 of Union List gives the power to the Union government to handle fishing and fisheries beyond territorial water. Besides, the Territorial Water Continental Shelf, Exclusive Economic Zones and other Maritime Zone Acts 1976 (80 of 1976) of India provides the union government sovereign rights for the purpose of exploitation, exploration, conservation and management of natural resources both living and non-living as well as for producing energy from tides, winds and currents in exclusive economic zone beyond its territorial waters up to two hundred nautical miles which also includes fishing and fisheries." (GOI). The Ministry of Agriculture and Farmers' Welfare(Department of Animal Husbandry, Dairying and Fisheries-DAHD&F) is the nodal authority to propagate, implement and prescribe Fisheries policies and help the State governments to implement these policies within the sanctioned budget limits. Besides, the respective State Governments have their own regulation and policies subject to resource constraints and availability of funds.

Recently The Government of India has drafted National Policy on Marine Fishery, 2016 (NPMF). Still this comprehensive Policy is not accepted, some changes and modifications inscribed in it has already been endorsed by the competent authority and remains under consideration. This policy has laid down the perspectives of modern concepts in fisheries and it is expected whence accepted it

would be able to sort out the various nitty gritty of administrative mechanism and help in facilitating the work. In the appendices of the study, the details of the draft Policies have incorporated to show an insight of the policies as a ready reference.

The present draft considers the opinion of local fishing community before port development and special emphasis has given to maintain the ecological balance and niche during building or enhancing any infrastructural facilities. On the operational aspects, an alternative mechanism to the letter of Permit (LOP) in deep-sea fishing has also been suggested. 'Suggesting an alternative to the controversial LOP scheme, the draft stood for providing skill enhancement support to stakeholders, modernisation of existing indigenous deep sea going vessels and new indigenous vessels. The draft policy also mooted strong Monitoring, Control and Surveillance (MCS) regime. Utilization of deep sea resources in the Exclusive Economic Zone (EEZ- between 12 to 200 nautical mile) may have to be reconsidered in terms not only the resources available in the EEZ, but also in terms of infrastructure, human capacity development and a comprehensive and implementable set of rules and regulations with a strong MCS," (2016 Draft)

The LOP scheme that allowed joint ventures involving foreign fishing vessels, apparently introduced to enhance the capabilities of Indian fishers and to help them learn technology of foreign industrial fishing in deep-sea operations, had been widely criticised by experts and all fisheries organisations.

The draft policy urged the government to control and regulate proliferation of fishmeal plants, which is a matter of concern as it can lead to overfishing of low value fish and by catch.

Other suggestions of the draft NPMF 2016

➢ Strong regional cooperation among nations in management and sustainable utilisation of resources.

➢ Bring in legislations to regulate fisheries in the EEZ

➢ Strengthen MCS in a phased manner using conventional tools, space technology and IT tools

➢ Control and regulate fish meal plants

➢ Promote mariculture but watch out for social and environmental impacts

➢ Diversification of seafood products, quality enhancement, traceability of seafood and eco-labelling

3.1.1 Role of Central Government

The Ministry of Agriculture and Farmers' Welfare (Department of Animal Husbandry, Dairying and Fisheries-DAHD&F) used to take various measures and prescribe and implement different development plans suitable to fisheries sector. The guidelines and provisions of the Comprehensive Marine Fisheries Policy (2004) of the Central Government, which advocates protection, and conservation of the resources, encouragement of subsistence level fishermen and technology transfer to small-scale sector and infrastructure support to industrial sector, are still in vogue.

The marine fisheries sector is being dealt by a number of inter and intra disciplinary institutions and Ministry from coastal State/Union Territories (DoF), Central Government (DADF), Ministry of Defence and Scientific & Maritime Department.

The pluralistic governance in this important sector is set-up a strong for effective coordinate between the Ministry of Agriculture and Farmers Welfare and the Coastal states/UTs on one hand and the different Ministries/Departments of the Union and State Government on the other hand. Marine fisheries in India are dynamic with continuous changes in practices and resource harnessing. The Marine Fishing Regulation Acts (MFRAs) have come into existence from the 1980s, and barring a few States/UTs, the MFRAs were in place by mid-1990s. Keeping in view the fact that most of the MFRAs were adopted before the adoption of key international agreements/arrangements (1982 UNCLOS, 1992 UNFSA, 1995 CCRF, etc.), the existing rules and regulations for governing fisheries in the MFRAs felt necessary for updating and in consonance with these international instruments/arrangements. The

modifications are done in order to ensure that they cover all aspects of fisheries management.

A comprehensive Marine Fishing policy considering conservation, management and sustainable utilization of country's marine wealth was drafted and adopted in 2004. This policy gave enough emphasis on livelihood and food availability of fish- folk.

The salient features of present Central Sector Scheme (CSS 2015-16) are:

i. Implementation of Centrally Sponsored Scheme on Development of Inland Fisheries and Aquaculture in States/UTs during 2015-16.
ii. Continuation of Centrally Sponsored Scheme on Development of Marine Fisheries, Infrastructure and Post Harvest Operations as Central Sector Scheme.
iii. Implementation of Central Sector Scheme "National Scheme of Welfare of Fishermen" in States/UTs during 2015-16.

3.1.2 Role of the State Government

West Bengal is well endowed with both inland and marine water resources and from the early two chapters a steady growth in terms of production and productivity in both of these two sectors over the periods is clearly visible. Main attention of the West Bengal Government is to proper utilize of the resources and enhance fish production coupled with enhancing quality of likelihood to the masses engaged in this sector. In this direction, Government of West Bengal has adopted a number of policies. The policies adopted along with the genesis of the Department of Fisheries and the role of the State government are presented as follows:

'The Fisheries Department of the then Government of Bengal was first set up in the year 1911. Thereafter, on the recommendation of the Bengal Retrenchment Committee, the Department was abolished in the year 1923. The Department again revived in the year 1942. As it was felt necessary to cope up with the growing needs for increase in production of fish by way of exploiting all the available impounded water resources in the then undivided Bengal primarily for two reasons: - (1) Love of

fish in the diet for every Bengali family and (2) increase in population. After revival of the Department in the year 1942, it has been functioning continuously since then. The scope of activities of the Department had been expanding gradually. Since the beginning of the first five year plan, increasing number of schemes are being taken up for development of Pisciculture in West Bengal with the end of not only attaining self-sufficiency in regard to production of fish in the State but also exploring possibilities for requirement of fish and fish products across the country and abroad. Because of involvement of the Department in multi-directional fishery related activities, it has been renamed as the Department of Fisheries, Aquaculture and Aquatic Resources & Fishing Harbours (hereinafter referred to as the Department) in May 2001.

The Department has under its administrative control one Directorate i.e. Directorate of Fisheries, West Bengal. The officers posted in the headquarters and districts responsible for not only implementing various programmes and policies of the Department with the object of increasing production of fish of various species by way of exploring different methods of culture in keeping parity with the modern scientific and technological developments in the world . The Department has also under its control two Corporations viz. State Fisheries Development Corporation (SFDC) and West Bengal Fisheries Corporation (WBFC) and one apex body of fishermen's co-operative viz. West Bengal State Fishermen's Co-operative Federation Ltd. (BENFISH). Besides, there are two agencies namely, Fish Farmers' Development Agency (FFDA) and Brackish water Fish Farmers' Development Agency (BFDA) under the control of the Department. All the above named Corporations, apex body and agencies are engaged in executing multi-dimensional activities of the Department related to the comprehensive development of fisheries and to uplift the socio-economic condition of the fishermen community still belonging to the down-trodden section of the society.' (Directorate of Fisheries, GOWB).

In order to exploit and explore Inland and Marine Fisheries resources the Government of West Bengal has enacted 'The West Bengal Inland Fisheries Act (WBIFA) & West Bengal Marine Fishing Regulation Act (WBMFRA) ' and to give the customary rights to the fishing communities. Comprehensive legislation

encompassing integrated coastal management, fisheries conservation, fisheries management and recognizing rights of fishermen got special emphasis.

3.2 Fishing Policies in West Bengal

The State of West Bengal has 8.65 lakh hectare water area is available for fish production. It includes 6.55 lakh hectare of fresh water, 2.10-lakh hectare of brackish water and 158 km of coastline. State's water resources are plenty and can produce 31.097 lakh ton per year provided pisciculture activities are extended in newer waters and potential big water bodies are fully harnessed through professional management and scientific culture. In order to boost fish production and to identify the hindrance factors. Boosting fish production, identifying the detrimental factors and to ease out the problems have necessitated the formulation of the Fisheries Policy to the State Government. Salient features of Fisheries policies as framed and prescribed by the Government of West Bengal given below:

Salient features of Fisheries Policy, 2015

1 Inland Fisheries

1.1 Realistic Resource Assessment

A detailed resource survey using Remote Sensing and Geographic Information System (GIS) will be undertaken for reliable assessment of inland fisheries resources in the context of land use and land cover change that have taken place during the past decade, for promoting capture and culture fisheries in the inland water bodies.

1.2 Capture Fisheries

With a view to ensuring the fishers earn sustainable livelihood, it will be the endeavor of the State to promote co-management of the resources by effective involvement of the local community in a cohesive manner.

1.3 Culture-cum-Capture fisheries in lakes/reservoirs/beels-baors:

Beel Fisheries / Reservoir fisheries and all kinds of Govt water bodies management and development will be in line with the provisions contained in the West Bengal L & L R M annual and guide lines issued by the Directorate of Fisheries from time to time.

1.4 Culture Fisheries in tanks and ponds

Aquaculture shall be developed in a sustainable manner to generate food and employment (job), and income and livelihoods of a cross section of the rural and urban populations.

1.5 Hatchery Accreditation, Fish Seed Production and Certification

Government shall facilitate development of seed banks in private sector / public - private partnership mode for ensuring round the year availability of quality seed at local level. Emphasis will be made so that quality and certified seed larger size fingerling only to be stocked.

2 Sustainable Brackish Water Aquaculture (coastal aquaculture)

By suitably restructuring the land lease policies, the government owned brackish water areas suitable for coastal aquaculture will be allotted to fisheries cooperatives, self help groups, unemployed youth and private entrepreneurs, for a minimum period of 7 years, for promoting Sustainable Aquaculture systems mentioned in the guidelines of Coastal Aquaculture Authority, issued from time to time.

Hilsa Fisheries

Hilsa being the most desired fish species (State fish) and considering its sharp decline of catch for the last some years, special efforts will be taken for its conservation and propagation through Hilsa Conservation and Research Center (HCRC).

4. Marine Fisheries

The guidelines and provisions of the Comprehensive Marine Fisheries Policy (2004) of the Central Government which advocates protection and conservation of the resources, encouragement of subsistence level fishermen and technology transfer to small-scale sector and infrastructure support to industrial sector, will be adopted.

4.1 Co-management and Community Involvement in Fisheries Management

Co-management is considered the most suitable approach to manage fisheries given that the fishing community has its own management traditions and institutions. It should be seen as a process, whereby through actual practice, a multi-tiered system has to be evolved given the length of the coastline and the different administrative jurisdictions involved. Existing traditional and self-organised structures at grass roots level need to be used as "building blocks" for this approach.

The current 'open access' arrangements which predominate in the fisheries shall be changed to a 'limited access' framework. One of the implications will be that new boats cannot be added to the fleet at will, by anyone, without proper scrutiny. In the end, any limited entry scheme will have to transit over time into a formalised system of fishing rights to West Bengal fishers in order to be effective and sustainable.

4.2 Reducing and Controlling Fishing Capacity

The first set of capacity controls need to start with the trawl fleet (bottom trawling) as it is the most over capitalized part of the sector and having a seriously negative impact on fishing habitat, fish resources, and other fishermen. 3 The safety of fishermen venturing out in deep sea will be a priority for the Government. The Transport Department will be partner with the Fisheries Department in putting in a system for regular checks of the engine and other safety paraphernalia.

4.3 Deep Sea Fishing

Deep sea fishing will be promoted in stages after establishing appropriate technology and scale of operation, ensuring that it is profitable for the operators and the resource available.

4.4 Mariculture as an alternative to Fishing

Introduction of Mariculture shall be backed by an implementable policy and legal framework, reliable R&D efforts from National Fisheries Research Institutes

(like CMFRI-ICAR) in the areas of controlled production of seed, feed and economy of culture operation and marketability of the products.

5. Post-harvest infrastructure support & marketing

a. Fish quality and related infrastructure

Development of appropriate fish handling, processing, preservation, transportation, distribution and marketing systems will be encouraged in both the inland and marine capture fisheries and aquaculture.

Large capacity ice plants, chilled rooms and stand-alone cold storages will be established at strategic locations with irradiation facility as a common facility, with uninterrupted power supply.

Measures as appropriate for ensuring the quality, wholesomeness, safety for human consumption and value of harvested fish and fishery products will be promoted and introduced in a phased manner, based on Hazard Analysis of Critical Control Points (HACCP) and Total Quality Management (TQM).

6. Fishery Harbours and Fish Landing Centres

Efforts are made for equipping all the fishery harbours and fish landing centres in all marine hubs along the West Bengal coast and made fully operational by providing all the basic infrastructure facilities such as roads, communications, electricity, cold storage facilities, ice plants and through maintenance by dredging for keeping the entrance to harbours/landing centres free from siltation, which hinders the free passage of fishing crafts.

a. Fish marketing and trade

Measures are taken to achieve sustainable increase in the value and volume of fish marketed for domestic consumption and export. Proper marketing facilities will be made available for whole sale/retail fish market including creation of modern fish market complex and modernisation of existing fish markets in industrial belt/cities and towns in association with the municipal/local organisations.

b. Safety of fishermen at Sea and welfare of fishermen

The fisher community will be provided with the requisite navigational and communication instruments, early warning about the cyclone, tsunami, storm surge, floods, etc., through easily accessible means for ensuring safety of the fishing community both at sea and on land.

7. Livelihoods

It is important to build upon the social strengths and social capital of the fishing community and to set an approach for enhanced fisheries livelihoods within the context of 'sustainable fisheries', focusing on achieving a balance between economic growth, security of fish resources and equitable development.

8. **Environment and fisheries**

The Government will ensure:

- that Environmental Impact Assessment (EIA) is carried out and taken into consideration in all large-scale/commercial fisheries sector projects.
- control/ban destructive fishing and processing methods.
- monitor and review environmental protection measures applied in the fisheries sector.
- promote protection of the fragile eco-systems, eco-system processes and conservation of biodiversity

9. Encouragement for growing small indigenous fish species (Supplementary nutrition)

Seasonal or small size ponds including backyard ponds and rice fields are suitable for culture of minnows (small indigenous fish species) such as mourala (Amblypharyngodon sp.), Puntius sp. Gobids, colisha, nados, koi etc., which have shorter life cycles, provide supplementary nutrition to the rural poor. Efforts will be taken for conservation and propagation of these fish species in situ.

10. Entrepreneurship development & Self Employment

Government will play a catalyst role in self-employment through developing private entrepreneurship in fisheries, in the areas of fish farming, integration of fish

culture with livestock rearing and paddy cultivation, fish seed production, ornamental fish trade, fish processing, production of value added 5 fishery products, fish marketing (wholesale/retail), fish trading/vending, transport operations, net mending /repairs, setting up small-scale industrial units for production of fishing equipment / ornamental fishery ancillary equipment, trading of aquaculture instruments, outboard and inboard motor repairing workshops, etc.

11. PPP & Joint Venture in fisheries

Public-private investment partnerships (PPP) and Joint Venture that equitably benefit both fishing communities, including the poorest and most vulnerable members of those communities, as well as the private investor, will be promoted.

An enabling environment that promotes the establishment and growth of community based private enterprises in the fisheries sector will be created. Joint partnerships between the entrepreneurs and the small-scale fishers of West Bengal in various fisheries/fishery related activities will be encouraged for harnessing judiciously the inland, brackish water and marine resources.

12. Special assistance for SC/ST peoples in fisheries

Proper forward and backward linkages at various levels between the Fisheries functionaries and the SC/ST community (fisher / fishermen by caste) are the need of the hour, if the downtrodden are really to be helped in improving their socio-economic condition and livelihood.

The requisite assistance at micro-level starting from identification of the progressive SHGs among the SC/ST community, registering them under the FFDAs/BFDAs, providing them training, allotting water areas for farming, arranging financial support for pond development and inputs to technical and extension support for fish farming and marketing, will be promoted. Skills of (fisher / fishermen by caste-jele/malo/kaiborto etc) in catching fish will be turned to their advantage by filling gaps in terms of providing fishing gears and marketing avenues.

13. Fiscal Incentives

Declaration of aquaculture as an agriculture activity for enabling easy flow of credit / institutional finance, lower power tariffs, tax, excise / customs duty concessions /waiver /exemptions and water supply and issue of Kisan Credit Cards (Matsyajibi Credit Card), will be considered in consultation with the authorities concerned.

14. Research and Technology services

Research and technology based fisheries will be promoted through effective and demand- led cost effective research, to be carried out by GOI, ICAR Fisheries Research Institutes, Fisheries Science Faculty / University etc. in close co-ordination with the State Fisheries Department that responds to the needs of the fisher folk, fish farmers, private investors and communities that are in front line of sustainable fisheries management and development.

15. Advisory support services

Fisheries extension service delivery system will be adopted through the existing district and village level fisheries organisations / NGOs / Farmers Clubs by suitably strengthening them besides establishing Village Knowledge Centres at the village/panchayat level, linking them with the respective One Stop Aqua Shop (OASIS), to provide information and advice, and facilitate extension service for all the fisher communities and fish farmers.

16. Institutional Arrangements

Productive linkages will be established with all macro-level institutions relevant to the management and development of the fisheries sector and to the socio-economic development of the people who depend on the sector.

17. Programmes and Schemes.

The government of West Bengal has taken the following programmes and schemes for its effective implementation and all these programmes are routed through State Fisheries Development Corporation(SFDC), West Bengal Fisheries Corporation (WBFC), West Bengal State Fishermen's Co-operative Federation Ltd.

(BENFISH) ,Fish Farmers' Development Agency (FFDA), Brackish water Fish Farmers' Development Agency (BFDA)and Rashtriya Krishi Vikash Yojana (RKVY). The Fisheries Department is one of the stakeholders under RKVY. The National Mission for Protein Suppliments (NMPS) is also a sub scheme of RKVY. (Detailed programme of RKVY and NMPS is given in the annexure).

3.5 Programs and Schemes

1. West Bengal Integrated Marine Fisheries Development Project.

This Project has been launched in 1989-90 with an idea to uplift the socio-economic condition of poor fishermen belonging to SC/ST Community engaged in marine fishing activities. During the project period (Phase I to IV), 950 nos. mechanized fishing boats assisted by the National Cooperative Federation (NCDC) and the Fisheries Department of Govt. of West Bengal have been distributed through Primary Marine Fishermen's Coop. Societies Ltd. covering both Contai, Purba Medinipur and Diamond Harbour, South 24 Parganas district. This Project has created employment 15000 nos. fishermen.

2. Beel Fisheries Development Project.

Big Inland water bodies are Beel and Boar which are mostly vested. By policy, these water bodies are leased out the fishermen's Coop. Societies. But most of the vested big water areas are in derelict/semi derelict condition due to soil erosion of marginal lands, weed infestation followed by resultant decomposition on wanton neglect over the years. The Fishermen's Cooperative Societies who are functioning in a chief managerial capacity do not have affordable fund to take up necessary development works such as deseeding, desilting, re-excavation etc. of the said derelict/semi-derelict water bodies. Consequent upon such a situation there has been gradual shrinkage of effective water bodies ultimately hampering fisheries activities and fish production. To find a solace to these gloomy pictures, a new proposal i.e. "Beel Fisheries Development Project" was initiated with the National Cooperative Development Corporation (N.C.D.C), New Delhi under this project.

3. Bundh/Reservoir Fisheries Development Project in The District of Bankura and Purulia.

A good number of Bundhs and Reservoirs have been lying fallow due to paucity of fund. Benfish executed this Project with the financial assistance of N.C.D.C., New Delhi and the Fisheries Department, Govt. of West Bengal, with an idea to enhance production of fish from those water bodies as well as to create employment to the poor fishermen through the Fishermen's Cooperative Societies.

4. Project on Establishment of Common Facilities Centre and Modern Fish/Shrimp Processing Infrastructure Products at Chakgaria in The District of South 24 Pgs.

Benfish set up a Common Facilities Centre of internationally accepted standard with the financial assistance of Fisheries Deptt. Govt. of W.B. and Ministry of Food Processing Industries, Govt. of India and NCDC, New Delhi. The Project started its function with 10 processing units along with all modern facilities which include a central administrative building, quality control laboratory, cold storage, ice plant, drainage etc. This is one of the new projects on fish processing under Cooperative Sector in the country, which will find opportunities of employment of skilled and unskilled group of 6000 nos. people with a cost of Rs.20.00 crores. Export of processed prawn has earned Rs.125.00 crores. This project gained popularity in respect of export of prawn and employment opportunities During 2007-08, 2584 MT prawn valued Rs.125.00 crores had been exported. The establishment at this I.S.F.P.C. is a unique venture and first of this kind all over Asia in the Cooperative Sector.

5. Project for Ornamental Fish Culture Through Fisherwomen Cooperative Socieities.

West Bengal State Fishermen's Cooperative Federation Ltd. (BENFISH) took up a project on Ornamental Fish Culture through Fisherwomen Coop. Societies Ltd. (Phase-I) in the district of Howrah & South 24 Parganas duly sanctioned by the Fisheries Department. Government of West Bengal and the NCDC, New Delhi.

The performance of the Societies is encouraging. It has been decided to cover all the districts of the state in the next Phase (Phase-II) of the Project. It is the first

time in India as well as in West Bengal that one Primary Co-operative Society viz. Tropical Aquaculture Co-operative Society Ltd. exported ornamental fish.

6. Project on Mud Crab Culture in Sundarban Areas of North 24 Parganas.

This project has been taken up by the West Bengal State Fishermen's Cooperative Federation Ltd. (BENFISH) in order to culture crab and fattening of crab through forming Cooperative Societies. Implementation of the project (Phase-I) has been completed. This project earned foreign exchange by export of crab as the same has good market abroad. 6 numbers of Primary Kankra Mach Chas Samabaya Samitis have been included in the Project. Sanction of the 2nd Phase of the Project has been received for Rs.321.18 lakhs from NCDC, New Delhi

7. Project on Development of Marine Fish Production and Processing in The Purba Medinipur District.

This project has been implemented by Benfish with the financial assistance of NCDC, New Delhi and the Department of Fisheries, Govt. of W.B. in order to eliminate exploitation of the sea based fishermen by the middlemen as the fishermen of the coastal belt of the district are fully dependent on sea fishing. Due to weak financial position of the fishermen. 8 numbers of Khuti Marine Fishermen's Cooperative Societies have been included in the project (Phase-I) who have been provided Doba/Vasa Behundi nets, the mechanized and non-mechanized boats (2 cylinder), temporary sheds, Central godown as per requirement of the societies. The Project cost is Rs.962.03 lakhs. In Phase I of the Project, 10 nos. Marine Fishermen's Cooperative Societies Ltd. covering 1339 nos., fishermen have been benefited directly.

This project responded well in the area as the members of the societies have been benefited. Implementation of the project (Phase-II) in both Contai and Diamond Harbour Sector has been completed. N.C.D.C. sanctioned Rs.915.00 lakhs for the project for Contai and Rs.1019.33 lakhs for Diamond Harbour Sector.

8. Project for Pre-Processing Complex and Food Park at Sultanpur, South 24 Parganas

This Project is situated on the western bank of the river Hooghly near Diamond Harbour in the district of South 24 Parganas, an important tourist spot with a view to providing a proper and hygienic infrastructure for handling and distribution of fish landed at Sultanpur Harbour. The annual landing of fish is bout 8000 MT. The project cost is Rs.801.13 lakhs only. The project comprises of the following components like 31 nos. weighing and packaging units, 40 nos. Auction Halls, 50 M.T. Ice Plant, Condenser tank, electrical substation and D.G. room, water distribution net work, toilet block, internal road etc. The project has been completed by Benfish. Distribution of weighing and packaging units has been started.

9. Project for Pre-Processing Complex and Food Park at Kakdwip, South 24 Parganas

This project is located on the eastern bank of the river hooghly at kakdwip in the district of south 24 parganas. It has been set up with an idea of providing proper and hygienic infrastructure of handling and distribution of landed fish brought at newly constructed kakdwip harbour with the facilities like 40 nos. weighing and packaging units, 30 nos. auction halls, 1 no. Community hall/shop, administrative building, ice plant (50 m.t.), electrical substation, toilet block, surface drain, water facilities etc.

The project cost is Rs.924.66 lakhs. This project will create employment opportunities of 8000 nos. skilled and unskilled workers. Benfish completed the project successfully. Allotment of packaging and weighing units has been done. In Phase-(II) of this project, NABARD have sanctioned of Rs.7.0 crores for setting up packaging units, auction hall, ice plant and boundary wall etc.

10. Fishermen's Group Personal Accident Insurance Scheme for The Active Fishermen

Benfish is implementing this Scheme. Active fishermen of 160000 nos. have been covered under the scheme. Since inception from 1986 to December 2008, an amount of Rs.270.25 lakhs only have been disbursed to 827 nos. fishermen families.

11. Centrally Sponsored Savings-Cum-Relief Scheme for The Marine Fishermen.

The fishermen who are engaged in marine fishing activities become idle from Feb to June every year. During this period, they have got no avenue of income. This scheme will provide Rs.1200/- only which include their savings of Rs.600/- only. During 2007-08, an amount of Rs.60.00 lakhs only have been disbursed to 10,000 nos. of marine fishermen.

12. Fish Processing Unit at Salt Lake

Benfish has set up a modern Fish Processing Centre at Salt Lake for processing of raw fish and preparation of various fish fried products. This project has created employment to 200 unemployed youth. This unit has obtained certificate of ISO 9001 and HACCP that responded well among consumers.

13. Benfish In Tourism

Benfish now has recorded its name in the Tourism Nap of West Bengal. Benfish constructed Tourist Lodges in different places of the State like Digha, Sankarpur, Coochbehar, Diamond Harbour, Frasergunj, Jalpaiguri, Darjeeling, Haldia, Puri and Berhampur for providing residential facilities and fooding to the tourist. (Department of Fisheries, GOWB)

The following schemes are undertaken by West Bengal Fisheries Corporation:

The Corporation has been assigned with the duties of creating infrastructural facilities for both inland and marine sectors. The major infrastructures undertaken by the Corporation are shown below :

1. ***World Bank aided shrimp and Fish Culture Project:*** The WBFC successfully implemented the project by constructing 4 project sites at Canning, Dighirpar, Digha and Dadanpatrabar. The farms consisted 600 no. of tanks with Electro-mechanical components, hatcheries, IQF Plant etc.

2. ***Minor Fishing Harbours*** : Altogether construction of five minor fishing harbours viz. Frasergunj minor fishing harbour, Kakdwip minor fishing harbour, Sultanpur minor fishing harbour, Shankarpur minor fishing harbour Stage-1 and Stage-II has been completed. Minor fishing harbours at Petuaghat in the district of Purba

Medinipur and Mayagoalinirghat in the district of South 24-Parganas are under construction. A brief description of minor fishing harbours already constructed and under construction is given below

(i) *Minor Fishing Harbour* at Fraserganj : The harbour is located on the Edward's Creek at Fraserganj which is at a distance of about 130 Km from Kolkata and is connected by motorable road. There is a barge jetty of this Deptt. at Namakhana for crossing the Hatania-Doania river. The work for construction of the fishing harbour was taken up in the year 1990 with provisions for berthing of 225 fishing boats and trawlers, dry dock, ice-plant, diesel outlet, supply of fresh water, auction market and easy quick transport communication facilities for the benefit of sea-going fishermen and fish vendors. The project was completed in the year 1995 at a total cost of Rs.7.15 crore. It has generated employment opportunities for 8000 persons in the locality. The harbour is run and maintained by Benfish.

(ii) *Minor Fishing Harbour*at Kakdwip : The harbour is located on the Nagini canal at Harwood Point which is at a distance of about 98 Km from Kolkata and is connected by motor able road. The work for construction of the fishing harbour was taken up in January 2004 with provisions for berthing of 100 fishing boats and trawlers, dry dock, ice plant, diesel outlet, supply of fresh water, auction market and easy quick transport communication facilities for the benefit of sea-going fishermen and fish vendors. The project was completed in March 2007 at a total cost of Rs 24.69 crore. Even though the work for construction of the harbour has been completed, it could not be made operative; because of the fact that the Indian Oil Corporation has not yet set diesel outlet and WBSEB is yet to make provision for installation of transformer needed for setting up of the ice plant. It is expected to generate employment opportunities for 15000 people in the locality. The harbour along with other installations will be handed over to the Benfish for maintenance. Within the harbour complex is located the Marine Food Par constructed by Benfish. The food park will start functioning immediately after the harbour is made operational.

(iii) *Minor Fishing Harbour* at Sultanpur: The harbour is located on the Hooghly rive at Sultanpur at a distance of only 3 Km from Diamond Harbour and is connected by motor able road. The work for construction of the fishing harbour was taken up in the year 2007 with provisions for berthing of 228 fishing boats and trawlers, dry dock, ice plant, diesel outlet, supply of fresh water, auction market and easy quick transport communication facilities for the benefit of sea-going fishermen and fish vendors. The project was completed in the year 2002 at a total cost of Rs.6.75 crore. Here also within the harbour complex the Benfish has constructed a Food Park which is functioning properly. It has generated employment opportunities for 3000 persons in the locality. The harbour is run and maintained by Benfish.

(iv) *Minor Fishing Harbour* at Shankarpur Stage - I: The harbour is located on the Shankarpur canal at Shankarpur, which is at a distance of about 198 Km from Kolkata and is connected by motorable road. The work for construction of the fishing harbour was taken up in the year 1983 with provisions for berthing of 150 fishing boats and trawlers, dry dock, ice plant, diesel outlet, supply of fresh water, auction market and easy quick transport communication facilities for the benefit of the sea-going fishermen and fish vendors. The project was completed in the year 1987 at a total cost of Rs.3.00 crore. It has generated employment opportunities for 5000 persons in the locality.

(v) *Minor Fishing Harbour* at Shankarpur Stage - II: This harbour was constructed also at Shankarpur in view of increasing load on the existing harbour (Stage - I). The work for construction of the fishing harbour was taken up in the year 1996 with similar facilities as in Stage - I. The project was completed in the year 2000 at a total cost of Rs.8.00 crore. It has capacity for berthing of 230 fishing boats. It has capacity for berthing of 230 fishing boats. It has generated employment opportunities for 7000 persons in the locality.

(vi) *Minor Fishing Harbours* at Petuaghat: It is located at Petuaghat on the Rasulpur river at a distance of about 25 Km from Contai town. The work for construction of the fishing harbour was taken up in January 2006 with provisions for

berthing of 255 fishing boats and trawlers, dry dock, ice plant, diesel outlet, supply of fresh water, auction market and easy quick transport communication facilities for the benefit of sea-going fishermen and fish vendors. The project is expected to be completed at the end of 2007 subject to availability of fund. Total project cost is Rs. 32.00 crore. The Govt of India have sine decided to convert it into a deep-sea fishing harbour for which modalities are being worked out. On completion of the entire project it is expected to generate employment opportunities for a huge number of persons apart from bringing in a sea-change in the socio-economic condition of the locality.

(vii) ***Minor Fishing Harbours*** **at Mayagoalinirghat**: The work for construction of the fishing harbour was taken up in January 2007 with provisions for berthing of 25 fishing boats and trawlers, dry dock, diesel outlet, supply of fresh water, auction market and easy and quick transport communication facilities for the sea-going fishermen and fish vendors. The project is expected to be completed within March 2008. Estimated project cost is 3.46 crore which has since been revised at 4.02 crore. On completion of the project it is expected to generate employment opportunities for a good number of persons in the locality.

3. Fish Landing & Berthing Jetty at Namkhana : The Corporation constructed fish landing-cum-berthing jetty at Namkhana on the river Hatania-Doania at a cost of Rs. 249.00 lakh which had been received from the Prime Minister's Special Relief Fund. In order to facilitate the transportation of vehicles across the river the Corporation built one LCT (Barge) at a cost of Rs.62.28 lakh.

4. RCC Bridge at Nandichawk at Paharpur in the Purba Medinipur district : The Corporation constructed one RCC bridge over the river Ballyghai at Paharpur in the Purba Medinipur district at an estimated cost of Rs. 29.00 lakh.

5 .Inland Fish Marketing Infrastructure: A 20 MT capacity ice plant with 10 MT cold storage facility was constructed at Frasergunj under Centrally Sponsored Scheme at an estimated cost of Rs. 102.00 lakh. Two ice plants each of which with 10 MT capacity

have also been constructed at Shankarpur.

6. Fishery Faculty Centre at Chakgaria, 24-Parganas (South): The project for construction has been accomplished at an estimated cost of Rs.992.93 lakh. Fishery Science Faculty under the West Bengal University of Animal and Fishery Sciences has already been shifted from Mohanpur in Kalyani to the new campus at Chakgaria.

7. Construction of Food Park at Shankarpur Fishing Harbour: The construction of a Marine Food Park at Shankarpur was taken up in the latter part of the year 2004 at an estimated cost of Rs.715.68 lakh. The work has been completed.

(i) Execution of work of other Govt. Departments : The Department of Sundarban Affairs, Govt, of West Bengal selected the WBFC Ltd. as the Executing Agency for construction of bridge across Bogeswar Khal at Hakuran Abad in 24-Parganas (North). The work has been taken up departmentally and 20% of the sanctioned amount has been received as advance.

(ii) Upgradation of Navigability of Shankarpur Fishing Harbour, Purba Medinipur : The scheme for construction of a spar for a length of about 1.00 KM on the sea beach near Digha at an estimated cost of about Rs. 1.50 crore was prepared under the guidance of an expert body chosen on the recommendation of the Govt, of India was taken up primarily with the objective of up gradation of navigability of Shankarpur Fishing Harbour and studying the effect of arresting erosion of about 11 KM stretch of sea beach from Shankarpur to Jaldha in Orissa. The work has been completed and navigability to the Shankarpur Fishing Harbour has already been ensured. There is also sign for arresting erosion of sea beach.

(iii) Construction of Marine Food Park at Shankarpur Fishing Harbour: The facility of an auction market along with other infrastructure facilities was considered essential for the export promotion as well as economic uplift of the inhabitants of the locality. The project envisages establishment of the following infrastructural facilities:

(a)Area Development;
(b)Boundary Wall;
(c)Parking Area;

(d)Pre-processing sheds for auctioneers and bulk purchasers;
(e)Internal roads;
(f)Potable water supply
(g)Drainage network;
(h)Shops for essential commodities and daily requirements; and
(i)Reserved space for future use.

(iv) Tourism: The Corporation on its own initiative constructed tourist complex known as '**Matsyagandhya**' and '**Joar**' at Shankarpur. The tourists are favouring this place because of its natural beauty and quite environment.

3.4 West Bengal Fisheries Central Co-operative Association

In order to optimum use of inland and Marine water resources the State has encouraged in forming three tier Cooperative Societies. These are i) Apex Society (BENFISH) at State level, ii) Central Fisheries Cooperative Societies (CFCS) at District level and iii) Primary Fish Cooperative Societies (PFCS) at local level. There are only one each CFCS is prevailing in the district of South 24 Paraganas and East Medinipur. According to functioning and volume of transaction and magnitude of fishing PFCS are classified into three categories. Number of PFCS is higher in Purba Medinipur than South 24 Paraganas though in terms of members this District has little edge over its counterpart.

Table1: Fisherman Co-operative Societies in West Bengal as on 31.03.2015

Sl. No.	District	CFCS	Primary Fisherman Co-opt. Society			Total	Total No. of Members
			A	B	C		
1.	South 24 Parganas	1	16	0	0	16	5457
2.	Purba Mednipur	1	7	0	58	65	4135
	Total	**2**	**23**	**0**	**58**	**81**	**9592**

Source: Hand Book of Fisheries Statistics 2014-15

Table2: Fishermen Co-operative Societies (Inland & Ornamental) in West Bengal as on 31.03.2015

Sl. No.	District	CFCS	Primary Fishermen Co-opt. Society Category			Total	Effective water area (in ha)	Total No. of Members
			A	B	C			
1.	Darjeeling	0	1	0	2	3	3	400
2.	Jalpaiguri	1	0	15	0	15	431	4000
3.	Cooch Bihar	1	37	12	15	64	3414	14073
4.	Uttar Dinajpur	1	0	0	22	22	134	5000
5.	Dakshin Dinajpur	1	12	0	0	12	156	5796
6.	Malda	1	75	13	5	93	3188	14671
7.	Murshidabad	1	24	13	76	113	21425	19312
8.	Nadia	1	39	31	27	97	7760	13056
9.	Birbhum	1	11	3	14	38	619	814
10.	Burdwan	1	22	8	28	58	222	4611
11.	North 24 Parganas	1	44	14	14	72	1727	8526
12.	South 24 Parganas	1	36	28	38	102	966	3512
13.	Hooghly	1	15	7	14	36	202	2115
14.	Howrah	1	13	0	0	13	121	728
15.	Purulia	1	0	0	49	49	6527	5919
16.	Bankura	2	4	6	11	21	43	2630
17.	Purba Medinipur	1	32	26	11	69	2070	2477
18.	Paschim Medinipur	1	19	6	4	29	93	4997
	Total	**18**	**384**	**182**	**340**	**906**	**49101**	**112647**

Source: Hand Book of Fisheries Statistics 2014-15

Chapter – IV

Present Status and Problems of Post- Harvest Infrastructure in West Bengal

4.1 Introduction

An optimum use of post-harvest infrastructure in marine fisheries acts an important role in reducing the potential losses. In relation to marine resources and their utilization and also for efficient management of the resources exploited from the EEZ, development of infrastructure facilities for landing of fish, berthing, outfitting and repairing facilities for fishing vessels play a crucial role . The on shore facilities for handling, processing, storage, marketing and transportation of fish and fish products and other ancillary facilities on the other are very essential. In the present chapter, an attempt has been made to examine the present status and problems of post-harvest infrastructure facilities in West Bengal.

4.2 Fishing Harbours in West Bengal

From the following Table it is found that there are only five fish harbours in West Bengal, two in Purba Medinipur district namely Shankarpur and Petuaghat, three in South 24 Pargonas namely Fresherganj, Kakdwip and Sultanpur,Diamond Harbour . In order to have an insight about functioning and to assess their role in augmenting marine fisheries in the state of West Bengal We have studied three harbours viz. Shankarpur, Petuaghat and Fraserganj.

Table -4.1 Major Fish Harbours and their capacity in West Bengal

Sr No.	District	No. of harbours	Name of Harbours	Fish Production capacity	No of Fish Landing centres	No. of Fishing Crafts
1.	Purba Medinipur	2	1.Shankarpur 2.Petuaghat	22000 MT	38	1.Boats(M)-2190 2.Boat(NM)-294
2.	South 24 Pargonas	3	1.Fresherganj 2.Sultanpur 3.Kakdwip	15000 MT	21	1.Boats(M)-5310 2.Boat(NM)-4621

Source : Hand Book of Fisheries Statistics -2014-15 ,Directorate of Fisheries, Govt. of West Bengal

There are 59 fish landing centres in these two districts out of which 38 numbers in Purba Medinipur and 21 numbers in South 24 Pargonas. In Purba Medinipur The number of licensed mechanized boats in Purba Medinipur(East Midnapore) is 2190 and the number of non- mechanized boats is 294 whereas in case of South 24 Parganas the number of licensed mechanized boats is 5310 and non- mechanized boats is 4621. Total number of Fishing Crafts is 15049 out of which the number of mechanized vessels is 2633. Number of mechanized boats and non-mechanized boats in West Bengal is 7500 and 4916 respectively.

4.3 Harbour-wise Fishing Infrastructure in West Bengal

As far as harbour wise fishing infrastructure in West Bengal is concerned, we see that fishing infrastructure available in all the five fish harbours is not same. In some harbours, it is moderate, in some harbours it varies from moderate to poor. The Post harvest Infrastructure Facilities in Selected Harbours is presented in Table-4.2.

Table -4.2: Post –harvest Infrastructure Facilities in Selected Harbours

Sl. No.	**Particulars**	**Shankarpur**	**Petuaghat**	**Fresherganj**
1	Fish landing Platform	1	3	1
2	Fish Auction Hall	2	1	1
3	Marine Service Station	0	0	1
4	Security Booth	1	2	4
5	Fish Storage	0	1	12
6	Cold Storage/ Chill Plants	0	1	1
7	Processing Centre, Freezing, Chilling	3	0	12
8	Wholesale Market(Wholesaler)	49	0	50
9	Retail Market (Retailer)	15	5	225
10	Fish meal Plant	2	0	1
11	Net making Plant	1	0	2
12	Ice Plant	73	1	35
13	Ice Crusher Plant	1800	2	30

Source: Field Survey Data

4.3.1 Shankarpur

Digha Sankarpur,one of the five fishing harbors in West Bengal, is situated in Purba Medinipur district. The harbour is located on the Shankarpur canal at Shankarpur almost 220 kms away from Kolkata and is connected by pucca road. Electricity and other facilities are available also. The work for construction of the fishing harbour was taken up in the year 1983 with provisions for berthing of 150 fishing boats and trawlers, dry dock. At present there are one fish landing platforms, two fish auction halls, one security booth, three processing centre, forty nine wholesale market(Wholesaler), fifteen retail market (Retailer), two fish meal plants, one net making plants, seventy ice plants and eighteen hundred ice crusher plants. Facilities of marine service stations, fish storages, Cold storages/ chill plants are zero.

4.3.2 Petuaghat

Petuaghat Fish harbour in Purba Medinipur district, is one of the biggest fish harbours in Asia commissioned in the year 2010. It is considered the seventh largest Fish Harbour in India. In Petuaghat there are two fish landing platforms, one fish auction halls, ,two security booths, one fish storage, one cold storage/ chill plants, , five retail market (Retailer), one ice plant and two ice crusher plants. No facilities for marine service station, processing centres, wholesale markets, fishmeal plants and net making plants are available. In Petuaghat, full facilities are available for commissioning wholesale market but due to lack of to administrative initiatives, it is yet to take full shape. The fishers usually have to go Digha Mohona for auctioning their product resulting more hazards and cost of transportation to them.

4.3.3 Fresherganj

Fraserganj harbour is located on the Edward's Creek at a distance of about 130 Km from Kolkata and is connected by well-maintained motor able road. There is a barge jetty at Namakhana for crossing the Hatania-Doania River. The work for construction of the fishing harbour was taken up in the year 1990 with provisions for berthing of 225 fishing boats and trawlers, dry dock, ice plant, diesel outlet, supply of fresh water, auction market and easy quick transport communication facilities for the

benefit of sea-going fishermen and fish vendors. The project was completed in the year 1995 at the cost of Rs.7.15 crore. It has generated employment opportunities for 8000 persons in the locality. The harbour is run and maintained by Benfish. There are two fish landing platforms, one fish auction hall, one marine service stations, four security booths, twelve fish storages, one cold storage/ chill Plants, ten Processing Centres, one hundred and fifty wholesale market, two hundred twenty five retail market ,one fish meal plant, two net making plant, thirty five ice plant and thirty ice crusher plant.

Besides these three fish harbours there are another two harbours are used exclusively for marine fisheries purposes. Short details of these two harbours are given below:

(i) Minor Fishing Harbour at Sultanpur: The harbour is located on the Hooghly rive at Sultanpur at a distance of only 3 Km from Diamond Harbour and is connected by pucca road. The work for construction of the fishing harbour was taken up in the year 2007 with provisions for berthing of 228 fishing boats and trawlers, dry dock, ice plant, diesel outlet, supply of fresh water, auction market and easy quick transport communication facilities for the benefit of sea-going fishermen and fish vendors. The project was completed in the year 2002 at the cost of Rs.6.75 crore.

ii) Minor Fishing Harbor at Kakdwip : The harbor is located on the Nagini canal at Harwood Point which about 98 Km away from Kolkata. Construction work of the fishing harbor was started in January 2004 with provisions for berthing of 100 fishing boats and trawlers, dry dock, ice plant, diesel outlet, supply of fresh water, auction market and easy quick transport communication facilities for the benefit of sea-going fishermen and fish vendors. The project was completed in March 2007 at the cost of Rs 24.69 crore.

4.3a. Present Resource Status of Marine Fisheries in West Bengal:

From time immemorial, West Bengal has long tradition in exploiting marine resources. However, prior to the Sixth Plan period (1980-85) very little was done for improving infrastructure facilities of marine fisheries. Since then, a number of major

and minor schemes were taken for providing berthing, landing and post-harvest facilities and all those at that period was considered enough for exploiting the marine resources. The Seventh Plan (1985-90) focused on the need for welfare measures, infrastructure development, deep sea fishing, and motorization of the fleet and diversification of fisheries. Since then a lot of measures have taken to ease up the process of fish harvesting and facilitating the marine fisheries sector to a meaningful way.

An inner look into the present resource status of Marine Fisheries in West Bengal can reflect the actual position and this status are depicted in the following Table.

Table -4.3Present Resource Status of Marine Fisheries in West Bengal

Particulars			Nos.	Capacity
				(in tons)
Fishing Harbours			5	
Fish Landing Centre			59	
Fishing Crafts -		Mechanized Vessels -	2633	
	Boats	Mechanized Boats -	7500	
		Non-mechanized	4916	
Ice Plants				
Cold Storages				
Chill Plants				
Insulated Vans				
Wholesale Fish Markets			477	
Retail Fish Markets			3157	
Processing Plants - Export Markets				
Domestic Markets				
Coastal Roads linking - Fish Processing				
- Marketing Centres				
Fishing Seasons - Peak -			15th October-15th February	
- Moderate -			15th February-15th April	
- Lean -			15th June-15th October	
- Ban Period -			15th April - 15th June	
- No of Days -			61 days	

The south-west monsoon influences West Bengal's fisheries to a greater extent. The peak season for fishing is considered during the fair weather period i.e. from mid-October to end-February. The moderate season is reckoned from 15th February to 15th April and lean season is from 15th June to 15th October. The ban period is observed from 15th April to 15th June (both days inclusive) i.e. 61 days.

4.4 Problems of Post- Harvest Facilities in West Bengal:

The following observation is gathered from the Directorate of Fisheries and the points have been mentioned as it was received from the concerned repositories. Problems of Landing/Berthing Facilities

Due to large tidal amplitude in these coastal regions it is considered construction of fixed jetties seemed not to be prudent. The boats usually land their catch on the bank using the tidal amplitude and frequency. The only harbour serving small fishing boats with a jetty at Sankarpur in Midnapore District..

Washing platforms at Junput, Jaldah and Namkhana have been set up and bore wells have been dug for extending washing, cleaning and most importantly for drinking facilities at some temporary camps at Fraserganj, Jambu Island, Junput, Jaldah. Thsee camps exist only from October to mid-February when behundi net fishermen, besides a few gillnet and line fishermen, use them as bases.

Availability of ice in general is found to be inadequate in South 24 Parganas. Ice is supplied to the fishers from private and cooperative sector plants adjacent to fish harbour. In most of the cases the fishers are to carry ice from Namkhana and kakdwip almost 40 Kms away from jetty.

Despite existence of Public, private and cooperative sector ice plants availability of ice is much low than the required quantity in East Midnapore. Moreover weights, quality (in terms of duration of melting) of ice blocks supplied by the private firms are inferior to the ice blocks available from Government sources. Price is also higher and throughout the seasons the fishers have to pay more for storing activities.

Owing to the distance of some of fishing centres like Jaldah, from the main towns or from ice plants it is sometimes transported in “carrier” launches. Boats engaged in long-voyage fishing (mainly with gillnets) carry ice in insulated iceboxes installed on board. There is no cold storage facility at any of the centres.

Harvested fish being stored in ice is transported to the main wholesale markets mainly in Kolkata, Diamond Harbour, Contai and Kharagpur by light commercial vehicles and trucks. All the wholesale markets are connected through well-maintained motor able road. Even landing centres at beach settlements like Jaldah ,Digha and some other places adjacent to Fraserganj can be reached by driving along the hard beach at low tide. For short distances; bicycles, van rickshaw or small tempo are used for transportation of fish.

In South 24 Parganas and East Midnapore the main centres for supply of diesel and lubricating oil are Namkhana, Kakdwip,Diamond Harbour and Contai. However, enterprising trader’s stock diesel oil most of the all-minor centres and sell it at a higher price.

Mentioned earlier a paradigm shift in operation and use of fleets in both of these two districts since the early ’80s, are found to be rampant There has been a rapid mechanization of traditional craft and for operational facilities the fishers opted for mechanized boats in place of traditional one. In the beginning, the fishers modified and developed their boats by setting up certain horse-powered engine with other ancillaries of modern tools and implements. Spare parts are usually procured from Kolkata, but running spares are usually available in the main centres or nearby towns. Mechanics are usually available at all centres to attend the minor problems. For more serious problems, including machining of stern-gear bushes, shafts etc., the fishermen have to travel to the nearest town.

Although facilities for small and minor repair works are done by the local machine men within the fish landing centres boat-building facilities in South 24 Parganas and in East in Midnapore District are found to be inadequate. In both of these two districts boat building facilities are largely available at Namkhana and

Shankarpur. Besides these two townships, traditional boats as well as modified version of boats by installing machineries are also available in Junput, Saulaghat and Kakdweep.

4.4a. Problems in Post Harvest Facilities on Selected Sample Harbours

During the discussion with all stake holders the following points are noted as constraints of proper functioning of harbours and fish landing centres due to which these harbours suffer post harvest losses in marine fisheries.

- Dredging in the transit route of vessels and on the mouth of river.
- Renovation of dry dock.
- For avoiding overcrowding of fleets setting up of another jetty in Shankarpur.
- Setting up cold storages, chill plants.
- Facilities for cold chain, insulated boxes etc.
- Broadening up approach road
- Uninterrupted power supply
- Inadequate supply of drinking water
- Inadequate drainage facilities
- Inadequate civic amenities
- Inadequate training facilities to the fishers
- Inadequate facilities of processing plants.
- Procrastinated decision regarding setting up auction market at Petuaghat.

4.5 Constraints faced by Fishery Officials

The Government officials are of the view man made sea pollution due to excessive tourism development, building construction, rapid urbanization are important constituents of risk factors for affecting fish health. Natural habitats and reproduction ground of sea fishes are getting destroyed or lost gradually.

Constraints faced by the officials as reported as:

- Fund constraint and on time non-availability.
- Lack of manpower.

- Over viewing of grass root level planning.
- Inadequacy of delegation of administrative and financial powers.
- Occurrence of overlapping of jurisdiction.

4.6 Fish Markets and Their Capacity

Table -4.4 District wise Details of Fish Markets and their Capacity

Sr No.	District	No. of Fish Markets((Wholesale)	Total selling Capacity (in tonnes)	No of Export Centres	No. of Fish Processing Centres
1.	Darjeeling	1	-	-	-
2.	Jalpaiguri	05	-	-	-
3.	Cooch Bihar	56	-	-	-
4	Uttar Dinajpur	16	-	-	-
5.	Dakshin Dinajpur	08	-	-	-
6.	Maldah	16	-	-	-
7.	Murshidabad	49	-	-	-
8.	Nadia	63	-	-	-
9.	Birbhum	06	-	-	-
10	Bardhaman	20	-	-	-
11	North 24 Pargonas	65	-	-	-
12	South 24 Pargonas	05	-	-	-
13	Hoogly	10	-	-	-
14	Howrah	28	-	-	-
15	Purulia	05	-	-	-
16	Bankura	33	-	-	-
17	Purba Medinipur	49	-	-	1
18	Paschim Medinipur	36	-	-	-
19	Kolkata	6	-	22	18
	Total	**477**	-	-	-

Source : Hand Book of Fisheries Statistics -2014-15 ,Directorate of Fisheries, Govt. of West Bengal

Chapter – V

Incidences of Post-harvest Losses & its Causes

5.1 Introduction

Present study essentially aims at to assess and to evaluate the post-harvest losses of marine fisheries with special reference to the coastal districts in West Bengal. Besides these there are some other certain objectives which can't be ruled out and among them important is to identify the demographic and socio-economic position of the boat owners and fishermen, specially engaged in various fisheries activities viz. – catching, processing, marketing, etc. We have discussed earlier that huge infiltration of Bangladeshi (East Pakistan) population in the bordering districts of West Bengal, particularly in 24 Parganas and subsequent migration in Midnapore districts had brought a qualitative change in traditional wisdom and conventional method of fishing. Bangladeshi people are well versed in traditional fishing technology and after immigration; most of them adopted fisheries as their main source of livelihood. It was prompt and instantaneous decision for their existence during the period of early settlement.

The next important thing is to examine the available post harvest infrastructure in three harbours namely, Shankarpur, Petuaghat and Fraserganj. Proximity to cold storages, transport, ice factory and means of carrying and transportation of harvested fish are also taken into consideration. The detailed activities of the stakeholders i.e. Wholesalers, Retailers, Consumers, Processors and above all the Fishers are also examined in consonance of the objectives of this study in order to have a better insight about post-harvest losses in Marine Fisheries in these areas. Finally, we have analyzed the views of the various implementing authorities, mainly Fisheries Officials to whom the onus of effective implementation of various fisheries programmes and policies are borne.

5.2 Boat Owner and Fisherman

5.2.1 Socio-Economic Characteristics of Boat Owner and Fisherman

From the socio-economic profile, we found 100 per cent of the fishermen and boat owners consider fisheries as their principal occupation though they have some secondary sources of income also. Overall 50 per cent of the respondents are engaged in agriculture and engagement in non-farm business sector is only 10 per cent. Most of them have APL ration card. On an average 65 per cent of them belong to SC and ST category, 45 per cent of the respondents belong to SC category and remaining 20 per cent belong to ST category. As far as education/literacy aptitude is concerned 35 per cent of the total respondent is reported uneducated/illiterate. Literacy percentage among boat owners is almost 70 percent where as in case of fishermen it goes down to 54percent only.

Stated earlier, almost all (100percent) the respondents (including boat owners and fishermen) have taken fisheries as their main source of livelihood – through majority of them have subsidiaries source of income also. Among fishermen overall 40 percent of them work as agricultural labour. Not a single case of engagement in service or being the pension holder among these categories of respondents is found. Gross annual income of the boat owner from fisheries is 25.07 lakh, though in case of fishermen it is 3.76 lakh and from the subsidiaries sector including agricultural land is 1.48 lakh. Subsidiary income including from agricultural source among the boat owners is 3.01 lakh/year. On an average, the boat owners reported to have almost 25 years experience in fishing operation for fishermen average figure lies between 18 to 24 years. [Table 5.1(a), 5.1(b), 5.1(c)].

Table - 5.1a: Socio- Economic Characteristics of Fishermen and Boat Owner(All)

Sr. No.	Particulars	Unit	Socio Economic Characteristic of Fishermen & Boat Owner			
			Shankarpur (n=20)	Petuaghatl (n=20)	Fresherganj (n=20)	Overall (n=60)
A	Age	years	44.05	47.8	49.15	47.00
B	Sex					
	Male	%	100	100	100	100
	Female	%				
C	Education	years				
	Illiterate	%	45	60	0	35.00
	Primary (1-4)	%	20	20	10	16.67
	Up to SSC (5-9)	%	20	15	45	26.67
	SSC and above (10 and above)	%	15	5	45	21.67
D	Religion					
	Hindu	%	85	90	100	91.67
	Islam	%	15	10	0	8.33
	Christian	%	0	0	0	0
	Sikh	%	0	0	0	0
E	Social Group					
	SC/ST	%	65/25	35/35	35/0	45/20
	OBC/SEBC	%	0	0	10	3.33
	Other/General	%	10	30	55	31.67
F	Experience in Fishing	years	19.65	23.3	26.45	23.13
G	Family Size	Nos.	4.75	4.45	5.75	4.99
	Male	Nos.	1.50	2.05	2.50	2.02
	Female	Nos.	1.55	1.15	2.10	1.60
	Children	Nos.	1.70	1.25	1.15	1.37
H	Family member in fishing/hh	No.	1.50	2.05	2.50	2.02
	Male	Nos.	1.50	2.05	2.50	2.02
	Female	Nos.	0.00	0.00	0.00	0.00
	Children	Nos.	0.00	0.00	0.00	0.00
I	Occupation					
	a) Main- *Fishery*	%	100	100	100	100
	b) Subsidiary*	%	90.0	30.0	30.0	50.0
	Cultivator		40.0	25.0	20.0	28.3
	Ag. Labour		15.0	0.0	0.0	5.0
	Non-farm Labour		5.0	5.0	0.0	3.3
	Own Non-Farm business		20.0	0.0	10.0	10.0
	Service		5.0	0.0	0.0	1.7
	Other (Net making)		5.0	0.0	0.0	1.7
j	Gross annual income (lakh)	Rs/year				
	Main		13.15	17.07	13.20	14.47
	Subsidiaries		2.48	2.32	1.94	2.24
K	House Structure					
	Pucca	%	85	100	50	78.33
	Semi-Pucca	%	15	0	50	21.67
	Kuccha	%	0	0	0	0
L	Agricultural owned Land	Hectare	5.80	16.75	6.5	8.20
M	Ration Card					
	BPL		0	0	45	15
	APL		100	100	55	85
N	Training					
	Fish handling	%				
	Total days	Nos.	3.0	2.0	2.5	2.5

Notes: % - Figures are percentage to total sample. Source: Field Survey Data.

Table 5.1b: Socio- Economic Characteristics of Boat Owner

Sr. No.	Particulars	Unit	Socio Economic Characteristic of Boat Owner			
			Shankarpur (n=10)	Petuaghatl (n=10)	Fresherganj (n=10)	Overall (n=30)
A	Age	years	46.60	49.00	52.60	49.40
B	Sex	%				
	Male	%	100	100	100	100
	Female	%				
C	Education	years				
	Illiterate	%	30	40	0	23.33
	Primary (1-4)		20	30	20	23.33
	Up to SSC (5-9)	%	30	20	60	36.67
	SSC and above (10 and above)	%	20	10	20	16.67
D	Religion					
	Hindu	%	90	100	100	96.7
	Islam	%	10	0	0	3.3
	Christian	%	0	0	0	0
	Sikh	%	0	0	0	0
E	Social Group					
	SC/ST	%	70/20	60/10	20/0	50/10
	OBC/SEBC	%	0	0	20/0	6.7
	Other/General	%	10	30	60	33.3
F	Experience in Fishing	Year	20.90	24.50	28.20	24.53
G	Family Size	Nos.	4.69	5.14	6.00	5.32
	Male	Nos.	1.30	2.50	2.70	2.17
	Female	Nos.	1.50	1.14	2.20	1.67
	Children	Nos.	1.89	1.50	1.10	1.48
H	Family member in fishing/hh	No.	1.30	2.50	2.70	2.17
	Male	Nos.	1.30	2.50	2.70	2.17
	Female	Nos.	0.0	0.0	0.0	0.0
	Children	Nos.	0.0	0.0	0.0	0.0
I	Occupation					
	a) Main- *Fishery*	%	100	100	100	100
	b) Subsidiary*	%	80.0	50.0	20.0	50.0
	Cultivator		40.0	40.0	10.0	30.0
	Ag. Labour		0.0	0.0	0.0	0.0
	Non-farm Labour		0.0	10.0	0.0	3.3
	Own Non-Farm business		20.0	0.0	10.0	10.0
	Service/Pension		10.0	0.0	0.0	3.3
	Other		10.0	0.0	0.0	3.3
j	Gross annual income (lakh)	Rs/year				
	Main		23.0	30.0	22.2	25.07
	Subsidiaries		3.5	2.64	2.88	3.01
K	House Structure					
	Pucca	%	90	100	50	80
	Semi-Pucca	%	10	0	50	20
	Kuccha	%	0	0	0	0
L	Agricultural owned Land	Hectare	3.50	16.75	7.08	9.70
M	Ration Card					
	BPL		0	0	20	6.67
	APL		100	100	80	93.33
N	Training					
	Handling	%				
	Total days	Nos.	3	2	2.60	2.55

Notes: % - Figures are percentage to total sample. Source: Field Survey Data.

Table 5.1c: Socio- Economic Characteristics of Fishermen

Sr. No.	Particulars	Unit	Socio Economic Characteristic of **Fishermen**			
			Shankarpur (n=10)	Petuaghatl (n=10)	Fresherganj (n=10)	Overall (n=30)
A	Age	years	41.50	46.60	45.70	44.60
B	Sex	%				
	Male	%	100	100	100	100
	Female	%	0	0	0	0
C	Education	Years				
	Illiterate	%	60	80	0	46.7
	Primary (1-4)	%	20	10	0	10.0
	Up to SSC (5-9)	%	10	10	30	16.7
	SSC and above (10 and above)	%	10	0	70	26.7
D	Religion					
	Hindu	%	80	80	100	86.7
	Islam	%	20	20	0	13.3
	Christian	%	0	0	0	0
	Sikh	%	0	0	0	0
E	Social Group					
	SC/ST	%	60/30	10/60	50/0	40/30
	OBC/SEBC	%	0	0	0	0
	Other/General	%	10	30	50/0	30/0
F	Experience in Fishing	Year	18.40	22.10	24.70	21.73
G	Family Size	Nos.	5.61	5.21	5.80	5.55
	Male	Nos.	1.70	1.60	2.30	1.87
	Female	Nos.	1.78	1.50	2.00	1.76
	Children	Nos.	2.13	2.11	1.50	1.92
H	Family member in fishing/hh	No.	1.70	1.60	2.30	**1.87**
	Male	Nos.	1.70	1.60	2.30	1.87
	Female	Nos.	0.00	0.00	0.00	0.00
	Children	Nos.	0.00	0.00	0.00	0.00
I	Occupation					
	a) Main- *Fishery*	%	100.0	100.0	100.0	100.0
	b) Subsidiary*	%	100.0	10.0	40.0	50.0
	Cultivator		40.0	10.0	30.0	26.7
	Ag. Labour		30.0	0.0	0.0	10.0
	Non-farm Labour		10.0	0.0	0.0	3.3
	Own Non-Farm business		20.0	0.0	10.0	10.0
	Service/Pension		0.0	0.0	0.0	0.0
	Other		0.0	0.0	0.0	0.0
j	Gross annual income (lakh)	Rs/year				
	Main		3.31	4.14	3.84	3.76
	Subsidiaries		1.45	2.00	1.00	1.48
K	House Structure					
	Pucca	%	80	60	50	63.3
	Semi-Pucca	%	20	40	50	36.7
	Kuccha	%	0	0	0	0
L	Agricultural owned Land	Hectare	7.33	2.00	6.00	5.11
M	Ration Card		100	100	100	100.00
	BPL		0	0	2	6.67
	APL		10	10	8	93.33
N	Training					
	Handling	%				
	Total days	Nos.	3.00	2.00	2.60	2.55

Notes: % - Figures are percentage to total sample.
Source: Field Survey Data.

5.2.2 Details of Fishing crafts (Boats) and Fishing Gears

When asked the fishermen and the boat owners replied that about 10-15 years ago they were accustomed with fisheries activities with traditional boat, in some cases boat changed or modified with ½ cylinder hp engines. Recently there has been a havoc change in fishing activities after introduction of modern trawlers, deep-sea trawlers, gill meters and using of other modern fishing crafts. Mechanization has taken place fast and mechanized/modified boating operation is seen as rampant.

Obviously, the boat owners have more fishing crafts with more modern facilities than the fishermen. Their possession and use of fishing crafts in Shankarpur, Petuaghat and Fraserganj are reported to be 6.8, 7.5 and 4.0 respectively. In case of fishing crafts (by design), the number of traditional vessels among fishermen in Shankarpur, Petuaghat and Freserganj are reported to be 2.3, 2.0 and 1.9. The boat owners have all sorts of modern accessories and fishing tools. The number of Deep-sea trawlers of the boat owners in Shankarpur, Petuaghat and Fraserganj are reported to have 6.8, 7.2 and 1.5. In case of Gill-netters, the number follows as 3.1, 2.3 and 2.6 in these areas respectively. [Table 5.2(a), 5.2(b), 5.2(c)].

Table 5.2a: Number of Fishing Crafts/Vessels with Boat Owners & Fishermen

Sr. No.	Type of Fishing Crafts	Number of Fishing Crafts/Vessels/Household (BO & FM)			
		Shankarpur	Petuaghat	Fresherganj	Over all
A	**Fishing Crafts (by use)**				
	a) Trawlers	3.4	3.8	2.0	3.1
	b) Gill netters	1.6	1.2	1.3	1.3
	c) Deep Sea Trawlers	3.4	3.6	0.8	2.6
	d) Long liners for Tuna	0	0	0	0
	e) Squid Jigging	0	0	0	0
	f) Shore seining	0	0	0	0
	g) Others (Cast nut & Purse Seine)	0	0	0	0
B	**Fishing Crafts (by design)**				
	a) Traditional Crafts	1.2	1.0	1.0	1.0
	b) Motorized Crafts	-	-	-	-
	c) Mechanized Boats	1.8	1.7	2.0	1.8

Note: BO- Boat Owner, FM- Fishermen.
Source: Field Survey Data.

Table 5.2b: Number of Fishing Crafts/Vessels with Boat Owners

Sr. No.	Type of Fishing Crafts	Number of Fishing Crafts/Vessels/Household (BO)			
		Shankarpur	Petuaghat	Fresherganj	Over all
A	**Fishing Crafts (by use)**				
	a) Trawlers	6.8	7.5	4.0	6.1
	b) Gill netters	3.1	2.3	2.6	2.7
	c) Deep Sea Trawlers	6.8	7.2	1.5	5.2
	d) Long liners for Tuna	0.0	0.0	0.0	0.0
	e) Squid Jigging	0.0	0.0	0.0	0.0
	f) Shore seining	0.0	0.0	0.0	0.0
	g) Others (Cast nut & Purse Seine)	0.0	0.0	0.0	0.0
B	**Fishing Crafts (by design)**				
	a) Traditional Crafts	0.0	0.0	0.0	0.0
	b) Motorized Crafts	-	-	-	-
	c) Mechanized Boats	3.5	3.3	4.0	3.6

Source: Field Survey Data.

Table 5.2c: Number of Fishing Crafts/Vessels with Fishermen

Sr. No.	Type of Fishing Crafts	Number of Fishing Crafts/Vessels/Household (FM)			
		Shankarpur	Petuaghat	Fresherganj	Over all
A	**Fishing Crafts (by use)**				
	a) Trawlers	0.00	0.00	0.00	0.00
	b) Gill netters	0.00	0.00	0.00	0.00
	c) Deep Sea Trawlers	0.00	0.00	0.00	0.00
	d) Long liners for Tuna	0.00	0.00	0.00	0.00
	e) Squid Jigging	0.00	0.00	0.00	0.00
	f) Shore seining	0.00	0.00	0.00	0.00
	g) Others (Cast nut & Purse Seine)	-	-	-	-
B	**Fishing Crafts (by design)**				
	a) Traditional Crafts	2.3	2.0	1.9	2.1
	b) Motorized Crafts	0.0	0.0	0.0	0.0
	c) Mechanized Boats	0.0	0.0	0.0	0.0

Source: Field Survey Data.

5.2.3 Temporary Fishing Restrictions (Ban Period)

Introduction of ban-period during fisheries activities is an important conception. In India, tradition, custom and culture along with some rituals are well connected with the economic activities of the countrymen. In this case banning of fishing during the seedling period bears some social taboos also. Such type of social restriction naturally helps small and juvenile fishes to grow. Ostensibly, it has more economic implication and need not to be clarified. In Shankarpur, Petuaghat and Fraserganj in all these three cases fishermen strictly comply of banning of fishing for 61 days – now they are effectively contemplating to enhance the duration of banning

period for more than a month thus to enhance the banning period from 61 days to 90 days. In this case, it is worthy to mention that fishermen during this ban period generally not remain in idle position. During that period, most of them are engaged with fisheries and fisheries related activities like net and boat repairing, making of new boats and repair or building of their dwellings or hutments. Many of them are also engaged in agriculture and some other non-farm business activities also. (Table 5.3).

Table 5.3: Details on Fishing Ban Period in Selected Harbours

Sr. No.	Harbour	Fishing Ban period	
		Ban Period	Length (days)
A	**Shankarpur**	15 April to 15 June	61 days
B	Petuaghat	15 April to 15 June	61 days
C	Fresherganj	15 April to 15 June	61 days

Source: Field Survey Data.

5.2.4 Details of Fishing Activities

We have taken (2014-15) as reference period for conducting the study. It has been discussed earlier that fishery and fishing activities is the main occupation of the respondent fishermen and boat owners, hence it is practically for all the times throughout years they are engaged with different fishing activities. From Table 5.4(a), 5.4(b) and 5.4(c) it is found that during Oct-Dec 2014 the fishermen including boat owners are associated with fishing activities and the overall figures corresponding to these activities figure reports as 61.87 days. Overall figure for fish trips in season during these days as 9.97, the figure is slightly higher among boat owners, it is 10.80 days. They consider the period during April to September as boom season for harvesting. The corresponding figure for boat owners and fishermen are 64.78 and 70.36 respectively. Overall fishing days per season is 189.09 and it is higher in case of fishermen. The corresponding figure for the fishermen go for fishing is 196.26 days in a year .Fishing with traditional as well as modern (modified and mechanized) facilities is being operative in full suing. On an average 12-14 people are required for each fish trip and multi-day fishing for all categories fishermen are reported to be 100%. Overall figure for the fishermen for fishing days per season in 196.26 but in case of Fraserganj it goes to 240.50 days approximately.

Table 5.4a: Harbour wise and Season wise Details of Fishing Activities (ALL)

Sr. No.	Particulars	Unit	Details of Fishing activities- ALL			
			Shankarpur	Petuaghat	Fresherganj	Av.
1	**Oct - Dec 2014**					
A	Fishing days per season	Av no.	56.95	61.90	66.75	61.87
B	Fishing trips in season	Av no.	9.70	7.85	12.35	9.97
C	Fishing trips by type of fishing craft	Av no.	9.70	7.85	12.35	9.97
	a)Traditional		0.10	0.05	0.05	0.07
	b) Motorized		8.60	6.65	11.30	8.07
	c) Mechanized		0.90	0.85	1.00	1.83
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	10.0	0.0	3.33
	b) Multi Day Fishing		100	90.0	100.0	96.67
E	Days of fishing per trip	Av no.	9.20	8.60	6.30	3.03
F	Fisherman on-board	Av no.	13.70	13.85	10.95	12.83
2.	**Jan to Mar 2015**					
A	Fishing days per season	Av no.	56.80	55.90	66.25	59.65
B	Fishing trips in season	Av no.	8.15	7.65	10.05	8.62
C	Fishing trips by type of fishing craft	Av no.	8.15	7.65	10.05	8.62
	a)Traditional		0.10	0.05	0.05	0.07
	b)Mechanized		0.90	0.85	1.00	1.83
	c)Motorized		7.15	6.75	9.00	7.72
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	Av no.				
	a) Day fishing		0.0	0.0	10.0	3.33
	b) Multi Day Fishing		100	100	90.0	96.67
E	Days of fishing per trip	Av no.	9.05	9.30	6.70	8.35
F	Fisherman on-board	Av no.	13.45	13.40	10.45	12.43
3.	**April to Sep2015**	Av no.				
A	Fishing days per season	Av no.	57.00	59.72	86.00	67.57
B	Fishing trips in season	Av no.	10.60	10.65	15.00	12.13
C	Fishing trips by type of fishing craft	Av no.	10.60	10.65	15.00	12.13
	a)Traditional		0.10	0.05	0.05	0.07
	b)Mechanized		0.90	0.85	1.00	1.83
	c)Motorized		9.60	9.75	13.95	10.23
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	10.0	3.33
	b) Multi Day Fishing		100	100	90.0	96.67
E	Days of fishing per trip	Av no.	9.15	8.70	6.55	8.13
F	Fisherman on-board	Av no.	13.70	13.25	12.55	13.17
4.	**Overall**					
A	Fishing days per season	Av no.	170.75	177.52	219.00	189.09
B	Fishing trips in season	Av no.	28.45	26.15	37.55	30.71
C	Fishing trips by type of fishing craft	Av no.	28.45	26.15	37.55	30.71
	a)Traditional		0.30	0.15	0.15	0.21
	b) Motorized		25.45	23.45	34.40	28.81
	c) Mechanized		2.70	2.55	3.0	2.75
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%.				
	a) Day fishing		0.0	10.0	0.0	3.33
	b) Multi Day Fishing		100	90.0	100	96.67
E	Days of fishing per trip	Av no.	27.40	26.60	19.55	24.51
F	Fisherman on-board	Av no.	40.85	40.50	33.95	38.43

Source: Field Survey Data.

Table 5.4b: Harbourwise and Seasonwise Details of Fishing Activities (BO)

Sr. No.	Particulars	Unit	Details of Fishing activities- ALL			
			Shankarpur	Petuaghat	Fresherganj	Av.
1	**Oct - Dec 2014**					
A	Fishing days per season	Av no.	57.90	63.30	64.50	61.90
B	Fishing trips in season	Av no.	9.60	8.00	14.80	10.80
C	Fishing trips by type of fishing craft	Av no.	9.60	8.00	14.80	10.80
	a)Traditional		0.0	0.0	0.0	0.0
	b) Motorized		7.80	6.30	12.80	8.97
	c) Mechanized		1.8	1.7	2.0	1.83
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	0.0	0.0
	b) Multi Day Fishing		100	100	100	100
E	Days of fishing per trip	Av no.	9.00	8.50	6.20	7.90
F	Fisherman on-board	Av no.	13.10	13.80	11.20	12.70
2.	**Jan to Mar 2015**					
A	Fishing days per season	Av no.	57.20	55.00	53.50	55.23
B	Fishing trips in season	Av no.	8.10	7.50	9.70	8.43
C	Fishing trips by type of fishing craft	Av no.	8.10	7.50	9.70	8.43
	a)Traditional		0.0	0.0	0.0	0.0
	b)Mechanized		1.8	1.7	2.0	1.83
	c)Motorized		6.30	5.80	7.70	6.60
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	0.0	0.0
	b) Multi Day Fishing		100	100	100	100
E	Days of fishing per trip	Av no.	9.20	9.10	6.20	8.17
F	Fisherman on-board	Av no.	12.40	12.60	9.70	11.57
3.	**April to Sep2015**	Av no.				
A	Fishing days per season	Av no.	55.00	59.85	79.50	64.78
B	Fishing trips in season	Av no.	10.70	11.10	15.80	12.53
C	Fishing trips by type of fishing craft	Av no.	10.70	11.10	15.80	12.53
	a)Traditional		0.0	0.0	0.0	0.0
	b)Mechanized		1.8	1.7	2.0	1.83
	c)Motorized		8.90	9.40	13.80	10.70
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	0.0	0.0
	b) Multi Day Fishing		100	100	100	100
E	Days of fishing per trip	Av no.	9.10	8.20	4.0	7.10
F	Fisherman on-board	Av no.	13.60	13.60	11.90	13.03
4.	**Overall**					
A	Fishing days per season	Av no.	170.10	178.15	197.50	181.91
B	Fishing trips in season	Av no.	28.40	26.60	40.30	31.76
C	Fishing trips by type of fishing craft	Av no.	28.40	26.60	40.30	31.76
	a)Traditional		0.0	0.0	0.0	0.0
	b) Motorized		23.00	21.50	34.30	26.27
	c) Mechanized		5.40	5.10	6.0	5.49
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	0.0	0.0
	b) Multi Day Fishing		100	100	100	100
E	Days of fishing per trip	Av no.	27.30	25.80	16.40	23.16
F	Fisherman on-board	Av no.	39.10	40.00	32.80	37.30

Source: Field Survey Data.

Table 5.4c: Harbourwise and Seasonwise Details of Fishing Activities (FM)

Sr. No.	Particulars	Unit	Details of Fishing activities- ALL			
			Shankarpur	Petuaghat	Fresherganj	Av.
1	**Oct - Dec 2014**					
A	Fishing days per season	Av no.	56.00	60.50	69.00	61.83
B	Fishing trips in season	Av no.	9.80	7.70	9.90	9.13
C	Fishing trips by type of fishing craft	Av no.	9.80	7.70	9.90	9.13
	a)Traditional		0.2	0.1	0.1	0.1
	b) Motorized		5.4	4.5	15.6	8.5
	c) Mechanized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	20.0	6.67
	b) Multi Day Fishing		100	100	80.0	93.33
E	Days of fishing per trip	Av no.	9.40	8.70	6.40	8.17
F	Fisherman on-board	Av no.	14.30	13.90	10.70	12.97
2.	**Jan to Mar 2015**					
A	Fishing days per season	Av no.	56.40	56.80	79.00	64.07
B	Fishing trips in season	Av no.	8.20	7.80	10.40	8.80
C	Fishing trips by type of fishing craft	Av no.	8.20	7.80	10.40	8.80
	a)Traditional		0.0	0.0	0.0	0.0
	b)Mechanized		4.6	4.2	16.6	8.5
	c)Motorized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	20.0	6.67
	b) Multi Day Fishing		100	100	80.0	93.33
E	Days of fishing per trip	Av no.	8.90	9.50	7.20	8.53
F	Fisherman on-board	Av no.	14.50	14.20	11.20	13.30
3.	**April to Sep 2015**	Av no.				
A	Fishing days per season	Av no.	59.00	59.60	92.50	70.36
B	Fishing trips in season	Av no.	10.50	10.20	14.50	11.73
C	Fishing trips by type of fishing craft	Av no.	10.50	10.20	14.50	11.73
	a)Traditional		0.0	0.0	0.0	0.0
	b)Mechanized		4.3	3.4	14.4	7.4
	c)Motorized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	20.0	6.67
	b) Multi Day Fishing		100	100	80.0	93.33
E	Days of fishing per trip	Av no.	9.20	9.20	9.10	9.17
F	Fisherman on-board	Av no.	13.80	12.90	13.20	13.30
4.	**Overall**					
A	Fishing days per season	Av no.	171.40	176.90	240.50	196.26
B	Fishing trips in season	Av no.	28.50	25.70	34.80	29.66
C	Fishing trips by type of fishing craft	Av no.	28.50	25.70	34.80	29.66
	a)Traditional		0.0	0.0	0.0	0.0
	b) Motorized		4.8	4.0	15.5	8.1
	c) Mechanized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	20.0	6.67
	b) Multi Day Fishing		100	100	80.0	93.33
E	Days of fishing per trip	Av no.	27.50	27.40	22.70	25.86
F	Fisherman on-board	Av no.	42.60	41.00	35.10	39.56

Source: Field Survey Data.

5.2.5 Details of Fish Caught& Sold

We have segregated harbour-wise and season-wise details of fish caught and sold in three different fishing seasons in these study areas. Table 5.5(a) gives the overall figure for fishermen including boat owners. From table-5.5(b) and 5.5(c), we get the corresponding figure of boat owners and fishermen about details of fish harvested and marketed.

Overall 18.03 ton fish landed per trip in all season, among them 10.71 ton regarded as grade-I (high value) and 7.33 ton as grade-II (low value) quality. The entire high quality fish are being sold to the wholesaler and remaining 7.33 ton grade-II quality disposed as dried fish or for fish meal. Small vendors some time purchase these fish for selling it to the consumers also.

The system of marketing is very complex, in some cases the boat owners themselves act as wholesalers and the entire harvest are being marketed through "kantadar" (wholesalers). Most of the cases the Boat owners employ agent to work on behalf of them. From wholesalers, the retailers, exporters, intermediaries and other traders purchased fishes and disposed accordingly.

Earlier a huge amount of fish, owing to comparatively existing poor post-harvest facilities are being dumped or wasted; now a days the second graded fishes are used as dried fishes for human consumption and also used for fishmeal. Buyers of such kind of products are not negligible, recently the processors of dried fish purchase such degraded fishes directly from the wholesalers and after purchasing, they sell to other places processed it through sun drying under the sky on sea bed. These dry fish processing unit is locally called as 'khuties'. In East Midnapore and South 24 Paraganas there are hundreds of khuties and thousands of villagers in coaster areas are associated with different activities of dry fishing. Dry fishes are sold to Assam, Tripura, Manipur, Mizoram, Nagaland and Other North –Eastern States of India. Traders come from that places or the local agents of big wholesalers purchase processed (dried) fish from the "khutidars" and supply it to these places.

Table 5.5a: Harbour wise & Season wise Details of Fish Caught & Sold (ALL)

Sr. No.	Harbour	Details of Fish Caught & Sold (ALL)							
		Shankarpur		Petuaghat		Fresherganj		Total	
1.	**Oct - Dec 2014**	tons	%	tons	%	tons	%	tons	%
A)	Fish landed per trip	5.53	100.0	4.68	100.0	4.68	100.0	4.96	100.0
	a) Grade I (high value)	3.33	60.2	2.75	58.8	2.75	58.8	2.94	59.3
	b) Grade II (low value)	2.20	39.8	1.93	41.2	1.93	41.2	2.02	40.7
B)	Fish Sold	3.33	60.2	2.75	58.8	2.75	58.8	2.94	59.3
	a)Exporter	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	b)Wholesaler	3.33	60.2	2.75	58.8	2.75	58.8	2.94	59.3
	c)Retailer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	d)Contractor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C)	Fish waste/fish dumped	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D)	Fish use to dry/fish meal	2.20	39.8	1.93	41.2	1.93	41.2	2.02	40.7
2.	**Jan to Mar 2015**								
A)	Fish landed per trip	4.25	100.0	4.25	100.0	4.08	100.0	4.19	100.0
	a) Grade I (high value)	2.28	53.5	2.21	52.1	2.26	55.5	2.25	53.7
	b) Grade II (low value)	1.98	46.5	2.04	47.9	1.81	44.5	1.94	46.3
B)	Fish Sold	2.28	53.5	2.21	52.1	2.26	55.5	2.25	53.7
	a)Exporter	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	b)Wholesaler	2.28	53.5	2.21	52.1	2.26	55.5	2.25	53.7
	c)Retailer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	d)Contractor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C)	Fish waste/fish dumped	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D)	Fish use to dry/fish meal	1.98	46.5	2.04	47.9	1.81	44.5	1.94	46.3
3.	**April to Sep2015**								
A)	Fish landed per trip	8.95	100.0	8.98	100.0	8.73	100.0	8.88	100.0
	a) Grade I (high value)	5.55	62.0	5.65	63.0	5.35	61.3	5.52	62.1
	b) Grade II (low value)	3.40	38.0	3.33	37.0	3.38	38.7	3.37	37.9
B)	Fish Sold	5.55	62.0	5.65	63.0	5.35	61.3	5.52	62.1
	a)Exporter	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	b)Wholesaler	5.55	62.0	5.65	63.0	5.35	61.3	5.52	62.1
	c)Retailer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	d)Contractor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C)	Fish waste/fish dumped	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D)	Fish use to dry/fish meal	3.40	38.0	3.33	37.0	3.38	38.7	3.37	37.9
4.	**Overall**								
A)	Fish landed per trip	18.73	100.0	17.90	100.0	17.48	100.0	18.03	100.0
	a) Grade I (high value)	11.15	59.5	10.61	59.3	10.36	59.3	10.71	59.4
	b) Grade II (low value)	7.58	40.5	7.29	40.7	7.11	40.7	7.33	40.6
B)	Fish Sold	11.15	59.5	10.61	59.3	10.36	59.3	10.71	59.4
	a)Exporter	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	b)Wholesaler	11.15	59.5	10.61	59.3	10.36	59.3	10.71	59.4
	c)Retailer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	d)Contractor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C)	Fish waste/fish dumped	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D)	Fish use to dry/fish meal	7.58	40.5	7.29	40.7	7.11	40.7	7.33	40.6

Source: Field Survey Data.

Table 5.5b: Harbour wise & Season wise Details of Fish Caught & Sold (BO)

Sr. No.	Harbour	Details of Fish Caught & Sold (FM)							
		Shankarpur		Petuaghat		Fresherganj		Total	
1.	**Oct - Dec 2014**	tons	%	tons	%	tons	%	tons	%
A)	Fish landed per trip	5.85	100.0	4.05	100.0	4.05	100.0	4.65	100.0
	a) Grade I (high value)	3.60	61.5	2.45	60.5	2.45	60.5	2.83	60.9
	b) Grade II (low value)	2.25	38.5	1.60	39.5	1.60	39.5	1.82	39.1
B)	Fish Sold	3.60	61.5	2.45	60.5	2.45	60.5	2.83	60.9
	a)Exporter	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	b)Wholesaler	3.60	61.5	2.45	60.5	2.45	60.5	2.83	60.9
	c)Retailer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	d)Contractor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C)	Fish waste/fish dumped	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D)	Fish use to dry/fish meal	2.25	38.5	1.60	39.5	1.60	39.5	1.82	39.1
2.	**Jan to Mar 2015**								
A)	Fish landed per trip	4.30	100.0	3.85	100.0	4.30	100.0	4.15	100.0
	a) Grade I (high value)	2.45	57.0	2.08	53.9	2.45	57.0	2.33	56.0
	b) Grade II (low value)	1.85	43.0	1.78	46.1	1.85	43.0	1.83	44.0
B)	Fish Sold	2.45	57.0	2.08	53.9	2.45	57.0	2.33	56.0
	a)Exporter	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	b)Wholesaler	2.45	57.0	2.08	53.9	2.45	57.0	2.33	56.0
	c)Retailer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	d)Contractor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C)	Fish waste/fish dumped	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D)	Fish use to dry/fish meal	1.85	43.0	1.78	46.1	1.85	43.0	1.83	44.0
3.	**April to Sep2015**								
A)	Fish landed per trip	8.70	100.0	8.25	100.0	8.25	100.0	8.40	100.0
	a) Grade I (high value)	5.40	62.1	5.00	60.6	5.00	60.6	5.13	61.1
	b) Grade II (low value)	3.30	37.9	3.25	39.4	3.25	39.4	3.27	38.9
B)	Fish Sold	5.40	62.1	5.00	60.6	5.00	60.6	5.13	61.1
	a)Exporter	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	b)Wholesaler	5.40	62.1	5.00	60.6	5.00	60.6	5.13	61.1
	c)Retailer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	d)Contractor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C)	Fish waste/fish dumped	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D)	Fish use to dry/fish meal	3.30	37.9	3.25	39.4	3.25	39.4	3.27	3.30
4.	**Overall**								
A)	Fish landed per trip	18.85	100.0	16.15	100.0	16.60	100.0	17.20	100.0
	a) Grade I (high value)	11.45	60.7	9.53	59.0	9.90	59.6	10.29	59.8
	b) Grade II (low value)	7.40	39.3	6.63	41.0	6.70	40.4	6.91	40.2
B)	Fish Sold	11.45	60.7	9.53	59.0	9.90	59.6	10.29	59.8
	a)Exporter	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	b)Wholesaler	11.45	60.7	9.53	59.0	9.90	59.6	10.29	59.8
	c)Retailer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	d)Contractor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C)	Fish waste/fish dumped	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D)	Fish use to dry/fish meal	7.40	39.3	6.63	41.0	6.70	40.4	6.91	40.2

Source: Field Survey Data.

Table 5.5c: Harbour wise & Season wise Details of Fish Caught & Sold (FM)

Sr. No.	Harbour	Details of Fish Caught & Sold (FM)							
		Shankarpur		Petuaghat		Fresherganj		Total	
1.	**Oct - Dec 2014**	tons	%	tons	%	tons	%	tons	%
A)	Fish landed per trip	5.20	100.0	5.30	100.0	5.30	100.0	5.27	100.0
	a) Grade I (high value)	3.05	58.7	3.05	57.5	3.05	57.5	3.05	57.9
	b) Grade II (low value)	2.15	41.3	2.25	42.5	2.25	42.5	2.22	42.1
B)	Fish Sold	3.05	58.7	3.05	57.5	3.05	57.5	3.05	57.9
	a)Exporter	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	b)Wholesaler	3.05	58.7	3.05	57.5	3.05	57.5	3.05	57.9
	c)Retailer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	d)Contractor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C)	Fish waste/fish dumped	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D)	Fish use to dry/fish meal	2.15	41.3	2.25	42.5	2.25	42.5	2.22	42.1
2.	**Jan to Mar 2015**								
A)	Fish landed per trip	4.20	100.0	4.65	100.0	3.85	100.0	4.23	100.0
	a) Grade I (high value)	2.10	50.0	2.35	50.5	2.08	53.9	2.18	51.4
	b) Grade II (low value)	2.10	50.0	2.30	49.5	1.78	46.1	2.06	48.6
B)	Fish Sold	2.10	50.0	2.35	50.5	2.08	53.9	2.18	51.4
	a)Exporter	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	b)Wholesaler	2.10	50.0	2.35	50.5	2.08	53.9	2.18	51.4
	c)Retailer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	d)Contractor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C)	Fish waste/fish dumped	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D)	Fish use to dry/fish meal	2.10	50.0	2.30	49.5	1.78	46.1	2.06	48.6
3.	**April to Sep2015**								
A)	Fish landed per trip	9.20	100.0	9.70	100.0	9.20	100.0	9.37	100.0
	a) Grade I (high value)	5.70	62.0	6.30	64.9	5.70	62.0	5.90	63.0
	b) Grade II (low value)	3.50	38.0	3.40	35.1	3.50	38.0	3.47	37.0
B)	Fish Sold	5.70	62.0	6.30	64.9	5.70	62.0	5.90	63.0
	a)Exporter	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	b)Wholesaler	5.70	62.0	6.30	64.9	5.70	62.0	5.90	63.0
	c)Retailer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	d)Contractor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C)	Fish waste/fish dumped	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D)	Fish use to dry/fish meal	3.50	38.0	3.40	35.1	3.50	38.0	3.47	37.0
4.	**Overall**								
A)	Fish landed per trip	18.60	100.0	19.65	100.0	18.35	100.0	18.87	100.0
	a) Grade I (high value)	10.85	58.3	11.70	59.5	10.83	59.0	11.13	59.0
	b) Grade II (low value)	7.75	41.7	7.95	40.5	7.53	41.0	7.74	41.0
B)	Fish Sold	10.85	58.3	11.70	59.5	10.83	59.0	11.13	59.0
	a)Exporter	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	b)Wholesaler	10.85	58.3	11.70	59.5	10.83	59.0	11.13	59.0
	c)Retailer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	d)Contractor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C)	Fish waste/fish dumped	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D)	Fish use to dry/fish meal	7.75	41.7	7.95	40.5	7.53	41.0	7.74	41.0

Source: Field Survey Data.

5.2.6 Species wise and Season wise Value of Fish

Table 5.6(a) and 5.6(b) depict the species-wise value of fish for both boat owners and fishermen. In Shankarpur, Petuaghat and Fraserganj – Hilsa (illish), Pomfret and Prawn are regarded as the high valued among all catches. Generally, Bengalee people are very food of illish and prawn. Discussed earlier and it has also been stated that a huge amount of hilsha are being imported from Bangladesh to cater the need for the Bengalee people over the years. For many reasons both quality and quality of Hilsa in West Bengal has goes down rapidly and the consumer has to depend upon the permission of Bangladesh government for exporting Hilsa to West Bengal (India) and thus need a lot of political and diplomatic discussion.

We have taken the average price of the main fishes that prevailed thought the year, Hilsa, Pomfret and Prown are most costly followed by Tur, Mackeroal, Bagga respectively. It is revealed from these two Tables that boat owners generally get higher prices than fishermen for obvious reasons. They have more bargaining capacity.

At this perspective it is worthy to mention a huge amount of high quality fish specially Hilsha are harvested in small and juvenile stages. During arrival of monsoons the fishermen set net at the estuarine sites and indiscriminately catch fish whatever sizes they found. Government legislation for harvesting, selling, and purchasing below the required (in West Bengal nine inches) sizes seems to be completely ineffective. Post harvest loss of harvesting such quality of fish or grade I fish cause huge economic loss of resources as far as quantity and quality of post harvest management in marine fisheries are concerned. We have discussed the matter in detail in other segments of the study.

Table 5.6a: Species wise Value of Fish (BO)

Sr. No.	Harbour	Specieswise Value of Fish (BO) – Av. Price Rs./kg					
		Oct - Dec 2014		Jan to Mar 2015		April to Sep2015	
1	**Sankarpur**	Grade I	Grade II	Grade I	Grade II	Grade I	Grade II
	Bagga	120.0	80.0	115.0	70.0	110.0	60.0
	Hilsha	600.0	350.0	650.0	400.0	550.0	300.0
	Mackrool	164.3	-	186.0	-	160.0	120.0
	Mix Fish	-	60.0	-	55.0	-	50.5
	Kokila	110.0	90.0	105.0	92.5	103.0	85.5
	Pomfret	400.0	250.0	450.0	300.0	420.0	260.0
	Prawn	450.0	150.0	-	-	400.0	120.0-
	Rani(Kaoa)	60.0	-	70.0	-	80.0	65.0
	Bhola	90.0	60.0	100.0	70.0	95.0	60.0
	Fita	-	-	-	50.0	-	
2.	**Petuaghat**						
	Bagga	120.0	80.0	115.0	70.0	110.0	60.0
	Hilsha	600.0	350.0	650.0	400.0	550.0	300.0
	Mackrool	164.3	-	186.0	-	160.0	120.0
	Mix Fish	-	60.0	-	55.0	-	50.5
	Kokila	110.0	90.0	105.0	92.5	103.0	85.5
	Pomfret	400.0	250.0	450.0	300.0	420.0	260.0
	Prawn	450.0	150.0	-	-	400.0	120.0-
	Rani	60.0	-	70.0	-	80.0	65.0
	Bhola	90.0	60.0	100.0	70.0	95.0	60.0
	Fita	-	-	-	50.0		
3.	**Fresherganj**						
	Bagga	130.0	85.0	120.0	75.0	115.0	65.0
	Hilsha	650.0	375.0	675.0	425.0	600.0	330.0
	Mackrool	170.5	-	180.0	-	165.0	-
	Mix Fish	-	44.0	-	43.0	-	40.8
	Kokila	115.0	95.0	107.0	95.0	105.4	87.0
	Pomfret	487.5	275.0	500.0	330.0	430.0	310.0
	Prawn	470.0	150.0	-	-	450.0	160.0
	Rani	65.0	-	75.0	40.0	80.0	-
	Bhola	95.0	65.0	105.0	75.0	100.0	70.0
	Tur	175.0	-	160.0	-	150.0	-

Source: Field Survey Data.

Table 5.6b: Species wise Value of Fish (FM)

Sr. No.	Harbour	Specieswise Value of Fish (BO) – Av. Price Rs./kg					
		Oct - Dec 2014		Jan to Mar 2015		April to Sep2015	
1	**Sankarpur**	Grade I	Grade II	Grade I	Grade II	Grade I	Grade II
	Bagga	115.0	78.0	113.0	68.0	108.0	59.0
	Hilsha	590.0	345.0	645.0	400.0	540.0	300.0
	Mackrool	160.3	-	184.0	-	155.0	120.0
	Mix Fish	-	60.0	-	55.0	-	50.5
	Kokila	108.0	90.5	103.0	90.5	100.0	85.5
	Pomfret	390.0	245.0	445.0	300.0	410.0	260.0
	Prawn	440.0	140.0	-	-	400.0	115.0
	Rani(Kaoa)	60.0	-	70.0	-	80.0	-
	Bhola	92.0	60.0	102.0	70.0	90.0	60.0
	Fita	-	-	-	50.0	-	60.0
2.	**Petuaghat**						
	Bagga	115.0	78.0	113.0	68.0	108.0	59.0
	Hilsha	590.0	345.0	645.0	400.0	540.0	300.0
	Mackrool	160.3	-	184.0	-	155.0	120.0
	Mix Fish	-	60.0	-	55.0	-	50.5
	Kokila	108.0	90.5	103.0	90.5	100.0	85.5
	Pomfret	390.0	245.0	445.0	300.0	410.0	260.0
	Prawn	440.0	140.0	-	-	400.0	115.0
	Rani	60.0	-	70.0	-	80.0	-
	Bhola	92.0	60.0	102.0	70.0	90.0	60.0
	Fita	-	-	-	50.0	-	60.0
3.	**Fresherganj**						
	Bagga	130.0	80.0	115.0	70.0	112.0	63.0
	Hilsha	640.0	370.0	670.0	420.0	600.0	325.0
	Mackrool	170.5	-	178.0	-	162.0	-
	Mix Fish	-	45.0	-	43.0	-	40.8
	Kokila	112.0	95.0	105.0	93.0	102.4	85.0
	Pomfret	487.5	275.0	500.0	330.0	430.0	310.0
	Prawn	467.0	150.0	-	-	445.0	162.0
	Rani	67.0	-	78.0	40.0	82.0	-
	Bhola	95.0	62.0	103.0	75.0	100.0	70.0
	Tur	170.0	-	160.0	-	150.0	-

Source: Field Survey Data.

5.2.7 Causes of Losses in Fish Value

In the first chapter on the sub heading of “limitation of the study” we have stared that finding out the causes of losses in marine fisheries was not an easy task. No readymade module or formula was available as accountancy for assessing the method was very poor. Moreover, we have categorically stated that the information at this

perspective we received from the memory of the fishermen though a huge experience in post-handling operation in them helped us in assessing the losses. Besides, within such subjective bottlenecks have objectively tried to find out and assess the losses during this reference period as meticulously as we could. A well-structured questionnaire incorporating the relevant points for assessing post-harvest losses were canvassed among boat owners and fishermen. Besides technical knowhow some other socio-economic aspects viz. advance payment, method of sale coupled with existence of intermediaries were also taken into account.

An overall picture of economic loss in terms of low market rate (Rs. /Kg.) due to poor post-harvest infrastructure shows the farmers and boat owners received at least Rs.14.6 less in per kilogram to its actual value. The figure is less for the BO (13.4) and higher in case of fishermen (15.9). In case of physical damage, the boat owners suffer less than the fishermen. 36.7 per cent of the physical damage during fishing was recorded for these categories of respondents; the corresponding figure for the fishermen is 44.3 per cent. It somehow proves that better icing and provision for adequate protection and availability of dumping space is more to the Boat owners than fisherman.

Financing to marine fisheries play an important role in post-harvest management in these sectors no doubt. Mode of financing, pre-arranged agreement of the wholesales and fishermen during disposal of catch and method of sale (auction) in the wholesale market influence the market process. The noteworthy picture available in all markets that in most of the business centres there are pre-arranged financing system with the fishermen. The wholesalers or the agents of wholesalers usually play a proactive role in such arrangements. This mode of financing influence negatively to the price/value of fishes resulting a huge economic loss to the harvester. Both in the cases of boat owners and fishermen the method of sale and receipt of money well in advance of auction is rampant in the study area. Among fishermen 67.8 per cent are engaged with pre-arranged financing with the money tenders, the corresponding figure for the boat owners are 40.00 per cent, much less than their fishing counterpart. [Table 5.7(a),5.7(b),5.7(c)].

Table 5.7a: Causes of Losses of Fish Value (ALL)

Sr. No.	Particulars	Causes of losses of fish value (ALL)															
		Shankarpur (n=20)				Petuaghat (n=20)				Fresherganj (n=20)				ALL (n=60)			
		Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.
I	Economic loss in terms of low market rate-Rs./kg due to poor post harvest infrastructure	14.5	13.3	13.1	13.6	15.2	14.5	14.5	14.7	16.3	15.6	15.7	15.9	15.3	14.5	15.8	14.6
II	**Causes of Fish Losses (% respondent to total)**																
A)	**Type of causes**																
a	Physical damage during fishing-1,	50	45	45	46.6	50	45	35	43.3	45	30	40	38.3	45	35	41.6	40.5
b	Spoilage due to improper icing-2,	15	20	25	20	15	10	20	15	15	30	20	21.6	15	26.6	23.3	21.6
b	fish eaten by birds-3,	0	0	5	1.6	0	0	5	1.6	0	0	0	0	0	0	5	1.6
d	1+2	35	34	25	31.6	35	45	40	40	40	40	40	40	40	38.3	30	36.1
B)	**Kind of craft**																
a	Trawlers-1,	80	80	75	78.3	80	80	75	78.3	60	65	55	60	71.7	75	68.3	71.7
b	Gill neters-2,	20	15	15	16.6	15	15	10	13.3	25	20	30	25	21.6	16.6	18.3	18.8
c	Deep sea trawlers-3,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
d	long liner for Tuna-4,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
e	Squid jigging-5,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
f	shore seining-6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
g	1+2	0	5	10	5	5	5	15	8.3	15	15	15	15	6.6	8.3	13.3	9.4
h	2+3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C)	**Method of sale**																
a	Auction-1,	45	50	45	46.6	25	35	25	28.3	35	25	35	31.7	35	36.6	35	35.5
b	Pre agreed -2,	25	25	25	25.0	25	20	35	26.6	20	25	40	28.3	23.3	23.3	33.3	26.7
c	contract 3	10	10	5	8.3	35	40	35	36.6	40	40	25	35.0	28.3	30	21.6	26.6
d	Auction + Pre agreed	5	0	15	6.7	0	5	5	3.3	0	0	0	0	1.6	5	6.6	4.4
e	Pre agreed + Contract	15	15	10	13.3	15	0	0	5	5	10	0	5	11.6	5	3.3	6.6
D)	**Receipt of money**																
a	in advance-1 ,	55	55	60	56.6	40	50	60	50	55	40	50	48.3	50	50	61.7	53.9
b	in same day-2,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
c	in a week time-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
d	in 15 days-4	15	20	10	15	15	25	10	16.6	15	10	20	13.3	15	16.7	13.3	15.1
e	1+4	25	25	25	25	35	15	25	25	15	35	20	25.0	25	25	18.3	22.7
f	1+2	5	0	5	3.3	10	10	5	8.3	15	15	10	13.3	10	8.3	6.6	8.3

Source: Field Survey Data.

Table 5.7b: Causes of Losses of Fish Value (BO)

Sr. No.	Particulars	Causes of losses of fish value (BO)															
		Shankarpur (n=10)				Petuaghat (n=10)				Fresherganj (n=10)				ALL (n=30)			
		Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.
I	Economic loss in terms of low market rate-Rs./kg due to poor post harvest infrastructure	13.5	12.5	12.2	12.7	14.0	13.0	13.5	13.5	15.0	14.8	14.5	14.8	14.2	13.4	16.1	13.4
II	**Causes of Fish Losses (% respondent to total)**																
A)	**Type of causes**																
a	Physical damage during fishing-1,	60	50	40	50.0	50	50	40	46.7	30	20	30	26.7	40	30	40	36.7
b	Spoilage due to improper icing-2,	0	0	20	6.7	0	0	10	3.3	0	20	20	13.3	0	20	20	13.3
b	fish eaten by birds-3,	0	0	10	3.3	0	0	10	3.3	0	0	0	0.0	0	0	10	3.3
d	1+2	40	50	30	40.0	50	50	40	46.7	70	60	50	60.0	60	50	30	46.7
B)	**Kind of craft**																
a	Trawlers-1,	80	90	70	80.0	90	80	60	76.7	60	50	50	53.3	76.7	73.3	60.0	70.0
b	Gill neters-2,	20	0	10	10.0	0	10	10	6.6	10	20	20	16.7	10.0	10.0	13.3	11.1
c	Deep sea trawlers-3,	0	0	0	0.0	0	0	0	0.0	0	0	0	0	0	0	0	0
d	long liner for Tuna-4,	0	0	0	0.0	0	0	0	0.0	0	0	0	0	0	0	0	0
e	Squid jigging-5,	0	0	0	0.0	0	0	0	0.0	0	0	0	0	0	0	0	0
f	shore seining-6	0	0	0	0.0	0	0	0	0.0	0	0	0	0	0	0	0	0
g	1+2	0	10	20	10.0	10	10	30	16.7	30	30	30	30	13.3	16.7	26.7	18.9
h	2+3	0	0	0	0.0	0	0	0	0.0	0	0	0	0	0	0	0	0
C)	**Method of sale**																
a	Auction-1,	40	50	40	43.3	30	40	30	33.3	40	30	40	36.7	36.7	40.0	36.7	37.8
b	Pre agreed -2,	20	10	30	20.0	30	20	40	30.0	20	20	40	26.7	23.3	16.7	36.7	25.6
c	contract 3	20	20	0	13.3	20	30	20	23.3	40	30	20	30.0	26.7	26.7	13.3	22.2
d	Auction + Pre agreed	0	0	20	6.7	0	10	10	6.7	0	0	0	0.0	0.0	10.0	10.0	6.7
e	Pre agreed + Contract	20	20	10	16.7	20	0	0	6.7	0	20	0	6.7	13.3	6.7	3.3	7.8
D)	**Receipt of money**																
a	in advance-1 ,	40	30	50	40.0	30	40	50	40.0	50	30	40	40.0	40.0	33.3	46.7	40.0
b	in same day-2,	0	0	0	0	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0
c	in a week time-3	0	0	0	0	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0
d	in 15 days-4	30	40	20	30.0	20	30	20	23.3	20	10	40	20.0	23.3	26.7	26.7	25.6
e	1+4	20	30	20	23.3	30	10	20	20.0	0	30	0	13.3	16.7	23.3	13.3	17.8
f	1+2	10	0	10	6.7	20	20	10	16.7	30	30	20	26.7	20.0	16.7	13.3	16.7

Source: Field Survey Data.

Table 5.7c: Causes of Losses of Fish Value (FM)

Sr. No.	Particulars	Causes of losses of fish value (FM)															
		Shankarpur (n=10)				Petuaghat (n=10)				Fresherganj (n=10)				ALL (n=30)			
		Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.
I	Economic loss in terms of low market rate-Rs./kg due to poor post harvest infrastructure	15.5	14.2	14.0	14.6	16.5	16.0	15.5	16.0	17.5	16.5	17.0	17.0	16.5	15.6	15.5	15.9
II	**Causes of Fish Losses (% respondent to total)**																
A)	**Type of causes**																
a	Physical damage during fishing-1,	40	40	50	43.3	50	40	30	40.0	60	40	50	50.0	50.0	40.0	43.3	44.3
b	Spoilage due to improper icing-2,	30	40	30	33.3	30	20	30	26.7	30	40	20	30.0	30.0	33.3	26.7	30.0
b	fish eaten by birds-3,	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
d	1+2	30	20	20	23.3	20	40	40	33.3	10	20	30	20.0	20.0	26.7	30.0	25.6
B)	**Kind of craft**																
a	Trawlers-1,	80	70	80	76.7	70	80	90	80.0	60	80	60	66.7	66.7	76.7	76.7	73.4
b	Gill neters-2,	20	30	20	23.3	30	20	10	20.0	40	20	40	33.3	33.3	23.3	23.3	26.6
c	Deep sea trawlers-3,	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
d	long liner for Tuna-4,	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
e	Squid jigging-5,	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
f	shore seining-6	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
g	1+2	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
h	2+3	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
C)	**Method of sale**																
a	Auction-1,	50	50	50	50.0	20	30	20	23.3	30	20	30	26.7	33.3	33.3	33.3	33.3
b	Pre agreed -2,	30	40	20	30.0	20	20	30	23.3	20	30	40	30.0	23.3	30.0	30.0	27.8
c	contract 3	0	0	10	3.3	50	50	50	50.0	40	50	30	40.0	30.0	33.3	30.0	31.1
d	Auction + Pre agreed	10	0	10	6.7	0	0	0	0.0	0	0	0	0.0	3.3	0.0	3.3	2.2
e	Pre agreed + Contract	10	10	10	10.0	10	0	0	3.3	10	0	0	3.3	10.0	3.3	3.3	5.5
D)	**Receipt of money**																
a	in advance-1 ,	70	80	70	73.3	50	60	70	60.0	60	50	60	56.7	60.0	66.7	76.7	67.8
b	in same day-2,	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
c	in a week time-3	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
d	in 15 days-4	0	0	0	0.0	10	20	0	10.0	10	10	0	6.7	6.7	6.7	0.0	4.5
e	1+4	30	20	30	26.7	40	20	30	30.0	30	40	40	36.7	33.3	26.7	23.3	27.7
f	1+2	0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0.0	0.0

Source: Field Survey Data.

5.2.8 Time and Cost incurred in Fishing Activity

Timing is an important constituent of marine fisheries. Unlike inland fisheries the vessels crafts and the deep sea trawlers run in various nautical miles, longer the distance more the man required for executing this operation and more the man, more the cost for meeting up the operational expenditure are to be taken into account. Hence, time and cost are both two important items of fish catching and post-harvesting management.

The boat owners with modern fleets and vessels usually catch fish more than 100 nautical miles beyond seashore. As more distance are covered, this operation needs more manpower, more fuel thus total operational cost increases with the distance covered by modern fleets. It is well reflected from the table-5.8(a), 5.8(b) and 5.8(c). Total cost for both of boat owners and fishermen varies to Rs 1.8 lakh/trip to Rs.2 lakh per trip. These costs include expenditure on food and water, labour cost, ice and fuel. Fuel cost measures almost 50 per cent of the total cost incurred in the fishing operation.

Table 5.8a: Details on Time and Cost incurred in Fishing Activity per trip (ALL)

Sr. No.	Particular	Unit / trip	Time and Cost incurred in Fishing Activity per trip (ALL)			
			Shankarpur	Petuaghat	Fresherganj	Over all
1	Fishing nets/instruments taken per fishing trip	Av. No.	11.40	12.25	10.35	11.31
2	Distance of the fishing ground from the shore	Nautical miles	12.50	11.35	12.50	11.78
3	Approximate time taken for fishing	hrs.	123.40	100.80	123.40	99.10
4	Approximate time taken for landing/unloading		5.70	5.28	5.62	5.53
	a) Handling by (Machine) Mechanical Device	hrs.				
	b) Handling Manually	hrs.	5.70	5.28	5.62	5.53
5	Quantum of fuel taken on board the vessel (diesel)	Litres	2400	2540	1980	2306.67
6	Fuel utilized per each trip	Litres	2045	2300	1714	2019.67
7	Operational expenses/trip					
	a) Exp. on Food and Water	Rs.	21775.00	22725.00	17600.00	20700.00
	b) Fuel Cost	Rs.	115000.00	106750.00	85800.00	102516.67
	c) Hired labour cost	Rs.	14700.00	15850.00	14650.00	15066.67
	d) Ice cost	Rs.	20350.00	20850.00	13275.00	18158.33
	e) Any other expenditure	Rs.	31850.00	30750.00	21200.00	27933.33
	f) Total Cost	Rs.	203675.00	196925.00	152525.00	184375.00

Note: 1 Nautical mile= 1.852 km.

Source: Field Survey Data.

Table 5.8b: Details on Time and Cost incurred in Fishing Activity per trip (BO)

Sr. No.	Particular	Unit / trip	Time and Cost incurred in Fishing Activity (BO)			
			Shankarpur	Petuaghat	Fresherganj	Over all
1	Fishing nets/instruments taken per fishing trip	Av. No.	11.40	9.70	9.70	10.27
2	Distance of the fishing ground from the shore	Nautical miles	13.20	11.80	13.20	12.73
3	Approximate time taken for fishing	hrs.	133.00	100.80	133.00	122.26
4	Approximate time taken for landing/unloading		5.80	5.10	5.80	5.57
	a) Handling by (Machine) Mechanical Device	hrs.				
	b) Handling Manually	hrs.	5.80	5.10	5.80	5.57
5	Quantum of fuel taken on board the vessel (diesel)	Litres	2430	2550	2030	2336.67
6	Fuel utilized per each trip	Litres	1970	2290	1760	2006.67
7	Operational expenses/trip					
	a) Exp. on Food and Water	Rs.	21900.00	22200.00	18400.00	20833.33
	b) Fuel Cost	Rs.	114500.00	107500.00	88000.00	103333.33
	c) Hired labour cost	Rs.	15200.00	17200.00	16100.00	16166.67
	d) Ice cost	Rs.	20100.00	21600.00	14000.00	18566.67
	e) Any other expenditure	Rs.	32800.00	29800.00	23600.00	28733.33
	f) Total Cost	Rs.	204500.00	198300.00	160100.00	187633.33

Note: 1 Nautical mile= 1.852 km., Source: Field Survey Data.

Table 5.8c: Details on Time and Cost incurred in Fishing Activity per trip (FM)

Sr. No.	Particular	Unit / trip	Time and Cost incurred in Fishing Activity (FM)			
			Shankarpur	Petuaghat	Fresherganj	Over all
1	Fishing nets/instruments taken per fishing trip	Av. No.	11.4	14.8	11.0	12.4
2	Distance of the fishing ground from the shore	Nautical miles	11.80	10.90	11.80	11.50
3	Approximate time taken for fishing	hrs.	113.8	100.8	113.8	122.8
4	Approximate time taken for landing/unloading		5.60	5.45	5.45	5.50
	a) Handling by (Machine) Mechanical Device	hrs.				
	b) Handling Manually	hrs.	5.60	5.45	5.45	5.50
5	Quantum of fuel taken on board the vessel (diesel)	Litres	2370	2530	1930	2276067
6	Fuel utilized per each trip	Litres	2120	2310	1668	2032.67
7	Operational expenses/trip					
	a) Exp. on Food and Water	Rs.	21650.00	23250.00	16800.00	20566.67
	b) Fuel Cost	Rs.	115500.00	106000.00	83600.00	101700.00
	c) Hired labour cost	Rs.	14200.00	14500.00	13200.00	13966.67
	d) Ice cost	Rs.	20600.00	20100.00	12550.00	17750.00
	e) Any other expenditure	Rs.	30900.00	31700.00	18800.00	27133.33
	f) Total Cost	Rs.	202850.00	195550.00	144950.00	181116.67

Note: 1 Nautical mile= 1.852 km., Source: Field Survey Data.

5.2.9 Infrastructural facilities available on board of fishing vessel:

On board infrastructural facilities in the fishing vessel act as an important instrument in keeping harvested fish in order. Proper processing with icing and storing into insulated box ostensibly reduce physical deformation and decomposition of fish body. As in most of the cases harvesting through vessels take multi-day operation hence storing or dumping of fish till the period of unloading to harbour are carried out carefully and with tenderness.

Table 5.9a: Infrastructural facilities available on board of Fishing Vessel-ALL

Sr. No.	Particular	Infrastructural facilities available (ALL)			
		Shankarpur	Petuaghat	Freshergan j	Overall
A	Fish-hold capacity (tons)	14.20	12.40	11.35	12.65
B	Ice boxes boxes (No.)	8.65	8.20	4.80	7.22
C	Capacity in Kg	0.0	0.0	0.0	0.0
D	Insulated boxes (No.)	0.0	0.0	0.0	0.0
E	Capacity in Kg	0.0	0.0	0.0	0.0
F	Facilities for hauling the fish (%)				
	a) Dragging	35	50	37.5	40.83
	b) Lifting	65	50	62.5	59.17
F	Status of Fish hold(%)				
	a) Fresh	100	100	100	100.00
	b) Not Fresh	0	0	0	0.00
	c) Spoiled	0	0	0	0.00
G	Washing/cleaning facilities onboard (%)				
	a) yes	95	65	90	83.33
	b)No	5	35	10	16.67
H	Vessel has on-board processing facility – Yes (%)	80.0	50.0	70.0	66.67
	a)Icing facility	80.0	50.0	70.0	66.67
	Icing capacity (in tons)	11.50	9.90	9.95	10.45
	b) freezing facility	0	0	0	0.00
	c) canning facility	0	0	0	0.00
	d) smoking facility	0	0	0	0.00
	e) other facility	0	0	0	0.00
	c) Mode of disposal of waste fish: sorting on Board (% to total)	100	100	100	100
	d) Duration for sorting/grading of fishes on board (Hrs.)	1.27	1.17	1.27	1.25

Source: Field Survey Data.

Table 5.9(a) shows overall 83.33 per cent of respondents stated that washing or cleaning facilities on board are available. For boat owners the figures goes to 100

percent but in case of fishermen overall figure for this group in 70 per cent only. Table 5.9(b) and 5.9(c).

They carried iceboxes for storing purpose. Icing capacity on board for the boat owners are almost 12.20 tons it is slightly less for the fishermen. They used to carry ice on the board to the tune of maximum 8.4 ton. 40.83 per cent of fish are being dragged in to board for lifting; the figure for this purpose is 59.17 per cent respectively.

Table 5.9b: Infrastructural facilities available on board of Fishing Vessel (BO)

Sr. No.	Particular	Infrastructural facilities available (BO)			
		Shankarpur	Petuaghat	Fresherganj	Over all
A	Fish-hold capacity (tons)	12.00	14.50	10.60	12.37
B	Ice boxes (No.)	8.40	8.70	6.60	7.90
C	Capacity in Kg	-	-	-	-
D	Insulated boxes (No.)	0.0	0.0	0.0	0.0
E	Capacity in Kg	0.0	0.0	0.0	0.0
F	Facilities for hauling the fish (%)				
	a) Dragging	50	60	50	53.33
	b) Lifting	50	40	50	46.67
F	Status of Fish hold(%)				
	a) Fresh	100	100	100	100.0
	b) Not Fresh	0.0	0.0	0.0	0.00
	c) Spoiled	0.0	0.0	0.0	0.00
G	Washing/cleaning facilities onboard (%)				
	a) yes	100	100	100	100.00
	b)No	0.00	0.00	0.00	0.00
H	Vessel has on-board processing facility – Yes (%)	90.0	60.0	80.0	100.0
	a) Icing facility	90.0	60.0	80.0	100.0
	Icing capacity (in tons)	12.60	12.40	11.60	12.20
	b) freezing facility	0	0	0	0.00
	c) canning facility	0	0	0	0.00
	d) smoking facility	0	0	0	0.00
	e) other facility	0	0	0	0.00
	c) Mode of disposal of waste fish: sorting on Board (% to total)	100	100	100	100
	d) Duration for sorting/grading of fishes on board (Hrs.)	1.40	0.90	1.25	1.19

Source: Field Survey Data.

Table 5.9c: Infrastructural facilities available on board of Fishing Vessel (FM)

Sr. No.	Particular	Infrastructural facilities available (FM)			
		Shankarpur	Petuaghat	Freshergan j	Over all
A	Fish-hold capacity (tons)	16.40	10.30	12.10	12.93
B	Ice boxes boxes (No.)	8.90	7.70	3.00	6.53
C	Capacity in Kg	0.0	0.0	0.0	0.0
D	Insulated boxes (No.)	0.0	0.0	0.0	0.0
E	Capacity in Kg	0.0	0.0	0.0	0.0
F	Facilities for hauling the fish (%)				
	a) Dragging	20	40	25	28.3
	b) Lifting	80	60	75	71.7
F	Status of Fish hold(%)				
	a) Fresh	100	100	100	100
	b) Not Fresh	0.0	0.0	0.0	0.0
	c) Spoiled	0.0	0.0	0.0	0.0
G	Washing/cleaning facilities onboard (%)				
	a) yes	80	60	70	70.0
	b)No	20	40	30	30.0
H	Vessel has on-board processing facility – Yes (%)	70.0	40.0	60.0	100.0
	b) Icing facility	70	40	60	100
	Icing capacity (in tons)	9.50	7.40	8.30	8.40
	b) freezing facility	0	0	0	0.00
	c) canning facility	0	0	0	0.00
	d) smoking facility	0	0	0	0.00
	e) other facility	0	0	0	0.00
	c) Mode of disposal of waste fish: sorting on Board (% to total)	100	100	100	100
	d) Duration for sorting/grading of fishes on board (Hrs.)	1.15	1.45	1.30	1.30

Source: Field Survey Data.

5.2.10 Details on Low value Fish

Harvesting of young or juvenile fishes by the fishermen resembles with the story to kill the goose laid golden eggs every day. Out of greed and lack of non-vigilance (virtually no vigilance) on part of the government functionaries invite big problems in harvesting of marine fisheries in India, particularly in West Bengal. We will discuss this important item of problems in the subsequent stages of proceedings that a huge amount of baby hilsa (khoka illish) are being caught by the fishermen and in some

cases the entire catch are thrown away in the shore or in the river channel causing havoc to fisheries environment and huge national losses.

Table 5.10(a) reflects the overall details on low value of fish catch. It is estimated that overall 1.43 ton of total harvested fish are being treated as low value owing to juvenile fishing and 0.72 ton as miscellaneous/low value (due to spoilage). Overall, in each trip almost 50 per cent of the catches are treated as low value as far as price and quality of harvested fishes are concerned.

Table 5.10(b) and Table 5.10(c) give almost the same picture for the boat owners and fishermen in Shankarpur, Pituaghat and Fraserganj respectively.

Table 5.10a: Details on Low Value of Fish (All)

Sr. No.	**Particular**	**Details on Low Value of Fish/trip ALL**			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Quantity of fish treated as miscellaneous/low value (young fish)	1.41	1.45	1.45	1.43
2	Quantity of fish treated as miscellaneous/low value (due to spoilage) in tons	0.70	0.72	0.72	0.72
3	Percentage is classified as by-catch (use for fish meal)	50.00	49.98	49.98	49.99

Source: Field Survey Data.

Table 5.10b: Details on Low Value of Fish (BO)

Sr. No.	**Particular**	**Details on Low Value of Fish/trip- BO**			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Quantity of fish treated as miscellaneous/low value (young fish)	1.35	1.32	1.32	1.33
2	Quantity of fish treated as miscellaneous/low value (due to spoilage) in tons	0.68	0.66	0.66	0.66
3	Percentage is classified as by-catch (use for fish meal)	50.00	49.96	49.96	49.97

Source: Field Survey Data.

Table 5.10c: Details on Low Value of Fish (FM)

Sr. No.	Particular	Details on Low Value of Fish/trip- FM			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Quantity of fish treated as miscellaneous/low value (young fish)	1.46	1.58	1.58	1.54
2	Quantity of fish treated as miscellaneous/low value (due to spoilage) in tons	0.73	0.79	0.79	0.77
3	Percentage is classified as by-catch (use for fish meal)	50.00	50.00	50.00	50.00

Source: Field Survey Data.

5.2.11 Facilities on Sea Shore

Modern fisheries need some basic amenities. Availability of infrastructural development coupled with basic amenities of the people is the pre-requisite of the concept of modern fisheries development. Shankarpur and Petuaghat in Purba Medinipur (East Midnapore) are two famous harbours not only in West Bengal but in India as well. Fraserganj in South 24 Parganas has long tradition of fish harbouring and fish landing. The overall picture regarding facilities available in those three important fish harbours gives a very pathetic picture. Overall 66.7 per cent of the respondent is unsatisfied with the landing platform available. Hundred per cent of the respondents clearly give their negative views about the existing washing, cleaning, facilities available there. Though there are storage facilities, chill plants, ice plants, flake ice plants and insulated vans are available – but they are not adequately enough to cater the practical need of the quantum of fish harvested. Regarding communication and approach road facilities, we have with ourselves no such encouraging figure to register. Almost 90 per cent of the respondents explicitly stated about the dilapidated condition and space available on approach roads and other mode of communication. Regarding basic facilities viz. – availability of drinking water, toilet and sanitation every one of them have categorically raised their voices against existing of such inhumanly ambience of basic needs and lackadaisical attitude of the management to improve the situation. In Fraserganj we have seen three numbers of lavatories exist for usage of 1000 people, more so doors are broken; roofs are completely in dilapidated

condition. Such pathetic in hygienic condition prevailing in all three fish harbours have enough reasons for contaminating fishes landed on that vicinity. [Table 5.11(a), 5.11(b), 5.11(c)]

Table 5.11a: Facilities on the Sea Shore (All)

Sr. No.	Particular	Facilities on the shore (% to total) ALL-%			
		Shankarpur	Petuaghat	Fraserganj	Overall
A	Landing platform				
	a) Satisfied	0.0	100.0	0.0	33.3
	b) Unsatisfied	100.0	0.0	100.0	66.7
B	Washing/cleaning facilities available	100.0	100.0	100.0	100.0
	a) satisfactory-1,	0.0	0.0	0.0	0.0
	b) unsatisfactory-2,	100.0	100.0	100.0	100.0
	c) very poor-3	0.0	0.0	0.0	0.0
C	Storage facilities	100.0	100.0	100.0	100.0
	i) Chill plants	100.0	100.0	100.0	100.0
	ii) Cold storage	0.0	0.0	0.0	0.0
	iii) ice plants	100.0	100.0	100.0	100.0
	iv) Flake ice plants	100.0	100.0	100.0	100.0
	v) Insulated vans	100.0	100.0	100.0	100.0
D	Drainage facilities				
	a) Yes	100.0	100.0	100.0	100.0
	b) No	0.0	0.0	0.0	0.0
E	Communication & approach facilities				
	a) Satisfactory	10.0	0.0	0.0	3.3
	b) Unsatisfactory	70.0	70.0	70.0	70.0
	c) Very poor	20.0	30.0	30.0	26.7
F	Drinking water facilities				
	a) Satisfactory	0.0	0.0	0.0	0.0
	b) Unsatisfactory	95.0	70.0	75.0	80.0
	c) Very poor	5.0	30.0	25.0	20.0
G	Parking facilities				
	a) Satisfactory	0.0	0.0	15.0	5.0
	b) Unsatisfactory	95.0	65.0	55.0	71.7
	c) Very poor	5.0	35.0	30.0	23.3
H	Toilet/sanitation facilities				
	a) Satisfactory	0.0	0.0	0.0	0.0
	b) Unsatisfactory	95.0	70.0	35.0	70.0
	c) Very poor	5.0	30.0	65.0	33.3
I	Solar fish dryer	0.00	0.00	0.00	0.00

Source: Field Survey Data.

Table 5.11b: Facilities on the Sea Shore (BO)

Sr. No.	Particular	Facilities on the shore (% to total) BO-%			
		Shankarpur	Petuaghat	Fraserganj	Overall
A	Landing platform				
	a) Satisfied	0.0	100.0	0.0	33.3
	b) Unsatisfied	100.0	0.0	100.0	66.7
B	Washing/cleaning facilities available	100.0	100.0	100.0	100.0
	a) satisfactory-1,	0.0	0.0	0.0	0.0
	b) unsatisfactory-2,	100.0	100.0	100.0	100.0
	c) very poor-3	0.0	0.0	0.0	0.0
C	**Storage facilities**	100.00	100.0	100.0	100.0
	i) Chill plants	100.0	100.0	100.0	100.0
	ii) Cold storage	0.0	0.0	0.0	0.0
	iii) ice plants	100.0	100.0	100.0	100.0
	iv) Flake ice plants	100.0	100.0	100.0	100.0
	v) Insulated vans	100.0	100.0	100.0	100.0
D	Drainage facilities				
	a) Yes	100.0	100.0	100.0	100.0
	b) No	0.0	0.0	0.0	0.0
E	Communication & approach facilities				
	a) Satisfactory	0.0	0.0	0.0	0.0
	b) Unsatisfactory	80.0	80.0	80.0	80.0
	c) Very poor	20.0	20.0	20.0	20.0
F	Drinking water facilities				
	a) Satisfactory	0.0	0.0	0.0	0.0
	b) Unsatisfactory	90.0	70.0	70.0	76.7
	c) Very poor	10.0	30.0	30.0	23.3
G	Parking facilities				
	a) Satisfactory	0.0	0.0	0.0	0.0
	b) Unsatisfactory	90.0	80.0	70.0	80.0
	c) Very poor	10.0	20.0	30.0	20.0
H	Toilet/sanitation facilities				
	a) Satisfactory	0.0	0.0	0.0	0.0
	b) Unsatisfactory	90.0	80.0	40.0	70.0
	c) Very poor	10.0	20.0	60.0	30.0
I	Solar fish dryer	0.00	0.00	0.00	0.00

Source: Field Survey Data.

Table 5.11c: Facilities on the Sea Shore (FM)

Sr. No.	Particular	Facilities on the shore (% to total) FM-%			
		Shankarpur	Petuaghat	Fraserganj	Overall
A	Landing platform				
	a) Satisfied	0.0	100.0	0.0	33.3
	b) Unsatisfied	100.0	0.0	100.0	66.7
B	Washing/cleaning facilities available	100.0	100.0	100.0	100.0
	a) satisfactory-1,	0.0	0.0	0.0	0.0
	b) unsatisfactory-2,	100.0	100.0	100.0	100.0
	c) very poor-3	0.0	0.0	0.0	0.0
C	**Storage facilities**	100.00	100.00	100.0	100.0
	i) Chill plants	100.0	100.0	100.0	100.0
	ii) Cold storage	0.0	0.0	0.0	0.0
	iii) ice plants	100.0	100.0	100.0	100.0
	iv) Flake ice plants	100.0	100.0	100.0	100.0
	v) Insulated vans	100.0	100.0	100.0	100.0
D	Drainage facilities				
	a) Yes	100.0	100.0	100.0	100.0
	b) No	0.0	0.0	0.0	0.0
E	Communication & approach facilities				
	a) Satisfactory	20.0	0.0	0.0	6.7
	b) Unsatisfactory	60.0	60.0	60.0	60.0
	c) Very poor	20.0	40.0	40.0	33.3
F	Drinking water facilities				
	a) Satisfactory	0.0	0.0	0.0	0.0
	b) Unsatisfactory	100.0	70.0	80.0	83.3
	c) Very poor	0.0	30.0	20.0	16.7
G	Parking facilities				
	a) Satisfactory	0.0	0.0	30.0	10.0
	b) Unsatisfactory	100.0	50.0	40.0	63.3
	c) Very poor	0.0	50.0	30.0	26.7
H	Toilet/sanitation facilities				
	a) Satisfactory	0.0	0.0	0.0	0.0
	b) Unsatisfactory	100.0	60.0	30.0	63.3
	c) Very poor	0.0	40.0	70.0	36.7
I	Solar fish dryer	0.00	0.00	0.00	0.00

Source: Field Survey Data.

5.2.12 Facilities away from Sea Shore

Modern day marine fisheries are associated with availability of chilling plants, cold storage, ice plants, flake ice plants, insulated boxes and vans, transport and communication etc. Earlier, we have referred a number of times that these three fish

harbours are famous for registering their ever-growing quantum of business. Hundreds and thousands of population are directly or indirectly engaged economically with marine fisheries and hence, naturally market driven forces has induced other basic infrastructure to grow and develop. Due to huge transaction and volume of fishing in these areas, both private and public enterprises have set up chill plants, ice plants, ice flake plants. All these plants have been setup at the vicinity of the buffer zone yet, as far as the requirement is concerned it is considered as minimal and there is huge scope for enhancing the facilities by setting up more and more plants to cater the emergent need of the fishermen. This will help them in reducing quantum of degradation of perishable fishing catches to a minimum extent. [Table 5.12(a), 5.12(b), 5.12(c)]

Table 5.12a: Details on Distance of Facilities away from the Sea Shore (All)

Sr. No.	Particulars	Distance of Facilities away from the Sea Shore (in kms)			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Chill plants	6.00	5.00	5.00	5.33
2	Cold storage	10.00	10.00	12.00	10.67
3	Ice plants	6.00	5.00	5.00	5.33
4	Flake ice plants	6.00	5.00	5.00	5.33
5	Insulated vans	1.90	1.65	1.65	1.73

Source: Field Survey Data.

Table 5.12b: Details on Distance of Facilities away from the Sea Shore (BO)

Sr. No.	Particulars	Distance of Facilities away from the Sea Shore (in kms)-BO			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Chill plants	6.00	5.00	5.00	5.33
2	Cold storage	10.00	10.00	12.00	10.67
3	Ice plants	6.00	5.00	5.00	5.33
4	Flake ice plants	6.00	5.00	5.00	5.33
5	Insulated vans	1.80	1.40	1.60	1.60

Source: Field Survey Data.

Table 5.12c: Details on Distance of Facilities away from the Sea Shore (FM)

Sr. No.	Particulars	Distance of Facilities away from the Sea Shore (in kms)-FM			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Chill plants	6.00	5.00	5.00	5.33
2	Cold storage	10.00	10.00	12.00	10.67
3	Ice plants	6.00	5.00	5.00	5.33
4	Flake ice plants	6.00	5.00	5.00	5.33
5	Insulated vans	2.00	1.90	1.70	1.87

Source: Field Survey Data.

5.2.13 Transport of Raw Fish

Details have been discussed about the infrastructural availability in these three fish-harbouring centres. As marine fishes are gaining momentum and more and more scientific appliances are being gradually introduced for bringing a qualitative change in post-harvest operation. Post-harvest operation needs thermal boxes, ice boxes, insulated boxes and van for reducing the decomposition ratio or the physical damage of the catching fishes. Needless to mention all these items are inadequately available in Shankarpur, Petuaghat and Fraserganj fish harbours. [Table 5.13(a), 5.13(b), 5.13(c)]

Table 5.13a: Details on Transport of Raw Materials-Fish (ALL)

Sr. No.	Particulars	**Details on Transport of raw materials** ALL			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Insulated van (%)				
	a) Yes	100.0	100.0	100.0	100.0
	b) No	0.0	0.0	0.0	0.0
2	Fishes stacked (%)				
	I) Ice Box	0.0	5.0	0.0	1.7
	ii) Insulated boxes	75.0	75.0	0.0	50.0
	iii)Ice box & Insulated box	25.0	15.0	100.0	46.7
	iv) Thermal boxes	0.0	5.0	0.0	1.7
	v) trolley	0.0	0.0	0.0	0.0
3	Grading/sorting (%)				
	i) On board	100.0	100.0	100.0	100.0
	ii) On landing shore				

Source: Field Survey Data.

Table 5.13b: Details on Transport of Raw Materials-Fish (BO)

Sr. No.	Particulars	**Details on Transport of raw materials** BO			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Insulated van				
	a) Yes	100.0	100.0	100.0	100.0
	b) No	0.0	0.0	0.0	0.0
2	Fishes stacked				
	i) Ice box	0.0	10.0	0.0	3.3
	ii) Insulated boxes	80.0	60.0	0.0	46.7
	iii)Ice box & Insulated box	20.0	20.0	100.0	46.7
	iv) Thermal boxes	0.0	10.0	0.0	3.3
	v) trolley	0.0	0.0	0.0	0.0
3	Grading/sorting				
	i) On board	100.0	100.0	100.0	100.0
	ii) On landing shore				

Source: Field Survey Data.

Table 5.13c: Details on Transport of Raw Materials-Fish (FM)

Sr. No.	Particulars	**Details on Transport of raw materials** FM			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Insulated van				
	a) Yes	100.0	100.0	100.0	100.0
	b) No	0.0	0.0	0.0	0.0
2	Fishes stacked				
	i) Ice box	0.0	0.0	0.0	0.0
	ii) Insulated boxes	70.0	90.0	0.0	53.3
	iii)Ice box & Insulated box	30.0	10.0	100.0	46.7
	iv) Thermal boxes	0.0	0.0	0.0	0.0
	v) trolley	0.0	0.0	0.0	0.0
3	Grading/sorting				
	i) On board	100.0	100.0	100.0	100.0
	ii) On landing shore				

Source: Field Survey Data.

5.2.14 Important Post-Harvest Facilities to Minimize Losses

It is imperative to note that no business or economic activities can ran smoothly without having any proper infrastructure and basic amenities. Post-harvest management in marine fisheries is not an exception of that. A proper and scientific infrastructure in landing platform helps the fishers in handling the fishes thus, existing of such facilities are to a formidable extent able to minimize losses of harvesting fish no doubt. During the discussion about the cleaning landing platform with washing and drainage facilities, availability of insulated storage boxes on board, availability of cold storage/ chill plants along with cold chain facilities both the respondents in unison advocated for setting up the above facilities in order to have proper post-harvest management in this area. Besides other cold chain facilities even they raised voices against inadequate supply of ice which is the basic requirement for initial stages for storing of catch fish on board or after landing. They made complaints the available ice blocks being purchased from the private sources are not at the quality supplied from the Government sources, moreover the weight of the ice blocks are less and price are higher.

For boat owner 90 per cent of the respondents demanded better cold-chain facilities where as in case of assessment of existing cold storages or chill plants 43.3 reported of them asked for more development of this system. Hundred per cent of the fishermen [Table 5.14(a), 5.14(b), 5.14(c)] delivered their opinion for bettering the existing cold chain systems where as in case of betterment of cleaner landing platform and availability of insulated storage boxes it varies from 30 per cent to 40 per cent and 10 per cent to 43.3 per cent respectively considering the opinion for all the harbours.

Table 5.14a: Important Post-harvest Facilities to Minimize Losses of Fishes- ALL

Sr. No.	Particulars	**Important Post harvest facilities to minimize losses of fishes-ALL**															
		Shankarpur				**Petuaghat**				**Fresherganj**				**Overall**			
		I	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**
1	A cleaner landing platform with washing and drainage facilities	35.0	30.0	35.0	0.0	40.0	35.0	25.0	0.0	40.0	35.0	25.0	0.0	38.3	33.3	28.3	0.0
2	Insulated storage boxes on board the fishing vessel	10.0	55.0	35.0	0.0	15.0	35.0	45.0	5.0	20.0	40.0	40.0	0.0	15.0	43.3	40.0	1.7
3	Cold storage/chill plants with in the FH premises	50.0	15.0	30.0	5.0	45.0	25.0	30.0	0.0	35.0	25.0	35.0	5.0	43.3	21.7	31.7	3.3
4	Cold Chain facility network	5.0	0.0	0.0	95.0	0.0	5.0	0.0	95.0	5.0	0.0	0.0	95.0	3.3	1.7	0.0	95.0

Source: Field Survey Data.

Table 5.14b: Important Post-harvest Facilities to Minimize Losses of Fishes - BO

Sr. No.	Particulars	Important Post harvest facilities to minimize losses of fishes-BO															
		Shankarpur				**Petuaghat**				**Fresherganj**				**Overall**			
		I	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**
1	A cleaner landing platform with washing and drainage facilities	40	20	40	0	40	40	20	0	30	40	30	0	36.7	33.3	30.0	0
2	Insulated storage boxes on board the fishing vessel	10	60	30	0	10	30	50	10	20	50	30	0	13.3	46.7	36.7	3.3
3	Cold storage/chill plants with in the FH premises	40	20	30	10	50	20	30	0	40	10	40	10	43.3	16.7	33.3	6.7
4	Cold Chain facility network	10	0	0	90	0	10	0	90	10	0	0	90	6.7	3.3	0.0	90.0

Source: Field Survey Data.

Table 5.14c: Important Post-harvest Facilities to Minimize Losses of Fishes - FM

Sr. No.	Particulars	Important Post harvest facilities to minimize losses of fishes-FM															
		Shankarpur				**Petuaghat**				**Fresherganj**				**Overall**			
		I	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**
1	A cleaner landing platform with washing and drainage facilities	30	40	30	0	40	30	30	0	50	30	20	0	40.0	33.3	26.7	0
2	Insulated storage boxes on board the fishing vessel	10	50	40	0	20	40	40	0	20	30	50	0	16.7	40.0	43.3	0
3	Cold storage/chill plants with in the FH premises	60	10	30	0	40	30	30	0	30	40	30	0	43.3	26.7	30.0	0
4	Cold Chain facility network	0	0	0	100	0	0	0	100	0	0	0	100	0.0	0	0	100

Source: Field Survey Data.

5.2.15 Losses due to Inadequate Post-Harvest Facilities on Shore

Main objective of the study is to assess and evaluate the post-harvest losses of marine fisheries along with identifying the main causes responsible for such huge economic losses owing to inadequate post-harvest facilities on shore in these harbouring areas.

An overall figure in Shankarpur, Petuaghat and Fraserganj reveals that losses incurred to almost 70 per cent within the loss range of 5 per cent to 15 per cent of total sale value. For fishermen the percentage is slightly higher (80 per cent) but for the boat owner 40 per cent of the losses lies within the range 15 per cent to 25 per cent of total sale value. [Table 5.15(a), 5.15(b), 5.15(c)]

Table 5.15a: Losses due to Inadequate Post Harvest facilities on Shore

Sr. No.	**Particulars**	**Losses due to Inadequate Post Harvest facilities on Shore (Percentage) ALL**			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Less than 1 % of total sale value	0.0	0.0	0.0	0.0
2	1-2 % of total sale value	0.0	0.0	0.0	0.0
3	2-5 % of total sale value	0.0	0.0	0.0	0.0
4	5-10 % of total sale value	35.0	35.0	35.0	35.0
5	10-15 % of total sale value	35.0	35.0	35.0	35.0
6	15-25 % of total sale value	30.0	30.0	30.0	30.0

Source: Field Survey Data.

Table 5.15b: Losses due to Inadequate Post Harvest facilities on Shore - BO

Sr. No.	**Particulars**	**Losses due to Inadequate Post Harvest facilities on Shore (Percentage) BO**			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Less than 1 % of total sale value	0.0	0.0	0.0	0.0
2	1-2 % of total sale value	0.0	0.0	0.0	0.0
3	2-5 % of total sale value	0.0	0.0	0.0	0.0
4	5-10 % of total sale value	30.0	30.0	30.0	30.0
5	10-15 % of total sale value	30.0	40.0	40.0	36.7
6	15-25 % of total sale value	40.0	30.0	30.0	33.3

Source: Field Survey Data.

Table 5.15c: Losses due to Inadequate Post Harvest facilities on Shore - FM

Sr. No.	Particulars	Losses due to Inadequate Post Harvest facilities on Shore (Percentage) FM			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Less than 1 % of total sale value	0.0	0.0	0.0	0.0
2	1-2 % of total sale value	0.0	0.0	0.0	0.0
3	2-5 % of total sale value	0.0	0.0	0.0	0.0
4	5-10 % of total sale value	40.0	40.0	40.0	40.0
5	10-15 % of total sale value	40.0	30.0	30.0	33.3
6	15-25 % of total sale value	20.0	30.0	30.0	26.7

Source: Field Survey Data.

5.2.16 Awareness about Fish Market

Awareness of the stakeholders about the operational fish market plays an important role in minimizing the losses to a reasonable extent. Distance of the wholesale market from the shore, number of intermediaries between fishermen and wholesaler and duration of landed fish to the markets are considered to be important and basic indicators of the post harvest operation. All these prevailing factors are necessary for quick disposal of harvested fish. Interestingly, as both the boat owners and fishermen operate in the same market and same intermediaries and wholesalers are involved in marketing of fishes we got almost the same information from both of these two respondents. Among these three harbours, Fraserganj is located distantly from the wholesale market and hence the fishers require more time for disposal of fishes than the fishermen of Shankarpur and Peatuaghat fish harbours. [Table 5.16(a), 5.16(b), 5.16(c)]

Table 5.16a: Awareness about the Fish Market - ALL

Sr. No.	Particulars	Awareness about the Fish Market –ALL			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Distance of the fish wholesale market from the shore (kms)	2.00	15.00	60.00	25.67
2	Intermediates between fisherman and wholesaler/retailers (Av. numbers)	3.00	4.00	5.00	4.00
3	Duration of transport of landed fish from the shore to the Market (minutes)	10.00	30.00	120.00	53.33

Source: Field Survey Data.

Table 5.16b: Awareness about the Fish Market - BO

Sr. No.	Particulars	Awareness about the Fish Market -BO			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Distance of the fish wholesale market from the shore (kms)	2.00	15.00	60.00	25.67
2	Intermediates between fisherman and wholesaler/retailers (Av. numbers)	3.00	4.00	5.00	4.00
3	Duration of transport of landed fish from the shore to the Market (minutes)	10.00	30.00	120.00	53.33

Source: Field Survey Data.

Table 5.16c: Awareness about the Fish Market - FM

Sr. No.	Particulars	Awareness about the Fish Market -FM			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Distance of the fish wholesale market from the shore (kms)	2.00	15.00	60.00	25.67
2	Intermediates between fisherman and wholesaler/retailers (Av. numbers)	3.00	4.00	5.00	4.00
3	Duration of transport of landed fish from the shore to the Market (minutes)	10.00	30.00	120.00	53.33

Source: Field Survey Data.

5.2.17 Problems faced by Boat Owners and Fishermen

Marine fisheries, nevertheless a hazardous job accepted by many as challenge to their occupation. Notwithstanding the natural calamities and frequent natural hazards, they have to make up their mind to live with this nature, as it is their sole source of livelihood. Despite natural vagaries the fishermen and the boat owners have to face number of problems and bottlenecks in course of their fisheries operation, Ostensibly, availabilities of adequate infrastructural facilities are important among them as they can ease their hardship and fishing activities facile and conducive for better management.

Table 5.17 has classified problems usually faced by the persons associated with the activities of marine fisheries. These problems include occurrence of cyclones, net and rope breaking, availability of high speed fleets, accident and medical related problems, communication with infrastructural amenities like drinking water, toilets, cold storages, parking lots and availability of fuel (diesel) and ice for proper preservation.

Interestingly, during the question they replied in an affirmative note that all of them are accustomed in dealing with such problems since the period they have been engaged in this occupation. In numerous occasions, they have tried to bring all these problems to the notice of proper administration for redressed but of no avail.

Post-harvest management in fisheries largely depends upon the system of stocking (fridging and ice availability) and quick transportation system. From Table 5.17 we find almost 90 per cent of the boat owner and 95 per cent of the fishermen stated availability of ice is a greater problem. Besides high rate, quality of ice purchased from the private sources affects volume of stocking / storing for catches enormously. Besides poor marketing facilities, almost 90 per cent of the boat owners and overall 93.3 per cent fishermen pointed out availability of cold storages also can be reckoned as one of the important factor for poor post-harvest operation in the fish harbouring and fish landing areas.

Stated earlier almost 87.3 per cent of the respondents including boat owners and fishermen in three fishing harbour regions have vehemently urged for better infrastructural facilities and to uplift the basic amenities to a better scientific and economic order than the actual position. The boat owners usually carry their products to the distant places in where the cold storages facilities are available; some of the boat owners who possess processing plants carry products to the processing plants directly from the wholesale markets.

The fishermen have to face number of bottlenecks after landing of fish and after auction. They have to be busy with arranging iceboxes, insulated boxes, and mode of transport for quick disposal of the product and this require a number of handling operation. Such type of frequent handling of harvested fish act as instrument of deterioration of physical quality of fish and mostly for the procrastinated process of transportation and disposal of fish they get slightly lower price than the boat owners though both of the groups do operate in the same market.

Table 5.17: Problems Faced by Boat Owners and Fishermen (%)

Sr. No.	BO/ FM	Problems	Problems (%respondents to total)			
			Shankarpur	Petuaghat	Fresherganj	Grand Total
A		**HARVESTING**				
	BO	Cyclone, net break, rope break, raining	20.0	30.0	40.0	30.0
		High quality fish are not available in last 5-6 years	10.0	10.0	10.0	10.0
		Lack medical facility	20.0	30.0	20.0	23.3
		Not having high speed boat, i.e. time consuming, more diesel consumption , cant took more quantity of fish	10.0	10.0	0.0	6.7
		Parking of boat is major problem	20.0	10.0	10.0	13.3
		Training & demonstration needed	0.0	0.0	10.0	3.3
		No Problem	20.0	10.0	10.0	13.3
		Total	**100.0**	**100.0**	**100.0**	**100.0**
	FM	Accident, medical problem (heart attack), wound etc, to get medical facility is difficulty ,cyclone, communication problem	20.0	30.0	40.0	30.0
		Availability of fish is away therefore distance of fishing increase	10.0	10.0	0.0	6.7
		Net break, rope break, cyclone	20.0	20.0	20.0	20.0
		Parking facility is not proper,	20.0	10.0	10.0	13.3
		Strom, cyclone, raining, bathing, drinking water, skin disease, tsunami, high wave	20.0	20.0	20.0	20.0
		No Problem	10.0	10.0	10.0	10.0
		Total	**100.0**	**100.0**	**100.0**	**100.0**
B		**COLD STORAGE**				
	BO	Cold storage facility is not available	80.0	90.0	90.0	86.7
		No Problem	20.0	10.0	10.0	13.3
		Total	100.0	100.0	100.0	100.0
	FM	Cold storage facilities is not available	90.0	95.0	95.0	93.3
		No Problem	10.0	5.0	5.0	6.7
		Total	100.0	100.0	100.0	100.0

Sr. No.	BO/ FM	Problems	Problems (%respondents to total)			
			Shankarpur	Petuaghat	Fresherganj	Grand Total
C		**MARKETING**				
	BO	Marketing facility is poor	50.0	70.0	80.0	66.7
		Price fluctuation	30.0	20.0	15.0	21.7
		No Problem	20.0	10.0	5.0	11.7
		Total	**100.0**	**100.0**	**100.0**	**100.0**
	FM	Low prices of fish	20.0	20.0	10.0	16.7
		Marketing facilities is poor.	30.0	40.0	40.0	36.7
		Pre-contract with wholesaler should be there	10.0	10.0	10.0	10.0
		Price fluctuation	20.0	15.0	20.0	18.3
		Washroom, water, drinking water is major problem	10.0	10.0	15.0	11.7
		No Problem	10.0	5.0	5.0	6.7
		Total	**100.0**	**100.0**	**100.0**	**100.0**
D		**ICE AVAILABILITY**				
	BO	Ice availability problem during peak season	80.0	90.0	90.0	86.7
		No Problem	20.0	10.0	10.0	13.3
		Total	100.0	100.0	100.0	100.0
	FM	High rate of ice in summer season	90.0	95.0	95.0	93.3
		No Problem	10.0	5.0	5.0	6.7
		Total	100.0	100.0	100.0	100.0
E		**FUEL AVAILABILITY**				
	BO	Irregular subsidy	20.0	20.0	30.0	23.3
		Shortage of diesel	60.0	70.0	60.0	63.3
		No Problem	20.0	10.0	10.0	13.3
		Total	100.0	100.0	100.0	100.0
	FM	Some time purchase in black	70.0	75.0	70.0	71.7
		Subsidy is not available	20.0	20.0	25.0	21.7
		No Ptoblem	10.0	5.0	5.0	6.7
		Total	100.0	100.0	100.0	100.0
F		**Any other suggestions**				
	BO	Diesel subsidy, storage facility is needed	10.0	20.0	30.0	20.0
		Make harbour hygiene	10.0	10.0	20.0	13.3
		Rules & regulation and advertisement is needed	10.0	10.0	10.0	10.0
		Total	30.0	40.0	60.0	43.3
	FM	Want platform, subsidy	20.0	30.0	40.0	30.0
		Total	20.0	30.0	40.0	30.0

Source: Field Survey Data.

5.3 Marketing of Fish

Fish markets adjacent to Shankarpur, Petuaghat (East Midnapore) and Fraserganj (South 24 Paraganas) are overwhelmingly dominated by the wholesalers.

Sometimes the wholesalers act as commission agent of the big trawler owners and with whom the trawler owner make a pre arrange marketing settlement to deal with with other boat owners and fishermen. The processing plants mostly are exporters of processed fish purchase fish directly from the wholesalers and the wholesalers in this case also play a mediating role between the processors and boat owners. Hilsha, Pomfret , Prawn are generally considered as high valued crops and besides these species wholesalers generally deal in other species and varieties also like Bhola, kaoa, Bagga, Fita, kokila , mackerol etc.

The wholesalers in unison have reported against the poor post harvest facilities and lack of basic amenities within the vicinity of fish harbours and fish landing centres. They belong to a very strong Association formed by all stakeholders and this association play numerous roles in framing and introducing fishing rules binding to all. Some basic infrastructural facilities including drinking water, toilets etc are made by the Association but it all these facilities are far behind of the required need. They maintain a good rapport with the Administration in other words the Administration with consultation with the executive members of the Fisheries Association frame infrastructural facilities plan and other programmes. Infrastructure of marketing dominates them all.

5.3.1 Wholesaler

5.3.1.1 Season –wise Fish Purchase by wholesaler

Five members of wholesalers each in Shankarpur, Petuaghat and Freserganj was taken for interview to have insight about quantity, price of purchase and sale during the all fishing session for the study.

It is seen from (Table 5.18,5.19 & 5.20) that among all fish catches Hilsha, Prawn, and Pomfret are more valuable than other fishes, not only that fishermen in these areas are found on fishing these three varieties more. It is reflected from the Tables that in Shankarpur taking all Seasons together quantity of prawn purchased by the whole seller is more than Hilsha and Pomfret. It is reported that in all cases they

took a margin of Rs. 15- 20/kg and dispose their sale to other wholesalers and retailers.

Table 5.18: Season-wise details of Fish purchases by Shankarpur Wholesaler

Sr. No.	Species	**Season-wise detail of fish purchases- Shankarpur (n=5)**			
		No. of wholesalers (WS)	Total Quantity of fish Purchase (tonne/WS)	Rate of Fish Purchase (Rs./ Kg)	Selling prices (Rs./ Kg)
I	**October to December 2014**				
	Bagga	1	100	120.0	132.0
	Hilsha	4	550	600.0	620.0
	Makool	1	200	164.0	175.0
	Mix Fish	-	-	-	-
	Kokila	2	40	110.0	120.5
	Pomfret	3	50	400.0	418.0
	Prawn	5	640	450.0	465.0
	Rani(Kaoa)	1	120	60.0	70.0
	Bhola	3	300	90.0	103.0
	Fita	1	30	50.0	60.0
II	**January to March 2015**				
	Bagga	2	110	115.0	128.0
	Hilsha	3	400	650.0	675.0
	Makool	4	210	186.0	200.0
	Mix Fish	1	40	40.0	50.0
	Kokila	2	300	105.0	118.0
	Pomfret	1	35	450.0	55.0
	Prawn	4	500	500.0	525.0
	Rani(Kaoa)	1	100	70.0	81.5
	Bhola	2	150	100.0	110.0
	Fita	1	25	55.0	65.0
III	**April to September 2015**				
	Bagga	2	120	110.0	120.0
	Hilsha	5	750	550.0	565.0
	Makool	2	200	160.0	170.0
	Mix Fish	1	80	35	45.0
	Kokila	2	150	103.0	115.0
	Pomfret	3	40	420.0	440.0
	Prawn	4	540	400.0	420.0
	Rani(Kaoa)	2	50	80.0	100
	Bhola	3	200	95.0	110.0
	Fita	1	30	50.0	62.0

Source: Field Survey Data

Table 5.19 : Season-wise detail of fish purchases by Petuaghat Wholesaler

Sr. No.	Species	Season-wise detail of fish purchases-Petuaghat (n=5)			
		No. of wholesalers (WS)	Total Quantity of fish Purchase (tonne/WS)	Rate of Fish Purchase (Rs./ Kg)	Selling prices (Rs./ Kg)
I	**October to December 2014**				
	Bagga	2	110	120.0	130.0
	Hilsha	3	400	600.0	625.0
	Makool	2	210	164.3	175.5
	Mix Fish	1	40	50.0	60.0
	Kokila	2	300	110.0	122.0
	Pomfret	2	35	400.0	420.5
	Prawn	4	500	450.0	470.0
	Rani(Kaoa)	1	100	60.0	70.5
	Bhola	2	150	90.0	105.0
	Fita	1	25	52.0	65.0
II	**January to March 2015**				
	Bagga	1	115	113.0	125.0
	Hilsha	2	350	645.0	665.0
	Makool	1	220	184.0	200.0
	Mix Fish	2	50	40.0	50.0
	Kokila	1	250	103.0	120.0
	Pomfret	3	45	445.0	460.0
	Prawn	3	300	430.0-	450.0
	Rani(Kaoa)	2	70.0	70.0	82.0
	Bhola	2	100.0	102.0	110.0
	Fita	1		60.0	70.0
III	**April to September 2015**				
	Bagga	2	345	108.0	118.3
	Hilsha	5	520	540.0	555.0
	Makool	2	250	155.0	165.0
	Mix Fish	1	100	50.0	60.0
	Kokila	2	110	100.0	112.0
	Pomfret	4	780	410.0	430.0
	Prawn	2	180	400.0	425.0
	Rani(Kaoa)	1	120	80.0	92.0
	Bhola	2	150	90.0	100.0
	Fita	1	30	50.0	60.0

Source: Field Survey Data

Table 5.20 : Season-wise detail of fish purchases by Fresherganj Wholesaler

Sr. No.	Species	Season-wise detail of fish purchases-Fresherganj (n=5)			
		No. of wholesalers (WS)	Total Quantity of fish Purchase (tonne/WS)	Rate of Fish Purchase (Rs./ Kg)	Selling prices (Rs./ Kg)
I	**October to December 2014**				
	Bagga	1	195	130.0	142.0
	Hilsha	3	300	650.0	670.0
	Makool	2	100	170.5	180.0
	Mix Fish	1	50	60.0	70.0
	Kokila	2	200	115.0	125.0
	Pomfret	4	250	487.5	500.0
	Prawn	3	300	470.0	490.0
	Rani(Kaoa)	1	150	65.0	76.0
	Bhola	2	250	95.0	110.0
	Tur	1	30	175.0	190.0
II	**January to March 2015**				
	Bagga	2	225	115.0	127.0
	Hilsha	2	250	670.0	690.0
	Makool	1	150	178.0	190.5
	Mix Fish	1	50	60.0	70.0
	Kokila	3	175	105.0	118.7
	Pomfret	5	200	500.0	520.0
	Prawn	3	250	550.0	565.0
	Rani(Kaoa)	1	100	78.0	90.0
	Bhola	2	190	103.0	115.2
	Tur	1	40	160.0	170.0
	April to September 2015				
III	Bagga	2	175	112.0	122.0
	Hilsha	5	320	600.0	625.0
	Makool	2	200	162.0	185.0
	Mix Fish	2	60	50.5	60.0
	Kokila	3	200	102.4	120.5
	Pomfret	4	250	430.0	450.0
	Prawn	3	300	445.0	470.0
	Rani(Kaoa)	1	150	82.0	100.0
	Bhola	2	200	100.0	113.0
	Tur	1	30	150.0	160.0

Source: Field Survey Data

5.3.1.2 Loss incurred by Wholesaler due to poor Post-harvest infrastructure

A season wise presentation of data during three season (Oct-Dec, Jan-Mar and April-Sept) excluding the barn period for the wholesalers in three different

harbours represents that overall 36.7 percent of the total loss occurred due to poor harvest infrastructure in the first session and the loss has been estimated to the tune of 11-15 percent. In shankarpur almost 60 per cent post-harvest losses is registered during the third session and its percentage are calculated as 6-10 percent. The same figure is available in the second session for Petuaghat harbour. The comparable figure for Freserganj during the same season is 60 per cent. It implies that the Wholesalers take adequate measure during the boon season for reducing the post harvest loss in order to minimize their economic losses as much as they could. (Table-5.21)

Table 5.21: Detail of Loss incurred by Wholesaler due to poor post harvest infrastructure

Sr. No.	Harbour/Loss Range	Loss of in wholesale market (% loss in fish value- Rs/kg)		
		Oct.- Dec. 2014	Jan.-Mar 2015	April Sept.2015
A	Shankarpur (n=5)			
1	1-5 %	30.0	40.0	30.0
2	6-10 %	40.0	50.0	60.0
3	11-15 %	30.0	10.0	10.0
B	Petuaghat (n=5)			
1	1-5 %	10.0	20.0	40.0
2	6-10 %	50.0	60.0	40.0
3	11-15 %	40.0	20.0	20.0
C	Fresherganj (n=5)			
1	1-5 %	20.0	30.0	40.0
2	6-10 %	40.0	50.0	30.0
3	11-15 %	40.0	20.0	30.0
D	All (n=15)			
1	1-5 %	20.0	30.0	36.7
2	6-10 %	43.3	53.3	43.3
3	11-15 %	36.7	16.7	20.0

Source: Field Survey Data

5.3.1.3 Facilities Availed by Wholesaler

Adequate supply of ice-blocks and that in time play a crucial rate for storing and dumping of fish during harvesting period. It is seen from Table 5.22 that overall 73.33 per cent of the wholesalers report against non-availability of adequate ice and 56.7 per cent report that also not available in time. In all three harbours adequacy and timelines of ice-blocks are serious concern to the wholesalers. In case of price stability

most of them responded in affirmative note, overall 40 per cent are them in view of price fluctuation. Price of ice-block almost same in all there harbours, it varies from Rs.124/q to 129/q, although the price rise slightly higher in season three i.e. during April- September.

Table 5.22: Supply of Ice to Wholesaler

Sr. No.	Particular	Supply of ice - Wholesaler			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Adequate (%)				
	Yes	30	20	30	26.66
	No	70	80	70	73.33
2	Timely (%)				
	Yes	40	50	40	43.30
	No	60	50	60	56.70
3	Uninterrupted (%)				
	Yes	40	60	80	60.00
	No	60	40	20	40.00
4	Stable Price of Ice (%)				
	Yes	80	60	40	60.00
	NO	20	40	60	40.00
5	Price of ice paid (Rs/Kg)	1.24	1.27	1.29	1.29
	a) Oct-Dec 2014	1.20	1.22	1.25	1.23
	b) Jan-March 2015	1.22	1.24	1.27	1.24
	c) Apr-sept 2015	1.30	1.34	1.36	1.33

Note: % to total wholesalers.
Source: Field Survey Data

5.3.1.4 Status of Fish Wholesale Markets

The wholesalers overwhelmingly dominate the fish markets in these three harbours. Most of the cases markets are not in modern shape and infrastructural facilities available are poor. It is seen that average capacity of wholesale market varied from 75 ton per day in Shankarpur to 15 ton per day in Petuaghat harbour. Most of the fish catch are transported to Shankarpur market to the wholesalers for auction and disposal after. Encouragingly insulated vehicle (mode of transport) is available in Sankarpur and Frasergunj. Overall figure in insulated mode of transportation is 53.33 percent though Petuaghat is lacking behind in exploiting these facility. On an average cold storage facility available for 400 ton of fish catch per day for these markets. Sankarpur has more capacity (650ton/day) and these harbours have more freezer boxes for storing and transporting to the cold storages as well. 80 per cent of the

whole sellers in Shankarpur have capacity to stock in bulk amount. As far as mode of marketing is concerned, 60 percent whole seller in Shankarpur practiced open auction, for Freserganj the figure is 40 percent. In case of direct selling almost 40 per cent of the wholesaler in Petuaghat and Freserganj are involved in such activities. (Table5.23)

Table 5.23: Details of Status of the Fish wholesale markets

S.N.	Particulars	Detail of Status of the fish wholesale markets (%) n=15			
		Shankarpur	Petuaghat	Freshergan j	Overall
1	Capacity of the wholesale market (Tons)	75	15	55	48.33
2	Linkage with other markets and consuming centres	90	10	80	60.00
	a) Number of markets (Av)	3	1	2	2.00
3	Type of transport				
	A) insulated	80	20	60	53.33
	B) non-insulated vehicles	20	80	40	46.67
4	Type of cold storage facilities				
	A) Cold storage	10	2	5	5.67
	Capacity of the wholesale market (Tons)	650	50	500	400.00
	B) freezer boxes	50	10	35	31.67
	Capacity of the wholesale market (Tons)	150	30	100	93.33
	C) Chill plants				
5	Regular fish supply				
	Yes	80	50	60	63.33
	No	20	50	40	36.67
6	Assured qualities				
	Yes	90	50	70	70.00
	No	10	50	30	30.00
7	Capacity to hold huge supplies	80	20	60	53.33
8	No capacity to hold huge supplies	20	80	40	46.67
	A) marketing activities				
	B) Open auction	60	10	40	36.67
	C) Direct sale	20	40	40	33.33
	D) Electronic bidding				
	E) other mode of transaction (Contract)	20	50	20	30.00
9	Staff involved (Ave)	20	8	15	14.33

Source: Field Survey Data

5.3.1.5 Bottle necks faced by the whole seller

It is revealed from Table 5.24 that the whole sellers face less difficulties/ problems in terms of supply, marketing of fish and upkeep of the marketing complex.

In case of storage facilities almost 76.33 percent of the wholesalers reported that the available facilities are not adequate. Adequate supply of ice and that in time act as inhibiting factor for fish decomposition. In order to prolonging the process of inevitable decomposition of fish uninterrupted, timely and adequate supply of fishes are essentials and that too within reasonable price.

Table 5.24: Details about Bottlenecks Faced by the Wholesalers

Sr. No.	Particulars	Bottlenecks Faced by the Wholesalers	
		Inadequate	adequate
1	In terms of Supply	20.00	80.0
2	In terms of marketing	40.00	60.0
3	In terms of upkeep of the market	50.00	50.0
4	Market Storage facilities	76.33	23.67

Source: Field Survey Data

5.3.2 Retailer

5.3.2.1 Marketing of Fish in Retail Market

Retailers are the main source of supply of fish to the consumers. The retailers of East Midnapore area supply bulk amount of fish to more than hundred hotels in Digha and nearby Contai town. Digha is one of the most attractive tourist spots in Bengal and geographically near to Kolkata. Each and every day thousands of commuters and tourists visit this place and fish lover Bengalese people taste various items and dishes of marine fishes, specially prepared by Hilsha, Pomfret and Prawn. Not only that they purchase fish from the retailers and fishermen (some of them occasionally act as retailer also) and carry it during their returning home. Hence, the retailers have to cater a bulk need of the consumers and except pricing they are quite satisfied with the availability of raw fish from the markets.

5.3.2.2 Socio Economic characteristics of Retailers in Fish Market

Retailers play a crucial role in fish marketing; virtually they are the main marketing channel through the bulk of the produce reaches to the kitchen of households. In this study almost 70 percent of the retailers are female and most of them are uneducated. In Petuaghat almost 90 percent of the female retailers are illiterate though they are capable of accounting by memory and traditional method.

Table 5.25: Socio- Economic Characteristics of Retailer

Sr. No.	Particulars	Socio- Economic Characteristics of Retailer (n=30)			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Age (Av.)	46.6	48.5	50.3	48.5
2	Gender (%)				
	i) Male	30.0	20.0	40.0	30.0
	ii) Female	70.0	80.0	60.0	70.0
3	**Education** (%)				
	Male				
	Illiterate	20	10	20	16.7
	Literate	80	90	80	83.3
	Female				
	Illiterate	80	90	80	83.3
	Literate	20	10	20	16.7

Source: Field Survey Data

5.3.2.3 Season Wise fish purchased and sold by the retailers

A detailed list of purchase and sell of major fishes harvested at Shankarpur, Petuaghat, and Fraserganj are given in Table no. 5.26, 5.27and5.28. It is seen in Shankarpur that both quantity and price of Hilsha are comparatively high during October- December in comparison to other two harvesting season. Hilsha price varies from Rs 40 /kg to 100/Kg while profit price may vary Rs. 10- Rs 100/Kg in these markets.

More or less price of prawn and the other fishes vary at the same tune as markets are adjacent and the wholesalers fix price as management in marketing through cartel is very much present there and obviously the retailer have to follow suit.

In marketing, source of goods is very important. A season wise categorization of source of fishes in these there markets reveals that broker/middle man plays a crucial role in marketing fish to the retailers. Considering the three seasons, over all figures for purchasing from the broker/ middleman is almost 57.8 per cent. In October- December at Shankarpur the figure is 70 per cent. Fishermen sometimes also sell directly to the retailer and the quantity taking all three markets together vary from 20-40 per cent throughout the years (Table 5.29).

Table 5.26: Season-wise details of Fish purchases by Shankarpur Retailer

Sr. No.	Species	Season-wise detail of fish purchases- Retailer-Shankarpur (n=10)			
		Fish Purchase (tonne/RL)	Rate of Fish Purchase (Rs./ Kg)	Fish sold (tonne/RL)	Selling prices (Rs./ Kg)
I	**October to December 2014**				
	Bagga	10	132.0	9	160.0
	Hilsha	40	620.0	40	640.0
	Mackrool	10	175.0	9	190.0
	Mix Fish	10	50.0	8	80.0
	Kokila	15	120.5	14	130.0
	Pomfret	25	418.0	25	450.0
	Prawn	5	465.0	5	500.0
	Rani(Kaoa)	10	70.0	9	90.0
	Bhola	15	103.0	14	120.0
	Fita	5	60.0	4	70.0
	ribbon fish	7	30.0	6	40.0
II	**January to March 2015**				
	Bagga	5	128.0	4.5	150.0
	Hilsha	20	675.0	19	700.0
	Mackrool	8	200.0	7.5	220.0
	Mix Fish	7	50.0	6	70.0
	Kokila	10	118.0	9	130.0
	Pomfret	30	450.0	30	480.0
	Prawn	6	525.0	6	550.0
	Rani(Kaoa)	12	81.5	10	100.0
	Bhola	10	110.0	9	125.0
	Fita	5	65.0	4	80.0
	ribbon fish	8	35.0	7	50.0
III	**April to September 2015**				
	Bagga	15	120.0	14	140.0
	Hilsha	60	565.0	58	600.0
	Mackrool	10	170.0	8	180.0
	Mix Fish	8	45.0	6	60.0
	Kokila	18	115.0	17	130.0
	Pomfret	20	440.0	20	470.0
	Prawn	15	420.0	15	460.0
	Rani(Kaoa)	14	100.0	12	120.0
	Bhola	12	110.0	10	140.0
	Fita	7	62.0	6	80.0
	Ribbon fish	9	30.0	8	40.0

Source: Field Survey Data

Table 5.27: Season-wise detail of fish purchases by Petuaghat Retailer

Sr. No.	Species	**Season-wise detail of fish purchases- Retailer- Petuaghat (n=10)**			
		Fish Purchase (tonne/RL)	Rate of Fish Purchase (Rs./ Kg)	Fish sold (tonne/RL)	Selling prices (Rs./ Kg)
I	**October to December 2014**				
	Bagga	10	135.0	9.5	150.0
	Hilsha	30	630.0	29.5	650.0
	Mackrool	8	175.0	7	90.0
	Mix Fish	12	55.0	10	70.0
	Kokila	17	120.0	15	136.0
	Pomfret	20	420.0	20	442.0
	Prawn	5	467.0	5	490.0
	Rani(Kaoa)	12	70.0	11	90.0
	Bhola	17	105.0	15	125.0
	Fita	5	60.0	4	75.0
	Ribon Fish	8	35.0	6	47.5
II	**January to March 2015**				
	Bagga	7	125.0	6	140.0
	Hilsha	20	680.0	20	700.0
	Mackrool	8	190.0	7	210.0
	Mix Fish	10	60.0	8	80.0
	Kokila	8	120.0	7	135.0
	Pomfret	25	455.0	25	480.0
	Prawn	5	530.0	5	550.0
	Rani(Kaoa)	10	85.0	8	100.0
	Bhola	10	110.0	8	130.0
	Fita	6	70.0	5	90.0
	Ribon Fish	7	35.0	6	50.0
III	**April to September 2015**				
	Bagga	12	125.0	10	142.0
	Hilsha	40	570.0	40	600.0
	Mackrool	12	175.0	10	200.0
	Mix Fish	10	50.0	8	70.0
	Kokila	18	115.0	16	136.0
	Pomfret	15	445.0	15	470.0
	Prawn	13	422.0	13	440.0
	Rani(Kaoa)	12	100.0	10	120.0
	Bhola	12	112.0	10	135.0
	Fita	7	62.0	6	80.0
	Ribon Fish	9	38.0	7	60.0

Source: Field Survey Data

Table 5.28: Season-wise detail of fish purchases by Fresherganj Retailer

Sr. No.	Species	**Season-wise detail of fish purchases- Retailer- Fresherganj (n=10)**			
		Fish Purchase (tonne/RL)	Rate of Fish Purchase (Rs./ Kg)	Fish sold (tonne/RL)	Selling prices (Rs./ Kg)
I	**October to December 2014**				
	Bagga	12	140.0	10	160.0
	Hilsha	35	630.0	35	650.0
	Mackrool	8	172.0	6.5	190.0
	Mix Fish	14	52.0	12	70.0
	Kokila	20	120.0	18	140.0
	Pomfret	22	415.0	22	135.0
	Prawn	10	465.0	10	490.0
	Rani(Kaoa)	15	70.0	14.5	85.0
	Bhola	20	100.0	18	120.0
	Tur	5	60.0	5	80.0
II	**January to March 2015**				
	Bagga	7	125.0	6.5	164.0
	Hilsha	25	680.0	25	700.0
	Mackrool	10	180.0	9	200.0
	Mix Fish	10	60.0	8	80.0
	Kokila	10	120.0	9	140.0
	Pomfret	30	450.0	30	480.0
	Prawn	10	530.0	10	550.0
	Rani(Kaoa)	10	80.0	8	100.0
	Bhola	12	110.0	10	135.0
	Tur	6	70.0	5	90.0
III	**April to September 2015**				
	Bagga	15	120.0	14	140.0
	Hilsha	60	565.0	58	600.0
	Mackrool	10	170.0	8	180.0
	Mix Fish	8	45.0	6	60.0
	Kokila	18	115.0	17	130.0
	Pomfret	20	440.0	20	470.0
	Prawn	15	420.0	15	460.0
	Rani(Kaoa)	14	100.0	12	120.0
	Bhola	12	110.0	10	140.0
	Tur	7	62.0	6	80.0

Source: Field Survey Data

Table 5.29: Source of Fish Purchase and Sold for Retailer

Sr. No.	Sources of	Source of Fish Purchase and Sold															
		Shankarpur (n=10)				Petuaghat (n=10)				Fresherganj (n=10)				ALL (n=30)			
		Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.
A	fish Purchase																
1	Fisherman	20.0	20.0	40.0	26.7	10.0	20.0	20.0	16.7	20.0	20.0	40.0	26.7	16.7	20.0	33.3	23.3
2	Broker/Middlemen	60.0	60.0	60.0	60.0	70.0	50.0	60.0	60.0	50.0	60.0	50.0	53.3	60.0	56.7	56.7	57.8
3	Both	20.0	20.0	0.0	13.3	20.0	30.0	20.0	23.3	30.0	20.0	10.0	20.0	23.3	23.3	10.0	18.9
B	Sold to																
1	Retailers-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	Proccerssors-2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Consumer-3	70.0	100.0	80.0	83.3	100.0	100.0	100.0	100.0	80.0	100.0	70.0	83.3	83.3	100.0	83.3	88.9
4	Hotel-4	30.0	0.0	20.0	16.7	0.0	0.0	0.0	0.0	20.0	0.0	30.0	16.7	16.7	0.0	16.7	11.1

Source: Field Survey Data

5.3.2.4 Detail of loss incurred by Retailer due to poor harvest infrastructure

The main task of the study is to assess the post-harvest loss of marine fisheries in different segment of marketing condition and to quantify (as far as practicable) the percentage of loss in different market operation in all fishing seasons. Owing to this assumption, Table 5.30 has given us a very interesting picture. The overall figure in Shankarpur fish market depicts a loss of 20 percent to the total loss during the fishing season Oct-Dec lies within the loss range of 16-20 per cent.

In case of Patuaghat and Freserganj the corresponding figures are 13.3 percent and 16.7 per cent respectively (though in Petuaghat no loss are visible within the range of 16-20 per cent of fish loss during Jan-March). In Petuaghat 50 percent of total fish loss lies between 6-10 per cent of loss ranges, Shankarpur (within the range) reflects the highest figure i.e. 60 per cent.

Within the loss range of 11-15 per cent in Shankarpur, Petuaghat and Freserganj, the figures are 30 percent, 30 percent and 33.3 per cent respectively.

Table 5.30: Detail of Loss incurred by Retailer due to poor post harvest infrastructure

Sr. No.	Harbour/Loss Range	Loss of in wholesale market (% loss in fish value- Rs/kg)		
		Oct.- Dec. 2014	Jan.-Mar 2015	April Sept.2015
A	Shankarpur (n=5)			
1	1-5 %	10.0	10.0	20.0
2	6-10 %	10.0	20.0	30.0
3	11-15 %	50.0	30.0	20.0
4	16-20%	30.0	40.0	30.0
B	Petuaghat (n=5)			
1	1-5 %	20.0	20.0	10.0
2	6-10 %	40.0	50.0	40.0
3	11-15 %	20.0	30.0	40.0
4	16-20%	20.0	0.0	10.0
C	Fresherganj (n=5)			
1	1-5 %	10.0	20.0	10.0
2	6-10 %	60.0	50.0	40.0
3	11-15 %	20.0	30.0	40.0
4	16-20%	10.0	0.0	10.0
D	All (n=15)			
1	1-5 %	13.3	16.7	13.3
2	6-10 %	36.7	40.0	36.7
3	11-15 %	30.0	30.0	33.3
4	16-20%	20.0	13.3	16.7

Source: Field Survey Data

5.3.2.5 Targeted consumers for retailers

In Shankarpur the retailers sell maximum of their product within the range of 5-20 kms radius. Overall 50 percent of the targeted purchaser or the consumers are residing within the 5-20 kms radius from the auction marke (Table 5.31). It is obvious that the retailers in Shankarpur, Petuaghat and Freserganj purchase fish from the wholesalers or from the traders or from fishermen from the auction market at Digha Mohona or from Freserganj dockyard and carry fishes at long distances to the hotels and neighbouring township for direct selling to the targeted consumers.

Mode of transportation in most of the cases is cycle rickshaws or rickshaw van, in very limited cases they carry with big vehicles or matadors. Sometimes, the relatives of fishermen act as retailer or sometimes the wholesalers employ persons for selling fish in retail markets. However, most of the cases the retailers are independent traders and they on their own operate business

Table 5.31: Targeted Consumers for Retailers

Sr. No.	Particulars	Targeted Purchasers/ Consumers for Retailer (n= 30)			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Within a radius of 1-5 km	40	20	10	23.3
2	Between 5 -20 Kms	20	30	30	26.7
3	Beyond 20kms	40	50	60	50.0

Source: Field Survey Data

It is seen from Table 5.32 that almost in all markets fishermen are of the view that adequate supply of ice is not available, only 23.3 percent of them are satisfied with the availability of ice.

In case of timely availability, overall 63.3 percent of the retailers register their complaints and it is higher in Petuaghat, in this area 70 percent of them viewed about un time- availability and 80 percent complaints about interrupted supply. Price is also not stable; often it fluctuates and varies during all occasions considering the heavy or less activities of marine fisheries in these areas also.

Table 5.32: Details of Supply of ice – Retailer

Sr. No.	Particular	Supply of ice – Retailer (n= 30)			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Adequate (%)				
	Yes	30	20	20	23.3
	No	70	80	80	76.7
2	Timely (%)				
	Yes	40	30	40	36.7
	No	60	70	60	63.3
3	Uninterrupted (%)				
	Yes	30	20	30	26.7
	No	70	80	70	73.3
4	Stable Price of Ice (%)				
	Yes	20	30	20	23.3
	NO	80	70	80	76.7
5	Price of ice paid (Rs/Kg)	1.35	1.38	1.36	1.36
	a) Oct-Dec 2014	1.30	1.32	1.31	1.31
	b) Jan-March 2015	1.35	1.38	1.36	1.36
	c) Apr-sept 2015	1.40	1.45	1.41	1.42

Source: Field Survey Data

5.3.2.6 Facilities Availed by Retailer

5.3.2.7 Status of Retail Fish markets

Needless to mention, that one proper and modern fish market with essential amenities to a significant extent capable of reducing fish losses including maintaining of hygienic value content. It is seen from Table 5.33 that Shankarpur is the largest market among three markets surveyed for the study purpose. It has capacity of 70 tons/day than Petuaghat (15ton/day) and Freserganj (50 ton/day). Though freezer boxes are not available in all these markets, 100 percent of harvested fishes are carried through iceboxes. A few percentages of retailers, only 20 percent of them complaints about irregular supply of fishes whereas almost 70 percent of them told that fish supplied to them are up to their satisfactory level. It implies that the retailers purchase fish from the wholesalers or direct from the fishermen within a short duration of landing fishes in the auction yards.

The retailers are generally habituated in selling fishes directly to the consumer. In this case the overall figure is 86.7 percent. Due to limited operations of purchasing

and selling fish number of persons involved in retail marketing in very limited. On an average 1.2 percent are involved in each retail fish marketing activity.

Table 5.33: Status of Retail Fish Market

Sr. No.	Particulars	Units	Status of Retail Fish Market (n=30)			
			Shankarpur	Petuaghat	Freshergani	Overall
1	Capacity of the Retail market	(in tons)	70	15	50.0	45
2	Type of transport vehicles	insulated-	20	10	20	16.7
		non-insulated	80	90	80	83.3
3	Type of cold storage	cold storage	0	0	0	0
		freezer boxes	0	0	0	0
		chill plants-	0	0	0	0
		Ice Box	100	100	100	100
		Capacity of box	40	30	35	35
4	Fish supply is regular	Y	90	70	80	80
		N	10	30	20	20
5	Fish supply in assured qualities	Y	80	60	70	70
		N	20	40	30	30
6	The fish market has the capacity to hold huge supplies in times of large arrivals	Y	0	0	0	0
		N	100	100	100	100
7	How the marketing activities are done	Direct Sale	90	80	90	86.7
		Open Auction	10	20	10	13.3
8	Staff involved in his retail business	Av. Numbers	1.3	1.0	1.2	1.2

Source: Field Survey Data

5.3.3 Fish Consumers

5.3.3.1 Economic characteristics of consumers

In order to get data of the existing marketing condition (infrastructure along with marketing operation) and quality of fish purchased by them, thirty numbers of consumers for ten numbers in each market was interviewed. The average number of consumer was above fifty years of age and out of them 60.3 percent is male. Only 6.7 per cent of them are involved in fishery activities and 20 percent of them are

serviceman. Overall 30 per cent of the female consumer taken for this observation is housewives and only 3.3 per cent are involved in business.

The family size is slightly higher in Frasergunj (6.6) while in case of Shankarpur and Petuaghat the corresponding figure is 5.4 and 6.2 respectively. Overall picture of male and female member in each family is 2.4 and 2.2 (Table5.34).

Table 5.34: Socio- Economic Characteristics of Consumer

Sr. No.	**Particulars**	**Socio- Economic Characteristics of consumer(n=30)**			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Age (Av) years	45.5	38.5	43.5	42.5
	Age between 20-40 years (%)	50	55	40	48.3
	Age more than 40 years (%)	50	45	60	51.7
2	**Gender**				
	i) Male (%)	60	50	80	63.3
	ii) Female (%)	40	50	20	36.7
3	**Main occupation (%)**				
	Male				
	Student	20	10	10	13.3
	Fishing	10	0	10	6.7
	Service	30	10	20	20.0
	Labour	0	20	20	13.3
	Store keeper	10	0	10	6.6
	other	0	20	0	6.7
	Female				
	House wife	30	20	10	30.0
	Business	0	20	20	3.3
4	**Family size (Av.)**	5.4	6.2	6.6	6.1
	i) Male	2.1	2.5	2.6	2.4
	ii) Female	1.9	2.2	2.4	2.2
	iii) Children	1.4	1.5	1.6	1.5

Source: Field Survey Data

5.3.3.2 Fish Purchase Behaviour of consumer

It is seen from the Table 5.35 that average frequency of purchasing fish in a week is 5.13. As far as species distribution of fish purchase is concerned Hilsha and Pomfret scores high that is twenty percent of all purchase followed by Bagga and Prawn in Shankarpur. In Petuaghat Bhola registers 20 percent of total fish purchase.

On an average at a time, the consumer purchases a little more than one kg, and the price varies between Rs.130/kg to- Rs150/kg. 70 percent of the consumer reported that quality of fish is consumable and only 40 percent of them have reported price is beyond the reasonable range.

5.4 Fish Processing in Selected Harbours

Fish being highly perishable in nature need to be processed through a chain of systems and should be kept at required temperature. The main method of fish processing are curing, caning and freezing. A cluster of fish processing plants is situated at Benfish complex, Chakgaria, Kolkata almost 250 kms away from Shankarpur and Petuaghat Harbors and 120 kms away from Fraserganj. Mentioned earlier, some of the Processing plants are owned by the trawler owners and they deal in exporting of processed items also.

5.4a Harbour wise Capacity of Plant

Three harbours namely Shankarpur and Petuaghat in Purba Medinipur(East Midnapore) and Fraserganj in South 24 Paraganas District have taken for this study purpose. Among three Shankarpur is the busiest harbour and the newly commissioned Petuaghat Harbour is regarded as Seventh largest harbour throughout India. Fraseganj harbour is very old and caters a long hinterland for harvesting of marine fishes. Capacity of Plant and its utilization over three separate fishing seasons have been depicted in the Table 5.36. It shows in Shankarpur Plant in terms of capacity utilization only 49.90 percent during Jan-March are being utilized. Capacity utilization during Oct-Dec and April- Sept are 70.25 and 56.24 percent respectively. In Petuaghat capacity utilization during all seasons are reported to have more than 50 percent. Fraseganj reported to have better utilization capacity; it varies from 56 percent to 66 percent taking functioning of harbour in all seasons accordingly. It reflects that all these harbours are under performing and there are enough opportunities for enhancing their capacity utilization.

Table 5.35: Purchase fish by Consumer

Sr. No.	Particulars	Purchases fish by Consumer			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	Av. No of days in week	5.8	4.5	5.1	5.13
2	Species Distribution (%)				
	Bagga	15	10	15	13.33
	Hilsha	20	15	20	18.33
	Mackrool	10	15	20	15.00
	Mix Fish	10	15	10	11.67
	Kokila	05	10	10	8.33
	Pomfret	20	10	10	13.33
	Prawn	10	05	05	6.67
	Bhola	10	20	10	13.33
3	Quantity (kg/purchase)	1.5	0.90	1.25	1.22
4	Price (Rs./kg)	150	130	140	140.0
5	Get the type and quality of fish (%)				
	Yes	80	60	70	70.0
	No	20	40	30	30.0
6	Reasonable price (%)				
	Yes	70	50	60	60.0
	No	30	50	40	40.0

Source: Field Survey Data

Table 5.36: Harbour wise capacity of Plant

Sr. No.	Particular	Harbour wise capacity (tons per day)		
		Capacity	Utilization	%
A	Shankarpur			
	Oct-Dec 2014	50.50	35.48	70.25
	Jan-March 2015	50.50	25.20	49.90
	Apr-Sept 2015	50.50	28.40	56.24
B	Petuaghatl			
	Oct-Dec 2014	30.25	15.45	51.09
	Jan-March 2015	30.25	15.45	51.09
	Apr-Sept 2015	30.25	18.21	62.21
C	Fresherganj			
	Oct-Dec 2014	60.50	35.86	59.28
	Jan-March 2015	60.50	33.87	55.99
	Apr-Sept 2015	60.50	39.98	66.08
D	Overall			
	Oct-Dec 2014	47.08	28.93	61.45
	Jan-March 2015	47.08	24.84	52.76
	Apr-Sept 2015	47.08	28.86	61.30

Source: Field Survey Data

5.4.1 Season wise detail of Fish taken up for Processing

On an average 2866.7 tons of fish during Oct-Dec and during Jan-Mar and Apr- Sept 2308.3 tons and 2833.3 tons of fish are purchased for processing purposes Value of purchased fish ranges between Rs 185/kg to Rs 205/kg and after processing the price of processed fish rise from Rs 295/kg to Rs 313/kg.

Though in terms of quantity 10-12 percent (weight) loss of total quantity in case of purchased fish is reported (Table5.37)

Table 5.37: Season-wise detail of Fish taken up to Processing

Sr. No.	Season-wise	Season-wise detail of fish taken up to processing				
		Quantity of fish taken for processing	Rate of Fish Purchase	Processed output quantity	Sold prices	Economic loss
		(tone)	(Rs./ Kg)	(tone)	(Rs./ Kg)	(Rs./ Kg)
A	Shankarpur					
	Oct-Dec 2014	3600	210.0	3340.5	300.0	30.25
	Jan-March 2015	2650	220.5	2350.0	310.5	32.50
	Apr-Sept 2015	3025	190.0	2720.5	340.0	28.25
B	Petuaghatl					
	Oct-Dec 2014	1975	200.5	1750.0	290.5	31.50
	Jan-March 2015	2050	210.0	1850.5	305.0	33.25
	Apr-Sept 2015	2225	187.5	2005.0	287.5	30.50
C	Fresherganj					
	Oct-Dec 2014	3025	205.5	2750.5	320.5	32.25
	Jan-March 2015	2225	200.0	2075.0	325.0	34.50
	Apr-Sept 2015	3250	180.5	2825.5	300.5	29.25
D	Overall					
	Oct-Dec 2014	2866.7	205.03	2613.67	303.37	31.33
	Jan-March 2015	2308.3	210.17	2091.83	313.33	33.42
	Apr-Sept 2015	2833.3	186.01	2517.01	295.70	29.33

Source: Field Survey Data

5.4.2 Sources of Fish Purchases and sold- Processor

The Processors purchase 50 percent of their produce directly from the fishermen and another 50 percent from the wholesaler in Sankarpur market, whereas in Freserganj, 60 percent are purchased from the wholesalers and rest from the fishermen. In Petuaghat the figure is 25 percent each and the bulk amount i.e. 50 percent of harvested fish are purchased from Wholesale market and fishermen jointly. In all cases, more than 80 per cent of the processed item is sold to the exporters, in

Petuaghat almost 92 per cent of the processed item are meant for exports only.(Table 5.38).

Table 5.38: Sources of Fish Purchases and sold- Processor

Sr. No.	Particulars	**Sources of Fish Purchases and sold- Processor**			
		Shankarpur	Petuaghat	Fresherganj	Overall
A	Sources of fish purchases				
	Fisherman	50.0	25.0	40.0	38.3
	Wholesale Market	50.0	25.0	60.0	45.0
	Broker/ Middleman	0.0	0.0	0.0	0.0
	Wholesale Market+ fisherman	0.0	50.0	0.0	16.7
	Broker/ Middleman+ Fisher man	0.0	0.0	0.0	0.0
	other	0.0	0.0	0.0	0.0
B	Fish Sold				
	Exporters	89.1	80.7	92.1	87.3
	Domestic Market	10.9	19.3	7.9	12.7

Source: Field Survey Data

5.4.3 Transport of raw materials by processors

Carrying of purchased fish with proper method and media plays an inhibiting factor for early decomposition of fish body no doubt. In Shankarpur only 70 per cent of the fish are being carried out through insulated van. The picture of Petuaghat is even worse, there only 40 per cent of fish are transported through this medium. Availability of ice boxes is also very poor. Only 20- 50 percent of fishes are being carried through these boxes. No data for carrying through thermal boxes are available.

Table 5.39: Transport of raw materials by Processor

Sr. No.	Particulars	Transport of raw materials (%)- Processor			
		Shankarpur	Petuaghat	Fresherganj	Overall
A	Insulated van	70	40	60	56.7
B	Fishes stacked	100	100	100	100
	a) Ice box	80	50	75	68.3
	b) Insulated box	20	50	25	31.7
	c) Thermal box	0	0	0	0
C	Grading/sorting				
	a) On board	20	0	25	15.0
	b) plant	80	100	75	85.0

Source: Field Survey Data

5.4.4 Processing Plant in Compliance with Export Houses/ Countries

The processing Plant has to carry out specific norms and strictures of International Standards made by Export Inspection Agency of India, Hazard Analysis and Critical Control Point with European Union. Besides these, it is customary and obligatory on part of all-processing houses should be registered with Marine Products Export Development Authority (MPEDA) during exporting their commodities to other foreign countries. It is seen from Table 5.40 that in case of EIA, HACCP and registration with MPEDA all processing house fully comply with the standard norms and rules. But in case of EU Norms overall 43.3 percent comply with the International standard. In Frasegang 60 percent of the processing plant Comply EU Norms, the figure for Petuaghat is very meager, it is only 20 percent. The Processing House at Shankarpur and Fraserganj Comply F &D of USA norms fully. No figure of compliance of the said norms is available in Petuaghat.

Table 5.40 : Processing Plant Incompliance with export houses/ Countries

Sr. No.	**Particulars**	**Processing Plant Incompliance (%)**			
		Shankarpur	Petuaghat	Fresherganj	Overall
1	EIA (Export Inspection Agency of India) Norms	100	100	100	100
2	EU (European Union) Norms	50	20	60	43.3
3	F&D of USA	60	0	80	46.7
4	HACCP (Hazard Analysis and Critical Control Point)	100	100	100	100
5	Registered with the MPEDA	100	100	100	100

Source: Field Survey Data

5.5 Factors Helpful in Minimizing Post-Harvest Losses of Fishes (Table 5.41)

Minimizing of Post-Harvest losses depends upon numerous factors. Besides, institutional, economic and social factors in this present study an attempt has been made to gather most relevant aspects about technical factors also. Among the technical factors i) a cleaner landing platform with washing and drainage facilities ii) availability of insulated storage boxes on board of the fishing vessel iii) availability of cold storages and chill plants and finally iv) cold chain facility network. Availability of these facilities has been ranked according to the respondents' preference or order of importance as I, II, III and IV. The overall picture in Table

5.41 depicted as 61.7 percent of the respondents reported for better landing facilities while in case of availability of insulated storage boxes 75 percent of them reported against it. In both of these two cases, they ranked these two factors as Rank III and over all percentage of responses in this case are 46.7 and 53.3 respectively. A majority of them classified these two factors in ranking Iv and overall figure of these response are 53.3 and 46.7.

A segregated analysis on this episode reveals in Petuaghat almost 80 percent of the respondents stated availability of storage boxes is the prime obstacle for maintaining quality of fish and 75 percent among them are of the view for better and cleaner landing plat form. The corresponding percentage figure for Shankarpur and Fraserganj are 70, 60 and 75 & 60 respectively.

Table 5.41: Factors more helpful in Minimizing Post-harvest Losses of Fishes- Processor

Sr. No.	**Rank**	**More helpful in minimizing post harvest loss of fishes- Processor**			
		A cleaner landing platform with washing and drainage facilities	Insulated storage boxes on board the fishing vessel	Cold storage/chill plants with in the FH premises	Cold chain facility network
A	Shankarpur				
	I	60	70	0	0
	II	40	30	0	0
	III	0	0	50	75
	IV	0	0	50	25
B	Petuaghat				
	I	75	80	0	0.0
	II	25	20	0	0.0
	III	0	0	60	40
	IV	0	0	40	60
C	Fresherjanj				
	I	60	75	0	0.0
	II	40	25	0	0.0
	III	0	0	50	25
	IV	0	0	50	75
D	Over all				
	I	61.7	75.0	0.0	0.0
	II	38.3	25.0	0.0	0.0
	III	0.0	0.0	53.3	46.7
	IV	0.0	0.0	46.7	53.3

Source: Field Survey Data.

Chapter – VI

Summary, Conclusions and Policy Recommendations

6.1 Background

Fish is an important item of Indian dietary schedule. In many parts of India especially in West Bengal, fish-rice (machh-bhat) is considered as the only staple food due to its immense food value and important source of animal protein. Fisheries sector is being considered as one of the most important economic activities in Indian economy as well. Considering its vast and varied resources along with huge potentials for flourishing, much attention was given for its development and more so in scientific and modern way. Fish production in India has increased from 0.75 million tons in 1950-51 to 9.6 million tons in 2012-13 and further 8.30 million tons per annum during 2013-14. An Assocham study predicts' with appropriate incentives coupled with robust investment in infrastructure, fish production in India can grow at a compounded annual growth rate(CAGR) of about seven percent during the course of next four-five years from the current level of over 3.5 per cent CAGR'. A little over 14.5 million people in India depend of Fisheries for their livelihood. A hopping amount of foreign exchange during 2012-2013 earned to the tune of US$ 3.51 billion and this is about almost 17 per cent on nation's total export earnings. From an estimate it is found during 2013-14 India contributes to 5.68 per cent of global fish production and ranked second after China among all fish producing nations.

A paradigm shift in operation in fisheries, particularly in marine fisheries is visible. Over the decades, 'the fishery sector has transformed itself from a purely traditional activity into a significant commercial enterprise. Thus, it is obvious that increasing fish production will certainly help to promote growth and development but fish, particularly marine resources, are fast developing due to overexploitation of our coastal areas. Given such resource constraint, preventing the loss of fisheries, particularly during the various post-harvest stages and gains more significance'. Introduction of modern technical know-how , method of operation and more significantly presence of foreign fleets and their mode of fisheries management with

in the Indian maritime resources has brought a qualitative change in the traditional wisdom of the indigenous fishermen .

Despite everything, post-harvest fish wastage is a major concern to all of the stakeholders. Post harvest losses are caused generally due to poor handling, improper method of processing, inadequate packaging and lack of suitable storage facilities and all these lead to early decomposition and rapid bio–chemical and microbiological spoilage. According to a sector-specific analysis by the Associated Chambers of Commerce and Industry 'post-harvest fish wastage leads to annual losses worth over Rs 15,000 crore in India's marine and inland fisheries sector... If all of the above constraints are addressed properly fish production in India might cross 13 million tons mark by 2016'.

Comprehensive fisheries policies were adopted to fulfil the following objectives:-

i. To increase income and employment within the fishery sector.

ii. To improve the levels of national nutrition, especially the availability of fish protein,

iii. To maintain maximum utilization of fishery sector,

iv. To increase foreign exchange earnings; and

v. To reduce inequalities the distribution of income and food supplies within the fishing community.

Needless to mention, all these objectives are not very ambitious enough rather they are very much in consonance with the national objectives for optimizing natural resources. In case of policy making both central government and the state governments have definite roles to play and it is clearly mentioned in the "Constitution of India".

As per the Article 246 of Constitution of India, "the entry no.21 of State List renders the powers to the provisional states to handle the subject matter of fisheries while the entry No.57 of Union List gives the power to the Union government to handle fishing and fisheries beyond territorial water. Besides, the Territorial Waters

Continental Shelf Exclusive Economic Zones and other Maritime Zone Acts 1976 (80 of 1976) of India provides the union government sovereign rights for the purpose of exploitation, exploration, conservation and management of natural resources both living and non-living as well as for producing energy from tides, winds and currents in exclusive economic zone beyond its territorial waters up to two hundred nautical miles which also includes fishing and fisheries."

Thus, on the operational part of fisheries management it is the joint responsibility of both Central and State government to frame an effective policy for exploiting the natural resources and to guide the fishermen, processors, distributors to maximize the benefit and by reducing fish losses. It is also the joint responsibility of both the governments for adopting effective mechanization for improving the existing handling and distribution system. Besides policies, an effective post-harvest fishery system controlled with adequate and better infrastructure facilities could enhance net increase in production and good quality of fish and fisheries product.

6.1.1 Fisheries Sector in India and West Bengal

Current Status of Fish Resources of India

The vast resources of both marine and inland fisheries are indicative of its immense growth potential of this sector. India has lone coastline of about 8118 km and an Exclusive Economic Zone (EEZ) of 2.02million sq km. With the declaration of the Exclusive Economic Zone (EEZ) in 1977, an area of 2.02 million sq km (comprising of 0.86 million sq. km on the west coast, 0.56 million sq.km on the east coast and 0.60million sq. km around the A&N Islands 'has came under India's jurisdiction with absolute right of exploring, exploiting and natural utilization of living resources falling within it. ..The inland Fishery resource include 1.96 lakh kms stretch of rivers and canals,29.07 lakh hectare reservoirs,24.40lakh hectares ponds and tanks,7.98 lakh hectares of beels, derelict water bodies and 12.40 lakh hectare brackish water areas.'(Handbook of Fisheries Statistics, 2014).

6.1.2 Fisheries Resources in West Bengal---

The coastline of West Bengal spreads over two maritime districts: East Medinipur and South 24 Parganas The total number of fishing villages and fisherman families are 188 and 76,981 respectively. A number of 380138 populations are directly or indirectly engaged with marine fisheries.

West Bengal has coastline amounting of 158km of length. The area in continental shelf (up to 100 fathom depth) area in 17049 sq.km, the offshore area within 10-40 fathom depth range is 1813 sq.km. and in share area within 10 fathom depth range is 777 sq km. respectively

6.1.3 Fisheries projects and Schemes are undertaken

The Government of West Bengal has taken various measures for development of fisheries and fishers and all these programmes are routed through State Fisheries Development Corporation(SFDC), West Bengal Fisheries Corporation (WBFC), West Bengal State Fishermen's Co-operative Federation Ltd. (BENFISH) ,Fish Farmers' Development Agency (FFDA), Brackish water Fish Farmers' Development Agency (BFDA)and Rashtriya Krishi Vikash Yojana (RKVY). The Fisheries Department is one of the stakeholders under RKVY. The National Mission for Protein Suppliments (NMPS) is also a sub scheme of RKVY. (Detailed programme of RKVY and NMPS is given in the annexure).

i. West Bengal Integrated Marine Fisheries Development Project.

This Project has been launched in 1989-90 with an idea to uplift the socio-economic condition of poor fishermen belonging to SC/ST Community engaged in marine fishing activities.

ii. Beel Fisheries Development Project.

Big Inland water bodies are Beel and Boar which are mostly vested. By policy, these water bodies are leased out the fishermen's Coop. Societies.

iii. Bundh/Reservoir Fisheries Development Project in The District of Bankura And Purulia.

A good number of Bundhs and Reservoirs have been lying fallow due to paucity of fund. Benfish executed this Project with the financial assistance of N.C.D.C., New Delhi

iv. Project on Establishment of Common Facilities Centre and Modern Fish/Shrimp Processing Infrastructure Products at Chakgaria in The District of South 24 Pgs.

Benfish set up a Common Facilities Centre of internationally accepted standard with the financial assistance of Fisheries Deptt. Govt. of W.B. and Ministry of Food Processing Industries, Govt. of India and NCDC, New Delhi.

v. Project for Ornamental Fish Culture Through Fisherwomen Cooperative Socieities.

West Bengal State Fishermen's Cooperative Federation Ltd. (BENFISH) took up a project on Ornamental Fish Culture through Fisherwomen Coop. Societies Ltd. (Phase-I) in the district of Howrah & South 24 Parganas duly sanctioned by the Fisheries Deptt. Govt. of West Bengal and the NCDC, New Delhi.

vi. Project on Mud Crab Culture in Sundarban Areas of North 24 Parganas.

This project has been taken up by the West Bengal State Fishermen's Cooperative Federation Ltd. (BENFISH) in order to culture crab and fattening of crab through forming Cooperative Societies.

vii. Project on Development of Marine Fish Production And Processing in The Purba Medinipur District.

This project has been implemented by Benfish with the financial assistance of NCDC, New Delhi and the Deptt. of Fisheries, Govt. of W.B. in order to eliminate exploitation of the sea based fishermen by the middlemen as the fishermen of the coastal belt of the district are fully dependent on sea fishing.

viii. Production of Hygienically Dried Fish and Fish Processing by Fisherwomen Co-Operative Societies Ltd. Contai Sector, Purba Medinipur

With the financial assistance of NCDC, New Delhi and the Fisheries Department, Govt. of West Bengal, an amount of Rs.225.77 Lakhs only for

implementation of the Project by 13 nos. Marine Fisherwomen Co-operative Societies Ltd.

ix. Project for Pre-Processing Complex and Food Park at Sultanpur, South 24 Parganas

This Project is situated on the western bank of the river Hooghly near Diamond Harbour in the district of South 24 Parganas, an important tourist spot with a view to providing a proper and hygienic infrastructure for handling and distribution of fish landed at Sultanpur Harbour.

x. **Project for Pre-Processing Complex and Food Park at Kakdwip, South 24 Parganas**

This project is located on the eastern bank of the river Hooghly at kakdwip in the district of south 24 parganas. It has been set up with an idea of providing proper and hygienic infrastructure of handling and distribution of landed fish brought at newly constructed kakdwip harbour

xi. Fishermen's Group Personal Accident Insurance Scheme for The Active Fishermen

Benfish is implementing this Scheme. Active fishermen of 160000 nos. have been covered under the scheme. Since inception from 1986 to December 2008, an amount of Rs.270.25 lakhs only have been disbursed to 827 nos. fishermen families.

xii. Centrally Sponsored Savings-Cum-Relief Scheme for The Marine Fishermen.

The fishermen who are engaged in marine fishing activities become idle from Feb to June every year. During this period, they have no avenue of income. This scheme will provide Rs.1200/- only which include their savings of Rs.600/- only.

xiii. Fish Processing Unit at Salt Lake

Benfish has set up a modern Fish Processing Centre at Salt Lake for processing of raw fish and preparation of various fish fried products. This project has created employment to 200 unemployed youth. This unit has obtained certificate of ISO 9001 and HACCP that responded well among consumers.

xiv. Benfish in Tourism

Benfish now has recorded its name in the Tourism Nap of West Bengal. Benfish constructed Tourist Lodges in different places of the State like Digha, Sankarpur, Coochbehar, Diamond Harbour, Frasergunj, Jalpaiguri, Darjeeling, Haldia, Puri and Berhampur for providing residential facilities and fooding to the tourist'. (Department of Fisheries, GOWB).

The following schemes are undertaken by West Bengal Fisheries Corporation:

The Corporation has been assigned with the duties of creating infrastructural facilities for both inland and marine sectors. The major infrastructures undertaken by the Corporation are shown below :

1.*World Bank aided shrimp and Fish Culture Project:*

2.*Minor Fishing Harbours* :

(i) *Minor Fishing Harbour*at Frasergunj

(ii)*Minor Fishing Harbour*at Kakdwip

(iii) *Minor Fishing Harbour* at Sultanpur.

(iv) *Minor Fishing Harbour* at Shankarpur Stage - I

(v) *Minor Fishing Harbour*at Shankarpur Stage - II

(vi) *Minor Fishing Harbours* at Petuaghat:

(vii) *Minor Fishing Harbours* at Mayagoalinirghat :

3. Fish Landing & Berthing Jetty at Namkhana

4. RCC Bridge at Nandichawk at Paharpur in the Purba Medinipur district

5 .Inland Fish Marketing Infrastructure

6. Fishery Faculty Centre a tChakgaria, 24-Parganas (South)

7. Construction of Food Park at Shankarpur Fishing Harbour

(i) Execution of work of other Govt. Departments:.

(ii) Upgradation of Navigability of Shankarpur Fishing Harbour, PurbaMedinipur

(iii) Construction of Marine Food Park at Shankarpur Fishing Harbour

(iv) iv) Tourism

6.2 Post-Harvest losses in Marine Fisheries

Post Harvest Losses in Marine Fisheries

Fisheries sector suffer a lot owing to its improper mode of operation. Right from the harvesting of fishes to its retail distribution and in different stages of handling and processing quality of the product gradually become poor, causing serious concern to economic losses to the fishermen and fish traders. Directly or indirectly it affects the consumer also. Despite the facts that marine fisheries being a renewable natural resource caters the livelihood of hundreds of thousands of fishermen, traders and processors over the years, a little attention was given to minimize or arrest the losses during post-harvest operation so far. Thus, a coherent strategy formulation and intervention in policy recommendation seem to be more pertinent in reducing post-harvest losses in marine fisheries. An effective policy is needed in different stages of handling, distribution and processing for less reduction and making fisheries more economically viable.

Estimation of assessment of post harvest loss in marine fisheries is very difficult as such no representative data are available. Ames (1991) suggested at least 3 years representative data are required for an effective estimation. Literature relating to post-harvest losses in Marine Fisheries in India is extremely limited. From a similar study in Bangladesh (Nowsad – 2010) we found that both in qualitative and quantitative terms “losses in net fish distribution chain and processed products … 20% of the marine fish landed was deteriorated up to 80% of its original quality before it was transported (BICAS, 2003) and about 28% of fish lost 60-70% of freshness

quality before it reached the consumer" (Nowsad – 2004). The same study reveals that a significant amount of post-harvest loss during pre-processing, processing, storage and transportation of fishery products in Bangladesh.

In case of dried fish contamination ratio (by both insects and harmful insecticides) comprises almost 80% of the total dried products. Earlier study assessed the seriousness of marketing difficulties in remote fishing communities particularly is the Bay of Bengal region, availing adequate ice and transportation. Inadequacy of these essential items put the fishermen in weak position in relation to intermediaries. "In this location much fish more processed into lower valued canned products and the process of caring involved losses through spoilage and infestation". (Conlter and Disney1987).

Owing to the prescription of the International Fisheries Research Meeting in Paris in 1991 the physical loss assessment model was adopted on the basis of information on examine value of the fish lost at every step of distribution and activation through participatory rural appraisal method. In this study also a well structured questionnaire was canvassed among all stakeholders to assess the postharvest losses in marine fisheries as far as practicable.

Losses of fish can be categorized into two broad aspects (i) quantitative and (ii) qualitative. Yet, Cheke and Ward (1998) explained a more pragmatic explanation of fish loss as four common categories; physical loss, quality loss, nutritional loss and market force loss. "Physical loss are easily understood; quality losses are the result of mishandling coupled with lack of icing and associated high temperature leading to spoilage and quality deterioration; nutritional quality of the fish can be altered post-mortem, for example, vitamin A in the corona of small fish or essential amino acid, lysine can be damaged due to high processing temperature; while market force loss is attributed to the changes in supply and demand of fish which may lead to price fluctuation ".

Fish is the most perishable item in nature and it spoils gradually, step by step. Owing to its bio-physiological nature, fishes are highly susceptible to bacteria. It is

commonly believed that, the lengthy the process of harvesting to distribution to the consumer, the higher the degree of bacterial infestation., the poorer the process of storing during transportation and handling the greater the risk of spoilage and deterioration of quality.

Quantitative loss can be assessed during harvesting when huge small and juveniles are killed, physical injury caused by melting (in case of gill melting) take place. Bottom trawling usually occur huge losses to the small and juvenile fishes and the loss is beyond accountancy.

The general hygiene condition and prevailing sanitary aspects of fishing harbours and fish markets influence the quality of marine harvest mostly in all regions in India. If all the stakeholders are sensitized for maintaining cleanliness and a more conducive atmosphere in the landing centres then the loss could be reduced significantly, not only that much alleged loss of hygiene value of fresh fish could be maintained for a pretty long duration.

At present, the landing and berthing facilities are inadequate to meet the requirements of the large fishing fleets. Not only that in number of cases siltation in estuarine areas compelled big fleets to anchor in a fairly long distance from the fish landing centres , causing transporting of harvested fishes by small vessels in number of occasions. It requires another stage of handling and icing. In many cases inadequate availability of ice or freezers or insulated boxes on board fastens the decomposition ratio of catch, inflicting an economic losses to all the stake holders also. On board facilities for proper handling of fish is very crucial in the sense, as it is the primary and most important condition for maintaining quality of high value fish and providing more fish for human consumption.

Degradation of fish qualities owing to poor post harvest facilities is directly or indirectly causing a concern to the ecological niche and balance in the fishing areas and neighbouring zones as well . In most of the cases fishers supply poor quality fishes to the feed industry and as per the requirement of the said industry

uncontrolled and overfishing of low value fish and by catch make a serious impact to level of pelagic stocks in this marine zone.

The present study attempts to examine all the technical, institutional and economic factors responsible for huge losses in marine fisheries sector. In the subsequent stages of the study we will discuss and try to asses about the physical losses of fishes during processing, transportation, storage, marketing associated with inadequate packaging etc. One comprehensive analysis of functioning of fishermen, wholesalers, retailers, consumers and all other stakeholders involved in this operation has also done to assess and evaluate the actual post harvest loss in marine fisheries sector in the state of West Bengal.

6.3 Rationale of the study

Seldom, marine fish after harvesting is reached to the direct consumer in the natural wet form. Almost in every case it is very rare. Usually, it takes a considerable time period to reach to the kitchen of consumers. After harvesting these catches are stored or preserved on the decks and in most of the cases usually with traditional wisdom. With the advent of modern technologies and use of modern tools and machineries – there has been visibly qualitative change in post-harvesting management in marine fisheries. Marketing chain coupled with modern processing industries play an important role in marketing and distribution of fisheries product in domestic and foreign market. An effective evaluation of all these activities along with the availability of post-harvest fishing inputs are needed to be studied accordingly.

6.4 Objectives and Methodology of the Study

The overall aim of the study is to examine the economic losses on account of inadequate post-harvest infrastructure facilities for the marine fisheries sector in India. The following are the specific objectives of the study.

- To examine the growth, composition and the contribution of the fisheries sector in India;

- To evaluate the availability of the post-harvest infrastructure facilities for marine fisheries sector in India;
- To review the Government policies and programs for the provision of post-harvest infrastructure facilities for marine fisheries sector in India;
- To evaluate and assess the economic losses on account of inadequate post-harvest infrastructure facilities for fisheries sector in India; and
- To arrive at relevant policy implications.

The study is based on both primary and secondary data. Secondary data on growth, species composition, catch disposition (Domestic, Export, Processing including traditional methods of processing like curing/smoking etc.), the market and processing infrastructure; market channels has been collected from the Department of Fisheries Govt. of West Bengal. Necessary primary data has been collected from the respondents who are involved in fishing, handling, trading, transport, processing, and marketing. The following fishing harbours have been chosen for collecting the infrastructural gap to arrest post-harvest fish losses in West Bengal viz Shankarpur, Petuaghat and Freserganj. In order to get primary information Ten fishermen with boat and Ten fishermen without boat in each harbour was interviewed. Five numbers of wholesalers, Ten retailers andTen numbers of consumers in each study area were taken for the study purpose. Two numbers of processors, exporters and same number of fishery officials in each harbour were selected for having information in consonance with the objective of this present study.

6.5 Limitations of the study

Main objective of the study is to assess the post-harvest losses of marine fisheries and essentially to find out the causes for such economic losses. Main respondents are Boat owners and fishermen. Ostensibly, the fishermen have no readymade data or information for accounting the losses .The big Boat owners could do this but in order to register a comparatively low margin in their business activity there has been a tendency to inflate the figure than they are actually have been. In many cases, the researchers have to depend upon the memory of the fishermen and

subjective analysis and projection of data. In number of cases, they had varied opinion and difference in estimation of losses. Secondly, due to segregation of different markets and marketing channels it seems practically impossible to collect information from all sources and hence estimation of losses to a significant extent depends upon the prudent and subjective perception of the researchers. And finally, as availability of fishes are heavily depended upon the vagaries of nature (monsoons) a concurrent study for at least three years in the same region with the same respondents may yield better result.

6.6 Observation of the Researchers

a) Financial arrangement/contract between the boat owner and fisherman

Generally, the trawler owners are rich and miniscule portions of boat owners usually go to sea for fishing, most of them operate and handle trading after post harvesting of marine fish. They employ fishermen for doing the operation with mutually agreed terms and conditions. At the outset of any voyage, the Trawler owner or the Boat owner comes to the agreement of the Driver of the Boat and Trawler. The driver an erstwhile fishermen or helper of the fisherman has had a long experience and wisdom about sea and movement of fish as well as weather and other all conditions of sea voyage. Needless to mention he is an expert fisherman and practically acts as captain of the Trawler and Boat.

The Driver/Fisherman makes an annual agreement Viz. for the entire fishing season with the owner of the Trawler and Boats. The negotiable contracts vary of his share from 8-10 percent to more with the proportionate increase of value of total catch of the entire season from or above Rupees 30 Lakhs. In other words he in the entire fishing season (business operation period) has to catch fish in value term at least to the tune of Rupees 30 lakhs. He will get an enhanced share over and above his agreed amount beyond the mutually agreed value of catch. It is the responsibility of the fishermen (Driver/leader) to form his own team. In case of manually operating netting and collection of fish for semi mechanized boats the requirement of fishermen (helper) are generally more than the completely motorized boats , moreover it varies

from season to season also. In peak season, it requires more person than lean season. Whatever it may be, the Leader (Head Fisherman/Driver) forms a group of able fisherman consisting a number of 12 to 13 for Trawler and 13 to 14 for mechanized boats. The terms and conditions of these sorts of fishermen vary according to their performance and work assigned to them by their leader.

The operational mechanism of catching fish and its subsequent operation like auctioning and marketing are very complex in nature. Almost all the trawler owners, boat owners and the fishermen are the members of the respective Fishermen's association locally formed by them. It's an important and strong union which serves them in time of dissention and wilful negation of contract between parties and stake holders during the operation.

b) Association of the Fishermen

Both the Boat owners and fishermen at Shankarpur and Petuaghat are members of "Digha Fishermen & Fish Traders Association". Fraserganj has four to five organisations for different categories of fishers. At the outset of their reporting, they vehemently opposed the Government decision of extending permission to the foreign trawlers to catch fish with in the EEZ. According to the members of the Association, the permission of the Government to the foreign trawlers of harvesting fish with in the EEZ resulting not only demolishing of Eco-System of Marine Fisheries but to a significant extent it seems to be the passport to the foreign vessels to loot invaluable foreign money and resources also. They made complaints about the systems and rules for providing the foreign vessels a safe passage. In order to exploit the EEZ Fisheries resources Government gave permission in the year 2010-2011 but owing to severe protest and legal battle it is stopped now. They are of the view that any leniency to the foreign fishermen would inflict a heavy loss to the country fishermen.

c) Regarding existing infrastructure and urgent needs

i) At present the requirement of ice blocks in Petuaghat is 5000 Blocks; supplies from the Government sources are only 750 blocks, the rest comes from the private sources. Moreover, the quality and weight of ice-blocks being supplied from

private sectors are inferior in quality in comparison to ice –blocks supplied by the Government sources. Often the weight of ice-blocks varies from 80-90 kgs in place of 100 kgs and its durability (duration of melting). Durability of ice blocks supplied by the Government sources remain for 7-10 days, in case of private supplies it varies from 3-5 days thus causing a severe impact on quality of fish catch. Owing to difference of quality and weight of ice blocks the fishermen has to purchase more ice blocks (in numbers) to their boats and trawlers.

ii) Dredging in the Sankarpur is urgently required. Owing to limited access of plying, a significant number of boats and trawlers have to move towards Digha mohona causing more time and distance to travel and inflicting serious damage on the quality of catch. Presently dredging operation in Sankarpur river is going on the limited distance of 700 mts only, dredging for another 1500 mts is also required and hopefully in terms of per unit cost it will be cost effective.

iii) In case of excessive harvesting, mainly in rainy season and owing to inadequate availability of insulated van and inadequate ice/ice boxes during transportation and storage, decomposition of catch started causing deterioration of physical quality. Such incidents largely make direct impact on reduction price. Earlier (seven to ten years back) the decomposed fishes were being thrown away in the sea or around the creek, now the farmers are engaged themselves in preparation of dry fishing and they collected it at nominal prices although they have to compromise with the quality of catches as well.

d) Dry fishing

A huge number of fishermen in East Midnapur and South 24 paraganas are involved in dry fishing. The poorer among the poor fishermen are associated with this type of fisheries activities. Low cost varieties of marine catch like Bombayduck, Ribbonfish, Small Bhola, Tapra are purchased /procured by the fishermen and then taken for Sun drying. Miscellaneous assorted varieties of very small size and mixture of fish catch are considered suitably for production of fish meal mainly feed for fish and poultry firm. These fishermen are not covered under any registered Primary

Fishermen's Cooperative Societies thus they are deprived of /not entitled all sorts of financial assistance from the state Government as well as other financial Institution. Hundreds of traditional seagoing fishermen of coastal villages assemble at a fixed place mainly from the month of July to start their fishing operation and fish drying activities till March by erecting purely temporary thatched huts/structures on the vested land adjacent to sea shore for their stay in the natural hazard prone sea side area. These are called 'Khuties".

In most of the Khuties there is no arrangement for cleaning and washing fishes , as a result fishes become dirty due to mixture of mud , sand and litters of birds. Due to financial incapability and unavailability of washing facilities the fishermen usually adopt the most crude and unhygienic method of drying fish in Sun under the sky on the sea-beach. Sun drying of fish particularly in case of small fish like chury,Phasa and Shrimps is done through the method of throwing of the catch on the sandy beach of coast in front of khuties even without any washing to get them dried. In case of large size of fishes, the breasts are open out and the entrails are pulled out by the fishermen. While fish like Bombay duck hung on bamboo structures.

The most dangerous part of their activities is they use chemicals, mostly pesticides for avoiding' contamination' so far they hardly presumed or liked to pay attention on the meaning of the word.

Hardly any civic and basic amenities like toilets, sufficient drinking water, schools and community hall for humanly living are available to them. The researchers have their own eyes have seen the most pathetic environment amidst they reside.

6.7 Summary and findings

- The Boat owners and fishermen engaged in fisheries activities, accepted this profession as decade-long tradition as practiced by their predecessors, through a significant number of them are induced with this engagement considering the huge potential of marine resources and ponder worthy to their toil and labour. Discussed earlier, the Bangladeshi migrants involved in fisheries

sector as a tool of readymade financial settlement in which they had yearlong wisdom and expertise.

- Most of the fishermen belong to SC and ST community. Majority of them have possession of APL card, 35 per cent of the fishermen are uneducated. Literacy percentage is higher in case of Boat owners. In aggregate, 50 per cent of the fishers consider agriculture or agriculture related activities as their second profession. 100 per cent of the fishermen are male and among them 90 per cent is found Hindu. Among the fishermen not a single pension holder or government employee is found in this area. Gross annual income of the Boat owners is more than Rupees 25lakh and for the fishermen (without boat) is Rupees 3.75 lakh. Boat owners have more experiences in fishing than fishermen. Many fishermen after a yearlong experience in fishing became the owners of the fishing boats.
- Catching fishes are done by both traditional as well as mechanized boats. Mechanization and specification of modern tools for fisheries activities stated for over the decades. e- Registration of mechanized boats has taken place for more than five years. Overall, 3.1 numbers of trawlers are found to be operative in these harbors. Average number of Gillnetters and Deep-sea trawler are reported to have 1.3 and 2.6 respectively.
- In case of fishing crafts (by design), the number of traditional vessels in Shankarpur, Petuaghat and Fraserganj are 2.3, 2.0 and 1.9 respectively. Number of Deep-sea trawlers in this area is 6.8, 7.2, and 1.5.
- In the larger interest of the society, banning of fish during seedling period or prohibiting fishermen for catching small and juvenile fish is felt with a much long experiences and economic damage. Banning is strictly maintained during the period of 15th April to 15th June i.e. 61 days.
- Overall fishing days throughout the season is 189.09 days, it is higher for the fishermen group, and the corresponding figure for them is 196.26 days. On an average, the fishers are involved 61.87 days for fishing activities per season. Overall 9.97 days are required for each fishing trip. The corresponding figure

for Boat owners is 10.80 days and 12 to 14 persons are required for one fishing trip.

- Harvested fish are generally categorized as Grade-I (high value) and Grade-II (low value) considering the quality and species & variety of fishes. Overall 18.03 tons of fish landed in each trip, and among them 60 per cent are regarded as high valued quality and rest are treated as Grade-II or inferior to grade I. Major portion of harvested fish are being marketed through the wholesalers and middleman or agent by the Processing Plants or Exporting Agencies. Sometimes the wholesalers act as agent of the big fishing houses.
- Hilsha, Pompret and Prawn are regarded as Grade-I variety and Tur, Mackeroal, Bigge, Kalia etc are regarded as Grade-II variety.
- After landing, the fishermen usually receive Rs.15.9 less per kg to its actual value. Due to better icing and washing facilities on board the boat-owners, receive a higher margin than the fishermen. In comparison to the fishermen , on an average they receive more than Rs.1.30 per kg. Almost 70 per cent of the fishermen have to go with pre-arranged financing agreement with the wholesalers. The figure is comparatively less for the boat-owners group.
- It is reported that cost per fishing trip for both the boat-owners and fishermen varies from Rs.1.8 lakh to Rs.2.0 lakh throughout the fishing seasons. Cost of fuel reported to have 50 per cent of the total voyage cost.
- Both boat-owners and fishermen carry ice and ice boxes on board. Almost 100 per cent of boat-owners have washing and cleaning facilities on board. These facilities availed by the fishermen much less than the boat-owners and overall 83 per cent fishermen possess such facilities on board.
- The respondents are not satisfied with the prevailing on shore fishing facilities available in three harbours. Overall 67 per cent of the respondents are unsatisfied with the condition of existing landing platform and almost 90 per cent of them reported about the poor condition of roads and other modes of communication.

- Conditions for basic civic facilities viz. availability of drinking water toilet and sanitation in all these sectors are very poor. The helpers (fishermen on board) used to live in a very hapless situation, they used to stay in the thatched hamlets with insufficient basic amenities. Hygienic condition is very poor as existence of toilets and lavatories in this area are virtually nil. In hygienic conditions of the surrounding areas of landing platforms are highly polluted and susceptible to contamination of harvested fishes.
- Both Shankarpur and Petuaghat have no auction market adjacent to the fish harbor/ fish-landing centres. Owing to this the fishermen have to carry product to Digha Mohona where fish auction facilities are available. Nevertheless, in both of these two cases ice plants, ice flake plants are being set up by both private and public enterprises. In Fraserganj all these facilities are available away from the sea-shore. The respondents are not satisfied with the qualities and services rendered by the facilitators.
- Facilities for tools and implements like insulated boxes, iceboxes, van, van-rickshaw etc. for storing and preserving fish are in adequate in three harbours. Even the cold-chain facilities including cold storage and chill plants are not sufficient to cater the need of the demand. In view of that in many times they have to depend on the 'bona fide co-operation' of the middlemen or intermediaries.
- Due to poor or inadequate post-harvest infrastructure availabilities the fishers have to face a significant portion of loss of their produce both in quality and value terms. In Shankarpur, Petuaghat and Fraserganj taking together about 70 per cent of the total fish loss lies between the ranges of 5 to 15 losses of harvested fish. For fishermen within the same range of fish losses register almost 80 per cent of total loss. For the boat-owners, 40 per cent of the total post-harvest loss in terms of sale value lies in the ranges within 15 per cent to 25 per cent.
- The fishers have to face numerous problems viz. occurrence of cyclones, net and rope breaking, medical related problem, availability of high speed fleets.

Communication and infrastructural amenities like drinking water, toilets, cold storages, parking lots, ice and fuel. It is reported that almost 90 per cent of the Boat-owners and 95 per cent of fishermen viewed availability of ice is a big problem. 90 per cent of the boat-owners and overall 93 per cent of fishermen reported against availability of cold storages. And almost 87 per cent of the respondents vehemently urged for improving better infrastructure facilities and to uplift the basic amenities for maintaining proper hygienic condition surrounding to the area of fish harbours and fish landing centers.

- The auction markets and the subsequent marketing chain are overwhelmingly dominated by the wholesalers. In all the cases, it has been reported that wholesalers charged 1 per cent (Rs.15 – Rs.20/kg.) of the total value of the fish auctioned in the market. In case of wholesalers due to poor – post harvest infrastructure overall 37 per cent of losses are registered during all seasons of fish harvesting and the loss lie within the range of 11 – 15 per cent of loss as mentioned earlier. In Shankarpur 60 per cent of post harvest losses are registered during third session and it lies within the range of 6-10 per cent of losses. The comparable figure for Fraserganj during the same season is 60 per cent.
- On time and adequate supply of ice play a crucial role in prohibiting quick decomposition of fishes. In this study overall 75.37 per cent of the wholesalers reported against availability of adequate ice and 56.7 per cent of them for in time availability. Price of ice-blocks remains almost same for these three harbors.
- As far as socio-economic characteristics are concerned 70 per cent of the retailers are women and among them literacy percentage is very nominal. On an average of 17 per cent of the female retailers are literate. Major quantity of fish purchased by the retailers is from middlemen and that amount varies to 58 per cent to 70 per cent of total purchase. 20 – 40 per cent of the quantity purchased by the retailer is directly from the fishermen. Purchase price varies

along the markets and that also to the tune of Rs.40 – 100/kg. Profit may vary accordingly.

- The retailers have to face heavy loss of vendible commodities due to poor post-harvest infrastructure. It is reported that overall 30 per cent wastage of total loss in saleable fish are found within the range of 11 – 15 per cent taken together. In Shankarpur fish market within the range of 16 – 20 per cent damage in case of saleable fish, the loss estimated to 20 per cent of total value loss. In Petuaghat 50 percent of total fish loss in value terms lies between 6 – 10 per cent ranges of losses. Shankarpur within this range reflects the highest figure i.e. 60 per cent.
- Like fishers and wholesalers, the retailers also are not satisfied with the availability of ice and iceboxes. Only 23 per cent of them have reported positively about on time availability of ice – the rest are dissatisfied. Almost 80 per cent of the retailers are in dire needs of on time supply of ice and ice-boxes.
- Generally, the retailers purchase bulk amount of fish from the wholesalers. In some cases they purchase fish directly from the fishermen within a short duration of landing fish in the auction yards. No freezer boxes are available by the retailers in all three markets. 100 per cent of the purchased fish are being carried through iceboxes. Fish purchased by the retailers both in quantity and quality terms reported to have their satisfactory level. However, in case of price of fish their lower bargaining capacity affects them most, in most of the cases they consider it as ‘fait-accompli’.
- Retailers usually sell their products to the households and hoteliers. The hoteliers are situated at the radius of 5 to 20 kms from the retail market. Most of the household consumers are male. Among household consumers only 6.7 per cent are involved in fisheries activities. Overall, 30 per cent of the female consumer taken for observation is housewives and only 3.3 per cent of them are involved in business activities. The family size of the households varies from 5.4 to 6.2 member/ household respectively. Average frequency of

purchase of fish increased is 5.13. On an average, at a time the consumer purchases a little more than one kg and it is found most of the cases they are satisfied with the quality of fish. It is obvious, as they reside adjacent to the fish market, fish reaches quickly to these categories of consumers than the average number of consumers in the district or state. The consumers are of the view that average price charged by the retailers are higher than the optimum (reasonable) price.

- Among three harbours Shankarpur and Fraserganj are older than Petuaghat. Petuaghat harbor inaugurated in the year 2010. Its infrastructural facilities are yet to run in full swing but it has the largest capacity. Petuaghat is the seventh largest fish harbor in the country.
- All three harbours are running behind their optimum level. In Petuaghat capacity utilization during all seasons reported to have more than 50 per cent. Fraserganj reported to have better capacity; it varies between 56 per cent to 66 per cent. in Shankarpur the capacity utilization figure is almost same, only the Ffirst season of fishing reflects a better result.
- Most of the processing plants are situated at Benfish Complex at Chakgaria, Kolkata, almost 250km away from the fish harbours of Shankarpur and Petuaghat and 120km away from Fraserganj. During data collection, it was found that processing management in most of the plants is reluctant to divulging the actual figure of his plant. It was presumed that capacity utilization for all plants lies between 45 – 55 per cent of their fullest capacity. 10 – 12 per cent weight loss of total purchased fish is reported by the processing plants.
- It is reported that 50 per cent of their product are purchased from the wholesalers and rest 50 per cent directly from the fishermen. In some cases the processing plants are owned by the Boat owners themselves. They engage agents to purchase best quality fish from the wholesalers or from the fishermen to whom they have pre-arranged financial contracts long before the fishing seasons started.

- In all cases, more than 80 per cent of the processed item is sold to the exporters. The processors generally act as exporters of their finished product.
- Mentioned earlier, transportation of raw fish is a big problem and the processing plants are not exception of that. It is reported that 70 per cent of the raw fish are being carried out through insulated van. Due to non-availability of adequate freezer, more than 50 per cent of fish are being transported through iceboxes.
- The processing plant has to carry out specific norm and strictures of International Standards made by Export Inspection Agency (EIA) of India, Hazard Analysis and Critical Control Point (HACCP) with European Union (EU). Besides all these exporting agencies should be registered with Marine Products Export Development Authority (MPEDA). It is seen in all cases the export houses follow the above rules and regulation. Only in case of compliance of EU norms it is found overall 43.3 per cent of the exporting house comply the usual schedule. Shankarpur and Fraserganj fish harbors comply F&D of USA norms fully.

6.8 Conclusions

- Marine fisheries sector in West Bengal is perceived to be at the cross roads of flourishment. A dichotomized activity of coexistence of traditional custom with modern method is visible. Post harvest operation is done both of these two methods.
- The existing infrastructural facilities available in Shankarpur, Petuaghat and Fraserganj fish harbors are seemed to be inadequate. The fish landing centres adjacent to these harbors are also in bad shape. A lot of scope and opportunities are there for its further development. Huge scopes are there for enhancing capacity utilization of the existing harbors as they are operating much below of their optimum level.
- Cleaning, washing and drainage facilities are inadequate. Supply and availability of ice, iceboxes, insulated boxes, insulated van, existence of cold storages, freezer all these basic tools and implements required for effective

post harvest management of marine fisheries are found to be far from the desired level.

- The fishermen, wholesalers, retailers and particularly the sailors possess lack conception of hygiene. Application of chemicals as preservatives and use of formalin and pesticides in fish drying operation are dangerous trend indeed, unfortunately, no sense of human health and poisonous effect hardly affects into their mind. Most of them, especially sailors are interested in quantity although quality has a big role to play. They tried to compensate quality rather some time compromise with quality by over harvesting of catch.
- An indifferent attitude or lackadaisical state of mind in the minds of Fisheries officials in course of vigilance or implementation of Government policies for preservation of marine resources and sustainable development in this sector are found to be rampant. Needless to mention, shortage of staff are in all sectors of fisheries department are responsible for the poor state of vigilance.
- A sort of sensitization programme of the fishers with active help and cooperation with the Federation of Fishermen's association in the direction of scientific method of post harvest operation could lead to a success in reducing losses in marine fisheries sector.
- Government has done little in providing basic amenities to the fishers especially to those are involved in fish drying activities.
- Effective legislation of marine fisheries and its proper implementation could enable in huge foreign exchange earnings and the sector has immense potentialities to absorb the growing work force as well as to provide nutrient supplements to the countrymen to a greater extent no doubt.

6.9 Policy Recommendations

- The available post-harvest infrastructure in West Bengal is not sufficient to cater the huge harvesting of marine fishes and hence need more attention from the Central as well as State Government. A sort of dualism of traditional as well as modern method of post harvesting operation is co existing in this

region. Considering the economic value of fish and an urge for supplying quality fish in reasonable price and that also in hygienic manner ought to be prioritized.

- In view of the above the existing infrastructure in the fish harbors and fish landing centers need to be modernized. For cleaning and washing more submersible pumps are to be bored.
- It is observed availability of ice and iceboxes are not sufficient. Ice blocks available from private sources are inferior in quality, price is high, moreover weight is much less than the scheduled one. Hence, the fishers have to purchase more ice-blocks causing an increase in cost of operation. More ice factory and ice crushing plants are to be set up at the vicinity of harbors.
- Cold storages are situated at a long distances of the harbors and capacity of cold storages are not adequate to store the required quantity within a very short duration. Until setting up more storages, supply of insulated boxes, insulated vans for carrying and transportation of raw fish from the auction yard to the doors of storages are to be assured.
- Usually the Boat owner sans the owner of the trawler has to make a pre harvesting financial agreement with the wholesaler. Besides an exorbitant rate of interest (24 percent to 36 percent per fishing season), the wholesalers charge 1 percent of the sale value of total catch inflicting an economic loss to them. It indirectly affects the consumers 'price also. Financing of these types of fishers should be facilitated from organized banking sectors. This area lacks of these facilities.
- Of late, the traditional boats are rapidly substituted by modern mechanized boats and registration of boats is in fully operating. Introduction of e-registration has facilitated the process significantly yet, no leniency on onboard requirements for maintaining the quality of fish is to be spared. A keen vigil on part of the Government officials is solicited.
- Proper training should be imparted to the fishers who are actively associated with handling, storing, transport and processing of harvested fish.

- Setting up one dry-fish plant is utmost essential as hundreds of population is engaged in processing and trading of dry fishes.
- Dredging in the mouth way of the jetty (in Shankarpur and Digha mohona) is urgently required as siltation has created severe problem in free moving of the boats and trawlers. Due to heavy siltation the trawlers occasionally anchor at a long distance and the fish are being carried through small boats with a larger frequency. This activity fastens the physical loss and decomposition of fish body.
- Setting up of Third Jetty in Sankarpur is most essential. At present two numbers of jetties are operating, setting up of third jetty will reduce the overcrowding of boats and facilitate the free movement of trawlers.
- Interestingly, Petuaghat harbor being the seventh largest harbor in the country has no advisory committee taking the stakeholders together. Petuaghat needs one advisory committee like Sankarpur for its further development and better utilization.
- Enhancing facilities for Dry dock systems in Shankarpur and Fraserganj should be facilitative the sailing and repair of damage fleets in need. The existing dilapidated dry dock at frasergang should be renovated and make it operational within a very short period.
- Auction market should be set up in Petuaghat. Apart from all facilities, non functioning of auction market at Petuaghat creates a havoc indecisiveness among the minds of the fishers. Usually, they have to carry fish to the auction market at Digha mohona, which is almost 50 kms away from the fish harbors. Frequent handling and transportation of the catch are easily susceptible to physical damage of fish and for that reason they have to depend on the middleman and intermediaries or agents of the Wholesalers or Exporting firms for quick disposal of their product.
- The fishermen on sea shore live in very abject inhuman condition. Poor arrangement of drinking water and sanitation, thatched house, dilapidated schoolrooms, unavailability of roads, electricity, hospitals with no basic

amenities of recreation are common phenomenon in all remote sea shore area around the harbors. Both Central and State governments should take appropriate decision for better habitation and providing basic amenities for making life more joyous, pleasurable and humane. Huge number of farmers are temporarily domiciled from the agricultural farm and engaged in dry fishing activities. They badly need a at least one child care unit in each cluster of khuties.

- Development of infrastructure in the 'Khuties" for improved quality of edible dry fish for human consumption as well as for good quality fish meal, development of link road for facilitating the movement and transport of fishermen and catch from the seashore to main road, establishment of suitable structures for sun drying are the primary need of dry fishing clusters.
- Setting up of modern dry-fish, plant is utmost essential as hundreds of population is engaged in processing and trading activities.
- The wholesale market yard and retail platform lies absolutely at the mercy of the contaminating reagents. Cleaning and washing activities are not properly done and the drainage facilities are very poor. But the most hazardous point is distinctly noticed the use of chemicals as preservatives and most of the cases formalin is used as popular item for preservation. Food Sanitary Inspectors or the Department of Health as positive role to play for precluding such hazardous chemicals used for human consumption.
- Huge quantity of juvenile and immature fish (Hilsha, pomfret,prawn, mackerel) ,despite official restriction are being harvested by many fishermen. A sense of responsibilities and sensitization among them should be imparted through proper and meaningful discourse. A strict vigil by the Government functionaries and spot fine or punishment to the guilty could be able to minimize huge economic and invaluable marine resources. In that case, Fishermen's Association also could play an active role.
- Bottom trawling within the EEZ and fishing beyond EEZ plays a havoc role on ecological niche causing an irreparable damage on marine resources. That

should be stopped immediately. Government should take effective measure in banning such type of suicidal measure with an immediate effect.

- Both Central and State Government over the years has adopted various measures in successive Fisheries Policies for improvement and development of this important sector. The main thrust of all fisheries policies is to sustainable development with eco-friendly fishing operation. It is saddening to note that even after successive Plan periods no concrete vigilance measure for maintaining fisheries resources in a sustainable way are found in the State of West Bengal. Policy implementation is more important than recommendation for fisheries development.
- The Fisheries Officials raised points on the issues of diversion of funds ; in number of cases funds allotted by the Department of Fisheries for marine fisheries development diverted to inland fisheries 'programme implementation keeping development of this sector at bay. That should not be encouraged and allotments of funds are to be done priority wise. Besides inland sector, equal emphasis should be given to marine fisheries sector also.
- It is reported that Fisheries Officials amidst all limitations and staff constraints are trying hard to implement Government Policies; they are of the view that a huge shortage of requisite number of staff in offices and extension services create a bottlenecks for effective supervision and surveillance in marine sector. State Government should take note of this situation. And finally,
- Federation of Fishermen's Association is in great debate regarding allowing foreign vessels within the EEZ or Indian Maritime Zone. At the present situation where National security at stake more attention and careful observation are solicited from the Functionaries of Central Government before allowing foreign vessels to enter into our maritime Zone and restricted permission to the foreigners are suggested.

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Appendices

Appendix for Chapter – 1

Table – 1: Top five fish producing States in order during 2011-12, 2012-13, 2013-14 & 2014-15

(Production in '000 tonnes)

Year	Andhra Pradesh	West Bengal	Gujarat	Kerala	Tamil Nadu
2011-12	1603.17	1472.04	783.72	693.21	611.49
2012-13	1675.44	1490.01	848.79	677.78	620.40
2013-14	2018.42	1580.65	793.42	708.65	624.30
2014-15	1964.43	1617.319	809.93	632.256	697.61

Source: Hand Book Of Fisheries Statistics 2014-15, Government of India

Table – 2: Contribution of Fisheries sector to GDP (at current Prices)

(Rs. in crores)

Year	Total GDP	GDP from Agri, Forestry & Fishing	GDP from Fisheries	GDP from Fisheries as % of	
				Total GDP	GDP from Agri, Forestry & Fishing
2005-06	3390503	637772	31699	0.93	4.97
2006-07	3953276	722984	35182	0.89	4.87
2007-08	4582086	836518	38931	0.85	4.65
2008-09	5303567	943204	44073	0.83	4.67
2009-10	6108903	1083514	50370	0.82	4.65
2010-11	7266967	1306942	57369	0.79	4.39
2011-12	8353495	1465753	65541	0.78	4.47
2012-13	9252051	1668676	78053	0.83	4.75
2013-14	10477140	1881152	96824	0.92	5.58

Source: Hand Book Of Fisheries Statistics 2014-15, Government of India

Table – 3: Export of Fisheries Products

Year	**Quantity ('000 tonnes)**	**Value (₹in Crores)**
2006-07	612.641	8363.52
2007-08	541.701	7620.92
2008-09	602.835	8607.94
2009-10	678.436	10048.53
2010-11	813.091	12901.47
2011-12	862.021	16597.23
2012-13	928.21	18856.26
2013-14	983.75	30213.26

Source: Hand Book Of Fisheries Statistics 2014-15, Government of India

Table – 4: Fishing Harbours (FHs) & Fish Landing Centers (FLCs)

FH at major port	Minor FH		FLCs	
	Commissioned	Under construction	Commissioned	Under construction
7	50	25	180	16

Source: Hand Book Of Fisheries Statistics 2014-15, Government of India

Table – 5: Fishing Craft:

Traditional crafts	Motorized Traditional crafts	Mechanized boats	Total
52,982	73,410	72,749	1,99,141

Source: Hand Book Of Fisheries Statistics 2014-15, Government of India

Appendix for Chapter – 2

Table – 1: Fisheries resources of West Bengal

Marine	
Length of coast line (Km)	158
Continental Shelf (‘000 sq km)	17
Number of Fish Landing Centers	59
No of Fishing villages	188
No of fishermen families	76,981
Fisher-folk population	3,80,138
Inland	
Total inland water bodies (lakh Ha)	5.45
Rivers & canals (Km)	2,526
Reservoirs (Lakh ha)	0.17
Tanks & ponds (lakh Ha)	2.76
Flood plain lakes/derelict waters (lakh Ha)	0.42
Brackish water (lakh Ha)	2.10

Source: Hand Book Of Fisheries Statistics 2014-15, Government of West Bengal

Table-2: Fishing gear details of West Bengal coastal areas (Appendices)

Types of nets	Small bag net	Gill net	Big bag net (for dry fish)	Trawler
Bathymetry (m)	4-6	6-100	20-30	30-100
Mesh size (mm)	Below 25-30	30-110	25-35	25-110
Length (m)	7-10 (mouth opening)	200-500	15-20	15-25 (mouth opening)

Source: Marine fisheries census 2010 Part II, 1, West Bengal, CMFRI

Table - 3 : Marine Fish Production in West Bengal(in lakh ton)(Appendices)

Year	Marine	Growth Rate %
2000-01	1.810	
2001-02	1.847	+2.04
2002-03	1.815	-1.732
2003-04	1.816	+0.005
2004-05	1.795	-1.15
2005-06	1.600	-10.86
2006-07	1.780	+10.11
2007-08	1.827	+2.64
2007-08	1.830	+0.164
2008-09	1.890	+3.27
2009-10	1.790	-5.29
2010-11	1.970	+10.05
2011-12	1.820	-7.61
2012-13	1.520	-16.48
2013-14	1.880	+23.68
2014-15	1.790	-4.78

Source: Hand Book Of Fisheries Statistics 2014-15, Government of West Bengal

Table.4: Shrimp production in West Bengal (in ton)

Year	Marine Penaeid	Marine Non-Penaeid	Total
2007-08	12854	6481	86895
2008-09	9600	6400	88200
2009-10	8531	3833	93564
2010-11	10235	3570	99977
2011-12	8449	3396	106886
2012-13	7643	2284	111654
2013-14	7645	7534	112815
2014-15	6767	2744	115916

Source: Hand Book Of Fisheries Statistics 2014-15, Government of West Bengal

Table – 5: Fish Farmers Development Agencies (FFDAs) and Brackish Water Fish

No of FFDAs (Bankura, Nadia, Hawrah, West Dinajpur, Hooghly, Birbhum, Darjeeling, North 24-Paraganas, Malda, Murshidabad, Cooch-Behar, Jalpaiguri, Burdwan, Midnapur, Purulia, 24-Paraganas (South), Siliguri Sub Division of Darjeeling District and Uttar Dinajpur)	18
Water area covered under FFDA (Ha)	1,29,668
No of Fish farmers trained under FFDA	2,09,138
No of beneficiaries under FFDA	4,07,551
Average productivity reported (Kg/Ha/year)-FFDA	4,400
No of BFDAs (North 24 Parganas, South 24 Pargnas and Midnapore)	3
Total Brackishwater (Ha)	2,10,000
Water area covered under BFDA (Ha)	5,994
No of Fish farmers trained under BFDA	12,343
No of beneficiaries under BFDA	7,465
Average productivity reported (Kg/Ha/year)-BFDA	1,106

Rashtriya Krishi Vikas Yojana (RKVY)

Table – 6: Details of year-wise and sector-wise projects cost for all States under RKVY are as follows:

(Rs in crore)

Year	Total RKVY projects cost for all States	Total project costs for Fisheries sector of all States
2007-08	1476.03	63.70
2008-09	3993.16	142.17
2009-10	4754.01	109.12
2010-11	8398.17	278.96
2011-12	8814.10	392.23
2012-13	11632.49	319.41
2013-14	5072.17	*247.97
2014-15	3195.44	*278.657

NMPS National Mission for Protein Supplement (NMPS)

Table – 7: Details of year-wise and sector-wise allocation for all States/UTs under RKVY sub scheme NMPS

(Rs in crore)

Year	Total NMPS allocation for AHD&F for all states/UTs	Allocation for fisheries sector for all states/UTs
2011-12	300.00	100.02
2012-13	500.00	200.26
2013-14	400.00	Allocation to Fisheries Sector is made by the respective states/UTs.
2014-15	300.00	80.97

Table – 8: Funds released during 11th Five Year Plan Period under the CSS & CS Schemes:

(Rs in lakhs)

Name of Schemes	Funds released during 11th Plan Period				
	2007-08	2008-09	2009-10	2010-11	2011-12
Development of Inland fisheries & Aquaculture	1284.23	1360.00	2074.95	2294.31	2985.40
Development of Marine Fisheries, Infrastructure & Post Harvest Operations.	4149.00	4956.26	6211.42	7811.43	7592.91
National Scheme of Welfare of Fishermen.	2138.02	2517.41	3623.19	4194.48	4456.03
Strengthening of Database & Geographic Information System for Fisheries Sector.	254.25	247.43	888.00	912.00	427.00
Biometric ID cards	-	-	3300.00	-	-
National Fisheries Development Board (NFDB)	5000.00	4690.00	10000.00	9230.00	10800.00

Table – 9: Funds released during 12th Five Year Plan Period under the CSS & CS Schemes**:**

(Rs in lakhs)

Name of Schemes	12th Plan		
	2012- 13	2013-14	2014-15
Development of Inland fisheries & Aquaculture	3141.64	3103.87	2632.17
Development of Marine Fisheries, Infrastructure & Post Harvest Operations.	7457.73	6375.68	9285.08
National Scheme of Welfare of Fishermen.	3938.47	5214.73	5204.25
Strengthening of Database & Geographic Information System for Fisheries Sector.	379.02	551.79	750.00
National Fisheries Development Board (NFDB)	10681.00	12316.00	13750.00

Allocation for the Fishery 2015-16

(Rs in lakhs)

Name of Schemes	**Total**
Development of Inland fisheries & Aquaculture	3665.00
Development of Marine Fisheries, Infrastructure & Post Harvest Operations.	7000.00
National Scheme of Welfare of Fishermen.	4349.00
Strengthening of Database & Geographic Information System for Fisheries Sector.	495.00
National Fisheries Development Board (NFDB)	15786.00

Appendix for Chapter – 3

Press Information Bureau Government of India Ministry of Agriculture 06-November-201517:38 IST

National Policy on Marine Fisheries to be reviewed

The Government is in the process of revising National Policy on Marine Fisheries. A committee under the chairmanship of DG, ICAR is seeking the inputs from stakeholders. The new policy will ensure all-round development of Fisheries sector in the country. Addressing the consultative committee of the ministry of agriculture and farmers welfare in Varanasi today, Union Minister of Agriculture and Farmers Welfare, Shri Radha Mohan Singh said that Marine Fisheries is the fastest growing food producing sector in the world with a great potential to meet the food, especially protein requirement of a large number of population. And With an annual growth rate of above 7 per cent, India is the second largest producer of fish from aquaculture in the world.

Underling the importance of fresh water aquaculture, the Minister said that the species diversification in the recent years has led to development of technology of breeding and hatchery management of several important species for fresh water aquaculture. Establishment of 'Brood bank' for commercially important species at Bhubaneswar by the NFDB is expected to ensure production and supply of certified broods to hatcheries in the country. The cage culture in reservoirs has picked up very well in recent years. The feasibility of inland saline aquaculture in the States of Haryana, Punjab and Utter Pradesh has opened up scope for bringing the land unfit for agricultural activity under economic use. In order to augment production of freshwater aquaculture, Guidelines have been issued for regulating introduction and culture of Tilapia as well as Pangasius species and also for Shrimp species L. vannamei. Shri Radha Mohan Singh apprised the members of the committee of development in Fisheries sector. He said that the Central Inland Fisheries Research Institute (CIFRI) has standardized pen and cage farming for some species which offer vast potential for inland aquaculture in the country i.e. Pangasius and Indian Major Carp. The production potential from sustainable cage culture is about 50 kg / m3 and from pens is about 3500-5400 kg / ha /6 months with huge potential for up-scaling. It is expected that large scale adoption of the technologies of breeding and seed production by the farmers across the country shall lead to sustainable freshwater aquaculture leading towards 'Blue Revolution' in the country.

The Agriculture and Farmers Welfare Minister said that Commercial farming of high value cold water species like brown trout and the exotic rainbow trout and exotic cold water carps has been taken up successfully in some of the hill States. For development of cold water fishery Directorate of Cold water Fisheries Research (DCFR) has been established at Bhimtal. In order to encourage and promote establishment of Shrimp Broodstock Multiplication Centres (BMCs) for increasing production and productivity of shrimp aquaculture, Guidelines for regulating establishment and operation of Specific Pathogen Free (SPF) Shrimp BMCs in the coastal areas have been issued. In addition, the Guidelines have also been formulated for the import of Seabass fingerlings for culture by private entrepreneurs/enterprises.

The Minister said that Brackish water aquaculture is another potential area of fish production. India has 1.2 million ha of brackish water area spread over 10 maritime States / UTs. The Coastal Aquaculture Authority (CAA) is regulating the activities in saline and brackish water systems within 2.0 kms from the High Tide Line for sustainable development of coastal aquaculture sector. Introduction of commercial farming of exotic shrimp L.

vannamei through CAA by adopting strict regulations and bio-security requirements has witnessed a spectacular growth in the sector. The regular awareness programs, availability of technologies pertaining to management practices, seed production, balanced feed etc along with private investment has made the brackish water aquaculture sector a vibrant industry. The sector is a major contributor to the fisheries export. Mariculture offers enormous scope for commercial farming of marine plants and animals in marine or brackish water environments in the main land and Island territories. The DAHD&F has undertaken a pilot project on sea cage units in different maritime states in collaboration with the Central Marine Fisheries Research Institute (CMFRI), Kochi for species such as cobia, pompano and groupers. Based on the outcome of the pilot study, States shall be assisted for setting up of open sea cages in both the East and West coast.

Stressing the need of development of fresh water, the Minister said that India has 5.4 million ha of inland water bodies, 1.2 million ha for brackish water fish culture and 8.5 million ha for sea farming and a rich biodiversity to harness aquaculture farming in fresh, brackish water and marine water bodies. Considering the vast potential aquaculture needs to be developed further in a sustainable manner for economic prosperity, for empowerment of fishermen, to generate employment and for food and nutritional security, especially protein malnutrition, by introducing new technologies for responsible and sustainable utilization of resources in an eco friendly manner, he added.

No.21001/5/2014-Fy(Ind) Vol.II
Government of India
Ministry of Agriculture & Farmers Welfare
Department of Animal Husbandry, Dairying & Fisheries
****

Krishi Bhawan, New Delhi.
Dated the 15th June, 2016.

Subject:- Second draft Statement on the National Policy on Marine Fisheries –invitation of feedback / comments- regarding.

Sir / Madam,

I am directed to refer to this Department's Order of even No. dated 28.07.2015 regarding constitution of the Committee to suggest Draft National Policy on Marine Fisheries under the chairmanship of Dr. S. Ayyappan, Former Director General, ICAR and to inform that the second draft Statement on National Policy on Marine Fisheries as provided by the above-mentioned Committee is uploaded on the website of this Department.

2. It is requested that stakeholders may kindly provide their feedback, considered views / comments, if any on the second draft Statement on National Policy on Marine Fisheries for consideration by the said Committee **on or before 26th June, 2016**.

3. The comments may please be communicated by e.mail / fax / speed-post on the following addresses:

Dr. S. Ayyappan, (**Chairman of the Committee**) Room No.103, Krishi Anusandhan Bhawan-II, Pusa, New Delhi - 110 012. E.mail:sayyappan1955@gmail.com Fax: 011-25843477	**Shri Aditya Kumar Joshi**, (**Member Secretary of the Committee**) Joint Secretary (Fisheries), Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture & Farmers Welfare, Room No.221-A, Krishi Bhawan, New Delhi-110014 E.mail: jsfy@nic.in Fax: 011-23070370

Yours faithfully,

15/6/16

(**Dr. P. Paul Pandian**)
Fisheries Development Commissioner
Telefax. 011-23386379

Distribution to: All members (As per the list)

Copy for kind information to:

1. Dr. S. Ayyappan, former DG, ICAR & Chairman of the Committee
2. Shri Aditya Kumar Joshi, J.S.(Fy) & Member Secretary of the Committee

National Policy on Marine Fisheries, 2016 2nd Draft

Second revised draft Statement on National Policy on Marine Fisheries

Preamble

1. The overarching goal of the National Policy on Marine Fisheries, 2016 (NPMF, 2016) will be to ensure the health and ecological integrity of the marine living resources of India through sustainable harvests for the benefit of current and future generations of the nation. The overall strategy of the NPMF, 2016 will be based on the four pillars of sustainable development, principle of subsidiary, inter-generational equity and precautionary approach. These four pillars will guide the actions of various stakeholders in meeting the vision set for the marine fisheries sector of the country. While fishers will be at the core of this Policy, actions will also be guided by the 'Public Trust Doctrine'.

Objectives and Vision

Noting that India has an Exclusive Economic Zone of 2.02 million sq.km, a long coastline of 8118 km and two major groups of islands with rich and diverse marine resources;

Recognizing that the marine fisheries wealth is estimated at an annual harvestable potential of 4.412 million metric tonnes;

Considering that an estimated 4.0 million people depend for their livelihoods on the marine fisheries resources;

Acknowledging that the marine fisheries contribute to an economic wealth valued at about Rs.65,000 crore;

Recognizing further that the marine fisheries are an important source of food, nutrition, employment and income generation;

Realising that the marine fisheries wealth contributes significantly to the export earnings of the country and balance of trade;

Observing that the marine fisheries of the country are highly diverse but predominantly comprising small-scale and artisanal fishers;

Observing further that the marine fisheries sector is serviced by a range of other stakeholders, including non-governmental and governmental agencies;

Accepting that the marine living resources of the nation offer immense potential for enhancement of production through sustainable means, including mariculture;

Knowing that the marine fisheries resources are not in-exhaustive and subject to overexploitation;

Realising further that such over-exploitation would lead to loss of biodiversity and reduced availability of resources for our future generations;

Bearing in mind that the nation is committed to International agreements and arrangements for sustainable use of the marine resources;

The Committee set up by the Government of India for formulation of the NPMF, 2016 recommends the following objectives and vision for the marine fisheries sector of the country:

Objectives

2. The specific objectives of the Policy will focus on sustainable fish production and utilization, employment and livelihoods; equity and equality; provision of food security and nutrition; and creation of wealth and prosperity in the sector. As a part of the process adopted for formulation of this draft Policy Statement, wide consultations were held with stakeholders at all levels to ensure a balanced understanding of the needs of the sector. While keeping 'sustainability of the resources' at the core of all actions, the policy framework is expected to meet the national economic goals and is intended to guide the coordination and management of marine fisheries in the country during the next ten years.

Vision

"A healthy and vibrant marine fisheries sector that meets the needs of the present and future generations."

Marine Fisheries Sector of India

3. The potential of fisheries sector in general and marine fisheries sector in particular was recognized quite early in the Indian development planning and since then, a considerable amount of public effort has been channelled into the sector for developing it as an instrument of growth. Apart from the prime consideration of securing food and nutritional requirements of the population, fisheries sector plays an important role in trade and commerce and in the process, promotes livelihoods of millions of people often living at the margin.
4. Commencing as a purely traditional activity in the fifties, fisheries have now transformed to a commercial enterprise. After declaration of the Exclusive Economic Zone (EEZ) in 1976, the sea area available to India is estimated at 2.02 million sq. km. With an absolute right on the EEZ, India has also acquired the responsibility to conserve, develop and optimally harness the marine living resources within this area. In 2011 the potential yield from the Indian EEZ has been estimated as 4.412 million metric tonnes (mmt). This estimate is 12.2% higher than the previous estimate made by the Working Group (WG) in the year 2000 (3.934 mmt). Pelagic resources such as oil sardine, ribbonfish, Indian mackerel, etc. form 2.128 mmt (48.2%); demersal resources such as penaeid and non-penaeid prawns, cephalopods, perches, croakers, etc. form 2.067 mmt (46.8%) and oceanic resources such as yellowfin tuna, skipjack tuna, bigeye tuna, billfishes, pelagic sharks, barracuda, dolphin fish, wahoo, etc. form 0.217 mmt (4.9%). Depth-wise distribution of the estimated potential yield from the Indian EEZ is 3.821 mmt up to 100 m depth (86.6%), 0.259 mmt from depth between 100-200 m (5.8%), 0.115 mmt from depth betwen 200-500 m (2.6%) and the remaining 0.217 mmt is from oceanic waters (4.9%). The average marine fish catch during the last 5 years (2011-2015) was 3.707 mmt, with the maximum of 3.938 mmt, in 2012 and minimum of 3.404 mmt, in 2015. While the fisheries resources from the near-shore waters are fully utilized, the off-shore waters still provide opportunities of increasing the catch.
5. In terms of revenue, some of the high value species such as tunas that occur in the deeper waters are yet to be optimally harvested. Harnessing the full potential of marine resources will ensure sustainable benefits for the country and the people. As the sector is quite dynamic, there is a need to streamline policies and programmes to take advantage of the present sum of technical knowledge and state of resources. In this direction, the Committee recommends a set of Strategic Actions that on acceptance will specify the intent of the Government towards fulfilling the objectives of the NPMF, 2016.

Fisheries Management

6. While re-defining its strategy for the fisheries sector, the Government will focus on bringing in 'Blue Revolution' by sustainable utilization of the fisheries wealth from the marine and other aquatic resources of the country for improving the lives and livelihoods of fishers and their families. The Blue Revolution also reinforces the 'Blue Growth Initiative (BGI)' voiced at the 2012 Rio+20 meet held at Rio de Janeiro City.
7. To realize the full potentials of marine fisheries, efforts of the Government will be directed towards fishing effort management; fleet-size optimization; mainstreaming biodiversity conservation in production processes; species-specific and area-specific management plans, including conservation of Ecologically and Biologically Sensitive Areas (EBSAs) and Vulnerable Marine Ecosystems (VMEs), protection of endangered and threatened species; spatial and temporal measures for sustainable utilization of resources, etc.
8. According to the National Marine Fisheries Census 2010, the marine fishermen population in India is estimated at 4.0 million, of which 0.99 million are active fishermen. Among the active fishermen, 33% are employed in the mechanised sector, 62% in the motorised sector and 5% in the artisanal sector. Of the total marine fish production 75% comes from mechanised sector, 23% from motorised sector and 2% from artisanal sector. The motorized and artisanal sectors together account for 25% of the production. The pattern of marine fish landings in India during the past fifty years clearly reveals that the contribution by the artisanal sector to the total production was significant up to the sixties. As a result of popularization and consequent expansion of mechanised fishing during the subsequent periods along with motorization of artisanal crafts, the contribution by the artisanal sector declined considerably over years. The mechanized trawl fishery is now the most important among various fishing methods in India and contributes about 55% to the total marine fish production in the country. The Working Group (WG) of 2011 indicated the level of overcapacity for different sectors for all maritime states and the optimum fleet size as suggested by the WG has to be maintained for sustainability. Strategies will be developed to reduce overcapacity and implement the same in a phased manner in consultation with stakeholders.
9. Marine fish harvests from the EEZ of the seas around India are close to the current potential yield estimates (4.412 mmt), and there is an untapped potential of high valued resources like tuna and tuna-like species. However, considering the wide confidence intervals of catch and potential yield estimates, there is a need for taking a precautionary approach in line with the global standards regarding wild fish harvests. Therefore, the main emphasis will be to maintain the harvest at about the current levels of Maximum Sustainable Yield (MSY), with sustainability and equity as the key principles. It will also be ensured that the smallscale character of the entire marine fisheries sector is retained.
10. Management of fisheries will follow an integrated approach, blending traditional knowledge and science with business principles and effective engagement of both primary stakeholders, as also those engaged in ancillary activities to ensure that fisheries are ecologically and economically sustainable.
11. Knowledge management will be the prime approach to foster quick and easy availability of information on key attributes of the marine fisheries sector, such as- resource abundance and distribution; real-time resource maps; productivity assessments; real-time Potential Fishing Zone (PFZ) advisories and weather forecasts

for the benefit of the fishers. The use of Information Technology (IT) sector and space technology will be put to optimum use for harnessing the benefits in support of the community.

12. Spatial and temporal closures have helped in sustaining the marine fish wealth of the country. To ensure that such management measures effectively improve the livelihoods of fisher people, periodic reviews will be conducted taking into account the best scientific information available, including a precautionary approach, and with due engagement of fishers and other concerned stakeholders.
13. The marine fish resources are not inexhaustible, and uncontrolled harvests will lead to depletion of resources, as experienced in many cases. Appropriate steps will be taken in consultation with concerned scientific institutions and fishers in optimizing the fishing effort and implementing measures that will help in sustaining the resources. Such measures will inter alia include mechanisms to limit fishing effort through input and output controls, fleet size, fishing days and area of operation, engine horsepower, gear size, MSY, minimum mesh size, minimum legal size, etc.; moving effort to areas which are relatively less exploited; developing fleet plan maps; and creating fisheries management areas to ensure that resource depletion is contained.
14. Presently, coastal States/UTs have specific areas earmarked (based on depth or distance from shore) as reserved for traditional fishers. Such Territorial Use Rights to Fisheries or TURFs have proved to be useful in sustaining the livelihoods of such artisanal fishers. The Government would continue to provide such support to artisanal/traditional fishers. In consultation with user groups the Government will consider further enlarging the scope through increase in the area presently available to the traditional/fishermen in the Territorial Waters.
15. The Ecosystem Approach to Fisheries Management (EAFM) will be implemented with due consideration to the well-being of all living and non-living components in the marine ecosystem and the social status of stakeholders. In the same vein, participatory management or co-management in fisheries, which is recognized as one of the successful management systems for multi-stakeholder, multispecies and multi-fleet fisheries throughout the world, will be promoted. Such a co-management system, which includes local, regional, interstate and national fisheries councils would also address resolving conflicts among different groups of fishermen. The norms for introducing these management measures will be worked out in consultation with the fisheries research institutions, coastal States/UT Governments, fishers and their associations and other concerned stakeholders in the sector.
16. The fishing operations in the 12-200 nm zone of the Indian EEZ are currently guided by a set of guidelines issued by the DADF, which was modified in 2014. Considering that the LOP scheme has not had the expected impact in the inclusive development of the deep sea fishing sector, an alternate mechanism will be looked at for development of the deep sea fishing sector and the committee recommends to rescind the LOP scheme. Alternatively, a new development scheme would be introduced for enhancing the skills and capabilities of National Policy on Marine Fisheries, 2016 2nd Draft 5 the traditional fishermen to undertake deep sea fishing. The scheme will inter alia consider modernisation of existing indigenous deep sea fishing fleet, introduction of new indigenous deep sea fishing vessels through fishermen cooperatives/self-help groups, on-board training and linkages to market and export, etc.
17. Utilization of deep sea resources in the EEZ will be reconsidered in terms of not only the resources available in the EEZ, but also of infrastructure, human capacity

development and a comprehensive and implementable set of rules and regulations, with a strong Monitoring, Control and Surveillance (MCS) regime in place, availability of scientific and technical information on the commercial fisheries resources and the best fishing methods with which to target them.

18. A holistic research resource utilization plan will be developed for the EEZ, taking in to considerations the requirements of coastal States. At the same time, coastal States would also have to recognize that the area of EEZ beyond 12 nautical miles is a common resource and isolated fishing strategies by the States may lead to over-exploitation and inter-state conflicts for this common resource. Therefore, the Union Government and the State Governments will act together to agree upon management policies and measures for sustainable utilization of the resources in the EEZ.
19. There is also considerable scope to harvest the fishery resources of the Areas Beyond National Jurisdiction (ABNJ) as done by many other countries. The Government will promote the utilization of fishery resources in the ABNJ by Indian fishing vessels subject to compliance of relevant provisions in the International Agreements/arrangements concerning fisheries in the high seas.

Monitoring, Control and Surveillance

20. The present mechanisms in place for a sound and effective MCS regime for marine fisheries sector need further strengthening. The Government has put in place an online uniform registration and licensing system (ReALCraft) to register all fishing crafts operating in the marine sector (traditional, motorized, mechanized and non-mechanized). While monitoring of fish catch & effort and control of fishing through registration and licensing is in place, MCS activities will be further strengthened through greater engagement of concerned agencies such as the Department of Fisheries, Coastal Marine Police and the Coast Guard. Strengthening and improvements in MCS will be carried out in a phased manner, by using conventional means (such as, use of log books, movement tokens, colour coding of fish vessels, biometric cards to fishers for their identity) and also space technologies and IT tools (e.g. Vessel Monitoring System and Automatic Identification System). The MCS system will allow the Government to put in place a sound enforcement mechanism at sea and at port to ensure full compliance and in the process, will also ensure that the Indian fishing fleet does not engage in any Illegal, Unreported and Unregulated (IUU) fishing within its own EEZ, high seas and EEZs of other nations. Legislations dealing with registration and manning of fishing vessels in the country also need to be updated for addressing the present needs of the sector and for ensuring that best labour conditions as per International Labour Organization (ILO) standards for fishing crews are put into place.

Marine Environment and Pollution

21. The state of the marine environment in India is under stress due to pollution and is probably one of the reasons for decline in fish stocks. Further, factors like poor effluent treatment on land, plastics (especially, micro-plastic particles) in the sea and ghost fishing are equally affecting fish stocks. Regulatory mechanisms to control pollutants will be made more stringent to ensure that land and sea-based pollution have minimum impact on the life in sea.
22. Development of Ports often leads to erosion and accretion along Indian coasts. Changes brought about in coastal configuration from such developments impact the coastline, damage fisher habitations and affect the ecology and fisheries. This is a

matter of utmost concern affecting fisher livelihoods. Adequate mechanisms will be put in place to ensure that opinion of fishers is taken before such projects are launched in future and in cases where their livelihoods are affected.

23. It is well known that coastal and inshore marine fish resources are highly dependent on many inland water bodies (estuaries, lakes and backwaters) for completing the life cycles of fish species. These water bodies are subject to anthropogenic pressures and degradation of environmental quality affects stocks of several important marine fishery resources, particularly the high value shrimps and many fish species, that complete one phase of their life cycle in these inland coastal waters. Appropriate mechanisms will be considered to address such issues related to development and ecological sustainability in large water bodies and also in Critically Vulnerable Coastal Areas (CVCA).
24. While promoting development of fisheries, emphasis will be accorded to maintain the ecological integrity of marine environment, so as to ensure that there are no adverse effects on the endangered, threatened or protected marine species. Mangrove plantations, seagrass beds and coral reefs are integral part of the coastal marine ecosystems and provide a range of ecosystem services, including habitation for many fish species and marine mammals, such as dugong. Such ecosystems will be protected from any undue anthropogenic impact.

Post-harvest & Processing

25. The general hygiene condition and sanitary aspects of fishing harbours and fish markets in the country need improvement to raise them to international standards. All stakeholders will be sensitized for maintaining cleanliness and hygiene in the fishing harbours. State Governments and Port Trust Authorities will be encouraged to develop suitable mechanisms to address the issue, including stakeholder run management committees for day-to-day management of the harbour facilities. This will ensure availability of safe and hygienic seafood.
26. Presently, the landing and berthing facilities are inadequate to meet the requirements of the large fishing fleet. Provision of adequate infrastructure facilities is critical to the marine fisheries value chain, and also critical for many MCS functions. Based on a re-assessment of the requirements, additional facilities will be constructed including fish processing estates. The Public-Private Partnership route will also be adopted to ensure speedy fulfilment of requirements of infrastructure facilities along the coastline.
27. Post-harvest losses will be adequately addressed through better on-board handling of fish, as it will lead to better quality and prices, particularly for high value fishes. More importantly, loss of valuable fish wealth will be minimized so that more fish is available for human consumption. Mitigation measures to reduce by-catch will be promoted through relevant implements and gears.
28. Use of low-value fish in fish feed industry is becoming a matter of concern as it can lead to overfishing of low value fish and bycatch, and could undermine the marine ecosystem. The spread of fish meal plants in some parts of the country and their overwhelming demand for small pelagics has led to overfishing, resulting in low level of pelagic stocks in some parts of the country. This issue will be addressed by taking steps to control and regulate the proliferation of fish meal plants.

Trade

29. Indian seafood finds a significant place in the global seafood trade. Over the period, seafood exports from India have grown both quantitatively and qualitatively. Notwithstanding these developments, Indian seafood is yet to realize its optimum value, first due to the low levels of value addition before the products leave the shore and second poor product branding. To overcome these weaknesses, efforts will be made to promote diversification of products, improve value addition and product branding and enhance the reach to new markets in different parts of the world.
30. Fishery product traceability and chain-of-custody needs should be addressed, as they have assumed paramount significance in global seafood trade. Besides, there is room to diversify seafood products at par with international standards, in order to get maximum value for fishery products. Furthermore, fishery products will be integrated with Food Safety Standards Authority of India (FSSAI) benchmarks to improve the domestic marketing value chain.
31. Traceability of seafood and ecolabelling are gradually gaining as important marketbased interventions to ensure environmental sustainability of fisheries. Demonstrating the traceability of seafood is an important requirement for all the seafood exported to EU markets. It is likely that in the coming years, more importing countries as also markets will demand only certified and labelled seafood to be sold through their counters. An enabling environment will be created for promoting ecolabelling of key Indian fisheries that would benefit the fish stocks, seafood industry and fishers.

Mariculture

32. Mariculture can play an important role in increasing fish production from the coastal marine waters. Schemes to set up mariculture farms/parks and setting up of hatcheries for seed supply for development of the sector will be encouraged. Institutional needs of this emerging sector, which would include lease rights, technology (farming practices, seed, feed, aquatic animal health management, etc.); environmental and social impacts; capacity building of fishers and entrepreneurs to take up mariculture; and develop market value chains will be addressed in consultation with the coastal States/UTs and concerned stakeholders.

Fisher Welfare & Social Security Nets

33. The current welfare measures that are in vogue will be continued and further strengthened to provide adequate safety nets to the fisher community in the country through Government of India's Direct Benefit Transfer Scheme (DBTS). Such measures will also include insurance coverage, housing and other amenities and community welfare programmes to fishermen. Availability of public finance to fishermen community would be made easier.
34. Weather events of extreme nature such as storm surges, cyclones, rogue waves, etc. will be considered as natural calamities and of man-made disasters (such as oil spill), the fishing communities will be provided with the admissible support/assistance in restoration of their livelihoods. In cases of loss of fishers life at sea, the procedures for compensation would be made easier so that the benefits to the affected fishers family is provided within a reasonable time using new technologies.
35. The institution of fisheries cooperatives has gained momentum over the years and in some States, such cooperatives have demonstrated their success. The cooperatives in fisheries sector can best serve the community if they adopt good business models that would include both harvest and post-harvest functions. Fisheries cooperatives in

the country will be facilitated and strengthened through skill development and technical and financial support, wherever necessary.

36. Institutionalizing cooperatives can also help in collecting a minimum levy or cess on fish production, which can then be pooled for funding fisher welfare measures and in the long run, also aid in fisher-directed local and regional research on fisheries. The cooperatives will also be encouraged and strengthened in carrying out a science-based approach to address fisheries and climate related issues.
37. Steps will be taken for training, capacity building as well as upgradation of technological skills of traditional fishers in moving from artisanal fishing to more economic and efficient means of fishing.

Gender Equity

38. Women constitute more than 66% of the total work force in post-harvest activities of the fisheries sector. Besides raising families, women play important roles in retailing fish, fish drying and other value addition activities. The Government will continue to support its contributions to the roles played by women and will further enhance support by way of forming women cooperatives; women-friendly financial support schemes; good working conditions that would include safety, security and hygiene, transport facilities for retail marketing, and also encouragement to take up small-scale fishing and value-addition activities.

Island Fisheries

39. Andaman & Nicobar and the Lakshadweep Group of Islands harbour significant fisheries resources, including lucrative fisheries of tuna and tuna-like species and other species of commercial values such as groupers, snappers and coral fishes. Their geographic remoteness has so far impeded fisheries development and optimal harnessing of the fisheries National Policy on Marine Fisheries, 2016 2nd Draft 9 wealth. The government will implement dedicated programmes for sustainable exploitation of fisheries resources, developing local capacities in terms of both men (and women) and material, and institute post-harvest support that can allow the harvested resources to come to the mainland markets as also to seafood export destinations.

    Additional/Alternate Livelihoods

40. Keeping in mind the dwindling marine fisheries resources, additional/ alternative sources of livelihoods will be essential for the vast number of fisher communities spread all along the coastline. Mariculture and eco-tourism are considered important in this regard and both offer good potential of offering additional/alternate sources of livelihoods. Game Fishing and the concept of Catch, Photograph and Release (CPR) is gaining importance throughout the world as part of fisheries tourism. The Andaman & Nicobar Islands and the Lakshadweep Group of Islands besides some coasts of the main land are ideally suited for promotion of such activities. The Government would promote CPR schemes among fishermen in areas suitable for such activities. In case of eco-tourism, it is essential that the Department of Tourism plans its activities related to coastal and marine waters in consultation with the Department of Fisheries to protect the livelihood of fishers.

Climate Change (Adaptation and new initiatives)

41. Climate change is one of the biggest challenges that the fisheries sector is facing and time-bound adaptation and management plans are imminent. The impacts of climate

change on marine fisheries are amply visible in the Indian EEZ and surrounding high seas. Such impacts have brought perceptible changes in the fishery of some species, forcing fishers to make changes in fishing operations. Climate change is considered to be one of the reasons for changes in abundance of some stocks of some fish species. Focused studies on climate change impacts on fish stocks will be encouraged. As a part of the International commitments on climate change, the concept of green fisheries by reducing Green House Gases (GHG) emissions from fishing and fishing related activities will be encouraged.

Regional Cooperation

42. The Indian sub-continent is surrounded on the west by the Arabian Sea and on the east by the Bay of Bengal. Together, the two seas form part of the upper Indian Ocean. On the west coast, India shares its maritime boundaries with Pakistan and the Maldives, while on the east coast, the boundaries are shared with Sri Lanka and Bangladesh. In some cases, it is not only the shared maritime boundaries but also shared ecosystems, such as the Gulf of Mannar and Palk Bay between India and Sri Lanka; Sunderbans between Bangladesh and India. Both the Arabian Sea and Bay of Bengal harbour migratory as well as straddling fish stocks such as tuna and tuna-like species, sharks and Spanish mackerels. Such situations necessitate strong regional cooperation in management and sustainable utilization of the resources, including conservation of species/stocks, wherever necessary.
43. Cooperation in safety and security of fishermen is also necessary as the upper Indian Ocean, especially the Bay of Bengal, witnesses high number of adverse weather events and every year many fishers lose their lives or suffer extreme hardships. Cooperation in the field of marine fisheries through bilateral arrangements as also by participating in the regional fisheries and environment bodies will be further enhanced. Such cooperation will facilitate National Policy on Marine Fisheries, 2016 2nd Draft 10 managing of shared resources and shared ecosystems; harmonization of policies and programmes aimed at optimized harvesting of trans-boundary resources; safeguard of human rights, in particular for fishermen straying in waters of other countries.
44. The skills, industrious nature and the ability to work under challenging conditions of the Indian fishers are widely recognized in other countries. Resultantly, more and more fishers from India are now finding employment in fishing fleets of other countries. On many occasions Indian fishers have been apprehended in neighbouring countries while fishing in other countries EEZ, making it difficult for the Government to secure their release through normal channels. It will be ensured that fishers who are willing to take employment in the fisheries sector in other countries go through formal approvals and knowledge of the Government.

International Agreements/Arrangements

45. Indian fisheries is now set in a globalized world. The global agenda on fisheries is guided by a set of binding and non-binding instruments that concern both fisheries and environmental aspects. India being a signatory to such instruments and agreements needs to implement the provisions of such instruments and agreements to meet its international obligations and make fisheries sustainable. Non-compliance of their provisions will impact the fisheries sector and in turn the livelihoods of fishermen. Active participation in the activities of the regional/international bodies

and demonstrating India's leadership in management of its marine resources that are part of the 'Common heritage of the world' would be ensured.

46. The FAO's Code of Conduct for Responsible Fisheries (CCRF or Code) is today the most significant of the non-binding agreements in the global fisheries sector. It is global in scope and directed towards members and non-members of FAO, fishing entities, organizations of all kinds, fishers, people engaged in the processing and marketing of fish and fishery products – in short, everyone concerned with conservation of fishery resources and management and development of fisheries. The Code is voluntary, but certain parts of the Code reflect and include major articles and provisions from a number of global UN conventions and agreements, as mentioned earlier. The Code sets forth principles and standards applicable to the conservation, management and development of all fisheries. The Government will ensure that the Code and its Principles are well-integrated in all its activities that relate to marine fisheries sector.
47. The global community has recognized the importance of small-scale fisheries as a principal contributor to poverty alleviation and food security and has agreed to the Voluntary Guidelines on Sustainable Small-Scale Fisheries (VG-SSF). The main objectives of the VG-SSF Guidelines are expected to be achieved through the promotion of a human rights-based approach, by empowering small-scale fishing communities. Efforts would be made to implement the provisions of the VG-SSF.
48. As the provisions contained in the binding and non-binding international instruments normally draw strength from each other, it is essential that these instruments are considered holistically and not in isolation. Wide consultations with stakeholders and fisheries organizations will be encouraged to provide a more balanced understanding and better implementation of such instruments.

Governance and Institutional Aspects

49. The marine fisheries sector is being dealt by a range of institutions from coastal State/UT Governments (DoF), Central Government (DADF), scientific bodies, Ministry of Defence (through Indian Coast Guard). This pluralistic governance set-up necessitates a strong coordination between the Ministry of Agriculture and Farmers Welfare and the Coastal states/UTs on one hand and the different Ministries/Departments of the Union Government on the other hand. Further, similar cooperation between coastal States/UTs will also be essential to ensure that fisheries, which move between the waters of one coastal State/UT to the other, are sustainably exploited. In this regard, it will be ensured that mechanisms are instituted to allow for this coordination between all concerned agencies.
50. Marine fisheries in India is dynamic with continuous changes in practices and resource harnessing. The Marine Fishing Regulation Acts (MFRAs) have come into existence from the 1980s, and barring a few States/UTs, the MFRAs were in place by mid-1990s. Keeping in view the fact that most of the MFRAs were adopted before the adoption of key international agreements/arrangements (1982 UNCLOS, 1992 UNFSA, 1995 CCRF, etc.), the existing rules and regulations for governing fisheries in the MFRAs will be updated and aligned with these international instruments/arrangements to ensure that they cover all aspects of fisheries management.
51. The Central Government is mandated to control and regulate fisheries in the EEZ, i.e., the area from 12 to 200 nautical miles. There is a need to regulate fisheries in the

EEZ with appropriate legislation. Steps will therefore be taken to bring in such legislation for development and management of fisheries in this area.

Way Forward

52. The NPMF, 2016 is expected to meet the multi-dimensional and growing needs of the marine fisheries sector for the next one decade. The Policy is holistic and adequately addresses the needs of all the segments of this diverse economic activity. The NPMF, 2016 will have an 'Implementation Plan' that will specify the action points under each recommendation contained in the Policy. These action points will be further elaborated with timelines for implementation, agencies responsible for the work and estimates and likely sources of the funds required for implementation. The Implementation Plan will also have a 'Monitoring and Evaluation' section that will address the timeliness and efficacy of implementation.

Approach to the 12th Five-Year Plan , Government of West Bengal

INTRODUCTION

The 12th Five-year Plan for the Fisheries Sector in the State shall be altogether different from the others in a number of ways. In the context of ever changing global scenario it has become all the more important to prioritise the items. So long major thrust was on production of fish in both inland and marine sectors. The Department has almost achieved the target of domestic requirement. It is expected that at the end of the 11th Plan period it will be possible to achieve production to the extent of 15.58 lakh MT per year, being the minimum requirement for the State. At the end of the 12th Plan the target of fish production has been fixed at 17.00 lakh MT per year. Alongside, welfare measures for fishermen community in the State and diversification of activities are equally being taken care of.

OBJECTIVES

The slogan for the 12th Five-year Plan is "Strengthening of rural and urban economy through sustained piscicultural development" which means more production by bringing in more water areas under intensive pisciculture, preparing an exhaustive database foe all types of water bodies, diversification of activities, value addition, processing, more infrastructural development and exploring the means for earning more revenue for the State.

With the above ideas in mind the approach to the 12th Five Year Plan aims at exploiting all the available water resources in the State for pisciculture development at the optimum level. This has necessitated in consideration of the fact that the offshore marine stock has considerably depleted on account of variety of reasons. Possibilities of deep-sea fishing with improved appliances are also being explored alongside. Out of the total impounded water area of about 295464.80 hectares in the State, the culturable area is about 236668.90 hectares and the rest is semi-derelict and derelict areas. Now out of the culturable area of 236668.90 hectares only an area of 126302.54 hectare has been covered under FFDA and BFDA programmes upto 2010-11 which amounts to about 53.37% of the total culturable area. The Deptt. aims at bringing not only the total culturable area under FFDA and BFDA programmes but also exploring means to develop semi-derelict and derelict areas into culturable area.

Apart from fish production, in the 11th Plan period the Department concentrated its focus on the following emerging priorities that need to be addressed in view of national level

priorities in the interest of socio-economic upliftment of the fishermen community, most of whom belong to scheduled caste and tribe, in particular and pursuing integrated development in the allied/associated fisheries related activities in general in the rural and urban areas in the State:-

a) Commissioning of one fishing harbour with state of the art facilities for deep-sea fishing and five more minor fishing harbours/fish landing centers in the coastal areas of the State;

b) Creation of infrastructure for setting up of wireless communication network in the marine sector;

c) Creation of more number of diesel outlets;

d) Construction of warehouse and market complex at important locations with transportation facilities;

e) Development of food-parks and processing centers;

f) Building up of ornamental fishery units in each block of the State primarily by forming women's co-operative societies and by individual entrepreneurs in view of the growing demands of ornamental or aquarium fish in the domestic as well as in the international markets;

g) Building up of hatcheries for ornamental fishery and freshwater prawn in each district to cope up with the growing demand of fish seeds & Setting up of one Ornamental Aqua Park for Export Promotion;

h) Development of cold-water/jhora fishery in greater numbers in three hill sub-divisions of Darjeeling district;

i) Construction of at least one lakh houses for the fishermen families in the State;

j) Construction of roads, culverts, bridges in more numbers for ensuring easy connectivity with the fishermen's villages in both inland and marine sectors;

k) Covering at least 50,000 fishermen per year under group insurance, pension and savings-cumrelief programmes

l) Reclamation of all beels, baors and derelict/semi-derelict impounded water areas in the State;

m) Development of reservoir fisheries by taking recourse to pen and cage culture;

n) Covering more areas under brackish water pisciculture;

o) Development of areas in the arid zones of the State like Purulia, Bankura, Paschim Medinipur, Birbhum and Durgapur and Asansol sub-divisions of Bardhaman district by application of watershed technology not only for pisciculture but also for irrigation;

p) Development of connectivity with the districts and project areas through the central sector scheme on "Strengthening of database and development of Geographical Information System for the fisheries sector";

q) Networking and e-Governance;

r) Research and development on endangered species, fish virology, pearl culture, brackish water farming and oceanography;

s) Covering more number of fishermen under extension and training programmes and

t) Modernising all the Govt. Fish Farms in the State and building each of those into eco-friendly tourist spot.

Reforms in 12th Five-Year Plan

Apart from the Departmental ongoing schemes as stated above, a dispensation may be taken for inclusion of following innovative schemes in the 12th Plan :-

1. **Special Economic package to the disturbed areas** under 17 Police Stations of the districts of Bankura, Purulia and Paschim Medinipur for development of Fisheries and fishermen. It will help to raise the socio-economic condition of the people of the area which is one of the top most priorities of the State Govt. as well as the Govt. of India. This may be taken as Centrally Sponsored Scheme on 50:50 share for which provision of ` 12.50 crore each may be kept under State share as well as Central share in the 12th Plan.
2. **Setting up of Fisheries Disaster Management Centre :** Several fishermen routinely lose their lives every year due to lack of access to modern life-saving equipment. The State Govt. considers suchun fortunate avoidable loss of lives very seriously and has taken a policy to set up a modern wellequipped Disaster Warning & Recovery Mechanism through setting up of a State Fisheries Disaster Management Centre, somewhat on the lines of the National Disaster Management Authority (NDMA). This may be taken as Centrally Sponsored Scheme on 50:50 share for which provision of ` 7.50 crore each may be kept under State share as well as Central share in the 12th Plan.
3. **Off-shore Marine Fisheries Industry for** the coastal areas of West Bengal. Setting up of at least one off-shore marine facility centre in the coastal area of West Bengal would be most appropriate in P-P-P model for promotion of marine fisheries, coastal aquaculture as well as industry-need. This may be taken as Centrally Sponsored Scheme on 50:50 share for which provision of ` 15.00 crore each may be kept under State share as well as Central share in the 12th Plan.
4. **Setting up of Special Fishery Zone in Sundarban** (unique in the country), where shrimp farming would be conducted following guidelines for organic farming protocol of international standard with an eye to 100% export and to establish this area as **Special Export Zone.** This will on the other hand supplement the efforts on the conservation of bio-diversity and ecology of Sundarban, a UNESCO heritage site. This may be taken as Centrally Sponsored Scheme on 50:50 share for which provision of ` 15.00 crore each may be kept under State share as well as Central share in the 12th Plan.
5. **Promoting value added marketing of "Gangar Ilish" :** Promoting value added marketing through establishment of Fish Board and declaring Hilsa as **"Gangar Ilish"** as a **G.I.** brand. This may be taken as Centrally Sponsored Scheme on 50:50 share for which provision of ` 2.50 crore each may be kept under State share as well as Central share in the 12th Plan.

6. **Assistance for developing and conservation of Hill Stream Fisheries (Mahseer) & setting up of Sport Fisheries** in the newly set up Gorkha Territorial Administration in the Darjeeling Hill areas**.** This may be taken as Centrally Sponsored Scheme on 50:50 share for which provision of ` 6.00 crore each may be kept under State share as well as Central share in the 12th Plan.
7. **Setting up of IQF & Marketing Kiosks** for promotion & marketing of prawn in the brand name **"Alampur (Digha)".** This may be taken as Centrally Sponsored Scheme on 50:50 share for which provision of ` 3.00 crore each may be kept under State share as well as Central share in the 12th Plan.
8. **Setting up of Demonstration Centres on methodologies of conversion of Berry / Gherry culture to Monocrop shrimp farming followed by polyculture.** This may be taken as Centrally Sponsored Scheme on 50:50 share for which provision of ` 1.00 crore each may be kept under State share as well as Central share in the 12th Plan.
9. **Support for covering prawn farming under Fisheries Crop Insurance.** This may be taken as Centrally Sponsored Scheme on 50:50 share for which provision of ` 7.50 crore each may be kept under State share as well as Central share in the 12th Plan.
10. **Setting up of sub-station of Marine Fisheries Research Station under CMFRI.** This may be taken as Centrally Sponsored Scheme on 50:50 share for which provision of ` 5.00 crore each may be kept under State share as well as Central share in the 12th Plan.
11. **Establishment of one modern Major Fishing Harbour (Digha Mohana) and promotion of Fish Tourism.** This may be taken as Centrally Sponsored Scheme on 50:50 share for which provision of ` 30.00 crore each may be kept under State share as well as Central share in the 12th Plan.
12. Declaration of Fisheries & Aquaculture at par with Agriculture: This will eliminate discrepancy of (i) higher electricity tariff; (ii) higher bank interest for fisheries loan /crop loan; (iii) income tax for fisheries input etc. and introduction of Fisheries Insurance alike Agriculture (NAIC scherme).

Apart from the Centrally Sponsored Schemes as outlined above, the Department wants to continue the ongoing schemes on 'Development of Inland Fisheries Statistics', 'Mapping of smaller water bodies and development of GIS based Fisheries Management System' and 'Networking and e-Governance' under the **Central Sector Scheme on "Strengthening of Database and development of Geographical Information System for the fisheries Sector" with 100% central assistance.** For implementation of the said two components an amount of ` 10.00 crore will be needed in the 12th Plan.

Rashtriya Krishi Vikash Yojana (2014 – 15)

Rashtriya Krishi Vikash Yojana (RKVY) is State Plan Scheme in the form of Additional Central Assistance in the 11th Five Year. It also continued in 12th Five year Plan. The broad objective of RKVY is to increase annual growth in agriculture and allied sectors by ensuring a holistic development of Agriculture and allied sectors. State Agriculture Department is the nodal Department for implementation of the scheme, which in turn reallocates the same to the concerned implementing departments/agencies. The Fisheries Department is one of the stakeholders under RKVY. The National Mission for Protein Suppliments (NMPS) is also a sub scheme of RKVY.

I. Schemes under RKVY (Normal): Following schemes have been taken under RKVY (Normal) by the Directorate of Fisheries during the year 2014-15:

A) Production Growth:

1. Scheme for Intensive Fish culture
2. Scheme for production of fingerlings of Carps
3. Scheme for Modified Extensive culture of Black Tiger Shrimp in Brackish Water
4. Hilsa Conservation Programme and Hilsa Resource Centre

B) Flexi Fund:

1. Scheme for Brooders management and production of quality Spawn of Indian Major Carp
2. Construction and commissioning of Block level Laboratory cum Training Centre

C) Infrastructure & Assets:

1. Distribution of hygienic insulated box to fish vendors /collectors
2. Distribution of Bi-Cycle with insulated box to fish vendors
3. Distribution of Matsyajan
4. Development of a model Fishermen Co-operative Society: Mahanad Matshya Utpadak Sanstha Samabay Samity

II. Schemes under NMPS: Following schemes have been taken under NMPS by the Directorate of Fisheries during the year 2014-15:

1. Scheme for production of big sized fish in large water bodies
2. Scheme for production of big sized fish in medium water bodies
3. Aquaculture Development through integrated approach in the beel

Outline of different RKVY & NMPS Schemes for Fish Farmers/SHG/FPG/FCS/Fish Vendors:

1. Scheme for Intensive Fish Culture under RKVY:

In West Bengal intensive fish culture is going on following the 'multiple stocking and multiple harvesting' method of culture practice. Multiple stocking and multiple harvesting (MSMH) is a system of composite fish farming, through which fish production can be augmented by many folds (6 to 10 ton/hectare/year). In this system, stocking density is high, 12000 - 14000 nos carp fingerlings per hectare. Harvesting is done after the fishes attain a size of 500 gms. The farmers need not to have a big capital to meet the various recurring expenditure of fish cultivation. He has to manage the pond for a maximum period of 4 months, thereafter he starts earning, which is reinvested for purchasing of various items required for further fish rearing. Therefore, a marginal farmer can also take up scientific fish farming with his meager resources by adopting this system. There are several other advantages; however, the prime advantage is that the production is much higher than yearly composite fish culture system.

With a view to improve the productivity of existing system, the scheme for intensive fish culture has been taken up under RKVY during the year 2014-15.

Objectives of scheme:

- To produce table size fish following the multiple stocking and multiple harvesting method of culture practice.
- To enhance productivity from 3500 – 4000 kg to 6000 – 6500 kg /hectare/year
- To motivate fish farmers to adopt the intensive fish culture technology for better production.
- To encourage fish farmers to use nutritionally balanced formulated feed (floating) for better result
- To uplift economic condition of the beneficiaries
- To effectively demonstrate the improved technology and practice for improving productivity and production in the sector.

Details of scheme:

- Unit area of water body: 0.25 hectare
- Culture period: 10 months
- Stocking size of fingerlings: 10-12 cm
- Number of fingerlings to be stocked: 3000 nos (12000 nos/hectare)
- Species to be stocked: Preferably Rohu (*Labeo rohita*) & Catla (*Catla catla*). Other species like Mrigal (C*irrhinus mrigala*) Silver carp (*Hypophthalmychthys molitrix*) and Grass carp (*Ctenopharyngodon idella*) may also be stocked for better utilization of pond productivity at different ecological niches.
- Targeted production: 1620 Kg (6480 kg/hectare)

Pattern of Assistance: Total schematic cost: Rs. 146000.00

i) Funding under RKVY: Rs. 36800.00 (25% of total schematic cost). Assistance to be provided to the beneficiary in the form of inputs like carp fingerlings and feed

ii) Contribution of beneficiary: Rs. 109200.00 (75% of total schematic cost).

Targeted Beneficiaries:

i) Individual fish farmers

ii) Self Help Groups (SHG)

iii) Fish Production Groups (FPG).

2. Scheme for Production of fingerlings of Carps under RKVY :

The fish production and productivity from inland sector largely depend on quality and quantum of fish seed available for freshwater aquaculture and reservoirs/floodplain wetlands. As the intensification of aquaculture especially Indian Major Carps is gradually increasing, importance of good quality seed and impact of appropriate stocking density raised the demand for quality seed in terms of species and size.

To produce good quality seed, especially fingerlings the scheme for production of fingerlings of carps has been taken up in RKVY during the year 2014-15.

Objectives of scheme:

- To produce good quality fingerlings
- To steady supply of fingerlings to the farmers producing table/big size fish
- To bring more seasonal small water bodies under seed production
- Application of supplementary feed for better survival and growth
- To uplift economic condition of the beneficiaries

Details of scheme:

- Unit area of water body: 0.10 hectare
- Culture period: 3 months
- Stocking size of fry: 25 - 30 mm
- Number of fry to be stocked: 30000 nos (3 lakh nos/hectare)
- Species to be reared: Preferably Rohu (*Labeo rohita*) & Catla (*Catla catla*). Other species like Mrigal (C*irrhinus mrigala*) Silver carp (*Hypophthalmychthys molitrix*) and Grass carp (*Ctenopharyngodon idella*) may also be stocked for better utilization of pond productivity at different ecological niches.
- Targeted production of fingerlings: 21000 nos (2.10 lakh/ha)

3. Problems of Post- Harvest Infrastructure in West Bengal :

Landing/Berthing Facilities

The large tidal amplitude makes the construction of fixed jetties impractical in most places. As a result, the boats usually land their catch on the bank. The only harbour serving small fishing boats with a jetty is Sankarpur in Midnapore District. A similar set-up is planned for Frazerganje under a Government of India-sponsored scheme.

Washing platforms have been provided at Junput, Jaldah and Namkhana. Many centres (Frazerganje, Jambu Island, Junput, Jaldah) are merely temporary camps, in existence only from October to mid-February when behundi net fishermen, besides a few gillnet and line fishermen, use them as bases. Tube wells have been dug for fresh water supply in most of these fishing centres.

Ice

Ice availability was, in general, found to be adequate in 24 Parganas, ice being supplied to the main centres from private and cooperative sector plants in the vicinity. Ice production is about 400 t/day at Kakdweep and Namkhana in 24 Parganas.

The ice supply in Midnapore is, however, inadequate at present. ice production is only 100 t/day at Contai, Sankarpur and Digha where there are private and co-operative sector plants.

The distance of some of the fishing centres from the main towns poses problems for some operators. Ice is sometimes transported in “carrier” launches to Jaldah.

Ice is used only for quality fish caught by encircling gillnets. Most of the Behundi catch is dried, though some is sold fresh for local consumption. Boats engaged in long-voyage fishing (mainly with gillnets) carry ice in insulated ice boxes installed on board.

There is no cold storage facility at any of the centres.

Transport

Iced fish is transported to the main markets in Calcutta, Diamond Harbour and Kharagpur by light commercial vehicles and trucks. Some fish is also transported by launches as well as by rail in 24 Parganas district. As mentioned earlier, road access to the main centres is good. Even landing centres at beach settlements like Jaldah and Digha can be reached by driving along the hard beach at low tide.

For short distances, fish is transported by bicycles and cycle-carts

Fuel & Lubricating Oil

Namkhana and Diamond Harbour in 24 Parganas and Contai in Midnapore District are the main centres for diesel and lubricating oil supply. However, enterprising traders stock diesel oil at minor centres and sell it at a premium.

Repair Workshops & Mechanics

Since the early '80s, there has been a rapid increase in motorization of traditional craft, Government-supported and otherwise. Engine spares are usually procured from Calcutta, but running spares are usually available in the main centres or nearby towns.
Mechanics are usually available at all centres to attend to minor problems. For more serious problems, including machining of stern-gear bushes, shafts etc., the fishermen have to travel to the nearest town. There is no serious problem on this front, as complaints can be attended to within a day, at most, due to the short distances.

Boat-Building

Boat-building facilties are available at Namkhana in 24 Parganas and Sankarpur in Midnapore District. Traditionally, boats have been built in centres like Junput, Saulaghat and Kakdweep. As with workshops, timber depots and saw mills are within a day's reach from

Pattern of Assistance Total Schematic Cost 46700.00

i) Funding under RKVY: Rs. 11500.00 (25% of total schematic cost). Assistance to be provided to the beneficiary in the form of inputs like carp fry and supplementary feed

ii) Contribution of beneficiary: Rs. 35200.00 (75% of total schematic cost).

Targeted Beneficiaries:

i) Small & marginal fish farmers

ii) Self Help Groups (SHG)

iii) Fish Production Groups (FPG)

iv) Fishermen Co - operative Societies (FCS)

4. Scheme for Brooders management and production of quality spawn of Indian Major Carps under RKVY:

Major constraint in aquaculture, however, appears to be non availability of good quality seed of cultivable fishes. The Indian Major Carps are the most important food fishes in West Bengal. The carps although attain gonadial maturity in ponds, normally do not reproduce in such an environment, but spawn in the natural reverine water habitat. The major break through in induced breeding of carps was achieved in 1957 which formed the basis for the popular induced breeding technology. The success of the seed production in the hatchery is dependent on the quality of the brood fishes which need to be managed scientifically in the brood stock ponds providing nutritionally balanced feed for early maturation.

To produce good quality seed (spawn) in hatchery and to bring the hatchery owners in the on going seed certification programme, the scheme for brooders management and production of quality spawn of Indian Major Carp has been taken up in RKVYduring the year 2014-15.

Objectives of scheme:

- To produce good quality seed through improved technology

- To steady supply of good quality seeds (spawn) to the fish growers (fry & fingerlings)
- To bring more hatchery under the programme of seed certification.
- Application of high quality nutritionally balanced feed for carp brooder (CIFA BROOD), developed by Central Institute of Freshwater Aquaculture (CIFA).
- To uplift economic condition of the beneficiaries

Details of scheme:

- Unit area: 0.10 hectare
- Brooder management period: 4 months
- Stocking size of brooder: Average 1.5 kg and above
- Stocking rate of brooders: 180 kg (1800 Kg / hectare)
- Species to be reared for breeding: Indian Major Carps
- Application of supplementary feed: Preferably a mixture of groundnut/mustard oil cake and rice bran at 1:1 ratio by weight for 75 days
- Application of High Quality CIFA Brood feed: 45 days for 200 kg Brooder
- Targeted production of spawn: 112.50 lakh/unit

Pattern of Assistance: Total schematic cost: Rs. 147000.00.00

i) Funding under RKVY: Rs. 36600.00 (25% of total schematic cost). Assistance to be provided to the beneficiary in the form of farm machineries/equipments and input like CIFA brood feed.

ii) Contribution of beneficiary: Rs. 110400.00 (75% of total schematic cost).

Targeted Beneficiaries: Carp Hatchery/brooder farm preferably registered under Seed Certification programme or applied for this programme.

5. Scheme for Modified Extensive culture of Black Tiger Shrimp (*Penaeus monodon*) under RKVY:

In West Bengal the brackish water fishery is one of the major fishery activities of the rural fishermen of coastal district. Presently, traditional/ improved traditional and scientific extensive shrimp farming practices are most common and adopted by the farmers in the coastal areas of the State. Transition from extensive to modified extensive shrimp farming is characterized by increased inputs such as seed and feed. In scientific modified extensive farming, stocking density of seed is medium (6-10 nos/sq. mt) and application of formulated feed is essential. Scientific modified extensive farming of shrimp alone should be encouraged, as a means of integrating more effectively the use of land and water resources. The maximum yield from scientific extensive farming would be around 1.8 to 2.00 ton/hectare/crop. With a view to sustainable brackish water farming and to protect the coastal environment; culture of *Penaeus monodon* has been taken up under RKVY during the year following the method of modified extensive system of shrimp farming.

Objectives of scheme:

- To produce Black Tiger Shrimp in modified extensive culture in sustainable way
- To bring more brackish water areas under scientific culture method
- Application of good quality feed with better management practice to enhance productivity from 500 – 800 kg to 1800-2000 kg /ha/crop
- To motivate fish farmers to adopt modern technology for better production
- To uplift economic condition of the beneficiaries

Details of scheme:

- Unit area: 0.50 hectare
- Culture period: 135 days
- Number of seed to be stocked: 40000 nos (80000 nos/hectare)
- Species to be stocked: Black Tiger Shrimp (*Penaeus monodon*)
- Feeding: Application of formulated artificial feed
- Targeted production: 960 Kg (1920 kg/hectare/crop)

Pattern of Assistance: Total schematic cost: Rs. 272000.00

i) Funding under RKVY: Rs. 68000.00 (25% of total schematic cost). Assistance to be provided to the beneficiary in the form of inputs like feed.

ii) Contribution of beneficiary: Rs.204000.00 (75% of total schematic cost).

Targeted Beneficiaries: Farmers registered under Coastal Aquaculture Authority (CAA) will get preference. Other farmers obtained Fish producer license from Fisheries Department may be considered.

6. Distribution of hygienic insulated box under RKVY:

Objectives: To keep fish in fresh condition for long time during transportation and vending for better price.

Unit Cost: Rs. 3300.00

Nature of assistance: Supply of 70 liter capacity insulated box (100% assistance). No beneficiary's contribution.

Targeted beneficiaries: Fish vendors /collectors

7. Distribution of Bi – cycle with insulated box under RKVY:

Objectives: Door to door vending of fish in fresh condition with better price.To keep fish in fresh condition for long time during transportation and vending for better price.

Unit Cost: Rs. 8000.00

Nature of assistance: One standard branded By-cycle with a specially fabricated carrier to carry a insulated box, one 50 L insulated box and one weighing balance and fish cutting equipments (100% assistance). No beneficiary's contribution.

Targeted beneficiaries: Fish seller/vendor or persons related to fish selling/vending work.

8. Distribution of Matsyajan under RKVY:

Objectives: Vending of fresh fish with better price in decorated cycle van mainly in urban areas.Door to door vending of fish in fresh condition with better price.To keep fish in fresh condition for long time during transportation and vending for better price.

Unit Cost: Rs. 50000.00

Nature of assistance: Supply of Masayajan comprising of three wheeler cycle, insulated ice box, weighing balance and audio system (100% assistance). No beneficiary's contribution.

Targeted beneficiaries: Fish vendor or persons related to fish vending work.

9. Scheme for production of big sized fish in large water bodies under NMPS:

The State of West Bengal is enriched with beel fisheries, sewage fed fisheries having variable sizes which are mostly under the administrative control of State Government. These are presently managed by the Fishermen Co operative Societies/Self Help Groups/Fish Production Groups taking lease from Govt. for a certain period. These water bodies offer immense scope for production of big sized fish with reasonable investment. This is an innovative scheme under National Mission for Protein Supplement (NMPS) – a special scheme as per the new guidelines of RKVY.

Objectives of scheme:

- To produce big sized fish with the application of partial formulated artificial feed considering maximum utilization of natural feed
- To enhance productivity from 1000 – 1500 kg to 2500 – 3000 kg/ha/year
- To involve Fishermen Co operative Societies/ Self Help Groups/Fish Production Groups as beneficiaries
- To uplift economic condition of the beneficiaries
- To effectively demonstrate the improved technology and practice for improving productivity and production in the sector.

Details of scheme:

- Unit area of water body: 5.00 hectare
- Culture period: 12 months
- Stocking size of fingerlings: 12-15 cm
- Number of fingerlings to be stocked: 20000 nos (4000 nos/hectare)
- Species to be stocked: Preferably Rohu (*Labeo rohita*) & Catla (*Catla catla*). Other species like Mrigal (C*irrhinus mrigala*) Silver carp (*Hypophthalmychthys molitrix*) and Grass carp (*Ctenopharyngodon idella*) may also be stocked for better utilization of pond productivity at different ecological niches.
- Feeding: Application of formulated artificial feed
- Harvested size of fish: 0.8 – 1.0 Kg
- Targeted production: 13500 Kg (2700 kg/hectare)

Pattern of Assistance: Total schematic cost: Rs. 1185000.00

i) Funding under RKVY: Rs. 470000.00 (40% of total schematic cost). Assistance to be provided to the beneficiary in the form of farm machineries/equipments and inputs like fingerlings, lime and feed.

ii) Contribution of beneficiary: Rs. 715000.00 (60% of total schematic cost).

Targeted Beneficiaries: Fishermen Co operative Societies (FCS), Self Help Groups SHG) & Fish Production Groups (FPG); but preference will be given to the Fishermen Co operative Societies. Fisheries Corporation/Govt Farms may also be included under this programme.

10. Scheme for production of big sized fish in medium water bodies under NMPS

In West Bengal fresh water pond fisheries of variable sizes are contributing one of the major resources of fish production. Farmers having own water bodies or on lease basis are doing pisciculture in these water bodies. These water bodies may be utilized to produce big sized fish with reasonable investment. This is an innovative scheme under National Mission for Protein Supplement (NMPS) – a special scheme as per the new guidelines of RKVY.

Objectives of scheme:

- To produce big sized fish with the application of partial formulated artificial feed considering maximum utilization of natural feed
- To enhance productivity from 2500 – 3000 kg to 4000 – 4500 kg/ha/year
- To involve Fishermen Co operative Societies/ Self Help Groups/Fish Production Groups/individual farmers as beneficiaries
- To uplift economic condition of the beneficiaries
- To effectively demonstrate the improved technology and practice for improving productivity and production in the sector

Details of scheme:

- Unit area of water body: 2.00 hectare
- Culture period: 12 months
- Stocking size of fingerlings: 12-15 cm
- Number of fingerlings to be stocked: 14000 nos (7000 nos/hectare)
- Species to be stocked: Preferably Rohu (*Labeo rohita*) & Catla (*Catla catla*). Other species like Mrigal (C*irrhinus mrigala*) Silver carp (*Hypophthalmychthys molitrix*) and Grass carp (*Ctenopharyngodon idella*) may also be stocked for better utilization of pond productivity at different ecological niches.
- Feeding: Application of formulated artificial feed
- Harvested size of fish: 0.7 – 0.8 Kg
- Targeted production: 8400 Kg (4200 kg/hectare)

Pattern of Assistance: Total schematic cost: Rs. 711000.00

i) Funding under RKVY: Rs. 287000.00 (40% of total schematic cost). Assistance to be provided to the beneficiary in the form of farm machineries/equipments and inputs like fingerlings, lime and feed**.**

ii) Contribution of beneficiary: 60% of total schematic cost.

Targeted Beneficiaries: Fishermen Co operative Societies (FCS), Self Help Groups SHG), Fish Production Groups (FPG) & individual beneficiaries

Outline of other ongoing RKVY & NMPS Schemes:

1. Construction and Commissioning of Block level Laboratory cum Training Centre under RKVY

In West Bengal there are 341 blocks where Fishery Extension Officers are posted to provide extension services to the rural farmers. Extension services are being provided in the form of technology dissemination, monitoring of farmers' ponds, tie up with the bank finance etc. With a view to strengthening the extension activities initiatives has been taken up for setting up Block Laboratory cum Training Centre under RKVY. So far 201 number of Block Laboratory cum Training Centre have been completed under RKVY. During 2014-15 another 62 units have been prposed.

Objectives:

- Testing of soil and water parameters at block level.
- Farmers need not to move to the district for such facilities which save money and time
- To keep good liaison between Fishery Extension Officers and farmers
- Quick transformation of results of water/soil parameters to the farmers for taking suitable measures
- To provide better extension services.

Project cost for setting up of one Unit: Rs. 7.20 lakh.

2. Hilsa Conservation Programme and Hilsa Resource Centre under RKVY:

Hilsa, a common renewable aquatic resource, having anadromous migratory habits and trans-boundary distribution, is a significant component of open- water capture fishery in our state contributing to about 19% of total fish landing in the Hoogly -Matla estuarine system. It represents one of the most lucrative commercial fisheries of a single species. Over the years, due to wanton exploitation, pollution & habitat destruction there has been an alarming decline in the availability of Hilsa both in sea and rivers due to failure in the natural recruitment process of this fish.

The Department of Fisheries, Govt. of West Bengal, apart from amending the Fisheries acts/rules to regulate the fishing and the gears, established a dedicated center on Hilsa at Sultanpur, Hilsa Conservation and Research Centre (HC RC). The very idea of commissioning an exclusive center for Hilsa fishery speaks of the commitment of the department towards the mandate of sustainable Hilsa Fishery in the state. Under the RastriyaKrishi Vikash Yojona.

(RKVY); the Department of Fisheries, having identified a very pertinent issue of open water Hilsa fishery- that needs eco-system management interventions, had proposed a unique project for sustainable Hilsa fishery by way of submitting a scheme " **Hilsa concervation programme and hilsa resource centre."**

Rastriya Krishi Vikash Yojona (RKVY) has been the élan vital of the agriculture and allied sector boosting new initiatives for production, self-reliance and diversification in the field of agriculture, fishery and animal husbandry. The Department of Fisheries Government of West Bengal, having identified a very pertinent issue of open water Hilsa fishery- that needs eco-system management interventions, had proposed a unique project for sustainable Hilsa fishery by way of submitting a scheme " hilsa concervation programme and hilsa resource centre" during the year 2013-14, in the tune of Rs 14.13 crores. A fund of Rs 200 lakhs was demanded from RKVY, which was ultimately sanctioned.

Objectives:

- Awareness generation among the stake holders on conservation of juveniles & brooders.
- Implementation of Inland and Marine Fisheries Act, West Bengal on Hilsa conservation.
- Co-ordination with the local administration, district and block level, for conservation.
- To Figure out alternate livelihood for artisanal hilsa fishers, in the long run.
- To calibrate all issues on hilsa fishery & research through sync & synergy with labs & institutes (CIFRI, CIBA, WUAFS) working on hilsa, as and when necessary.
- To set up a dedicated center for Hilsa conservation and research, for taking up collaborative and adoptive trials under the guidance of a technical sub-committee. etc.

Total Approved Project cost: 200.00 lakh. The project has been started in the year 2013-14 and expected to be completed in 2014-15.

3. Development of a model Fishermen Co-operative Society: Mahanad Matshya Utpadak Sanstha Samabay Samity under RKVY:

Objectives: To develop a model fishermen co operative society in an integrated manner of fisheries activities

Project Site: The proposed site is located at Mahanad village under Polba-dudpur block, Hooghly district.

Components of Project: Poly farming of scampi, multipurpose hatchery, training centre, retail marketing outlet etc.

Total Approved Project cost: 150.00 lakh. The project has been started in the year 2013-14 and expected to be completed in 2014-15.

4. Aquaculture Development through integrated approach in the beel under NMPS:

Objectives:

- Utilization of big water bodies in an integrated manner for better production of fish
- Intially fry of carp are being reared in an enclosure (pen) of beel to produce fingerlings which are to be stocked in the beel for table fish

Project cost for one unit: 23.77 lakh. The project has been started in the year 2012-13 & 2013-14 in 56 beels and expected to be completed in 2014-15.

Annexure - I

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Comments on draft report

"**Evaluation and Assessment of Economic Losses on Account of Inadequate Post-Harvest Infrastructure Facilities for Fisheries Sector in West Bengal State**"

Submitted by
Agro-Economic Research Centre
Santinikentan West Bengal

1.	Title of report	" **Evaluation and Assessment of Economic Losses on Account of Inadequate Post-Harvest Infrastructure Facilities for Fisheries Sector in West Bengal State"**
2.	Date of receipt of the Draft report	30th July 2016
3.	Date of dispatch of the comments	11th August 2016
4.	Comments on the Objectives of the study	It is in order and it meets the objectives of the study.
5.	Comments on the methodology	There is no comments on the Methodology of the study
6.	Comments on analysis, organization, presentation etc.	There are typographical errors throughout the report, which they by giving thorough reading can eliminate them before submitting to the Government of India. But I cannot resist my temptation to appreciate the team work they have put in spite of non-availability of adequate data with them.
7.	References:	No comments
8.	General remarks	
	• There are typographical errors throughout the report, which they by giving thorough reading can eliminate them before submitting to the Government of India.	
9.	Overall view on acceptability of report:	
	• The report may be accepted after due corrections as mentioned above.	

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Annexure - II

Action Taken on Comments

Proper attention has been taken to minimize the typographical errors.

Authors