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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 Assessment 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 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.

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 between 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 in 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 Wholesale & Market Retailer	Category-3 Fish Processing Centre	Category-4 Fishery Officials
I	West Bengal	Sankarpur	A* 10×3=30	Wholesaler 5×3=15	Exporter (2×3)= 6	2×3=6
		Petuaghat Freserganj	B* 10×3=30	Retailer 10×3=30 Consumer 10×3=30	Small Scale/local Processor (2×3)= 6 Total 12	
		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 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 at Chakgaria, 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) 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 25 lakh 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, Mackeroyal, 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 inadequate 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 taken 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 first 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 flourishing. 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 facilitate 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.