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Supply chain and market infrastructures for Marine Fishery in Gujarat

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Abstract

The aim of the study was to examine the existing supply chain and marketing infrastructure for marine fisheries in Gujarat, India. The primary data were collected during month of October 2015 covering three periods spread in the year 2014-15 (October 2014 to September 2015) from three fishing harbours namely, Veraval, Porbandar and Mangrol of Gujarat. It was observed that the post harvest infrastructure in marine sector in Gujarat seems to have received less attention. It is also true that as the industry has been pre-occupied with the exports, no major initiatives have been made for the development of the domestic market (may be due to less demand). Fish is by and large sold in the most unhygienic conditions and this area needs considerable intervention in the coming period. Fishing harbours are being developed at both major and minor ports. However, the condition of washing and cleaning facilities available at selected harbours was unsatisfactory at Porbandar and Mangrol while same was very poor at Veraval harbor. Also the facilities like clear landing platform and cold storage/chill plants within the FH premises and availability of insulated storage boxes on board the fishing vessel need to be ensured. The retail markets are unhygienic and lack basic facilities that to when more than 90 percent retailers are women. Most of whole fish is sold in the market and there is no processing/value-addition. The retail markets operate in open sky condition and thus, in view of less availability of ice, the quality of fish deteriorates very fast. The harbors like Porbandar and Veraval are overcrowded due to less space in harbor region and large number of boats parked there than its capacity. Because of same, fish catch exceeds the capacity of harbor. Therefore, there is a need of emphasizing further development of harbor regions as well as marketing infrastructure for fishery sector of Gujarat.

Keywords: Fishery sector, production and conservation

Introduction

The fisheries sector plays an important role in the Indian economy. It contributes to the national income, exports, food and nutritional security and in employment generation. The fisheries and aquaculture in India are vibrant economic activities, and have been one of the fastest growing food production systems during the last three decades. Their significance and contribution towards agricultural (4.75 per cent GDP in 2012-13 at current prices) and national economies (0.83 percent to national GDP in 2012-13 at current prices), livelihood and nutritional security, employment generation (14.49 million people) and foreign exchange earnings (over Rs. 33441 crores in 2014-15) have been enormous though understated so far. In India, fish is the major source of protein for over one-third of the population especially for the rural poor in coastal areas. About 35 per cent of Indian population is fish eaters and the per capita consumption is 9.8 kg whereas the recommended intake is 13 kg (Srinath *et al*., 2008; GOI, 2011). The marine fish production has also been stagnating over recent years (CMFRI, 2004).

The efficient marketing system is one of the most important factors for rapid growth of the fish farming sector. Technological breakthroughs in the field of Aquaculture have resulted in heavy investment by private entrepreneurs for establishing big Aqua farms.

As there is a big gap between supply and demand, fish marketing or selling of fish is very easy domestically. All types of fish - high cost or low cost - are easily sold due to the presence of a heterogeneous mixture of buyers. High cost fish like Carps, Catfish, Live fish from inland waters and pomfrets, Indian Salmon, Snappers, Grunters and Eels, are either sold to the affluent or are processed for export. Mixed fish are usually sold to the vast majority of the people, those of the low income group. Due to high domestic and international demand, the

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prices of exportable species have increased a few folds. The prices of fish fluctuate far higher than any other agricultural commodity. The price changes may be due to the changes in supply beside due to the prices of other fishes in the market when a bumper catch on any days will slash down the fish price and a small catch will boost the price to very high level (Shaikh, 2014).

The fish markets and the marketing of fish are generally conducted by fish traders, either individually or as groups, or Fish Traders' Associations or Fishermen's Cooperative Societies. Almost all fish markets operated by them are ill-managed, unhygienic and unscientific. There is no proper handling, washing, cleaning, icing or re-icing of the fish (FAO, 1995). They care very little for post-harvest management of the resource, being more interested in earning more revenue at the cost of the fishermen and the consumers. Most fish markets managed by fish traders in cities, district towns and rural areas have no modern infrastructural facilities, not even overhead covering. In the villages, fish is directly landed on the soil and in bamboo baskets and sold by auction, before being transported to cities/towns for retailing. Being a highly perishable commodity, fish requires proper landing facilities, processing, storage, transport and distribution facilities running through the entire supply chain from capture to consumer. Aquaculture development in recent years might have changed the whole of the shape of fish marketing. These changes are needed to be examined. Furthermore, the above mentioned studies do not focus in depth the causes and magnitude of inefficiencies and nature of competition in the market. These two issues are key factors, the investigation of which may prove highly useful in formulating aqua price policies for strengthening and improving the efficiency of fish marketing in Gujarat.

Gujarat is endowed with a wide range of marine and inland aquatic resources. The state has a long coastline extending to 1600 km accounts for 19.70 per cent of the total coastline of the country and about 46 per cent of the western coastline of India. It has a continental shelf area of 0.18 million km^2, Exclusive Economic Zone (EEZ) of 0.214 million km^2, which occupies 32 per cent of the continental shelf area and 10 per cent of the total EEZ of India. The Gujarat coast, including the two Gulfs, is blessed with physical features congenial to the development of fisheries. The major fisheries resources of the state include Elasmobranches, Bombay ducks, Sciaenid's, Shrimps, Seer fishes, Tunas, Threadfin Breams, Pomfrets, Catfishes, Lizard fishes, Bull's eyes, Carangids, Anchovies, Ribbon fishes, Croakers, Prawns, Lobsters and Cephalopods

In this context, the present study examines the adequacy of existing marketing infrastructures and supply chain in distribution and sell of marine fishery products in Gujarat.

Data and Methodology
The study is based on primary data collected from three fishing harbours of Gujarat, namely, Veraval, Porbandar and Mangrol. The data were collected during three fishing periods in the year 2014-15 (October 2014 to September 2015). Since the main objective was to assess the infrastructural gap in order to arrest the post-harvest fish losses in Gujarat, the primary data were collected from a number of stakeholders involved in the supply chain viz. boat owner & fishermen (60), wholesalers (10), retailers (10) and small processors (6) and exporters (6). Some administrators at selected harbours and Fishery Department were also interviewed on various aspects including fish quality, loss and policy related issues.

Result and Discussion
Details on Fish Catch and Sold
The harbour wise and season wise details on fish catch and sold is presented in Table 1. On an average, around 14 tonnes fish per trip was caught in selected harbors. The maximum fish was landed at Veraval harbor by selected boat owners and fishermen, i.e. 14.65 tonnes/trip and the lowest was in Porbandar (12.23 tonnes/trip). Fish catch depends entirely on the size of the boats, types of fishing gear, types of nets and also the number of times the fishermen go to the sea in a day. Out of total fish landed at harbours, about 85 percent fish was of Grade I and remaining was categorized as low grade (around 15 percent), i.e. Grade II. Across the harbours, the percentage of Grade I fish ranges between 82 to 87 percent. The fish used as dry/fish meal was found around 3.6 percent of total fish landed.

The sale pattern of fish landed indicates that, about 94 percent of total fish was sold, of which around 37 percent each was sold to exporter, around 29 percent to wholesaler and contractor and remaining was sold to retailer.

Table 1: Harbour wise & Season-wise Details of Fish Caught & Sold

Sr. No.	Harbour	Details of Fish Caught & Sold							
		Porbandar		Veraval		Mangrol		Total	
1.	Oct - Dec 2014	tons	%	tons	%	tons	%	tons	%
A)	Fish landed per trip	4.20	100.0	5.33	100	4.31	100.0	4.61	100.0
	a) Grade I (high value)	3.03	72.0	4.05	76.1	3.42	79.4	3.50	75.9
	b) Grade II (low value)	1.18	28.0	1.28	23.9	0.89	20.6	1.11	24.1
B)	Fish Sold	3.94	93.9	4.98	93.6	4.09	94.9	4.34	94.1
	a)Exporter	1.14	28.9	2.69	53.9	0.82	19.9	1.55	35.6
	b)Wholesaler	0.99	25.0	1.39	27.8	1.46	35.5	1.28	29.4
	c)Retailer	0.10	2.6	0.06	1.3	0.30	7.3	0.15	3.5
	d)Contractor	1.72	43.5	0.85	17.1	1.53	37.3	1.36	31.4
C)	Fish waste/fish dumped	0.11	2.7	0.16	2.9	0.06	1.3	0.11	2.3
D)	Fish use to dry/fish meal	0.15	3.5	0.19	3.5	0.16	3.7	0.16	3.6
2.	Jan to Mar 2015								
A)	Fish landed per trip	4.19	100.0	4.62	100	4.28	100.0	4.36	100.0
	a) Grade I (high value)	3.10	74.0	3.50	75.8	3.42	79.9	3.34	76.6
	b) Grade II (low value)	1.09	26.0	1.12	24.2	0.86	20.1	1.02	23.4
B)	Fish Sold	3.92	93.6	4.22	91.3	4.04	94.3	4.06	93.0
	a)Exporter	1.57	39.9	2.00	47.4	0.86	21.3	1.47	36.3
	b)Wholesaler	1.00	25.5	1.26	29.8	1.33	32.9	1.20	29.4

	c)Retailer	0.19	4.8	0.19	4.4	0.27	6.6	0.21	5.3
	d)Contractor	1.17	29.7	0.78	18.4	1.59	39.2	1.18	29.0
C)	Fish waste/fish dumped	0.13	3.0	0.17	3.6	0.11	2.6	0.14	3.1
D)	Fish use to dry/fish meal	0.15	3.5	0.23	5.0	0.13	3.0	0.17	3.9
3.	April to Sep2015								
A)	Fish landed per trip	4.19	100.0	4.45	100	4.03	100.0	4.22	100.0
	a) Grade I (high value)	3.28	78.3	3.50	78.7	3.26	80.7	3.34	79.2
	b) Grade II (low value)	0.91	21.7	0.95	21.3	0.78	19.3	0.88	20.8
B)	Fish Sold	3.94	94.1	4.12	92.6	3.73	92.4	3.93	93.1
	a)Exporter	1.34	34.0	1.97	47.8	1.25	33.5	1.52	38.7
	b)Wholesaler	1.33	33.6	1.06	25.7	1.08	28.8	1.15	29.4
	c)Retailer	0.09	2.2	0.21	5.1	0.10	2.5	0.13	3.3
	d)Contractor	1.19	30.2	0.88	21.4	1.31	35.1	1.13	28.7
C)	Fish waste/fish dumped	0.09	2.2	0.16	3.6	0.19	4.7	0.15	3.5
D)	Fish use to dry/fish meal	0.15	3.6	0.17	3.8	0.12	2.9	0.15	3.5
4.	Overall								
A)	Fish landed per trip	12.6	100.0	14.39	100	12.63	100.0	13.20	100.0
	a) Grade I (high value)	9.40	74.8	11.05	76.8	10.10	80.0	10.18	77.2
	b) Grade II (low value)	3.18	25.2	3.34	23.2	2.53	20.0	3.01	22.8
B)	Fish Sold	11.8	93.9	13.32	92.5	11.86	93.9	12.33	93.4
	a)Exporter	4.05	34.3	6.66	50.0	2.92	24.6	4.54	36.8
	b)Wholesaler	3.31	28.0	3.70	27.8	3.86	32.5	3.62	29.4
	c)Retailer	0.38	3.2	0.46	3.4	0.66	5.6	0.50	4.0
	d)Contractor	4.07	34.5	2.51	18.8	4.42	37.3	3.67	29.7
C)	Fish waste/fish dumped	0.33	2.6	0.48	3.4	0.36	2.9	0.39	3.0
D)	Fish use to dry/fish meal	0.44	3.5	0.59	4.1	0.41	3.2	0.48	3.6

Sources: Field Survey Data.

The details on time and cost incurred in fishing activity per trip are presented in Table 2. The total operational expenditure incurred has been estimated to be Rs. 1.71 lakh/per visit comprised of expenditure on food and water, fuel cost, ice cost, hired labour and other miscellaneous items.

Table 2: Details on Time and Cost incurred in Fishing Activity per trip

Sr. No.	Particular	Unit / trip	Time and Cost incurred in Fishing Activity per trip			
			Porbandar	Veraval	Mangrol	Overall
1	Fishing nets/gears taken per fishing trip	Av. No.	13.4	16.8	15.1	15.1
2	Distance of the fishing ground from the shore	Nautical miles	88.2	180.9	109.0	126.0
3	Approximate time taken for fishing	Hrs.	130.3	174.1	118.5	141.0
4	Approximate time taken for landing/unloading					
	a) Handling by (Machine) Mechanical Device	Hrs.	26.0	40.1	28.6	31.6
	b) Handling Manually	Hrs.	4.1	2.9	2.7	3.2
5	Quantum of fuel taken on board the vessel (diesel)	Liters	2267.5	3515.0	2282.5	2688.3
6	Fuel utilized per each trip	Liters	1947.5	3110.0	2026.5	2361.3
7	Operational expenses/trip					
	a) Exp. on Food & Water	Rs.	9200	15250	9675	11375
	b) Fuel Cost	Rs.	94064	150213	97880	114052
	c) Hired labour cost	Rs.	24900	38900	26200	30000
	d) Ice cost	Rs.	3900	5650	4625	4725
	i) total quantity	kg	9100	11550	7550	9400
	ii) Rate	Rs./Kg	1.3	1.2	1.3	1.2
	e) Any other expenditure	Rs.	11303	13552	10121	11659
	f) Total Cost	Rs.	143367	223565	148501	171811

Note: 1 Nautical mile= 1.852 km.
Source: Field survey data

There was huge difference in cost incurred by respondents of three selected harbors. The highest cost was incurred by the respondents from Veraval harbor (Rs. 2.24 lakh) while the lowest cost was recorded by respondents from Porbandar harbor (Rs. 1.44 lakh per trip). The high cost per trip at Veraval respondent would be due to longer time taken for fishing (174.1 hours). Around two third of total cost was incurred on fuel only, followed by about one fifth of total cost on hired human labour for fishing activity. Thus, these two costs put together accounted for about 84 percent of total cost. As there is a big gap between supply and demand, fish marketing or fish business is very profitable. The fish markets and the marketing of fish are generally conducted by fish traders, either individually or as groups, or Fish Traders' Associations or Fishermen's Cooperative Societies. Four levels of markets or marketing systems are observed in the distribution channel of fish trade i.e. fish wholesaler/trader-processer / exporter – retailer- consumer.

Fish Wholesale Markets
Wholesale fish markets are not well developed throughout the state. Fish landing centres are administered mutually by Fishery Department and fishermen association. Though some of the landing centres are well developed, some lagged behind

due to the poor participation of all stakeholders. It may be seen from Table 3 that the percentage of losses in fish value due to poor post-harvest infrastructure during Season I and Season II was to the tune of 6-10 per cent in case of 60 per cent of wholesalers in Porbandar harbor. However, during Season III, 6-10 per cent loss was experienced by 40 per cent of wholesalers in same harbor. The higher extent of losses (11-15%) was faced by 20 per cent of wholesalers during Season I and III, whereas such range of losses was not found in Season II in Porbandar harbor. Relatively, the percentage of losses in fish value due to poor post harvest infrastructure to the tune of 11-15 per cent was the highest in Veraval and was lowest in Porbandar. On the other hand, the percentage of losses in fish value in the lower range (to the tune of 1-5 per cent) was more in Porbandar and was the lowest in Veraval harbour.

Table 3: Detail of Loss incurred by Wholesaler due to Poor Post Harvest Infrastructure

Sr. No.	Harbour/Loss Range	Loss in wholesale market (% loss in fish value- Rs/kg)		
		Oct.- Dec. 2014	Jan.-Mar 2015	April Sept.2015
A	Porbandar (n=5)			
	1-5 %	20.0	40.0	40.0
	6-10 %	60.0	60.0	40.0
	11-15 %	20.0	0.0	20.0
B	Veraval (n=5)			
	1-5 %	20.0	20.0	0.0
	6-10 %	40.0	40.0	40.0
	11-15 %	40.0	40.0	60.0
C	Mangrol (n=5)			
	1-5 %	0.0	20.0	20.0
	6-10 %	60.0	40.0	40.0
	11-15 %	40.0	40.0	40.0
D	All (n=15)			
	1-5 %	13.3	26.7	20.0
	6-10 %	53.3	46.7	40.0
	11-15 %	33.3	26.7	40.0

Source: Field Survey Data

Among the types of cold storage facilities availed by wholesalers, freezer boxes were major ones that used by about 73 per cent wholesalers, while remaining 27 per cent had used cold storage facility. About 80 per cent respondents could get regular fish supply and about 87 per cent got the fish of assured quality. About 80 per cent of them had the capacity to hold huge supplies. On an average, 20 people were engaged with a wholesaler. As far as mode of marketing is concerned, open auction method was followed by 80 per cent wholesalers in Porbandar whereas 60 per cent wholesalers in Mangrol resorted to direct sale method of marketing. Wholesalers did not face many difficulties in terms of supply, marketing and upkeep of the markets. Only about 27 per cent wholesalers expressed that they faced problem of market storage facilities. The study finding reveal that fish marketing system is not well arrange, high cost storage facilities, a little attention from public agencies and mainly handled of intermediaries in marketing channels. Compared to the achievement in fish production, the fish marketing system is very poor and highly inefficient in India reported by Kumar *et al*. (2008)

Fish Retail Markets
The local retail markets for marine fishes catered the need of local people in the cities and nearby areas. However, during the survey, it was found that there were no proper shops/buildings for marketing of fish in retail. The fishes were sold on the roadside without facility of proper roof, electricity, water, drainage, storage room and proper flooring. At some places, small platforms were constructed in the market. There were no proper lavatory and washing facilities in most of the retail markets. The hygienic conditions were also very poor. Fishes were piled up on the floor and sold. Majority of retail fish markets those were visited by the research team are found to be ill-managed and unhygienic. There were no proper handling, washing, cleaning, icing or re-icing of the fishes in the market places. The major sources of purchase of fish by the retailers were the brokers or middle men. About 70 per cent of total fishes were purchased by retailers through the brokers/middlemen. Entire fishes in the retail market were sold to the consumers coming from the nearby areas.

It may be seen in Table 4 that the percentage of losses in fish value due to poor post-harvest infrastructure during Season I was to the tune of 6-10 per cent in case of 60 per cent of retailers in Porbandar market. However, during Season III, the 6-10 per cent loss was experienced by 30 per cent of retailers in the same harbor. The higher extent of losses (16-20%) was not faced by any retailers during any seasons in Porbandar, however such range of losses was found in other harbors.

Table 4: Detail of Loss incurred by Retailer due to poor post harvest infrastructure

Sr. No.	Harbour/Loss Range	Loss in value due to inadequate post-harvest infrastructure Retailer (% loss in fish value- Rs/kg)		
		Oct.- Dec. 2014	Jan.-Mar 2015	April Sept.2015
A	Porbandar (n=5)			
1	1-5 %	30.0	40.0	50.0
2	6-10 %	60.0	40.0	30.0
3	11-15 %	10.0	20.0	20.0
4	16-20%	0.0	0.0	0.0
B	Veraval (n=5)			

1	1-5 %	20.0	30.0	0.0
2	6-10 %	50.0	40.0	60.0
3	11-15 %	20.0	30.0	30.0
4	16-20%	10.0	0.0	10.0
C	Mangrol (n=5)			
1	1-5 %	30.0	30.0	20.0
2	6-10 %	50.0	30.0	60.0
3	11-15 %	10.0	30.0	20.0
4	16-20%	10.0	10.0	0.0
D	All (n=15)			
1	1-5 %	26.7	33.3	23.3
2	6-10 %	53.3	36.7	50.0
3	11-15 %	13.3	26.7	23.3
4	16-20%	6.7	3.3	3.3

Source: Field Survey Data

The major facility required by the fish retailers was availability of ice to keep the fish afresh in the market places as well as in their storage boxes. About 93 per cent of selected sample retailers got ice in adequate quantity and about 90 per cent of them could get ice in time and uninterruptedly. On the whole, only about 33 per cent retailers expressed that ice price was more or less stable throughout the year. The average ice price in retail market was around Rs.1.25 per kg. Among the types of cold storage facilities availed by retailers, ice boxes were the major ones that used by all the retailers. Also all the retailers could get regular fish supply in assured quality and they had the capacity to hold huge supplies. As far as mode of marketing is concerned, direct sale method was followed by about 97 per cent retailers. Mostly single member had handled the fish selling in retail market.

Fish Consumers
The consumers have purchased the fish four days in a week. Majority of consumers purchased cuttle fish, squid, ribbon fish, jinga and pomfret. The average quantity of purchase was 0.89 kg per visiting day. All the consumers expressed that they used to get desired type and quality of fish since all these markets are located very close to main harbor areas. About 83 percent of the consumers reveal that the average price was reasonable. Across the selected harbors, there were no major variations in the types of purchases made by the consumers.

Fish Processors and Exporters
The harbor wise capacity and utilization of processing plant shows that the average installed capacity for processing seafood in a sample processor in Gujarat was 57.9 tons per day with utilization capacity varied from 58.3 to 72.4 percent in different seasons. The installed capacity of an average processing plant in Porbandar was 80.3 tons per day which was higher than that in Veraval (52.8 tons per day) and Mangrol (40.8 tons per day). However, the capacity utilization in processing plant was higher in Veraval as compared to Porbandar and Mangrol. In Veraval, the utilization capacity of plant varied from 71.1 to 82.0 per cent across different seasons; whereas the same in Porbandar and Mangrol varied from 56.7 to 77.9 per cent and from 44.8 to 49.1 per cent, respectively. The season-wise details of fish taken for processing have been presented in Table 5.

Table 5: Season-wise Details of Fish Taken for Processing

Sr. No.	Season-wise	Season-wise detail of fish taken up to processing				
		Quantity of fish taken for processing (ton)	Rate of Fish Purchase (Rs./ Kg)	Processed output quantity (ton)	Sold prices (Rs./ Kg)	Economic loss (Rs./ Kg)
A	Porbandar					
	Oct-Dec 2014	3800	162.5	3537.5	250	23.75
	Jan-March 2015	2875	200.0	2650	287.5	28.75
	Apr-Sept 2015	3250	187.5	2950	337.5	27.5
B	Veraval					
	Oct-Dec 2014	3875	188.75	3412.5	317.5	33.75
	Jan-March 2015	3050	182.5	2787.5	300	30
	Apr-Sept 2015	3250	187.5	3037.5	325	30
C	Mangrol					
	Oct-Dec 2014	1975	207.5	1750	362.5	36.25
	Jan-March 2015	2300	175.0	2075	337.5	35
	Apr-Sept 2015	2250	163.75	2025	305	30
D	Overall					
	Oct-Dec 2014	3216.67	186.25	2900.00	310.00	31.25
	Jan-March 2015	2741.67	185.83	2504.17	308.33	31.25
	Apr-Sept 2015	2916.67	179.58	2670.83	322.50	29.17

Source: Field Survey Data

On an average, a selected processor had purchased fish of 2741.7 tons to 3216.7 tons at the rate of Rs. 179.6 to 186.3 per kg for processing in a season. Overall, the processed quantity sold during a season varied from 2504.2 tons to 2900.0 tons; whereas the selling price varied from Rs. 308.3 per kg to Rs. 322.5 per kg. Overall, the economic loss varied from Rs. 29.2 per kg in Season III to Rs. 31.3 per kg during Seasons I and II.

Overall 66.67 per cent of sample processors purchased the fish from both wholesale market and fishermen and 8.33 percent of them purchased fish from broker/middleman + fisherman. Only 16.67 per cent respondents had purchased fish from fisherman and 8.33 per cent has purchased from wholesale market directly. As far as processed fish and fish products sold by the processors is concerned, overall 90.9 per cent of the processors sold the product to exporters; whereas only 9.1 per cent of them sold in domestic market. In Porbandar, 92.0 per cent processors sold their quantity in export market whereas in Veraval and Mangrol, 91.0 per cent and 90.87 per cent fish was sold to export market, respectively. The agents of Overall, about 83.3 per cent of processors did grading and sorting of fishes in the processing plants; whereas only 16.67 per cent of them relied on on-board sorting of fishes.

The main task facing these companies/ plants is to comply with various certifying agencies such as EIA (Export Inspection Agency of India), EU (European Union), F&D act of USA, HACCP (Hazard Analysis and Critical Control Point) etc. All the sample processing plants were complied with EIA norms, HACCP norms and were registered with the Marine Products Exports Development Authority (MPEDA). About 58.33 per cent processors were compiled with EU norms and F&D of USA.

The harbor wise details on value addition by processors indicate that, about 75 per cent of total quantities of fish were used for export as frozen fish and remaining 25 per cent as whole fish plus frozen. Overall 80 to 90 per cent of total processed quantity of fishes were exported to Europe, Japan, US, China, Vietnam, Dubai, Italy and South Korea and 10-20 per cent of total quantity of processed fish products were sold in Delhi, Ahmadabad Jodhpur, Mumbai, Surat, Vadodara, Anand, Pune and other domestic markets. Overall about 75 per cent processed products were ready to cook and eat.

As opined by the processors, the modernized post-harvest facilities are essential to minimize post-harvest losses of fish and fish products. The data on perceptions of the processors regarding the required improvements in post harvest infrastructures so as to minimize the losses indicate that about 58.3 per cent of processors have revealed first preference to insulated storage boxes on board. They have assigned second preference to clean landing platform with washing and drainage facilities and third preference to cold storage/chill plants facilities. Harbour wise analysis reveals that processors in Veraval have attached more importance to insulated storage boxes on board followed by the requirement of cleaner landing platform with washing and drainage facilities in their harbor. Both these facilities are also assigned more importance in other two harbors also. About 75 per cent sample processors in Porbandar and Mangrol have assigned forth preference to cold chain network facility while about 75 per cent of Veraval processors have assigned forth preference to cold storage/chill plants within the fish harvest premises.

Summery and Conclusion

It was observed that the post harvest infrastructure in marine sector in Gujarat seems to have received less attention. It is also true that as the industry has been pre-occupied with the exports, no major initiatives have been made for the development of the domestic market (may be due to less demand). Fish is by and large sold in the most unhygienic conditions and this area needs considerable intervention in the coming period. Fishing harbours are being developed at both

major and minor ports. However, the condition of washing and cleaning facilities available at selected harbours was unsatisfactory at Porbandar and Mangrol while same was very poor at Veraval harbor. Also the facilities like clear landing platform and cold storage/chill plants within the FH premises and availability of insulated storage boxes on board the fishing vessel need to be ensured. The retail markets are unhygienic and lack basic facilities that to when more than 90 percent retailers are women. Most of whole fish is sold in the market and there is no processing/value-addition. The retail markets operate in open sky condition and thus in view of less availability of ice, the quality of fish deteriorates very fastly. The harbors like Porbandar and Veraval are overcrowded due to less space in harbor region and large number of boats parked there than its capacity. Because of same, fish catch exceeds the capacity of harbor.

Policy Suggestions

- Fishing harbours are being developed at both major and minor ports. However, the condition of washing and cleaning facilities available at selected harbours was unsatisfactory at Porbandar and Mangrol while same was very poor at Veraval harbor. Also the facilities like clear landing platform and cold storage/chill plants within the FH premises and availability of insulated storage boxes on board the fishing vessel need to be ensured.

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- It was reported that the prices of fish generally drop down sharply when there is glut in the market mostly during the rainy season (October to December), and therefore marketing and processing activities need to be strengthen by the government. Balancing technical interventions to improve fish quality with the potential increase in selling prices, associated with better quality fish with the demand for cheaper fish by low income consumers, is an important dilemma.

- The dumping of hazardous chemical waste from industries located nearby sea shore (particularly at Veraval and Porbandar) not only affect the fish quality due to polluted water but also results in dying and moving away of good species of fish from the harbor area. That force the fishermen to go far way (till Pakistan border) to catch good fish. Therefore, dumping of industrial waste should be prohibited effectively.

- The post harvest infrastructure in marine sector in Gujarat seems to have received less attention. It is also true that as the industry has been pre-occupied with the exports, no major initiatives have been made for the development of the domestic market (may be due to less demand). Fish is by and large sold in the most unhygienic conditions and this area needs considerable intervention in the coming period.

- In governments and development agencies should ensure that changes in post-harvest fisheries-related policy and practices take stock of the loss assessment tools, information generated and experience of the programme. Fish loss assessments should be incorporated into national data collection systems and used regularly to inform policy.

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