

## Post harvest losses in Marine Fisheries

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In India, fish is the major source of protein for over one-third of the population especially for the rural poor in coastal areas. The per capita consumption of fish in India is 9.8 kg. against the recommended intake of 13 kg. The marine fish production has also been stagnating over recent years (CMFRI, 2004). As per FAO, the post harvest loss in world fisheries is 10%. Considering the nutritional significance coupled with stagnating catches in India, it is imperative that losses at all levels should be reduced. A pilot study to assess harvest and post harvest losses in the marine sector was carried out by Central Institute of Fisheries Technology, Cochin in collaboration with Indian Agricultural Statistics Research Institute, New Delhi. This paper presents the results obtained vis-à-vis the post harvest sector in the study.

**Key words :** Post harvest losses, Marine Fisheries, India.

In India, fish is the major source of protein for over one-third of the population especially for the rural poor in coastal areas. The per capita consumption of fish in India is 9.8 kg. against the recommended intake of 13 kg. As per the authentic reports, the marine fish production have been stagnating over recent years (Anon 2003 & 2004). FAO reported the post harvest loss in world fisheries to be around 10%. Considering the nutritional significance coupled with stagnating catches in India, it is imperative that fish losses at all levels should be reduced. Attempts have been made to develop methodologies to assess losses of fish at different stages especially at post harvest level (FAO 1981; Wood, 1986; Ward, 1996; Ward & Jeffries, 2000). However, very few systematic attempts have been made in India to assess quantitatively, the post harvest loss in marine fisheries. In 1981, FAO estimated fish loss to the tune of 40% in some developing countries. An International Development Research Centre, Canada (IRDC) sponsored study in Central Institute of Fisheries Technology, Cochin, India in 1985 was aimed at better utilization of trawler by-catches for prevention of such fish losses. A pilot study to assess harvest and post harvest fish losses in the marine sector was carried out by Central Institute of Fisheries Technology, Cochin in collaboration with Indian

Agricultural Statistics Research Institute, New Delhi. This paper presents the results obtained vis-à-vis the post harvest sector in the study.

### Materials and Methods

The data was generated in a mission mode project under National Agricultural Technology Project (NATP) on 'Assessment of Harvest and Post harvest losses (marine fisheries)', which was taken up in 2002 in Ernakulam district of Kerala, India. The quantity of marine fish, which is not available for human consumption due to physical loss, spoilage or due to some other reason, was considered as loss for the purpose of the study.

The major stages for estimation of post harvest losses identified were mechanized, motorized and traditional fishing sectors at the landing center level, pre-processing and processing sectors (both for fresh fish and frozen fish) and different types of markets for fresh and dry fish-namely wholesale market, major retail market, minor retail market, road side market and vendor; drying unit and consumer level.

Stratified random sampling was adopted for selection of samples in the study. In the fishing sector at the landing center level, the

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crafts were stratified into four strata viz. traditional crafts, motorised crafts, mechanised boats and deep-sea trawlers (boats well equipped for deep sea operation) with sample sizes of 103,200,60 and 20 respectively. The sample sizes selected for pre-processing and processing sectors were 30 and 7. In marketing channels, samples of sizes 2,2,7,9 and 25 were selected for wholesale market, major retail market, minor retail market, roadside market and vendor levels respectively. At consumer level, two strata namely rural and urban were defined and sample sizes of 100 and 20 were selected. The sample size for drying unit was 10. Data was collected at weekly intervals and both enquiry and physical observations were adopted for data collection through separate schedules for each stage. The data was collected for a period of 12 months from January to December 2002, at weekly intervals through separate schedules for each stage by both enquiry and observation.

## Results and Discussion

Post harvest losses in the traditional fishing sector at landing centre was estimated as 4.30% for the period under study. The loss in the sector was mainly due to landing of low value fish and juveniles of oil sardine that was used for manufacture of animal feed. A major portion of these catch moved out of the district to other states including Karnataka, Andhra Pradesh and Gujarat.

The percentage of post-harvest loss for motorized sector was 5.16 and losses occurred in this sector mainly due to discard of juveniles in large quantities and spoilage due to improper icing. Good catch from the month of March to August has resulted in discard of large quantities of low value species. When heavy landings of oil sardine were reported, large quantities of the species were dried for conversion into animal feed. Higher losses occurred when ring seine was in use and loss was observed while unloading of fish from fishing crafts. The major species landed in the sector were sardine, mackerel, prawns, anchovy, russel's scad, glassy perchlet, pony fish, pomfret, tuna, and ribbonfish.

Based on the data collected from small and medium size boats of the mechanized

sector, post-harvest loss reported for the year under study was 0.41%. Larger vessels, which are capable for deep-sea operation, reported a post harvest loss of 0.18% during the period under study.

The major reasons for losses at this stage in the mechanised sector were physical damage during fishing, spoilage due to improper icing, fish being eaten away by birds etc. The major species landed were threadfin bream, lizard fish, prawns, whip tail sting ray, anchovy, trevally, glassy perchlet, crab, squid, octopus, cuttlefish, pony fish, pomfret, tuna, russel's scad, spotted butter fish, black king fish and seer fish.

Table 1. Post harvest losses in different fishing sectors

Fishing sector	% Loss
Traditional	4.30 (0.25)
Motorised	5.16 (0.37)
Mechanised	0.41 (0.03)
Mechanised (Large vessel)	0.18 (0.04)

Figures in parenthesis - SE

Pre-processing and processing channels are crucial for fisheries sector as all fish items meant for export marketing pass through these channels. The overall percentage of loss in pre-processing channel was 0.26% for fresh fish and 0.14% for frozen fish. The loss occurred due to faulty handling and discard of small size fish. Shrimp, squid and cuttlefish were the main species processed in these channels. Loss also occurred in the shrimp meat while washing, grading and packing. The pre-processing centres handled shrimp from different places outside the state and in such a stock, black spot and discolouration were frequently observed. The spoilage also occurred due to improper icing and exposure to ambient temperature while transportation of flower tail prawns (poovalan), brown shrimp (kazhanthan) and deep-sea prawns. In kiddi prawn (karikkadi), discolouration and white patches were observed. Small size fish found in these consignments were thrown out along with the shrimp shell. This is observed in the raw material received from the non-mechanised

fishing units. Tiny deep-sea lobsters that were supplied along with deep-sea shrimp were also discarded. Losses also occurred during unloading, re-icing, weighing and hasty operation by the workers.

Like in the case of pre-processing sector, losses in the processing sector were also studied for both fresh fish and frozen fish. Losses were comparatively less in this sector with processing of fresh fish recorded a loss of 0.15% and that of frozen fish 0.03%. In this sector, losses occurred due to discolouration, black spot in shrimp, loss due to broken tentacles and wings in cuttle fish and squid. Spillage of shrimp meat while moving through conveyor in the processing plants was also observed. During glazing also loss occurred in the meat portion. Pre-processing and processing sectors showed comparatively low percentage of losses, as these channels were export oriented and tuned towards minimizing the losses.

In the export sector, rejection of consignment due to food safety problem was reported in which case the importing country rejected and destroyed the entire consignment. This channel was however not subjected to detailed study.

Table 2. Post-harvest losses with standard error (S.E) in different fish processing sectors.

Fish Processing Sector	% Loss
Pre-processing sector (fresh fish)	0.26 (0.07)
Pre-processing sector (frozen fish)	0.14 (0.02)
Processing sector (fresh fish)	0.15 (0.03)
Processing sector (frozen fish)	0.03 (0.02)

Figures in parenthesis - SE

The losses reported for fresh fish in the wholesale market was 2.17%. The major reasons for losses in this channel were handling losses and loss due to spoilage. Improper icing and exposure to ambient temperature were the main causes for spoilage. Handling losses during loading and unloading were also observed. Percentage loss of dry fish in the wholesale market was 8.28 for the year under study. The major

reasons for loss for dry fish in wholesale markets were spoilage due to high humidity and exposure to ambient temperature. Increase in humidity, which leads to spoilage and insect infestation, is the major reason of loss as far as dry fish products are concerned. Handling losses were also observed during loading and unloading.

Major retail market reported a loss of 0.16% for fresh fish. A loss of 2.40% was reported over the year for dry fish in the major retail market. Minor retail market reported fresh fish loss of 1.89% whereas loss for dry fish was 6.43%. Physical damage due to improper handling, discard of fish due to lack of demand and low prices were the major reasons for loss at the retail market level. The problems of dry fish were similar to that in other channels and were due to spoilage during periods of high humidity and due to infestation of spoilage organisms and insects.

Roadside market reported a loss of 2.35% for fresh fish. A loss percentage of 5.86 was reported for dry fish in this market channel. The volume of fish traded in roadside markets by each trader was rather small and as such the losses were also minimal. The fish that left unsold was usually dried for use. Loss occurred mainly due to damage and spoilage of fish. In roadside market losses were observed in oil sardine due to belly bursting and physical damage.

In vendor level, a loss of 9.73% was reported during door to door vending of fish. The loss at vendor level was mainly occurred due to discard of damaged and discoloured fish. Lack of demand for smaller varieties in some months also resulted in loss. Unsold fish, which could be kept in good condition for longer duration was thrown away which in turn resulted in loss.

In household level a percentage loss of 1.93 is recorded in the urban area and 4.95% is reported in rural areas. The major reasons for losses are spoilage of fish due to lack of refrigeration facilities especially in the rural areas and feeding of pet animals.

Table 3. Post-harvest losses with standard error (S.E) in different fish marketing sectors.

Fish Marketing Sector	% Loss	
Wholesale market (Fresh fish)	2.17	(0.55)
Major retail market (Fresh fish)	0.16	(0.06)
Minor retail market (Fresh fish)	1.89	(0.26)
Roadside market (Fresh fish)	2.35	(0.37)
Wholesale market (Dry fish)	8.28	(2.86)
Major retail market (Dry fish)	2.40	(1.36)
Minor retail market (Dry fish)	6.43	(2.48)
Roadside market (Dry fish)	5.86	(1.69)
Vendor level	9.73	(2.12)
Consumer (Urban)	1.93	(0.30)
Consumer (Rural)	4.95	(0.18)

Figures in parenthesis - SE

Drying unit is the channel where maximum percentage of loss is observed. In this channel, 58.07% of the marine fish arrived was estimated as loss with standard error 13.32, as most of the fish arrived in this channel are utilised for animal feeds (not fit for human consumption).

Based on the percentage estimates made in this study, a quantitative estimate of post harvest loss was calculated. As per this estimate, a total quantity of 84087 tonnes, which is to the tune of 14.26% of fish production in the state of Kerala, is estimated as post harvest loss for the year 2002.

The major reasons for post harvest losses at different channels were inadequate infrastructure for packaging, storage and transportation, inadequate icing and slackness in preservation process during the peak seasons of harvest. The study amply illustrates that post harvest loss at wholesale market and subsequent channels like retail markets, road side markets and vendors could be minimised to a reasonable extent by improving the infrastructure conditions and other appropriate measures of the wholesale market like strong and well protected warehousing facilities with high platform to prevent infestation due to moisture, pest and rodents and other

animals in the case of dry fish. Damage of fresh fish can be countered by installing proper common refrigerated system so that everyone can access it to keep the fish afresh for longer time. Similar measures can be adopted in these subsequent market channels as well. The hygienic conditions of all market channels are to be improved and awareness is to be created among the people who actively involve in this sector. With these strategic measures, the post harvest losses of marine fish of the country can be reduced and much of the fish can be saved through converting into value added products.

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