

## Harvest Losses in Marine Fisheries

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A study on the assessment of harvest and post harvest losses in marine fisheries was undertaken in Ernakulam district of Kerala. This paper deals with the loss occurring at the harvest stage. Losses were estimated to be 4.13% in the traditional non-motorized, 3.61% in the motorized, 14.48% in the small and medium mechanised crafts and 21.41% for large mechanized crafts. The main reasons for loss observed were discard of juveniles and low value fish and spoilage.

**Key words :** Harvest loss, Marine fisheries, low value fish, spoilage, responsible fishing, stratification

Harvest and Post Harvest losses has been defined as the quantity of marine fish which is not available or is not fit for human consumption due to physical damage, spoilage or some other reasons. There are appreciable losses during both harvest and post harvest stages in fisheries. Harvest losses are losses that occur at the time of harvesting and onboard the fishing craft. There have been attempts to develop assessment methodologies (FAO, 1981; Wood, 1986; Ward, 1996; Ward & Jeffries, 2000) and to actually assess the losses (Clucas *et. al.*, 1989 & Adams, 1995). There have been very few systematic attempts made at the country level to quantify the fish losses in our country. As early as 1981, FAO estimated fish loss up to 40 per cent in some developing countries. An International Development Research Centre, Canada (IDRC) sponsored study in Central Institute of Fisheries Technology, Cochin, India in 1985 was aimed at better utilisation of trawler bycatches for prevention of such fish losses.

A pilot study was undertaken on the assessment of harvest and post harvest losses in marine fisheries under the National Agricultural Technology Project (NATP). The study was designed to obtain a quantitative estimate of marine fish losses at various stages so that appropriate measures for minimisation of loss could be taken. This paper discusses the losses at the harvest stage in marine fisheries.

### Materials and Methods

The study was undertaken in 2002 in Ernakulam district of Kerala, a major coastal

Table 1: Stratum of different types of crafts selected for the study

| Stratum | Type of Boats                                                                    | *N   | *n  |
|---------|----------------------------------------------------------------------------------|------|-----|
| I       | Mechanised crafts (larger vessels above 48 feet equipped for deep sea operation) | 400  | 20  |
| II      | Mechanised crafts (small and medium vessels)                                     | 1237 | 60  |
| III     | Motorised Crafts                                                                 | 3930 | 200 |
| IV      | Traditional crafts                                                               | 2074 | 103 |

\* N- Population size, n- sample size.

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district and an important centre for marine fisheries in the country. Preliminary studies showed that there were variations in loss reported among different categories of fishing crafts. Hence stratification was carried out based on the type of fishing craft. The fishing crafts were categorised into four strata for the purpose of estimation (Table 1).

The mechanised crafts included trawlers, purse seiners, gill netters and liners. Motorised crafts included large and small plank built crafts and mini trawlers fitted with outboard and inboard engines operating a variety of gears like ring seines, hook and line, pelagic and demersal mini trawls. The traditional crafts included small size fishing crafts without the use of any engine power.

A sample of 5% was selected from each stratum for data collection. Repeated observations were taken from each stratum during every week of the month to get an adequate coverage of loss occurring over the month, using four separate schedules. Information on profile, extent, types and reasons for loss were recorded through enquiry and observation. Data were collected through field visits with the help of 40 enumerators, specially recruited and trained for this purpose. The quality of data was ensured by supervision and periodic inspection by the project team. The collected data was scrutinized through monthly appraisal meetings.

The locations selected for traditional and motorised crafts were Fort Cochin, Puthenthode, Ambalakkadavu and Chappakadappuram and for mechanised craft, the Munambam and Cochin Fisheries harbours.

The season for which data were collected were classified as Pre-monsoon (March-May), Monsoon (June-October), Post-monsoon (November-February), Pre-Trawl ban (December-June 15), Trawl ban (June 15- July 31)

and Post-Trawl ban (August-November). The data collected was coded and computerized. The lead centre, the Indian Agricultural Statistical Research Institute, New Delhi, prepared software for data analysis based on developed methodologies. Data analysis for all the channels was done using this software. The mean loss percentages and standard error were estimated. The season-wise estimates for each stratum were pooled separately.

## Results and Discussion

For traditional sector, the harvest loss pooled over seasons was arrived at 4.13%. The losses were 4.18% in pre-monsoon, 4.69% in post-monsoon and 3.65% in the monsoon season. Losses with respect to the trawl ban were 4.70%, 3.90% and 3.39% for pre-trawl ban, trawl ban and post-trawl ban periods respectively. With reference to monsoon seasons and trawl ban period, not much variation was observed in the loss estimates (Table 2).

Table 2. Harvest loss at traditional sector - over seasons

| Season         | Loss (%) | S. E. (%) |
|----------------|----------|-----------|
| Pre-Monsoon    | 4.18     | 0.59      |
| Monsoon        | 3.65     | 0.48      |
| Post-Monsoon   | 4.69     | 0.92      |
| Pre-Trawl-Ban  | 4.70     | 0.68      |
| Trawl-Ban      | 3.90     | 1.04      |
| Post-Trawl-Ban | 3.39     | 0.31      |
| Pooled         | 4.13     | 0.39      |

The major reasons observed for loss at the harvest stage in traditional fishing was discard of juveniles in large quantities especially during heavy landing as reported by 68.94% of the respondents. The other reasons included spoilage due to improper icing (50.32%), use of fish as bait in hooks and lines fishing (32.82%), handling loss during unloading (11.82%), the retention of catch in the craft and gear (11.44%) and attack by larger species (7.7%).

The percentage of loss at harvest level for motorized sector was estimated at 3.61%. The

seasonal losses reported were 7.83% for pre-monsoon, 2.25% for monsoon and 2.15% for post-monsoon periods. With reference to monsoon trawl ban the loss was 4.79% for pre-trawl ban period, 1.41% for trawl ban period and 2.96% for post-trawl ban period (Table 3). The major gears operated by the non-mechanised sector were ring seine, drift net, gill nets, cast nets etc. and the major species landed in the sector were sardine, mackerel, prawns, anchovy, trevally (*vattapara*), glassy perchlet (*nandan*), pony fish (*mullan*), pomfret, tuna etc.

Table 3. Harvest loss at motorized sector - over seasons

| Season         | Loss (%) | S. E. (%) |
|----------------|----------|-----------|
| Pre-Monsoon    | 7.83     | 1.26      |
| Monsoon        | 2.25     | 0.21      |
| Post-Monsoon   | 2.15     | 0.46      |
| Pre-Trawl-Ban  | 4.79     | 0.64      |
| Trawl-Ban      | 1.41     | 0.28      |
| Post-Trawl-Ban | 2.96     | 0.48      |
| Pooled         | 3.61     | 0.36      |

The motorised sector reported high loss during pre-monsoon period that coincided with pre-trawl ban period. The reasons observed were similar as in the case of traditional fishing. From March to August, good catch has resulted in discard of low value species (with 50.71% of respondents). Rough seas during the monsoon season also led to physical loss due to the difficulty in landing. Porpoises that damaged fishing nets in non-mechanised crafts were kept off bay by feeding them with some of the fish harvested.

Some of the fishermen reported loss of fishing days during the period under study due to adverse weather conditions. One of the important observations made in motorized fishing was the new innovation in pelagic mini trawling which lead to mortality of small pelagic fish. Use of banned fishing nets such as ring seines with very small mesh size (8mm to 10 mm) also led to loss due to catches of juveniles.

Loss at mechanized sector which included small and medium mechanised craft was estimated at 14.48% for the year under study with seasonal variation of 12.23%, 13.96% and 16.83% for pre-monsoon, monsoon and post-monsoon periods respectively. With reference to trawl ban season, the percentage of losses was 14.26% for pre-trawl ban and 22.06% for post-trawl ban (Table 4). Since the operation of mechanised crafts during the trawl ban period is banned, no loss was reported.

Table 4. Harvest loss for small &amp; medium mechanized crafts - over seasons

| Season         | Loss (%) | S. E. (%) |
|----------------|----------|-----------|
| Pre-Monsoon    | 12.23    | 0.88      |
| Monsoon        | 13.96    | 1.13      |
| Post-Monsoon   | 16.83    | 1.64      |
| Pre-Trawl-Ban  | 14.26    | 1.13      |
| Trawl-Ban      | 0        | 0         |
| Post-Trawl-Ban | 22.06    | 1.49      |
| Pooled         | 14.48    | 0.75      |

Vessels, which also operate at deep sea, reported a loss of 21.41% for the period under study and the losses for pre-monsoon, monsoon and post-monsoon periods were respectively 19.91%, 20.95% and 23.12%. Pre-trawl ban period reported a loss of 20.37% and post-trawl ban period 25.56% (Table 5).

Table 5. Harvest loss for large mechanized crafts - over seasons

| Season         | Loss (%) | S. E. (%) |
|----------------|----------|-----------|
| Pre-Monsoon    | 19.91    | 2.01      |
| Monsoon        | 20.95    | 3.07      |
| Post-Monsoon   | 23.12    | 1.61      |
| Pre-Trawl-Ban  | 20.37    | 1.30      |
| Trawl-Ban      | 16.26    | 5.69      |
| Post-Trawl-Ban | 25.56    | 2.77      |
| Pooled         | 21.41    | 1.48      |

The significant increase in the loss percentage for mechanised sector in post-monsoon and post-trawl ban seasons are largely attributed to discard of low value fish and non-target fish.

Multi-day fishing reported higher loss (21.41%) largely due to discard of juveniles and low value fish in to the sea (with 50% of respondents reported). A loss of about 1000 – 2000 kg due to discard of low value fish was reported during a fishing cruise of 3 – 5 days. Low market price of the landed varieties and the limitation in the fish hold capacity onboard were the main reasons for discard of such fish. Trawlers carrying out multi-day fishing carried with them about 15 types of nets on board for catching different species. The mesh size of cod end was less than 30 mm. Gill net boats operated for a period of 15 – 20 days continuously. These boats also used hooks and lines for capture of shark, ray, sailfish, tuna etc. Small fish was used as bait in the hooks and lines, which is also reported to be a reason for loss (44.12% respondents). It was also observed that physical damage occurred in the gill net boats due to limited storage capacity and over filling of fish holds. Major catch landed by purse seiners were mackerel, pomfret and oil sardine. During the period of study, huge loss due to discard of oil sardine, was reported from purse seine boats on account of low price. Another reason for loss was entangling of fish in the net and consequent damage of fish (39.83%). Loss of fishing nets in the fishing grounds was also an important reason (5.36%) for loss of fish in the marine sector.

From the above study, it is concluded that a substantial amount of loss of fish occurs at harvest level. The percentage loss at this stage is high for mechanized boats, going for multi day fishing and is attributed to the capture of juveniles and non-target species that are usually discarded in the sea itself as and when the target fish is caught. With better on board facilities for processing of low value fish for value addition and with strict implementation of responsible fishing methods, losses can be minimized. Harvest loss in motorized and traditional sectors are comparatively less and occur mainly due to retention of fish in the craft and gear, handling losses while unloading, attack by larger species and discard of juveniles in large quantity

especially during pelagic trawling. Sector specific modifications of responsible fishing methods and creation of awareness among stake holders by holding awareness programmes, monitoring and evaluation of fishermen's own innovations in craft and gear and implementation of mesh size regulation to avoid capture of juveniles will effectively reduce losses at the harvest stage.

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