Post Harvest Losses at Various Marketing Channels in Inland Fisheries Sector

J. Charles Jeeva[1], D. Imam Khasim, Krishna Srinath[#], G.R. Unnithan[1], K.L.N. Murthy and M. Trinadha Rao
Research Centre of Central Institute of Fisheries Technology,
Pandurangapuram,Visakhapatnam - 530 003, Andhra Pradesh, India

&

H.V.L. Bathla and Tauqueer Ahmad
Indian Agricultural Statistics Research Institute,
Library Avenue, New Delhi - 110 012, India

An attempt has been made in this study to assess the post harvest fish losses at various marketing channels in inland fisheries sector. The study was conducted in five field centres viz., Kakinada, Rajahmundry, Eluru, Akiveedu and Bhimavaram, in East and West Godavari districts of Andhra Pradesh. The samples of respondents were selected using two-stage sampling, simple random sampling without replacement and stratified random sampling methods. Data from the selected respondents were collected at weekly intervals through interview method, using structured interview schedules. The percentage losses were found to be 0.29 at packaging centres, 0.19 to 1.57 at pre-processing units, 0.15 to 0.54 at processing units, 1.42 to 10.98 at wholesale markets, 2.96 at retail markets, 4.10 to 5.52 at the level of vendors and 2.22 at live fish transportation centres. The causes have also been discussed in the light of this study.

Key words : Post harvest loss, packaging centre, pre-processing unit, processing unit, wholesale market, retail market, vendors, live fish transportation centre

There are appreciable losses of food grains, fruits, vegetables, milk, meat, eggs etc. from producer to consumer level. The losses could occur at harvest/ production and post harvest/ post-production stages. In case of fisheries, harvest and post harvest losses occur mainly due to discard in good condition, improper handling immediately after catch, insufficient icing, inefficient containers used for transportation of fish, delays in transport, physical damage and chemical changes leading to spoilage, making it unavailable and unacceptable for human consumption. Besides these, fish being a highly perishable food commodity, needs immediate attention after catch. Efficient utilization of fish resources by reducing

post harvest losses has been of prime concern in recent years as global production falls short of growing demand for human consumption (Ward, 1996). To properly plan loss reduction strategies, information on the magnitude of losses is important.

However, no attempt has been made to estimate the extent of losses in case of fishery at different levels i.e., producer, market and consumer in the Indian context. In certain cases, some information regarding the extent of loss is available but has not been obtained through any objective criteria. During the period 1975 to 1980, Central Institute of Fisheries Technology conducted studies on transportation of fresh fish in an All-India

[1] Central Institute of Fisheries Technology, Matsyapuri P.O., Cochin - 682 029, India

[#] Chennai Research Centre of Central Marine Fisheries Reserarch Institute, No.75, Santhome High Road, Raja Annamalaipuram, Chennai - 600 028, India

Co-coordinated Research Project. In this study, the physical, chemical and bacteriological changes in some varieties of fish before and after transportation were studied.

The need of such estimates has become all the more important to know the magnitude of loss and underlying causes and to plan the loss-reduction strategies. This will also be helpful to create awareness regarding the losses among the fisher persons, planners, policy makers and administrators for planning and implementing the programmes related to these areas. In this background, this study was taken up during 2001-04, with the objective of conducting a pilot study to assess the post harvest losses at various marketing channels in inland fisheries sector.

Materials and Methods

For the present study, loss has been operationally defined as the quantity of fish unacceptable and unavailable for human consumption. The qualitative and economic losses have not been taken into account in this study. Post harvest loss occurs after disposing the catch from aquaculture ponds or landing centres to various marketing channels till it reaches the consumer level. The three climatic seasons distinguished for the study are, pre-monsoon (March – May), monsoon (June – November) and post monsoon seasons (December – February). The marketing channels covered under the study were, packaging centres, pre-processing units, processing units, wholesale markets, retail markets, vendors and live fish transportation centres (Fig. 1). This study was undertaken in East and West Godavari districts of Andhra Pradesh. The data were collected from five field centres viz., Eluru, Akiveedu, Bhimavaram, Rajahmundry and Kakinada.

The samples were selected using simple random sampling without replacement

(SRSWOR), two-stage sampling and stratified random sampling methods. SRSWOR was used for selection of sample from packaging centres, pre-processing units, processing units, retail markets and live fish transportation centres. In the case of wholesale markets, stratified random sampling was used for selection of sample in which units within the stratum were selected by SRSWOR. The selected wholesale markets were divided into two strata, the first stratum was that of wholesale traders, while the second stratum was of retail traders. Two-stage sampling was used for selection of sample from the vendors. Mandals were treated as first stage units and vendors as second stage units. The marketing channels, location of the channels, sampling techniques, sampling units, population size and sample size are given in Table 1.
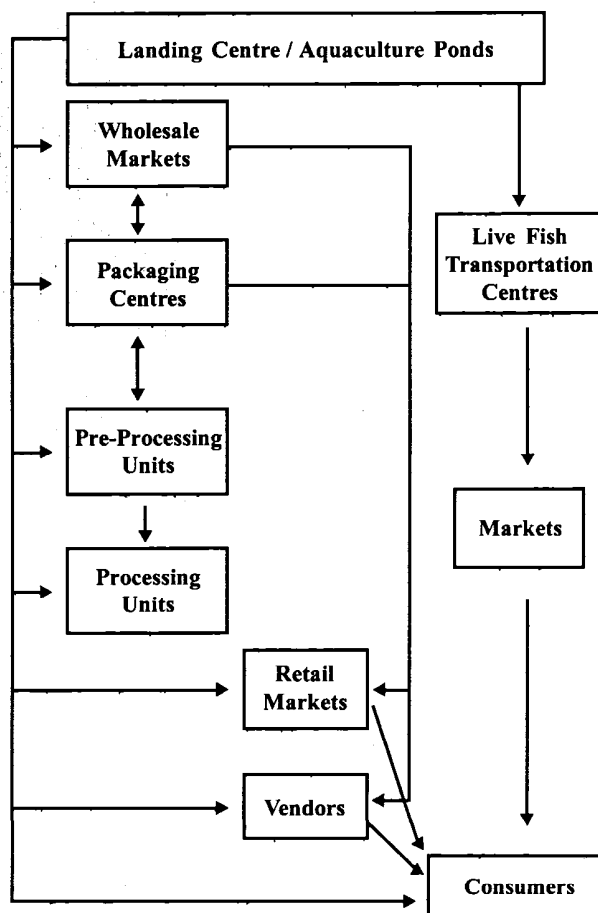

Fig. 1.　Marketing Channels in Inland Fisheries covered

Table 1. Marketing channels, Location of the channels, Sampling techniques, Sampling units, Population size and Sample size

Sl. No.	Marketing channels	Location of the channels	Sampling techniques	Stratum 1	Population size	Sample size	Stratum 2	Population size	Sample size	1st stage units	Population size	Sample size	2nd stage units	Population size	Sample size
1.	Packaging Centres	Bhimavaram Mandal in West Godavari Dist.	SRSWOR	-	-	-	-	-	-	Packaging Centres	15	4	-	-	-
2.	Pre-processing units	East & West Godavari Districts.	SRSWOR	-	-	-	-	-	-	Pre-processing units	70	4	-	-	-
3.	Processing Units	East & West Godavari Districts.	SRSWOR	-	-	-	-	-	-	Processing Units	26	4	-	-	-
4.	Wholesale Market	Kakinada, Rajahmundry, Eluru and Akiveedu.	Stratified random sampling	Wholesale traders	63	16	Retail traders	213	16	-	-	-	-	-	-
5.	Retail Market	East & West Godavari Dist.	SRSWOR	-	-	-	-	-	-	Retail traders	88	5	-	-	-
6.	Vendors	Mandals in East & West Godavari	Two-stage sampling	-	-	-	-	-	-	Mandals	105	4	Vendors	277	16
7.	Live Fish Transport centres	West Godavari District	SRSWOR	-	-	-	-	-	-	Live fish Transport centres	13	3	-	-	-

For this purpose, methods of loss assessment used in UK (Ward, 1997), namely 1) a formal recall questionnaire survey method; and, 2) an informal method based on rapid and participatory rural appraisal was tried. These two methods complemented one another, as one primarily generated quantitative data and the other qualitative data. The results suggested that the use of informal tools for fish loss assessment should be seen as a valid approach, but further research is required into the way price data is gathered and used in the measurement of losses.

In the present study, data from the selected units at each channel were collected through interview method, using well-structured schedules. The data were collected at weekly intervals, for a period of one year. Secondary data pertaining to this study were collected from the records of State Department of Fisheries, Panchayat and Mandal offices etc. Suitable estimation procedures for obtaining post harvest losses were developed. Data analysis was carried out using these procedures.

Results and Discussion

The percentage loss of fish at the packaging centres in West Godavari district is given in Table 2. Packaging centres are the

Table 2. Season-wise loss at packaging centres in West Godavari district

Season	Loss (%)	SE
Pre-monsoon	0.28	0.05
Monsoon	0.28	0.05
Post-monsoon	0.30	0.03
Pooled	0.29	0.03

places with shelter and ice plants/ source of ice and the main activities at this stage were receipt of raw materials from the production or harvest site, icing, packing with insulation materials and re-distribution to various marketing channels. Rohu and Catla were the major varieties handled at these centres. Season did not play any major role as the extent of loss was found to be almost same in all the three seasons and the overall loss percentage was 0.29 with the percentage standard error of 10.77.

Table 3. Season-wise loss at pre-processing units

Season	East Godavari District		West Godavari District	
	Loss (%)	SE	Loss (%)	SE
Pre-monsoon	1.10	0.29	0.23	0.06
Monsoon	2.17	0.37	0.16	0.03
Post-monsoon	0.84	0.50	0.22	0.03
Pooled	1.57	0.23	0.19	0.02

The possible causes were physical losses due to faulty handling practices at loading/ unloading/ packing stage, spoilage due to delay in transportation at raw material receiving stage and spoilage due to insufficient icing at storage stage.

The main activities carried out were, peeling, beheading, cleaning etc and Table 3 shows the loss of fish in percentage at pre-processing units. The loss percentage at the units in West Godavari district was negligible (0.19) with the percentage standard error of 11.27. In East Godavari, it varied

Table 4. Season-wise loss at processing units

Season	East Godavari District		West Godavari District	
	Loss (%)	SE	Loss (%)	SE
Pre-monsoon	0.77	0.31	0.26	0.02
Monsoon	0.55	0.11	0.11	0.04
Post-monsoon	0.28	0.09	0.11	0.05
Pooled	0.54	0.10	0.15	0.02

from 0.84 to 2.17% over the seasons and the overall loss percentage was 1.57. In case of pre-processing units in East Godavari, the raw materials arrived from far away sources, compared to West Godavari, where in, the sources of raw materials were nearby to the units, which was the reason for variation in loss between these two districts.

The causes identified were spoilage due to delay in transportation and insufficient icing at raw material receiving stage and discarding of little meat portions due to faulty handling practices at peeling stage.

Proportion of loss of fish at processing units has been presented in Table 4. It was observed that the loss percentage was negligible and un-avoidable. The percentage loss at the units in West Godavari district was 0.15 and in East Godavari district, it was 0.54. The percentage loss did not vary significantly over the seasons in both the districts. Spoilage due to delay in transportation and insufficient icing at raw material receiving stage was the only cause of loss identified.

Table 5. Season-wise loss at wholesale markets

Season	Akiveedu		Eluru		Kakinada		Rajahmundry	
	Loss (%)	SE	Loss (%)	SE	Loss (%)	SE	Loss (%)	SE
Pre-monsoon	3.71	0.45	1.76	0.27	3.26	0.56	10.65	0.87
Monsoon	3.35	0.67	1.44	0.20	5.85	0.55	13.40	0.66
Post-monsoon	2.00	0.43	1.05	0.22	4.55	0.62	6.45	0.56
Pooled	3.10	0.37	1.42	0.13	4.88	0.34	10.98	0.42

Wholesale markets are the places where the fish come from different locations in different forms and no consumer level purchases take place usually. The normal courses of action are auctioning, re-packing and re-distribution etc. The major varieties marketed were *Rohu* and *Catla*. Table 5 shows the loss at wholesale markets. The overall loss percentages at Akiveedu, Eluru, Kakinada and Rajahmundry were found to be 3.1, 1.42, 4.88 and 10.98 with percentage standard errors of 9.22, 11.89, 7.03 and 3.82 respectively. At Akiveedu, the loss percentage varied from 2.00 to 3.71% over the seasons, 1.05 to 1.76% at Eluru, 3.26 to 5.85% at Kakinada and 6.45 to 13.40% at Rajahmundry.

Because of the poor infrastructural facilities and huge volume of arrivals from far away landing centres of Godavari river, the percentage loss was high at Rajahmundry wholesale market. The variation in loss percentage between different wholesale markets was due to the infrastructural facilities (shelter, availability of ice, storage facilities etc.) available in those markets and the distance of the sources from where the raw materials were arriving at the markets. Hot weather during pre-monsoon and lack of demand during monsoon season also played a major role.

Four major causes have been identified. The first and the most important cause of spoilage is due to improper packing/ inefficient containers, delay in transportation and unreliable transportation at transportation stage. Secondly, it was spoilage due to lack of storage facilities, insufficient icing and adverse weather conditions during storage. Third cause was physical loss/ bruises due to faulty handling practices at loading/ unloading / packaging stage. Lastly, it was discarding due to un-economical sizes or lack of demand at marketing/ re-distribution stage. Especially in Andhra Pradesh during

the *Karthika Masam* period and due to some special *pujas* like *Ayyappa Swamy Puja* during the months of November-January, majority of the fish consumers were not purchasing the fish and hence, lack of demand for fish during this period. The non-availability of storage facilities added to the problem of spoilage of fish and losses.

These causes identified are in line with the findings of Ward and Jeffries (2000), who reported that the general factors that could increase the likelihood of post harvest losses were, unreliable transportation, inadequate preservation techniques, adverse weather conditions, diligence or skills of workers, species of fish, type of processing methods, fish supply greater than demand and market for fish not developed.

Table 6. Season-wise loss at retail markets in East and West Godavari districts

Season	Loss (%)	SE
Pre-monsoon	0.26	0.02
Monsoon	5.73	0.98
Post-monsoon	0.11	0.05
Pooled	2.96	0.49

Retail markets are the market places with shelter and storage facilities, where fish from different landing centres, aquaculture ponds and wholesale markets arrive and redistributed to vendors and consumers. The varieties of fish marketed were, catla, rohu, mrigal, wallago, gobies and some prawns. The percentage loss at retail market (Table 6) was as low as 0.26 and 0.11 during pre-monsoon and post-monsoon seasons. It was high (5.73) during monsoon season. The overall loss was observed to be 2.96%. The causes were almost similar as in the case of wholesale markets.

Mndeme (1998) worked on post harvest fish losses in Tanzania in a case study of Lake Victoria and Mafia Island fisheries and

Table 7. Season-wise loss at the level of vendors

Season	East Godavari District		West Godavari District	
	Loss (%)	SE	Loss (%)	SE
Pre-monsoon	3.29	2.05	3.12	1.55
Monsoon	6.63	2.49	4.47	1.71
Post-monsoon	5.53	3.82	4.33	2.46
Pooled	5.52	1.65	4.10	1.12

Gitonga (1998) worked on Nile perch in Kenyan waters of lake Victoria, observed that by processing of fishes into salted and smoked products, the losses were reduced to great extent. In the present study, it was observed that salting and smoking processes were not followed with inland fishes viz., *rohu* and *catla*.

Percentage loss of fish at the level of vendors is presented in Table 7. The major species marketed were, catla, rohu, mrigal, wallago, gobies and some prawns. In East Godavari district, the percentage loss was 3.29 during pre-monsoon, 5.53 during post-monsoon and a maximum of 6.63 during monsoon seasons. The overall loss was 5.52%. In West Godavari, it was 3.12, 4.33 and 4.47 during pre-monsoon, post-monsoon and monsoon seasons respectively. The overall loss percentage was 4.10. In case of East Godavari district areas, the inland fish had to come from far away places (West Godavari and Kolleru lake area) and the distance travelled was more, hence the loss percentage was comparatively more than in West Godavari district.

Table 8. Season-wise loss at live fish transportation centres in West Godavari district

Season	Loss (%)	SE
Pre-monsoon	2.22	0.76
Monsoon	1.71	0.71
Post-monsoon	3.23	0.70
Pooled	2.22	0.44

The causes observed were, discarding/spoilage due to lack of demand (during monsoon season), adverse weather conditions (summer), in-efficient containers used/insufficient icing and delay in selling (prolonged duration of marketing) at marketing stage. At storage stage, it was spoilage due to lack of storage facilities, adverse weather conditions, in-efficient containers used and insufficient icing.

Gitonga (1998) reported that Nile perch (*Lates niloticus*) constituted 60% of total landings in the Kenyan waters of lake Victoria. Post harvest losses of Nile perch were experienced by fishermen, processors and traders. The heaviest losses occurred during the rainy season, which corresponded to the period of optimum production. The causes of post harvest losses of Nile perch were found to be bacterial deterioration, blowfly larvae infestation, moulds and fragmentation. Ward *et al.* (1998) reported that post-harvest fish losses, suffered by small-scale traders in India were excessive during monsoon. Many traders considered losses to be an unavoidable aspect of their business.

Live fish transportation centres are the centres with shelter and source of water, from where live fish in water is transported to distant markets in specially designed containers, mostly containers made of galvanized iron (GI). The en-route practice during transportation is water exchange. The varieties of fishes handled mainly were, *Clarias spp.*, *H. fossilis*, *murrels* and *tilapia*. The loss of fish (in percentage) is given in Table 8. It was 2.22, 1.71 and 3.23 during pre-monsoon, monsoon and post-monsoon seasons. The overall loss percentage was 2.22. The loss at destination, which could have been very high, was not studied since the destinations were, East and West Bengal and Northeastern states, which are far away and beyond the jurisdiction of area of this study. The maximum loss during pre and post

monsoon seasons was due to heavy arrivals during the months, from January to April. The causes observed were, discarding due to small size at unloading stage, discarding dead fishes (mortality during transportation, mortality due to high density, mortality due to faulty handling practices) at unloading/ packing stage and mortality due to lack of proper storage facility/ inefficient containers at storage stage. The dead fishes were collected by local vendors, dried in sun for further marketing as dry fish.

Enujiugha & Nwanna (1998) had examined the impact of post-harvest handling and processing techniques on the supply and demand for African catfish (*Clarias gariepinus*) and tilapia (*Oreochromis niloticus*), two common fish species in Nigeria's aqua-habitat. It was observed that more than 20% of the harvest of the two fish species was lost as a result of inadequate handling and processing.

The percentage losses at various marketing channels were found to be 0.29 at packaging centres, 0.19 to 1.57 at pre-processing units, 0.15 to 0.54 at processing units, 1.42 to 10.98 at wholesale markets, 2.96 at retail markets, 4.10 to 5.52 at the level of vendors and 2.22 at live fish transportation centres. The possible causes were found to be physical losses due to faulty handling practices, spoilage due to insufficient icing, spoilage due to improper packing and inefficient containers, unreliable transportation, spoilage due to delay in transportation, spoilage due to lack of storage facilities, adverse weather conditions, discarding due to un-economical sizes or lack of demand and delay in selling (prolonged duration of marketing).

The types of losses can be grouped as avoidable and unavoidable losses. Fish losses due to faulty handling practices, spoilage due to non-usage of ice, improper packing, use of inefficient containers and unreliable transportation can be avoided by proper

managerial measures. Losses due to discarding of meat portions during peeling and cleaning stages at pre-processing and processing units are minimum and unavoidable. Some of the managerial measures required to minimize the post harvest losses are, adequate icing, strengthening of infrastructural facilities in the markets, good storage and hygiene conditions, improved handling practices and improvements in transportation. The technological requirements are the improved packaging materials and efficient containers and improved processing techniques, especially for inland fishes. If such losses are avoided, then it would help in not only meeting the nutritional requirements of the people, but also in earning foreign exchange by exporting the surplus.

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