Harvest Losses at Various Resources
of Inland Fisheries

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To properly plan loss reduction strategies, information on the magnitude of losses is important. The up-to-date data on harvest and post harvest losses in inland fisheries from different sources are not available in Indian context. The need of such estimates has become all the more important. Hence, a pilot study was undertaken with the objective of assessing the harvest losses at various inland fishery resources in East Godavari, West Godavari and Khammam districts in Andhra Pradesh, and Hirakud reservoir in Orissa. The extent of losses were found to be 2.40% in freshwater aquaculture, 1.86% in brackishwater aquaculture, 6.52 to 8.89% in reservoir fisheries, 3.69 to 4.48% at landing centres of lake, 8.56 to 13.94% in riverine fisheries and 6.32% in estuarine fisheries. An effort has also been made to identify the causes for these losses, which have been discussed in detail in this paper.

Key words : Harvest losses, inland fishery resources, capture fisheries, aquaculture, landing centre.

As a source of food, employment and a sustainable large foreign exchange earner, fisheries sector plays a vital role in subsistence economy and health of the people and ultimately social, economic and cultural prosperity of the country. Total fish production of India during 2001-02 was 6.13 million tonnes with marine and inland fisheries contributing 2.83 million tonnes and 3.30 million tonnes to the total respectively. Of the total inland fish production, about 80% comes from aquaculture (Ayyappan & Biradar, 2004) and the growth of inland fisheries is gaining momentum due to good scope in aquaculture, year-by-year.

There are huge avoidable losses of almost all agricultural, livestock and fishery products. Developing countries like India cannot afford to lose their fisheries produce in view of its requirements for the fast growing population. The need of assessment of such losses has become all the more important to know the magnitude of loss and underlying causes and to plan the loss reduction strategies. The efficient utilization of fish resources by reducing post-harvest losses has been of prime concern in

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recent years as global production falls short of growing demand for human consumption (Ward, 1996). Presently, only limited studies have been carried out for estimation of extent of losses of these commodities. These studies were mostly related to major food grain crops and important fruits and vegetables. 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 order to study the magnitude of losses and the underlying causes in inland fisheries, this pilot study was taken up during 2001-04, with the main objective to assess the harvest and post harvest losses in various inland fishery resources.

Materials and Methods

Inland fisheries have mainly been classified into fresh and brackishwater sectors. These are further grouped into culture and capture fisheries. Culture fisheries in both the sectors are practised in the ponds and fields connected to the water resources. Capture fisheries in freshwater mainly takes place in the natural rivers, ponds, lakes, canals, tanks and reservoirs, and in brackishwater, in the lakes and estuaries. The inland fishery resources such as freshwater aquaculture ponds (West Godavari district) and brackishwater aquaculture ponds (East and West Godavari districts) from culture side, and reservoirs (Yerrakalva, a small reservoir in West Godavari district, Wyra, a medium reservoir in Khammam district and Hirakud, a larger reservoir in Orissa), lake (Kolleru lake), riverine (Godavari river) and estuarine (estuary of Godavari river in Kakinada) from capture side were chosen for this Study. The inland fishery resources selected for this study have been depicted in Fig.1.

Ward (1997) has given details on two systematic fish loss assessment methodologies developed in UK, which may be used by

fisheries researchers, policy makers and planners: 1) a formal recall questionnaire survey method; and, 2) an informal method based on rapid and participatory rural appraisal. The two methods complement one another, as one
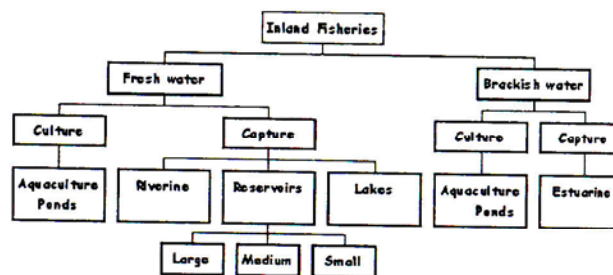

Fig.1. Inland Fishery Resources Covered under the Study

primarily generates quantitative data and the other, qualitative data. A number of data collection tools are associated with Rapid Rural Appraisal (RRA), some of which have been used experimentally by Natural Resources Institute of England and the Tanzania Fisheries Division for fish loss assessments. The results of this study suggest 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.

For the present study, loss has been defined as the quantity of fish unavailable or unacceptable for human consumption. The other losses like qualitative loss, food value loss and economic loss etc. have not been considered in this study. The loss due to pest and disease incidence during culture period has also not been taken into account, since such losses occur at pre-harvest level. The three climatic seasons defined for the study are, pre-monsoon (March – May), monsoon (June – November) and post-monsoon season (December – February). This demarcation has been done for the sake of convenience of projection of data only.

The samples were selected using three-stage stratified random sampling for freshwater aquaculture ponds, two-stage stratified random sampling for brackishwater aquaculture ponds, landing centres of reservoirs, landing centres of lake and landing centres of estuarine fisheries and simple random sampling without replacement (SRSWOR) for landing centres of riverine fisheries. The resources, location of the resources, sampling techniques, sampling units, population size and sample size are given in Table 1.

Data from the selected units from each resource 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/ Mandal offices etc. Suitable estimation procedures for obtaining losses were developed and data analysis was carried out using these procedures.

Results and Discussion

The major fishes cultured in the freshwater resources of Andhra Pradesh are the Indian carps, *Catla catla* and *Labeo rohita*, and small percentage of *C. mrigala* and cat fishes. The percentage losses in freshwater aquaculture ponds have been given in Table 2. The losses in different seasons varied from 0.76% to 6.23 %. The overall loss was estimated as 2.40%. The losses were mainly due to faulty handling practices and discarding of un-economical sized, spoiled or bruised species. Sometimes, spoilage occurred due to delay in timing from harvest to packing/ loading. It was due to maximum catch (peak harvesting season) and co-incidence with summer, the loss percentage was high during pre-monsoon season.

Due to failure of monsoon rains during the period of this study, the aquaculture activity has become negligible adding a chain of reactions affecting the farmers, packaging centres, pre-processing and processing units.

Table 1. Resources, Location of the resources, Sampling techniques, Sampling units, Population size and Sample size

Sl No	Resources	Location of the resources	Sampling techniques	1st stage units	Population size	Sample size	2nd stage units	Population size	Sample size	3rd stage units	Population size	Sample size
1.	Freshwater aquaculture ponds	West Godavari District	Three stage sampling	Mandals	46	3	Villages	56	8	Ponds	715	80
2.	Brackish water aquaculture ponds	East & West Godavari Districts	Two stage sampling	Mandals	105	4	Ponds	2760	40	-	-	-
3.	Reservoirs									-	-	-
	a) Large	Hirakud	Two stage sampling	Landing centres	39	2	Fishermen	162	40	-	-	-
	b) Medium	Wyra	Two stage sampling	Landing centres	10	2	Fishermen	500	20	-	-	-
	c) Small	Yerrakalva	Two stage sampling	Landing centres	5	2	Fishermen	50	20	-	-	-
4.	Lakes	Kolleru Lake	Two stage sampling	Landing centres	35	3	Fishermen	438	30	-	-	-
5.	Riverine	Godavari river	SRSWOR	Fishermen	600	20	-	-	-	-	-	-
6.	Estuarine	Creeks in Kakinada	Two stage sampling	Landing centres	12	3	Fishermen	2300	30	-	-	-

The predominant species cultured in brackish water aquaculture ponds is the tiger prawn, *Penaeus monodon*. The percentage losses over the seasons varied from 0.13 to 2.79, as shown in Table 3. The overall loss percentage was 1.86. The causes of losses were found to be similar as in the case of freshwater aquaculture ponds. Since the maximum catch was obtained during September to November, the loss percentage was also comparatively more during

Table 2. Season-wise loss in freshwater aquaculture ponds in West Godavari District

Season	Loss (%)	SE*
Pre-monsoon	6.23	6.53
Monsoon	1.31	0.90
Post-monsoon	0.76	0.51
Pooled	2.40	1.70

* Standard Error

Table 3. Season-wise loss in brackishwater aquaculture ponds in East & West Godavari Districts

Season	Loss (%)	SE*
Pre-monsoon	1.74	2.31
Monsoon	2.79	1.60
Post-monsoon	0.13	0.10
Pooled	1.86	0.99

* Standard Error

monsoon season.

The commercially important fishes harvested from reservoirs are *Catla catla, Labeo rohita, C. mrigala* and *Wallago attu*. The percentage losses are presented in Table 4. The percentage losses at Yerrakalva, a small reservoir in West Godavari district in Andhra Pradesh were found to vary from 7.72 to 10.30. The overall loss was estimated to be 8.89%. At Wyra, a medium reservoir in Khammam district in Andhra Pradesh, the percentage losses were 1.90, 4.15 and 0.47 during pre-monsoon, monsoon and post-monsoon seasons respectively. At Hirakud reservoir, the large reservoir selected for this study, the percentage losses varied from 5.08 to 8.85 between different seasons with the overall loss of 6.52%.

The causes identified were, spoilage due to adverse weather conditions (summer and inflow of muddy water), inordinate delay in

harvesting timing and insufficient icing and physical losses or bruises due to faulty handling practices. The loss due to inordinate delay in taking out the catches from hook and line and gill nets, which led to spoilage of fish which was caught earlier, was found to be high in Hirakud Reservoir areas. The inflow of muddy water during post monsoon season was also a factor causing mortality of fish caught in the gears.

Cheke (1997) has described a model using an example comparing the results of transporting Nile perch (*Lates niloticus*) caught in three different ways at Vioctoria reservoir, Tanzania, and transported either by rail or by air to markets in Dar-es-Salaam, in a sequential

Table 4. Season-wise loss at landing centres of reservoirs

Season	Yerrakalva (small)		Wyra (medium)		Hirakud (large)	
	Loss (%)	SE*	Loss (%)	SE*	Loss (%)	SE*
Pre-monsoon	9.80	4.42	1.90	0.44	5.08	2.06
Monsoon	7.72	2.47	4.15	0.93	6.08	2.19
Post-monsoon	10.30	3.53	0.47	0.17	8.85	4.68
Pooled	8.89	1.88	-	-	6.52	1.68

* Standard Error

chain with the highest losses occurring at the processing stage. It is concluded that the most cost-effective method, amongst the six comparisons made, is to catch fish in beach seine nets and to transport them by air. The model was designed to be adapted to other fishery systems and so be an useful tool for policy-makers and fisheries officials.

The fishes caught from lakes are murrels, carps, tilapia etc. The loss percentage at landing centres in Kolleru lake (Table 5) varied from 0.38 to 4.48 over the seasons. The major causes of loss were, spoilage due to adverse weather conditions, delay in harvesting timing and insufficient icing and physical losses or bruises due to faulty handling practices and physical loss or damage caused by 'Kolleti cat', a species of sea otter prevalent in Kolleru. The loss was high during pre-monsoon (summer) season.

Eyo (1997) has given an assessment of post-harvest losses in the lake Kainji fisheries of Nigeria. The study focussed on quantifiable information on post-harvest technology and post harvest losses from fisherfolk, fish processors and fish traders operating within the Kainji lake basin. The information was obtained from questionnaires sent to a total of 668 respondents, comprising 317 fishermen, 115 fish processors, 125 fish buyers and 111 fish sellers

Table 5. Season-wise loss at landing centres of Kolleru lake

Season	Loss (%)	SE*
Pre-monsoon	4.48	3.20
Monsoon	3.69	1.60
Post-monsoon	0.38	0.30
Pooled	-	-

*Standard Error

in 45 fishing villages and collection centres within the lake basin. Considering the total catch from gill nets, long-lines, traps and cast nets estimated at 14,000 t in 1995, about 1,000 t of fish was either discarded or lost value due to spoilage during handling by fisherfolk.

The important commercial fishes harvested from rivers are *Catla catla, Labeo rohita, C. mrigala, Wallago attu,* gobies, hilsa etc. The fish losses at landing centres in Godavari river are given in Table 6. The loss was high during monsoon season at both the landing centres i.e. 12.12% and 14.66% at Kovvur and Dowleswaram landing centers respectively. The overall loss percentage was 8.56 at Kovvur and 13.94 at Dowleswaram. The volume of catch handled at Dowleswaram landing centre was high since the catches from other landing centres too were brought here for redistribution. The infrastructural facilities were very poor at both the landing centres. Spoilage due to adverse weather conditions (summer, inflow of muddy water), delay in harvesting timings and insufficient icing and physical losses or bruises due to faulty handling practices and delay in taking out the harvested fish from hook & line, gill net and other types of fishing gears used, were the main causes.

A heterogeneous mixture of different species viz., mullets, chanos, hilsa, prawns, crabs, catfish etc., are caught from the creeks in estuaries of Godavari river in East Godavari

Table 6. Season-wise loss at landing centres of Godavari river

Season	Kovvur		Dowleswaram	
	Loss (%)	SE*	Loss (%)	SE*
Pre-monsoon	10.83	0.33	15.59	1.98
Monsoon	12.12	0.55	14.66	0.96
Post-monsoon	9.17	1.76	10.87	2.09
Pooled	8.56	0.53	13.94	0.86

*Standard Error

district. From Table 7, it was observed that the percentage loss of fish was around 6% over the seasons. The overall loss was estimated to be 6.32%. The major causes of loss were spoilage due to adverse weather conditions, delay in harvesting timings and insufficient icing. The other types were physical losses or bruises due to faulty handling practices and discarding due to un-economical sizes or lack of demand.

In order to study the magnitude of harvest and post harvest losses and to know the underlying causes, various inland fishery resources were chosen for this study. The samples were selected using suitable sampling techniques. The extent of percentage loss was estimated using the estimation procedures developed under the study. The extent of losses were found to be 2.40% in freshwater aquaculture, 1.86% in brackishwater aquaculture, 6.52 to 8.89% in reservoir fisheries, 3.69 to 4.48% at landing centres of lake, 8.56 to 13.94% in riverine fisheries and 6.32% in estuarine fisheries. The possible causes were found to be faulty handling practices, inordinate delay in timing from harvest to packing and transportation, spoilages due to non-usage of ice, discarding of juveniles and un-economical sized fishes, adverse weather conditions, inflow of muddy water during monsoon and post monsoon season, physical losses and discarding due to lack of demand. Use of suitable fishing gears, avoiding the delay in harvesting timing,

avoiding the catches of juveniles and un-economical sized species, use of ice boxes, strengthening of infrastructure facilities in landing centres, good storage and hygiene conditions, improved handling practices and training and demonstration on proper handling and transportation methods are some of the

Table 7. Season-wise loss at landing centres of Estuaries in East Godavari District

Season	Loss (%)	SE*
Pre-monsoon	6.20	1.63
Monsoon	6.61	0.97
Post-monsoon	5.88	1.55
Pooled	6.32	0.74

* Standard Error

managerial measures required. This study may be helpful to create awareness regarding the losses among the fisherpersons, planners, policy makers and administrators for planning and implementing the programmes related to these areas. This may also be helpful to plan the loss reduction strategies. More such studies covering the actual economical losses, at each stage of handling and transportation are required.

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