

RESEARCH PROJECT ON MONSOON LOSSES IN POST-HARVEST FISHERIES  
(R6817)

PHASE III: FIELD-TESTING OF SIMPLE LOSS-REDUCTION METHODS

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## **GLOSSARY**

|       |   |  |
|-------|---|--|
| AIG   | : | Alternate income-generation                    |
| AP    | : | Andhra Pradesh                                 |
| CBO   | : | Community-based organisation                   |
| CPDA  | : | Coastal People's Development Association       |
| DFID  | : | Department for International Development       |
| DOF   | : | Department of Fisheries                        |
| FIRM  | : | Forum for Integrated Rural Management          |
| GMP   | : | Good management practices                      |
| HACCP | : | Hazard Analysis Critical Control Point         |
| ICM   | : | Integrated Coastal Management                  |
| MCOF  | : | College of Fisheries, Mangalore                |
| NGO   | : | Non-governmental organisation                  |
| NRI   | : | Natural Resources Institute                    |
| OR    | : | Orissa   |
| PIP   | : | Participatory Intervention Planning            |
| RNRRS | : | Renewable Natural Resources Research Strategy  |
| SIFFS | : | South Indian Federation of Fishermen Societies |
| SSP   | : | Small-scale processor                          |

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## EXECUTIVE SUMMARY

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### *Introduction*

1. This report is the outcome of field-testing of a package of interventions developed as part of a research programme on “Monsoon Losses in Post-Harvest Fisheries”, being carried out under the RNRRS Post-Harvest Fisheries Research Programme (R6817), funded by the Department for International Development (DFID), UK, and managed jointly by the Natural Resources Institute, UK, and the College of Fisheries, Mangalore, India.
2. The previous phases of the project indicated that in most selected sites, some relatively minor technical improvements in handling and processing of fish could reduce losses significantly. Subsequent to the second phase, a comprehensive list of possible technical and non-technical intervention options was developed based on the coping strategies of the small-scale processors (SSPs) during monsoon periods. This was refined further with inputs from agencies and individuals working in post-harvest sector.
3. These interventions related to simple, low-cost improvements to the processing methods during monsoon periods. Some of these interventions were being used locally in some places, but their usefulness to reduce losses over a wider geographical area needed to be tested. In the case of new interventions, which had not been used previously, their effectiveness as well as accessibility to the SSPs was to be tested. The third phase of the research consequently focussed on field-testing the intervention package with the small-scale processors at selected locations.
4. The field team tested the loss-reduction interventions in five days at each site. Arrangements were made for monitoring the usage and adoption of the inputs for the next two months.

### **Field-testing sites**

5. A total of six sites – three each in Andhra Pradesh and Orissa – were covered during the study.

#### *Andhra Pradesh:*

Suradapeta-Mayapatnam (2-5 July)  
Konapapa Peta (6-9 July)  
Chodipalli Peta (10-14 July)

#### *Orissa:*

Chandrabhaga (16-19 July)  
Balipantal (20-22 July)  
New Bakshipalli (25-28 July)

### **Objectives of the study:**

6. The objectives of the third phase of the research, as discussed by the field-team were:
  - To field-test the identified interventions in partnership with SSPs at selected locations.
  - To assess the impact of the intervention on reduction of losses and risks in monsoons.
  - To identify the constraints to the adoption of intervention and in scaling up.
  - To monitor the uptake and spread of intervention and assess the sustainability.
  - To produce a package of practices based on GMP.

### **Problems and constraints encountered by SSPs during monsoon period**

7. Broadly, on the technical front, the fish losses in monsoons occur for two main reasons:
  - The inability of SSPs to dry fish during monsoon periods because of incessant rains and inclement weather conditions (cloudy skies etc.);
  - When brined/salted, two factors – insect infestation, and accumulation of dirt and other contaminants, such as microorganisms – cause physical, quality and economic losses. These would occur during non-monsoon periods also, but during monsoons, the longer duration of brining, prevalent climatic conditions, and glut catches add significantly to losses.
8. Two more factors – limited scope for production of new – non-traditional – products as an alternative to traditional processing, and limited potential for taking up alternate income generating programmes – also affect the livelihoods of small-scale processors during monsoons.

### **Inadequacies/deficiencies of existing practices which contribute to losses**

9. The traditional processing systems are beset by a number of inadequacies/deficiencies:
  - *Water.* In many of the villages, the processors often use seawater for fish processing operations. Where the processing sites were far away from the beach, or were located on high sand dunes, procurement of seawater for processing purposes was a major constraint.
  - The quality of the seawater from the near-shore waters, particularly near crowded villages or industrial areas, is suspect and could be a cause of contamination itself.
  - The tendency of processors to complete processing as quickly as possible – albeit for valid reasons – does not allow them to take sufficient care in pre-processing stages. Sand contamination, delays in washing and high ambient temperature have adverse effect on quality of fish, hastening spoilage as well as problems of infestation.
  - The time and effort required in collection and transport of seawater results in frugal usage of water for washing of vats, fish, and the processing tools. Improper cleaning of vats, fish and processing tools leads to cross contamination.
  - The insufficient spread of weight over salted fish does not allow complete immersion of fish, and exposes fish to maggot infestation.
  - The closing of vats after salting with dried palm leaves and plastic sheet is ineffective in preventing the entry of flies, other insects and rainwater. Also, high winds carry away the leaves, which is not only an economic loss, but also means keeping constant watch over the vats in the monsoon periods.
  - The practice of drying fish at ground level using nets, leaves, sheets is not very effective in increasing the drying speed and removing fish in a hurry in case of sudden rain.
  - *The influence of current marketing practices.* The existing marketing practices are not very conducive for the processors to adopt improved processes. Rather, such practices as selling by weight encourage the processors to make poor quality products. Even for adoption of some of the loss reduction methods, the response of the markets – positive or adverse – plays a crucial role. Because the sales were done by weight, the net result of brining to the processor could be a loss.

### **Opportunities to overcome losses during monsoon period by SSPs**

10. Considering the two major problems faced by the processors – inability to dry, and poor quality salted products – the team decided upon two objectives for any initiatives to reduce losses:

- To explore, identify, and test options for increasing drying speed in sun-drying processes
- To explore, identify, and test options for obtaining better quality salted product through simple loss reduction methods

The ‘critical control points’ where the team felt interventions were important, and could be undertaken by this project were:

- Improving quality of water used in processing
- Washing of fresh and gutted fish
- Minimisation of sand contamination at each step
- Complete immersion of fish in salt brine during salting/brining
- Protection of fish during salting from seepage of rainwater and infestation.
- Increasing speed of drying

The team developed a programme based upon the ‘critical control points’:

- To clean vats using bleaching powder before starting a new processing operation
- To treat seawater using bleaching powder and give adequate contact time for chlorination
- To wash fish in treated water
- To gut fish on plastic sheets
- To wash gutted fish using treated water
- To monitor brine strength and quality during, and between, brining cycles
- To keep trays over the fish with clean weights over them, for complete immersion of fish
- To cover the vats with a strong lid which would not allow insects or rainwater, and would not be carried away by heavy winds.
- To dry on an elevated rack with facilities for air circulation. This also facilitates covering of fish using plastic sheet in case of sudden showers or carrying the racks into a shelter.

11. Losses were often the cumulative result of many shortcomings in the processing chain, and the package of intervention would need to be tested as a whole, rather than in a piecemeal fashion. The exact effects of any single input are very difficult to quantify and required a much longer timeframe. The use of any of the inputs cannot be a substitute for good processing practices as a whole.

### **Common and specific features of field-sites**

12. The team put together the distinctive features as well as the common features of the field sites. This exercise was important to understand how far the conditions in each site resembled those in other sites, and to assess how representative the conditions at each site were of the region. This was in order to facilitate understanding the applicability of the interventions over a wider area and to discuss options for scaling up.

### **Features common to all locations**

13. *General:*

- A large majority of the SSPs in all test sites were women.
- SSPs’ occupations were confined largely to fish processing throughout the year.
- Processing continues through monsoon periods in all sites.
- Mostly local fish landings were used for processing.
- The processors were reluctant to invest in anything other than the barest essentials – fish and salt – and would use a new method only after they were totally convinced of its efficacy.
- The SSPs preferred traditional processing activities to making any new products because of the uncertainties in scaling up and marketing of value-added products.
- Most SSPs preferred fisheries-related activities to other income-generating activities.
- Most processors were interested in testing new methods for reduction of losses.

14. *Glut landings:*

- Glut landings of small pelagics was a characteristic feature in most sites.
- Glut landings were often both an opportunity as well as a liability, and the fishing and fish processing operations were geared to make the best use of glut landings. Any investment was made after a careful consideration of the risk factors.
- The existing processing capacities of the processors for utilising fish for human consumption were not sufficient to process glut catches, which were sun-dried and sold as fishmeal.
- Good demand existed for fishmeal from poultry and aquaculture sectors, but the quality of the fishmeal was very poor.

15. *Salting and drying for human consumption:*

- Maggot infestation was a major cause of losses in all sites.
- Vats were seldom cleaned.
- Dressing and salting practices largely depended on species and market demand.
- SSPs had a good knowledge of quantities of salt to be used for fish salting/brining.
- Quality of salt used in processing operations was seen to be generally poor, but its price was affordable to the processors. Availability of salt was not seen to be a problem at any site.
- Washing of fish after gutting and using clean surfaces, such as plastic sheets, for gutting was prevalent, although these practices could be made more effective.
- Lids to the vats were generally makeshift arrangements such as palm leaves, plastic sheets, or both, and stone weights were used to prevent them from getting blown away by the wind.
- During monsoon periods, keeping continuous vigil over the salting vats whenever it rained to protect fish from seepage of rainwater was a common feature in all sites except Balipantal.
- Lack of space for drying within the village often forced the processors to dry away from their homes, and this contributed significantly to the losses during monsoons.
- Short cycle time was preferred as a coping mechanism to reduce losses.

16. *Marketing:*

- SSPs had fairly good market access; the produce was sold in weekly markets. Though the processors in Balipantal had problems with regard to market access in a physical sense, the existing market linkages seemed to be working well.
- The processors had a clear idea of the requirements of each market, and products would be made differently for different markets (except in Balipantal), though processing methods remain the same.

**Features specific to each state**

17. *Andhra Pradesh:*

- Prevalent processing methods in the three sites were sun drying, dry-salting, and wet salting.
- Processors in all three sites used seawater for processing; the distance between the processing sites and the sea varies from 200 to 500 Mt. (Suradapeta processors use well water).
- All processors used vats made of cement or hollowed-out palmyrah trunks for processing purposes. The cement vats were purchased from local production units.
- The same brine was used for many cycles.
- Processors assessed the quality of brine based on odour, colour, sediments, and oiliness. In many cases, the quality of the brine in vats was very poor though the processors maintained it was usable.
- Smaller quantities of fish were dried close to the homes in the village.
- Processing necessities: cement vats without lids, plastic sheets for protecting salt and fish in brine in case of rains, palm leaves and nets for drying.
- Good access to markets

18. *Orissa:*

- Prevalent processing methods in the three sites were sun-drying and dry-salting. Brining was not known to the processors in Balipantal and Bakshipalli, and was done to a limited extent in Chandrabhaga.
- SSPs in Chandrabhaga and Bakshipalli work in groups as a coping strategy to reduce the impact of market upsets.
- Freshwater was used for washing in Balipantal, freshwater and seawater in Chandrabhaga, and only seawater in Bakshipalli. There was no need for water for brining, because brining was not practised.
- Cement vats were used in two sites, which were made by the processors themselves, while earthenware pots were used in Balipantal.
- Self-brine from one cycle was used for washing the next batch of fish and then thrown away.

**Response of the processors to field-tested intervention**

19. Broadly, the intervention did seem to address a felt need of the processors, considering their full-hearted participation throughout the field-testing period at every site.
20. The processors did not feel that adoption of the package involved extra time or monetary investment.
21. In most sites, processors were seen to start using the inputs immediately after the field-tests, and some new initiatives for accessing the inputs were also noticed in some villages.

**Constraints for uptake of the intervention package**

22. A positive response to the intervention package was no indicator of adoption. The processors' enthusiasm could quickly turn into complacency, unless the practices have a visible and positive outcome. While most of the inputs in the intervention package were fairly easy to adopt, others such as lack of access to clean water, cement lids, could be important constraints for uptake.
23. Awareness building should be followed by making the inputs available to at least a few processors for a set time period to enable them find for themselves the efficacy of the practice.
24. Secondly, it would require putting in place some means to make the inputs available to the processors on a sustainable manner before the interventions could take root. In this case, merely raising awareness or providing a few inputs to the SSPs would not achieve the objective.

**Opportunities for adoption**

25. Summing up the opportunities for overcoming the problems, the team came up with a list of six conditions, which required to be in place for a successful adoption of the intervention package.
  - Awareness generation among SSPs
  - Programmes for promotion of usage with suitable incentives in the short-term
  - Group/government initiatives for accessing intervention inputs
  - Improved infrastructure facilities for processing
  - Technical improvements to currently used inputs
  - Suitable low-cost local alternatives and refinements to the intervention inputs.

**Support agencies for a sustainable uptake of the intervention package by SSPs**

26. The field-testing was carried out in six sites, and being only a testing phase, it would be premature to think of taking interventions to a higher level at this stage. But it was likely that the package would be found useful by the SSPs, in which case there was a need to ensure that it was taken to a larger number of processors in due course.
27. The team compiled a list of possible sources of assistance for the SSPs in adoption of the inputs.



### **Refinements to the intervention package based on the field-testing experiences**

28. The team's emphasis had been on the concept rather than the actual input, so that if the processors felt that the input served some purpose, they could always make modifications to it depending on their need. The processors themselves often suggested low-cost or better alternatives to the inputs shown. The team put together a list of refinements needed to make the loss reduction methods more effective.

#### *Value-added products and AIG options during monsoon periods*

29. Basically, the two objectives of the value-addition exercise were:

- (i) To give an idea to the SSPs of the scope for production and marketing of value-added products, which might be taken up as a group venture or individually, and
- (ii) To enable the SSPs to use the small quantities of monsoon landings to make ready-to-eat products for domestic consumption, which could reduce their expenditure on food.

30. The differences in the experiences of the various SSP groups made it possible for the team to identify the constraints and opportunities as perceived by the processors in value-addition. The conditions necessary for a successful adoption of new enterprises would be:

- Initiatives to facilitate marketing by SSPs
- Awareness programmes to SSPs on opportunities
- Group initiatives
- Institutional credit
- Infrastructure to facilitate production of good quality products
- Technical refinements to the products

### **Alternate income-generating activities**

31. On the issue of alternate income-generation during monsoon periods, the processors were seen to have their own valid reasons to prefer fish processing to everything else. Except in Balipantal, most processors would prefer to continue with fish processing or simply stay at home, rather than venture out into other areas. The need for consumption loans was reportedly high during monsoon periods, although the amounts borrowed – often from friends and relations in the village – were not very big, according to the processors.

### **Researchable constraints for adoption of the intervention package**

32. During the field-testing period, the team identified four researchable constraints, which could have a bearing in reducing monsoon losses. These were:

- Effect of chelating agents in the water used for fish processing
- Composition of 'self-brine' and factors affecting its stability
- Brining as a method of long-term preservation of fish
- Development of an appropriate method for preservation of sardines.

### **Lessons learnt**

33. The lessons learnt from the field-testing are summarised here:

- *The practical experience of the processors was often more appropriate than the 'objectively verifiable' assumptions of an external agency.*
- *A strong grass-root level organisation would be essential for the success of any intervention.*
- *Flexibility is an important ingredient in tackling any situation: compromises may be required.*
- *Do not intervene at too many steps at the same time.*
- *Knowledge of local practices and resources and ethos prior to making an intervention are essential.*
- *Not all development interventions are likely to succeed, nor are they expected to.*
- *It is the concept behind input, rather than the actual input itself, that is important.*

- *Although the intervention package tries to address a particular group of individuals, it requires the active participation of a large number of other stakeholders for a successful uptake by the target groups.*
- *It is not enough that awareness is generated among the target groups, but the required inputs should be accessible on a sustainable manner for a successful uptake.*
- *Steady facilitation, monitoring and supply of inputs for a period must be ensured to help the adoption of inputs into their practices.*
- *The choice of a site where an intervention is to be made should be done based on the opportunities for rapid uptake, and wider dissemination of the results.*
- *The chances for uptake of a particular intervention are more if they are useful in the non-monsoon periods also.*
- *Selection of the key players, i.e., SSPs, to take part in the field-testing plays a crucial role in the adoption or rejection of the intervention.*
- *In an informal production and marketing enterprise, a number of factors beyond the control of the key players may be at work, affecting the usefulness of the intervention.*

## **VOLUME I MAIN REPORT**

## 1. INTRODUCTION

### 1.1 Background

This report is the outcome of field-testing of a package of interventions developed as part of the research programme on “Monsoon Losses in Post-Harvest Fisheries”. This research was carried out under the RNRRS Post-Harvest Fisheries Research Programme (R6817), funded by the Department for International Development (DFID), UK, and managed jointly by the Natural Resources Institute, UK, and the College of Fisheries, Mangalore, India. Two phases of the research project were completed before the current field-testing phase: an exploratory phase during the monsoon of 1997 in the states of Kerala, Tamil Nadu, Andhra Pradesh, and Orissa, and a micro-level focused loss assessment study in Orissa and Andhra Pradesh during the monsoon of 1998.

The previous phases of the project indicated that in most selected sites, some relatively minor technical improvements in handling and processing of fish could reduce losses significantly. Subsequent to the second phase, a comprehensive list of possible technical and non-technical intervention options was developed based on the coping strategies of the small-scale processors (SSPs) during monsoon periods as observed by the field teams. Following the dissemination of results of the second phase at a workshop in Chennai in March 1999, a questionnaire was circulated among the agencies and individuals working in post-harvest sector to obtain their perceptions for reducing monsoon losses, and feasible options were included in the intervention package.

These interventions related to simple, low-cost improvements to the processing methods during monsoon periods. Some of these interventions were being used locally in some places, but their usefulness to reduce losses over a wider geographical area needed to be seen. In the case of those interventions, which had not been used previously, their effectiveness as well as accessibility to the SSPs was to be tested. The third phase of the research consequently focussed on field-testing the intervention package with the small-scale processors at selected locations.

Prior to the field-testing, a participatory planning exercise was conducted with the SSPs and major stakeholders during April-May 1999 in Andhra Pradesh and Orissa. The objective of this participatory intervention planning (PIP) was to discuss the intervention options with the target group to find out whether the processors considered the options to be of significance in reducing the losses related to monsoon periods. The intervention menu would require site-specific modifications to suit local requirements, and a few these changes were identified during the PIP.

At a planning workshop conducted in June 1999, the findings of the PIP were discussed, and the intervention package was refined to suit the conditions at the field-sites. In all, the PIP identified six sites – three each in Andhra Pradesh and Orissa – for field-testing the intervention package. It was decided to conduct the field-testing in July 1999, when the Southwest Monsoon would be over the two states, so that the processors would be able to test the package during the monsoon period. The field team was to test the package participatorily in five days at each site, before moving on to the next site. Monitoring of the usage and adoption of the loss reduction methods would continue for the next two months.

## 1.2 Composition of the team

The field-testing took place during 1-29 July 1999. As the intervention package mainly consisted of technical improvements to the current practices, the field-testing team consisted of two technologists from the College of Fisheries, Mangalore. The composition of the team was as follows:

- Venkatesh Salagrama, Integrated Coastal Management (ICM) – team leader;
- L N Srikar, College of Fisheries, Mangalore – technologist
- N S Sudhakara, College of Fisheries, Mangalore – technologist

In Andhra Pradesh, the team included:

- P Sreeramulu, Fisheries Development Officer, Department of Fisheries
- G Durga Prasad, Field Officer, ICM
- M Sreerama Murthy, Co-ordinator, Forum for Integrated Rural Management (a local NGO)

In Orissa, the team included:

- Binod Ch Mahapatro, Social worker
- Lachhman Naik, Chief Functionary, Coastal People's Development Association (a local NGO)
- K Jayaraju, Activist.

## The team was able to test the intervention package with processors at selected locations, and 1.3 Field-testing sites

*Andhra Pradesh:*

Suradapeta-Mayapatnam (2-5 July)  
Konapapa Peta (6-9 July)  
Chodipalli Peta (10-14 July)

*Orissa:*

Chandrabhaga (16-19 July)  
Balipantal (20-22 July)  
New Bakshipalli (25-28 July)

Details of field-testing at each site are provided in *Section II: Field Notes*.

## 1.4 Objectives of the study:

During the field-testing period, the team discussed about the objectives for the third phase of the research, and decided upon the following:

1. To field-test the identified interventions in partnership with SSPs at selected locations.
2. To assess the impact of the intervention on reduction of losses and risks in monsoons.
3. To identify the constraints to the adoption of intervention and in scaling up.
4. To monitor the uptake and spread of intervention and assess the sustainability.
5. To produce a package of practices based on GMP.

to a certain extent assess the impact of an intervention. The team also tried to identify the constraints to adoption and scaling up of the interventions, which are incorporated in this report. Because the team spent only about 5 days in a village, and also because in some of the test sites the non-availability of fish did not allow the processors to test the interventions for a second time when the team was present at the site, the team's information on the impact of the interventions and the constraints for uptake remained inconclusive.

## **2. METHODOLOGY OF THE STUDY**

Following the workshop in Chennai, the inputs to be tested during the field-testing in Andhra Pradesh and Orissa were made, based on the site-specific requirements at each field-site. Regular watch was maintained on fish landings and also on the processing operations in the field-sites until the beginning of the field-testing on the 1<sup>st</sup> of July 1999.

At the beginning of the field-testing in both states, a day was kept for planning a schedule of activities for the field-sites. It was agreed that elaborate planning would be counter-productive considering the many uncertainties – availability of fish, for instance – and that the field-tests be conducted with as much flexibility as possible. Although the needs assessment done during PIP in May 1999 showed that not all interventions were necessary or needed by the processors in all villages, since the menu of interventions follows a chronological sequence, it was decided to test the inputs as one package in all sites, unless there was a valid reason for not doing so in particular instances.

After testing the intervention package in the first field-site, it was decided that four days were sufficient for each site, which was also adequate to observe a second cycle of operations by the SSPs. In those sites where there were no landings of fish, the team procured fish from the nearest source, and used them for field-testing.

The first day at each site involved a familiarisation process and this included a meeting with SSPs. At the meeting, the team discussed about the intervention package, and also showed a video film made on monsoon fish losses and processing methods on the West Coast. At each site, the team split into three smaller groups in order to be able to work with three processors individually. At the end of each day a record of activities would be prepared. The information for the daily report would come from field observations by the team members, the responses and comments of the SSPs (both targeted and other participants), and from interviews with the SSPs and other fisherfolk – both individually and in groups – to obtain specific information related to the intervention package, or other issues such as the use of ice, production and marketing of value-added products and so on. At the end of each field-testing period, the perceptions of the processors who had been involved in the programme were gathered. The processors' responses for each test site are included in the Field Notes.

A demonstration of some easy-to-make value-added products was an important component of the intervention package, based on which feedback was generated on the possibility of using the monsoon landings for production and marketing of value-added products.

The intervention inputs underwent substantial changes from village to village, particularly in Orissa, where each village had a distinct way of fishing and fish processing, and required fine modifications to the inputs before they could be tested.

The team tried to prioritise the individual inputs for each village, based on (i) awareness of the concept/input that existed among SSPs (ii) availability of, or access to, the required inputs for the SSPs, and (iii) the prior usage of the inputs by SSPs. These three issues were compared against the criticality of an intervention to reduce losses. Criticality could be likened to the Critical

Control Point (CCP) in the HACCP process, and was rated as high, medium or low for each input. Based on these criteria, a prioritisation was attempted based on a ranking system.

The prioritisation was done mainly to decide the importance of different inputs at each site for achieving the objective of reducing losses. Besides reinforcing the assumption that not all inputs might be needed at each field-site, this helped the team, and the monitoring persons, to give adequate attention to those issues which were considered as more important than those which were either already being practised by the SSPs or were not so crucial to the success of the programme. Issues such as brine concentration and use of mats were not only known to the SSPs, but were also practised and giving equal attention to such things as, say, washing fish properly or increasing drying speed, was considered to be unnecessary.

This prioritisation was attempted at all sites, and was to a large extent found to be in harmony with the processors' perceptions as well as the team's own regarding the importance of an input for that field-site. The perceptions of the team about the criticality of different inputs varied from place to place and this prioritisation also changed accordingly. This prioritisation is included at the end of the notes for each field site in the Field Notes.

The team also made use of the presence of local Department of Fisheries officers and NGOs wherever possible, and obtained information regarding the intervention package, ways to make it more refined, and probable sources of support for ensuring sustainability of the interventions in the event of the processors finding it useful to follow the interventions.

At the conclusion of field-testing at each site, the team discussed the intervention inputs in the light of lessons learnt, and suitable modifications to the programme were made to refine it for the next site. A monitoring format was developed by the team during the field-testing period, and was refined based on information generated from testing it in the villages.

### 3. THE INTERVENTION PACKAGE

#### 3.1 Problems and constraints encountered by SSPs during monsoon period

The previous phases of the research studied the problem of losses from the SSPs' point of view, their socio-economic impact, and attempted an assessment of losses through micro-level studies. The field-testing team also had extensive discussions with the selected SSPs in test-sites, along with other key stakeholders, such as fishermen, village elders etc., to try and identify where losses might be occurring in the processing chain. This was mainly a 'quick-and-dirty' way to check how far the intervention package was addressing the real issues related to losses at various points in the processing chain, and also to refine the intervention inputs further to suit the site-specific requirements. This information was put together into a problem tree (Table 1).

Broadly, on the technical front, the fish losses in monsoons occur for two main reasons:

- (i) The inability of SSPs to dry fish during monsoon periods because of incessant rains and inclement weather conditions (cloudy skies etc.);
- (ii) When brined/salted, two factors – insect infestation, and accumulation of dirt and other contaminants, such as microorganisms – cause physical, quality and economic losses. These would occur during non-monsoon periods also, but during monsoons, the longer duration of brining, prevalent climatic conditions, and glut catches add significantly to losses.

Based on the team's understanding of the situation, two more factors – limited scope for production of new – non-traditional – products as an alternative to traditional processing, and limited potential for taking up alternate income generating programmes – were added as the other reasons for the adverse effects of monsoons on the livelihoods of small-scale processors. These problems were much broader in scope than the technical constraints, and could be technical, socio-economic, marketing-related or cultural in nature. Consequently they required a more integrated and long-term strategy than was adopted for the field-testing, which had a technical focus. However, these issues would still need to be considered in the context of the problem of losses. At the Chennai workshop, it was decided to discuss these issues with the processors during the field-testing period.

All the contributing factors to losses during monsoons fell into one or more of these categories, and these were delineated in a tabular form. Each of the problems was looked at from the point of view of the field-testing package, and an effort was made to see how the various inputs in the intervention package would address these factors, and how significant could their contribution be to overcoming the problem/constraint.

*Inadequacies/deficiencies of existing practices which contribute to losses:*

- In many of the villages, the processors often use seawater for fish processing operations. Where the processing sites were far away from the beach, or were located on high sand dunes, procurement of seawater for processing purposes was a major constraint. Even the prevalence of dry salting in many places was seen to be a way of reducing the need for water (for brining) at the risk of increased infestation.
- The quality of the seawater from the near-shore waters, particularly near crowded villages or industrial areas, is suspect and could be a cause of contamination itself.

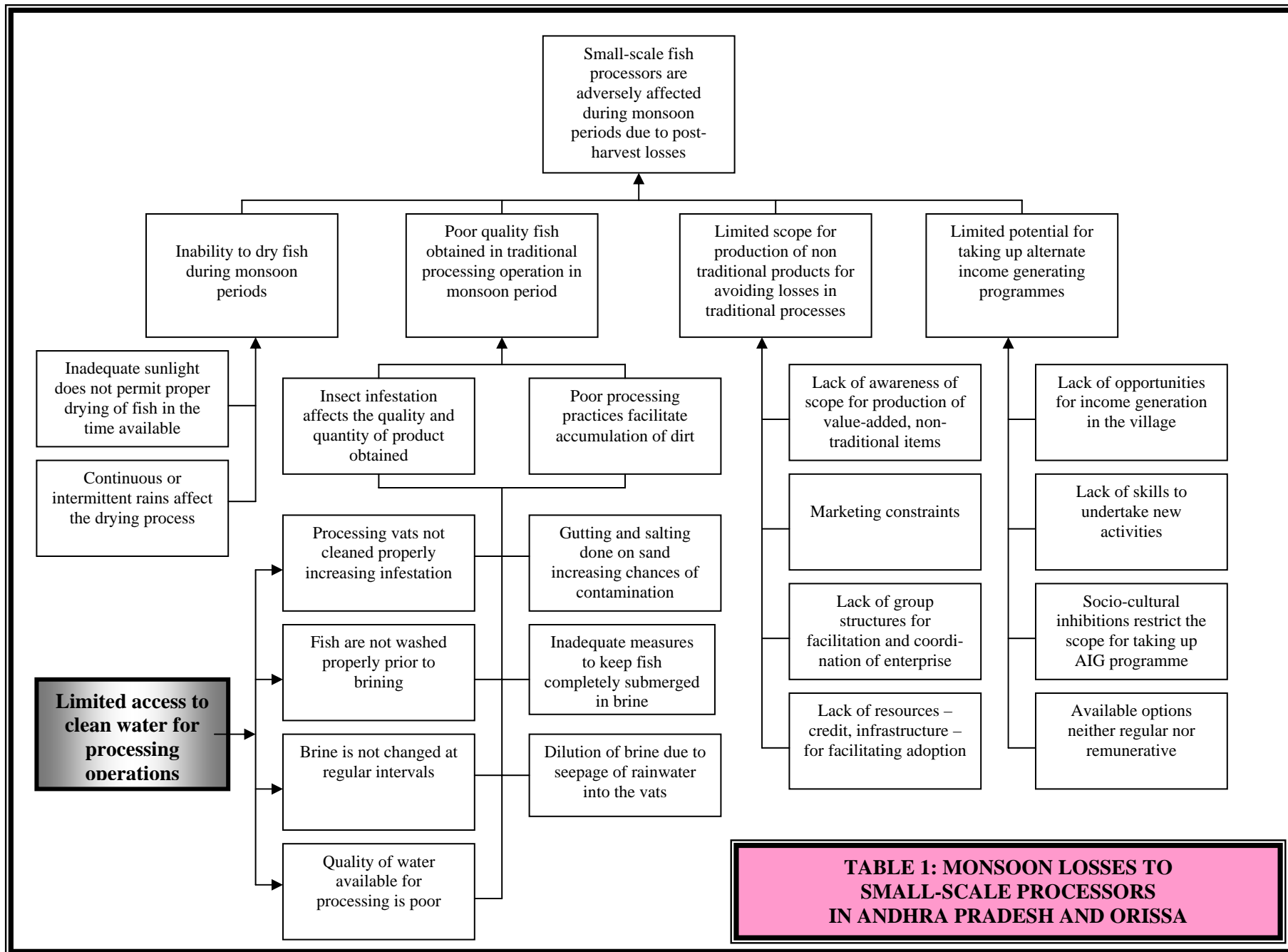
- The tendency of processors to complete processing as quickly as possible - albeit for valid reasons – does not allow them to take sufficient care in pre-processing stages. Sand contamination (when fish are landed directly on the beach, and when they are kept on the ground for gutting), delay in washing and high ambient temperature have adverse effect on quality of fish, hastening spoilage as well as problems of infestation.
- The time and effort required in collection and transport of seawater results in frugal usage of water for washing of vats, fish, and the processing tools. Most processors feel that salting/brining and subsequent rinsing will take away the dirt, and do not prefer to clean the fish prior to salting. Improper cleaning of vats and fish leads to cross contamination.
- The insufficient spread of weight over salted fish does not allow complete immersion of fish, and exposes fish to maggot infestation.
- The closure of vats after salting using dried palm leaves and plastic sheet is ineffective in preventing the entry of flies, other insects and rainwater. Further, high winds carry away the leaves, which is not only an economic loss, but also means keeping constant watch over the vats throughout the monsoon periods.
- The practice of drying fish at ground level using nets, leaves, sheets<sup>1</sup> is not very effective in increasing the drying speed and to remove fish in a hurry in case of sudden rain.
- *The influence of current marketing practices.* The existing marketing practices are not very conducive for the processors to adopt improved processes. Rather, such practices as selling by weight encourage the processors to make poor quality products. Even for adoption of some of the loss reduction methods, the response of the markets – positive or adverse – plays a crucial role. For instance, the processors in the two test sites in Orissa – where dry-salting is the common processing method – were apprehensive about using brining as a method of processing, because the product would not be as heavy as the dry-salted one. The processors agreed that the product obtained by brining was very good, but said that its usefulness was confined to making good quality products for their domestic consumption. Because the sales were done by weight, the net result of brining to the processor could be a loss.

However, the number of items in the intervention package, which required a positive market response for their successful adoption, was very limited. Marketing interventions were beyond the scope of the current project, whose aim was primarily the reduction of losses, rather than increasing value of the products, although both of them were closely interlinked. The field-team could take the view that, it was the possibility of carrying more fish than previously – as a result of reduced losses – that was more important. The improved practices might result in a better price, but that is an additional, rather than a direct, benefit.

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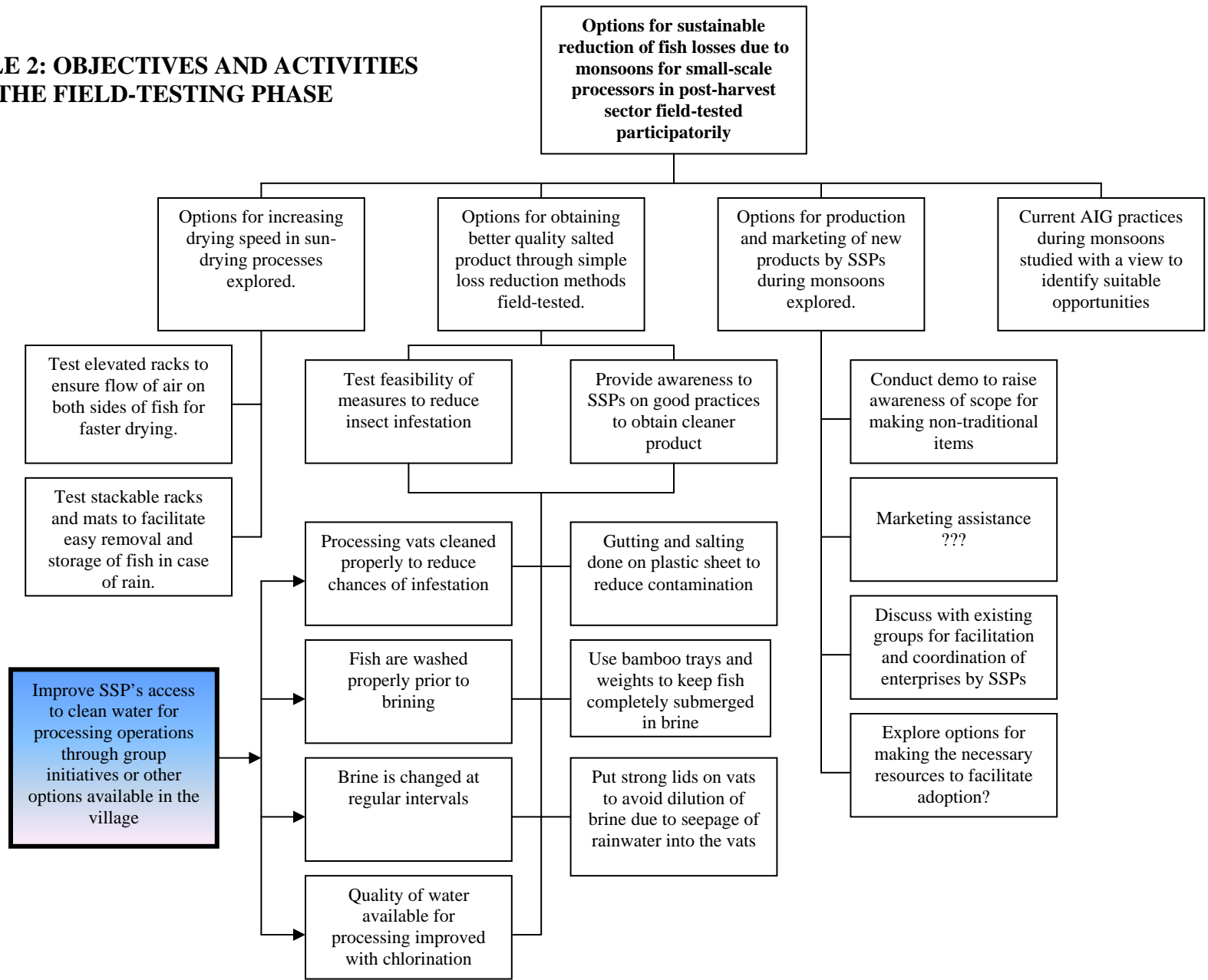
<sup>1</sup> Use of leaves, mats and nets for drying – and use of plastic sheets for processing - were a recent development in many areas, indicating a rising quality consciousness among processors.





**TABLE 1: MONSOON LOSSES TO SMALL-SCALE PROCESSORS IN ANDHRA PRADESH AND ORISSA**

**TABLE 2: OBJECTIVES AND ACTIVITIES FOR THE FIELD-TESTING PHASE**



### 3.2 Options to SSPs to overcome losses during monsoon periods

Based upon the problems and constraints (Table 1), the field-team developed objectives for overcoming the losses during the monsoon periods (Table 2). Following the two major problems faced by the processors – i.e., inability to dry, and poor quality salted products – the team decided upon two objectives for any intervention aimed at overcoming the monsoon losses:

- (i) To explore, identify, and test options for increasing drying speed in sun-drying processes
- (ii) To explore, identify, and test options for obtaining better quality salted product through simple loss reduction methods

The specific, low-cost, locally available inputs/activities, which formed the intervention package, were now compared against the constraints to see if they addressed the constraints adequately. The problems/constraints, which were beyond the scope of the project – such as providing marketing assistance or undertaking group-based activities to address common issues – were identified. These issues formed the basis for discussions with the other agencies, such as the Department of Fisheries, NGOs, and the fisherfolk groups, to explore the possibility of local organisations taking up some of the activities that could not be tackled by this project.

The ‘critical control points’ where the team felt interventions were important, and could be undertaken by this project were:

1. Improving quality of water used in processing
2. Washing of fresh and gutted fish
3. Minimisation of sand contamination at each step
4. Complete immersion of fish in salt brine during salting/brining
5. Protection of fish during salting from seepage of rainwater and infestation.
6. Increasing speed of drying

The team developed a programme based upon the ‘critical control points’ (Table 3):

1. To clean vats using bleaching powder before starting a new processing operation<sup>2</sup>
2. To treat seawater using bleaching powder and give adequate contact time for chlorination
3. To wash fish in treated water
4. To gut fish on plastic sheets
5. To wash gutted fish using treated water
6. To monitor brine strength and quality during, and between, brining cycles
7. To keep trays over the fish with clean weights over them, for complete immersion of fish
8. To cover the vats with a strong lid which would not allow insects or rainwater, and would not be carried away by heavy winds.
9. To facilitate covering of fish on the racks using plastic sheet in case of sudden showers or carrying the racks into a shelter.

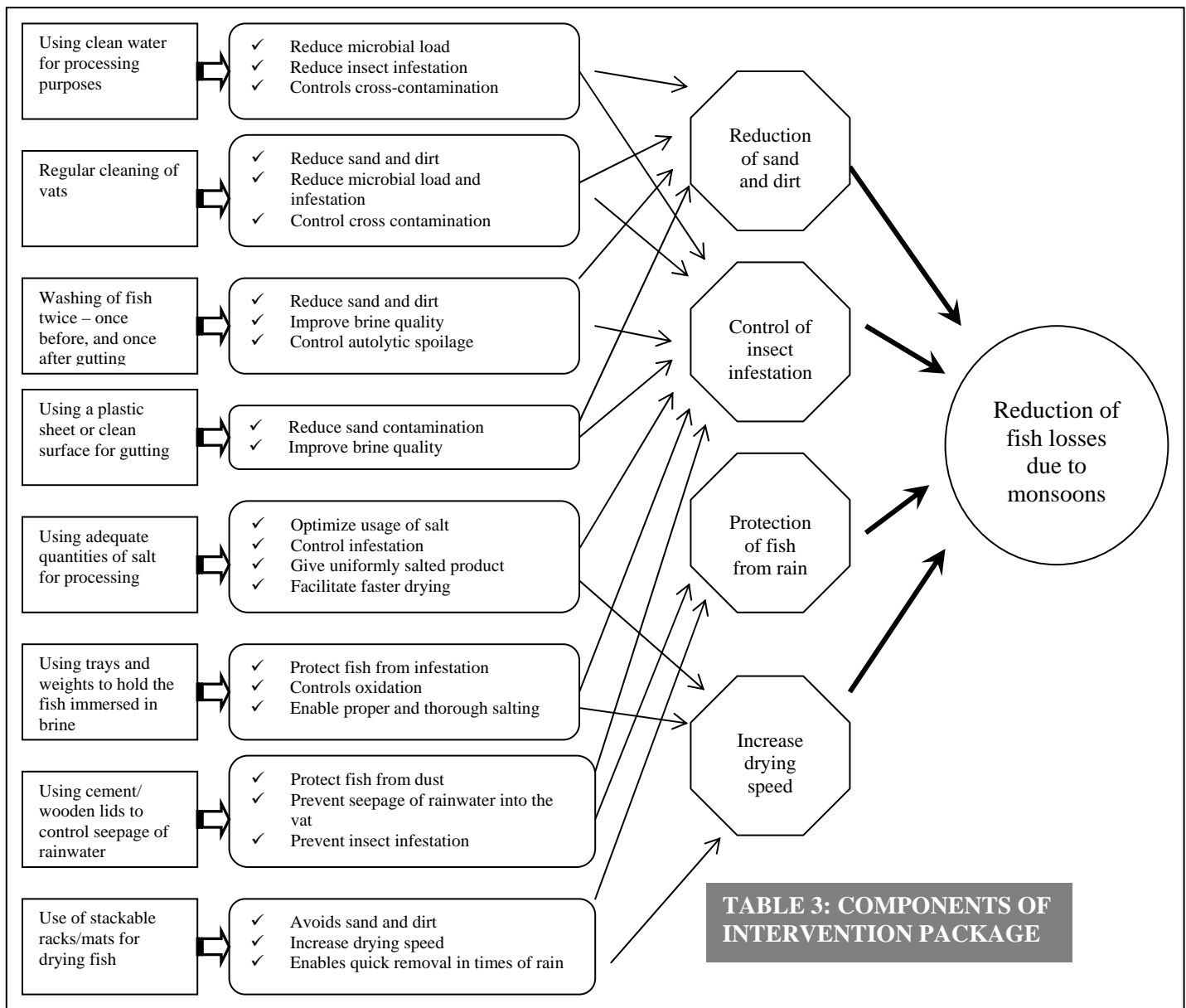
Observations of the existing processing operations indicated that losses were the cumulative result of many shortcomings in the processing chain, and the package of intervention would need to be tested as a whole, rather than in a piecemeal fashion. The exact effects of any single input – say, the trays to immerse the fish in the water – are very difficult to quantify and required a much longer timeframe. The team also felt that the use of any of the inputs should not be treated as a substitute for good processing practices as a whole.

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<sup>2</sup> A processing operation, in case of brining, could last up to 15 days depending on the quality of brine, and involves repeated use of the same brine, adding salt from time to time, for many batches of fish.

Two other issues – production and manufacture of non-traditional products and options for alternate income generation – were included as additional objectives, but the intervention package did not target either of these issues directly. The information generated in most field sites did not show much scope in the short term for production and marketing of non-traditional products. The processors in general were seen reluctant to do anything other than processing even during monsoon periods, and this applied to a large extent to the alternate income generating opportunities also. These issues are discussed separately in a subsequent chapter (Chapter 8).

### 3.3 Components of the intervention package



#### 4. SUMMARY OF GENERAL AND SITE-SPECIFIC FEATURES OF THE FIELD-SITES

After completion of the field-testing at each state, the team put together the distinctive features of the locations, as well as the common features of the field sites studied until then. This exercise was important to understand how far the conditions in each site resembled those in other sites, and to assess how representative the conditions at each test site were of the region. Unless the field-sites can be said to be representative samples of the fishing villages over a wider geographical area, the results of this research could be treated as being relevant to the particular field-sites. This chapter tries to summarise both the general and site-specific conditions, in order to facilitate understanding the applicability of the interventions over a wider area and to discuss options for scaling up. This list is by no means exhaustive, and the team chose to treat this compilation as the beginning of a process which might be continued for the next few months, to make the list as comprehensive as possible.

##### 4.1 Features common to all locations

###### *General:*

- ❖ A large majority of the SSPs in all test sites were women.
- ❖ SSPs' occupations were confined largely to fish processing throughout the year. Very small (marginal?) processors would also try to sell fresh fish whenever possible (except in Balipantal).
- ❖ Processing continues through monsoon periods in all sites.
- ❖ Mostly local fish landings were used for processing.
- ❖ The processors were reluctant to invest in anything other than the barest essentials – fish and salt – and would use a new method only after they were totally convinced of its efficacy.
- ❖ The SSPs preferred traditional processing activities to making any new products because of the uncertainties in scaling up and marketing of value-added products. If any tested and workable opportunities were available, they had no reservations about making new products.
- ❖ Most SSPs preferred fisheries-related activities to other income-generating activities and would opt for any other employment only as a last resort.
- ❖ Most processors were interested in testing new methods for reduction of losses; it was seldom that the team came across a negative response to the field-tests.

###### *Glut landings:*

- ❖ Glut landings of small pelagics was a characteristic feature in most sites.
- ❖ Glut landings were often both an opportunity as well as a liability, and the fishing and fish processing operations were geared to make the best use of glut landings. Any investment was made after a careful consideration of the risk factors.
- ❖ The existing processing capacities of the processors for utilising fish for human consumption were not sufficient to process glut catches, which were sun-dried and sold as fishmeal.
- ❖ Good demand existed for fishmeal from poultry and aquaculture sectors, but the quality of the fishmeal was very poor.

###### *Salting and drying for human consumption:*

- ❖ Maggot infestation was a major cause of losses in all sites.
- ❖ Vats were seldom cleaned.
- ❖ Dressing and salting practices largely depended on species and market demand.
- ❖ SSPs had a good knowledge of quantities of salt to be used for fish salting/brining.

- ❖ Quality of salt used in processing operations was seen to be generally poor, but its price was affordable to the processors. Availability of salt was not seen to be a problem at any site.
- ❖ Washing of fish after gutting and using clean surfaces, such as plastic sheets, for gutting was prevalent, although these practices could be made more effective.
- ❖ Lids to the vats were generally makeshift arrangements such as palm leaves, plastic sheets, or both, and stone weights were used to prevent them from getting blown away by the wind.
- ❖ During monsoon periods, keeping continuous vigil over the salting vats whenever it rained to protect fish from seepage of rainwater was a common feature in all sites except Balipantal.
- ❖ Lack of space for drying within the village often forced the processors to dry away from their homes, and this contributed significantly to the losses during monsoons.
- ❖ Short cycle time was preferred as a coping mechanism to reduce losses.

*Marketing:*

- ❖ SSPs had fairly good market access; the produce was sold in weekly markets. Though the processors in Balipantal had problems with regard to market access in a physical sense, the existing market linkages seemed to be working well.
- ❖ The processors had a clear idea of the requirements of each market, and products would be made differently for different markets (except in Balipantal), although the processing methods remain the same.

#### **4.2 Features specific to each state**

*Andhra Pradesh:*

- ❖ Prevalent processing methods in the three sites were sun drying, dry-salting, and wet salting.
- ❖ Processors in all three sites used seawater for processing; the distance between the processing sites and the sea varies from 200 to 500 Mt. (Suradapeta processors use well water<sup>3</sup>).
- ❖ All processors used vats made of cement or hollowed-out palmyrah trunks for processing purposes. The cement vats were purchased from local production units.
- ❖ The same brine was used for many cycles.
- ❖ Processors assessed the quality of brine based on odour, colour, sediments, and oiliness and discarded it once it is regarded as unfit. In many cases, the quality of the brine in the vats was very bad though the processors maintained that it was usable.
- ❖ Smaller quantities of fish were dried close to the homes in the village.
- ❖ Processing necessities: cement vats without lids, plastic sheets for protecting salt and fish in brine in case of rains, salt, palm leaves and nets for drying.
- ❖ Good access to markets

*Orissa:*

- ❖ Prevalent processing methods in the three sites were sun-drying and dry-salting. Brining was not known to the processors in Balipantal and Bakshipalli, and was done to a limited extent in Chandrabhaga.
- ❖ SSPs in Chandrabhaga and Bakshipalli work in groups as a coping strategy to reduce the impact of market upsets.

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<sup>3</sup> Within a few days after the field-testing in Suradapeta-Mayapatnam, the processors installed a bore-well near the processing site. There was also an initiative to install a bore-well in the processing site in Chodipalli Peta.

- ❖ Freshwater<sup>4</sup> was used for washing in Balipantal, freshwater and seawater in Chandrabhaga, and only seawater in Bakshipalli. There was no need for water for brining, because brining was not practised.
- ❖ Cement vats were used in two sites, which were made by the processors themselves, while earthenware pots were used in Balipantal.
- ❖ Self-brine from one cycle was generally used for washing the next batch of fish and then thrown away.

### 4.3 Salient features of the individual field-sites

#### 1. *Suradapeta-Mayapatnam*

- Source of water for processing: seawater, groundwater from open wells (Suradapeta)
- Main source of fish for processing: traditional and FRP boats
- Limited drying place in the middle of the village – unhygienic conditions
- Good fishing operations during monsoons; regular supply of fish for processing
- Good transportation facilities.
- Presence of NGOs and women’s groups. Department of Fisheries represented.
- Some processors in Suradapeta-Mayapatnam work as wage labourers in agriculture during monsoon periods.
- Previous exposure to post-harvest fisheries programmes.

#### 2. *Konapapa Peta*

- Source of water for processing: seawater
- Main source of fish for processing: Shore-seine catches, traditional and FRP boats
- Village separated from the sea by a sand dune; processing on the beach and the sand dune.
- Irregular fishing during monsoons, inconsistent supplies of fish for processing
- Transportation facilities were good.
- No NGOs. Department of Fisheries represented. DWCRA-based women’s groups.
- No previous exposure to post-harvest fisheries programmes.

#### 3. *Chodipalli Peta*

- Source of water for processing: seawater
- Main source of fish for processing: Shore-seine catches, traditional and FRP boats
- Village at a distance of 300 Mt from the sea; processing carried out on the intervening patch of land, away from the village
- Irregular fishing during monsoons, inconsistent supplies of fish for processing.
- Transportation difficult.
- No NGOs. No Department of Fisheries representation. DWCRA-based women’s groups.
- No previous exposure to post-harvest fisheries programmes.

#### 4. *Chandrabhaga*

- Source of water for processing: seawater and groundwater from bore-wells
- Main source of fish for processing: FRP and wooden catamarans
- Processing and drying near the processors’ homes; large quantities sun-dried on the beach
- Limited space for drying in the village

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<sup>4</sup> Freshwater, for the purpose of this report, is the water that is obtained from a non-marine source – it could be groundwater, pond water or riverine water.

- Processing necessities: cement vats made by the processors themselves, plastic sheets for protecting salt, salt, knives and razors for gutting, palm leaves and nets for drying.
- Use of drying racks seasonally.
- SSPs operate as groups to reduce impact of market upsets.
- Transportation facilities good.
- NGOs and Church-based organisations active. Department of Fisheries represented. Active women's group.
- Previous exposure to post-harvest fisheries programmes.

#### 5. *Balipantal*

- Balipantal is an atypical village in many respects.
- Traditional Oriya fisherfolk community
- Agricultural orientation
- No price was paid for raw material: the women obtain all unsold catches from their husbands for processing.
- The processors had access to alternate sources of income.
- Source of water for processing: freshwater from ponds and the creeks
- Main source of fish for processing catches from wooden dongas.
- Processing necessities: earthenware pots, plastic sheets for protecting the vat from rains, salt, palm leaves and nets for drying.
- Dry-salting and drying near the processors' homes; very large glut-landings dried on the seabeach, which is about 12 km away.
- Limited space for drying in the village
- Inaccessibility and poor transport restrict marketing activities significantly
- Presence of an NGO. No Department of Fisheries representation. Active women's groups
- No previous exposure to post-harvest fisheries programmes.
- Limited fishing operations during monsoon periods

#### 6. *New Bakshipalli*

- Source of water for processing: seawater
- Main source of fish for processing FRP catamarans, Sandwich catamarans, Masula boats, and shore-seines.
- Processing necessities: cement vats made by the processors themselves, plastic sheets for protecting salt, salt, bamboo mats and nets for drying.
- Village about 300 Mt from the beach, the intervening space covered by sand dunes. Fish processing and drying on the sand dunes. Sun drying of glut catches on the beach.
- Transportation facilities adequate
- SSPs operate as groups to reduce impact of market upsets.
- Previous existence of NGO activities; currently none. No Department of Fisheries representation. Active women's groups, but group activities confined to fish processing.
- Some processors work as wage labourers in agriculture.
- Fishing operations continue through monsoon months; good catches available for processing.
- Previous exposure to post-harvest fisheries programmes.



## 5. RESPONSES OF THE PROCESSORS TO LOSS-REDUCTION METHODS

1. The field-team spent four to five days at each field-site, consequently, drawing any conclusions from the responses of the processors to an intervention is fraught with many problems. A few broad conclusions could however be drawn.
2. The intervention package does address a felt need of the processors. This observation comes from the fact that, in all test-sites, the participation of the processors had been complete, and whole-hearted. Whether the actual inputs would fulfil their needs varies from site to site depending on the local needs, practices, and accessibility.
3. The interventions were quite within the reach of the processors if they wanted to adopt them. The extra investment needed to obtain some of the inputs – stackable racks, cement lids, or bleaching powder – was seldom mentioned as a constraint for uptake.
4. In most sites, processors were seen to start using the inputs immediately after the field-tests, and some new initiatives for accessing the inputs were also noticed in some villages.
5. Processors provided feedback on the intervention package, which are summarised at the end of field notes for each village in Volume II . A consolidated summary is given here.
6. The team’s own prioritisation of inputs in the intervention package for each village is provided in Volume II, a consolidated summary is given here.
7. The ranking is based on the awareness, accessibility, and practice of each input already existing at each field-sites, which was compared against the criticality of the input in reducing losses.
8. Based on this prioritisation, it would be possible to concentrate on those issues, which would have a significant bearing on the reduction of losses. Issues, such as maintaining brine concentration (Overall Ranking 7), using mats to reduce contamination (8), and plastic sheets for gutting operations (9), were known to the processors, and were in use in many places, whereas the use of clean water, i.e., treated water (1), trays to submerge fish (2), and lids to avoid seepage of rainwater (3), were new and had a significant use in reducing losses.
9. The team’s overall prioritisation of the intervention package is as follows:

| Activity  | A | B | C | D | E | F | Overall ranking |
|---|---|---|---|---|---|---|-----------------|
| 1. Use of clean water for processing                            | 1 | 1 | 1 | 1 | 1 | 1 | 1               |
| 2. Cleaning of vats regularly                                   | 2 | 3 | 2 | 3 | 2 | 5 | 5               |
| 3. Washing fish twice   | 3 | 3 | 4 | 4 | 3 | 4 | 6               |
| 4. Using plastic sheet or clean surfaces for gutting operations | 6 | 4 | 5 | 4 | 4 | 5 | 9               |
| 5. Using trays to submerge fish                                 | 2 | 2 | 2 | 3 | 1 | 2 | 2               |
| 6. Using lids to avoid seepage of rainwater                     | 2 | 2 | 2 | 3 | 3 | 1 | 3               |
| 7. Maintaining brine concentration                              | 5 | 4 | 4 | 4 | 3 | 4 | 7               |
| 8. Stackable racks  | 4 | 3 | 3 | 4 | 1 | 1 | 4               |
| 9. Use of mats to reduce contamination and for faster drying    | 7 | 5 | 6 | 2 | - | 5 | 8               |
| 10. Value-added products  | - | - | - | - | - | - | -               |

**Table 4: Team’s prioritisation of intervention inputs**

A. Suradapeta-Mayapatnam; B. Konapapa Peta; C: Chodipalli Peta; D. Chandrabhaga; E. Balipantal; F. New Bakshipalli

10. The processors' responses to the intervention package are as below:

| Activity   | Traditional practice                           | Suggested practice                                 | Processors' response |              |          |
|--|--|--|----------------------|--------------|----------|
|  |  |  | 1                    | 2            | 3        |
| 11. Use of clean water for processing                            | Water from the nearest source used             | Treatment of water with bleaching powder           | CB, B, N             | S, K, CP     | -        |
| 12. Cleaning of vats regularly                                   | Occasionally done with groundwater or seawater | Regular cleaning of vats, with treated seawater    | CB, B, N             | S, K, CP     | -        |
| 13. Washing fish twice   | Done once                                      | Washing twice, once before and once after, gutting | CP, CB, B, N         | S, K         | -        |
| 14. Using plastic sheet or clean surfaces for gutting operations | Used, but often inappropriately and sparingly. | More appropriate and regular use of plastic sheet  | CP, CB, B            | S, K         | -        |
| 15. Using trays to submerge fish                                 | Stones are placed on fish for immersion        | Bamboo frame with adequate weights                 | S, K, CP, B          | CB, N        | -        |
| 16. Using lids to avoid seepage of rainwater                     | Plastic sheets, weighed down by stones         | Cement lids  | S                    | K, CP, CB, N | -        |
| 17. Maintaining brine concentration                              | By experience                                  | Use of the wooden egg                              | S, K, CP, CB, B      | N            | -        |
| 18. Stackable racks  | On racks, or on old nets                       | Stackable racks                                    | S, CP                | K, CB, N     | -        |
| 19. Use of mats to reduce contamination and for faster drying    | On racks, or on old nets                       | As traditionally practised, and on bamboo mats     | S, K, CP, CB, B      | -            | -        |
| 20. Value-added products   | Not practised                                  | Exploratory studies                                | -                    | S, CB, B     | K, CP, N |

**Table 5: Processors' responses to the intervention inputs**

S. Suradapeta-Mayapatnam; K. Konapapa Peta; CP: Chodipalli Peta; CB. Chandrabhaga; B. Balipantal; N. New Bakshipalli

## **6. CONSTRAINTS FOR UPTAKE AND OPPORTUNITIES FOR ADOPTION OF THE INTERVENTION PACKAGE**

### **6.1 Constraints for uptake**

The intervention package consisted of mostly simple, low-cost, easily accessible inputs, most of which could be put together by the processors themselves. But there were some issues, such as constraints in procuring seawater or obtaining bleaching powder for treatment of the water, which might need a more organised and broad-based intervention.

The team spoke to the processors who were involved in the field-testing at each site to gather their perceptions of the intervention package. A questionnaire was used to gather the information, but the discussions were free ranging, and covered a number of related issues. If the response of the processors to a particular input was positive, they would be encouraged to explain whether they thought they could start using the practice right away, and if not, what constraints they foresaw for the uptake of the intervention (Table 6).

The team recognised that a positive response to the intervention package by itself was no indicator of adoption. The processors' responses could be a result of initial euphoria, which could quickly turn into complacency, unless the practices have a visible and positive outcome. Awareness building should be followed by making the inputs available to at least a few processors for a set time period to enable them find for themselves the efficacy of the practice. It would also require continuous facilitation and monitoring for a specific time period, so that the processors would continue to use the processes. The role of grass-root level organisations to achieve this was significant, and the team found that the presence of a group structure in the villages could be very beneficial in the uptake and adoption of new processes.

Secondly, though some of the items in the package were well received in the villages, the team recognised that it would require putting in place some means to make these inputs available to the processors on a sustainable manner before the interventions could take root. In this case, merely raising awareness or providing a few inputs to the SSPs would not achieve the objective; it would require initiatives on the part of the government, NGOs and other grass-root groups. The team was glad to see some initiatives coming up from the processors themselves in some villages as a result of the field-testing, but this cannot be generalised.

### **6.2 Opportunities for uptake**

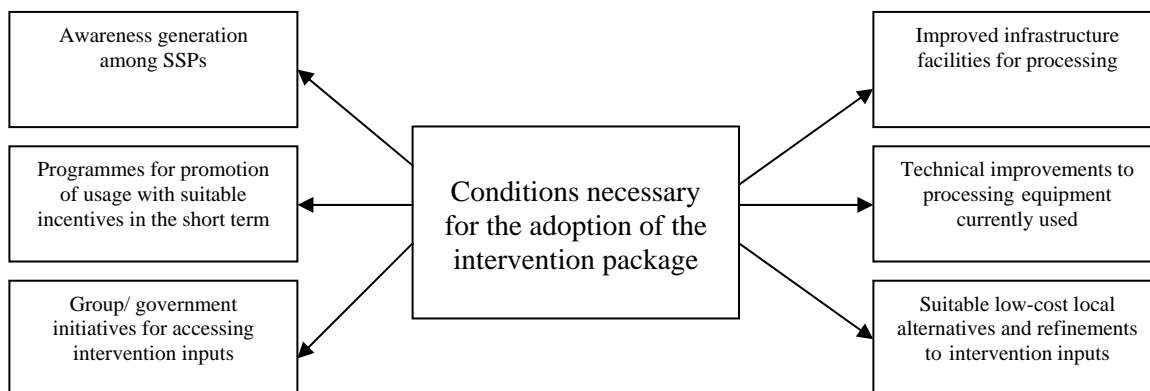
The team put together the constraints as voiced by the processors, and looked at the options for overcoming these constraints (Table 6). The processors provided some ideas, but the common attitude seemed to be that the government or some development agency should provide all inputs either as a loan or as a grant. Discussions with the Department of Fisheries officers showed some scope for obtaining support to the SSPs in overcoming the problem of losses, but the team felt that initiatives should be forthcoming from the processors themselves. Also, not all constraints were linked to financial investment: there were many others – such as technical improvements to the existing processing infrastructure, or improving the general hygiene and cleanliness of the environment – where the processors need to take an active hand. The role of development agencies would be important to ensure that the package of interventions was supported through suitable incentives for a short time, in order that the processors understand the benefits.

| ACTIVITY                              | CONSTRAINTS FOR UPTAKE   | OPPORTUNITIES FOR ADOPTION  |
|---------------------------------------|--|---|
| Using treated seawater                | <ul style="list-style-type: none"> <li>❖ Lack of awareness</li> <li>❖ Availability of bleaching powder</li> <li>❖ Extra cost/additional cost</li> </ul>  | <ul style="list-style-type: none"> <li>✓ Awareness generation</li> <li>✓ Group/Govt. initiatives for procurement and sale</li> <li>✓ Programmes for promotion of usage with suitable incentives in the short term<sup>5</sup>?</li> </ul> |
| Washing vats regularly                | <ul style="list-style-type: none"> <li>❖ Availability of water</li> <li>❖ Extra effort and labour</li> <li>❖ No drainage facility for vats</li> <li>❖ Most vats buried in sand (AP)</li> <li>❖ Fragility of vats (OR)</li> <li>❖ Salt requirement is more for fresh brine each time</li> </ul> | <ul style="list-style-type: none"> <li>✓ Group/ govt. initiatives</li> <li>✓ Technical improvements</li> <li>✓ Infrastructure improvements</li> <li>✓ Programmes for practical demonstration and support to SSPs?</li> </ul>              |
| Washing fish twice                    | <ul style="list-style-type: none"> <li>❖ Availability of water</li> <li>❖ Extra labour &amp; time</li> <li>❖ Increased slush in the processing areas</li> </ul>  | <ul style="list-style-type: none"> <li>✓ Group/govt. initiatives</li> <li>✓ Programmes for practical demonstration to SSPs</li> <li>✓ Infrastructure improvements</li> </ul>  |
| Use of plastic sheet for keeping fish | <ul style="list-style-type: none"> <li>❖ Investment on plastic sheet</li> </ul>  | <ul style="list-style-type: none"> <li>✓ Increased returns through reduced losses</li> <li>✓ Suitable low-cost local alternatives</li> </ul>  |
| Maintaining brine concentration       | -  | -   |
| Trays and weights                     | <ul style="list-style-type: none"> <li>❖ Irregular shape of vat (OR)</li> </ul>  | <ul style="list-style-type: none"> <li>✓ Technical improvements</li> </ul>  |
| Lids to cover the vats                | <ul style="list-style-type: none"> <li>❖ Heavy</li> <li>❖ Cost of lids</li> </ul>  | <ul style="list-style-type: none"> <li>✓ Technical improvements</li> <li>✓ Suitable low-cost local alternatives</li> <li>✓ Programmes for practical demonstration and support to SSPs?</li> </ul>   |
| Stackable racks                       | <ul style="list-style-type: none"> <li>❖ Too small for drying larger quantities</li> <li>❖ Cost of rack</li> <li>❖ Space for stacking inside homes (OR)</li> </ul>   | <ul style="list-style-type: none"> <li>✓ Improved quality of smaller quantities (better returns)</li> <li>✓ Suitable low-cost local alternatives</li> <li>✓ Programmes for practical demonstration and support to SSPs?</li> </ul>        |
| Mats                                  | -  | -   |

**Table 6: Constraints for uptake of the intervention package and opportunities for adoption**

Summing up the opportunities for overcoming the problems, the team came up with a list of six conditions, which required being in place for a successful adoption of the intervention package. These conditions are depicted in Figure 1.

<sup>5</sup> The direct benefit from the package would be reduction of losses, which, however, is hard to quantify or perceive in the short-term by the SSPs. Loss reduction is cumulative effect of the package as a whole, which makes it difficult to pinpoint the usefulness of any or some of the inputs. In the long-term, it is expected that the SSPs would start using the intervention package without any incentives, as the benefits become more obvious.



**Fig 1: Conditions necessary for the adoption of the intervention package**

### 6.3 Ranking of the field-sites according to their access to the six conditions

Taking the presence or absence of these six conditions at each site into consideration, the team tried to judge how the intervention package would be likely to fare in the field-sites. This would provide a functional – albeit subjective – basis for appraising the uptake of interventions in due course, depending on how the increased availability of these inputs would facilitate adoption.

| CONDITIONS NECESSARY FOR UPTAKE  | TEAM’S RANKING OF THE FIELD-SITES IN ANDHRA PRADESH AND ORISSA |   |   |   |   |   |
|--|--|---|---|---|---|---|
|  | A  | B | C | D | E | F |
| 1. Awareness generation  | 3  | 2 | 3 | 3 | 2 | 2 |
| 2. Programmes for promotion of usage with suitable incentives            | 3  | 1 | 1 | 2 | 1 | 2 |
| 3. Group/Govt. assistance to SSPs in obtaining intervention inputs       | 3  | 1 | 2 | 3 | 2 | 2 |
| 4. Infrastructural facilities for processing                             | 2/3  | 3 | 1 | 3 | 1 | 1 |
| 5. Technical improvements to existing processing infrastructure          | 2  | 2 | 2 | 1 | 1 | 2 |
| 6. Suitable low-cost alternatives and refinements to intervention inputs | 2  | 2 | 2 | 2 | 1 | 2 |
| <b>RANKING</b>   | 1  | 3 | 3 | 2 | 4 | 3 |

**Table 7: Ranking of field-sites according to their access to the six conditions**

A: Suradapeta-Mayapatnam B: Konapapa Peta C: Chodipalli Peta D: Chandrabhaga E: Balipantal F: New Bakshipalli

**RANKING:**

1: The required condition is accessible/available to a limited extent only; 2: The required condition is accessible/available to a moderate extent; 3: The condition is accessible/available to a high degree.

### 5.4 Support agencies for a sustainable uptake of the intervention package by SSPs

The field-testing was carried out in six sites, and being only a testing phase, could not already start thinking in terms of taking interventions to a higher level at this stage. But it was likely that the SSPs would find the package useful – the team found enough evidence to support such an assumption – in which case, there was a need to take the lessons to a wider cross section.

The Department of Fisheries is specifically mandated to work for the development of the fisherfolk. The Department has the necessary infrastructure, manpower, and more importantly, the reach. It is the only organisation that can take up any programme sufficiently big enough to cover the SSPs in all parts of the state. Their extension services are well placed to take up the promotion of the intervention package at the village-level. An important factor that emerged in discussions with the Department of Fisheries officers was that there was no single programme with any of the government agencies aimed at assisting specifically the SSPs in any manner<sup>6</sup>.

The NGOs, on the other hand, might not have the reach and the manpower that is available to the government organisations, but have the confidence and trust of the fisherfolk. Working at the grass-root level, the NGOs are able to identify the needs of the SSPs, and make the necessary site-specific refinements to the intervention package.

There are many other agencies – banks, research institutes, funding agencies – which can play a significant role in the wider uptake and sustainability of the intervention package (Table 8).

| Activity   | Possible support agencies   |
|--|---|
| 1. Awareness generation  | NGOs, Department of Fisheries, CBOs <sup>7</sup> , Academic and educational institutions                |
| 2. Programmes for promotion of usage with suitable incentives in the short term    | Department of Fisheries, Department of Rural Development, Panchayat Raj <sup>8</sup> institutions, NGOs |
| 3. Group/Govt. initiatives for assistance to SSPs in obtaining intervention inputs | Department of Fisheries, Department of Rural Development, NGOs, CBOs, financial institutions            |
| 4. Infrastructural facilities for processing                                       | Department of Fisheries, Panchayat Raj institutions   |
| 5. Technical improvements to processing infrastructure currently used              | Research agencies, Department of Fisheries, SSPs  |
| 6. Suitable low-cost local alternatives and refinements to intervention inputs     | Research agencies, NGOs, Department of Fisheries, CBOs, SSPs  |

**Table 8: Possible support agencies for assisting the SSPs in adoption of the intervention package**

### **6.5 Refinements to the intervention package based on the field-testing experiences**

The team’s emphasis during the field-testing had been to demonstrate the concept rather than the actual input, so that if the processors felt that the input served some purpose, they could always make modifications to it depending on their need. During the field-testing period, a number of refinements still needed to be made to the intervention package to ensure that the processors understood the concept clearly. While some of these – such as the wooden trays to immerse fish – could be easily attempted at the field-sites, some others were not so easy. The processors themselves often suggested low-cost or better alternatives to the inputs shown.

<sup>6</sup> The Development of Women and Children in Rural Areas (DWCRA) programme does assist SSPs among others, but does not specifically target their needs, and the fisherwomen’s access to this programme varies widely from area to area.

<sup>7</sup> Community-based organisations

<sup>8</sup> Local self-government institutions

The following is a list of refinements to the intervention package as suggested by the processors, or by the team based on the processors' responses to the inputs.

| <b>Activity</b>                                     | <b>Refinements required</b>   |
|---|---|
| 1. Video on losses                                  | Editing to avoid repetitions<br>Duration of film to be reduced to about 20 minutes<br>Add shots of people using intervention package (as a 'before' and 'after' narrative?) preferably shot on the east coast.<br>Dub into local languages  |
| 2. Using treated seawater                           | -   |
| 3. Cleaning of vat                                  | Vats to be constructed with a drain hole for easy washing (AP)  |
| 4. Washing of fish more often with treated seawater | -   |
| 5. Gutting on plastic sheet                         | -   |
| 6. Monitor brine concentration                      | -   |
| 7. Placing of frames & weights                      | Testing with a tray made of 4-6 concentric circles of bamboo, which are detachable to fit into the vat properly in Orissa.  |
| 8. Covering with lids                               | Cement lids to be made less heavy (AP).<br>Field-test the two-piece lids from Andhra Pradesh in Bakshipalli.<br>Testing with alternate – less heavy – material for making lids (OR) such as earthenware lids or plastic sheet (Balipantal). |
| 9. Drying on elevated surfaces (stackable racks)    | Cheaper alternatives – using locally available materials – to be tested.  |
| 10. Mats  | -   |
| 11. Value-added products                            | To be explored further, and require inputs beyond the scope of the field-testing phase.   |

**Table 9: Refinements required to the intervention package**

## 7. USEFULNESS OF THE INTERVENTION PACKAGE DURING NON-MONSOON MONTHS:

| Activity   | During Monsoons | During Non-monsoons | Remarks  |
|--|-----------------|---------------------|--|
| 1. Using treated seawater                            | Yes             | Yes                 | Reduces contaminants in the water  |
| 2. Cleaning of vat                                   | Yes             | Yes                 | Reduces contamination in the vat   |
| 3. Washing of fish<br>- Once <sup>9</sup><br>- Twice | Yes<br>Yes/No   | Yes<br>Yes/no       | Reduces contamination and filth in fish<br>If water is a constraint, the SSPs may do one washing, after gutting                      |
| 4. Gutting on plastic sheet                          | Yes             | Yes                 | Reduces dirt on fish, and helps obtain a cleaner product   |
| 5. Monitor brine concentration                       | Yes             | Yes/No              | In non-monsoon months, brining is often accompanied by drying, reducing brining time, and need for maintaining proper concentration. |
| 6. Placing of frames & weights                       | Yes             | Yes                 | Adequate brine over the fish.  |
| 7. Covering with lids                                | Yes             | Yes/No              | Rainwater seepage would not be a problem in non-monsoon months, but the lid could have other advantages.                             |
| 8. Drying in elevated surfaces                       | Yes             | Yes                 | Faster drying helps reach market quicker.  |
| 9. Mats  | Yes             | Yes                 | Faster drying rate, and easier removal of fish   |
| 10. Value-added products                             | Yes/No          | Yes/No              | Uncertainties involved.  |

**Table 10: Usefulness of the intervention package during non-monsoon months**

<sup>9</sup> Already practised in many villages



## 8. VALUE-ADDED PRODUCTS AND AIG OPTIONS DURING MONSOON PERIODS

### 8.1 Objectives

The field-testing team discussed options for undertaking production and marketing of new value-added products by SSPs during monsoon periods. In most field-sites, the small-scale processors had no prior exposure to the opportunities for production of new items with fish, and discussing with them the possibilities of starting any enterprise – of whatever nature – with new products would not be very fruitful, unless they had some idea of the opportunities. Consequently, a demonstration of one or two simple value-added products was done at each field site (except in New Bakshipalli), followed by a discussion with the processors about the possibilities of taking up value-addition as an alternate income-generating venture.

Basically, the two objectives of the value-addition exercise were:

- (iii) to give an idea to the SSPs of the scope for production and marketing of value-added products, which might be taken up as a group venture or individually, and
- (iv) to enable the SSPs to use the small quantities of monsoon landings to make ready-to-eat products for domestic consumption, which could reduce their expenditure on food.

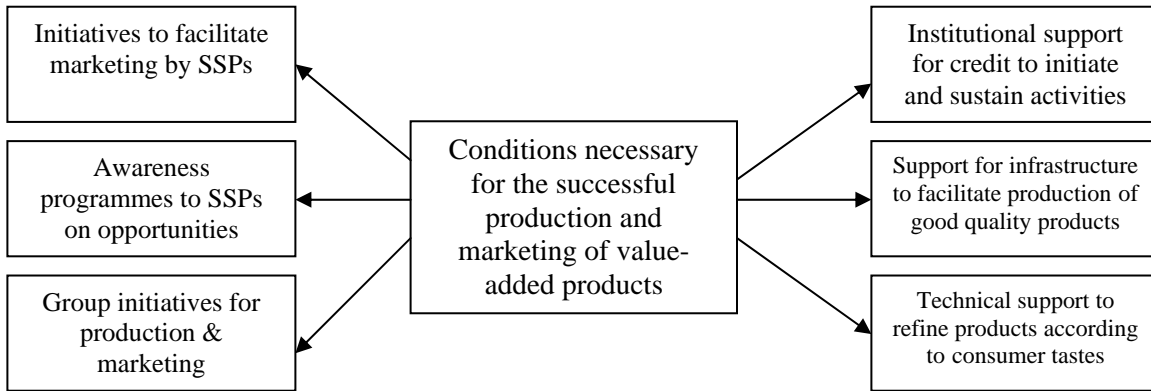
### 8.2 Constraints for uptake

The exposure of processors in different field sites to value-addition varied. The SSPs in Suradapeta-Mayapatnam had previous exposure to making new products, and they were also in the process of taking up commercial ventures with the help of NGOs. In Bakshipalli, some of the processors had undergone training at the local College of Fisheries about 4 years ago, but there had been no initiatives to use the skills for income-generation. The team felt that it might be more useful to discuss why the previous training failed, rather than to demonstrate a few more products of its own. In Chandrabhaga, there had been some previous exposure to manufacture of new items, without any concrete outcome. The other three field sites, Konapapa Peta, Chodipalli Peta, and Balipantal, had no previous exposure to the concept of production and marketing of new products. The differences in the experiences of the various groups made it possible for the team to explore the constraints and opportunities as perceived by the processors.

| ACTIVITY             | CONSTRAINTS FOR UPTAKE   | OPPORTUNITIES FOR ADOPTION  |
|----------------------|--|---|
| Value-added products | <ol style="list-style-type: none"> <li>1. Lack of awareness to the SSPs</li> <li>2. Lack of suitable grass-root level organisations.</li> <li>3. Technical expertise</li> <li>4. Lack of financial support</li> <li>5. Lack of infrastructure</li> <li>6. Marketing constraints</li> </ol> | <ul style="list-style-type: none"> <li>• Awareness programmes</li> <li>• Group initiatives to promote, produce and market the products</li> <li>• Technical support to refine products according to consumer tastes</li> <li>• Credit support for initiating and sustaining the activities</li> <li>• Support for infrastructure to facilitate production of good quality products</li> <li>• Marketing facilitation</li> </ul> |

Table 11: Constraints and opportunities for value-addition

### 8.3 Conditions necessary for the uptake of value-added enterprises by SSPs



**Figure 2: Conditions for uptake of value-added production and marketing**

1. *Initiatives to facilitate marketing by SSPs:* There have been many attempts in the past where development agencies – particularly government agencies – tried to encourage new products by entering into marketing themselves, often with disastrous results. The team felt that the government could play a meaningful role by facilitating the marketing ventures by SSPs – through holding periodical exhibition-cum-sales programmes, setting up marketing outlets at important centres, and ensuring that the SSPs could take advantage of such ventures for a nominal fee<sup>10</sup>.
2. *Awareness programmes to SSPs on opportunities:* The team found that in most of the field-sites simple improvements to the existing processes could yield very positive benefits in terms of improving the quality of the product significantly. The use of bleaching powder was a case in point: once the processors became aware of the benefits, they started using it with unflinching regularity. For many processors, fish were only to be sold fresh, or dried, or salted, and the potential for using it for other purposes would need to be demonstrated.
3. *Group initiatives:* This was found to be an important requirement for a successful enterprise. The current individualistic practices might not hold when new markets are targeted for the new products, and group initiatives, besides helping in fine-tuning the production and marketing aspects, would also help in reducing the risk of losses, as seen in Chandrabhaga and Bakshipalli.
4. *Institutional credit:* The SSPs prefer short cycle time because the returns from one cycle would provide the working capital for the next cycle. Any upset in the market would reduce their purchasing power for the next cycle. Under such conditions, where there are little surpluses, it would be very difficult for the SSPs to undertake any new enterprise, however lucrative it might be. If credit were to be extended for such enterprises, not only would the processors be able to undertake the ventures, but also ensure that the ventures were planned along the right lines, incorporating other important issues such as market promotion. Moreover, the fact of someone willing to support the initiatives with financial support would be a morale booster.
5. *Infrastructure to facilitate production of good quality products:* The infrastructure facilities in most test-sites were so poor that it would be really difficult for the SSPs to make better

<sup>10</sup> The efforts of the Andhra Pradesh state government in setting up DWCRA bazaars and Rythu Bazaars (Farmers' markets) are a good example.

quality products, even if they had the necessary awareness and expertise. Most processing is carried out in very unhygienic conditions, and the quality of the product depends as much on the processing methods as the conditions existing in the area. While this would be a major constraint to reducing losses in the traditional processing sector itself, its influence on any new ventures would be catastrophic. Access to clean and hygienic environment, clean water, proper processing and drying areas, and waste disposal systems, would be essential prerequisites for any enterprise to succeed.

6. *Technical refinements to the products:* The products would require fine modifications from area to area, and the processors can attempt this, if they understood the technical aspects clearly. Also, innovations are an important necessity in overcoming the competition in the markets. To make innovative products, the processors would need to be very knowledgeable and adaptive.

The interactions with the processors on the issue of new products gave a clear indication to the team that unless the six issues discussed here were tackled, it was unlikely that much could be expected in this regard.

Discussions on the potential for use of ice for storage of fish (i) during times of rain, and (ii) for sale of fish in fresh condition found lukewarm response from the processors. For reasons explained in this section and the next, with regard to value-added products and AIG options, the processors were not interested in any employment other than processing.

#### **8.4 Alternate income-generating options**

On the issue of alternate income-generation during monsoon periods, the processors were seen to have their own valid reasons to prefer fish processing to everything else. In Suradapeta-Mayapatnam and New Bakshipalli, some processors took up other employment, such as working as wage labourers in agriculture, but the processors were not clearly happy at the prospect. In Balipantal, for all practical purposes, fish processing itself was an alternate income-generating activity during monsoon, but in all other sites, most processors would prefer to continue with fish processing or simply stay at home, rather than venture out into other areas. The need for consumption loans was reportedly high during monsoon periods, although the amounts borrowed – often from friends and relations in the village – were not considered very big by the processors.

Based on the interactions with the processors, the team put together a few points regarding why the SSPs preferred fish processing in general, what problems they faced during monsoons, and what constraints they had for taking up alternate work, which are given below:

*On why SSPs generally prefer fish processing to any other alternatives:*

- ❑ Fish processing is their traditional occupation, and they are most familiar with it.
- ❑ It is a way of life, one into which most of them are born.
- ❑ Directly related to their husband's occupation.
- ❑ Little investment required.
- ❑ Short cycle times mean quick returns.
- ❑ Is profitable in its own way.
- ❑ It is a predominantly community-based activity.
- ❑ Informal production and marketing systems.
- ❑ Good demand for the product.

- ❑ It can be undertaken at their leisure and can be done within the village itself.
- ❑ Does not disturb the routine of childcare and household chores.

For women in single-headed households, and for destitute women, fish processing was the single most important income earner. Any other work would either require larger investments, or going out of the village, both of which were not practicable.

*On the conditions that prevail during monsoons:*

- ❑ Irregular supplies – often not sufficient for the purpose.
- ❑ Risk of loss is high because of inability to process properly.
- ❑ Rotation of capital is less and investment capacity reduces as a consequence.
- ❑ When small quantities land, demand increases, forcing the investments to go up.
- ❑ When large quantities land, market fluctuations take away the profits.
- ❑ A persistent need to generate income to support the family as fishing income is reduced.
- ❑ Increased borrowings.

*On the constraints for uptake of alternate income generating activities:*

- ❑ Alternate avenues not easy to come by.
- ❑ Wages paid in other sectors low when compared to processing activities.
- ❑ Many uncertainties are involved.
- ❑ Inability to take risks.
- ❑ Lack of skills to undertake any other work.
- ❑ Intermittent fish landings permit fish processing at – albeit irregular – intervals.
- ❑ Cultural reasons: it is often regarded as beneath their dignity to work in any other sector.

The processors' resolve to 'sink or swim' with fish processing through the monsoon periods could be taken to mean either of these three things:

- (i) They were confident of obtaining fish one way or the other;
- (ii) They could survive during lean periods without too much hardship in spite of lack of fish;
- (iii) They were helpless to do anything, and were not even aware of any feasible alternatives, and continue with what they knew best.

Reason (i) was ruled out by the fact that during the field-testing period, fishing was so badly affected due to rough sea conditions that in some of the villages – such as Konapapa Peta – not even one processing cycle could take place even 20 days after the completion of the field-testing.

Reason (ii) was not valid considering the SSPs' constant refrain that monsoon period was the worst season of the year for them, causing enormous hardship and losses. Almost every processor mentioned that she would be forced to borrow money for consumption needs during the period. The previous phases of the research also indicated this.

This leaves reason (iii), which, if true, would need to be a cause for concern for any development agency working with coastal fisherfolk. This would mean that, the apparent nonchalance of the processors was more a sign of helplessness, and would need to get a priority.

## 9. RESEARCHABLE CONSTRAINTS IN REDUCING FISH LOSSES DURING MONSOON PERIODS

### 1. *Effect of chelating agents in the water used for fish processing*

Presence of metal in water used for fish processing can lead to serious problems such as oxidation leading to subsequent browning, struvite crystal formation, and discoloration (bluing and greening). A simple and cost-effective method to bind the metals would be useful in small-scale fish processing sector in improving the quality of processed fish.

The presence of metals in water used for processing was observed in Chandrabhaga, Orissa.

### 2. *Composition of 'self-brine' and factors affecting its stability*

The water released from fish during the process of salting is usually saturated salt solution. In addition, it contains nitrogenous water and salt soluble fractions and excess of undissolved salt. Further studies on self-brine characteristics and efforts towards its reusability will be beneficial to the small-scale processors in making the process more cost-effective.

Formation of self-brine and its reuse for the next cycle were observed in all field-sites.

### 3. *'Brining as a method of long-term preservation of fish*

Pickle curing of fish is well established as a method of processing seasonal glut catches. The product is packed with dry salt and possesses a tough texture. A method to keep the product immersed in salt brine would result in a softer textured product after desalting. Packing in transparent bags or bottles as in the case of other brined products like lime and eggs would serve as a value-addition. The bulkiness of the product and the fragility of containers will need a careful consideration before this can be undertaken by small-scale processors as an income-generating venture.

Pickle curing of fish was observed in three field-sites in Andhra Pradesh.

### 4. *Development of an appropriate method for preservation of sardines*

During monsoons, when glut landings of sardines occur, small-scale processors face a number of problems related to not being able to process the fish properly as a result of its high oil content, which results in a poor quality product that can only be sold for fishmeal or manure. A simple method to overcome the drawbacks in processing sardines is needed for effective utilisation of the one single species, which dominates the catches during monsoons. The viability of pressing salted fish or any other simple method would reduce post-harvest losses significantly.

Glut landings of sardines was a regular feature in all field-sites in Andhra Pradesh and Orissa.

## 10. LESSONS LEARNT

Any exercise where the flow of information was one-sided cannot be a participatory one. This was particularly true in case of this field-testing, where the inputs might have been technically sound, but their usefulness in the field was to be decided based upon the processors' responses to them. Thus, the field-testing exercise was a period of learning to the members of the team, and the lessons learned will have relevance while undertaking any similar programmes in the future. Those of the lessons, which have a direct relation to the intervention package, are discussed in the Field Notes, here an attempt has been made to put together the general lessons.

1. *The practical experience of the processors was often more appropriate than the 'objectively verifiable' assumptions of an external agency.* This was proved to be the case with respect to the use of salt for brining and dry-salting purposes, and the team accepted that the processors had a good knowledge of the quantity of salt to use, because they knew what the markets wanted.
2. *A strong grass-root level organisation would be essential for the success of any intervention.* The rapid uptake of some of the field-tested inputs in Suradapeta-Mayapatnam owes much to the fact of strong women's groups in the village. The interest shown by the processors towards the field-testing, at least in the initial stages, in Chandrabhaga and Balipantal, owes as much to the fact of the existence of a group as on the specific interventions. The intervention inputs would succeed or fail based on their merits and relevance in due course.
3. *Flexibility is an important ingredient in tackling any situation: compromises may be required.* The processors were not interested in two washings – one prior to, and another after, gutting – for several reasons. Also, processors in Chandrabhaga and Konapapa Peta were observed to touch sand once in a while to prevent fish slipping from their hands. The team's advice to wash fish before gutting, and not to touch sand during gutting, was not very fruitful: it took far longer to gut the fish, and the processors had difficulties in doing it. The team decided that the amount of contamination as a result of not being able to wash before gutting and touching sand might not be very significant, hence could be left to the processors' choice, provided that a thorough washing was done after gutting operations.
4. *Do not intervene at too many steps at the same time.* It could be possible that there were many things which needed an improvement, but the team should be careful in not getting into too many things at the same time. Besides getting sidetracked from the objectives of the exercise, it was also possible that the processors would get fed up with the 'preachers' and throw away the teachers along with the treated water.
5. *Knowledge of local practices and resources and ethos prior to making an intervention are essential.*
6. *Not all development interventions are likely to succeed, nor are they expected to.* Particularly when a menu of interventions was being tested, the intention would be to study why some of the inputs were taken up while others were rejected, rather than to ensure the success of all inputs. The development agency's role is to understand the causes for success or failure, and learn from the experience.
7. *It is the concept behind an input, rather than the actual input itself, that is important.* Demonstration of specific inputs would often yield a mixed response. The important thing is to ensure that the target groups understood the underlying principles of a tool, so that even if

the tool itself was rejected, they could still make use of the concept, and make a better alternative to the tool by themselves.

8. *Although the intervention package tries to address a particular group of individuals, it requires the active participation of a large number of other stakeholders for a successful uptake by the target groups.* The team felt that if the intervention package aimed exclusively at the SSPs, it would not be able to achieve its objectives, unless the other participants in the process – fishermen, village elders, and traders – were also encouraged to adopt certain practices. Generally, the fishermen on arrival dump fish on the sand, which is a cause for contamination. This contamination will have an effect on the quality of the final product, over which the processor does not have any control. Similarly, an individual processor adopting new techniques like bamboo trays or cement lids cannot control the menace of infestation, unless the breeding places of the flies are not completely cleaned, which is a task for the village as a whole.
9. *It is not enough that awareness is generated among the target groups, but the required inputs should be accessible on a sustainable manner for a successful uptake.*
10. *Steady facilitation, monitoring and supply of inputs for a period must be ensured to help the adoption of inputs into their practices.*
11. *The choice of a site where an intervention is to be made should be done based on the opportunities for rapid uptake, and wider dissemination of the results.*
12. *The chances for uptake of a particular intervention are more if they are useful in the non-monsoon periods also.*
13. *Selection of the key players to take part in the field-testing plays a crucial role in the adoption or rejection of the intervention.* If the key participants in the exercise were active enterprising people, the scope for uptake of the intervention is more. It was found that if the selected processors understood the concept of the field-testing well, the team's task was made considerably less difficult, and the chances for rapid uptake of the useful interventions were more.
14. *In an informal production and marketing enterprise, a number of factors beyond the control of the key players may be at work, affecting the usefulness of the intervention.*

## **ANNEXES**



## ANNEX 1: Notes on Water Sanitation

Despite its ubiquity, water (that is, the safe and potable variety) is not always available and obtaining clean and potable water in whatever quantities is a major problem in many coastal village. Concerns about the quality of water used in food processing have increasingly focused attention on methods for treating water.

Compounds containing chlorine are by far the most common means of disinfecting water is used in food industry. The antibacterial active moiety that forms when a chlorine containing compound is added to water is hypochlorous acid which dissociates into  $H^+$  and the hypochlorite ( $OCl^-$ ) anion.

| Compound             | Available chlorine (%) |
|----------------------|------------------------|
| Gaseous chlorine     | 100                    |
| Sodium hypochlorite  | 1-7                    |
| Calcium hypochlorite | 35                     |
| Chloramine - T       | 25                     |
| Chlorine dioxide     | -                      |
| Cyanurates           | 70                     |

Table 1: Chlorine containing compounds used as sanitizers

The range of micro-organisms killed by chlorine based sanitizers is probably broader than any other approved sanitizer. Bacterial spores are more resistant than vegetative cells and gram positive bacteria such as *Staphylococcus aureus* tend to be more resistant than gram negative species. Fungal spores appear to be slightly more resistant to hypochlorites than vegetative cells of bacteria, perhaps as a result of greater difficulty in penetrating the spore coat.

Chlorine concentration, pH, temperature, presence of organic matter decide the antibacterial activity.

Proposed mechanisms of chlorine antimicrobial activity:

- Oxidative effect
- Formation of toxic chloramines
- Precipitation of cell permeability
- Precipitation of bacterial protein
- Prevention of enzyme regeneration activity.

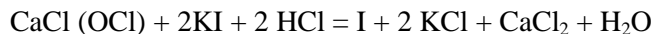
Hypochlorites are the frequently used forms of chlorine, with sodium hypochlorite having the broadest applications despite some of its disadvantages.

| Advantages  | Disadvantages   |
|---|---|
| <ul style="list-style-type: none"> <li>• Broad spectrum of activity</li> <li>• Approved in food processing</li> <li>• Inexpensive</li> <li>• Easy to use</li> </ul> | <ul style="list-style-type: none"> <li>• Corrosive</li> <li>• Possible discoloration</li> <li>• May oxidise lipids</li> <li>• Inactivated by organic matter</li> <li>• Possibility of formation of trihalomethanes and other reaction products</li> </ul> |

Table 2: Advantages and disadvantages of hypochlorites

For household purposes, commercial bleaching powder containing about 5% available chlorine is used. Bleaching powder is a mixture, the most important constituents being two double salts – Ca (OCl<sub>2</sub>) and CaCl<sub>2</sub>. Its formula is more conveniently written as CaCl (OCl) or CaOCl<sub>2</sub>. In addition to this salt, bleaching powder contains a considerable amount of lime and small amounts of Ca(ClO<sub>3</sub>)<sub>2</sub> and CaCl<sub>2</sub>.

The determination of active chlorine is done based on the following reaction:



The iodine liberated (the amount of which is equivalent to the amount of active chlorine in the bleaching powder) is titrated with thiosulphate in the presence of starch. Accurate results cannot be obtained by determination of active chlorine in an aqueous extract of bleaching powder, because lime strongly adsorbs certain chlorine compounds. A suspension must therefore be used.

Excellent reviews are available on this subject. An authoritative and indepth information is given by Mercers and Somers (1957), White (1972) and Dychdala (1991). An account on the use of chlorine compounds as a surface-active agent is given by Cutter and Siragusa (1965), Lillard (1979) and Lin *et al* (1996). The effect of chlorine compounds on protein and amino acids is given by Tan *et al* (1987). Enormous work on the chlorination of waters and its impact on health and environment has been carried out and plenty of data is available in conference proceedings and reports. The FDA-USA has approved hypochlorites for use in food contact surfaces, utensils.

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**ANNEX 2: Travel schedule for field-testing****Andhra Pradesh**

| <b>DATE</b> | <b>LOCATION</b>       | <b>ACTIVITY</b>  |
|-------------|-----------------------|--|
| 29.6.99     | Mangalore             | Dr Srikar/Sudhakara depart for Kakinada  |
| 1.7.99      | Kakinada              | Arrival: Kakinada<br>Planning schedule of activities for Andhra Pradesh  |
| 2.7.99      | Suradapeta-Mayapatnam | 1 day: Meeting with SSPs, demonstration of inputs and video<br>Preparing vats for salting  |
| 3.7.99      | Suradapeta-Mayapatnam | 2 day: Processing operations in the three vats by SSPs<br>Discussions with women's groups<br>Arrangements for value-addition demonstration   |
| 4.7.99      | Suradapeta-Mayapatnam | 3 day: Observe second cycle of operations<br>Check brining operations<br>Stackable racks<br>Demonstration of value-added products<br>Discussion with youth groups and village elders |
| 5.7.99      | Suradapeta-Mayapatnam | 4 day: Observe second cycle of operations<br>Discussions with processors on perceptions  |
|             | Kakinada              | Discussion: Lessons learnt<br>Reporting format<br>Report writing for Suradapeta-Mayapatnam   |
| 6.7.99      | Konapapa Peta         | 1 day: Meeting with SSPs, demonstration of inputs<br>Preparing vats for salting operations   |
| 7.7.99      | Konapapa Peta         | 2 day: Procurement of fish from Uppada<br>Processing operations in two vats<br>Video film; arrangements for value-added demonstration  |
| 8.7.99      | Konapapa Peta         | 3 day: Brine concentration tested  |
|             | Chodipalli Peta       | 1 day: Meeting with SSPs   |
|             | Suradapeta-Mayapatnam | Review of progress   |
| 9.7.99      | Konapapa Peta         | 4 day: Stackable racks and mats<br>Discussions with processors on perceptions  |
|             | Kakinada              | Discussion: Lessons learnt<br>Report writing for Konapapa Peta   |
|             | Chodipalli Peta       | Discussions with processors about appropriate time for field-testing; preparations for next day  |
| 10.7.99     | Chodipalli Peta       | 2 day: Demonstration of value-added products   |
| 11.7.99     | Chodipalli Peta       | 3 day: Processing operations in three vats with processors<br>Procurement of some fish from Kakinada   |
| 12.7.99     | Chodipalli Peta       | 4 day: video   |
| 13.7.99     | Chodipalli Peta       | 5 day: Removal of fish from brine; keeping on stackable racks  |
|             | Konapapa Peta         | Check out fish landings and second processing cycles   |
|             | Kakinada              | Report preparation   |
| 14.7.99     | Chodipalli Peta       | Discussions with processors on intervention package  |
|             | Kakinada              | Final discussions on the field-testing and report preparation<br>Departure for Bhubaneswar   |

**Orissa:**

| DATE    | LOCATION           | ACTIVITY   |
|---------|--------------------|--|
| 15.7.99 | Konark             | Arrival: Konark<br>Planning schedule of activities for Orissa  |
| 16.7.99 | Chandrabhaga       | 1 day: Meeting with SSPs, demonstration of inputs and video<br>Preparing vats for salting<br>Meeting with Asst Director of Fisheries, Puri   |
| 17.7.99 | Chandrabhaga       | 2 day: Second meeting with processors<br>Field-testing intervention package with SSPs  |
| 18.7.99 | Chandrabhaga       | 3 day: Stackable racks and mats<br>Observing second cycle of operations<br>Preparations for value-addition demonstration   |
| 19.7.99 | Chandrabhaga       | 4 day: Value-addition demonstration<br>Observing second cycle of operations<br>Discussions with processors on perceptions  |
| 20.7.99 | Balipantal         | 1 day: Discussions with groups to decide a plan of action<br>Introduction to the programme<br>Interaction with fisherfolk on disposal patterns of fish                               |
| 21.7.99 | Balipantal         | 2 day: Cleaning of vats<br>Showing of video<br>Field-testing interventions<br>Demonstration of brining<br>Interaction with processors and fisherfolk                                 |
| 22.7.99 | Balipantal         | 3 day: Stackable racks<br>Brining process<br>Demonstration of value-added products<br>Interaction with processors about monsoon losses<br>Discussions with processors on perceptions |
| 23.7.99 | Konark             | Report writing   |
| 24.7.99 | To Gopalpur on Sea |  |
| 25.7.99 | New Bakshipalli    | 1 day: Meeting with women's groups<br>Preparations for the field-testing<br>Video film   |
| 26.7.99 | New Bakshipalli    | 2 day: Field-testing of intervention package   |
| 27.7.99 | New Bakshipalli    | 3 day: Demonstration of brining<br>Report writing  |
| 28.7.99 | New Bakshipalli    | 4 day: Stackable racks<br>Discussions with processors on perceptions   |
|         | Berhampur          | Report writing<br>Venkatesh departs for Kakinada   |
| 29.7.99 | Berhampur          | Srikar and Sudhakara depart for Mangalore  |
| 30.7.99 |                    |  |
| 31.7.99 | Mangalore          | Arrive: Mangalore  |

**ANNEX 3: List of processors involved in field-testing**

## **I. Andhra Pradesh**

A. *Suradapeta-Mayapatnam* (2-5 July 1999)

Surada Sathiyamma  
Kare Nookamma  
Kambala Yellayamma

B. *Konapapa Peta* (6-9 July 1999)

Benugu Bangamma  
Kare Muthyalamma  
Kondela Bangamma

C. *Chodipalli Peta* (10-14 July 1999)

Koda Danayamma  
Marupilli Lakshmi  
Chokka Kasiyya (Male)

## **II. Orissa**

D. *Chandrabhaga* (16-19 July 1999)

Mailipilli Bandemma  
Chawwakula Gangamma  
Chepala Thotamma

E. *Balipantal* (20-22 July 1999)

Menaka Behera  
Parbati Behera  
Charulata Behera

F. *New Bakshipalli* (25-28 July 1999)

Souripalli Rajamma  
Kalaga Hemalatha  
Dase Enjamma

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**ANNEX 4: SCHEDULE FOR SITE-WISE FIELD-TESTING**

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**DAY I:**

- 10:00 Reach field site
  - Visits to selected processing sites
  - Arrangements for the field testing
- 14:00 Meeting SSPs and village leaders, to explain about programme
  - Discussion on good management practices
- 16:00 Video film
- 17:00 Daily summing-up

**DAY II:**

- 07:00 Arrival at field sites
  - Salting/brining process
- 15:00 Prepare vats and other equipment for the next cycle
- 16:00 Decide the value-addition programme for the village
- 17:00 Daily summing-up

**DAY III:**

- 09:00 Arrival at field site
  - Demonstrate/use stackable fish drying racks and mats with selected processors, if possible, or others, if not.
  - Check the brine in the vats and compare with traditional brine
- 14:00 Explore options for new initiatives, and for sustainable coping strategies with SSPs and record their responses
  - Iceboxes
  - Value-added products including manure (Demonstrate simple methods)
  - Discuss about what other inputs from which sources are important for coping strategies to succeed.
- 17:00 Daily summing-up

**DAY IV:**

- 09:00 Arrival at field site
  - Review progress with salting/brining/drying methods
  - Observe the selected processors doing the second cycle
- 11:00 Initiate discussion with local organisations – women’s group, NGOs, DOF etc – about possible follow-up measures
  - Summing-up discussion with processors – how do they perceive the interventions
  - Record responses
- 15:00 Discuss the changes to the programme for the next village, and draw up schedules of work.
  - Summing up
- 17:00 Report writing for the village.

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**ANNEX 5: Monitoring Form**

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**Monsoon losses of fish in small-scale post-harvest fisheries sector**

1. Date:
2. Name of the processor and village:
3. Number of processing cycles since last visit:
4. Utilisation of inputs:

| Activity   | Utilised/unutilised | Reasons for utilisation/non-utilisation |
|--|---------------------|---|
| 1. Cleaning of vat with water treated with bleaching powder      |                     |   |
| 2. Washing of fish with treated water before and after gutting   |                     |   |
| 3. Use of plastic sheet for gutting operations                   |                     |   |
| 4. Monitor brine concentration                                   |                     |   |
| 5. Placing of frames & weights for holding fish down             |                     |   |
| 6. Covering with lids to reduce infestation and seepage of water |                     |   |
| 7. Drying on stackable racks & mats                              |                     |   |

5. Marketing:
  - a. Place of sale:
  - b. Market response to the product made using improved processes:
  - c. Reasons for positive/negative response in the market:

6. Monitoring person's perceptions:

| Activity                | Remarks |
|-------------------------|---------|
| 1. Cleaning of vat with |         |

|  |  |
|--|--|
| water treated with bleaching powder                              |  |
| 2. Washing of fish with treated water before and after gutting   |  |
| 3. Use of plastic sheet for gutting operations                   |  |
| 4. Monitor brine concentration                                   |  |
| 5. Placing of frames & weights for holding fish down             |  |
| 6. Covering with lids to reduce infestation and seepage of water |  |
| 7. Drying on stackable racks & mats                              |  |



**ANNEX 6: Questionnaire for perceptions of processors**

| <b>Input</b>                    | <b>General impression of processor (1-5)</b> | <b>Does s/he think it is sustainable as of now? (Yes/No)</b> | <b>If no, constraints for uptake</b> | <b>Opportunities to overcome constraints</b> |  |
|---------------------------------|--|--|--------------------------------------|--|--|
| Water                           |  |  |                                      |  |  |
| Bleaching powder                |  |  |                                      |  |  |
| Washing                         |  |  |                                      |  |  |
| Use of plastic sheet            |  |  |                                      |  |  |
| Maintaining brine concentration |  |  |                                      |  |  |
| Regular cleaning of vats        |  |  |                                      |  |  |
| Trays and weights               |  |  |                                      |  |  |
| Cement lids                     |  |  |                                      |  |  |
| Stackable racks & mats          |  |  |                                      |  |  |
| Value-added products            |  |  |                                      |  |  |

3: Good 2: Average 1: Poor