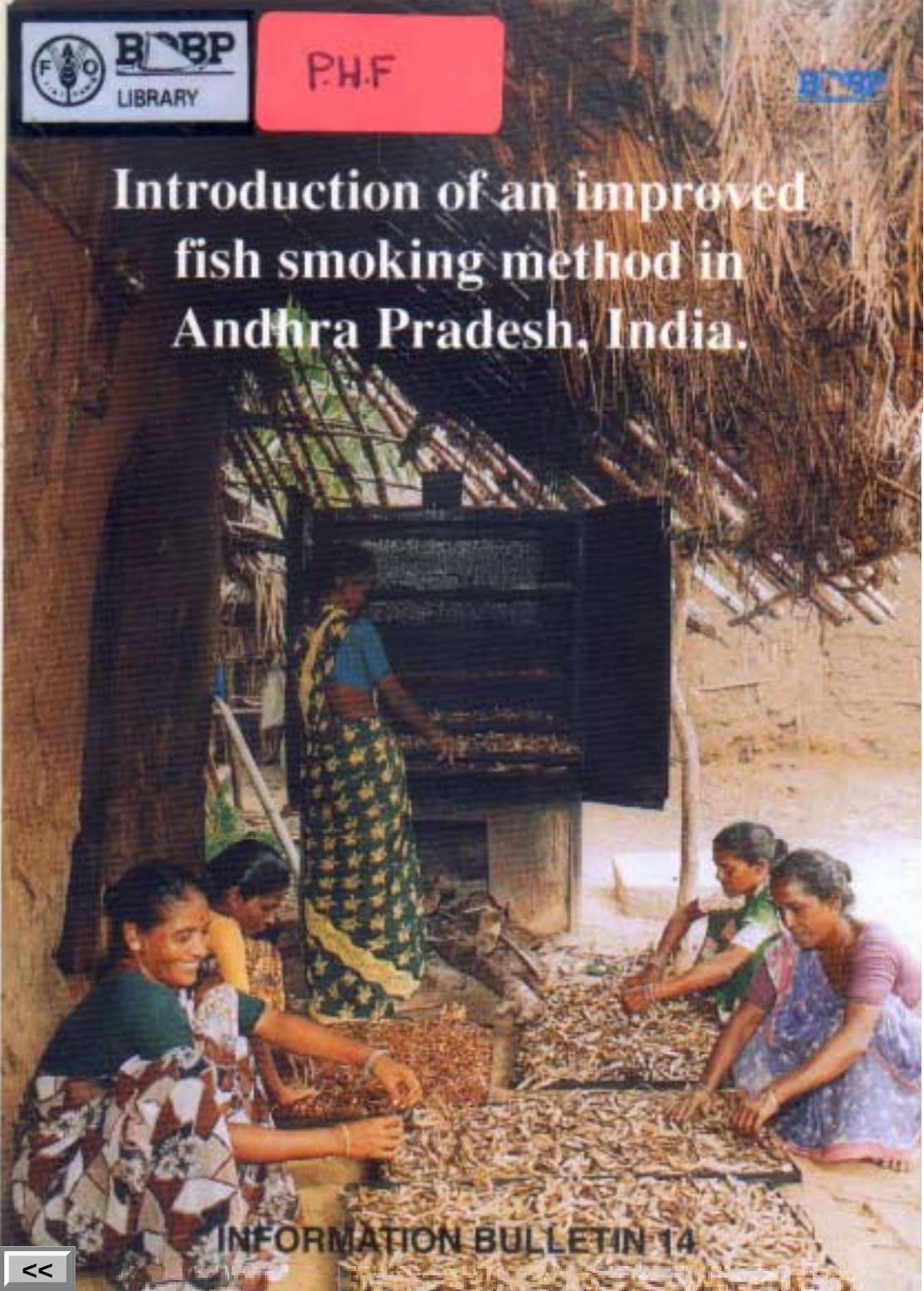
Introduction of an improved fish smoking method in Andhra Pradesh, India.



INFORMATION BULLETIN 14

Information Bulletin 14

Introduction of an Improved Fish Smokin Method in Andhra Pradesh,India

Post-Harvest Fisheries Project
Department for International Development
Chennai, India

<<

This report gives an account of the traditional fish smoking practices in Andhra Pradesh, India, and the findings of a DFID Post-Harvest Fisheries Project pilot study to develop an improved method of smoking based on existing practices, which at the same time is more efficient and cost-effective.

It summarises the trials and the comparative efficiencies of the traditional and improved kilns.

Activities under this study were taken up in two phases: Phase I, from June to December 1994, was mainly concerned with standardising a prototype design which is technically, economically and socially suitable for local conditions and practices, with the participation of the traditional processors. Stage Il. from February to May 1995, concerned developing a full tledged smoking kiln which could smoke quantities of fish or shrimp equal to that smoked in an average traditional kiln. In the last stage, a more pennanent brick-and-cement kiln was constructed on the suggestions of the processor-women.

This report is divided into 4 parts. Part 1 describes the traditional smoking methods. Part II summarises activities in the pre-pilot stage. Part III concerns the pilot phase of the study. Part IV describes the implementation of the activity by the concerned agencies, and the lessons learned by the project in managing the sub-project.

The Project thanks the Department of Fisheries, which assisted in successful management of the trials; the District Collector, East Godavari; the District Rural Development Agency, Kakinada; the Backward Classes Development Corporation; tinkers at Kakinada; the various government and non-government agencies and individuals, who provided the necessary encouragement at every step; and most importantly. the women processors of BCV Palem. Ramannapalem and Pallam villages. They have been unstinting in extending their support and expertise in designing, streamlining and standardising the kiln and finally making it their own in every sense.

The Project works with small-scale artisanal fishing communities in reducing post-harvest losses of fish; develops low cost improvements in handling. processing and marketing fish; and provides technical support. advice and training to government and non-government organisations, fisherfolk associations and women's groups.

The Project is funded hy the Government of the United Kingdom and Covers three countries within the Bay of Bengal region — India, Bangladesh and Sri Lanka. The project started in 1987 and is presently in its third phase.

This information bulletin has been prepared by Duncan King, Project Field Manager and Venkatcsh Salagrama, Field Liaison & Extension Officer. Andhra Pradesh and Orissa, of the Project. It has not been cleared by the governments concerned or by the DFID.

ABBREVIATIONS AND ACRONYMS

AP	Andhra Pradesh
DFID-PHFP	Department for International Development — Post-Harvest Fisheries Project
DOF	Department of Fisheries
DRDA	District Rural Development Agency
GI	Galvanised Iron
NGO	Non-Governmental Organisation
PPC	Participatory Project Cycle
ROSA	Rural Organisation for Social Action
SEU	Social and Economic Unit
VJNNS	Visakha Jilla Nava Nirmana Samiti
NRI	Natural Resources Institute
BCV Palem	Boddu Chinna Venkataya Palem

<<

CONTENTS

1. INTRODUCTION

1.1 Fish smoking in the region

In most developing countries, fish processed by traditional methods are a major source of dietary protein. Fisher-folk communities, with little or no ready access to markets and modern preservation facilities, have depended on processes developed over centuries — like salting, drying and smoking — to enhance the shelf life of the fish. Although icing is becoming more common for high-value shrimp and larger fish, a major part of the catches continues to be processed by traditional methods.

Fish smoking is a very popular processing method in Europe, Africa and the Far East, where smoked fish and meat are relished as a delicacy. Nearer home, Sri Lanka has a high demand for smoked fish. In India, the Laccadive Islands, some pockets on the west coast and on the east coast, the Godavari and the Krishna deltas in Andhra Pradesh, are traditional fish smoking centres. It is not difficult to see why these areas, generally inaccessible, should have developed this particular method of preservation. The Godavari delta is criss-crossed by innumerable creeks that make immediate transport of fresh fish very difficult. The very fertile soil that results from siltation is used for cultivation, leaving little scope for fish drying. Smoking is an ideal option because it requires less space and less time than drying, at the same time improving the shelf life of the product up to a week or two. In due course, in spite of the growth of transport facilities, smoked fish developed a rich market in the area, the flavour, texture and taste of the smoke taking precedence over its preservative qualities with the consumers. There are some 50 villages in the Godavari area, where fish smoking is widely practised.

1.2 What is Smoking?

The preservative process of smoking combines the effects of drying, heating and smoking, coupled often with salting. The pre-treatment before smoking involves gutting, splitting, kench salting, brining and/or drying, depending on consumer preferences and the method of smoking. A combined heating/drying/smoking process entails application of smoke using suitable firewood, passing it over the fish in a closed chamber at temperatures of about 30-35°C for a cold smoked product, or alternatively, 70-80°C for a hot smoked product. Cold smoking does not cook the flesh or coagulate the protein; refrigerated storage is necessary before consumption. Cold smoking is designed to impart the desired flavour to the product rather than a degree of preservation. It is not generally made in tropical countries.

Hot smoked products are adequately cooked. The preserving effect of smoking on fishery products is attributed to a combination of surface drying, salting and deposition of anti-oxidant (phenolic) and anti-microbial constituents on the fish.

1.3 Traditional Fish Smoking in Andhra Pradesh

In the traditional practice, fish are washed, scaled and gutted before drying and smoking, but as a rule never salted[1]. The smaller fish are generally gutted, but not split. Medium-sized fish, such as mullets and catfish, are normally split and gutted.

The traditional smoke-house is a thatched hut, in which a raised platform with bamboo mats spread across it, called Jithaga, is used for keeping fish. Firewood — generally mangrove wood or any other combustible material available in the village — is placed in the pits beneath the platform. Smoke envelops the hut, and temperature rises up to 50°C. Fish, sun-dried from a few hours to a couple of days depending on the availability of sunlight, are spread on the platform in batches and smoked on and off for 18-24 hours. Fresh batches are spread alongside the old ones to facilitate continuous processing. The fully smoked product is packed in gunny sacks or baskets and taken to markets. Smoked fish has good demand and is expensive, costing Rs. 100 or more per kilogram, while smoked shrimp is sold at Rs.150/- or more. There are some 15 important markets and many lesser ones in the area dealing in smoked products. About 25 species are used for smoking. About half a dozen varieties predominate, with mullets and shrimp being the preferred species. The capacity of individual kilns to smoke fish varies greatly ranging between 25-100 kg in one cycle, the average kiln being capable of smoking about 60 kg/cycle.

1.4 Problems with the traditional process

The traditional method of smoking has been perfected over the years, particularly in minimising capital costs through the best use of local conditions and in the manufacture of products to suit consumer preferences. However, the fact that the enterprises are run mostly on shoe-string budgets and that the products cater to particular niche markets within the area meant that very little scope exists for improving the process in any way and that a large proportion of catches were wasted. The region-specific nature of the activity makes it little-known outside the

[1]Salting prior to smoking, though very useful in reducing water activity and improving shelf life, seems to have been confined to certain areas in Europe. In Africa too, fish is seldom salted before smoking. One reason could be that only not-so-fresh or semi-spoilt fish are ever used in these areas with the result that the presence of salt has come to be automatically linked with spoilt fish. Another reason could be, and this is true of the Godavari delta, the non-availability of salt in sufficient quantities.

area, restricting expansion of the method to other areas and, perhaps, for making other products. Likewise, even though the market potential for smoked products within the area is quite large, the preference for specific varieties restricts the activity to a few months in the year when those varieties of fish are available. Lastly, although the process was standardised, it was not entirely fine-tuned to get the most out of it, leaving much to be desired at different stages. The fact that despite a very good market price the women make very little profit makes the point very clear.

Improved smoking method

2. INTRODUCTION OF AN IMPROVED SMOKING METHOD

2.1 DFID Post-Harvest Fisheries Project

The Post-Harvest Fisheries Project (PHFP) was funded by the UK Government's Department for International Development. The Project worked on the east coast of India, Bangladesh and Sri Lanka, since 1987, addressing the needs of small-scale marine fisher-folk communities. The Project used a participatory, need-based approach, which was reflected in its sub-project on introduction of an improved smoking kiln. Besides providing the project an opportunity to understand the dynamics of conducting a micro-level activity at the village level, it also gave the Project a chance to refine and replicate its Participatory Project Cycle (PPC).

2.2 Background of the Sub-Project

This sub-project is a good example of the process approach adopted by the Project in taking up any post-harvest related activities. What had originally started as a venture to make 'Masmeen' or Maldive Fish[2], using tuna as raw material in South Arcot district of Tamil Nadu, concluded with designing a new technique for smoking for the women processors of the Godavari delta area in Andhra Pradesh.

2.3 Masmeen

'Maldive Fish', also referred to as 'Masmeen' or 'Masi' in India and 'Umbalakada' in Sinhalese, is a traditional cooked, smoked and dried tuna product, originally developed in the Maldives. The finished product, obtained after nearly three months of processing, is very hard and is bone dry. It is powdered and used as a condiment in food preparations. It is a highly popular product in Sri Lanka and southern pockets of India, like Tuticorin, Nagercoil, Madurai and Trichy. Masmeen has been traditionally exported to Sri Lanka from the Maldives and India (Laccadive processed).

Within India, fresh tuna, which is landed in good quantities has low marketability — attributed to its dark meat. While exploring the opportunities for developing income-generation activities for fisherwomen in India, the Project felt that the marketability of tuna and consequently its utilisation, can be vastly improved

[2] Maldive fish, according to some sources, is different from "Masmeen." Maldive fish is produced in the Maldives, and involves a prolonged smoking process, while Masmeen is produced in the Laccadives and Southern Tamil Nadu, and does not involve smoking.

through value addition, and that the production and marketing of Masmeen will contribute significantly to raising the incomes of small-scale processors. Masmeen held great promise, owing to its high acceptability and the relatively IOU capital-intensive technology involved in its production.

2.4 Phase I: Tamil Nadu

Initially, it was planned to take up pilot projects for processing Masmecn in two villages, Reddiarpettai and Pudukuppam in South Arcot district. These sites were chosen mainly because of their proximity to tuna landing centres. the availability of fuel required for smoking and cooking. and the availability of a suitable site for setting up infrastructure. The fact of the Project working with an NGO in the area — Rural Organisation for Social Action (ROSA) — was also a deciding factor.

It was planned to provide training to a group of 10 fisherwomen in each village. The training was to be done by the College of Fisheries, Tuticorin. ROSA was to he involved for supervising and executing the activity. through mobilisation of locally available material and manpower. Prior to conducting the pilot study, studies were conducted to determine the current landings, utilisation and disposal patterns of tuna in the area.

The studies revealed that tunacatches in the area were increasingly being purchased by fresh fish traders from Kerala. It was found that fresh tuna commands a good market in Kerala. especially in Trivandrum, and that these markets had the capacity to absorb any further increase in supplies. Due to the strong market linkages prevailing between South Arcot landing centres and Kerala markets. landing prices of tuna were expected to remain high. It was found that the landing price of tuna had always exceeded the maximum ceiling of procurement prices calculated for the pilot activity. It was concluded that Masmeen production would not be economically feasible in South Arcot.

2.5 Phase II: Andhra Pradesh

At about the same time (February-March, 1993), data collected from traditional (gill-netter) landing centres of Kakinada. Andhra Pradesh, showed good landings of tuna in the area. which were fetching low prices. To ascertain the feasibility of starting a Masmeen unit, regular data collection was kept up at the landing centre over the next 15 months (up to June, 1994). Data were collected on quantities of various species of tuna landed and prices during this period. The influence of extraneous factors, such as the Kerala trade, on the availability and price of tuna was studied.

A demonstration on preparing Mnsmeen was proposed to be carried out in Uppada village, near Kakinada, where the Bay of Bengal Programme (BOBP) had been working on various other projects from I980, and had consequently established a good rapport with the tisherfolk.

Initially, it was planned that following production and marketing trials. the enterprise would be managed by the Project. employing local women as wage labourers. Eventually, with the help of a local NGO. this business would be taken over by the women themselves.

Due to the difficulties in transporting Maldive fish made in Uppada to traders and agents in the southern part of the country, the Project employed its Marketing Consultant to draw up a marketing plan.This clearly outlined the proposed marketing strategy and included information on marketing channels, institutional arrangements and transport. To manage the activity at the field level, a local NGO, the Visakha Jilla Nava Nirmana Samiti (VJNNS), was employed. This NGO was to assist with group formation and, simultaneously, learn about the technology.

In order to identify the women processors. who would be drawn from the poorer sections of the community. Bennett (1993) suggested the following strategy:

- the collaborating NGO would set up a women's co-operative from among the fish processors and women-head loaders, who appear keen to form such a group;
- this group would be requested to identify 10 individuals among them to be recipients of training;
- this group would be encouraged to identify other social issues which could be addressed by the Project and the NGO;
- initially a wage would be paid to the participants, which would eventually lead to a profit-sharing system, and.
- if Maldive fish production proved profitable. the Project would develop a method for privatising it as a business.

For supplying the daily requirement of tuna for processing. cycle traders operating out of the Kakinada beach landing centre were sought to be involved. It was agreed that, while this would work in the short term, in the long run the producers would most likely bypass cycle traders and procure supplies directly from the landing. During the training and trial production, it was planned that 4 cycle traders would supply fish daily to Uppada on a rotation basis. They would be paid Re.1/- per kilogram over the procurement price. Previous studies conducted by the Project

showed that the average daily income of cycle traders in two villages (Jaggampeta and Gollaprolu) was Rs.30-40/- per trader. At Re. 1/- extra per kg., it was expected that the traders would get an assured income of Rs.50/- Besides, the traders would travel a shorter distance for marketing. After supplying the fish at Uppada, the traders could go back to purchase more fish for their regular marketing operations. The project planned to use this opportunity to try out insulated bicycle fish boxes during the trial period.

Accordingly, the NGO started forming groups at the village from May 1993. The pilot project was scheduled to start in January, 1994, when the fishing season would commence in the area. Since tuna landings were confined to five months a year, preparation of other fish products -rack dried fish, smoked fish -was proposed to be taken up to ensure sustainability and reduce idle time.

2.6 Phase III: The Pre-Pilot Activity

By January 1994, however, there were several developments: two marketing advisors had left the Project within four months. Consequently the proposed marketing plan did not materialise. As most of the activity hinged on marketing, and very little hard information was available, the training programme could not be conducted. The pilot project had to be deferred till more information could be gathered. Also, two factors became apparent during the daily data collection:

- Longliners operating from Kakinada use tuna meat as bait for sharks. During the shark-fishing season, which generally coincides with that of tuna, the landing price of tuna could go far above the ceiling price; shark-longlining in Andhra Pradesh started in the mid-'80s and gathered momentum during the early '90s with the result that prices of fish like tuna and mullets went up considerably during the early '90s:

- With the arrival of ice into the area, more and more varieties of fish were being iced and transported to distant markets in Tamil Nadu and Kerala. This led to an increased consumption of fresh tuna along with other hitherto less utilised, varieties in local markets. This naturally had an impact on procurement prices.

In an appraisal carried out of the activity during mid-'94 by Mike Pritchard of NRI. four major concerns were raised about this sub-project:

- The project was economically unviable, because the conversion ratios of tuna to Masmeen were lower than expected. According to information available to the Project. it was about 4/6: 1, whereas trials conducted by the Project indicated a conversion rate of 8: 1.

- The project was going to have a very limited impact area, with little prospect for dissemination outside the few villages where production was planned;
- The time and resources that the DFID-PHFP would have to spend on a technically complicated project would not be justified, considering the limited number of beneficiaries:
- The local partner NGO did not have the institutional capacity to manage such a technical project.

At the same time, a short survey done in Tuticorin to study the different methods of preparing Masmeen, to ascertain its market potential in local and export markets, and arrange the sale of Masmeen to be prepared by the pilot project, showed that while Masmeen had a very good market in the area, producing a good quality product was a very difficult operation. Many details needed to be ascertained through trials, before even a pilot project could be established. There were questions about the minimum quantity of product required if Tuticorin agents and wholesale fish traders were to visit Uppada and collect the Masmeen themselves.

Added to this, a doubt was raised about the social and cultural implications of an activity in an area like Uppada, where smoking was totally unknown. These considerations, coupled with the concerns raised by Pritchard, suggested that a pre-pilot study might be useful to ascertain the feasibility of the project. In the pre-pilot stage, the local infrastructure was proposed to be used to keep the investment as low as possible.

So it was that the pre-pilot study was shifted to BCV Palem, a 'smoking' village, so that locally available infrastructure and expertise could be used to cut down the expenses, and at the same time widen the potential impact area substantially.

2.6.1 The Study

Trials were conducted with 5-6 pairs of tuna for making Masmeen in BCV Palem, starting mid-'94. The trials indicated that making Masmeen was a very complicated process; the returns were hardly commensurate with the effort. At the same time, on closer examination of the infrastructural facilities available within the villages for smoking, the traditional method of smoking was found to be inefficient, for reasons explained above. The time, effort and investment required to produce the smoked products was far too high. However, considerable improvement was possible by slightly modifying the process.

Thus, as part of the trials, an improved smoking kiln was designed, taking existing practices and conditions in the area into consideration. Trials were conducted

through local women processors to establish comparative efficiencies for traditional and improved techniques. This activity, which started as a secondary aspect to the primary objective of making Masmeen, was found to have a more positive impact on a far wider scale. The most important impetus came from the processors themselves -to whom Masmeen was an alien concept, but the improved smoking kiln wasn't and it promised potential benefits. With the smoked fish products — mullets and lesser varieties of shrimp — finding very good markets within the area, often fetching more than Masmeen at distant markets, it was decided that the trials to produce Masmeen would be abandoned and standardising the smoking practises would be made the focus of the study. This also meant that many other varieties of fish products could be made to establish the economic feasibility of the activity. As nearly 1,500 families were likely to benefit directly from the activity, all of whom had traditionally depended on smoking, some of the concerns raised regarding the technical, financial, social and cultural implications could be satisfactorily put to rest, by shifting the focus from the product to the process itself.

From this point, the activity took on a new shape, and the community -particularly the processing women — took a more active role in deciding the course of the programme.

(i) Criteria for design of the smoking kiln

The design of the kiln took into consideration the following factors:

- The traditional practices, the types of fish used for smoking, quantities and seasonality of landings.
- Space available in the fishing villages — which are generally overcrowded — for installing a smoking unit.
- The scarcity of firewood material in the area, which is also expensive. At the same time, availability of cheaper alternative firewood in abundance.
- The additional costs, running and maintenance costs for smoking in the kiln to be as low as, preferably lower than, in the traditional process.
- The additional labour and training that would be needed for using an improved kiln.
- The need to regularly clean the drum.

The traditional activity being very much a community exercise, the need to maintain the status quo of the social aspects of the exercise. It being a predominantly women-oriented method, it was essential that it remained with the women.

(ii) The smoking kiln

The improved smoking kiln is not a new invention; countless variations of design and size exist in various parts of the world. The kiln itself was a derivative of the modified oil drums, which have long been in use in Africa for smoking purposes. The prototype used for the trials was constructed with galvanised iron (GI) sheet; 5 feet in height (including the lid) and 2 feet in diameter. There was a one-foot square hole near the bottom for feeding the firewood. This had a lid with vents to facilitate air movement.

Trays were arranged from one foot above the fire, at 3 inch-intervals. Initially, trays were placed on four GI strips riveted to the inside of the kiln at regular intervals. This was found to be a very difficult, hazardous and laborious operation with fish and shrimp frequently falling down. A idly-stand design was next tried with a central pole fixed to a stand on which trays slid into place one above the other. In the next change, the pole was removed and trays were made to sit one above the other, separated from one another by the 3" long strips attached to the bottom of each tray. In the last modification, the GI support to the trays was totally dispensed with; more sturdy and protective L-angler and 1" flats were used.

A chicken mesh partition separated the space between the fire and the lowest tray. This partition acted as a spreader as well as a screen to prevent larger ash particles from reaching the fish. In all there were seven trays with a combined capacity to smoke 15-18 kg of fish. Fish were arranged on trays.

There was a conical top with a central outlet which could be closed with a perforated lid. The kiln stood on an iron stand, 6 inches in height. Handles were provided for both the lids and the drum; this made it easy to transport the kiln from place to place and clean it as and when required.

(iii) General design considerations

- Capacity: The prototype kiln was designed to smoke about 50 kg of fresh fish in one day, this being the average smoking capacity of a small-scale processor.
- Placement: The kiln could be used anywhere on the beaches, or outside the processors' houses. After the smoking, it could be stored in a comer of the house as it took up very little space.
- The Trays: The trays were so designed that their movement was very easy and periodical interchange could be done with very little effort. Coating the trays with food-grade oil had reduced the problem of fish sticking to the trays and consequent losses due to breakage, which are substantial (about 20%; Table II) in the traditional kilns.

- The drum and trays could be cleaned so that a cleaner product could be obtained.
- Height: Keeping the average height of women processors in view, the kiln was so designed as to make it convenient for the women to move the trays on their own.

(iv) The trials

The Staff:

The Department of Fisheries (DOF) deputed one of their field staff to the area to manage the trials full time. In addition, the Project employed a field assistant for the activity. The processor in charge of the activity in the village was an go-year old woman, Mrs Putramma, with over 50 years of experience in fish smoking. With local processors and the field staff of the DOF assisting her, she standardised the smoking kiln and experimented with different aspects of the technique.

The Activity:

The initial objective of the trials, i.e., to ascertain the technical feasibility of making Masmeen, could not be met before the onset of the monsoons and the consequent disappearance of tuna from catches. The three trials conducted showed little scope for taking up the activity.

In the next stage, mullets were smoked in the traditional way to suit consumer preferences — i.e., adding little or no salt, gutting the fish, but not splitting, and hot smoking for different durations to get different yield ratios, so as to be able to standardise the ideal combination of pre-drying period, quantity and variety of firewood, smoking duration and yield ratio.

Saw dust, wood shavings and coconut husk, all of which are easily available within the area were used as firewood. Different combinations were tried out to arrive at a suitable mixture. It was established that in the kiln, temperatures could go beyond 80°C and were maintained at the required levels by calculated sprinkling of wet saw dust or by removing the lid. Both cold and hot smoking were possible, besides the preparation of smoke-dried products (an intermediate to cold and hot smoked products).

In the kiln, smoked fish could be made to order, to suit any region-specific requirements. Uniform products could be made through periodical exchange of trays. Hot smoked products could be made within 5 hours with little pre-drying and in 3-3½ hours when sufficient pre-drying was done.

Information Collected:

Over the period from June to October 1994,18 trials were conducted (not including the three Masmeen trials and the three trials with sardines and mackerels for "standardising" the kiln). The information collected in the trials included:

- Smoking time and effort.
- Varieties used, species, weight and price of procurement.
- Different combinations of firewood materials used.
- Duration of pre-drying and its effect on the process.
- Yield ratios.

At the same time, similar data was gathered from different traditional kilns also, for comparative analysis (Information from a traditional kiln — Mrs Putramma's own — was collected consistently and used mainly for comparison with the improved kiln).

Marketing:

Since the beginning, studies on market acceptance of the product were an integral part of the exercise. Consequently, samples were distributed among the traders and consumers. Test marketing of the product was done five times by the women processors themselves, who were assisted by field assistants. Based on the feedback from the markets, necessary changes were made in the product to suit the requirements.

Alongside the traditionally smoked fish products, fish like mackerels, sardines and clupeids were smoked in a more systematic manner, i.e., brining the butterfly cut fish, drying and smoking at gradually rising temperatures up to 70°C for four hours. The samples, fulfilling all criteria for smoked fish as laid down in **Codex Alimentarius,** were used for exploratory market surveys within and outside the state, which showed some promise. However, this was not pursued for two reasons: one, the local markets were not interested in non-traditional varieties of fish, second, should the activity be found lucrative in distant markets, it could bring outsiders into the activity. This could ultimately be counter-productive to the project's objectives, i.e., assisting small-scale fish processors.

Follow-up:

The prototype kiln underwent changes, depending on the processing requirements, difficulties faced in processing, feedback from processors/traders and experts' suggestions. The processing schedule — i.e., pre-treatment of fish, amounts of different combinations of firewood required for different varieties of products,

time taken for smoking, regularity of interchange of trays and, most importantly, correct yield ratios of finished products — has been tine-tuned to ensure a quality product.

2.6.2 Advantages of Using the Smoking Kiln

It was found that the kiln, despite its small capacity (hardly 14 kg per cycle) could still earn more than a traditional kiln (average 60-70 kg). Some of the advantages of the smaller kiln which applied equally well to the bigger kilns are summarised here.

Technical Advantages:

The advantages of using a smoking kiln over a traditional smoke house are manifold and often so interlinked as to make it difficult to pinpoint specific aspects. Broadly however, as brought out by the women processors themselves, the kiln saves on time, firewood, space and labour. It curtails the health-related problems often associated with the traditional smoking process. Further, the quality, texture and appearance of the product is enhanced to high standards. Shelf life is more than doubled and at the same time breakage losses are cut down to the minimum.

The comparative advantages of the smoking kiln over the traditional kiln, as established during the trials by women processors of the village, showed that the yield ratios, which have been manipulated to provide a vast range of yields in the bin, contrast well with the limited range of 2-3: 1 ratio of the traditional kiln. The apparently high yield ratios in the traditional kilns also highlighted the reason for a high degree of breakage losses in processing and marketing and also the incompleteness of the activity despite long periods of smoking.

Financial Advantages:

The cost of firewood consumed per kg of fresh fish was brought down from 0.90 paise with the traditional kiln to 0.20 paise in the improved kiln — assuming the cost of firewood in both cases to be the same (mangrove wood used in the traditional practice was twice as expensive as other firewood material).

While the limited quantities prepared were not sufficient to establish that better products obtained better prices, there were strong indications to justify the assumption. The product made from the improved process was arranged in a display over the traditional product to improve the appearance and make it more attractive to consumers. Also, quite a few traders had come forward to place firm orders for the improved product even as the trials were on. Even if a better quality product does not fetch a better price, it was clear that profits would increase because:

- production costs came down substantially;
- shelf life of the product increased three times to facilitate access to more markets;
- losses due to breakage reduced to less than one-third. Net surplus actually improved though the quantities smoked in the kiln were very much less, and,
- rate of return more than doubled.

The usefulness of the kiln for small-scale processors was apparent because of its low capital cost and higher rate of return.

Social Issues:

As the whole exercise was standardised into a clearly definable unit, it was possible for the women to approach government institutions for support. As a community exercise, it suited government agencies, which included the activity in their action plans as a group venture. The processing is done almost entirely by women, who also play an active role in marketing. Consequently, the activity has a strong orientation towards women and this suited the aims and objectives of the development agencies. The increased earnings can be assumed to generate social impact as well with an estimated 1500 processing families involved in the area — about 8,000 people. In addition, there are substantial numbers of people working as processors' assistants and traders. Many traditional fishermen fishing in rivers and creeks, who supply almost exclusively to these women, depend on the activity and are likely to benefit indirectly with improvements in the processing methods or the quality of the product. Studies conducted by the PHFP in this regard did not show any scope for adverse impact on the part of the exercise on the community.

2.7 Appraisal of the Smoking Activity

Pritchard (1994) urged the Project, particularly its Social and Economic unit (SEU) to carry out a socio-economic appraisal of the activity before full implementation of any production system, so that the project could be cancelled if it was not deemed economically and socially viable.

Accordingly, the SEU conducted an appraisal of the activity, and concluded that:

- with the introduction of the kiln, smoking would become a more comfortable activity for the processors, with fewer health hazards;
- the products from the improved kiln show a good appearance and a relatively long shelf life, thereby reducing the quantum of losses. The time taken for processing was also considerably less than the traditional kiln; this gives the women more time for other household activities;

- fire hazards were also greatly reduced, as the heat could be easily controlled and regulated.

Drawing from the experiences of a smoking project in Tanzania, (also supported by the DFID), the SEU commented that, in the Indian case, the issues requiring research, the intended users of the output of the research and their requirements were considerably clearer; that the technical trials and socio-economic studies progressed side by side, making it open to changes along the way; that the smoking project in AP looked in great detail at the field situation and the real needs of the community involved. It took note of the fact that regular discussions were held with the community on the activity and that trials had been conducted in a participative manner.

The SEU, at the same time, pointed out that:

- ❖ The diversion of mangrove forests to shrimp farming led to a shortage of firewood and construction of roads, which made it possible to transport ice into the delta area. The destruction of mangrove forests drastically reduced availability of firewood;
- ❖ The destruction of the resource base because of the dumping of affluents could reduce the catch of species used for smoking;
- ❖ Given the limited geographical area where smoking was carried on and the rather bleak prospects for the activity in the delta area in the long-term, care should be exercised in undertaking any future activities.

Taking these concerns into account, it was decided that only traditional firewood material would be used for smoking in the new kiln as well, to ascertain if it was equally efficient with any firewood material.

Also, the issues raised in the SEU report were divided into long-term and term impact. Short-term was defined as the project life, while the long-term was taken to extend beyond the project life. It was decided that for the time being, the focus would be on standardising the smoking kiln to suit local requirements. Decisions to further extend the activity would be taken after a review of the situation.

3. THE PILOT STUDY — STANDARDISATION OF SMOKING METHOD

3.1 Main Objectives:

During the first phase of trials, a major objection raised by processors to the improved kiln concerned its small size and capacity. With a capacity of 15 kg., the prototype did not stand comparison with the 75 kg in traditional kilns. To handle large quantities in one cycle, a bigger kiln was required — which at the same time would not be unmanageable for the processing women.

The main objectives of the next phase were:

(a) To develop a bigger kiln — comparable in smoking capacity in one cycle to a traditional kiln, which at the same time retained the technical and economic advantages of the prototype design;

(b) While the product from the prototype seemed to have a better market potential than the traditional product, this advantage could not be quantified in terms of increased income to the processor. It was true that the decrease in processing costs (to a fraction of the one used in traditional operation), had by itself meant more income for the processors; but an improved market price would have made the kiln itself a more useful tool for the processors.

3.2 Criteria for the design of new smoking kiln:

- The kiln should be able to handle quantities comparable to those of traditional kilns in one cycle.
- The height and the diameter of the kiln to be of manageable dimensions for processors, particularly women.
- The shortcomings in the prototype kiln — difficulties in exchange of trays — to be rectified.
- More efficient use of firewood material to further improve the system.
- Cost of bin to be within reach of the processors.

3.3 Dimensions of the new kiln:

Smoking Area:

The area available for smoking in the new kiln should be around 50 - 60 ft^2. This figure was arrived at after calculating the effective average smoking area in 12 traditional smoking kilns, which included the largest smoking kilns in three villages.

Woman processor engaged in traditional fish smoking.

Fisherman operates improved smoking kiln.

<<

Woman processors readying fish for loading on to smoking trays.

Processors check the fish after smoking.

Dimensions of the kiln:

The processing women suggested that a rectangular kiln may be more appropriate for the following reasons:

- Trays could be easily put in and brought out
- Space was more than in a cylindrical kiln
- Construction was easier
- Maintenance was easier

3.4 **The smoking kiln:**

A new rectangular smoking kiln was constructed in March, '95 with the following dimensions :

Length : 3' 1"
Breadth : 2' 2"
Height : 5' 2" (excluding lid, which was about 9")

A GI sheet was welded over an iron framework. The skeleton provides structural strength as well as a frame for moving the trays. A total of 11 trays, in addition to one chicken mesh partition, could be accommodated in the kiln. The effective smoking area of 60 ft^2. (3' x 2' x 10 trays) compares favourably with that of an average traditional kiln.

Each tray had an L-angler frame which provides a 'lip', so that fish will not spill into tire during exchange. Handles were provided to the trays.

The firebox was a rectangular - 3' x 2' - unit with a GI wall of thicker gauze, with firewood feeding hole to the front. This was provided with a lid. Adoor was provided to shut off the smoking area after the trays were installed on the sliding panels. The door fitted closely, so no smoke would escape. The top lid was a dome, with a central hole to let out steam and excessive smoke.

With an effective smoking area of 60-72 ft^2 (6 ft^2 x trays) this design compared well with that of the traditional kiln. As trays could be pushed sideways through the opening, women did not need to bend.

3.5 Trials

For the actual trials, it was decided that, instead of the Project managing the procurement, processing and marketing, it would be appropriate if the kiln was

provided to one of the processors. who would use it to smoke their own fish. Resides reducing the pilot study cost. this had the important advantage of giving the women an opportunity to decide for themselves the usefulness of the intervention. Processors had been showing interest in using the kiln anyway. It would help to provide the kiln to them for the trial period. Accordingly, one woman processor from Ramannapalem village. 8 km to the north of BCV Palem. was selected for using the kiln. initially the Project helped the processor with standardisation, management and maintenance of the kiln. but later confined itself to gathering data. It was proposed to use only locally available and traditionally used firewood material — such as wood, dung cakes and wood shavings — during the study.

3.6 Feedback from the trials:

The response to the new kiln was overwhelming. Within a few days of bringing the kiln into the village. the processors made it thoroughly their own. The Project was only gathering data for purposes of quantification.

In brief, the smoking advantages of the new kiln as explained by processors were :

- It reduced smoking time (from l 2 hours to less than 5 hours): reduced effort; cut firewood consumption (the kiln requires approximately 1/6th to 1/8th quantity of firewood needed for the traditional kiln); and post processing losses. It was established that irrespective of the kind of firewood used — sawdust. wood shavings or traditional material like mangrove wood and dungcakes — the efficiency remained the same: firewood consumption in the kiln was about 20% that of the traditional kiln.
- It enhanced quality (the shelf life of the kiln-made product was at least thrice that of the traditional product): quantities smoked (at least 3 times more than in the traditional kiln in a day): and efficiency of operation.
- It made the processing activity much easier and healthier. The major difficulty of coping with smoke while the processing was going on was totally avoided with the kiln.
- It has been possible to establish that the product from the kiln fetched about 12-1 8% more than the traditional product. Buyers gave this product priority over the traditional product. Consequently. it could be sold much more quickly. The concern that improvement in quality need not mean an improvement in **value** has been satisfactorily put to rest-with traders carefully distinguishing between the two products and paying a little extra for the kiln-made product.

Although provided to just one processor. the kiln was used by most of the 14 processors in the village. Since the processing time had come down. 2-3 processors

could smoke their product one after the other in one day. People who used to dry their fish in the sun (prior to smoking) close to their huts, had started drying outside the hut where the kiln stood, so that as soon as one cycle was over, the next processor could put in her fish and start smoking.

Even as the trials were on, almost all processors in the village asked for kilns of their own. People from all over the smoking belt started visiting the village and demanded demonstrations in their villages as well as kilns for their use. Representations were received from 26 villages by the time the trial concluded in the village on 3 1 May, 1995.

As for identifying new areas for marketing the products, it was felt that it must be done cautiously, and in a phased manner. Available data indicates that the limited geographical reach of the smoked products ensured that the activity would remain in the hands of the women. Expansion to other areas and more lucrative markets could mean an influx of entrepreneurs taking over the activity so completely that women-processors could totally be sidelined — something to be avoided at all costs.

Meanwhile, a more standardised design was worked out, based on feedback received from the trials. Local tinkers were taken to the villages to get a general idea about the kiln and understand the women's requirements.

3.7 Smoking kiln — the next model:

A new model was constructed by tinkers, based on the larger design of the kiln used at Ramannapalem. An important feature was that the welded parts in the previous design were replaced to the extent possible with riveting, which not only saved time required for actual construction, but made it easier to repair the kiln in the village itself. The front door was a 2-piece unit that could be opened like the doors of a hut, so operation became easier and strength of the door increased manifold. The top lid too was simplified. Overall height increased by 6" to increase the space between trays by at least 3/4" as requested by processors. Thicker gauze G I was used, so the kiln was sturdier.

3.8 Trials with revised design:

The new kiln was placed in Pallam village on the Godavari delta, the heartland of smoking. Within 15 days of giving the kiln at Pallam, it was clear that the response of the processors was exactly similar to the one at Ramannapalem. Since the day the kiln was placed there, the processor given charge of the kiln never used the traditional kiln.

The only modifications required to be done to the revised kiln to were: changing the doors (which had been fixed to close horizontally) to close longitudinally, as in an almirah. The women suggested that about 1" space may he provided between the trays and front door : they wanted to use the space for hanging eels from hooks to be provided at the top front rim of the kiln.

3.9 Smoking kiln: Follow-up

With the trials proving the suitability of the improved kiln to everyone's satisfaction. the project liaised with the district administration and the various agencies working in the area. such as the DRDA and the Backward Classes Development Corporation. The officers of these departments were taken to the villages for demonstrations as well as to get the views of the processors on the activity. Institutional support was assured for the processors in the form of l/3 subsidy and credit. The women would pay 20% of the cost of the kiln initially and pay the rest of the amount in instalments in one year. Provision was made for 100 kilns of the revised design for women processors of East Godavari district for the financial year. 1995-96.

4. IMPLEMENTATION AND FOLLOW-UP

4.1 Expansion of Fish Smoking

The implementing agencies, going by the enthusiasm of processors in villages ***where the improved method had been demonstrated,*** raised the number of kilns to 200, against the advice of the Project, which felt that some time should be given for the kiln to mature into a fully acceptable tool to the community. However, plans already having been made, the agencies went ahead and got the kilns constructed. The Project motivated the women processors in Ramannapalem and Pallam villages, where the trials had taken place, to pay their contribution of Rs. 1,000 each.

Of the 200 kilns made, around 80 were taken by the fisherwomen, who were convinced of the use of the kilns, and started using them almost immediately after receiving them. But the rest found their way to people who had no idea about the new method of smoking. A few of them were encouraged by the fact that the agencies concerned waived the stipulation for an advance contribution of Rs. 1,000. This meant that, while most kiln-owners did not have any particular stake in managing the kiln properly, those who had paid their contribution were not very happy either-because they had to pay to get the kilns, while others did not need to pay anything. Studies done by the Project during the immediate aftermath of delivery of the kilns in villages, showed that less than 50% of the processors were using them. As time went by, more processors started using the kilns.

The last survey conducted by the Project in March 1997, showed that of the 200 kilns, nearly 100 had been irreparably damaged or lost because of poor maintenance — and more importantly, because of a major cyclone in the area in November 1996. Of the other 100,83 were in working condition, and all these 83 processors claimed that they had not once gone back to the traditional method after starting to use the kilns. In fact, most of the traditional kilns were demolished; the smoking chambers of the past were now being utilised as an extra room an unexpected bonus! The women carry the damaged trays to Kakinada to get a new mesh fixed.

4.2 Smoking Kiln: The Last Design

During the survey, two problem areas stood out prominently.

- The galvanised iron chamber, particularly the lower part which comes directly in contact with the fire, is damaged in a short time. The reasons could be that very high temperatures were generated in the kiln, to speed up the process. The kiln was never cleaned regularly.

- The aluminium mesh used for trays does not last for more than a year. The reason again was: no cleaning, no regular maintenance. Most processors, however, felt that the short life of the aluminium mesh was an occupational hazard, and could not be helped.

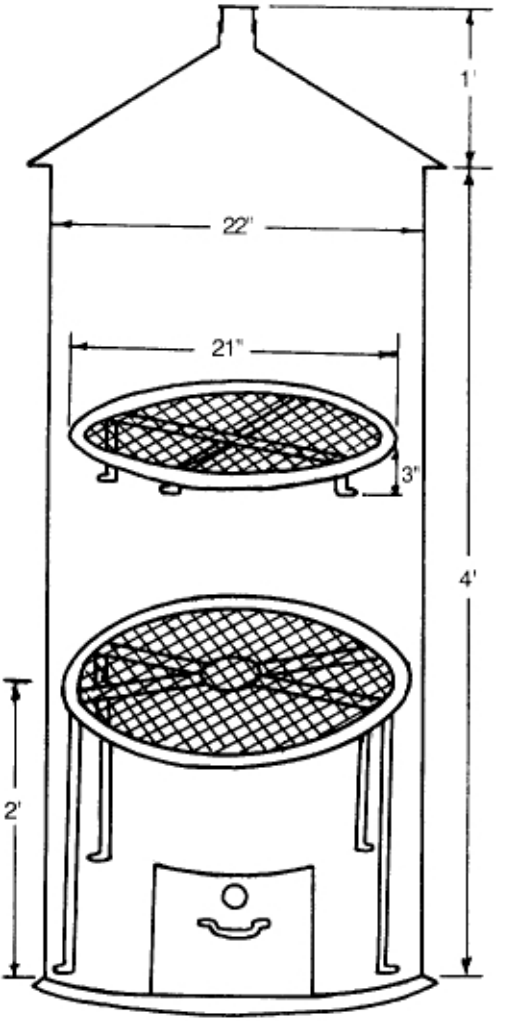
After due consideration, it was agreed that there was very little scope to avoid the damage to the trays, but the damage to the kiln itself could be avoided by constructing in brick and cement. Using good, dry bricks, and mixing the cement with lime powder, was found to yield very good results by avoiding cracks to the structure during smoking.

A final version of the kiln, which was substantially the same as the previous one, but was constructed with brick and cement instead of galvanised iron, was built in Ramannapalem village in August 1997. After a few trials to satisfy the efficiency of the structure, the Project used the new kiln for demonstration purposes. The women of Ramannapalem feel thatafter the galvanised iron kilns were discarded, they could turn to the cement and brick structure.

4.3 Impact Assessment

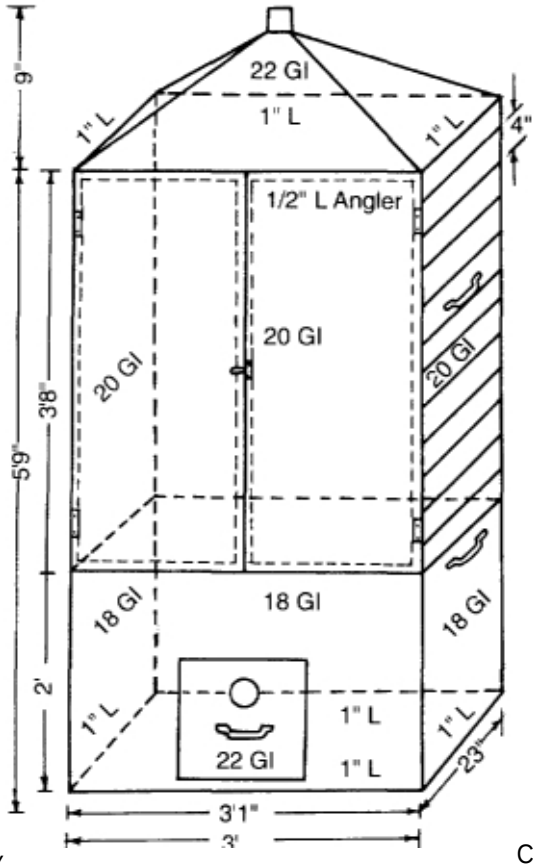
An impact assessment carried out by the Project in 1996, with consultants from outside agencies along with the staff of the project, its partner agencies and the target groups of fisherfolk communities, found that the smoking kilns promoted in project villages have all been accepted by the fisher-women. The main reasons for the adoption were: reduction in fuel consumption (about 50% in a fuel scarce area), improved quality of product and prices (about 10% premium over prices realised for traditionally smoked fish), reduction in processing losses, reduction in
of women, and relief from prolonged exposure of women to smoke. The net gain to producers: 105% over traditional smoking practices.

Fig. 1 Improved Fish Smoking Kiln (Prototype)



DRUM	(Cylinder, lid & bottom)		22 gauge GI	Height (OA): 5' Cylinder: 4 Dia: 22"
TRAYS	7 Nos.	Frame	: 1 1/2 Iron Angler	Mesh: 1'
		Supports	1" Iron flats :	4 1/2' x 7 Nos.
STAND	1' Iron flats x 3' x 4 Nos.			
SPREADER	Chicken wire mesh with GI frame			

Fig. 2. Improved Fish Smoking Kiln (Final Version)



10 Trays +1 Chicken Mesh Partition

TRAY

	Aluminium Mesh
	1/2 Flat

1/2L

x 10 Nos.

Chicken Mesh	1 No.
Small Mesh	6 Nos.
Large Mesh	4 Nos.
Doors (110 x 31) with latches	x 2 Nos.

5. LESSONS LEARNT

This sub-project has graduated from a technology-focussed activity to one which could provide the Project with a refined Participatory Project Cycle. As the foregoing narrative shows, there have been many changes. many wrong turns and many Iearnings from this project. Some of the lessons learnt are summarised here:

- **"Bottom-Up" approach:** A flexible. needs-based, community-oriented. process approach has a better chance of success than an elaborately planned project rigidly implemented. Solutions to post-harvest problems should be evolved jointly by the development agents and the community in the context of what is sustainable and within the needs, aspirations and capacity of the fisherfolk.

- **Integrated approach to development:** A technological intervention by itself is a poor approach to developing communities: it needs to be taken up in a more holistic way, integrating social, economic and environmental issues into the design. Post-harvest problems are often symptomatic of wider social and economic problems and these often have to be addressed before post-harvest interventions can be introduced.

- **Time frame required for maturity of an intervention:** Working with low-income individuals and groups within complex social, economic and cultural structures, is a gradual process which must be carried out over a long time period if sustainable impact is to be achieved. There is often a critical mass of development effort required within a particular community to stimulate uptake of new approaches at a level that leads to sustainability.

- **Synergy and institutional capacity:** The problem to be addressed should reflect the priorities of the fisherfolk and not just those of the development agents. But the needs, aims and capacities of the partner development agencies are important factors in the design of intervention methodologies. Post-harvest intervention is best carried out as a balanced partnership between the fisherfolk, local support agencies (NGO and Government) and the project, rather than in a prescriptive and top-down manner.

- **Good management practices:** Changing minor aspects of post-harvest processes can often have a profound effect. This may entail lower risk and produce higher impact than introducing a completely new technology. which may be expensive and fraught with uncertainties.

a

post-harvest interventions are benign. In some cases. post-harvest intervention may lead to improved incomes being re-invested in a productive capacity in over-exploited resources. In such cases, the most appropriate intervention for post-harvest operators is alternative income-generating opportunities outside of the sector.

- **Documentation and dissemination:** The cost of defining problems, evolving solutions, developing support and changing methodologies can be high. The benefits are maximised when the interventions are recorded in ways which are relevant to a wide audience and are effectively disseminated.
- **Participatory planning and monitoring:** The impact of development efforts should be measured in a participatory way. All the key stakeholders should help define the indicators of success, deciding the means by which their achievement should be verified, and implementing the monitoring.
- **Policy:** While solutions to post-harvest problems may start at the community level, the ultimate success of these solutions requires changes in the way NGOs and government departments support the uptake and transfer of these solutions to communities through technical assistance and appropriate policies.

REFERENCES

ANON, 1983. Recommended International Code of Practice for smoked fish (CODEX ALIMENTARIUS V0L.B).

BENNETT.C.J.,1993. Mission to Sri Lanka and India to review progress and plan future inputs into BOBP Post-Harvest Fisheries activities. NRI Report R (1979).

BURT, J.R., 1988. Fish smoking **and** drying. Elsevier Science Publishers Limited.

BOSTOCK, T.W., WALKER, D.J. and WOOD, C.D., 1987. Reduction of Losses in cured fish in Tropics; TDRI G-204.

CLUCAS, I.J., and SUTCLIFFE P.J., 198 1. An Introduction to Fish Handling and Processing: Tropical Products Institute G- 143.

CLUCAS, I.J., 1991. Design and Trial of Ice Boxes for use on fishing boats in Kakinada, India. BOBP Working Paper No.67.

CONNELL, J.J., 1975. Control of Fish Quality (II Edition). Fishing News Books Limited.

DFID - PHFP, 1996. Impact Assessment of The DFID Post-Harvest Fisheries Project.

LUPIN, H. Fish Preservation II - Smoking Drying (Film Strip Commentary) FAO/ DANIDA.

MATHEW G & MEERA S,1995. An Appraisal of Smoking Activities. IMU Appraisal Series No. 1.

PRITCHARD, M.P.,1994. Mission to India to develop a strategy for the Bay of Bengal Project to support fish marketing in India. NRI Report R (2 150).

RAJ, M.M.,1993. A Review of Maldive Fish Trade and Processing in India and Sri Lanka. DFID-BOBP Occasional Paper.

SALAGRAMA, V., 1990. “Where is Fish smoked in India? Come to BCV Palem, Andhra Pradesh”. BOBP Newsletter Issue No.39.

UNIVERSITY OF PHILIPPINES, COLLEGE OF FISHERIES QUEZON CITY. Drum Smoke House Operations Manual.

APPENDIX I

VILLAGES WHERE SMOKING IS PRACTISED IN THE AREA

I. Ramannapalem
2. Boddu Peda Venkatayapalem
3. Boddu Chinna Venkatayapalem (BCV Palem)
4. Chinna Valasala
5 Peda Valasala
6. Laxmipati Puram
7. Gadimoga
8. Bhyravalpalem
9. Chollangipeta
10. Giriyampeta
11. Balusutippa
12. Kothapalem
13. Mulletimoga
14. Pandi
15. Pallam
16. Pora
17. Valasala
IX. Chirra Yanam
19. Neelapalli
20. Samantakurru
21. Pathapadu
22. Yetimondi
23. Varatippa
24. Tokatippa
25. Poohalamoru
26. Vodalarevu
27. Rebbanapalli
28. Narasapuram
29. Mogalturru
30. Antarvedi
31. Gondi
32. N Kothapallai
33. Rameswaram
34. Vakalagaruvu
35. Vemula Devi
36. Moolapoda
37. Mynavani Lanka
38. Semmaladevi
39. Chinna Semmaladevi
40. Kalipatnam
41 Patahadi
42. Mutyalapalli
43. Kothota
44 . Kothuru (Matlapalem)
4.5. Uppalanka
46. Nayudupalem
47. Baruvanipeta
48 . Gariladibba
49. Dongapandi
50. Matlam
5 1. Laxmipuram
52. Undi

Some villages on the Krishna river delta to the south of Kakinada are also known to smoke fish in limited quantities. Shrimp are smoked to some extent in other villages on the Godavari delta and nearby areas.

APPENDIX II

FIREWOOD USED IN TRADITIONAL KILNS

Telugu Name	English Name	Lat Name
NALLA MADA	MANGROVE WOOD	Avicennia officinalis
I-ELLA MADA	-DO-	Amarina
TILLA KARRALU	-DO-	***Exoccaria aquallocha***
TANGIDI	-DO-	***Lummiitzer racimosa***
GUGGILAM	-DO-	Aqua iras cornizulatum

All this firewood material originates in the mangrove swamps at the Godavari river mouth. A kg of this firewood sells for about Re. 1/- Small craft called dhonis, mainly fishing in the creeks and the Kakinada Bay. bring the firewood to the village. The unit of sale is "dhoni-load," which is about 250 kgs and sells at Rs. 250-300.

DUNG CAKES: One of the most important fuel materials used extensively. 100 number\ weighing 1 0kgs are sold for Rs. 1 0/-

Apart from these, any dry, inflammable material available in the village – coconut husk and fronds. coconut and palm leaves, dead stems, etc.. are all used.

APPENDIX III

MARKETS WHERE SMOKED FISH AND **SHRIMP** ARE **SOLD**

Day	*Markets Operating on Each day*
SUNDAY	**Amalapuram*; T Kothapalli; Malikipuram*; Voolapalli; Tadepalligudem # Dowlaiswaram*; # Peddapuram*; # Ramachandrapuram***
MONDAY	**Mummidivaram*; Edurulanka; Draksharama*; Konkuduru; Kothapeta; Narsapur**
TUESDAY	**Yanam*; Pandalapaka; Bheemannapalli; Pathapadu**
WEDNESDAY	**Ambajipeta*; Muramalla*; Antarvedi***
ThURSDAY	**# Kakinada*; # Pithapuram*; Injaram; Yeleswaram; Narsapur, Anaparti; Yeleiwaram; Gokavaram**
FRIDAY	**# Nakkapalli*; Pallamkurru*; Guthenadevi; Anatavaram (Kothurumagam)**
SATURDAY	**Katrenikona***

* denotes a major market.

# denotes markets where mainly shrimp is sold.

APPENDIX IV

FISH USED FOR SMOKING

Telugu Name	*English Name*	*Latin Name*
KATFA CHEPA	MULLETS	*Mugil spp*
KADISELU	-DO-	*Valamugil spp*
KOYYINGA	**-DO-**	*Liza spp*
MAGA	THREADFINS/ INDIAN SALMON	*Polynemus spp*
RAMALU	**MUD SKIPPERS**	*Periopthalmus*
ERRA RAMALU	TRYPAUCHEN	*Trypauchen spp*
YETLU	MUD SKIPPERS	*Boleopthalmus*
KULUM **PAMA**	**EELS**	*Muraena spp*
KOWWASULU	**HALF BEAKS**	*Hemirhamphos*
GORASA	CROAKERS	*Fly: Sciaenidae*
TELLA PAMULU	**EELS**	*Muraenosox*
SEMMIRAYI PAMU	EELS	*Anguilla spp*
SAVIDAYILU	**RIBBON** FISH	*Trichiurus*
TELLA PARIGALU		*Kurtus spp*
PARALU	**HORSE MACKERELS**	*Caranx spp*
GUMMIDI CHUKKA		*Drepane punctatus*
GUDDIAKURAYI	ILISIIA	*Ilisha melanoptera*
MUDDA AKURAYI	PELLONA	*Pellona spp*
TOKA **PARIGI**		*Coilia spp*
JELLALU	**CATFISH**	
DONDULU	GOBIES	*Gobids*
Shrimp		*Metapenaieds, Parapenaeids Palaemonids, Lesser Penaeids*

Published by the DFID Post-Harvest Fisheries Project
91, St. Mary's Road, Chennai 600 018, India