

R 1813 (R)

Mission To Sri Lanka to review progress  
and plan future inputs into BOBP  
post-harvest fisheries activities

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## Abbreviations and acronyms

BOBP	Bay of Bengal Programme
FTI	Fisheries Training Institute, Sri Lanka
GRP	Glass Reinforced Plastic
IREN	Development Innovations and Networks
ITDG	Intermediate Technology Development Group, UK
NARA	National Aquatic Resources Agency
NGO	Non Government Organisation
NORAD	Norwegian Agency for Development Co-operation
NRI	Natural Resources Institute
ODA	Overseas Development Administration
PIB	Permanent ice boxes
SIDA	Swedish International Development Agency

£1 = Sr Rs 72 (March 1992)

## **Summary and conclusions**

1. Work carried out to date and in-hand is providing useful insights into the informal fish marketing systems of Sri Lanka. The response of the target population has been extremely positive. Prospects for income enhancement and group formation are good.

2. Subject to the results of these activities, the team propose a package of further inputs building on experience to date. Taken together these will form the basis for wide ranging assistance to marketing aspects of fisheries in Sri Lanka. The approach adopted concentrates heavily on encouraging small traders to participate in identifying perceived needs and developing appropriate solutions. The involvement of local consultants and local NGO's is an integral part of this process.

3. A suggested programme of remaining and future activities is given at Annex I.

## **Key findings and recommendations**

### *Progress on base-line survey*

4. After a slow start, IRED have initiated a sound programme of activities which will produce the envisaged results with some slight delay. Given the nature of the work involved (ie, highly participatory and reactive) we are pleased with progress.

5. An outline of activities remaining under the current phase is given at paragraph 30 below. In addition the consultants recommend that a further 20 insulated boxes of the most suitable and preferred type incorporating any modification suggested during the trial be ordered. These boxes will be offered to all the participants in the impact monitoring survey and used for a period of twelve months to assess their durability.

Action: BOBP

6. It is further recommended that the present survey be extended to include:

- . a follow-up impact survey during peak fishing season (Sept/Oct) to assess the benefits of insulated boxes during a period of high fish availability.

- . a regular monthly follow-up survey during the first twelve months after the impact survey to assess the durability of the various insulated fish boxes.

Action: BOBP

7. Additionally, it is felt that the opportunity afforded to include motorcycle traders in the present study should not be missed. Therefore, it is recommended that a similar, but smaller scale trial and impact survey be conducted with this group in parallel with the current survey.

Action: BOBP, IRED

8. The project has adopted a process approach to developing appropriate methodologies; each stage of research being reviewed and where necessary redirected to achieve the required objectives. Because of the innovative nature of this work, continued professional assistance is essential to ensure proper survey design and interpretation of results.

9. This assistance should include: commentary and advice on the local consultant's draft final reports for Phase I and extended activities under Phase II (see paragraph 10.) - estimated at one person week in UK.

10. Moreover, a further brief monitoring mission should take place in September/October 1992 to review progress with the current work programme and other inputs proposed below - estimated at two person weeks (social scientist and technologist).

Action: BOBP, NRI

#### *Strategy for dissemination*

11. The team considered what next steps should be taken to build upon the work completed to date and prior to the nation-wide introduction of insulated fish box technology. A package of activities is recommended including:

- . Extension of bicycle and motorcycle assistance to 2/3 new target groups including initial identification, "needs assessment" and impact monitoring;

- . Identification and support of appropriate local NGO groups interested in back-stopping assistance to itinerant fish traders;

- . production of a credit funding proposal for presentation to suitable lending institution;

- . Development of appropriate and sustainable credit facilities. This should include drawing up a "borrower education programme" to improve access to formal credit;

- . Training of local consultants and counterpart NGO staff, development of extension leaflets and production of videos;

. An indicative study of the number and location of bicycle traders and motorcycle traders in Sri Lanka, in both coastal and inland areas;

. Identification of, and assistance to, fish traders who carry fish on foot ("Pingo" traders).

12. These activities should be concluded with a regional workshop on itinerant fish trading and the production of a working paper on methods for assisting such groups.

Action: BOBP

#### *Insulated fish boxes*

13. The need to develop an effective and acceptable insulated box for use by fish traders before undertaking the impact assessment may delay the programme.

14. It is recommended that the project should provide funds to support the continued development of the these boxes.

Action: BOBP

#### *Fish consumption survey*

15. The team has proposed a number of activities to enhance the incomes of small scale traders. This package is concentrated heavily on improving aspects of fish supply. So far as the team are aware, little or no recent research has been conducted in Sri Lanka on fish demand.

16. Therefore, a phased survey of fish consumption by a local marketing research company is recommended. A marketing brief for this activity is presented at Annex II.

Action: BOBP

#### *Training for ice box construction*

17. If the initial trials with the insulated boxes prove encouraging it is recommended that the project should consider presenting a training course in insulated box construction for local craftsmen. A two week practical course with up to 15 participants is envisaged. A costed proposal with Terms of Reference for the Post-harvest Technologist is given as Annex III.

Action: BOBP, NRI

#### *Permanent ice boxes and Ice meltage trails*

18. A programme of work has been drawn up to compare the ice melting rate in a "PIB" and in damp sawdust. NARA have

scheduled the work for the next few months. The "PIB" has been constructed but the trial is held up pending erection of a shade.

19. An opportunity has arisen to field-test an existing PIB at the home of an ice trader in Dodanduwa. Subject to the satisfactory result of an acceptability trial, a longer term trial to establish the costs and benefits associated with PIB use is recommended.

Action: BOBP

20. NARA has undertaken a number of trials to compare the ice melting rate in the prototype insulated cycle trader boxes. Results on the trials are available but have not been written up.

Action: NARA

21. Although NARA has carried out some ice meltage trials, progress has been limited. NARA remains seriously understaffed. We understand that interviews have been held to recruit two established research officers.

22. Therefore, it is recommended that, given the logistical problems NARA has had collaborating with the project to date, future efforts should be concentrated on developing the capabilities of local consultants and NGO's.

23. The project should consider funding the training of a local counterpart in rapid rural appraisal. Such skills would be highly relevant to the proposed programme of work.

Action: BOBP

#### *Biogenic amines*

24. NARA has recently received equipment capable of conducting the necessary analysis. A purpose built laboratory suite is being fitted out to house the equipment. It is estimated that it will be operational within three months.

25. Subject to the successful commissioning of this laboratory it is recommended that a short consultancy visit be authorised to assist NARA in developing appropriate and reliable analytical procedures to measure biogenic amines in fish. In addition, the consultant would plan a survey of the levels of biogenic amines in fish and fish products sold in Sri Lanka.

26. A costed proposal, with Terms of Reference for the consultant Food Biochemist is given at Annex IV.

Action: BOBP

## MAIN REPORT

### Introduction and background

27. This mission was conducted under the ODA funded Post-Harvest Fisheries Project, a component project of the Bay of Bengal Programme. A survey of small trader fish marketing, initiated during a previous mission (Clucas and Bennett, 1991) was reviewed. This survey was conducted by local consultants (IRED) to characterise, in socio-economic terms, the present system and assess the likely impact of future interventions.

28. The mission reported here consisted of a number of components. These included a review of the progress on the socio-economic base-line survey of bicycle traders in Colombo, assessment of a range of insulated fish boxes for bicycle traders, development of a strategy for dissemination of insulated fish box technology and identification of other possible target groups among itinerant fish traders who might be potential beneficiaries of future assistance.

29. In addition the mission assessed the results of progress with ice meltage trials set up during the Clucas/Bennett mission and discussed the possibility of collaboration on research into biogenic amines in the fish distribution chain. The full terms of reference for the mission are given in as Annex V.

30. The mission lasted approximately 2.5 weeks and included field surveys and discussions with relevant institutions. A full itinerary is at Annex VI.

### Progress on base-line survey

31. The following activities have already be completed or are in the process of completion:

- (a). A census of bicycle and motorcycle traders using St Johns market car park as their base of operation;
- (b). A separate head count of the same;
- (c). An unstructured survey of 50 individual bicycle and motorcycle traders. This study was aborted at an early stage due to difficulties with enumeration.
- (d). A semi-structured "case study style" survey of 50 individual bicycle and motor-bike traders including participant observation (about 35 complete to date). This sample was stratified from census data according to:
  - . box type (wood and galvanised)
  - . vehicle (bicycle and motorcycle)

- . distance travelled to marketing areas (long, short, urban and rural)
- . time involved in fish marketing (less than three years or greater than three years)

(e). A "needs assessment workshop" attended by the focus group of 50 traders including a formal survey of all those attending.

32. The following activities remain to be completed under the current agreement:

- . An initial impact study of 20 bicycle traders, including 10 with improved boxes and 10 with traditional boxes. Each respondent should be interviewed once a week during the survey period.
- . Drafting and production of report on activities under phase I of the agreement.

33. Delays in completion of the work contracted have been largely due to the process approach adopted by the local consultant and problems maintaining contact with such an itinerant target group. Several survey methods have been tried and not all have proved successful. For instance, the highly anthropological approach proposed in Clucas and Bennett (1991) proved unworkable given the staff available and was dropped in favour of a more structured, questionnaire based method.

34. Having enumerated and analysed a full census of the traders at St Johns market, IRED took a sample of 50 bicycle and motorcycle traders based on fish box type, vehicle type, distance travelled and time involved in marketing. Regrettably, the opportunity to choose these sub-groups randomly from the census was missed. Therefore, the focus group may be less representative than had been intended.

35. This focus group is currently the subject of an in-depth case-study style survey, which involves both semi-structured interviews and participant observation.

36. In addition to this, IRED will be conducting an impact monitoring survey with 20 cycle traders. Ten traders will be given new improved insulated boxes. Ten further traders will be used as a control group. Participants have been chosen randomly from the original 50 traders involved in the case studies. This group has then been further divided into sub-groups by the modal distance travelled during the course of fish trading. This was done in order to identify any difference between the likely financial benefits to traders travelling widely differing distances.

37. IRED propose to visit each target trader once a week during the period of the study.

38. An example of the original monitoring pro forma for this study is given at Annex VII. The following amendments were suggested:

- . The number of visits to each trader should be reduced from 7 to 4;
- . Types of fish traded should be specified exactly so that the range of fish sold can be ascertained;
- . Classification of customer type should be measured using a pre-determined proxy indicator of status such as house type. Where several types are visited, all should be included;
- . Distance travelled during trading should be measured precisely using the odometer on the enumerators' motor-cycles. IRED should ensure that all these instruments are in working order before commencing the survey;
- . The total number of customers contacted and the total number of individual transactions should be included in the survey (note that the first should be numerically larger than the second);
- . Fish left over at the end of the selling period should be weighed (using the traders' scales), the fish type given and an estimated value attached (ie, the residual value);
- . Box condition should be assessed to give an indication of the level of deterioration. Damage should be recorded. A photographic record should be kept of a sample of boxes.

#### **Additional activities under the present work programme**

39. To build upon this study, the mission proposed two additional activities: firstly, IRED should continue the study for a further 11 months after the initial period, visiting each respondent once a month. This is deemed necessary to clearly demonstrate the durability and long term financial efficacy of the insulated fish box. Secondly, the consultants should intensify the data gathering among the study group during the peak fish production period of September and October. It is suggested that IRED resume weekly surveys for four weeks during this period.

40. The IRED original sample group of 50 traders included both bicycle and motorcycle traders. The latter group has been particularly responsive to the group forming opportunities presented by the BOBP activities. Since baseline data are already available the team proposes an extension to the current programme to include motorcycle traders.

41. In order to carry out this study IRED will require 5 additional insulated boxes suitable for use on motorcycles, plus a further 5 boxes to be given to the control group at the end of the initial survey period. They may also require additional funds to cover the increased research demands placed upon their existing staff.

### **Strategy for dissemination**

42. The team were asked to consider a strategy for the dissemination of trader ice box technology, initially in Colombo and later in selected landing sites in Sri Lanka.

43. The approach adopted to date has concentrated on fostering participation among traders and encouraging group formation based upon clearly identified perceived needs. The key to this approach is that it is reactive. The drawback is that it is time-consuming and labour-intensive. The team consider that investment in needs assessment and group formation at this stage will be more than repaid in terms of identification of sustainable improvements in the future.

44. Therefore, the team has proposed a number of activities with small-scale traders which use the same "process approach" concentrating on forming groups, encouraging participation and discussion of needs. These are outlined in the following paragraphs.

### **Proposed future activities**

#### *Extension of insulated fish boxes*

45. The project should extend bicycle and motorcycle assistance to 2/3 new target groups. Lessons learnt during the research in St John's Market should be applied, including initial identification, "needs assessment" and impact monitoring. To start with this should include a large landing site (eg, Negombo or Beruwala), a small landing site (eg, Dodanduwa or Matara) and an internal distribution point (eg, Kandi).

46. With few exceptions, small traders are not organised and fall outside the Government of Sri Lanka's Cooperative programme. Provision of insulated boxes is seen as an access point to bring small-scale traders into contact with groups who can offer them a range of assistance.

47. The consultant should identify appropriate local NGO groups interested in supporting assistance to itinerant fish traders. Every effort should be made to facilitate long-term contact between NGO's and fish traders.

### *Provision of credit*

48. Traders have identified access to credit as a constraint to their current activities. Traders use credit to cover large capital outlays (eg, purchase of transport) and to buy stock during periods of exceptional demand (eg, festivals). Furthermore, the introduction of an improved insulated fish box will require traders to borrow against expected additional income.

49. Itinerant traders traditionally borrow from non-formal credit sources such as middle men or professional money-lenders who frequent the fish landing sites and markets. They have little or no experience of formal credit mechanisms.

50. Though formal credit is available in Sri Lanka, and discussions held with the key lending institutions during the mission clearly showed that itinerant traders are a group who they would like to lend to, few fish traders have availed themselves of the facility. The primary reason for this is that of access. Borrowers must complete a complex series of forms, provide adequate identification, supply suitable references and prove they have collateral.

51. Widespread distribution of improved, insulated ice boxes to small scale traders will require credit provision. These groups are seen as a high risk by lending institutions. Therefore, the project, or another donor, should consider the need to underwrite a credit scheme during its initial stages. Assuming a demand for 3,000 boxes and a bond of 10% this could represent a collateral of £15,000.

52. Lending institutions will require clear evidence of the financial benefits accruing from technical changes before agreeing to allow itinerant trader access to credit schemes. Subject to the production of the consultant's final report on Phase I activities, it is recommended that a credit funding proposal be drawn-up and presented to the banks.

53. Development of an appropriate and sustainable credit facility will be an important element of any future programme of small trader assistance. It is suggested that this should include drawing up a "borrower education programme" to improve access to formal credit. This programme might consist of seminars and workshops for fish traders explaining the mechanism for applying for credit. Ideally, each trader group should have at least one member who is trained to provide assistance with loan applications.

### *Country-wide census of "'cycle traders"*

54. The team attempted to estimate the population size of bicycle traders in one coastal and one inland region of Sri Lanka. This highlighted the large numbers of small-scale

traders involved in fish marketing and the difficulties of enumeration. Fish traders tend to be gathered together only briefly in the early morning. Their activities also appear to be quite seasonal in rural areas where falling supply causes many to seek alternative employment.

55. An indicative study of the number and location of bicycle traders and motorcycle traders in Sri Lanka, both coastal and inland is proposed. This will provide a guide to possible future target groups and a clear indication of the overall target population. This is necessary to gauge the likely economic benefits from assistance to bicycle traders. Moreover, it will form the basis for measuring the possible market for both improved fish marketing and fish marketing technology. Should the project decide to manufacture an insulated fish box centrally this information will be required for an investment decision.

56. This study should be conducted during the peak fish landing period (September - October).

#### *Extension materials*

57. It is important that the lessons learnt from the project during these difficult early stages when data are being gathered are disseminated. This information is of two types: data of interest to development practitioners, and data of use to the target beneficiaries. The former should be supported through dissemination of the IRED final report and also through funding a regional workshop on assistance to itinerant traders. Requests from IRED for assistance with other publications should be considered favourably.

58. The project should support the production of extension material for use among beneficiaries both in Sri Lanka and regionally. Specifically, the production of videos on bicycle trading and insulated fish box construction are recommended.

#### *Training*

59. The team consider the training of local consultants, counterpart NGO staff and local artisans as an integral part of the projects' approach to institutional development. Training needs include: development of appraisal and survey skills - a local short course in Rapid Rural Appraisal is recommended and training of local craftsmen in insulated box construction.

60. If the initial trials with the insulated boxes prove encouraging it is recommended that the project should consider presenting a training course in insulated box construction. Participants would be drawn from a range of centres in Sri Lanka including boat-builders, carpenters and small fibre-glass workshops. A two week practical course with up to 15 participants is envisaged. Both ITDG and

NORAD are prepared to nominate participants from among their counterparts.

61. It is suggested that the course is presented at the Fisheries Training Institute (Colombo or Tangalle).

#### *"Pingo" traders*

62. Door-to-door fish traders who carry their produce on foot are called "Pingo" traders. This group, made up of women head loaders and men who carry fish on baskets balanced from a pole carried over their shoulder. "Pingos" buy their fish either directly from landing sites, from central fish markets or from individual local retailers. In this latter case, it seems common for the Pingo and the retailer to be related, sharing marketing costs and providing a range of services, both door-to-door and static. At larger landings and central markets, it is common to see Pingos arriving in trucks and vans which they have combined to rent for the purpose of carrying themselves and their fish to their trading areas.

63. Little is known about Pingo traders. Anecdotal evidence suggests that they exist in very large numbers and are an important intermediary in the fish marketing chain.

64. An investigation of both women headloaders and male shoulder loaders is recommended. Initially, a local consultant social scientist should be employed to conduct a preliminary investigation of this group (estimated at 3 person weeks). The terms of reference for this study should include:

- . identify key locations of Pingo trading;
- . describe modes of operation and returns to labour;
- . assess likely constraints to development, areas for income enhancement and quality improvement;
- . characterise the role of Pingo traders in the fish marketing chain.

65. Subsequently, the consultant should conduct a number of group meetings to assess the key needs of these traders and suggest areas where the project might assist. If a role for the project is clearly demonstrated, a socio-economic base-line survey should be initiated.

#### *Fish consumption survey*

66. The team has proposed a number of activities to enhance the incomes of small-scale traders. This package of activities is concentrated heavily on improving aspects of fish supply. So far as the team is aware, little or no recent research has been conducted in Sri Lanka on fish demand. There are indications that consumption habits are changing. For example, iced marine fish now appears to be widely accepted. Almost all the bicycle and motorcycle

traders interviewed so far use ice routinely and many indicated a strong consumer preference for iced fish. Supporting evidence is given in a case study of bicycle trading in Colombo at Annex VIII.

67. A marketing brief has been drawn up for the initial investigation of fish consumption patterns among various income groups in rural and urban Sri Lanka. This is presented at Annex II. Two local marketing research companies have been identified as capable of undertaking the study ("Lanka Market Research Bureau" and "Survey Research Lanka"). It is recommended that both be asked to tender.

68. A phased approach has been suggested starting with qualitative research (focus group interviews) and, subject to results, continuing with quantitative research (either a formal questionnaire sample survey or the purchase of a number of questions on a Sri Lankan "Omnibus" survey<sup>1/</sup>

#### **Fish Trader Insulated Boxes**

69. A number of prototype cycle trader insulated boxes had been constructed following the Clucas & Bennett mission to Sri Lanka in 1991. The visit report included simplified construction drawings for a plywood/expanded polystyrene box of a similar size to the lightweight wooden box used by many of the traders. The carpenter/boatbuilder contracted to build the prototypes had obvious problems in understanding even simplified construction plans and the resultant boxes were far too heavy and had poorly fitting lids. In an attempt to reduce the weight the Project Field Manager (Tim Bostock) commissioned glass reinforced plastic (GRP) insulated prototypes, but these were only partially and inadequately insulated.

70. All the available prototypes were shown to a group of cycle and motor-cycle traders at the beginning of the visit. Numerous comments were made regarding size, shape, colour, weight and fittings for ancillary equipment (scales, knives and chopping board). Bicycle traders all commented adversely on the excessive weight of the prototypes. Both the plywood and GRP prototypes were unduly heavy but, in part, the traders could only compare them with their existing simple, open, lightweight wooden boxes. The discussions with the traders established their requirements for boxes for bicycle and motor-cycle use in terms of weight, capacity, shape and ancillary fittings.

71. Modified versions of both the plywood and GRP prototypes were constructed during the course of the visit in preparation for the impact monitoring trials initiated at the conclusion of the visit. An order was also placed with

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<sup>1/</sup> An "Omnibus" survey is a nationwide representative random sample survey conducted at regular intervals by a professional market research organisation. Clients add individual questions to the survey as necessary.

the GRP box builder to construct moulds for a fully insulated (25mm thick expanded polystyrene), double skinned box and lid, with a close fitting lid with rubber seals. A prototype insulated motorcycle trader box was also ordered that incorporated the changes in size and proportions suggested at the earlier meeting with the traders.

72. The design and construction of an insulated box for the traders presents a considerable challenge to achieve adequate insulation performance, durability, minimum weight and cost, within the constraints of locally available materials and skills. GRP is a durable material that is widely used in Sri Lanka (eg fishing boats, furniture and water tanks). Unfortunately it has limited impact resistance and may have a very limited life in the thin sections necessary to give a lightweight box. Most GRP work in Sri Lanka is carried out with polyester resins; these attack expanded polystyrene foams and any repair work would tend to destroy the insulating material in the box. Other resins are available, at increased cost, that would allow the direct laying up of GRP onto an expanded polystyrene box. As all GRP raw materials are currently imported into Sri Lanka, acquiring epoxy resins should not present any problems.

73. The builders of both the plywood and GRP boxes used fairly heavy grade, coarse, chopped strand glass fibre mat to make or reinforce the boxes. This was apparently the grade commonly used by all small workshops in Sri Lanka, but was unduly heavy and gave a rough finished surface unless laid up on a mould over a gel coat. This resulted in thicker sections than required and added to the weight problem.

74. As the experience of the bicycle and motorcycle traders does not extend beyond the simple containers they have used to date, any discussion with them of alternative boxes with a weight penalty for insulation and improved hygiene was difficult. The impact monitoring survey initiated at the end of the visit will be particularly important in establishing the requirements for an acceptable insulated box.

75. A meeting was held with an injection moulder of rigid expanded polystyrene foam products. It is possible to produce a box and lid of suitable size and a quotation was requested to cover tooling costs and likely price if several thousand boxes were required. The possibility of an injection moulded polyethylene outer and inner for the box and lid was also discussed and further information was requested. Injection moulded boxes could only be made by an industrial company and the cost of tooling would only be justified if large numbers were manufactured. Although reliable information on the numbers of cycle and motorcycle traders is not available at the present time, it is estimated that the total number in the accessible areas of the country is around 3,000 - 4,000. This may not be sufficient to cover the tooling costs for an injection

moulded design. Polyethylene is also vulnerable to deterioration in ultra violet-light, becoming brittle and cracking. Repair is difficult and probably impractical in the field situation.

76. To minimise the acceptability problems with the traders, hold down initial cost and allow construction and repair in the field development of the following box is suggested. An outer lightweight wooden box of similar size and construction to the existing uninsulated container currently used by most the traders; a 25mm thick expanded polystyrene liner and lid sheathed with a thin layer of epoxy resin GRP. The wooden outer would provide robust protection for the polystyrene liner, be easily attached to the cycle and carry the ancillary fittings for knives, cutting boards, scales, etc. The insulated inner should not add more than 4 kg to the weight of the current box. Construction details and sketch plans are shown at Annex IX.

77. The need to develop an effective and acceptable insulated box for the traders, before undertaking the impact assessment study, may delay the programme. The results of the impact study will be jeopardised if the traders are using boxes they consider unsuitable. The various boxes described above should be tested by the traders for technical performance and acceptability, incorporating any indicated modifications that are required until an acceptable box is developed. It is recommended that the project should provide funds to support the continued development of the boxes.

#### *Training for Box Construction*

78. If the initial trials with insulated boxes prove encouraging and if an effective and acceptable box can be developed that is suitable for building in small workshops, it is recommended that the project should consider presenting a training course in insulated box construction. Participants would be drawn from a range of centres in Sri Lanka including boatbuilders, carpenters and small fibre-glass workshops. Local offices of NORAD and ITDG were approached and requested to nominate participants for the course.

79. The course should be essentially practical in presentation, with each participant constructing at least one box during the course. If the participants are drawn from the pool of skilled artisans in the fishing centres they should be able to bring a basic set of woodworking tools with them. The project should provide the materials necessary to construct the boxes, including any special tools required. A costed proposal for the course is appended at Annex III.

80. It is suggested that the course should be presented at a Fisheries Training Institute (Colombo or Tangalle) where residential facilities are available.

## Permanent Ice Boxes

81. The previous visits (Rogers, 1991 and Clucas & Bennett, 1991) had identified a small-scale ice seller in Dodanduwa fish landing as a suitable recipient of a PIB (see Clucas & Bennett, 1991, pp17-22 and Annex V). The box was intended to increase the availability of ice to the itinerant fish traders, improve the continuity of supply at the landing and reduce the financial risk to the ice trader. This would provide cost and benefit data and serve as a demonstration model. A series of local social and institutional constraints emerged during the Clucas & Bennett mission and it was considered unwise to proceed with a trial to test the feasibility of the ice seller using a PIB on the landing. Since the last mission a new and rival ice seller has been allowed to erect a traditional ice store on the landing beach.

82. During the course of field work on this mission, the team visited Dodanduwa again. The position of the proposed recipient had not changed and we were unable to obtain permission for her to site a PIB on the landing. However, she indicated that there would be no objection to siting a PIB at her residence on the main road through the village. She holds her stock of ice in sawdust on the front porch of her house.

83. We believe that a PIB would reduce the amount of ice lost in pre-sale storage and permit her to hold larger stocks to meet both fluctuating supply and demand. This would greatly reduce the financial risk involved. Hopefully this would prove to be an effective demonstration of the PIBs.

84. We recommend that the Project Field Manager approach the "Sandskipper" project with a view to borrowing their model of the PIB design proposed in Rogers, 1991 for use at Dodanduwa for initial acceptability trials. Preliminary discussions with the Acting Manager of the Sandskipper project suggested that the PIB could be borrowed for a limited period.

85. Transportation costs (a small pick-up) and minimal site preparation should be borne by BOBP. After a period of familiarisation (say one month) and subject to a successful outcome, the project should train the recipient to collect regular data prior to and after receipt of the box. These data should include ice purchased (weight and cost), weight lost during storage, ease of operation and a record of sales.

86. We recommend, subject to a satisfactory result with the acceptability trial, conducting a longer term trial to establish costs and benefits associated with the use of a PIB. If a longer term trial is indicated the Sandskipper Project Manager and the British High Commission should be approached with a view to the PIB being permanently transferred to the ODA funded Post Harvest Fisheries Project

of BOBP. The Sandskipper project is to finish in the third quarter of 1992.

### Ice meltage trials

#### "PIB's"

87. A programme of work has been drawn up to compare the ice melting rate in a PIB and in traditional storage in damp sawdust. A top loading PIB has been constructed but the trial is held up pending erection of a simple shade. NARA have the work scheduled for the next few months.

88. A report on this work is expected soon after the completion of these trials.

#### Small insulated boxes for traders

89. NARA have undertaken a number of trials to compare the ice melting rate in a number of the prototype insulated fish boxes and the traditional wooden boxes used by both cycle and motorcycle traders. Preliminary results are presented in Table 1. These results show that the ice meltage rate is significantly reduced in the insulated boxes.

Table 1: Preliminary trial to measure ice melting rates in prototype insulated boxes and traditional wooden boxes used by bicycle and motorcycle traders.

Elapsed time (hours)	NARA1	NARA2	IREDD1	IREDD2	6A	7A
	-----weight of ice melted (kg)-----					
0	0	0	0	0	0	0
1	1.25	0.5	1.0	1.0	3.25	2.25
2	2.25	1.25	2.5	2.25	5.0*	5.0*
3	3.25	2.25	3.5	2.75	-	-
4	3.75	2.5	4.0	3.25	-	-
5	4.25	3.25	4.5	3.75	-	-
6	4.75	3.25	5.0*	4.25	-	-

#### Notes:

Initial weight of ice in each box = 5.0 kgs

"\*" denotes all ice melted.

#### Key to boxes:-

NARA1 - insulated plywood, motorcycle trader.

NARA2 - " " , bicycle trader.

IREDD1 - insulated GRP, bicycle trader.

IREDD2 - small, insulated GRP, bicycle trader.

6A - traditional wooden box, motorcycle trader.

7A - " " " , bicycle.

90. The traditional boxes lost all the ice within two hours, whereas the insulated boxes all held some ice for 5 - 6 hours. Ideally the trial should be repeated, allowing time for the boxes to cool down from ambient and recording the loss of ice at shorter time intervals. This would more accurately reflect the actual marketing practices of the bicycle traders as shown by the socio-economic base-line study. The insulated boxes, even with the constructional and design faults, hold ice for three times longer than the simple wooden boxes.

91. Although NARA have carried out some work, progress has been limited. NARA remains seriously understaffed. We understand that interviews have been held to recruit two additional, established, research officers.

### **Biogenic Amines**

92. Further discussions with NARA staff and other fisheries officials confirmed the concerns expressed in the earlier visit (Clucas & Bennett, 1991) that biogenic amine levels (histamine) probably reach toxic concentrations in some fish, particularly pelagic species, eg tunas. Until now suitable equipment to measure biogenic amines was not available within the fisheries administration. Method sheets for estimation of histamine were left with NARA.

93. NARA has recently received a donation of laboratory equipment which was said to include instruments that could be used to determine biogenic amine levels in fish. The equipment had not been unpacked at the time of the visit and time was not available to obtain detailed lists of all the items included, or the condition of existing laboratory equipment in NARA. An existing room in the main building will be refurbished and air conditioned to house the equipment. Dr Namaratne, the Officer in Charge of the Post Harvest Institute, NARA, estimated that the equipment will be installed and operational within three months. NARA have been requested to inform the BOBP office when the new laboratory is operational and provide a list of all the new and existing equipment.

94. When the new laboratory suite and the new equipment is operational it is recommended that the project fund a short term (two week) technical consultancy visit by an experienced food biochemist to assist NARA to develop the necessary analytical procedures to analyse fish samples for biogenic amines. Once the analytical methodology has been developed the consultant should also assist NARA in designing a survey programme to establish whether biogenic amines present a significant health hazard to consumers in Sri Lanka.

95. Term of reference for the consultancy visit are presented at Annex IV.

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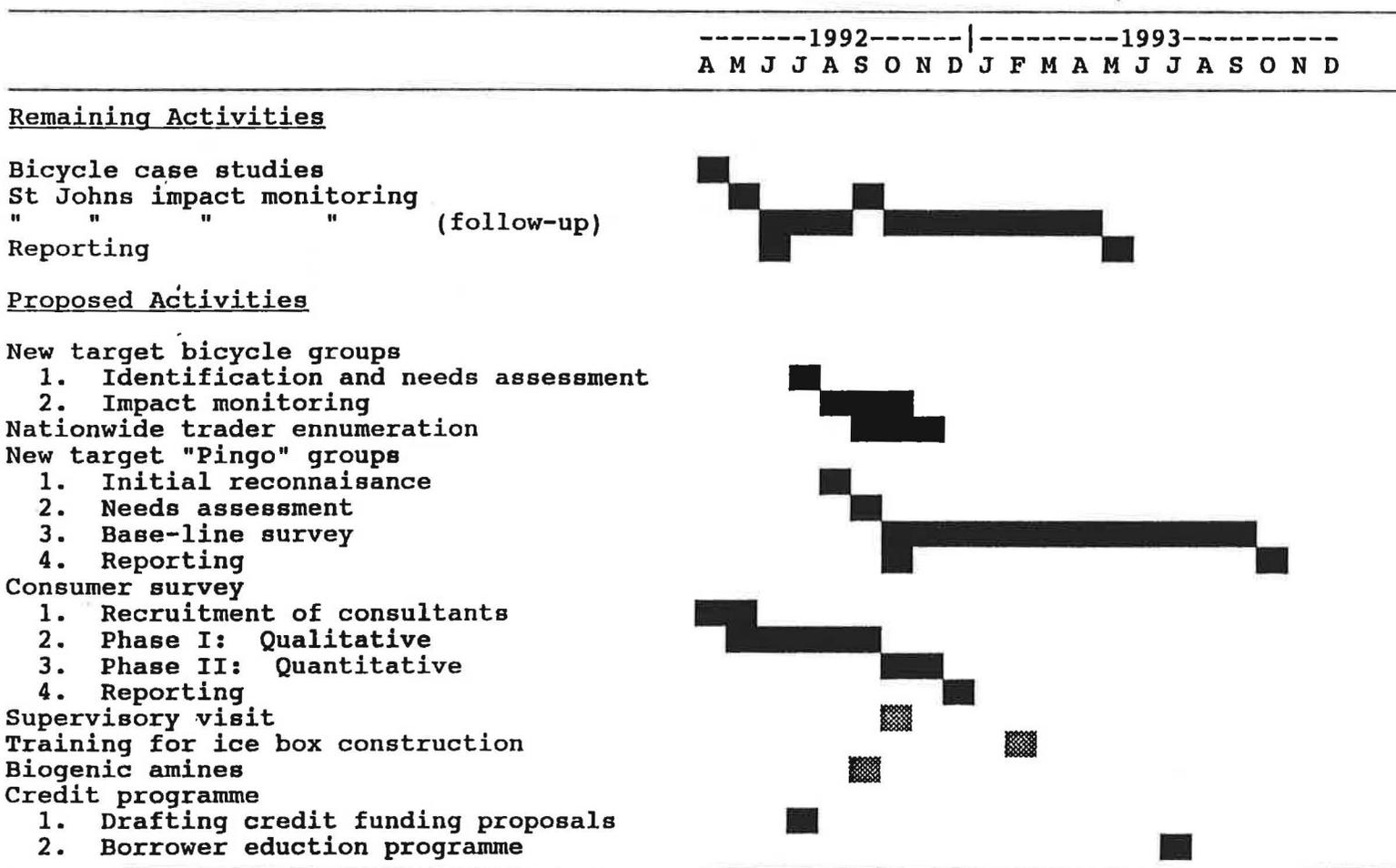
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Annex I

Suggested programming of activities



Note: ■ denotes local consultant activity and ■ denotes external consultant activities

## **Annex II**

### **Fish Consumption Survey: Marketing Brief**

#### **Background**

1. The ODA funded Post-Harvest Fisheries Project in Sri Lanka, part of the FAO, Bay of Bengal Programme, has been undertaking a socio-economic base-line survey of bicycle and motorcycle traders selling fish in central Colombo.

2. As part of this programme traders are currently testing an improved insulated fish box which is intended to result in the following benefits:

- . extended selling period
- . overnight storage of fish
- . reduced losses due to ice meltage
- . increased marketing range
- . reduced risk to public health

3. Subject to the successful conclusion of this work it is proposed to undertake of further activities in the area of small scale trading of fish. Target groups include: bicycle traders, motorcycle traders, traders who carry fish from door to door and small scale retailers. These activities will be conducted in both rural and urban areas.

4. The project has identified a need to form a better understanding of the consumption patterns of fresh fish in Sri Lanka in so far as they effect the target population (fish traders of various types). This is complimentary to the project's efforts to generate additional value in the fish marketing chain.

5. The study should cover both rational considerations and attitudinal aspects of demand. Therefore, both qualitative and quantitative market research is proposed.

6. To this end, the ODA/BOBP programme is requesting a number of local marketing and research groups to submit a fully costed proposal for exploratory research.

#### **Objectives**

7. The overall objective of such a study is to enhance the incomes of small-scale traders as measured by either reduced losses (quality, quantity, financial and nutritional), increased sales/value and reduced costs.

8. Short term objectives are to identify the key market segments, outline areas of growth or decline in demand, and determine consumer response to a number of initiatives to improve fish quality.

## **Information required:**

9. Data required fall in the following broad areas:
  - a. Reaction to improvements in quality ie,
    - . use of ice
    - . presentation of product
    - . range of product
    - . quality of product
    - . access to product
  - b. Consumer sensitivity to price ie,
    - . substitution effects
    - . income effects
  - c. Importance of credit relationships to consumption decisions.
  - d. The language client groups use to describe all aspects of the products and the marketing of the products.
  - e. Product preferences.
  - f. Seasonal differences in consumption patterns and product perception.

## **Main activities**

10. A dual approach is envisaged involving two phases:
11. Qualitative research - Initially a number of focus groups will be recruited representing key market segments and socio-economic groups.
12. Quantitative research - The results of the qualitative research will be used to develop a suitable questionnaire for investigation of areas of specific interest.
13. Initially the consultants will conduct and report upon qualitative aspects of fish consumption. Subject to the satisfactory completion and review of the report on this work, a quantitative study will be initiated.
14. Proposals should, therefore, be costed in two phases and include adequate time and resources for report writing and publication.

## **Recruitment**

15. Key sectors of society should be represented including a range of urban and rural fish consumers, both men and women. The groups should consist of consumers who presently

purchase fish from a variety of sources including: door-to-door foot, bicycle and motorcycle traders, informal retailers (eg, semi-permanent outlets), formal retailers (eg, permanent outlets) and super-markets.

16. Where possible, focus groups interviews should be conducted in an environment which is both familiar and comfortable.

**Time-scale**

17. The following time-scale is proposed:

Phase I: Recruitment and interviews - May/June 1992  
Draft interim report - August 1992

Comments from BOBP - September 1992

Phase II: Development of questionnaire or  
development of questions for inclusion in an  
"Omnibus" survey (as appropriate) -  
September 1992

Survey enumeration - October 1992

Data analysis and report writing - November  
1992

Production of draft report - December 1992

## **Annex III**

### **Proposal for a Training Course in the Construction of Insulated Fish Boxes for Cycle and Motorcycle Traders**

#### **Summary**

1. The successful introduction and long term use of insulated boxes by itinerant fish traders will depend on designing an effective box that can be made and repaired within the fishing communities. Research work is currently underway in Sri Lanka to develop an effective and acceptable box for the traders to use. Once an acceptable design is established it will be essential to transfer the technology to the fishing communities if widespread uptake is to be achieved.

2. The training course proposed, with the emphasis on practical instruction and the construction of boxes, together with the participants making templates and moulds for future manufacture, will provide for the sustainable transfer of the technology.

#### **Objective**

3. To present a practical training course to skilled artisans from fishing communities in the construction of insulated boxes for itinerant bicycle and motorcycle traders, and to enable future construction and repair to be undertaken at village level.

#### **Duration**

4. A 10 day residential course is proposed.

#### **Participants**

5. The optimum number of participant would be 15.

#### **Location**

6. At the Fisheries Training Institute, (Colombo or Tangalle as appropriate)

#### **Timing**

7. Participatory research is currently being conducted into box design. An on-going impact monitoring study is being conducted concurrently to assess the technical and financial efficacy of insulated fish boxes. Training for box construction will be necessary only when these activities are complete.

8. It is proposed to conduct the course early in 1993, when an acceptable, effective box has been developed.

#### **Counterpart Organisations**

9. The following counterparts are suggested;

- . Ministry of Fisheries - Extension and Training Division;
- . National Aquatic Resources Agency.

#### **BOBP Consultants**

10. The following staffing is recommended:

- . Fisheries Technologist;
- . Glass Reinforced Plastic specialist (locally recruited);
- . Technical instructor/woodwork (locally recruited);
- . Guest speaker ie, local social scientist to explain results of the base-line survey and outline trader needs.

11. The consultant would be required for three weeks, one week to prepare for the course and two weeks to present it. The guest speaker would be required for one morning.

#### **Course Content**

12. The following outline course content is suggested:

- i. A basic introduction to the salient features of an efficient insulated box, the particular requirements of the fish traders in Sri Lanka and design options for boxes suitable for use by cycle traders and motorcycle traders.
- ii. A demonstration of the selected designs and construction methods, with the aid of schematic drawings and cut-away models.
- iii. Practical sessions to instruct each participant in the construction of:
  - . a complete cycle trader box
  - . a cut-away cycle trader box incorporating all essential dimensions and showing internal construction details.

. preparation of a set of full size templates for both the cycle and motorcycle trader boxes to aid in the accurate construction of further boxes on return to their home areas.

iv. If a GRP design is selected the course would include:

. GRP construction methods and the fabrication of a cycle trader box.

. the construction of a full set of moulds for the two sizes of box to facilitate further construction on return to their home areas.

**Costs (estimated)**

	£
Fisheries Technologist (NRI 24, days @ £320/day)	7,680
Travel (Return air fare to Colombo via Madras)	2,117
Subsistence (21 days, @ £60 per day)	1,260
GRP Specialist (locally recruited) 2 weeks	200
Instructor/woodwork (locally recruited) 2 weeks	200
Guest speaker	40
Participant travel and subsistence	320
Food and accommodation at FTI	560
Materials and specialised tools	3,000
Industrial visits	200
Incidental expenditure	300
Publication costs	50
<b>Sub-total</b>	<b>15,927</b>
<b>Contingencies @ 10%</b>	<b>1,593</b>
<b>Total</b>	<b>17,520</b>

**Suggested Terms of Reference for the Fisheries Technologist to conduct a training course in insulated box construction**

13. During a three week mission to Sri Lanka the consultant Fisheries Technologist should undertake the following in close collaboration with officials from the BOBP Office, NARA, the Ministry of Fisheries and assisted by a locally recruited GRP Specialist and a Woodwork Instructor.

- i. A two week training course on the construction of insulated fish boxes with up to 15 participants who have been chosen for their practical background in small scale boatbuilding, carpentry and GRP work.
- ii. Organise and present, with the assistance of the locally recruited specialists, practical instruction for the participants to be able to construct one complete bicycle trader box each and for them to understand the essential factors involved in making effectively insulated fish boxes.
- iii. Provide practical instruction for participants to make full size templates and/or sets of GRP moulds to enable them to begin regular production on return to their home areas.
- iv. Advise the project managers of the prospects for producing an extension booklet on box construction methods.
- v. If required, stopover in Madras on the way home to debrief with the BOBP Post Harvest Field Manager.
- vi. Within 24 hours of return to office produce a brief "back to officer report" summarising the outcome of the visit.
- vii. Within three weeks of return to UK submit a full visit report.

## **Annex IV**

**Proposal for a consultancy visit to assist NARA in establishing the estimation of biogenic amines in fish and planning a survey to assess the public health risk posed by biogenic amines in fish and fish products currently traded in Sri Lanka.**

### **Summary**

1. Reports have been made of consumers in Sri Lanka regularly developing allergic reactions after eating fish, particularly the pelagic tuna species. The type of reactions reported suggest that high levels of biogenic amines in the fish could be the cause. Scombroid species, such as the tunas, have a tendency to develop toxic levels of biogenic amines if the post-harvest handling procedures are inadequate. Reports of the handling methods on the boats and observation of the distribution and marketing chain from landing to consumer suggest that toxic levels of amine could develop.

2. NARA have recently acquired analytical instruments that would allow measurement of biogenic amines in fish. A short term consultancy is proposed to assist NARA in developing suitable analytical techniques and in planning a survey to monitor levels in the fish and fish products currently traded in Sri Lanka.

### **Objectives**

3. To establish a reliable method of estimating biogenic amines in fish with the new equipment available to NARA and train NARA staff to carry out the analytical method.

4. To assist NARA in planning a survey to establish the level of biogenic amines in fish and fish products currently traded in Sri Lanka.

### **Duration**

4. A 2 week mission is proposed.

### **Location.**

5. NARA, Colombo.

### **Timing.**

6. The mission should take place after the commissioning of the new laboratory suite. This is expected in mid to late 1992.

**BOBP Consultant**

7. An experienced food biochemist familiar with the analytical techniques to estimate biogenic amines in fish and fish products.

**Counterpart staff**

8. NARA's principal biochemist (Dr Namaratne), junior scientists and laboratory technicians.

**Costs (estimated)**

	£
Consultant food biochemist (NRI, 18 days @ £320)	5,760
Travel (Return air fare to Colombo via Madras)	2,117
Subsistence (18 days, @ £60 per day)	1,080
Reagents and chemicals	500
Local travel	250
Publication costs	50
Sub-total	9,757
Contingencies @ 10%	976
Total	10,733

**Suggested Terms of Reference for the Food Biochemist to assist NARA estimate Biogenic Amines in fish**

9. During a two week mission to Sri Lanka the consultant should undertake the following in close collaboration with counterpart staff from the Post Harvest Fisheries Research Unit of NARA:

- i. Provide training in analytical techniques to measure biogenic amines in fish and fish products in Sri Lanka;
- ii. Set up methods for the estimation of biogenic amines in fish and fish products.
- iii. Instruct counterpart staff to undertake the analytical techniques.
- iv. Assist NARA staff to design a sample survey to establish the biogenic amine levels in fish and fish products currently traded in Sri Lanka.
- v. Advise on any further inputs that may be required to develop the technical facilities and analytical skills of NARA staff.
- vi. If required, stopover in Madras on the return journey to debrief with the BOBP Post Harvest Field Manager.
- vii. Within 24 hours of return to office produce a brief "back to office report" summarising the outcome of the visit.
- viii. Complete a final report on the visit within three weeks of return to UK.

## **Annex V**

### **Terms of Reference for the visit reported here**

During a two week visit to Sri Lanka (Feb/March 1992) the consultants should undertake the following, working in collaboration with Post Harvest Fisheries Institute of the National Aquatic Resources Agency (NARA) and Innovations et Reseaux Pour Le Developpment (IRED).

1. Review progress on the socio-economic base-line survey of bicycle traders in Colombo and advise the local consultants (IRED) on further inputs required.
2. Assess the potential technical and economic performance of a range of prototype insulated, bicycle trader fish boxes constructed following the previous NRI consultancy visit (Clucas and Bennett, 1991), and, in collaboration with traders' groups and local craftsmen, advise on changes in design and construction required in order to optimize these factors.
3. Outline a strategy for dissemination of bicycle trader ice box technology initially in Colombo and later at other selected landing sites in Sri Lanka. This would include technical, social, institutional and financial aspects as well as the identification of suitable local non-government organisation(s) capable of managing and monitoring such an input.
4. Visit selected landing sites and centres of peripatetic fish trading to identify potential future target groups for implementation of this outline strategy.
5. Appraise the results of the NARA ice meltage and alternative insulations trials for permanent ice boxes for potential use at fish landing sites. Particular attention to be paid to the technical, financial, economic, social and institutional factors involved in any future implementation.
6. Identify and establish initial contact with local institutions which possess equipment to measure biogenic amines in Fish and discuss the possibility of later conducting a survey to monitor these substances at key stages in the Fish Distribution chain.
7. Return to UK, via Madras, for debriefing with the BOBP Post-Harvest Project Manager, at the same time submitting a brief written summary of the findings of the visit.
8. Within one week of return to the UK submit a "back to office report" of immediate action required. Within four weeks of return submit a full visit report.

## Annex VI

### Itinerary

Date	Action
27/2/92	Arrive Colombo
28/2/92	M Foord, Second Secretary (Aid) British High Commission, Colombo Ministry of Fisheries Mr Weragoda, Secretary
29/2/92	St John's market, Colombo IRED W Gamage, National Coordinator Jayawardana, Coordinator Wijayalal, Researcher
2/3/92	IRED - NGO groups C Wickramasuriye, Hambantota Fisheries Cooperative A Pramanasii, Upali Dodomgoda W Liyanage H R H Peiris, Janodaya Centre M De Silva, General Manager, Puttlam Regional Development Association S Prasantha, Janawabodha Kendraya St John's market: consultative meeting with a sample of fish traders Inspection of venue for launching ceremony
3/3/92	BOBP L Joseph, Programme Officer National Aquatic Resources Centre Dr S Y Namaratne, Research Officer C Batugedara, Research Assistant Peoples Bank B Balathsinhala, Assistant General Manager (Cooperatives and Fisheries), Peoples Bank L P Chandrasena, Bank of Ceylon D Attanayake, National Credit Officer, BOBP Intermediate Technology Development Group

R De Silva, Country Programme Manager

4/3/92 Bennett: Participant observation with bicycle trader

Rogers: Negombo

Boat builder, "Nicholas"

T & E Fibreglass Company, Marawila

T Fernando, Proprietor

K P Sunil, Technician

Puttulam Rural Development Agency

D Lamahewa, Development Manager

D A Podirathne, Project Officer

5/3/92 BOBP

IRED

6/3/92 Moratuwa Market  
Kalutara Market  
Beruwalla landing  
Beruwalla District Fisheries Office

R Anselan, District Fisheries Officer

S Jayasuriya, Fisheries Inspector

Donanduwa

Galle

7/3/92 Ratnapura

8/3/92 Return Colombo

9/3/92 Bennett:

NORAD

R Weerasinghe

ITDG

R De Silva

P Calvert

G M Henegedara

A Scott

Lanka Market Research Bureaux Ltd

N De Silva, Research Director

R Bamunusingha, Senior Research Executive

Survey Research Lanka

D H Uduman, Managing Director

Rogers:

Negombo & Puttalam box makers

Mr Bostock arrives

10/3/92 Ministry of Fisheries

Mr Weragoda, Secretary

Preparation for inauguration of ice box  
research programme

Inauguration of ice box programme  
Random selection of subjects for study

11/3/92 Round up meeting

Depart to Madras

12/3/92 Meetings at BOBP, Madras

Depart to UK

# STUDY ON THE RETAIL FISH TRADERS OPERATING FROM THE ST. JOHN'S FISH MARKET.

## FORMAT FOR MONITORING CHANGES IN THE RETAIL FISH TRADE

ITEM	Control Group A (with New Boxes)								Control Group B (with Conventional Boxes)							
	Present Situation	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Present Situation	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
1. Vehicle																
2. Box																
3. Ice																
4. Investment																
5. Fuel																
6. Credit																
7. Type of Fish																
8. Quantity of Fish																
9. Area																
10. Distance																
11. Starting Time																
12. Closing Time																
13. Left Over																
14. Income																

## **Annex VIII**

### **Case Study - Bicycle trading in Colombo**

1. This case study illustrates the risks inherent in itinerant fish trading using a bicycle and analyses the mechanisms used by a particular fish trader to overcome these risks.
2. After a brief description of a typical marketing day, the marketing problems faced by itinerant bicycle traders are outlined and the methods used by the subject of the case study to avert them stressed. This is followed by an analysis of the likely incremental financial benefits that might accrue to the subject of the case study from an improved insulated fish box had he used it on the day of the case study.
3. Finally, the implications of the case study are considered and several issues pertinent to the project highlighted.
4. A calendar of key marketing events is given at Table 1.

#### **A typical trading day**

5. Mr Upal Weranjana sets out on his bicycle for St John's Fish Market, Colombo, from his home at 05:00 every day. He is 23 and has been trading fish for a living since migrating to Colombo from his home village of Balapitiya in the South of Sri Lanka in 1988. He has a wife and a child to support. Among his fellow traders he is considered a successful fish seller of some experience. His customers say that he brings only the best fish and is not known to cheat on weight.
6. On the day of the study he arrived at the market at 05:50, parked his bicycle in the Municipal Parking Lot and went into St John's Market to buy fish for the days trading. By this time there were already nearly 500 other bicycles and motorcycles parked in the car-park.
7. A number of difficult decisions faced Mr Weranjana. He had about an hour to decide how much fish to buy, what varieties and size of fish his customers will require, and what price to pay. Experience tells him that prices can fluctuate wildly as new truck loads of fish arrive from the landing sites. All the time he must remain aware of the time: if he spends too long dithering over what fish to buy other traders may beat him to the best customers or he may leave the market too late to be in time to sell to the key middle class market who tend to leave for work by 8.30am.
8. Ultimately these decisions rest upon his experience in the business, which over the years has taught him ways of minimising the high level of risk involved in marketing such a highly perishable commodity.

Table 1: Event calendar - bicycle trader case study

Time	Time elapsed (minutes)	Distance Travelled from St Johns (kg)	Customer number	Sex (M/F)	Type of fish	Quantity sold (Wet weight equivalent) (kg) 1/	Quantity sold (Actual weight) (kg)	Total Price (Rs)	Price per kg (Rs/kg)	Cumulative income (Rs)
6.45	0	0								.00
7.37	52	9.4	1	F	Tuna	.42	.25	22.00	88.00	22.00
7.51	66	11.1	2	F	Crab	1.00	1.00	50.00	50.00	72.00
7.56	71	11.2	3	M	Mullet	.75	.75	67.50	90.00	139.50
8.08	83	11.6	4	F						139.50
8.18	93	11.9	5	M	Mullet	.55	.55	45.00	81.82	184.50
8.24	99	11.9	6	F						184.50
8.26	101	11.9	7	F						184.50
8.31	106	11.9	8	F						184.50
8.33	108	11.9	9	M						184.50
8.35	110	13.2	10	F	Ray	.35	.35	21.00	60.00	205.50
8.41	116	13.3	11	F	Tuna (head)	n/a	n/a	10.00		215.50
8.45	120	13.4	12	F	Mullet	.70	.70	56.00	80.00	271.50
8.46	121	13.5	13	M	Mullet	.60	.60	46.00	76.67	317.50
9.01	136	14.2	14	F	Tuna	1.00	.60	48.00	80.00	365.50
9.02	137	14.3	15	F	Tuna	.42	.25	20.00	80.00	385.50
9.13	138	14.4	16	F	Tuna	.42	.25	25.00	100.00	410.50
9.22	147	15.0	17	F	Tuna	.42	.25	20.00	80.00	430.50
9.27	152	15.1	18	M						430.50
9.28	153	15.2	19	M	Tuna	.42	.25	20.00	80.00	450.50
9.33	158	15.3	20	F	Ray	.40	.40	25.00	62.50	475.50
9.37	162	15.4	21	F	Tuna (?)	.50	.30	24.00	80.00	499.50
9.42	167	15.5	22	F						499.50
9.47	172	16.2	23	F	Ray	.30	.30	20.00	66.67	519.50
9.52	177	16.3	24	F						519.50
9.53	178	16.4	25	F						519.50
9.54	179	16.5	26	F	Tuna	.58	.35	28.00	80.00	547.50
10.07	192	17.5	27	F						547.50
10.13	198	17.6	28	F						547.50
10.16	201	18.2	29	F	Crab	1.00	1.00	40.00	40.00	587.50
10.17	202	18.3	30	F						587.50
10.24	209	18.8	31	F						587.50
10.27	212	19.2	32	F	Ray	.25	.25	15.00	60.00	602.50
10.36	221	19.6	33	F						602.50
10.37	222	19.7	34	F	Ray	.75	.75	35.00	46.67	637.50
10.56	241	21.4	35	F	Ray	.25	.25	15.00	60.00	652.50
11.02	247	21.5	36	F	Ray	.50	.50	25.00	50.00	677.50
11.06	251	21.6	37	F	Ray	.60	.60	30.00	50.00	707.50
11.12	257	21.7	38	F						707.50
11.19	264	22.7	39	F						707.50
11.24	269	23.4						70.00		777.50
<b>Totals</b>						<b>12.15</b>	<b>10.50</b>	<b>777.50</b>		

1/ Tuna is sold dressed and, therefore, actual yield is 60% of total purchased weight

9. After several trips into the market he bought a mixture of big and small fish and speculated with some crabs (see Table 2).

Table 2: Mr Weranjana' variable costs

Species	Wet weight purchased (kg)	Cost (Sr Rs)	Cost per kg (Sr Rs)	Dressed cost per kg (SrRs) <sup>1/</sup>
Skipjack Tuna	4.8	200	41.7	69.44
Red Mullet	3	120	40	n/a
Manta Ray	4.2	150	37.7	n/a
Crabs	4	150	37.5	n/a
Total	16	620	38.75	-

10. Furthermore, he had a number of recurrent costs to cover before leaving the market. These cost are summarised in Table 3:

Table 3: Mr Weranjana's recurrent costs

Item	Quantity	Marketing function	Cost (Sr Rs)
Ice	7kg	Fish preservation	10
Newspaper	40 sheets	Wrapping fish	2
Parking fee		Provision of parking area	2
Exit fee		"	1
Minding fee		Guarding scales, chopping board and knife	1
Sand	1kg	Various 2/	1
Total	8kg		17

<sup>1/</sup> With heads, tails and belly flaps off tuna yield is approximately 60% of wet weight - from: Rogers J F (1990), "Visit to St Helena: Commercial Fisheries Development, Sept 1990", NRI R Report R 1616 (R).

<sup>2/</sup> Traders gave the authors a variety of reasons for adding sand to the fish, among which were "to improve presentation", "to increase adhesion and prevent movement" (and, therefore, spoilage), and "to help preserve the fish". In addition, adding sand has the dual advantages of increasing the weight of the fish and giving it the appearance of having just been fetched from a beach landing, which may enhance its marketability.

11. The greatest of these is ice. He buys 7kg of ice each day which is just enough to keep his fish in a reasonable condition until he reaches the first customer at around 07:30. His total expenditure was Sr Rs 637 and the total weight in his bicycle box on departure from St John's Market was around 24kg.

12. After a 9.4 km 'cycle ride which took 52 minutes (including about 15 minutes at the road-side cutting, gutting and preparing his fish for marketing), Mr Weranjana started marketing. During the next 3 hour 37 minutes he cycled 14 km, visited and talked to 39 individual customers, 22 of whom purchased fish from him (a success rate of a sale every 1.7 marketing "events"). On average, a typical purchase was 0.48kg of fish/crabs. Most consumers purchased one species of fish which was either pre-dressed or gutted and sliced by the trader.

13. A graph of cumulative income against time elapsed is given at figure 1. This shows that over the time spent marketing, Mr Weranjana maintained his sales very near to an imaginary rate of sales represented in Figure 1 by line "AA". At around 09:00 his wealthier custom dried up because many went to work. He moved on to a less wealthy area to maintain an even spread of sales. At 10.37 he reached the point at which total (marginal) costs equalled total (marginal) revenue for the days trading<sup>1/</sup>. At this point he broke even. Figure 2 shows how well different species of fish sold with time and how much they were price discounted as the day went on. It can be seen that the tuna and mullet sold well in the early part of the day, when the trader was primarily selling to regular customers in wealthier areas. By the end of the trading period he only had crab and ray left to sell. Whilst the price of tuna held up well through the selling period, mullet and ray both fell in price as quality declined and customers became harder to find. Figure 3 shows the spread of marketing events over the sale period. Mr Weranjana was very successful at maintaining a regular flow of sales (on average, about one every 9 minutes) throughout the time spent trading. An indication of fish weight remaining is also given.

14. He reached break-even at 10.37am with the sale of 75g of ray. Total revenue from sales, including the residual value of the fish left over at the end of the day (Sr Rs 70 of crabs) was Sr Rs 777.5. Total costs (including variable and recurrent costs, excluding depreciation on capital items such as his bicycle, fish box and cutting implements), was Sr Rs 637. He was left with 1.75kg of crabs with an imputed value of about Sr Rs 70. These he could not sell without much extra effort which he considered not worth while so he took them back for his family to eat. His eventual profit on this days activity was, therefore, Sr Rs 140.5.

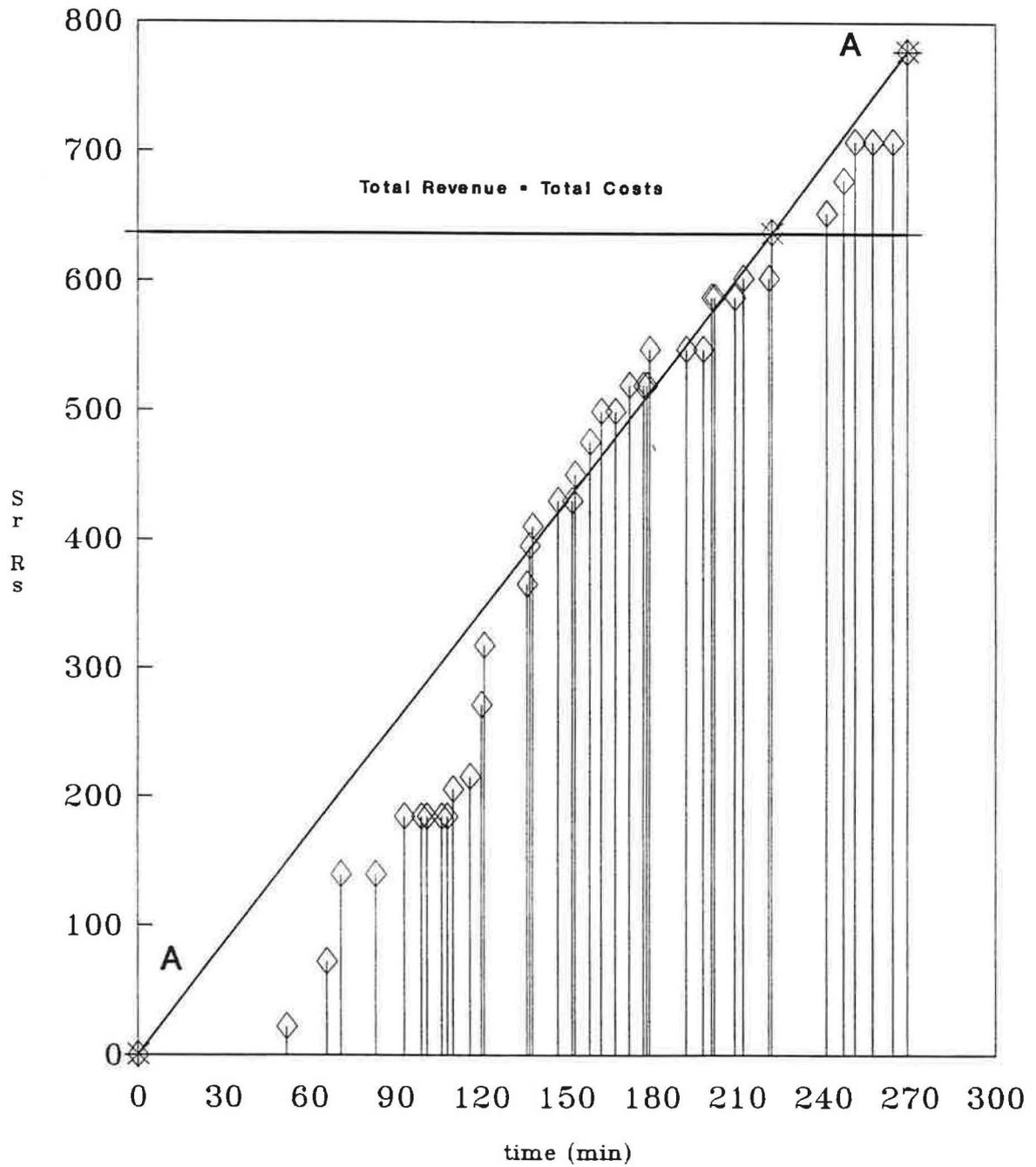
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<sup>1/</sup> Depreciation of fixed capital assets (eg, bicycle) is assumed to be constant and, therefore, excluded from the calculation.

15. This case study highlights the following marketing problems faced by itinerant bicycle traders selling fish:

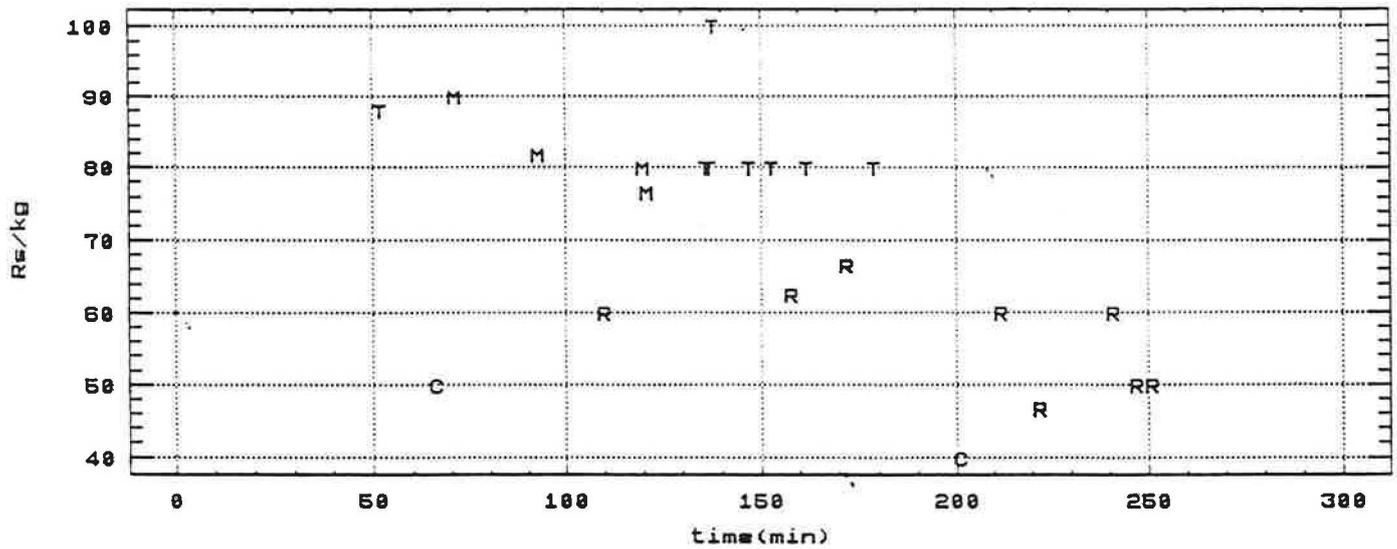
i. Fresh fish products are by nature highly perishable. Unless they are preserved, they deteriorate in quality over time until eventually they are either only useful for drying or are spoiled completely.

Figure 1  
 Cumulative income against time elapsed



Nb: line AA = ideal rate of sales

Figure 2  
PRICE AGAINST TIME

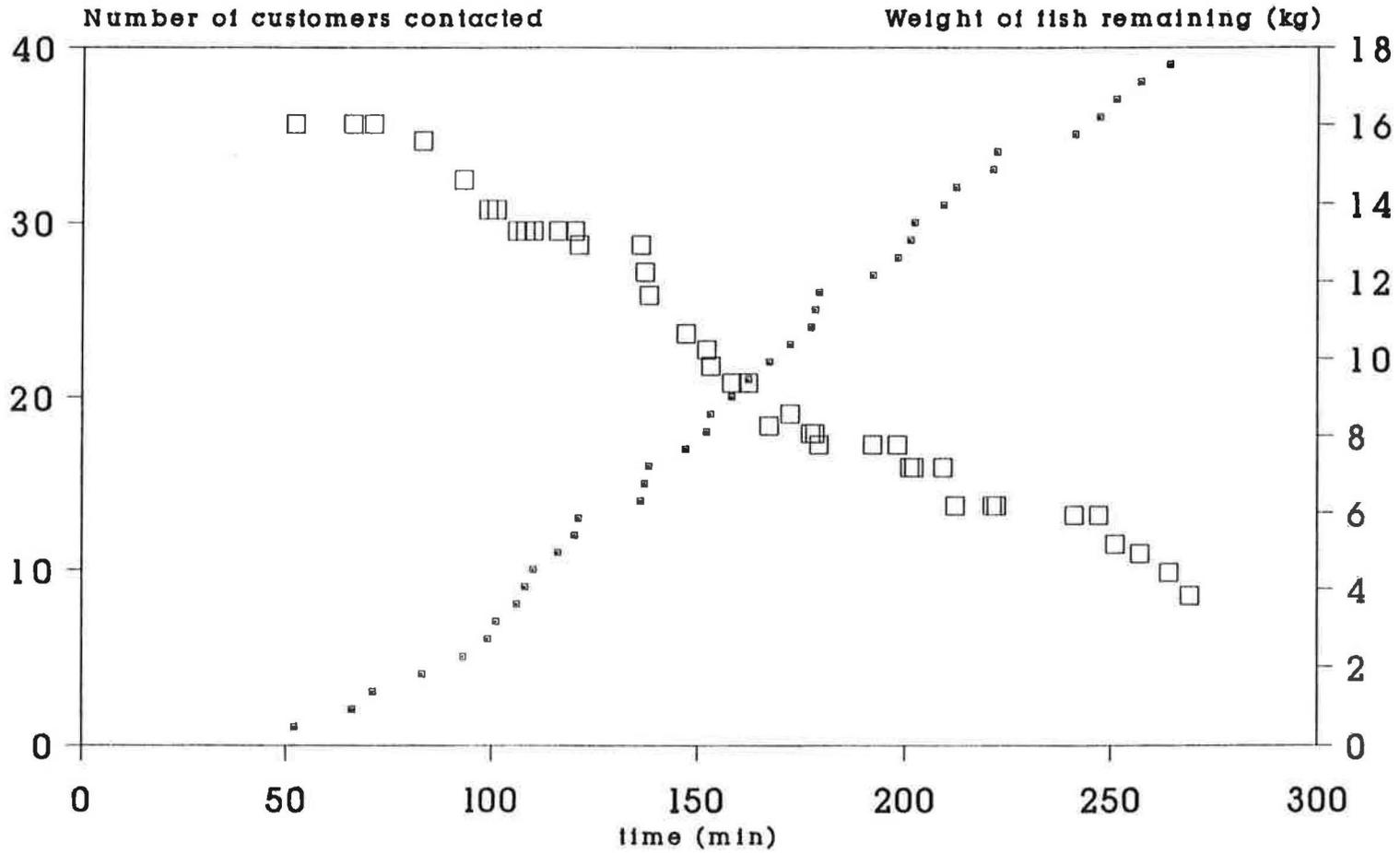


Notes:

Key to figure 2

- R = Ray
- T = Tuna
- M = Mullet
- C = Crab

**Figure 3**  
**Customers & weight of fish vs time**



• No. of customers      □ Weight of fish

ii. The distance and the time taken to travel from the residence of the fish trader, to the fish market and onto the marketing zone dictates the amount of time and effort which can be expended marketing. Crucially, the trader needs to arrive at the right time and place with the right product at the right price. This is fundamental to all marketing transactions, but particularly true of fish.

iii. The number of individual transactions/marketing events (ie, contact between buyer and seller) necessary to sell all stock. The trader must have a big enough client group to guarantee sales, but he must also have a sales success rate (ie, ratio of successful sales to total marketing events) sufficient to ensure that his stock is gone before it spoils or before he is too exhausted to carry on. Mr Weranjana was particularly successful on this score.

16. To overcome these problems Mr Weranjana adopts four key strategies:

i. He buys a range of different varieties of fish to market. The trader must provide the customers with a wide enough range of fish to meet the clients' needs (ie, different tastes and income). At the same time the trader wants to take advantage of any bargains available in the market place, buying fish cheaply and selling at a higher than normal profit. This is called the marketing mix.

ii. He remains acutely aware of the price/quality relationship: some fish varieties lose value over time faster than others. This is a result of physical deterioration. For instance, in the case study, by 9.30am when the last piece of tuna was sold, customers were complaining that it was looking "white", whereas the ray appeared unchanged. It is also caused by changing marketing conditions (ie, by 9.00am the buyers of the more expensive varieties and cuts have gone to work). The extent of price discounting can clearly be seen in Figure 2.

iii. He sells to a range of consumers from different socio-economic groups: the traders must decide which customers to sell to. Wealthier customers and poorer customers have different advantages and buy different varieties of fish. The trader needs to carefully divide his marketing effort between these groups.

iv. He knows from experience when to cut losses: there is a critical point during the traders marketing period when he starts to have difficulties finding customers largely because their needs have already been met. This often coincides with the warmest time of day and, therefore, the rapid deterioration of the fish which by now is no longer under ice. He is also beginning to feel both tired and hungry, having been

cycling for around 6 hours or more. It is important that the trader recognise this critical point and discounts his product accordingly. Note (from figures and 3) how evenly balanced Mr Weranjana's marketing activities were. This indicates graphically how an experienced trader attempts to balance risk, profit maximisation and marketing effort to produce the greatest possible return to labour.

17. For new traders coming into the trade there are severe problems of access. In the early stages the trader must develop marketing skills, identify a marketing area and develop a regular client group. Being able to keep fish for longer may well be a considerable advantage to this group.

20. Competition from other traders: these including other bicycle traders, "Pingo" traders (ie, those that carry fish in basket or shoulder loads) and market stalls. In order to defend a marketing area, traders may have to take punitive measures such as price discounting, offering credit or giving regular bonuses of fish. An established trader is in a much stronger position to do this than a newcomer.

21. To avert these risks, Mr Weranjana has developed a marketing strategy which accentuates his advantages and minimises the chances of something going seriously wrong.

22. First of all he is careful to ensure a good marketing mix. The trader buys a range of fish thereby reducing the risk of market resistance to any one variety. For example, tuna are considered by some less acceptable after religious festivals due to their bloody appearance and may not be in demand. Therefore, the trader buys some fish that he knows will sell and some to speculate with. An example of this are the crabs which Mr Weranjana bought, which were sold to him at an advantageous price, but which he subsequently had trouble selling.

23. In addition to mixing produce, the trader also mixes the types of customer that he will sell to. Mr Weranjana tends to start out his day with the wealthy customers (often men preparing to go to work) because:

- . they buy more expensive fish;
- . they are not considered hard bargainers;
- . they often pay cash;
- . the trader wants to present the wealthy customers with the widest choice of fish when they are in peak marketing condition;
- . the trader wishes to reduce the weight of fish carried early on so that the effort involved in selling fish later in the day when customers become few and far between is reduced;

24. The trader develops a regular groups of clients, which in Mr Weranjana's case fall into three categories:

- . those that buy regularly;
- . those that pay cash;
- . those that are tied to the trader through credit agreements.

25. A mixture of such custom is required to ensure all fish are sold. Fish of deteriorating quality which remain unsold at the end of the day can be retailed to less wealthy clients. However, this target group often require credit and so tend to be used as a last resort.

**The economics of improved insulated fish boxes**

26. What would the advantages be for Mr Werajana if he invested in an improved insulated fish box? A broad indication of returns is suggested pending the results of the impact monitoring assessment survey. From the case study we can assume that these are likely to fall into two broad areas - tangible and intangible benefits. Tangible benefits are capable of being appraised at an actual or approximate price. Intangible benefits cannot realistically be assessed in actual or approximate money terms.<sup>1/</sup>

27. The tangible advantages:

i. Increased time at the marketing zone and therefore greater sales. Mr Werajana bought a total of 16kg of fish at a cost of Sr Rs 38.75 per kg (see Table 2). His gross profit was, on average, Sr Rs 8.78 per kg of fish carried (ie, total profit / weight of fish carried). Assuming an insulated fish box allowed him an additional hour in the marketing zone, and given that, on average Mr Werajana made a sale of 0.75 kg roughly every 9 minutes with a notional profit of approximately Sr Rs 8.78 per kg, and using the formula:

$$(I) \begin{array}{l} \text{number of} \\ \text{marketing} \\ \text{events per} \\ \text{hour} \end{array} \times \begin{array}{l} \text{profit} \\ \text{per kg} \\ \text{wet weight} \\ \text{(Sr Rs)} \end{array} \times \begin{array}{l} \text{average} \\ \text{sale weight} \\ \text{(Sr Rs)} \end{array} = \begin{array}{l} \text{estimated} \\ \text{incremental} \\ \text{benefit} \\ \text{(Sr Rs)} \end{array}$$

a feasible additional return from increased time at the marketing zone is given of Sr Rs 43.92.

ii. Reduced ice loss. A study currently being carried out by NARA has shown that losses from ice meltage in improved insulated fish boxes are as much as 50% less than with traditional wooden boxes. For the trader, this means that either his ice last for longer (possibly throughout the trading period) or he would

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<sup>1/</sup> Definitions from Gittinger (1982).

need to buy less ice in the first place. A 50% reduction in ice purchased would be worth Sr Rs 5 a day to Mr Werajana.

iii. Reduced fish spoilage and, therefore, higher prices. Mr Weranjana bought tuna for Sr Rs 41.70/kg. Initially he sold it dressed (eg, with the head, tail and guts removed) for Sr Rs 88/kg (a profit of Sr Rs 18.56/kg). By 09:45 when he sold his last piece of tuna, the price had fallen to Sr Rs 80/kg representing a gross profit of Sr Rs 10.56/kg, a discount of Sr Rs 8.56 per kg. Add to this the potential premiums from Red Mullet (Sr Rs 13.33/kg) and Ray (Sr Rs 16.67/kg) and we have an indication of the potential from reduced spoilage.

We assume that the last 3 sales of each type of fish in the case study could have been discounted by 50% less than they actually were because of their improved appearance. The results are given in Table 4.

Table 4: Possible net benefit from enhance fish storability

	Sales (kg)	Additional value at 50% of actual discount (Sr Rs/kg)	Net Benefit (Sr Rs)
Tuna	0.90	4.28	3.85
Mullet <sup>1/</sup>	0.60	6.66	4.0
Ray	1.35	8.33	11.24
Total	-	-	19.09

Note:

<sup>1/</sup> last sale only (represents 25% of total sales of Red Mullet)

Note that these figures are only indicative and represent one traders sales from one days activities. Profits may fluctuate seasonally and from day to day. Moreover, discounting is not solely related to quality. Other factors may be at play such as the need to engender customer loyalty.

iv. Ability to keep unsold fish overnight. If Mr Werajana had an insulated fish box he could have kept his crabs overnight and sold them the next day. This would have prevented a total loss of Rs 70. Some ice may have been required (say 7kg at Sr Rs 10). Therefore, his net gain would have been Sr Rs 60.

28. In sum, a rough estimate of the possible benefits to Mr Werajana from using an insulated fish box gives a total additional return *from this particular days trading* (which may not be typical) of Sr Rs 128 before the additional incremental expenditure on a new insulated fish box is taken into account.

29. The intangible advantages:

i. Avoidance of total loss: It is always possible that having invested nearly Sr Rs 700 in fresh fish, Mr Werajana may not be able to reach the market ie, as a result of a break-down or accident. Under these conditions an insulated box would prevent a catastrophic loss.

ii. A better presentation of the produce. An insulated fish box would improve the appearance of fish at the point of sale. Fresher fish, possibly still with ice, a better colour, texture and overall improved presentation would be possible. This could mean better prices or it could result in the trader being able to sustain prices at their peak for a longer period. Many of Mr Weranjana's customers claimed that presentation and quality were very important aspects of their marketing decisions.

iii. Greater access to the market for new entrants. When Mr Weranjana first came to Colombo and started trading fish he often had to keep trading up to 16:00 before all his fish had been sold. Ownership of an insulated fish box at this stage would considerably improve a traders chances of survival in an increasingly competitive market segment.

30. These possible benefits must be weighed against the additional cost burden that an improved insulated fish box represents for Mr Werajana.

31. A final note of caution concerning these case study figures: there are a number of inconsistencies between input and output values. These are, by and large, a result of errors in estimating fish weights. For instance, Mr Weranjana told us that he purchased 16kg of fish. The total weight of fish actually sold was 12.15kg (weighing the tuna at their wet weight equivalent). One explanation for these inconsistencies might be respondent under-estimation of profit. Another, more likely reason is that the scales used by the middleman who sold the fish to Mr Werajana were in some way defective and over-estimated the weight of fish sold. There is also the possibility that Mr Weranjana underestimated the weight of fish sold to each customer or failed to report to us bonus fish given to encourage repeat sales. The only sure way of resolving this issue would be to undertake the exact measurement of all transactions.

## Issues and further areas of analysis

32. The case study raises a number of points which are important for the future study of itinerant fish trading. Firstly, it highlights the importance and unpredictability of consumer preference. This suggests a need for more information about customers needs and perceptions.

33. It emphasises the variability of demand, both for fish as a food and for individual species of fish. There are periods of demand peaks, for instance during the regular Sri Lankan religious festivals. At these times sales are constrained by the quantity of fish that the traders can carry and the number of customers he can reach before the fish deteriorates.

34. Loss of quality due to poor storage. The traders discounts for a number of reasons including quality deterioration. It is interesting to note that early in the day, when the fish is still under ice, the trader goes to his best customers and sell his most valuable fish. This suggests that traders who can maintain their fish under ice for longer and present them in better condition might have a marketing advantage. This also points toward the need for a study of consumer dynamics.

35. Finally, fish trading is a very low status activity despite receiving relatively good financial returns. Traders are often outsiders, having migrated to the city for work. They do not always reside in the communities in which they work. As a group they do not have any collective power and are highly differentiated. Any effort to organise traders and improve the quality of their marketing effort would have a beneficial impact on their status within society and their self perception.

## **Annex IX**

### **Construction of a lightweight insulated box for bicycle and motorcycle fish traders**

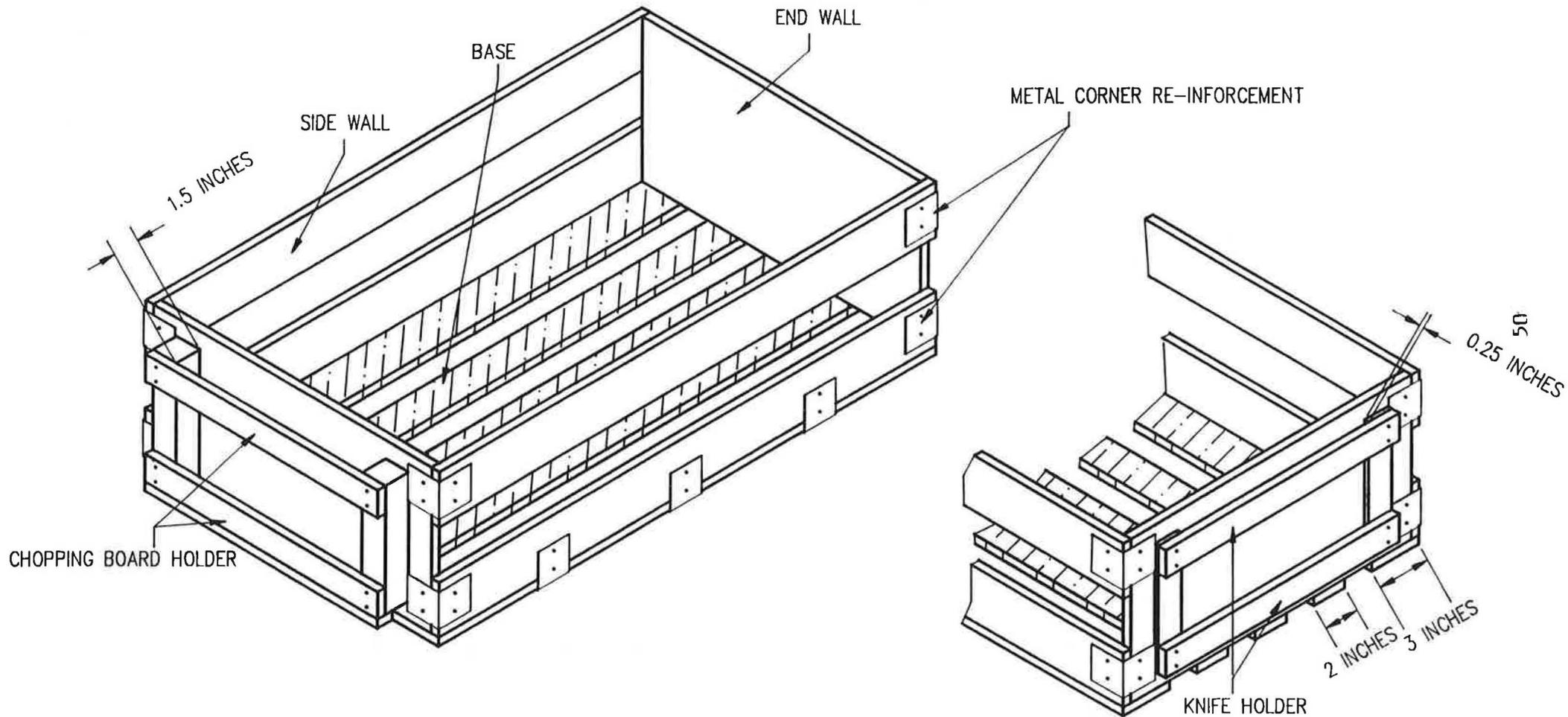
#### **Background**

1. The successful adoption of insulated boxes by the itinerant fish traders to allow iced fish to be retailed depends on developing an effective and acceptable box.
2. Problems have been encountered with the traders accepting the prototype box built to date. In part the problems stem from a lack of understanding by the traders of the technical requirements of an insulated box and a reluctance to accept a box different from the traditional. The prototypes were also overbuilt and unduly heavy.
3. The design proposed is built around an outer box very similar to the traditional design and utilises the same construction methods. A lightweight insulated inner container is then fitted into this. This approach will hopefully give an acceptable insulated container that will be partly familiar to the traders and will only impose a minimal weight penalty.

#### **Box construction.**

4. The box is built in two parts, an outer, slatted wooden container and an insulated GRP covered, expanded polystyrene inner.
5. The outer box is constructed from a lightweight, cheap locally available timber fastened with nails and reinforced with strips of tin sheet on the corners.
6. The inner is made up from one inch thick expanded polystyrene sheet sheathed in a tissue grade fibreglass mat, bonded with an epoxy resin. The top edge of the box has a thin strip of timber, or plywood, bonded in to protect the bearing surface where the lid fits on. The lid is made up of a one inch sheet of expanded polystyrene with thin sheet plywood bonded onto the top and a thin, wooden edging strip to bear onto the box. The GRP sheath will provide structural strength, an impervious surface and protect the underlying insulation.
7. The schematic drawings show the essential dimension and clearly present the constructional details.

TRADER BOXES



CYCLE BOX OUTER DIMENSIONS 32.5 x 19.5 x 9.5 INCHES

TIMBER REQUIREMENTS

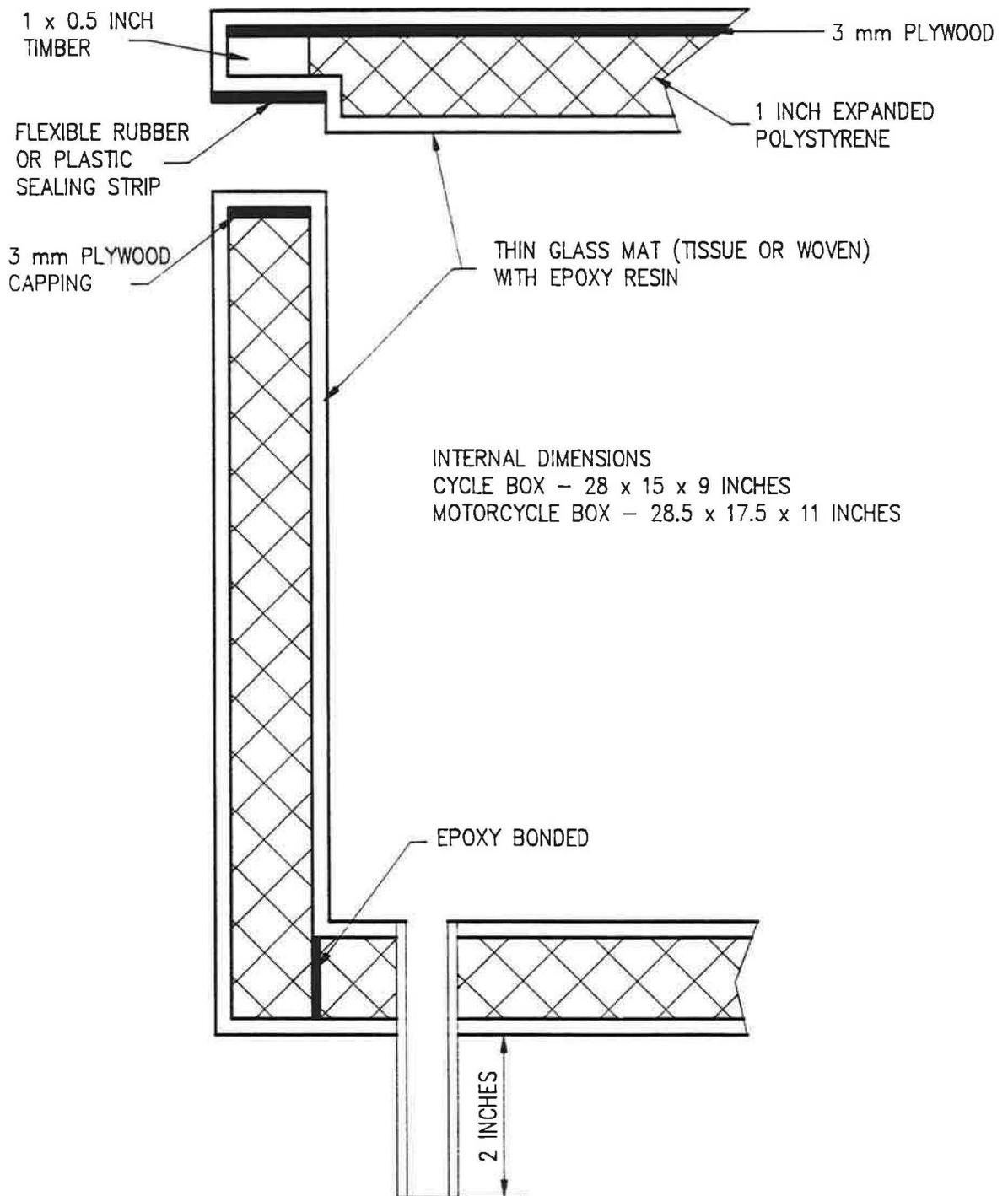
SIDE WALL 32.5 x 3 x 0.5 INCHES 4 OFF  
 END WALL 18.5 x 9 x 0.5 INCHES 2 OFF  
 BASE 32.5 x 3 x 0.5 INCHES 2 OFF  
 32.5 x 2 x 0.5 INCHES 3 OFF

MOTORCYCLE BOX OUTER DIMENSIONS 33 x 22 x 11 INCHES

TIMBER REQUIREMENTS

SIDE WALL 33 x 3 x 0.5 INCHES 4 OFF  
 END WALL 21 x 11 x 0.5 INCHES 2 OFF  
 BASE 33 x 3 x 0.5 INCHES 2 OFF  
 33 x 2 x 0.5 INCHES 3 OFF

TRADER BOXES



DRAIN PIPE IN LEFT HAND REAR CORNER,  
TO TAKE HOSE PIPE EXTENTION  
(STOPS MELT WATER SPLASHING OVER BIKE  
AND CUSTOMERS)