Monitoring and Evaluation Training Program

Report prepared by:

Md. Ferdous Alam
Khondker Murshed-e-Jahan
Khandokar M. Shameem Kamal
Manuara Azim
Johannes Janssen

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Development of Sustainable Aquaculture Project
WorldFish Center
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WorldFish
C E N T E R

Preface

Freshwater Resources Research Program of the WorldFish Center is aimed at improving food security and eradicating poverty by introducing small-scale fresh water aquaculture as an element into the economic activities of resource poor households in rural area (Bangladesh). The target groups are the poor producers and consumers who can benefit from the better use and management of aquatic resources.

After a long experimentation and field trials WorldFish Center has been able to generate low cost productive aquaculture technologies for the resource poor farmers of Bangladesh. Year 2000 was the beginning of the USAID funded Development of Sustainable Aquaculture Project (DSAP). The major thrust of the project is to implement aquaculture demonstration and to bring unused and/or underused seasonal and perennial ponds and rice fields into improved production with methods that are feasible, affordable and acceptable to resource poor households in rural areas of Bangladesh. The DSAP approach aims at making cooperating farmers and implementing NGOs sustainable so that after withdrawal of support from the WorldFish Center, aquaculture practices and development are continued in the rural areas.

The DSAP has reoriented many of its strategies in 2002 to ensure effective and quality support to the partner NGOs to attain sustainability at both beneficiaries and partner NGO level. Dhaka based administration of DSAP has been restructured and taken to the fields by opening eight regional liaison offices. For the sake of providing quality services, beneficiaries are being served by the staff of these liaison offices. At present, the outreach activities of the project are being implemented through 33 partner NGOs in 37 districts of Bangladesh. DSAP is providing technical and financial support to these Partner NGOs (PNGO). In addition, the DSAP is also providing training and technical feedback to the staff of associate partner NGOs to familiarize DSAP technologies and to disseminate the aquaculture practices in rural areas.

From the beginning, DSAP is working with the NGOs to build up capacity of the PNGOs through various training program. It is expected that this would enable the cooperating NGO partners to maintain and continue aquaculture support programs in the absence of external support. Monitoring and Evaluation (M & E) training is one of such initiatives.

The report presents the materials which were used for the monitoring and evaluation training program of the partner NGOs involved in aquaculture activities. Till April 2004, three monitoring and evaluation training program (Foundation - I and - II and one Follow-up) was organized by the DSAP. The main objective of the training program was to help PNGOs involved with DSAP to monitor their aquaculture extension program in a much-organized way and to build up their own monitoring and evaluation program. We hope, this report will provide support to the PNGO's relevant staff familiar with the importance of monitoring aquaculture extension program as well as help as a guide line for monitoring and evaluation of their field activities.

Johannes Janssen
Project Leader
Development of Sustainable of Aquaculture Project

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Monitoring and Evaluation Training Program

Introduction

The Development of Sustainable Aquaculture Project (DSAP) of the WorldFish center was authorized by USAID under the Cooperative Agreement # 388-A-00-00-00068-00 on June 2000. The project will end on June 2005. The overall goal of the DSAP is to increase the number of small enterprises producing and supporting the production of freshwater aquaculture products. The objectives are to improve the household incomes and life circumstances of resource limited people. To increase the production of fish DSAP, WorldFish center is disseminating 19 recommended fish culture technologies in collaboration with partner NGOs (PNGOs). Another objective of DSAP is to build up capacity of the PNGOs that will enable the cooperating NGO partners to maintain and continue aquaculture support programs in the absence of external support. In this regard from the beginning DSAP is trying to develop the capacity of the NGO's through various training and other capacity building program. Monitoring and Evaluation (M & E) training is one of such initiatives.

Objective

It was expected that training on the monitoring and evaluation would help PNGOs involved with DSAP to monitor their aquaculture extension program in a much-organized way and to build up their own monitoring and evaluation program.

Monitoring and Evaluation Training Program

Till April 2004, three monitoring and evaluation training program (Foundation - I and - II and one Follow-up) was organized by the DSAP. A brief description of those training program is given below.

Foundation Training - I

A training program on monitoring and evaluation was organized for the PNGOs involved with the DSAP on 9th and 10th March 2003 at the liaison offices of Comilla and Bogra and 12th March and 13th March 2003 at Mymensingh and Jessore respectively. This training program is considered as foundation training program – I.

Aim:

The aim of the training program was to make the PNGO's relevant staff familiar with the importance of monitoring aquaculture extension program as well as tools and techniques used for such monitoring.

Objectives:

- Identify factors required for effective monitoring of the of aquaculture program
- Make understand the DSAP supported monitoring and evaluation tools (Fish Farmer Record Book)

Participants: Project Coordinator (PC) and Monitoring and Evaluation staff of NGOs

Achievements:

- The participants have understood the importance of monitoring and evaluation for the success of aquaculture extension program.

- Aquaculture performance monitoring forms have been developed (Form-1 for fish culture in pond and Form -2 for fish culture in rice field) to monitor the performance of the beneficiaries.

- Two forms (Form – 3 & Form -4) have been developed to elicit the basic information of the beneficiaries. Form-3 is meant for accommodating the detail information of the group, while From-4 is for the summary information of each group.

Foundation Training - II

The second training program on monitoring and evaluation was organized for the PNGOs involved with the DSAP on 7th to 9th September at Gazipur and 15th to 17th September at Jessore. This training program was considered as foundation training program – II.

Aim: To develop the analytical skills of the PNGO staffs for making performance evaluation.

Objectives :

- Coding, recoding, compiling the data collected for monitoring the performance of their aquaculture extension program

- Analyze and evaluate the performance of their monitoring program

- Writing reports based on analyzed data

Participants :   Project Coordinator (PC) and Monitoring and Evaluation staff of NGOs

Achievements:

- The participants have understood the monitoring and evaluation techniques to analyze the collected data.

- They have also gained first-hand idea about the content and composition of report along with the idea of writing the same.

Follow Up Training

A one day follow-up training program was organized on 26th and 27th January 2004 at the IDB Bhaban and WorldFish Center office respectively to refresh the ideas and improve monitoring mechanism.

Aim: To improve the level of understanding of the trainees on monitoring and evaluation.

Objective:

a) Review of the DSAP supported monitoring and evaluation tools (Fish Farmer Record Book)

b) Review and adjust of the beneficiary survey forms

c) Review and adjust of the aquaculture performance survey forms

Participants: Project Coordinator (PC) of NGOs

Achievements:

- The improvement/changes were made in terms of the names of the monitoring forms as well as contents of the same. Feedback received this time from the participants has been incorporated into the previous forms and improved versions have been designed for use. The forms are now termed as aquaculture performance survey form 1 and 2 (previously called form1 and 2) and Beneficiary survey form-1 (previously called Form-3) and beneficiary survey form-2 (previously called Form-4) will provide FFG-wise summary information to be derived from Beneficiary survey form-1.

A summary of the major issues discussed is attached in the Annex 1 (Foundation – I), Annex – 2 (Foundation – II) and Annex – 3 (Follow–up).

Foundation Training – I

Annex 1.1 Training plan Monitoring and Evaluation (Foundation – I)

Training Course: Monitoring and Evaluation (Foundation – I)	Duration: 1. 5 (day)
Participants: **Project Coordinators (DSAP supported Aquaculture Program) and Monitoring and Evaluation officer of NGOs**	**Time Duration** 1st Day: 9:00 A.M. to 5: 30 P.M. 2nd Day: 9:00 A.M. to 12:30 P.M
Place: WorldFish Center, Comilla / Mymensingh /Bogra / Jessore Office	**Date:** 09 & 10 March 2003 13 & 14 March 2003

Aim : To improve the level of understanding of the trainees on monitoring and evaluation.

Objectives: **By the end of the training the trainees are expected to be able to:**

- Identify factors necessary for effective monitoring of the of aquaculture program
- Understand the DSAP supported monitoring and evaluation tools

<table>
<tr><td colspan="4" align="center">Training Contents</td></tr>
<tr><td colspan="4" align="center">DAY I</td></tr>
<tr><td>Session</td><td>Topics</td><td>Learning Points</td><td>Duration</td></tr>
<tr><td rowspan="3">Session I</td><td rowspan="2">Introduction</td><td>- Welcome</td><td>9:00 A.M – 9: 05 A.M.</td></tr>
<tr><td>- Overview of the days program</td><td>9:05 A.M – 9: 15 A.M.</td></tr>
<tr><td>What is Monitoring and Evaluation</td><td>- Concept of Monitoring and Evaluation</td><td>9: 15 A.M – 9: 30 A.M</td></tr>
<tr><td></td><td>Monitoring and Evaluation Program of NGO's</td><td>- Checking of the NGO's existing monitoring and evaluation system and identifying the gaps</td><td>9: 30 A.M – 10: 30 A.M</td></tr>
<tr><td colspan="4">Tea Break (10:30 A.M. – 11: 00 A.M.)</td></tr>
<tr><td rowspan="2">Session II</td><td rowspan="2">Monitoring and Evaluation of NGO aquaculture program (DSAP supported)</td><td>- Recall of DSAP strategy</td><td>11: 00 A.M – 11: 15 A.M.</td></tr>
<tr><td>- Identification of the factor that need to be monitored</td><td>11: 15 A.M. – 1:00 P.M.</td></tr>
<tr><td colspan="4" align="center">Lunch Break (1: 00 P.M. – 2: 00 P.M.)</td></tr>
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Training Contents			
Session	**Topics**	**Learning Points**	**Duration**
Session III	Monitoring and Evaluation of NGO aquaculture program (DSAP supported)	- Quantitative and qualitative factors - Introduce Fish Farmer Record Book and Monitoring Form - Sampling technique	2:00 P.M – 2: 15 P.M. 2:15 P.M – 2:30 P.M 2:30 P.M – 2:45 P.M
	Group Exercise	- Exercise to fill in those Fish Farmer Record Book and monitoring forms	2:45 P.M – 3: 30 P.M.
Tea Break (3:30 P.M. – 4: 00 P.M.)			
Session IV	Group Exercise	- Exercise to fill in those Fish Farmer Record Book and monitoring forms	4:00 P.M. – 5: 00 P.M.
DAY II			
Session V	Presentation group exercise	- Discussion of the Fish Farmer Record Book and Monitoring Form fill in process based on the exercise	9:00 A.M. – 10:30 A..M
Tea Break (10:30 A.M. – 11: 00 A.M.)			
Session VI	Evaluation	- Recap main points and check objectives - Suggestion for next course	11: 00 A. M – 12: 30 P.M

Annex 1.2 Concept of Monitoring and Evaluation

What is Monitoring?

Literally monitoring means watching, auditing, or policing. In the context of a program, monitoring is a day-to-day follow up of activities during the implementation of a program to ensure that they are proceeding as planned and are on schedule.

Why Monitoring ?

To observe the followings

- On going activities
- Progress achieved
- Obstacles faced
- Personnel matters
- Supplies and equipment
- Money spent and budget allocation

Parameters of Monitoring:

Three basic aspects of a programme are generally kept under watchful observation. These are called basic parameters of monitoring. These are as follows:

Time: See whether the particular tasks are being carried out time

Cost: See whether the particular tasks are being carried out within the allotted resources.

Performance: See whether the quantity and quality of the tasks performed are as per the specific target and the standard.

Resource needed for Monitoring:

- Money
- Manpower
- Material
- Equipment
- Time
- Technology

Fundamental Questions:

- Who
- Dose what
- For whom
- When
- Where
- How
- At what cost

Annex 1.2 Concept of Monitoring and Evaluation (Contd.)

Designing a Monitoring System:

Designing a monitoring system involves decisions with respect to:

- What to monitor?
- What report/checklists required that provide the needed information?
- When to monitor?
- Who should monitor?

Steps of the Monitoring process:

The following are the steps involved in the monitoring process.

- Set performance standard
- Develop reporting system
- Data collection
- Analysis the collected data
- Report writing
- Analysis the report for identifying deviation between standard and actual performances.
- Identify the reasons for actionable deviations
- Decide about the corrective actions.

EVALUATION

What is Evaluation?

Evaluation is a systematic way of learning from experience and using the lessons learned to improve current activities and promote better planning by careful selection of alternatives for future action.

Simply evaluation is defined as:

- What was done
- How done
- What are the results of undertaken activities

Prerequisites for Evaluation:

Following are considered prerequisites for evaluation

- Motivation: Wanting to change
- Preparation of plan, policy & objectives
- Implementation: Programme, Projects, services or activities need to be implemented.
- Information system should be adequate
- Indicators and criteria
- Indicator for assessment of effectiveness and impact.

Why Evaluation:

- Achievement: see what has been achieved
- Measuring progress: in accordance with the objectives of the programme.
- Improving Monitoring- for better management.
- Identifying strengths and weakness to strengthen the programme
- Cost benefit: were the costs reasonable?
- Collecting information: to plan and manage programme activities better
- Improving effectiveness- to have more impact.
- Allowing for better planning- more in line with the needs of the target group

How to Evaluate:

Before evaluation the following points should be considered

1. Decide to evaluate
2. Chose evaluation goals and methods, decide who will take part, how and when, make a detailed plan
3. Collect materials and resources, begin the evaluation.
4. Use the evaluation methods ie, Questionnaires, Surveys, Records etc.
5. Study the facts, Figures and information collected during the evaluation.
6. Reach the conclusion, write them down, study them.
7. Prepare the report, decide how to improve the monitoring and when to evaluate again and discuss feedback.

Reporting:
What is reporting?

The final task of evaluation exercise is to prepare report. The outline and contents of the report depend on the type and scope of evaluation. However, a report should contain the following:

1. Introduction
2. Background of information
3. Objectives of evaluation
4. Methodology of evaluation
5. Findings
6. Major achievement
7. Recommendations

Evaluation result should use to improve the followings:

- To improve programme, organization, and management;
- To improve planning;
- To assist decision making;
- To assist policy making;
- To indicate where action is needed;
- To indicate where further research is needed;

মৎস্য চাষীর রেকর্ড বই এবং মনিটরিং ফর্ম পূরণের জন্য একটি উদাহরণ

মোঃ আবু বকর ছিদ্দিক, পিতা মৃতঃ মোঃ কছিম উদ্দীন ময়মনসিংহ জেলার ফুলপুর উপজেলার ফুলপুর ইউনিয়নের বাকাই গ্রামের একজন চাষী। তার বয়স ৪৫ এবং সে পঞ্চম শ্রেণী পর্যন্ত লেখাপড়া করেছে। স্ত্রী এবং সন্তানসহ তার পরিবারের সদস্য সংখ্যা ৫। দুই ছেলে এবং এক মেয়ের বয়স যথাক্রমে ১৮, ২০ এবং ৫। কৃষি কাজই তার আয়ের প্রধান উৎস। তার বার্ষিক আয় ৫০,০০০ (পঞ্চাশ হাজার) টাকা এবং জমির পরিমান ৯০ শতাংশ। মাছ চাষের ইচ্ছা থাকা সত্ত্বেও কোন পুকুর না থাকায় সে মাছ চাষ করত না। একদিন তার সাথে স্থানীয় একটি এনজিও জিএমটির মৎস্য চাষ কর্মকর্তা মোঃ রুহুল আমীনের সাথে পরিচয় হয়। তার কাছ থেকে সে ধান ক্ষেতে মাছ চাষ সম্বন্ধে জানতে পারে এবং তারই উৎসাহে ২০০৩ সালে জিএমটির মৎস্য চাষ কর্মসূচীর সাথে যুক্ত হয়। তাদের গ্রামের আরও ৭ জন উৎসাহী মৎস্য চাষী মিলে জিএমটির তত্ত্বাবধানে শাপলা নামে একটি দল গঠন করে। তাদের মধ্যে ৩ জন ধানক্ষেতে মাছ চাষ এবং ৪ জন পুকুরে মাছ চাষের প্রযুক্তি গ্রহন করে। মোঃ আবু বকর ছিদ্দিক মৎস্য চাষ কর্মকর্তার পরামর্শে ধানক্ষেতে ধানের সাথে কার্প মাছের মিশ্র চাষ প্রযুক্তি গ্রহন করে। সে তার কৃষি জমি থেকে ধানক্ষেতে মাছ চাষের জন্য উপযুক্ত ৫০ (পঞ্চাশ) শতাংশ জমি বেছে নের যেখানে ৪-৫ মাস বর্ষার পানি থাকে।

ধানক্ষেতে একই সাথে ধান ও মাছ চাষের জন্য সে যে সমস্ত কাজ করেছিল তা নিম্নে দেয়া হলঃ

৩০ মে ২০০৩	দৈনিক ৫০ টাকা মজুরিতে ২ জন শ্রমিক এবং সে নিজে ৫ ঘন্টা পরিশ্রম করে আইল তৈরীর কাজ সম্পন্ন করে।
৪ জুন ২০০৩	জমিতে ৫ শতাংশের গর্ত খনন করার জন্য দৈনিক ৬০ টাকা মজুরীতে ২ জন শ্রমিক নিয়োগ করে এবং তারা ৫ জুন ২০০৩ এ কাজটি সম্পন্ন করে।

১০ জুন ২০০৩   পাওয়ার টিলারের সাহায্যে জমি প্রাথমিক প্রস্তুতির কাজ শেষ হয়। পাওয়ার টিলারের ভাড়া বাবদ ৪০০ টাকা পরিশোধ করে।

১১ জুন ২০০৩   তার নিজস্ব উৎস থেকে ১৫০ কেজি গোবর জমিতে প্রয়োগ করে। এ কাজে সে নিজে ৩ ঘন্টা সময় ব্যয় করে।

১৩ জুন ২০০৩   জমিতে ১২ কেজি ইউরিয়া এবং ৭ কেজি টিএসপি দেয়ার জন্য ২ ঘন্টা সময় ব্যয় করে। ইউরিয়া এবং টিএসপির খরচ ছিল যথাক্রমে ৬০ টাকা এবং ৭০ টাকা।

১৬ জুন ২০০৩   সে নিজে এবং তার পরিবারের ২ জন সদস্য ৫ ঘন্টা কাজ করে ধানের চারা রোপন করে। ধানের চারার খরচ ছিল ৩০০ টাকা।

১৮ জুন ২০০৩   ধানক্ষেতে মাছ চাষের জন্য তৈরী গর্তে ৫ কেজি চুন প্রয়োগ করে যার খরচ ছিল ৩৫ টাকা। এ কাজে সে ১ ঘন্টা ব্যয় করে।

২৩ জুন ২০০৩   ধানক্ষেতে মাছ চাষের জন্য তৈরী গর্তে নিজস্ব উৎস থেকে ৪০ কেজি গোবর দেয়। এ কাজে সে ২ ঘন্টা ব্যয় করে।

১ জুলাই ২০০৩   ধানক্ষেতটি মাছ চাষের জন্য উপযুক্ত হওয়ার পর সে ৩০০টি ৪ ইঞ্চি সাইজের কমন কার্প এবং ১০০০টি ২.৫ ইঞ্চি সাইজের রাজপুঁটির পোনা পাতিওয়ালার কাছ থেকে কিনে গর্তে ছাড়ে। কমন কার্প পোনার মোট ওজন ছিল ৩ কেজি যার মূল্য ছিল ৩০০ টাকা এবং রাজপুঁটি পোনার মোট ওজন ছিল ৪ কেজি যার মূল্য ছিল ৪০০ টাকা।

১০ জুলাই ২০০৩	সে পুনরায় ২০০টি ৪ ইঞ্চি সাইজের কমন কার্প পোনা পাতিওয়ালার কাছ থেকে কিনে গর্তে ছাড়ে। কমন কার্প পোনার মোট ওজন ছিল ২ কেজি যার মূল্য ছিল ২০০ টাকা।
১০ আগষ্ট ২০০৩	মাছের খাদ্য হিসাবে ৫ কেজি খৈল এবং ১০ কেজি চালের কূঁড়া ধানক্ষেতে দেয়। যার খরচ ছিল যথাক্রমে ৪৫ টাকা এবং ৫০ টাকা। এ কাজে সে ১ ঘন্টা ব্যয় করে।
১০ অক্টোবর ২০০৩	সে ধানক্ষেতে পর্যবেক্ষনের মাধ্যমে বুঝতে পারে যে কিছু মাছ রোগাক্রান্ত হয়েছে। ১১ অক্টোবর ২০০৩ তারিখে মৎস্য চাষ কর্মকর্তা তার ধানক্ষেত পরিদর্শনে আসলে তার সাথে সে বিষয়টি নিয়ে পরামর্শ করে। উক্ত কর্মকর্তা রোগাক্রান্ত মাছ গুলোকে সরিয়ে ফেলার পরামর্শ দেন।
১১ অক্টোবর ২০০৩	৩০০টি রাজপুঁটি আহরন করে যার ওজন ছিল ১৫ কেজি। এরমধ্যে ৩ কেজি নিজস্ব ভোগের জন্য রেখে বাকি ১২ কেজি বিক্রি করে দেয় যার মূল্য ছিল ৩৬০ টাকা। মাছ ধরার কাজে সে ২ ঘন্টা সময় ব্যয় করে।
২৮ অক্টোবর ২০০৩	সে ধান কাটার জন্য দৈনিক ৬০ টাকা মজুরীতে ২ জন শ্রমিক নিয়োগ করে যারা ঐ দিনই ধান কাটা শেষ করে। সে ৩০০ কেজি ধান এবং ২৫০ কেজি খড় পায় যার মূল্য যথাক্রমে ১৮০০ ও ১০০০ টাকা।

৫ নভেম্বর ২০০৩   সে ৪০০টি রাজপুঁটি আহরন করে যার ওজন ছিল ২২ কেজি। এরমধ্যে ২ কেজি নিজস্ব ভোগের জন্য রেখে বাকি ২০ কেজি বিক্রি করে দেয় যার মূল্য ছিল ৭০০ টাকা। সে আরও ৩৫০ টি কমনকার্প আহরন করে যার ওজন ছিল ৫৫ কেজি এর মধ্যে ১৫ কেজি নিজস্ব ভোগের জন্য রেখে বাকি মাছ বিক্রি করে দেয় যার মূল্যে ছিল ১৩৫০ টাকা। রাজপুঁটি ও কমন কার্পের সাথে ধানক্ষেতে আরও ৪ কেজি ছোট মাছ পাওয়া যায় যা বাজারে বিক্রি করে সে ২০০ টাকা পায়। মাছ আহরনের জন্য সে একজন জেলেকে ২০০ টাকা মজুরী দেয়।

উপরোক্ত কাল্পনিক উদাহরণটি অনুসরন করে প্রথমে মৎস্য চাষীর রেকর্ড বই এবং পরে মনিটরিং ফর্মটি পূরণ করুণ।

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Annex 1. 4   Monitoring Fish Farmer Record Book (Pond)   *Form 1*

1. Background Information:

Farmer name:............................ Age (Year) :.............. Sex (Male / Female): ....

Husband /wife/ father name:............................... Village: ....

Union:...............................Upazilla: .... District: ....

NGO: .... Extension worker name:..

Farmer group name:.............................. Technology group name:...

Year joined in the program: .... Current production year: ....

2. Household Information:

a) Household head name: .... b) Household head sex (Male/Female):..............

c) Land size (including homestead) (decimal):................. d) Annual income (Tk): ....

e) Household size (number): .... Adult: male.........female..........Child: male..........female..........

f) Number of ponds:.......................Total surface area (decimal):..

g) Number of rice-fish plots: .... Total surface area.(decimal):............................

3. Basic Information of Demonstrated Pond:

a) Pond area (decimal): ....

b) Tenure status (Single owned /joint owned /single leased / joint leased): ....

c) If multiple ownership (joint owned or joint leased), how many persons:......................................

4. Information of fish culture in the demonstrated pond (Current production year, 2002/03):

a) Culture period (days): ....

b) Costs of fish culture:

Inputs	Cost (Tk)
Cost before releasing fry/fingerling	
Cost after stocking	

c) Information of stocking and harvesting:

Stocking			Harvesting			
Number	Weight (Kg)	Value (Tk)	Number	Consumed and Given away (Kg)	Sold (Kg)	value of produced fish (Tk)

....

Date   Signature of the Interviewer

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Annex 1.5 Monitoring Fish Farmer Record Book (Rice field)

1. Background Information:

Farmer name:......................... Age (Year) :............ Sex (Male / Female): ....

Husband /wife/ father name:.................................... Village: ....

Union:.......................Upazilla: .... District: ....

NGO: .... Extension worker name:..

Farmer group name:.................................... Technology group name:..........................

Year joined in the program: .... Current production year: ....

2. Household Information:

a) Household head name: .... b) Household head sex (Male/Female):..............

c) Land size (including homestead) (decimal):............... d) Annual income (Tk): ....

e) Household size (number): .... Adult: male.........female..........Child: male..........female..........

f) Number of ponds:.....................Total surface area (decimal):....................................

g) Number of rice-fish plots: .... Total surface area (decimal):..........................

3. Basic Information of Demonstrated Plot:

b) Plot area (decimal): .... b) Ditch area (decimal): ....

c) Tenure status (single owned / joint owned / single leased / joint leased): ....

d) If multiple ownership (joint owned or joint leased), how many persons: ....

4. Information of fish culture in the demonstrated plot (Current production year, 2002/03):

a) Culture period (days): ....

b) Costs of rice-fish culture:

Inputs	Cost (Tk)
Cost before releasing fry/fingerling	
Cost after stocking fry/fingerling	
Cost of rice production (if rice-fish concurrent)	

c) Information of stocking and harvesting:

Stocking			Harvesting			
Number	Weight (Kg)	Value (Tk)	Number	Consumed and Given away (Kg)	Sold (Kg)	Value of produce fish (Tk)

d) If rice-fish concurrent practice, please mention:

Total volume of rice production (Kg) .... and Total value of rice production (Tk) ....

Total volume of straw production (Kg) .... and Total value of straw production (Tk) ....

Date   Signature of the Interviewer

Annex 1.6 Monitoring Form of Fish farmer Group

Aquaculture Extension Program of ....

Particulars of Ponds/Plots of Fish Farmer Group

Group No:............................. Thana: .... District:................................... Name of FA ....

Sl No	Name of Farmer	Father/ Husband Name	Sex (M/F)	Village	Union	Pond Area (Dec)	Particular of Rice Plots		Technology Group	Year of Joining	Remarks
							Ditch Area (Dec)	Total Area (Dec)			

Prepared by: ....
Name & Signature

Approved by: ....
Name & Signature

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Annex 1.7 Summary Form of Fish farmer Group

Aquaculture Extension Program of ....

Summary of Fish Farmer Groups in 2003

Name of FA: .... Thana: .... District: ....

Group No	Village	Union	Technology Group	Ponds/Plots in 2002		Directly Carried Over Pond/Plot in 2003 (a)		New Pond/Plot in 2003 (b)		Total Pond/Plot in 2003 (a+b)		Status of the Pond/Plot in 2003				Spread Over by Non-member's Pond/Plot (Farmer No)
												Demonstration		Spread Over		
				No	Area (Dec)	No	Area (Dec)	No	Area (Dec)	No	Area (Dec)	No	Area (Dec)	No	Area (Dec)	

Prepared by: ....
         Name & Signature

Approved by: ....
         Name & Signature

Annex 1.8 Exercise to Use Fish Farmer Group and Summary Form

Particulars of Ponds/Plots of Fish Farmer Group   *Form 3*

Name of NGO:...LKK........ DFG No:...01.......... Thana: ...Y......... District:...Z........

Sl No	Name Farmer	Father/Husband Name	Sex (M/F)	Village	Union	Particular of Pond			Particular of Rice Ditch				Technology Group	Year of Joining	Remarks
						Length (ft)	Width (ft)	Area (Dec)	Length (ft)	Width (ft)	Area (Dec)	Total Area (Dec)			
1	A 1	A 11	M	W	X			25					12	2001	Dropped after 2001
2	A 2	A 21	F	W	X						5	39	4	2001	
3	A 3	A 31	M	W	X						8	56	4	2001	
4	A 4	A 41	F	W	X			18					13	2001	
5	A 5	A 51	M	W	X			34					12	2001	
6	A 6	A 61	M	W	X			30					13	2002	
7	A 7	A 71	M	W	X			35					13	2002	Dropped after 2002
8	A 8	A 81	M	W	X			40					13	2003	
9	A 2	A 21	F	W	X			20					12	2003	
10	A 3	A 31	M	W	X			23					12	2003	

FA
....
Name and Signature of the Field Assistant

PC
....
Name and Signature of Project Coordinator

Annex 1.8 Exercise to Use Fish Farmer Group and Summary Form (Contd.)

Particulars of Ponds/Plots of Fish Farmer Group

Form 3

Name of NGO:.....LKK.......... DFG No:.....02.......... Thana: .....Y.......... District:.....Z..........

Sl No	Name Farmer	Father/Husband Name	Sex (M/F)	Village	Union	Particular of Pond			Particular of Rice				Technology Group	Year of Joining	Remarks
									Ditch						
						Length (ft)	Width (ft)	Area (Dec)	Length (ft)	Width (ft)	Area (Dec)	Total Area (Dec)			
1	C 1	C 11	M	M	N			25					12	2002	
2	C 2	C 21	F	M	N						5	39	4	2002	
3	C 3	C 31	M	M	N						8	56	4	2002	
4	C 4	C 41	F	M	N			18					13	2002	Dropped after 2002
5	C 5	C 51	M	M	N			34					12	2002	Dropped after 2002
9	C 2	C 21	F	M	N						6	40	4	2003	
10	C 3	C 31	M	M	N						10	60	4	2003	

FA

....
Name and Signature of the Field Assistant

PC

....
Name and Signature of Project Coordinator

Annex 1.8 Exercise to Use Fish Farmer Group and Summary Form (Contd.)

Particulars of Ponds/Plots of DFG

Form 3

Name of NGO:....LKK....................... DFG No:....03........................... Thana: ....Y................... District:....Z...................

Sl No	Name Farmer	Father/Hu sband Name	Sex (M/F)	Village	Union	Particular of Pond			Particular of Rice				Technolog y Group	Year of Joining	Remarks
									Ditch						
						Lengt h (ft)	Width (ft)	Area (Dec)	Lengt h (ft)	Width (ft)	Area (Dec)	Total Area (Dec)			
1	A 1	A 11	M	P	X			25					12	2003	
2	A 2	A 21	F	P	X						5	39	4	2003	
3	A 3	A 31	M	P	X						8	56	4	2003	
4	A 4	A 41	F	P	X			18					12	2003	
5	A 5	A 51	M	P	X			34					12	2003	

FA

....
Name and Signature of the Field Assistant

PC

....
Name and Signature of Project Coordinator

Foundation Training – II

Annex 2.1 Training plan of Monitoring and Evaluation (Foundation II)

Training Course: Monitoring and Evaluation (Foundation II)	Duration: 3 days
Participants: Project Coordinators (DSAP supported Aquaculture Program) and Monitoring and Evaluation officer of NGOs	Time Duration 1st Day: 9:00 A.M. to 5: 30 P.M. 2nd Day: 9:00 A.M. to 5:30 P.M 3rd Day: 9:00 A.M. to 5:30 P.M
Place: CERDI, Gazipur RRC, Jessore	Date: 7 – 9 September 15 – 17 September

Aim   :   To develop the analytical skills of the trainees.

Objectives: **By the end of the training the trainees are expected to be able to:**

- Compile the data collected for the monitoring of their aquaculture extension program
- Analyze and evaluate the performance of their monitoring program

Training Contents			
Session	Topics	Key issues	Duration
Session I	Introduction	- Welcome - Overview of the days program	9:00 A.M – 9: 15 A.M. 9:15 A.M – 9: 30 A.M.
	Discussion on monitoring form	- Objectives of NGO's M&E Program - Recall foundation training - Identification of the gaps of the monitoring forms - Establishing linkages of this form with NGO's aquaculture program objectives	9: 30 A.M – 10: 30 A.M
Tea Break (10:30 A.M. – 11: 00 A.M.)			
Session II	Indices for evaluating the performance of aquaculture	- Physical measure - Economic measures	11: 00 A.M – 1: 00 P.M

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Annex 2.1 Training plan Monitoring and Evaluation (Foundation – II) (Contd.)

<table>
<tr><td colspan="4" align="center">**T r a i n i n g C o n t e n t s**</td></tr>
<tr><td>**Session**</td><td>**Topics**</td><td>**Learning Points**</td><td>**Duration**</td></tr>
<tr>
<td>Session III</td>
<td>Fundamental statistical concepts for data analysis</td>
<td>- Preliminary concepts of statistics

- Sampling and sampling plans

- Measures of central location

- Measures of variability

- Graphical techniques for data presentation</td>
<td>2:00 P.M – 4:00 P.M.</td>
</tr>
<tr><td colspan="4" align="center">**Tea Break (4:00 P.M. – 4: 30 P.M.)**</td></tr>
<tr>
<td>Session IV</td>
<td>Data management, analysis and report writing</td>
<td>- Discussion on the lay out of the research report

- Techniques for data compilation</td>
<td>4:00 P.M – 5:30 P.M.</td>
</tr>
<tr><td colspan="4">Day II*</td></tr>
<tr>
<td>Session V, VI, VII & VIII</td>
<td>Exercise</td>
<td>- Exercise and report preparation Using the monitoring form (by each NGO or group)</td>
<td>9:00A.M. – 5:30 P.M</td>
</tr>
<tr><td colspan="4">Day III*</td></tr>
<tr>
<td>Session IX, X & XI</td>
<td>Result presentation</td>
<td>- Results presentation and discussion</td>
<td>9:00A.M. – 4:00 P.M</td>
</tr>
<tr>
<td>Session XII</td>
<td>Evolution closing</td>
<td>- Recap main points and check objectives of training</td>
<td>4:00 P.M – 5:30 P.M</td>
</tr>
</table>

* Tea break and lunch on Day II and Day III as per the Day I schedule

Annex 2.2 Indices for monitoring the Performance of fish culture

Introduction:

There are many ways of measuring and comparing the performance of fish culture in ponds or rice fields. These are broadly classified as

- Physical measures and
- Economic measures

Physical Measures

The following indices are mainly used to measure the physical performance of ponds:

- Yield or productivity
- Growth rate
- Survival rate and Mortality rate

Yield or Productivity

Production is the increase in total weight that has taken place during a specified period. It is the difference between biomass at the end and the biomass at the beginning of the period. Yield or productivity is the production per unit area.

$$Y = \frac{W_e - W_i}{A}$$

Where, Y = Yield or productivity

        Wi= Fish biomass at the beginning of the period

        We= Fish biomass at the end of the period

        A = Area of the pond

Growth rate

Growth rate is expressed in terms of per unit of time. It is obtained by dividing the net weight gain of fish during a period by duration of this period. It is calculated either for a given period during the production cycle or for the whole cycle.

Growth rate is expressed as $G = \frac{W_e - W_i}{D}$

Where, G = Growth rate

Wi =   Average weight of fish which is obtained by dividing the biomass by the total number of fish at the beginning of the period

We =   Average weight of fish which is obtained by dividing the biomass by the total number of fish at the end of the period

D =   Duration of the production period

Survival Rate and Mortality Rate

Survival rate is the number of fish remain in the waterbody following stocking at a particular point of time expressed in percentage. It is obtained by dividing number of fish remaining in the waterbody at a particular point of time by the number of fish stocked multiplied by 100. Survival rate can be expressed as S =

Where, S = Survival rate

      Ni = Number of fish stocked

      Ne = Number of fish remaining in the waterbody at a particular point of time

Mortality rate = 100 – Survival rate

Example of Survival Rate and Mortality Rate

Mr. Rahim's 10 decimal pond has been stocked with 680 fish with an initial biomass of 5.6 kg. By the end of current period (149 days) Mr. Rahim end up with a harvest of 43.8 kg against 450 pieces of fish. Calculate the following:

- Yield
- Growth rate and
- Survival and mortality rate

Economic Measures:

Cost and Return Analysis

Cost and return analysis, sometimes referred to as budget analysis, is the basic method usually used to evaluate the economic viability or performance of aquaculture operation. It addresses questions such as:

- How much does it cost to operate the fish farm annually?
- What is the major cost items?
- Is it profitable to invest in this venture?

Production Costs

The first step in cost-return analysis is to estimate the production costs. Production costs is generally divided into two groups:

- Fixed Costs
- Variable Costs

Annex 2.2 Indices for monitoring the Performance of fish culture (Contd.)

Fixed Costs

Fixed costs do not change with the volume of output in the short run. The producer would have to pay these cost items regardless of how much his farm produces. Examples of fixed costs are:

- Interest on capital
- Land lease
- Property tax
- Depreciation cost
- Interest on loan

Variable Costs

Variable costs do change with the volume of output for a particular enterprise. In aquaculture, variable costs normally include items such as fry, feed, fertilizer, pesticides, electricity, labor etc. Variable costs can be classified into two categories such as:

- **Cash Costs:** Costs of inputs for which money is immediately spent out of pocket. Expenses for items such as fry, feed, fertilizer, hired labor, pesticides are examples of variable cash costs.
- **Non-cash Costs:** Costs of inputs for which immediate payment is not made. Home supplied inputs such as family labor, cowdung, poultry drops, home supplied seeds and feeds are considered as variable non-cash costs.

Full Cost = Cash cost + Non-cash cost

Gross Revenue

Gross revenue is defined as the total farm value of production (main product and by-product) during a specified period. It includes the following categories.

- Cash sales: Quantity sold multiplied by unit farm price
- The imputed value of the quantity consumed on farm
- The imputed value of the quantity given away
- The imputed value of the quantity used for in kind
- Payment.

Annex 2.2 Indices for monitoring the Performance of fish culture (Contd.)

Economic Analysis

Based on the cost and revenue data collected, various economic indicators that evaluate the viability/performance of a farm can be calculated. The following indicators are commonly used to evaluate the performance of aquaculture operation:

- Gross profit
- Net profit
- Benefit-Cost Ratio

Gross profit: Gross profit is defined as the difference between the total revenues (TR) and operating or variable costs (VC). A farmer is expected to continue operating fish farming activities as long as a positive gross profit is earned.

$$\Pi gross = TR - VC$$

Net profit: Net profit is defined as the difference between total revenues and total costs (fixed and variable costs). Nonnegative net profit is a prerequisite for the long-term viability of fish culture practices.

$$\Pi net = TR - VC - FC$$

Benefit-Cost Ratio (BCR): Benefit-Cost Ratio is defined as the ratio of the total return and total costs (undiscounted).

$$BCR = \frac{TR}{TC}$$

The criterion of the measurement is that

If   BCR > 1, which means that benefits exceed total costs, investment would be economically feasible.

BCR < 1, investment would not be economically feasible.

BCR = 1, it would be a break-even situation (no profit – no loss).

Annex 2.2 Indices for monitoring the Performance of fish culture (Contd.)

Hypothetical Example

A hypothetical example of costs and return of Mr. Rahim's fish culture practices in his 10 decimal pond. For simplicity only a few items are included in the example

Activities	Quantity (Kg)	Unit cost (Tk/Unit price)	Cost and Return (Tk)
Fingerling (piece)	1000	50	500
Cowdung	30		
Poultry drops	20		
Urea	10	8	80
Feed	25	10	250
Hired Labor (manday)	1	50	50
Interest paid			200
Sold	35	40	1400
Consumed	10		
Given away	5		
In kind payment	5		

Calculate:

a) Gross revenue   b) Gross profit
c) Net profit, and   d) BCR

Annex 2.3 Fundamental Statistical Concepts for Data Analysis

What is statistics?

There are two parts to the definition of the word 'Statistics'

Statistics are a collection of data or numbers, such as number of silver carps in a pond or the total number of fishes in a pond.

Statistics is a logic that makes use of mathematics in the science of collecting, analyzing and interpreting data for the purpose of decision making. Thus the field of statistics is oriented towards drawing logical conclusions. This implies that there is some type of question or problem, which commands an interest in finding an answer. Research in fisheries can address several different questions? Suppose, average productivity of 10 ponds is 13 kg per decimal. One may be interested to know what is the dispersion of the productivity of ponds from these average productivity.

Title: Definition of Sample and Population

Population: A population is the set of all items of interest in a statistical problem. It is frequently very large and may, in fact, be infinitely large. For example, NGO "X" is demonstrating 750 demonstrations in pond in 2003. Now, if we are interested to know the pond productivity of NGO "X" aquaculture program in 2003, the population of interest will be all 750 ponds.

Sample: A sample is a set of data draw from the population. Sample is taken to drawn inference about the population. For example, if we are interested to know the pond productivity of NGO "X" aquaculture program, we may take 5% of the sample from 750 population. Based on the results, we may draw inference about the 750 population.

Title: Definition of Variable and Data

Variable: A variable is any characteristics of a population that
is of interest to us. Suppose we are interested to know about the productivity of NGO "X" aquaculture demonstration in pond. Here, the variable in which we are interested is the pond productivity.

Data: The data refers to the actual values (measurements or observations) of variables. Thus variable is the word we use to describe the name of the characteristics of interest, and data is the word that describes the actual values or observations of the variable.

Title: Types of Data

Data may be either quantitative or qualitative.

Annex 2.3 Fundamental Statistical Concepts for Data Analysis (Contd.)

Quantitative:

- Values are real numbers;
- Arithmetic calculations are valid

For example: 30 fish farmers are surveyed and asked to state their age and fish productivity, the numerical responses they will give are quantitative data.

Qualitative

- Categorical data and values are the names of possible categories
- Valid computation: count of the number of observations in each category

For example: If the farmers are asked about their sex, occupation. The responses will come in categories. These are the examples of qualitative data.

Title: Cross-sectional and Time series data

Cross-sectional data: If the observations are measured in one point of time or at the same time, the data is referred as cross-sectional data.

For example: The cost and return data of the pond of a sample of 30 fish farmers for the aquaculture production year 2002-2003.

Time series data: If the observations are measured at successive points in time, the data is referred as time series data.

For example: The cost and return data of the pond of a sample of 30 fish farmers over the years (2001, 2002 and 2003).

Title: What is Frequency distribution

Frequency distribution is a simple and effective method of organizing and presenting data so that one can get an overall picture of where the data are concentrated.

Example 1: Consider the following example of pond productivity of 28 ponds.

10	5	4	5	8	10	7	8	9	5	16	15	14	15
20	84	9	5	18	20	9	14	15	16	12	12	12	

Frequency distribution of pond productivity

Class Limits	Frequency
4 up to 8	7
8 up to 12	8
12 up to 16	8
16 up to 20	5
Total	28

Annex 2.3 Fundamental Statistical Concepts for Data Analysis (Contd.)

$$\text{Approximate class width} = \frac{Largest\ Value - Smallest\ Value}{Number of\ Classes}$$

$$= \frac{20-4}{4}$$

$$= 4$$

Measures of Central Location

Measure of central location summarizes a large set of raw data so that the meaningful essentials can be extracted from it. It describes the center of the distribution of observations. Of the various types of measures of central location, here we will consider three namely

- Arithmetic mean
- Median
- Mode

Arithmetic mean

The most popular and useful measure of central location is the arithmetic mean, which we will refer simply as the mean. Widely known in everyday usage as the average, the mean of a set of n measurements x1, x2, x3 ...., xn is defined as follows:

Example 2: Arithmetic mean

Suppose Mr. Rahim has 10 ponds and from each pond fishes were harvest. The information of productivity (kg / decimal) of this pond are 5, 6, 7, 8, 10, 8, 6, 6, 3 and 7. The average productivity of fish in the ponds are as follows

$$\bar{x} = \frac{5+6+7+8+10+8+6+6+3+7}{10}$$

Exercise 1: Calculate mean of the following two samples

Sample one: 1   23   6   7   13   15   16   17   20
Sample two: 1   7   8   9   9   10   11   12   13   20

Annex 2.3 Fundamental Statistical Concepts for Data Analysis (Contd.)

Median

The median of a set of measurements is the value that falls in the middle when the measurements are arranged in order of magnitude. When an even number of measurements is involved, any number between the two middle values would satisfy the definition of median. In such a case, it is conventional to take the middle point between the two middle values as median.

See Example 2: To estimate the median of fish productivity per pond, as per the definition we have to organize fish production in pond in ascending or descending order. If we organize the exercise in ascending order, it becomes

| 3 | 5 | 6 | 6 | 6 | 7 | 7 | 8 | 8 | 10 |

As in the example the even number of measurements is involved, the median is 6.5 the mid point between 6 and 7

Mode

The mode of a set of measurements is the value that occurs most frequently. The mode doesn't necessarily lie in the middle of the set of measurements, although it often does; its claim to be a measure of central location based on the fact that it indicates the location of greatest clustering or concentration of values.

The mode of the pond productivity mentioned in the Example 2 is 6 kg/decimal.

Mean, Median and Mode which is the best?

The question arises which method should we use among the three measures of central location.

- The mean is generally the best measure of central location to be used unless there are valid reasons to use some other measures. However, one disadvantage of using the mean is that it is sensitive to extreme values.

- In such case, the median is considered to be a better measure of central location.

- The mode is most useful when an important aspect of describing the data

involves determine the number of times each value occurs. If the data are qualitative mode is the best measure of central location. The use of mean and median is useless there. On the other hand, if the data are quantitative and all the measures of central location are meaningful. In that case, it is usually best to report the values of all three measures, because each conveys somewhat different information.

Annex 2.3 Fundamental Statistical Concepts for Data Analysis (Contd.)

Measures of Variability

Sometimes the measure of central tendency such as mean does not provide the whole story about a distribution of measurements. In the above example (Exercise 1), in sample two, most observations are near the mean, whereas in sample one they are more scattered. In this situation, measure of dispersion is required to supplement the mean. Of the various types of measures of variability, we will consider the following:

- Range
- Variance
- Standard Deviation
- Co-efficient of Variation

Range

The first and simplest measure of variability is the range. The range of a set of measurements is the numerical difference between the largest and smallest measurements. The usefulness of the range stems from the ease with which it can be computed and interpreted.

Example 3: Suppose Mr. Rahim has 10 ponds. The productivity (kg/decimal) of the ponds in are given below:

5   6   5   9   10   13   16   10   8   12

In example 3 the smallest and largest productivity of fish ponds were 5 and 16 respectively, which established that the range was $16 - 5 = 11$ kg/decimal.

A major shortcoming of the range is that it provides us with no information on the dispersion of the values that fall between the smallest and largest observations.

Variance

Variance is one of the two most widely accepted measures of the variability of a set of quantitative data (the other is standard deviation). The variance of a sample of n measurement $x1, x2, x3 \ldots xn$ having mean of x- is defined as follows

$$\sigma^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}$$

The short cut formula for the variance is

$$\sigma^2 = \frac{1}{n-1}\left[\sum_{i=1}^{n}x_i^2 - \frac{\left(\sum_{i=1}^{n}x_i\right)^2}{n}\right]$$

Annex 2.3 Fundamental Statistical Concepts for Data Analysis (Contd.)

Example 4: Find the mean and variance of the productivity of 4 ponds (in kg/decimal)

3, 8, 9 and 6

The mean of the sample of 4 measurements is $\bar{x} = \dfrac{3+8+9+6}{4} = 6.5$ kg/decimal

To find the sample variance by means the shortcut formula we first compute

$$\sum_{i=1}^{4} x_i^2 = (3)^2 + (8)^2 + (9)^2 + (6)^2 = 190$$

From the Computation of the mean we already know that $\sum_{i=1}^{4} x_i = 26$

Therefore, $S^2 = \dfrac{1}{3}\left[\sum_{i=1}^{4} x_i^2 - \dfrac{\left(\sum_{i=1}^{4} x_i\right)^2}{4}\right] = \dfrac{1}{3}\left[190 - \dfrac{(26)^2}{4}\right] = 7$ (kg/decimal)

Standard Deviation

The standard deviation of a set of measurements is the positive square root of the variance of measurements. Standard deviation is denoted as

$$S = \sqrt{s^2}$$

For example, the standard deviation of the sample of measurements in Example 4 is

$$S = \sqrt{7} = 2.65 \text{ (kg/decimal)}$$

Co-efficient of Variation

If one wishes to compare the variability of two or more sets of data with different units of measurement, the standard deviation can not always be used directly. In this situation, the coefficient of variation should be used to compare the variability of the distribution. The coefficient of variation (c.v.) is the ratio of the standard deviation to the mean

For example, the coefficient of variation of the sample of measurements in Example 4 is

The coefficient of variation is a unit less measure of variability. It is an appropriate measure for comparing the variations of two sets of data measured in different units.

Graphical Techniques for presentation of Data

Bar Graph

Graphical methods used to present the information are more visually appealing. One very common graphical presentation is Bar graph, which is created by drawing rectangles. They graphically represent the frequency (or relative frequency) of each category as a bar rising vertically from the horizontal axis; the height of each bar is proportional to the frequency (or relative frequency) of the corresponding category.

Example 5: Bar Graph

Example 5: The beneficiaries of NGO "X" under aquaculture extension program are practicing fish culture in pond and rice field. They found the average productivity of fish from Pond is 12 kg/decimal; Rice-fish: 8 kg/decimal and Nursery: 7 kg/decimal. Draw a bar graph using these data.

Productivity of fish culture during 2002-2003
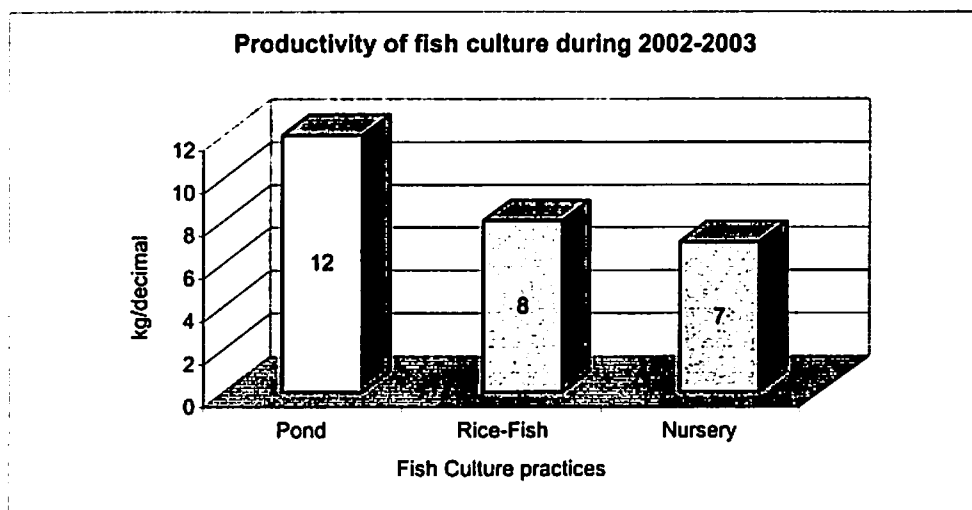
Pie Charts

The most popular graphical graphically presentation method is using pie charts. Pie charts are effective whenever the objective is to display the components of a whole entity in a manner that indicates their relative sizes. Before drawing the pie charts following matters should be considered

- A pie chart is simply a circle subdivided into a number of slices that represent the various categories.

- It should be drawn so that the size of each slice is proportional to the percentage corresponding to that category. As the entire circle corresponds to 3600, every
1% of the observations should corresponds to 3.60 [. 01 (1%) X 360].

Example 6: NGO " P " selected 500 fish farmers for demonstrations under his aquaculture extension program in 2002-2003. Among those, 200 farmers adopted pond culture, 200 rice-fish and 100 hundred nursery. Draw a pie chart to present the aquaculture practices of the farmers.

Firstly, to draw a pie chart we have to calculate the proportion of farmers following above mentioned aquaculture practices

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Aquaculture practices	Number of farmers	Proportion of farmers
Pond culture	200	40%
Rice-fish culture	200	40%
Nursery	100	20%
Total	500	100%

Secondly, to draw the pie chart we have to calculate the angles of the pie chart and it becomes

Pond culture : 40 X 3.6 = 1440
Rice-fish culture: 40 X 3.6 = 1440
Nursery : 20 X 3.6 = 720
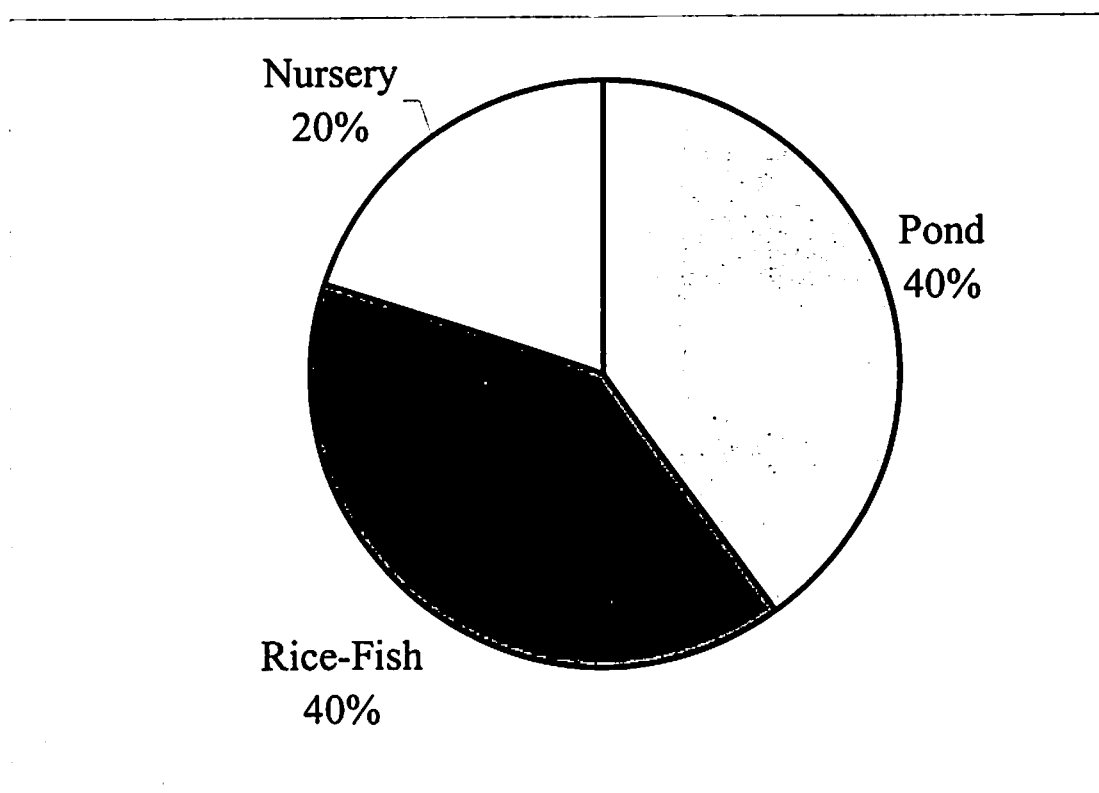
Annex 2.3 Fundamental Statistical Concepts for Data Analysis (Contd.)

Sampling

The main motive for examining a sample rather than a population is time and cost. Statistical inferences permit us to draw conclusions about a population parameter based on a sample that is quite small in comparison to the population.

For example, the Executive director of NGO "X" wants to know the production of pond of the fish farmers under his aquaculture extension program. Suppose 1000 of the NGO's beneficiaries are practicing fish culture under the program. To know the production of each beneficiaries is impractical and expensive. Therefore, the production of a sample of farmers are then examined to determine the production of the population. This result is then used as an estimate of all households under the program.

Sampling Plans

Commonly used sampling techniques are:

- Simple random sampling
- Stratified random sampling
- Purposive sampling

Simple random sampling

In a simple random sampling, samples are selected in such a way that each observation in the population is equally likely to be chosen.
One simple way to do the simple random sampling is to assign a number to each element in the population, write those numbers on individual slips, toss them into a basket and draw the required number of slips (the sample size, n) from the basket.

Stratified random sampling

A stratified random sample is obtained by separating the population into mutually exclusive sets or strata and then drawing simple random samples from each stratum.
For example, under the aquaculture extension program of NGO "X" 300 farmers are practicing fish culture. Now depending on the research interest these farmers can be stratified in the following ways:

Sex	Household Income	Technology
Male	< Tk 10,000	Pond culture
Female	Tk. 10,000 – Tk. 29,999	Rice-fish culture
	Tk. 30,000 – Tk. 59,999	Nursery
	Tk. 60,000>	

Types of Stratified Random sampling

Proportionate stratified sampling

In proportionate stratified sampling the observations are drawn from each stratum in the same proportion as they occur in the universe.

Disproportionate stratified sampling

A stratified sample in which the number of observations drawn from the various strata is independent of the size of these strata is called s disproportionate stratified sampling.

Example of proportionate and disproportionate stratified random sampling

Example 7: Under the aquaculture extension program of NGO "X" 300 farmers are practicing fish culture. Among these farmers 120 farmers (40% of the total) are practicing fish culture in pond, 120 farmers (40% of the total) are practicing rice-fish culture and the rest are practicing nursery. The Executive of the NGO is interested to see the production of each technology. He decides to examine 10% of the sample farmers (30 farmers). How will he do the sampling following proportionate and disproportionate stratified random sampling?

Example of proportionate and disproportionate stratified random sampling (continued)

Strata	Population	% of total population	Proportionate sampling		Disproportionate sampling	
			Sample	% of total sample	Sample	% of total sample
Pond culture	120	40	12	40	10	33
Riee-fish	120	40	12	40	11	37
Nursery	60	20	6	30	09	30

Annex 2.4 Basic of Research Report Writing

Introduction:

The research task is hardly completed until the report on it is written. The most important findings of a study may be useless unless they are communicated with others. The purpose of a report is to communicate with others and not with oneself. The most important thing that should be kept in mind before preparing a report is as follows:

← What does the audience (or consumer) want or need to know about the study?

↑ How can this information be best presented?

Lay out of the Research Report

A comprehensive lay out of the report should comprise

← Preliminary pages

↑ Main text

→ End matter

Preliminary pages

The preliminary pages should be designed in such a way that any body interested in reading the report can easily locate the required information in the report. The preliminary pages of the report should carry

← Front page: Title and date followed by organization name

↑ Acknowledgments in the form of 'preface' or 'foreword'

→ Table of contents

↓ List of tables and figures

° Illustrations

Main text

The main text provides the complete outline of the research report along with all details. The main text of the report should have the following sections:

← Statement of the problem with which the study is concerned

↑ The research procedures or methodology

→ The results or major findings

↓ The implications of the research results for theory and practice

° Summary

Annex 2.4 Basic of Research Report Writing (Contd.)

Statement of the problem

The purpose is to introduce the research project to the readers. It should contain

← A brief summary of other relevant researches in the problem area. This will help the reader to place the present study in the proper context.

↑ A clear statement of the objectives of the study i.e. enough background should be given to make clear to reader why the problem was considered worth investigating.

→ The hypotheses of the study, if any had been formulated.

↓ The definitions (formal and operational) of major concepts employed by researcher

The research procedures

The methodology adopted in the study must be fully explained. It should contain

← The study design

↑ The nature of the sample and how they were collected.

→ Data collection technique

↓ The method of statistical analysis

The results or major findings

← The basic rule in presenting the findings is to give all the evidence relevant to the research question, whether or not the results are in accord with the researcher views.

↑ All the relevant results should be presented in logical sequence and splitter into identifiable sections.

→ The result section of the report should contain statistical summaries of the data rather than
  raw data in the form of tables and charts

The implications of the research results for theory and practice

The implications that flow from the results generally have threes aspects as stated below:

← A statement of the inference drawn from the present study which may be expected to apply in similar circumstances

↑ A report of the conditions of the study that expectedly limit the extent of legitimate generalization.

→ The relevant questions that still remain unanswered or new questions raised by the study along with suggestions for the kind of research that would provide answers for them.

Summary

It is considered a good practice to conclude the research report with a brief summary, resting in brief the research problem, the methodology, the results and the major conclusion drawn from the research problems.

End Matter

At the end of the report, the following topics should be included:

← Appendices should be enlisted in respect of all technical data such as questionnaire, sample information etc.

↑ Bibliography of sources consulted should also be given

Follow-up Training

Annex 3.1 Training plan of Monitoring and Evaluation (Follow-Up)

Training Course: Monitoring and Evaluation (Follow up)	**Duration:** 01 (day)
	Time Duration: 9:00 A.M. to 5:30 P.M.
Participants: Project Coordinators (DSAP supported Aquaculture Program) of NGOs	
Place: WorldFish Center, Dhaka Office IDB Bahaban (Meeting room 1)	**Date:** 26 January 2003 27 January 2003

Aim : To improve the level of understanding of the trainees on monitoring and evaluation.

Objectives : By the end of the training the trainees are expected to be able to:

- Identify factors necessary for effective monitoring of the of aquaculture program
- Understand the DSAP supported monitoring and evaluation tools

Training Contents			
Session	**Topics**	**Learning Points**	**Duration**
Session I	Introduction	- Welcome - Overview of the days Program	9:00 A.M – 9: 30 A.M.
	Pond Record book	- Discussion - Procedure to use the pond book - Problems	9: 30 A.M – 10: 30 A.M
Tea Break (10:30 A.M. – 11: 00 A.M.)			
Session II	Review of beneficiary survey form	- Identify the factors that need to be monitored - Development of the survey form - Exercise & presentation	11: 00 A.M. – 1:00 P.M.
Lunch Break (1:00 P.M. – 2: 00 P.M.)			
Session III	Review of Aquaculture performance survey form	- Sampling methodology - Identification of the factor that need to be monitored - Exercise & presentation	2:00 P.M – 4:00 P.M
Tea Break (4:00 P.M. – 4: 30 P.M.)			
Session IV	Closing	- Recap main points and check objectives - Closing remark	4:30 P.M – 5:00 P.M

Annex 3.2 Monitoring Fish Farmer Record Book (Pond)

1. Background information:

Farmer name:..Husband /wife/ father name:...

Age (Year): .... Sex (male / female): .... Year of schooling: ...... Fish culture experience: .... (years)

Village: ....Union:......................Upazilla: .... District: ....

NGO: .... Extension worker name:...

Farmer group name:.............................. Technology group name:..

Year joined in the program: .... Current production year: ....

2. Family information:

a) Family head name: .... b) Family head sex (male/female):..............................

c) Major occupation:..................... d) Secondary occupation:...

e) Land area (including homestead) (decimal):............... f) Annual income (Tk): ....

g) Number of ponds:......................Total surface area (decimal):..

h) Number of rice-fish plots: .... Total surface area (decimal):...................................

3. Family participation on aquaculture

a) Family size (no.): .... Adult: male.........female..........Child: male..........female...........................

b) Participation on aquaculture training (no.): Adult: male.........female..........Child: male..........female........

c) Participation on aquaculture activities (no.): Adult: male.........female......Child: male..........female..........

d) Contribution on aquaculture activities (% time spent): Adult: male......female.....Child: male......female......

e) Participation on field rallies (no.): Adult: male.........female.........Child: male.............female.................

4. Basic information of demonstrated pond:

a) Pond surface area (decimal): .... b) Dike area (decimal): ....

c) Soil type: .... d) Pond type (seasonal/perennial): ....

d) Tenure status (single owned / joint owned / single leased / joint leased): ....

e) If multiple ownership (joint owned or joint leased), how many persons: ....

5. Information of fish culture in the demonstrated pond (current production year, 2003/04):

a) Amount grant money received .... (Tk) b) Service charge paid .... (Tk)

Annex 3.2 Monitoring Fish Farmer Record Book (Pond) (Contd.)

c) Amount borrowed ....(Tk) and interest paid .... (Tk) d) Land tax for the pond............. (Tk)

e) Last re-excavation of pond

Year	Cost (Tk)	Economic Life (Years)

f) Lease value ....(Tk) g) Culture period: .... (days) (Period between first stocking and final harvesting)

h) Input use for fish culture:

Inputs	Quantity (kg)	Cost (Tk)
Organic fertilizer Cowdung		
Poultry drops		
Compost		
Others		
Inorganic fertilizer Urea		
TSP		
MP		
DAP		
Chemical Lime		
Poison		
Others		
Supplementary feed Azolla/Duckweed		
Rice/wheatbran		
Oil cake		
Fish meal		
Others		
Labor (man-day) Own Labor		
Family labor		
Hired labor		
Others (.............................)		
Total		

Annex 3.2 Monitoring Fish Farmer Record Book (Pond) (Contd.)

i) Information of stocking and harvesting:

Name species	Stocking			Harvesting				
	Number	Weight (Kg)	Value (Tk)	Number	Consumed (Kg)	Given away (Kg)	Sold (Kg)	Value of produced fish (Tk)
Total								

6. Management technique followed for fish culture

Characteristics	(✔/✗)		(✔/✗)
Dike construction		Regular monitoring of fish behavior	
Sunlight exposure		Sampling of fish	
Control of aquatic weed		Multiple harvesting	
Measure to control predatory fish (drying, poisoning, netting)		Restocking practices	
Natural food investigation		Water supply	
Pre-stocking liming		Regular observation of water color	
Pre-stocking organic fertilization		Control of heavy plankton	
Pre-stocking inorganic fertilization		Supplementary feeding	
Use of compost		Supply sufficient quantity of Azolla/ duckweed/soft leafs	
Turbidity control		Use of feeding ring	
Composition and combination (species)		Regular monitoring of feed	
Post-stocking organic fertilization		Preventive measures against disease	
Post-stocking inorganic fertilization			

....
Date   Signature of the Interviewer

Annex 3.3 Monitoring Fish Farmer Record Book (Rice field)

1. Background information:

Farmer name:...Husband /wife/ father name:...

Age (Year): .... Sex (male / female): .... Year of schooling: ...... Fish culture experience: ....(years)

Village: ....Union:.....................Upazilla: .... District: ....

NGO: .... Extension worker name:...

Farmer group name:.............................. Technology group name:..

Year joined in the program: .... Current production year: ....

2. Family information:

a) Family head name: .... b) Family head sex (male/female):.........................

c) Major occupation:.................... d) Secondary occupation:...

e) Land area (including homestead) (decimal):.................. f) Annual income (Tk): ....

g) Number of ponds:........................Total surface area (decimal):...

h) Number of rice-fish plots: .... Total surface area (decimal):...............................

3. Family participation on aquaculture

a) Family size (no.): .... Adult: male.........female..........Child: male..........female....................

b) Participation on aquaculture training (no.): Adult: male.........female..........Child: male.......female......

c) Participation on aquaculture activities (no.): Adult: male......female......Child: male..........female.........

d) Contribution on aquaculture activities (% time spent): Adult: male......female.....Child: male......female......

e) Participation on field rallies (no.): Adult: male......female.........Child: male.............female..............

4. Basic information of demonstrated plot:

c) Ditch area (decimal): .... b) Total plot area (decimal):................ c) Soil type:
....

d) Tenure status (single owned / joint owned / single leased / joint leased): ....

c) If multiple ownership (joint owned or joint leased), how many persons: ....

5. Information of fish culture in the demonstrated plot (current production year, 2003/04):

a) Amount grant money received .... (Tk) b) Service charge paid ....(Tk)

c) Amount borrowed ....(Tk) and interest paid .... (Tk) d) Land tax for the plot .... (Tk)

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Annex 3.3 Monitoring Fish Farmer Record Book (Rice field) (Contd.)

e) Last re-excavation of ditch

Year	Cost (Tk)	Economic Life (Years)

f) Lease value ....(Tk) g) Culture period: ......(Days) (Period between first stocking and final harvesting)

h) Input use for rice-fish culture:

Inputs use for fish productio	Quantity (kg)	Cost (Tk)
Organic fertilizer Cowdung		
Poultry drops		
Compost		
Others		
Inorganic fertilizer Urea		
TSP		
MP		
DAP		
Chemical Lime		
Poison		
Others		
Supplementary feed Azolla/Duckweed		
Rice/wheat bran		
Oil cake		
Fish meal		
Others		
Labor (man-day) Own Labor		
Family labor		
Hired labor		
Others (...........................)		
Total		

Annex 3.3 Monitoring Fish Farmer Record Book (Rice field) (Contd.)

h) Input use for rice-fish culture (Contd.)

Input use for rice production:	Quantity (kg)	Cost (Tk)
Seed		
Organic fertilizer Cowdung		
Poultry drops		
Compost		
Others		
Inorganic fertilizer		
Urea		
TSP		
MP		
DAP		
Others		
Insecticide		
Labor (man-day) Own		
Family labor		
Hired labor		
Others (...)		
Total		

i. Information of stocking and harvesting:

Name species	Stocking			Harvesting				
	Number	Weight (Kg)	Value (Tk)	Number	Consumed (Kg)	Given Away (Kg)	Sold (Kg)	Value of produced fish (Tk)
Total								

j) If rice-fish concurrent practice, please mention:

Total volume of paddy production (Kg) .... and total value of paddy production (Tk) ....

Total volume of straw production (Kg) .... and total value of straw production (Tk) ....

6.   Management technique followed for fish culture

Characteristics	(✓/✗)	Characteristics	(✓/✗)
Dike construction		Regular monitoring of fish behavior	
Sunlight exposure		Sampling of fish	
Control of aquatic weed		Multiple harvesting	
Measure to control predatory fish (drying, poisoning, netting)		Restocking practices	
Natural food investigation		Water supply	
Pre-stocking liming		Regular observation of water color	
Pre-stocking organic fertilization (Cowdung, poultry drops)		Control of heavy plankton	
Pre-stocking inorganic fertilization (Urea, TSP, MP, DAP)		Supplementary feeding	
Use of compost		Supply sufficient quantity of *azolla*/ duckweed/soft leafs	
Turbidity control		Use of feeding ring	
Composition and combination (species)		Regular monitoring of feed	
Post-stocking organic fertilization (Cowdung, poultry drops)		Preventive measures against disease	
Post-stocking inorganic fertilization (Urea, TSP, MP, DAP)			

....
Date   Signature of the Interviewer

Annex 3.4 Monitoring Fish Farmer Record Book (Rice field) (Contd.)

e) Last re-excavation of ditch

Year	Cost (Tk)	Economic Life (Years)

f) Lease value ....(Tk) g) Culture period: ......(Days) (Period between first stocking and final harvesting)

h) Input use for rice-fish culture:

Inputs use for fish production	Quantity (kg)	Cost (Tk)
Organic fertilizer Cowdung		
Poultry drops		
Compost		
Others		
Inorganic fertilizer Urea		
TSP		
MP		
DAP		
Chemical Lime		
Poison		
Others		
Supplementary feed Azolla/Duckweed		
Rice/wheat bran		
Oil cake		
Fish meal		
Others		
Labor (man-day) Own Labor		
Family labor		
Hired labor		
Others (............................)		
Total		

Annex 3.4 Monitoring Fish Farmer Record Book (Rice field) (Contd.)

h) Input use for rice-fish culture (Contd.)

Input use for rice production:	Quantity (kg)	Cost (Tk)
Seed		
Organic fertilizer Cowdung		
Poultry drops		
Compost		
Others		
Inorganic fertilizer		
Urea		
TSP		
MP		
DAP		
Others		
Insecticide		
Labor (man-day) Own		
Family labor		
Hired labor		
Others (...)		
Total		

i. Information of stocking and harvesting:

Name species	Stocking			Harvesting				
	Number	Weight (Kg)	Value (Tk)	Number	Consumed (Kg)	Given Away (Kg)	Sold (Kg)	Value of produced fish (Tk)
Total								

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Annex 3.4 Monitoring Fish Farmer Record Book (Rice field) (Contd.)

j) If rice-fish concurrent practice, please mention:

Total volume of paddy production (Kg) .... and total value of paddy production (Tk) ....

Total volume of straw production (Kg) .... and total value of straw production (Tk) ....

6. Management technique followed for fish culture

Characteristics	(✓/✗)	Characteristics	(✓/✗)
Dike construction		Regular monitoring of fish behavior	
Sunlight exposure		Sampling of fish	
Control of aquatic weed		Multiple harvesting	
Measure to control predatory fish (drying, poisoning, netting)		Restocking practices	
Natural food investigation		Water supply	
Pre-stocking liming		Regular observation of water color	
Pre-stocking organic fertilization (Cowdung, poultry drops)		Control of heavy plankton	
Pre-stocking inorganic fertilization (Urea, TSP, MP, DAP)		Supplementary feeding	
Use of compost		Supply sufficient quantity of *azolla*/ duckweed/soft leafs	
Turbidity control		Use of feeding ring	
Composition and combination (species)		Regular monitoring of feed	
Post-stocking organic fertilization (Cowdung, poultry drops)		Preventive measures against disease	·
Post-stocking inorganic fertilization (Urea, TSP, MP, DAP)			

....

Date   Signature of the Interviewer

Aquaculture Extension Program of ....
Particulars of Ponds/Plots of Fish Farmer Group

Group no:.. Thana: .... District:.......................... Name of FA ....

Sl No	Family no.	Pond/ plot no.	Name of farmer	Father/ Husband name	Union	Village	Approach followed on aquaculture Individual = I (Male/Female) Whole family = W	Pond area (dec)	Particular of rice plot Ditch area (dec)	Total area (dec)	Technology Group name	Year of joining	Remarks

Prepared by: ....
Name & Signature

Approved by: ....
Name & Signature

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Aquaculture Extension Program of ....

Summary of Fish Farmer Groups in 2004

Name of FA: .... Thana: ....……..…. District: ....……...............

Grou p no.	Number of Family	Group formed (year)	Village	Union	Technolo gy group (code)	2002 New Ponds/plots		2003						2004						Status of the ponds/plots in 2004				Spread over by non- member's ponds/plot s (number of farmer)
								Carried over ponds/plots (a)		New ponds/plots (b)		Total Ponds/plots (a+b)		Carried over ponds/plots (c)		New ponds/plots (d)		Total ponds/plots e=c+d		Demonstration (f)		Spread over (e-f)		
						No.	Area (dec)	No.	Area (dec)	No.	Area (dec)	No.	Area (dec)	No.	Area (dec)	No.	Area (dec)	No.	Area (dec)	No.	Area (dec)	No.	Area (dec)	

Prepared by: ....
　　　　　Name & Signature

Approved by: ....
　　　　　Name & Signature

Aquaculture Extension Program of ....

Particulars of Ponds/Plots of Fish Farmer Group

Group no:............. 01...................... Thana: ....K..................... District:.........Z................ Name of FA ....AA.....................

SI No	Family no	Pond/plot no.	Name of farmer	Father/ Husband name	Union	Village	Approach followed on aquaculture Individual = Male/Female Whole Family = W	Pond area (dec)	Particular of rice plot		Technology group	Year of joining	Remarks
									Ditch area (dec)	Total area (dec)			
1	1		A 1	A 11	X	Y	W	25			12	2002	Dropped after 2002
2	2		A 2	A 21	X	Y	W		5	39	4	2002	
3	3		A 3	A 31	X	Y	W		8	56	4	2002	
4	4		A 4	A 41	X	Y	W	18			13	2002	
5	5		A 5	A 51	X	Y	W	34			12	2002	
6	6		A 6	A 61	X	Y	W	30			13	2003	
7	7		A 7	A 71	X	Y	W	35			13	2003	Dropped after 2003
8	8		A 8	A 81	X	Y	W	40			13	2004	
9	2		A 2	A 21	X	Y	W	20			12	2004	
10	3		A 3	A 31	X	Y	W	23			12	2004	

Prepared by: ....   Approved by: ....
           Name & Signature   Name & Signature

Aquaculture Extension Program of ....

Particulars of Ponds/Plots of Fish Farmer Group

Group no:............. 01........................ Thana: ......K..................... District:..........Z................. Name of FA ....AA....................

SI No	Family no	Pond/plot no.	Name of farmer	Father/ Husband name	Union	Village	Approach followed on aquaculture Individual = Male/Female Whole Family = W	Pond area (dec)	Particular of rice plot		Technology group	Year of joining	Remarks
									Ditch area (dec)	Total area (dec)			
1	1		C 1	C 11	M	N	W	25			12	2003	
2	2		C 2	C 21	M	N	W		5	39	4	2003	
3	3		C 3	C 31	M	N	W		8	56	4	2003	
4	4		C 4	C 41	M	N	W	18			13	2003	Dropped after 2003
5	5		C 5	C 51	M	N	W	34			12	2003	Dropped after 2003
6	2		C 2	C 21	M	N	W		6	40	4	2004	
7	3		C 3	C 31	M	N	W		10	60	4	2004	

Prepared by: ....

Name & Signature

Approved by: ....

Name & Signature

Annex 3.6 Exercise to Use Fish Farmer Group and Summary Form

Aquaculture Extension Program of ....

Particulars of Ponds/Plots of Fish Farmer Group

Group no:............. 01........................ Thana: ......K..................... District:.........Z................ Name of FA ....AA........................ .....

Sl No	Family no	Pond /plot no.	Name of farmer	Father/ Husband name	Union	Village	Approach followed on aquaculture Individual = Male/Female Whole Family = W	Pond area (dec)	Ditch area (dec)	Total area (dec)	Technology group	Year of joining	Remarks
1	1		A 1	A 11	P	X	W	25			12	2004	
2	2		A 2	A 21	P	X	W		5	39	4	2004	
3	3		A 3	A 31	P	X	W		8	56	4	2004	
4	4		A 4	A 41	P	X	W	18			12	2004	
5	5		A 5	A 51	P	X	W	34			12	2004	

Prepared by: ....
Name & Signature

Approved by: ....
Name & Signature