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PRA Impact Study
on
Batch 2 Fisheries Villages
of the
Aquaculture Extension and Training Component

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PRA Impact Study on
Batch 2 Fisheries Villages of the
Aquaculture Extension and Training Component

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Executive Summary

The objective of the present study was to assess the performance and problems of trainees under Batch 2 of the Aquaculture Extension and Training (AET) component of the Fourth Fisheries Project (FFP), based on the Participatory Rural Apprisal (PRA) data collected by staff of the implementing Upazilas. This is the second volume of a series. The first volume, covering Batch 1 trainees was published in June 2003. The study aimed to assess the outcomes of FFP training in terms of knowledge and adoption of recommended aquaculture practices, its impacts on production and livelihoods, and the problems farmers face in applying the recommendations.

The Batch 2 Fishery Villages comprise Fisheries Villages (FV) 7-18 in each of the 211 Upazilas under FFP, with 25 trainees in each FV. The trainees were inducted in mid-2001 and had completed one post-training production cycle at the time of the study. The data were collected during August-October 2003 by Upazila teams of DoF. Four FVs were sampled from each Upazila (33% of the total FV), though not all Upazilas returned usable data. Usable data were returned for 752 FVs (31% of the FVs organised in Batch 2). In the surveyed FVs, 19.7% of trainees were female.

Annual incremental production is estimated to average 0.89 mt./ha. or 79%, which exceeds the FFP target of 50%. The incremental production of female trainees was similar (0.86 mt./ha. or 79.6%) compared to male trainees (0.89 mt./ha. or 78.8%). Incremental production of seasonal ponds was better (1.00 mt./ha or 107.7%) compared to perennial ponds (0.85 mt./ha or 73.3%). This indicates that the performance of relatively less-wealthy trainees, who tend to have seasonal ponds, was better. The production estimates exclude the once-only gain in stock remaining at the end of the production cycle, estimated at 0.43 mt/ha.

Of the total output from the ponds of the surveyed farmers, on average 28% was used for family consumption. Consumption from female operated ponds was much higher (39%) compared to that of male operated ponds (27%), indicating that targeting women can give more security for household nutrition as well as better performance in production.

Self-assessment of livelihood impacts by farmers showed that more than 60% of farmers had improved their position as measured by 7 indicators, except increase of water area. Under 2% were worse off by any indicator. The strongest positive impacts were on fish production (88% of farmers), fish consumption (85%), increased use of time for aquaculture (80%) and income (78%).

The FFP target of 40% of farmers fully knowing and applying recommended practices was exceeded. More than 50% of the trained farmers had correct knowledge and had fully applied the training messages at their aquaculture sites. About 25% had correct knowledge but had only partially applied it; while more than 15% had some knowledge but had not applied it at all. The remaining trained farmers had no knowledge, nor did they apply any of the training messages.

The main areas of farmers' concerns were the financial cost of carrying on aquaculture, and the availability of fingerlings of the required species, size and quality. The sincerity of the financial concerns, which were expressed by 73% of all sample villages is dubious in many cases, especially since the Batch 2 trainees were not selected with a specific poverty focus; they therefore represent a relatively affluent socio-economic stratum (sample surveys shows that more than 50% of trainees' landholdings was above 150 dec. or 0.60 ha.). The concerns about supply and quality of fingerlings, which were expressed in 40 per cent of all villages, merit the serious attention of DoF.

In conclusion, the study indicates that, for Batch 2, FFP had achieved its technology adoption and incremental production targets. The FFP gender goal of 25% women trainees was not achieved (it was 19.7% in the surveyed FVs of Batch 2), but women who did participate achieved better results than men. The implication is that the sectoral gains from engaging women in aquaculture are potentially large, but projects and programmes need to take a pro-active stance on involving them. The study methodology does not permit any conclusions on the degree to which the FFP poverty target was achieved, or on sustainability of the gains in technology adoption and fish production. More detailed studies in the last quarter of 2004 will address these issues.

Contents

1. Introduction

1.1 Background of the AET Component

Over the last decades, the Department of Fisheries has carried out a considerable amount of work in aquaculture extension. The aim is to improve the access of rural fish farmers to appropriate technologies and skills, and thereby increase protein food production and rural incomes. In many areas, aquaculture production has increased dramatically. However, these developments have not been consistent across the country and between socio-economic groups. Particularly, in the case of the rural poor, achievements of aquaculture have been limited as an element in their livelihood.

The Fourth Fisheries Project (FFP) is jointly funded by the World Bank, DFID, and the Government of Bangladesh, and has been in operation since January 2000. The Aquaculture Extension and Training (AET) component of the project aims to provide conditions for sustainable increase of fish production in the country. It will also strengthen extension links between the Department of Fisheries (DoF) and the private sector.

The AET component is the largest activity of DoF. It has trained 200,000 farmers in 8,000 villages in 211 Upazilas[1] in 30 Districts in six Divisions, over the life of the project. The extension approach of the component is based on the village model, called the “Fisheries Village" approach. In each Fishery Village (FV), a group of 25 farmers is trained. In total 40 groups have been formed in each Upazila. The number of groups to be formed in each Upazila in each year was fixed by the project. In each Upazila in the first year 6 FVs were formed, in the second year 12 FVs, in the third year another 12 FVs and in the fourth 10 FVs.

The project targeted that 40% of its trained farmers would fully adopt the training messages, and that trained farmers would attain 50% incremental fish production at the end of two years' intervention. Beside that, general project objective is to arrange at least 50% of project benefits accrue to moderately and extremely poor[2] households on a sustained basis by end of project. The AET component is expected to contribute to this.

Project intervention in each Fisheries Village is for two years. In the first year, technical messages on aquaculture are provided in three training sessions, along with an awareness session at the beginning. In the second year, two follow-up sessions are organised for converting the training messages into practices, along with several pond site visits by extension agents. Usually the second follow-up session is organised at the end of the two years' intervention by the project, to assess the immediate impact of the imparted training messages among the trainees. This assessment is done using Participatory Rural Appraisal (PRA) methods, which were introduced in 2002.

1.2 Objectives of the PRA Impact Study

The objective of the PRA Impact Study was to gather information for FFP project management, DoF, Government of Bangladesh, and the donor agencies, about the incremental fish production against the project target. Production data have been analysed by sex of pond operators for gender focus, and by type of aquaculture sites to compare the productivity of different types of water body.

The study also describes the farmers' assessment of the impact of training on their livelihoods, in the form of fish production, amount of fish consumed, cash income, investment in aquaculture, water area used, time used for aquaculture, and the contribution of aquaculture to household savings.

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[1] In the Chittagong Hill Tracts scope for aquaculture is limited by the terrain. Consequently, the 21 Hill Tract Upazilas were formed into 10 groups, each of which formed the same number of FVs as one lowland Upazila.

[2] Moderate poor : land ownership up to 0.5 ac; household annual income (pcx5) Tk. 31,435, and
Extreme poor : land ownership up to 0.15 ac; household annual income (pcx5) Tk. 18,785 (Ref. BIDS)

The study also assesses the outcomes of the project interventions in terms of trainees' knowledge of appropriate fish culture techniques, and progress in adoption of technical messages, which were imparted during the farmers' training sessions.

Finally, the study assesses farmers' concerns, both about the interventions made by FFP, and about the problems of carrying on aquaculture using the recommended practices.

1.3 Coverage of the Study

In the second batch of the AET component a total of 2,400 Fisheries Villages was formed, 12 (FV Nos. 7-18) in each of 211 Upazilas or groups of Upazilas under FFP. It was planned to evaluate project impact using data from a sample of 4 FVs, out of the total 12 in each Upazila. To avoid any possibility of bias by the Upazila staff, the selection of the four fisheries villages was fixed by the project; these were Fisheries Villages number 7,9,12 and 16 in each Upazila.

This should have produced a sample of 800 villages' results from the 211 Upazilas under FFP. In reality, there was a significant amount of missing and spoiled data. This is not unexpected given the inexperience of DoF staff in PRA and the large scale of the exercise. Ultimately, data from a total of 752 FVs were available for analysis (31% of the total FVs organised in Batch 2). There are no patterns in the distribution of the missing data which would raise concerns about the introduction of biases in the results. The final total of usable village data sets represents a theoretical total of 18,800 trainees (not all of whom actually participated in the PRA).

The data quality problems, and the number of villages which were usable, varied between different parts of the PRA exercise. The principle adopted was to use all the good data from each section; consequently, the analyses for each section are based on different numbers of villages. The number of FVs actually included for different types of analysis is presented in Table 1.

Table 1: Number of Fisheries Villages Included for Different Types of Analysis, by Division

Division	**Total FV in study**	**Fisheries villages by types of analysis**				
		Production impacts by type of aquaculture site	**Production impacts by sex**	**Farmers' assessment of liveli-hood impacts**	**Farmers' knowledge and practices**	**Analysis of farmers' concerns**
Barisal	72	66	72	72	72	
Chittagong	216	212	209	214	216	
Dhaka	112	112	110	111	111	
Khulna	88	87	88	88	88	
Rajshahi	236	231	235	236	236	
Sylhet	28	27	28	28	28	
Total	752	735	742	749	751	
% of 1st batch FVs	31	30	31	31	31	

1.4 Timing of the Study

At the beginning of the AET activities in 2000, it was decided to initiate a participatory evaluation of fisheries village activities by trainees after receiving two years support from project. The PRA methodology was chosen for the evaluation.

All Extension Officers of Upazila teams received training on PRA methodologies in June 2002 to carry out the PRA sessions at the fisheries villages.

The Upazila team members conducted the PRA impact survey for the Batch 2 Fisheries Villages during August-October 2003. There were some delays by Upazila staff in forwarding the results to FFP and also some delays in data entry, which resulted in delayed analysis and reporting until 2004.

1.5 Outline of the Methodology

The data for this report were collected by the Upazila team members of Department of Fisheries using a standardised format for training impact assessment (AET/ME: 004e, see Annex 4). This format imposes some constraints on the level of analysis, as discussed in Annex 5.

Data on the results of the FFP interventions have been analysed in four stages:

- Quantified impact on fish yield (analysed by sex of pond operator and by type of aquaculture site);
- Qualitative assessment of livelihood impacts of FFP interventions;
- Trainees' knowledge and application of improved aquaculture practices; and
- Problems and constraints of aquaculture raised by farmers.

The presentation of results follows the structure of the logical framework of project interventions:

Impacts (production, income)
are produced by

↑

Outcomes (knowledge and adoption of improved practices)
which are produced by

↑

Outputs (training sessions and support visits by DoF staff)
which are produced by

↑

Inputs (funds and staff time)

The present study focuses on the top two levels of the logical framework, the Outcomes and Impacts. It also attempts to probe the Assumptions governing progress from Outputs to Outcomes and from Outcomes to Impacts. This has been done through analysis of farmers' perceived constraints on development of aquaculture.

The main text, and the tabulations and charts included in it, focus on results at the whole project level, combining data from all the 6 administrative Divisions of Bangladesh. For FFP and DoF management purposes, the data have also been analysed by Division. Due to the large number of tabulations required, these are presented in Annexes 1, 2 and 3 rather than the main text.

The study recorded information on the estimated quantity of fish remaining in trainees' ponds at the end of the production cycle. As discussed in Annex 5, stock changes can only be treated as a one-off project benefit, not an annual event. Also, there are serious problems regarding the accurate measurement of remaining stocks. Remaining stock estimates are large in relation to annual harvest, which is also reason to be cautious in treating them as benefits. For this reason, remaining stock has been separated from annual production benefits in the tabulations.

2. Impact of FFP Interventions

2.1 Quantified Production Impacts

Production impact data from the study are available classified under two headings: by sex of trainees and by type of aquaculture sites. Both classifications have some cases of missing data, which are different for each of the classifications. Therefore, the totals and averages for the impact indicators differ slightly depending on which classification is used. The classification by sex of operators has fewer missing cases, and this is, therefore, used as the primary evidence of impact.

2.1.1 <u>Production Impacts Classified by Sex of Pond Operators</u>

Compared with Batch 1, at the time of the Batch 2 trainees' induction the AET component was more organised and more experienced on the training curriculum. However, it was still mainly concerned with meeting quantitative targets for number of trainees, rather than following up on gender and poverty issues.

It is expected that the intervention through aquaculture training will increase the fish production of the trainees. Total production was measured as the sum of quantity sold and household consumption. The impact of training on fish production in 742 FVs, broken down by sex of pond operator, is given in Figure 1 and Table 2. Production data by sex of pond operators were also analysed by administrative Division, as presented in Annex 1.

Incremental production was measured by comparison with baseline data recorded at the time when trainees were inducted. The incremental fish production was more than 79% in the Batch 2 FVs. The project target of incremental fish production is 50%. It was 49.1% in the Batch 1. As shown in Figure 1, incremental production of female operated ponds was similar (79.6%) compared to male operated ponds (78.8%). In Batch 1, though overall incremental yield was low (49%) but female were 14% higher than male.

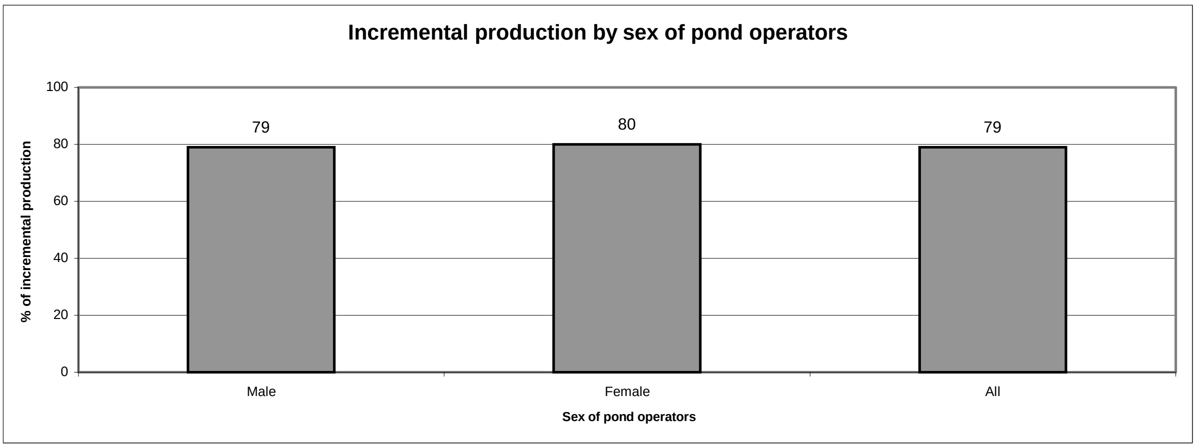

Figure 1: Production Impacts by Sex of Operator (All Divisions)

There was a total of 18,800 pond operators from 752 fisheries villages under 188 upazilas in the sample of Batch 2 FVs. Among the total 752 sample FVs, 35% were male groups, about 3% were female and 62% were mixed groups.

Of the total pond operators19.7% were women which was an improvement compared to Batch 1 (17.8%). The project target of female trainees is 25%. Total pond area of the surveyed operators was 2340.79 ha., with an average of 0.12 ha (31 dec.). The average area of male operated ponds was 0.14

ha (34 dec.) and that of female operated ponds was 0.08 ha (19 dec.). The overall pond size of Batch 1 was little higher (0.14 ha. or 35 dec.), which in general indicates added inclusion of lower landholdings in the Batch 2 FVs.

The overall baseline production was 1.12 mt./ha. (4.5 kg./dec.); there was negligible difference between male and female operated ponds in baseline production.

The average fish yield after training was 2.01 mt./ha. (8.10 kg./dec.). The average fish yield of male operated ponds was a little higher (2.02 mt./ha.) compared to female operated ponds (1.94 mt./ha.). However, evidence of superior management was found from female operators in Batch 3 of the AET component[3]. The average fish yield in Batch 2 FVs was 20% higher compared to Batch 1[4].

Out of the total production, the pond operators' own families used 28% for consumption. Interestingly, the proportion of post-training yield used for family consumption from female operated ponds was much higher (39%) compared to male operated ponds (27%). This emphasises the scope for better nutrition, as well as better national aquaculture performance, which can be achieved by targeting women. Rate of family fish consumption was similar compared to the previous Batch; however, female operated ponds of Batch 2 consumed more.

Table 2: Breakdown of Production by Sex of Operator (All Divisions)

Issues	**Unit**	**Sex of Operator (1)**		
		Male	**Female**	**All (2)**
Total pond area	Ha	2050.79	290.00	2340.79
Pre-training:				
Baseline production	mt.	2325.69	313.96	2639.65
Baseline yield	mt./ha	1.13	1.08	1.12
Post-training:				
Consumption	mt.	1116.47	216.48	1332.95
Sale	mt.	3044.98	345.36	3390.34
Total production	mt.	4161.45	561.84	4723.29
Post-training yield	mt./ha	2.02	1.94	2.01
Incremental yield	mt./ha.	0.89	0.86	0.89
	%	78.76	79.63	79.46
Residual stock change	mt./ha.	0.42	0.46	0.43

Notes: *(1) Based on data from 742 villages (10 villages excluded due to data quality problems).*
(2) Total production & area differ between Tables 2 &3 due to different numbers of missing cases.

The study also estimated the remaining stock of the ponds. An average of 0.43 mt./ha. residual stock was found for the sample ponds. It must be noted that this is a one-off increase due to intensification of production after FFP training. It is not an annual production benefit.

2.1.2 Production Impacts Classified by Type of Aquaculture Site

The project beneficiaries of the surveyed Fisheries Villages are predominantly pond farmers. Ponds are classified as perennial and seasonal. Also, a few trainees are involved in fish culture in paddy fields, ditches and canals. The survey recorded post-training yield data for different categories of aquaculture sites to assess the productivity. Fish production impact of 735 fisheries villages by type of aquaculture site is given in Figure 2 and Table 3. Production impact data were also analysed by Divisions, as presented in Annex 1.

As shown in Figure 2, incremental yield of seasonal ponds was better (107.6%) compared to perennial ponds (73.28%) or from Ditches/canals (21.7%). Surprisingly, production from paddy field was higher (109.5%) than any other aquaculture sites but it showed negative incremental result in Batch 1.

[3] Sample Baseline Survey of Pond Operators of Batch 3 (October 2003)
[4] PRA Impact Study on Batch 1 Fisheries Villages of the AET Component (June 2003) and Sample Impact Assessment of Batch 1 Villages of the AET Component (draft)

The available data cover a total of 2303.55 ha of water bodies, of which 86.4% were perennial ponds, 13.1% seasonal ponds, 0.8% paddy fields and very small areas were brought under ditches/canals or cage culture. The area of seasonal ponds was increased in Batch 2, which again indicates the trends of inclusion of less wealthy trainees in these FVs. As noted above, the totals and percentages classified by type of waterbody differ slightly from those by sex of operator, due to varying levels of missing data.

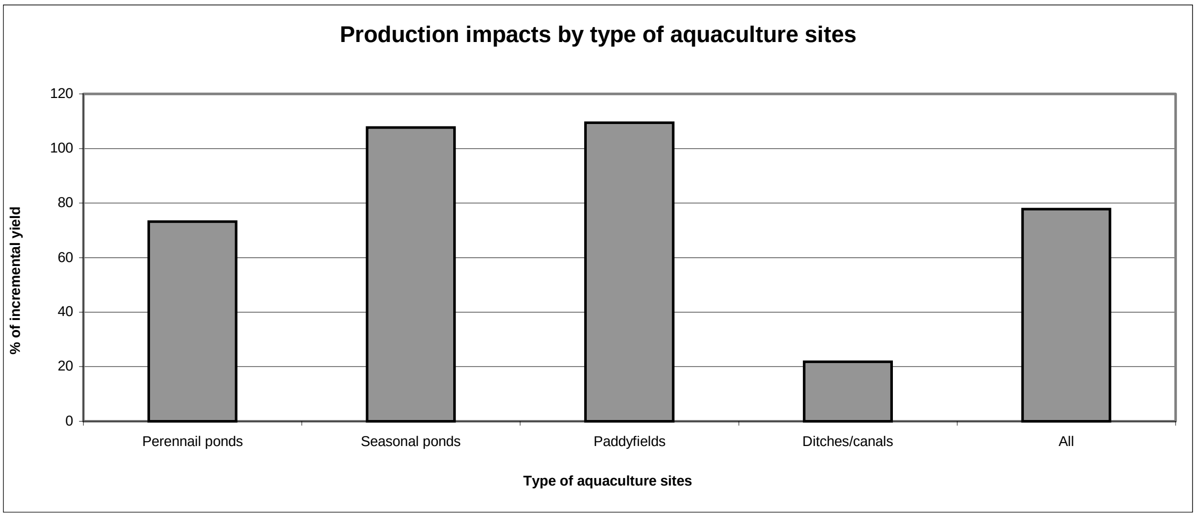

Figure 2: Production Impacts by Type of Aquaculture Site (All Divisions)

Classified by type of waterbody, the overall baseline production was 1.12 mt./ha. (4.5 kg/dec). The baseline production of perennial ponds (1.16 mt./ha.) was a little higher than that of seasonal ponds (0.93 mt./ha.). As expected, the baseline production of paddy fields was much lower, 0.54 mt./ha. This is due to the lower intensity of aquaculture systems on these types of site. Surprisingly, the noted baseline yield of canals was higher than all type of aquaculture sites (1.55 mt./ha.).

Table 3: Breakdown of Production by Type of Aquaculture Site (All Divisions)

Issues	Unit	Type of Site (1)					
		Perennial Pond	Seasonal Pond	Paddy Field	Ditch/ canal	Cage	All (2)
Total pond area	ha.	1991.63	303.20	8.62	0.09	0.003	2303.55
Pre-training:							
Baseline production	mt.	2301.78	283.28	4.66	0.14		2589.86
Baseline yield	mt./ha.	1.16	0.93	0.54	1.55		1.12
Post-training:							
Consumption	mt.	1107.68	194.93	3.13	0.06	0.005	1305.80
Sale	mt.	2885.75	390.64	6.62	0.11	0.01	3283.14
Total production	mt.	3993.44	585.57	9.75	0.17	0.02	4588.95
Post-training yield	mt./ha.	2.01	1.93	1.13	1.89	7.39	1.99
Incremental yield	mt./ha.	0.85	1.00	0.59	0.34		0.87
	%	73.28	107.66	109.46	21.74		77.87
Residual stock change	mt./ha.	0.61	0.67	0.04			0.62

Notes: (1) *Based on data from 735 villages (17 villages excluded due to data quality problems).*
(2) *Total production & area differ between Tables 2 & 3 due to different numbers of missing cases.*

The overall average post-training fish yield of the sample aquaculture sites was 1.99 mt./ha.. (8.1 kg/dec.). The output from perennial ponds was higher than that of seasonal ponds, 2.01 mt./ha. and 1.93 mt./ha. respectively. However, incremental yield from seasonal ponds was significantly better. Yield from ditches/canals was 1.89 mt./ha.; while yield from paddy field was very low (1.13 mt./ha.).

Unfortunately, as discussed in Annex 5, the study design does not permit separate analysis of farmers' levels of knowledge and practice by type of waterbody, so it is not possible to identify the causes of these results.

The production from cages was encouraging (7.4 mt./ha.). However. it must be noted that the result of this new technology comes from a very small area and only from one village in Bandar upazila under Narayanganj district.

Residual stock in the ponds was estimated at 0.61 mt./ha. in perennial ponds compared to 0.67 mt./ha. in seasonal ponds; while only 0.04 mt./ha. in paddy fields. The lower level for paddy fields accords with expectation, since most of these paddy fields will be dried up and fished right out at some stage. However, as noted in Annex 5, measurement problems dictate caution in accepting any estimates of residual stock.

2.2 Farmers' Assessment of Livelihood Impacts of FFP Interventions

This section highlights the views of the farmers about the impact of aquaculture activities of FFP on their livelihoods. Seven key indicators were discussed with them. Farmers evaluated for themselves whether the indicators showed positive or negative impacts. Figure 3 shows the results of farmers' self assessment of the project interventions. Farmers' assessments have also been analysed by individual Divisions, as presented in Annex 2.

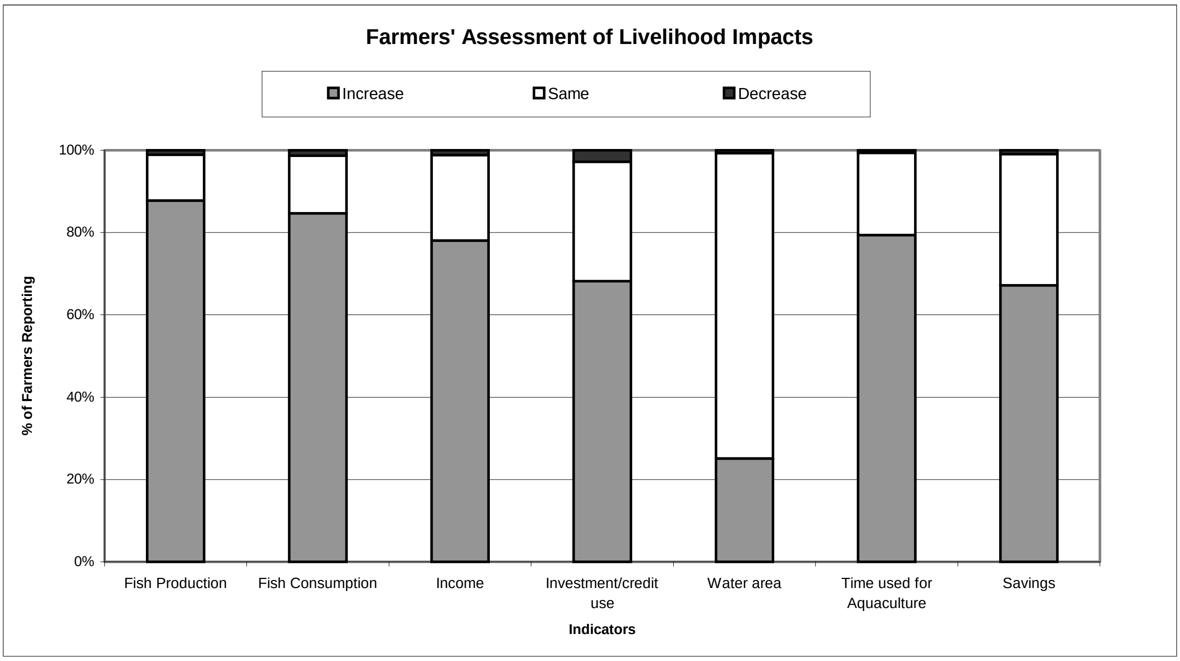

Figure 3: Farmers' Assessment of Livelihood Impacts (All Divisions)

It was found that at least 70% of farmers had improved their position for all indicators except water area. About 20% of farmers' positions (depending on the indicator used) remained the same, while only about 1% of farmers reported a negative result. Interestingly, PRA assessments of farmers both from Batch 1 and 2 were identical.

The highest number of responding farmers (88%) mentioned that their fish production had increased as an outcome of the project intervention. 78% of farmers considered that their income had also increased, and 67% of farmers increased their savings.

It is found that higher fish production has resulted in increased household fish consumption; more than 84% of farmers had improved fish supply for their family.

The only indicator, which did not show improvement for a majority of farmers was water area used for aquaculture; almost 75% of farmers reported that their water area was unchanged. This is not surprising in view of the constraints on pond area expansion. This needs money and also has to be done in the dry season. Usually villagers prefer to undertake any pond excavation or re-excavation during the winter when the water recedes and the harvest has been completed. From that viewpoint, at the time of the PRA trainees had so far only had one season to undertake such activities.

After receiving training, about 68% of farmers had invested more money in aquaculture activities either from their own resources or with borrowed money from banks/NGOs and local moneylenders.

It was also found that more than 79% of farmers reported that they had spent more time on aquaculture activities compared to the pre-training situation.

2.3 Trainees' Knowledge and Adoption of Improved Aquaculture Practices

The levels of trainees' knowledge and adoption across the whole sample are shown in Figure 4. Trainees' knowledge and adoption were also analysed by individual Divisions, as presented in Annex 3. A total of 13 key issues was defined by the proj ect to assess the trainees' knowledge and adoption. Knowledge and adoption level were assessed in four categories:

- Correctly known and fully applied
- Correctly known and partially applied
- Known but not applied
- Not known and not applied

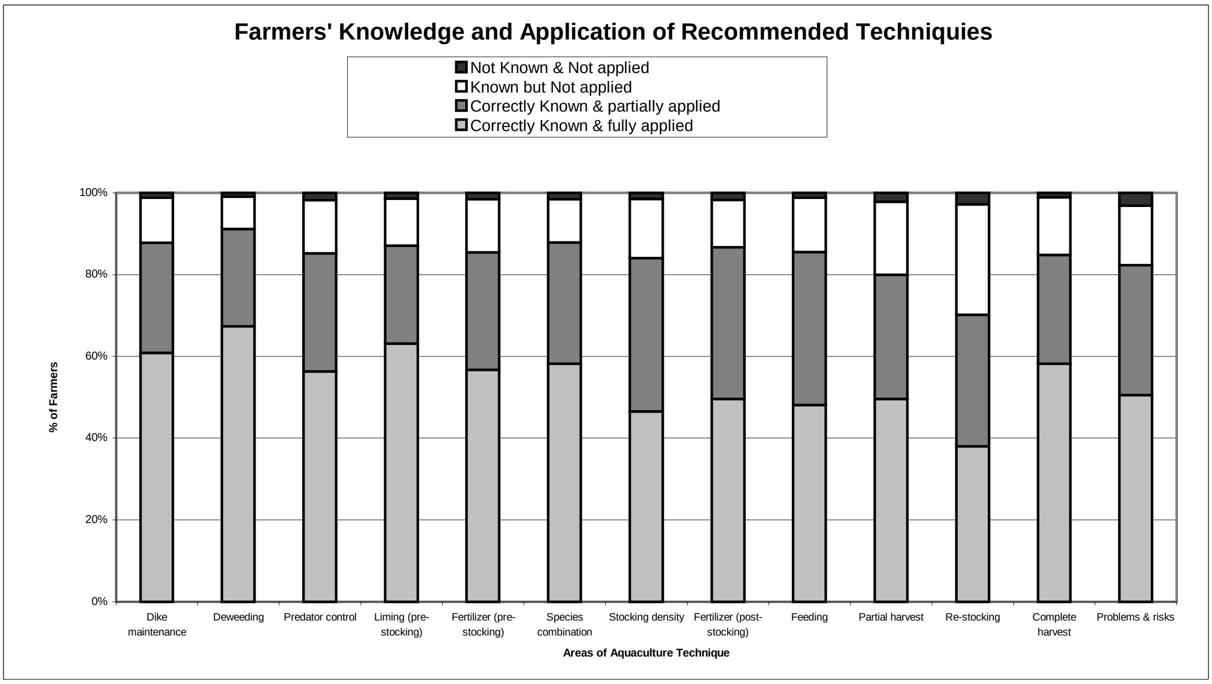

Figure 4: Farmers' Knowledge and Application of Recommended Techniques (All Divisions)

The project target of 40% of pond operators with good aquaculture knowledge, adopted fully in their aquaculture sites, has been achieved in Batch 2 trainees. Full knowledge and application was over 50% for most of the key areas of knowledge. Depending on the individual area of knowledge concerned, 24% to 38% had correct knowledge but had only partially applied it. 8% to 18% (again depending on the area of knowledge) had some knowledge but had not applied it at all in their ponds. The remaining farmers had no knowledge, nor did they apply any of the training messages.

About 60% of trainees had good knowledge and fully applied the messages on pre-stocking like dyke repair, de-weeding, predatory and weed fish control, liming before stocking, etc. Moreover, another one-fourth of respondents with good knowledge had partially applied these technical messages for fish culture.

In particular, farmers' acceptance of appropriate species combination and density of species is a vital achievement in technical improvement. Only 47% of farmers had fully followed the recommended species density and 58% of trainees followed the species combination. This indicates that a large number of the farmers had retained the traditional idea of high density of stocking for better profit.

On the other hand, about 12% of trained farmers had not understood fully about the importance of liming and fertilizing before stocking, dike maintenance and the problems and risks of aquaculture. This may limit their scope for utilizing their aquaculture resources.

Restocking depends on the availability of fingerlings when farmers want to stock after partial harvest. The rather low score on restocking in the category of 'correctly known and fully applied' (38%) and highest score in the category of 'known but not applied' (27%) indicates the inadequate availability of quality fingerlings of the right size. This also agrees with farmers' concerns about availability and quality of fingerlings (see Section 2.4).

Trainees' knowledge and adoption level of Batch 2 was almost similar that of Batch 1.

2.4 Problems and Constraints of Aquaculture Raised by Farmers.

The survey recorded the problems and constraints of aquaculture raised by farmers. The trained farmers participating in the PRA in each FV were asked to reach a consensus on their three most important problems. A total of 178 issues was stated, but with many duplications and overlaps. Those issues have been grouped and analysed under six headings: production economic; financial; gender-related; input-related; production management; and training.

The level of data problems in this part of the study was rather high, but the results are still considered to provide valuable insights into farmers' problems. The findings from 680 fisheries villages which produced usable data have been organised by Division, as presented in Table 4.

2.4.1 Production economic issues

Production economic issues were categorised in two areas. It is found that farmers were not concerned about the sustainability of the aquaculture practices, nor did they perceive them as risky. A small group of FVs noted that their profit had been affected by poor transportation system and marketing facilities; this concern was most felt in Khulna Division, where it was expressed by about 5% of FV.

2.4.2 Financial issues

Financial issues raised by the fisheries villages were summarised in three broad categories. It is not surprising that respondents mentioned credit or financial aid as one of the major constraints for aquaculture extension. Overall, about three-fourths of FVs listed credit as a problem. More than 80% of FVs of Chittagong and Dhaka Division noted credit as a major problem, followed by Barisal, Khulna and Rajshahi Division. In addition, another 7.9% of FVs asked for free or subsidised equipment; FVs from Khulna were more in favour of that. A small group of FVs of Rajshahi division (7.9%) raised the high input cost of aquaculture as a constraint.

A large percentage of farmers asked for support in meeting the cost of aquaculture operations, but the realism of their concerns is open to doubt. Batch 2 trainees were selected primarily on the criteria of pond access and interest in aquaculture, which perhaps mainly included wealthy farmers in this Batch. The PRA results do not permit detailed economic analysis, but the Batch 1 & 2 Sample Impact Survey[5] shows that more than 50% of trainees belongs to high landholdings (>150 dec), while only around 8% trainees were extreme poor or about 13% were moderate poor ('Land Owned' is sum of agricultural land and ponds, excluding homesteads). Similar results also found from the Batch 3 Baseline Sample Survey[6].

Figure 5 and 6 shows the land distribution of the trainees organised in Batches 1,2 and 3, which reflects the status of land ownership of 75% of trainees in the AET component of FFP. It is expected that Batch 4 will be more poverty focused as special attention had been given for inclusion of poor pond operators in the last Batch of Fisheries Villages.

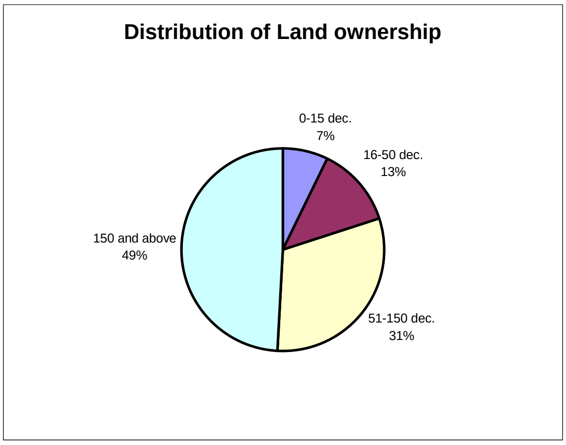

Figure 5. Batch 1 & 2 Contact Farmers

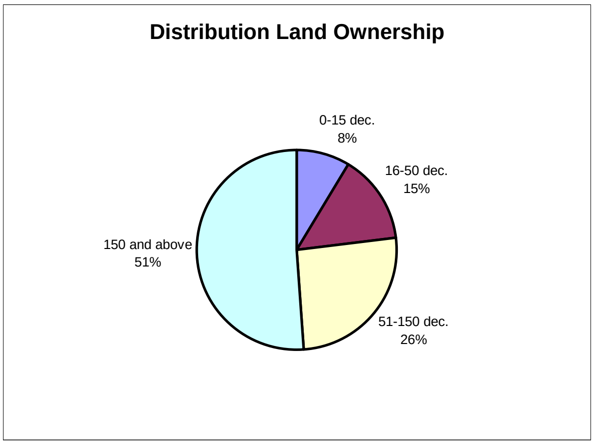

Figure 6. Batch 3 Contact Farmers

2.4.3 Gender-related

Gender-related issues were sorted into two main categories. The FVs of Batch 2 did not put forward women's issues in aquaculture as a major constraint. It is to be noted that more than 19% of the respondents in the sample FVs were female. This raises a doubt over how active was the participation or role of women in the fisheries village groups, either in mixed FVs (62% of the sample) or in the female FVs (3% of the sample). It may also indicate a degree of gender-insensitivity in the DoF staff who conducted the PRAs, in spite of their pervious training.

2.4.4 Input-related issues

Input-related issues were classified in three groups. Quality and availability of fingerlings was a problem to two-fifths of FVs and availability/quality of other inputs was also a constraint to about 20% of FVs. These concerns were not very serious in Sylhet and Rajshahi Division but were high in Barisal, Chittagong, Dhaka and also at Khulna Division.

None of the FVs said timely availability of fingerlings was a problem except two villages in Chittagong. Overall, issues regarding fingerlings were by far the biggest single area of concern (excluding finance) revealed by the entire study.

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5 AET Impact Study of Batch 1 & 2 (to be published in August 2004)

6 Sample Baseline Study of Trainee Farmers in Batch 3 Fisheries Villages of the Aquaculture Extension and Training Component (published in October 2003).

2.4.5 Production management issues

Production management issues raised by the FV were summarised in 12 categories.

Usually it has been considered that multiple ownership of ponds is an important barrier for aquaculture extension. The survey found that only about 7% of FVs were concerned about multiple ownership. Sylhet Division was the most concerned; more than 32% of FVs in Sylhet raised this issue. About 10% of FVs of Chittagong and Barisal division were also concerned about multiple ownership.

Table 4 **Issues and Problems Raised by Farmers**
(% of sample FV mentioning)

#	Areas of Concern		Divisions						
			Barisal	**Chittag.**	**Dhaka**	**Khulna**	**Rajshahi**	**Sylhet**	**All**
		Total FV	64	201	102	69	216	28	680
1	**Production Economic Issues**								
1.1	Sustainability & risk	% of FV	0	0.5	0	0	0	0	0.1
1.2	Transportation & marketing	% of FV	0	0	0	4.3	0	0	0.4
2	**Financial Issues**								
2.1	Requests for credit & financial aid	% of FV	79.7	80.6	80.4	72.5	63.9	53.6	73.2
2.2	Statements of high input cost	% of FV	0	0	0	0	402	0	1.3
2.3	Requests for free/subsidised equipment	% of FV	1.6	6.5	10.8	21.7	6.5	0	7.9
3	**Gender-Related Issues**								
3.1	Women's needs for assistance in harvesting & selling	% of FV	0	0	0	0	0	0	0
3.2	Low participation by women	% of FV	0	0	0	0	0	0	0
4	**Input-Related Issues**								
4.1	Timely availability of fingerlings	% of FV	0	1.0	0	0	0	0	0.3
4.2	Quality & size of fingerlings	% of FV	56.3	46.8	43.1	34.8	21.9	10.7	40.0
4.3	Availability/quality of other inputs	% of FV	18.8	18.9	25.5	20.3	18.1	14.3	19.6
5	**Production management Issues**								
5.1	Management complications of multiple ownership	% of FV	9.4	10.4	3.9	0	3.7	32.1	7.1
5.2	Disease	% of FV	7.8	28.4	6.9	11.6	29.2	17.9	21.3
5.3	Water quality	% of FV	0	1.5	2.0	0	11.1	0	4.3
5.4	Flooding & water-logging	% of FV	4.7	8.0	2.9	0	5.6	3.6	5.1
5.5	Predator control	% of FV	0	0.5	2.9	0	1.9	25.0	2.2
5.6	Low growth rate	% of FV	0	3.0	0	1.4	4.2	0	2.4
5.7	Feeding	% of FV	0	0	0	0	2.3	0	0.7
5.8	Stocking density	% of FV	0	3.5	0	1.4	0.9	107	1.9
5.9	Fertilization & liming	% of FV	0	1.0	0	1.4	2.8	0	1.3
5.10	Conflict of use	% of FV	3.1	18.9	3.9	10.1	15.3	35.7	13.8
5.11	Pond construction and conformation	% of FV	1.6	2.0	2.9	4.3	4.2	0	2.9
5.12	Other	% of FV	3.1	3.5	1.0	0	8.3	3.6	4.3
6	**Training Issues**								
6.1	Amount of training provided	% of FV	17.2	4.0	3.9	42.0	7.4	7.1	10.3
6.2	Timing & organisation of training	% of FV	6.3	0	5.9	2.9	2.3	0	2.5
6.3	Post-training support	% of FV	10.9	7.0	12.7	10.1	6.5	0	8.1
6.4	Training of other pond operators	% of FV	0	0	0	0	0.5	0	0.1
6.5	Specific areas of training required	% of FV	0	0.5	0	0	1.9	0	0.7
6.6	Generalised need for training	% of FV	0	0	0	0	0	0	0
6.7	Problems in applying training	% of FV	0	0	0	0	0	0	0
6.8	Training & demonstration facilities	% of FV	0	0	1.0	1.4	2.3	0	1.0

In production management fish disease was the most important concern for the members of FVs; overall, more than 21% of FVs raised this issue. These concerns were serious in Rajshahi and Chittagong Division compared to other divisions; it was about 7% at Dhaka.

Water quality was not in general a serious problem for the FVs; however, overall it was noted as a problem by about 5% of FVs. More that 11% of FVs in Rajshahi noted water quality as a problem.

More than 5% of FVs were concerned about flooding and water-logging, it was comparatively high at Rajshahi division.

Conflict of use (mainly poaching and poisoning) was one of the major concerns in production management; about 14% of FVs raised this issue as major barrier to carrying out fish farming. It was a serious issue in Sylhet division (about 36% of FVs raised this issue) followed by Chittagong (about 19%) and Rajshahi (more than 15%).

Overall, FVs of Barisal Division were less concerned about production management issues, even though they attained a very low incremental fish yield.

2.4.6 Training issues

Training related issues pointed out by the FVs were classified into 8 groups. More than 10% of FVs considered that the amount of training provided by the project was insufficient. The demand for more training was very high from Khulna; 42% of the FVs of this Division asked to know more about aquaculture and 17% of Barisal Division were of the same opinion.

Timing and organisation of training sessions were also a concern; about 3% of all sample FVs said that the project's training schedule did not address the local cropping season where most of the villagers have to be engaged, and the suitable season for farmers. Fisheries villages of Dhaka Division were perhaps more affected; more than 12% of FVs of this Division raised the issue follwed by Barisal and Khulna. Farmers also felt that the way training sessions had been organised was not effective.

Post-training support, which is mainly concerned with extension workers' pond site visits or services from Local Extension Agent for Fisheries (LEAF), was also a concern from FVs. More than 8% of FVs raised this issue, while about 13% of FVs of Dhaka were in consensus to increase hands-on extension support from the project.

Training on specific aquaculture issues was not a common concern; only about 2% of FVs of Rajshahi Division asked for such training. Similarly, the need for training and demonstration facilities was voiced only by a few FVs. However, demand for such initiatives was a little stronger in Rajshahi Division.

3. Summary and Conclusions

Based on the most complete subset of the available data, the outcomes target of 40 per cent of trainees with full knowledge and application of improved practices was comfortably passed. The impact target of 50 per cent incremental production was also considerably exceeded. However, it must be noted that the study took place after only the first year in which the trainees were implementing the recommended practices. Considering the good achievement at the outcomes level (knowledge and application), it can be expected that production achievements (impact) will be better in next production year. Nonetheless, performance in incremental fish yield of Batch 2 FVs (83.5%) was better compared to Batch 1 FVs (49.1%).

The quantitative impact estimates are strongly supported by the farmers' own qualitative livelihood impact assessments. On all indicators except water area used for aquaculture, a large majority of farmers assessed their position as improved, compared with before training. The relative lack of improvement in water area under aquaculture is probably in part due to the limited time so far available to the trainees for carrying out the necessary works. It must also be noted that, for water area to increase, aquaculture must be economically competitive with alternative uses for the land.

Economic viability is also critical for the sustainability of the improved practices. If the farmers find they are making a loss on their additional expenditure, or even an insufficiently high profit compared to other activities, the improved practices and production impacts will not be sustained. A large percentage of farmers asked for support in meeting the cost of aquaculture operations, but the realism of their concerns is open to doubt. The PRA results do not permit detailed economic analysis, but the Batch 3 Baseline Sample Survey and the Batch 1 & 2 Sample Impact Survey shows that only around 8% of trainees were extremely poor and about 13% were moderately poor, while more than 50% belong to the high landholding class (> 150 dec.).

The study did not set out to assess the achievement of AET Batch 2 against FFP's objectives for poverty targeting. With hindsight, this was a weakness that could have been avoided, since Upazila staff members have been trained in poverty evaluation as part of the process of targeting AET Batch 3. It is known that Batch 2 trainees were selected primarily on the criteria of pond access and interest in aquaculture, which makes it likely that they are relatively wealthy by the standards of their communities.

Next to finance, farmers' principal concern was fingerling supply. This appears to be a potentially serious constraint on application of some of the key practices for aquaculture. Fingerling supply is almost entirely a private sector activity where DoF's ability to influence outcomes is limited. However, the extent of the concerns expressed call for DoF to review the problem and develop solutions if possible.

FFP's targets for female participation were significantly under-achieved in Batch 2, but those women who did participate, achieved better results than their male counterparts. Women were also more inclined to use the production benefits to improve household nutrition, rather than converting them into cash. Overall, the findings on gender impact emphasise the large potential for involving women in aquaculture, and also the need to take active measures to ensure women's participation. It must be borne in mind that the relatively low participation by women in Batch 2 reflects the trainee selection process in 2001. FFP has subsequently taken a more pro-active stance on this issue.

By intention, the PRA Impact Study was carried out at the earliest possible period for measuring Batch 2 impacts, when the trained farmers had just completed their first production cycle using FFP's recommended practices. As in all extension activities, the repeated adoption rate - the percentage of farmers who continue to apply the recommendations in the second and subsequent years - is the true indicator of achievement. Measurement of repeated adoption will have to wait at least one further year. However, the study findings are highly encouraging for the eventual success of the whole AET component, but they will require confirmation during the remaining duration of FFP.

Annex 1: Quantified Production Impacts by Division

A1.1: Barisal Division

Table A1.1-1: Quantified Production Impacts by Sex of Operator

		Sex of Operator		
Issues	**Unit**	**Female**	**Male**	**All**
Total pond area	ha.	29.58	89.51	119.08
Pre-training:				
Baseline production	mt.	34.89	112.07	146.96
Baseline yield	mt./ha.	1.10	1.08	1.09
Post-training:				
Consumption	mt.	25.85	62.38	88.23
Sale	mt.	22.67	92.99	115.66
Total production	mt.	48.52	155.37	203.89
Post-training yeild	mt./ha.	1.44	1.48	1.46
Increment yield	mt./ha.	0.34	0.40	0.37
	%	31.21	36.57	34.21
Residual stock change	mt./ha.	0.55	0.52	0.53

Notes: Based on data from 72 villages
Total number, production, area differ between tables 3 and 4 due to different type of missing data

Table A1.1-2: Quantified Production Impacts by Type of Aquaculture Site

		Type of Site					
Issues	**Unit**	**Perennial Pond**	**Seasonal Pond**	**Paddy Field**	**Canal**	**Cage**	**All**
Total pond area	ha.	104.40	3.12	0.24			107.76
Pre-training:							
Baseline production	mt.	114.47	2.65	0.16			117.29
Baseline yield	mt./ha.	0.95	0.84	0.66			0.91
Post-training:							
Consumption	mt.	75.72	3.35	0.06			79.12
Sale	mt.	100.94	0.92	0.42			102.28
Total production	mt.	176.66	4.27	0.48			181.40
Post-training yeild	mt./ha.	1.38	1.29	1.96			1.36
Increment yield	mt./ha.	0.43	0.46	1.30			0.45
	%	45.79	54.91	196.88			49.28
Residual stock change	mt./ha.	0.53	0.55				0.53

Notes: Based on data from 66 villages (6 villages excluded due to data quality problem)
Total number, production, area differ between tables 3 and 4 due to different type of missing data

A1.2: Chittagong Division

Table A1.2-1: Quantified Production Impacts by Sex of Operator

		Sex of Operator		
Issues	**Unit**	**Female**	**Male**	**All**
Total pond area	ha.	71.49	691.52	763.02
Pre-training:				
Baseline production	mt.	76.23	753.42	829.64
Baseline yield	mt./ha.	1.06	1.05	1.05
Post-training:				
Consumption	mt.	42.03	314.43	356.45
Sale	mt.	94.46	999.23	1093.69
Total production	mt.	136.49	1313.66	1450.14
Post-training yeild	mt./ha.	1.85	1.84	1.84
Increment yield	mt./ha.	0.79	0.79	0.79
	%	74.71	74.78	74.76
Residual stock change	mt./ha.	0.44	0.37	0.39

Notes: Based on data from 209 villages(7 villages excluded due to data quality problem)
Total number, production, area differ between tables 5 and 6 due to different type of missing data

Table A1.2-2: Quantified Production Impacts by Type of Aquaculture Site

		Type of Site					
Issues	**Unit**	**Perennial Pond**	**Seasonal Pond**	**Paddy Field**	**Canal**	**Cage**	**All**
Total pond area	ha.	710.07	53.93	0.83			764.83
Pre-training:							
Baseline production	mt.	771.57	46.40	0.02			817.98
Baseline yield	mt./ha.	1.06	1.02	0.33			1.05
Post-training:							
Consumption	mt.	324.26	27.35	0.14			351.75
Sale	mt.	1005.61	62.58	0.75			1068.94
Total production	mt.	1329.87	89.93	0.89			1420.69
Post-training yeild	mt./ha.	1.76	1.60	0.94			1.71
Increment yield	mt./ha.	0.70	0.58	0.61			0.66
	%	65.98	57.12	184.07			63.30
Residual stock change	mt./ha.	0.40	0.36				0.39

Notes: Based on data from 212 villages(4 villages excluded due to data quality problem)
Total number, production, area differ between tables 5 and 6 due to different type of missing data

A1.3: Dhaka Division

Table A1.3-1 Quantified Production Impacts by Sex of Operator

		Sex of Operator		
Issues	**Unit**	**Female**	**Male**	**All**
Total pond area	ha.	47.11	260.92	308.04
Pre-training:				
Baseline production	mt.	44.89	258.66	303.55
Baseline yield	mt./ha.	0.99	1.01	1.00
Post-training:				
Consumption	mt.	26.33	114.19	140.52
Sale	mt.	46.44	351.39	397.83
Total production	mt.	72.77	465.59	538.36
Post-training yeild	mt./ha.	1.76	1.84	1.80
Increment yield	mt./ha.	0.77	0.82	0.80
	%	77.65	81.44	79.80
Residual stock change	mt./ha.	0.30	0.28	0.28

Notes: Based on data from 110 villages (2 villages excluded due to data quality problem)
Total number, production, area differ between tables 7 and 8 due to different type of missing data

Table A1.3-2: Quantified Production Impacts by Type of Aquaculture

		Type of Site					
Issues	**Unit**	**Perennial Pond**	**Seasonal Pond**	**Paddy Field**	**Canal**	**Cage**	**All**
Total pond area	ha.	213.83	94.29	1.35		0.003	309.47
Pre-training:							
Baseline production	mt.	231.22	71.54	0.39			303.15
Baseline yield	mt./ha.	1.08	0.81	0.46			0.95
Post-training:							
Consumption	mt.	101.92	35.20	0.23		0.005	137.35
Sale	mt.	261.37	102.35	0.41		0.01	364.15
Total production	mt.	363.29	137.55	0.64		0.02	501.50
Post-training yeild	mt./ha.	1.58	1.55	0.67		7.39	1.58
Increment yield	mt./ha.	0.50	0.74	0.21			0.63
	%	46.49	91.39	45.45			66.87
Residual stock change	mt./ha.	0.31	0.41				0.34

Notes: Based on data from 112 villages
Total number, production, area differ between tables 7 and 8 due to different type of missing data

A1.4: Khulna Division

Table A1.4-1: Quantified Production Impacts by Sex of Operator

		Sex of Operator		
Issues	**Unit**	**Female**	**Male**	**All**
Total pond area	ha.	43.04	276.47	319.51
Pre-training:				
Baseline production	mt.	49.70	317.23	366.93
Baseline yield	mt./ha.	1.22	1.18	1.20
Post-training:				
Consumption	mt.	37.53	173.24	210.77
Sale	mt.	54.69	448.69	503.39
Total production	mt.	92.22	621.94	714.16
Post-training yeild	mt./ha.	2.70	2.21	2.40
Increment yield	mt./ha.	1.48	1.02	1.21
	%	121.71	86.81	100.98
Residual stock change	mt./ha.	0.67	0.50	0.57

Notes: Based on data from 88 villages
Total number, production, area differ between tables 9 and 10 due to different type of missing data

Table A1.4-2: Quantified Production Impacts by Aquaculture sites

		Type of Site					
Issues	**Unit**	**Perennial Pond**	**Seasonal Pond**	**Paddy Field**	**Canal**	**Cage**	**All**
Total pond area	ha.	259.92	46.35	2.02			308.30
Pre-training:							
Baseline production	mt.	319.93	45.74	0.75			366.42
Baseline yield	mt./ha.	3.94	2.32	0.37			3.32
Post-training:							
Consumption	mt.	166.89	36.36	0.16			203.40
Sale	mt.	419.22	65.26	0.70			485.18
Total production	mt.	586.11	101.61	0.86			688.58
Post-training yeild	mt./ha.	8.38	2.39	0.42			6.12
Increment yield	mt./ha.	4.44	0.07	0.05			2.79
	%	112.71	3.15	14.67			83.97
Residual stock change	mt./ha.	1.83	2.11	0.02			1.87

Notes: Based on data from 87 villages(1 village excluded due to data quality problem)
Total number, production, area differ between tables 9 and 10 due to different type of missing data

A1.5: Rajshahi Division

Table A1.5-1: Quantified Production Impacts by Sex of Operator

		Sex of Operator		
Issues	**Unit**	**Female**	**Male**	**All**
Total pond area	ha.	88.54	661.55	750.10
Pre-training:				
Baseline production	mt.	99.38	824.21	923.59
Baseline yield	mt./ha.	1.11	1.16	1.14
Post-training:				
Consumption	mt.	79.09	417.45	496.54
Sale	mt.	113.27	1035.75	1149.03
Total production	mt.	192.36	1453.20	1645.56
Post-training yeild	mt./ha.	2.27	2.20	2.22
Increment yield	mt./ha.	1.16	1.04	1.09
	%	104.46	90.12	95.48
Residual stock change	mt./ha.	0.46	0.49	0.48

Notes: Based on data from 235 villages(1 village excluded due to data quality problem)
Total number, production, area differ between tables 11 and 12 due to different type of missing data

Table A.5-2: Quantified Production Impacts by Type of Aquaculture Site

		Type of Site					
Issues	**Unit**	**Perennial Pond**	**Seasonal Pond**	**Paddy Field**	**Canal**	**Cage**	**All**
Total pond area	ha.	635.83	94.23	2.93	0.09		733.08
Pre-training:							
Baseline production	mt.	806.59	106.61	3.34	0.14		916.68
Baseline yield	mt./ha.	1.19	1.22	1.25	1.55		1.20
Post-training:							
Consumption	mt.	405.59	86.77	2.44	0.06		494.86
Sale	mt.	985.52	142.47	4.07	0.11		1132.17
Total production	mt.	1391.11	229.24	6.51	0.17		1627.03
Post-training yeild	mt./ha.	2.23	2.81	1.94	1.89		2.44
Increment yield	mt./ha.	1.04	1.59	0.69	0.34		1.24
	%	87.49	130.31	55.20	21.74		103.54
Residual stock change	mt./ha.	0.50	0.44	0.05			0.48

Notes: Based on data from 231 villages (5 villages excluded due to data quality problem)
Total number, production, area differ between tables 11 and 12 due to different type of missing data

A1.6: Sylhet Division

Table A1.6-1: Quantified Production Impacts by Sex of Operator

		Sex of Operator		
Issues	**Unit**	**Female**	**Male**	**All**
Total pond area	ha.	10.23	70.82	81.05
Pre-training:				
Baseline production	mt.	8.88	60.10	68.98
Baseline yield	mt./ha.	0.95	0.97	0.96
Post-training:				
Consumption	mt.	5.65	34.79	40.43
Sale	mt.	13.82	116.92	130.74
Total production	mt.	19.47	151.71	171.18
Post-training yeild	mt./ha.	2.00	2.17	2.11
Increment yield	mt./ha.	1.06	1.20	1.14
	%	111.83	123.02	118.77
Residual stock change	mt./ha.	0.24	0.19	0.21

Notes: Based on data from 28 villages
Total number, production, area differ between tables 13 and 14 due to different type of missing data

Table A1.6-2. Quantified Production Impacts by Type of Aquaculture Site

		Type of Site					
Issues	**Unit**	**Perennial Pond**	**Seasonal Pond**	**Paddy Field**	**Canal**	**Cage**	**All**
Total pond area	ha.	67.59	11.28	1.24			80.11
Pre-training:							
Baseline production	mt.	58.00	10.34				68.34
Baseline yield	mt./ha.	1.03	0.97				1.01
Post-training:							
Consumption	mt.	33.31	5.92	0.10			39.32
Sale	mt.	113.09	17.06	0.28			130.42
Total production	mt.	146.40	22.98	0.37			169.75
Post-training yeild	mt./ha.	2.22	1.90	0.30			2.05
Increment yield	mt./ha.	1.18	0.93				1.04
	%	114.44	96.77				103.44
Residual stock change	mt./ha.	0.21	0.25				0.22

Notes: Based on data from 27 villages(1 village excluded due to data quality problem)
Total number, production, area differ between tables 13 and 14 due to different type of missing data

Annex 2: Farmers' Assessment of Livelihood Impacts of FFP Training, by Division

A2.1 All Divisions

	Impact On	Increased		Same as		Decreased		Total farmer's
		No.	%	No.	%	No.	%	No.
1	Fish production	15963	87.8	2018	11.1	193	1.1	18174
2	Fish consumption	15442	84.8	2545	14.0	229	1.3	18216
3	Income	13961	78.1	3695	20.7	209	1.2	17865
4	Investment	12172	68.2	5168	29.0	507	2.8	17847
5	Water area	4365	25.1	12924	74.2	128	0.7	17417
6	Time used for fish culture	14365	79.5	3608	20.0	107	0.6	18080
7	Savings	11677	67.2	5536	31.9	163	0.9	17376

Notes: Based on data from 749 villages(3 villages excluded due to data quality problem)
Total vary between indicators due to variable levels of missing data

A2.2 Barisal Division

	Impact On	Increased		Same as		Decreased		Total farmer's
		No.	%	No.	%	No.	%	No.
1	Fish production	1478	83.4	292	16.5	3	0.2	1773
2	Fish consumption	1413	79.9	353	20.0	2	0.1	1768
3	Income	1068	65.5	555	34.0	7	0.4	1630
4	Investment	1087	62.5	555	31.9	98	5.6	1740
5	Water area	520	30.6	1146	67.4	34	2.0	1700
6	Time used for aquaculture	1298	73.2	464	26.2	11	0.6	1773
7	Savings	995	59.3	671	40.0	11	0.7	1677

Notes: Based on data from 72 villages
Total vary between indicators due to variable levels of missing data

A2.3 Chittagong Division

	Impact On	Increased		Same as		Decreased		Total farmer's
		No.	%	No.	%	No.	%	No.
1	Fish production	4396	85.9	614	12.0	109	2.1	5119
2	Fish consumption	4182	81.6	821	16.0	124	2.4	5127
3	Income	4013	78.8	964	18.9	115	2.3	5092
4	Investment	3284	66.1	1511	30.4	171	3.4	4966
5	Water area	1137	23.1	3717	75.4	78	1.6	4932
6	Time used for fish culture	4050	80.2	927	18.4	73	1.4	5050
7	Savings	3143	64.1	1665	34.0	93	1.9	4901

Notes: Based on data from 214 villages(2 villages excluded due to data quality problem)
Total vary between indicators due to variable levels of missing data

Annex 2: Farmers' Assessment of Livelihood Impacts of FFP Training, by Division (cont'd.)

A2.4 Dhaka Division

Impact On		Increased		Same as		Decreased		Total farmer's
		No.	%	No.	%	No.	%	No.
1	Fish production	2362	85.8	369	13.4	23	0.8	2754
2	Fish consumption	2258	82.9	457	16.8	9	0.3	2724
3	Income	2049	74.7	687	25.1	6	0.2	2742
4	Investment	1674	63.8	859	32.8	89	3.4	2622
5	Water area	567	21.7	2042	78.3	0	0.0	2609
6	Time used for fish culture	2084	75.5	673	24.4	5	0.2	2762
7	Savings	1841	68.6	843	31.4	0	0.0	2684

Notes: Based on data from 111 villages(1 village excluded due to data quality problem)
Total vary between indicators due to variable levels of missing data

A2.5 Khulna Division

Impact On		Increased		Same as		Decreased		Total farmer's
		No.	%	No.	%	No.	%	No.
1	Fish production	1871	86.9	274	12.7	8	0.4	2153
2	Fish consumption	1850	83.3	320	14.4	51	2.3	2221
3	Income	1654	79.0	409	19.5	31	1.5	2094
4	Investment	1550	72.2	545	25.4	53	2.5	2148
5	Water area	598	29.1	1453	70.8	1	0.0	2052
6	Time used for fish culture	1659	77.9	463	21.7	7	0.3	2129
7	Savings	1232	62.0	743	37.4	13	0.7	1988

Notes: Based on data from 88 villages
Total vary between indicators due to variable levels of missing data

A2.6 Rajshahi Division

Impact On		Increased		Same as		Decreased		Total farmer's
		No.	%	No.	%	No.	%	No.
1	Fish production	5218	91.9	410	7.2	47	0.8	5675
2	Fish consumption	5108	90.0	528	9.3	40	0.7	5676
3	Income	4644	82.8	913	16.3	50	0.9	5607
4	Investment	4152	73.2	1425	25.1	94	1.7	5671
5	Water area	1432	26.4	3977	73.3	15	0.3	5424
6	Time used for fish culture	4693	82.8	964	17.0	9	0.2	5666
7	Savings	4014	74.0	1371	25.3	40	0.7	5425

Notes: Based on data from 236 villages
Total vary between indicators due to variable levels of missing data

Annex 2: Farmers' Assessment of Livelihood Impacts of FFP Training, by Division (cont'd.)

A2.7 Sylhet Division

Impact On		Increased		Same as		Decreased		Total farmer's
		No.	%	No.	%	No.	%	No.
1	Fish production	638	91.1	59	8.4	3	0.4	700
2	Fish consumption	631	90.1	66	9.4	3	0.4	700
3	Income	533	76.1	167	23.9	0	0.0	700
4	Investment	425	60.7	273	39.0	2	0.3	700
5	Water area	111	15.9	589	84.1	0	0.0	700
6	Time used for fish culture	581	83.0	117	16.7	2	0.3	700
7	Savings	452	64.5	243	34.7	6	0.9	701

Notes: Based on data from 28 villages
Total vary between indicators due to variable levels of missing data

Annex 3: Farmers' Knowledge and Adoption of Training Messages, by Division

A3.1 All Divisions

Recommended Practices on		Correctly Known & Fully Applied		Correctly Known & Partially Applied		Known But Not Applied		Not Known & Not applied		Total farmers(2)
		No.	%	No.	%	No.	%	No.	%	No.
1	Dyke repair	9049	60.8	4015	27.0	1634	11.0	173	1.2	14871
2	De-Weeding	11106	67.3	3931	23.8	1307	7.9	151	0.9	16495
3	Predatory and weed fish control	9477	56.3	4872	28.9	2187	13.0	299	1.8	16835
4	Liming before stocking of pond	11480	63.0	4368	24.0	2098	11.5	263	1.4	18209
5	Fertilizing before stocking	10310	56.6	5248	28.8	2344	12.9	300	1.6	18202
6	Type of species	10627	58.2	5412	29.7	1918	10.5	291	1.6	18248
7	Density of species	8488	46.6	6834	37.5	2635	14.5	266	1.5	18223
8	Fertilizing after stocking	9006	49.6	6755	37.2	2100	11.6	314	1.7	18175
9	Feeding after stocking	8751	48.1	6811	37.5	2411	13.3	213	1.2	18186
10	Partial harvest	8768	49.6	5362	30.4	3141	17.8	393	2.2	17664
11	Re Stocking	6443	38.0	5464	32.2	4577	27.0	470	2.8	16954
12	Total harvest	10046	58.2	4604	26.7	2425	14.1	182	1.1	17257
13	Problems and risks	7418	50.5	4669	31.8	2139	14.6	451	3.1	14677

Notes: Based on data from 751 villages(1 village excluded due to data quality problem)
Total vary between indicators due to variable levels of missing data

A3.2 Barisal Division

Recommended Practices on		Correctly Known & Fully Applied		Correctly Known & Partially Applied		Known But Not Applied		Not Known & Not Applied		Total farmers(2)
		No.	%	No.	%	No.	%	No.	%	No.
1	Dyke repair	985	59.8	435	26.4	210	12.7	18	1.1	1648
2	De-Weeding	1102	62.1	435	24.5	219	12.3	19	1.1	1775
3	Predatory and weed fish control	904	51.5	551	31.4	277	15.8	24	1.4	1756
4	Liming before stocking of pond	1150	64.9	414	23.4	193	10.9	16	0.9	1773
5	Fertilizing before stocking	960	54.1	528	29.8	266	15.0	19	1.1	1773
6	Type of species	921	52.0	528	29.8	292	16.5	31	1.7	1772
7	Density of species	784	44.0	633	35.6	340	19.1	23	1.3	1780
8	Fertilizing after stocking	795	45.1	658	37.3	287	16.3	23	1.3	1763
9	Feeding after stocking	806	46.5	640	36.9	273	15.7	16	0.9	1735
10	Partial harvest	711	40.1	689	38.8	334	18.8	41	2.3	1775
11	Re Stocking	520	29.6	648	36.9	545	31.0	45	2.6	1758
12	Total harvest	858	52.0	453	27.4	316	19.1	24	1.5	1651
13	Problems and risks	710	44.3	516	32.2	327	20.4	50	3.1	1603

Notes: Based on data from 72 villages
Total vary between indicators due to variable levels of missing data

Annex 3: Farmers' Knowledge and Adoption of Training Messages, by Division (cont'd.)

A3.3 Chittagong Division

	Recommended Practices on	Correctly Known & Fully Applied		Correctly Known & Partially Applied		Known But Not Applied		Not Known & Not Applied		Total farmers(2)
		No.	%	No.	%	No.	%	No.	%	No.
1	Dyke repair	2509	57.6	1301	29.9	463	10.6	81	1.9	4354
2	De-Weeding	2986	65.2	1185	25.9	356	7.8	55	1.2	4582
3	Predatory and weed fish control	2567	51.5	1662	33.4	621	12.5	131	2.6	4981
4	Liming before stocking of pond	3076	59.6	1370	26.5	624	12.1	95	1.8	5165
5	Fertilizing before stocking	2566	49.8	1704	33.1	767	14.9	111	2.2	5148
6	Type of species	2804	54.2	1643	31.8	603	11.7	123	2.4	5173
7	Density of species	2444	47.5	1894	36.8	699	13.6	112	2.2	5149
8	Fertilizing after stocking	2368	45.8	2041	39.5	625	12.1	133	2.6	5167
9	Feeding after stocking	2445	47.3	1951	37.7	695	13.4	79	1.5	5170
10	Partial harvest	2344	45.9	1644	32.2	963	18.9	153	3.0	5104
11	Re Stocking	1753	35.7	1635	33.3	1369	27.9	158	3.2	4915
12	Total harvest	2881	57.6	1514	30.3	515	10.3	94	1.9	5004
13	Problems and risks	1971	45.8	1592	37.0	553	12.8	191	4.4	4307

Notes: Based on data from 216 villages
Total vary between indicators due to variable levels of missing data

A3.4 Dhaka Division

	Recommended Practices on	Correctly Known & Fully Applied		Correctly Known & Partially Applied		Known But Not Applied		Not Known & Not Applied		Total farmers(2)
		No.	%	No.	%	No.	%	No.	%	No.
1	Dyke repair	1468	60.3	577	23.7	387	15.9	2	0.1	2434
2	De-Weeding	1801	66.7	627	23.2	264	9.8	9	0.3	2701
3	Predatory and weed fish control	1405	53.0	768	29.0	460	17.4	17	0.6	2650
4	Liming before stocking of pond	1724	62.4	626	22.6	393	14.2	21	0.8	2764
5	Fertilizing before stocking	1532	55.7	754	27.4	431	15.7	35	1.3	2752
6	Type of species	1517	54.5	928	33.4	318	11.4	19	0.7	2782
7	Density of species	1129	40.2	1148	40.9	512	18.3	16	0.6	2805
8	Fertilizing after stocking	1280	46.5	1022	37.2	417	15.2	32	1.2	2751
9	Feeding after stocking	1332	47.9	1047	37.7	382	13.8	17	0.6	2778
10	Partial harvest	1103	42.0	796	30.3	700	26.7	25	1.0	2624
11	Re Stocking	877	34.2	812	31.6	851	33.2	27	1.1	2567
12	Total harvest	1570	58.5	768	28.6	339	12.6	7	0.3	2684
13	Problems and risks	1133	50.6	618	27.6	469	21.0	18	0.8	2238

Notes: Based on data from 111 villages (1 village excluded due to data quality problem)
Total vary between indicators due to variable levels of missing data

Annex 3: Farmers' Knowledge and Adoption of Training Messages, by Division (cont'd.)

A3.5 Khulna Division

Recommended Practices on		Correctly Known & Fully Applied		Correctly Known & Partially Applied		Known But Not Applied		Not Known & Not Applied		Total farmers(2)
		No.	%	No.	%	No.	%	No.	%	No.
1	Dyke repair	1274	67.6	423	22.4	176	9.3	12	0.6	1885
2	De-Weeding	1431	71.7	408	20.4	147	7.4	11	0.6	1997
3	Predatory and weed fish control	1222	63.6	414	21.5	265	13.8	21	1.1	1922
4	Liming before stocking of pond	1216	56.6	496	23.1	370	17.2	65	3.0	2147
5	Fertilizing before stocking	1230	57.7	504	23.7	341	16.0	56	2.6	2131
6	Type of species	1284	59.9	558	26.0	274	12.8	29	1.4	2145
7	Density of species	1013	47.2	706	32.9	403	18.8	25	1.2	2147
8	Fertilizing after stocking	1010	47.4	751	35.2	314	14.7	56	2.6	2131
9	Feeding after stocking	1055	49.1	720	33.5	352	16.4	22	1.0	2149
10	Partial harvest	1242	59.0	457	21.7	355	16.9	51	2.4	2105
11	Re Stocking	796	38.2	537	25.8	678	32.5	72	3.5	2083
12	Total harvest	1165	58.8	396	20.0	400	20.2	20	1.0	1981
13	Problems and risks	883	51.9	453	26.6	281	16.5	83	4.9	1700

Notes: Based on data from 88 villages
Total vary between indicators due to variable levels of missing data

A3.6 Rajshahi Division

Recommended Practices on		Correctly Known & Fully Applied		Correctly Known & Partially Applied		Known But Not Applied		Not Known & Not Applied		Total farmers(2)
		No.	%	No.	%	No.	%	No.	%	No.
1	Dyke repair	2430	60.5	1157	28.8	378	9.4	52	1.3	4017
2	De-Weeding	3297	68.5	1178	24.5	293	6.1	45	0.9	4813
3	Predatory and weed fish control	2934	59.3	1378	27.9	536	10.8	96	1.9	4944
4	Liming before stocking of pond	3784	66.9	1361	24.0	453	8.0	62	1.1	5660
5	Fertilizing before stocking	3524	62.1	1617	28.5	459	8.1	73	1.3	5673
6	Type of species	3640	64.1	1589	28.0	363	6.4	84	1.5	5676
7	Density of species	2679	47.5	2268	40.2	612	10.8	83	1.5	5642
8	Fertilizing after stocking	3091	54.6	2123	37.5	383	6.8	67	1.2	5664
9	Feeding after stocking	2642	46.7	2272	40.2	662	11.7	78	1.4	5654
10	Partial harvest	2990	55.5	1590	29.5	696	12.9	107	2.0	5383
11	Re Stocking	2182	43.8	1606	32.2	1044	21.0	151	3.0	4983
12	Total harvest	3019	57.6	1377	26.3	804	15.4	37	0.7	5237
13	Problems and risks	2380	56.2	1327	31.3	443	10.5	86	2.0	4236

Notes: Based on data from 236 villages
Total vary between indicators due to variable levels of missing data

A3.7 Sylhet Division

Recommended Practices on		Correctly Known & Fully Applied		Correctly Known & Partially Applied		Known But Not Applied		Not Known & Not Applied		Total farmers(2)
		No.	%	No.	%	No.	%	No.	%	No.
1	Dyke repair	383	71.9	122	22.9	20	3.8	8	1.5	533
2	De-Weeding	489	78.0	98	15.6	28	4.5	12	1.9	627
3	Predatory and weed fish control	445	76.5	99	17.0	28	4.8	10	1.7	582
4	Liming before stocking of pond	530	75.7	101	14.4	65	9.3	4	0.6	700
5	Fertilizing before stocking	498	68.7	141	19.4	80	11.0	6	0.8	725
6	Type of species	461	65.9	166	23.7	68	9.7	5	0.7	700
7	Density of species	439	62.7	185	26.4	69	9.9	7	1.0	700
8	Fertilizing after stocking	462	66.1	160	22.9	74	10.6	3	0.4	699
9	Feeding after stocking	471	67.3	181	25.9	47	6.7	1	0.1	700
10	Partial harvest	378	56.2	186	27.6	93	13.8	16	2.4	673
11	Re Stocking	315	48.6	226	34.9	90	13.9	17	2.6	648
12	Total harvest	553	79.0	96	13.7	51	7.3			700
13	Problems and risks	341	57.5	163	27.5	66	11.1	23	3.9	593

Notes: Based on data from 28 villages
Total vary between indicators due to variable levels of missing data

Annex 4: Data Recording Format

AET/ME 004e

Department of Fisheries, Bangladesh
Summary of Training Impact Assessment
(Upazila fisheries office will send this format directly to respective District, Division and PMU office)

FV name		***Date of assessment***	
FV ID		Nos. of farmers attended assessment: Female	
Union		Nos. of farmers attended assessment: Male	
Upazila		Nos. of Female trainees	
District		Nos. of male trainees	
Division		Total farmers trained	

Adoption of technologies/ Subject	Understand and fully apply technology	Understand but only partially apply technology	Understand but NOT apply technology	Not understand and NOT apply technology
1. Dyke repair				
2. De-weeding				
3. Removal of unwanted fish				
4. Pre-stocking liming				
5. Pre-stocking fertilisation				
6. Species composition				
7. Stocking density				
8. Post stocking fertilisation				
9. Post stocking feeding				
10. Partial harvesting				
11. Re-stocking (perennial ponds)				
12. Final harvesting				
13. Problems and hazards				

Indicator of success	**Nos. of farmers**		
	Increase	**Same**	**less**
1. Production of fish			
1. Consumption of fish			
2. Income from fish culture			
3. Investment in fish culture			
4. Seek to increase water area for fish production			
5. Time spent in fish culture (self and family)			
6. Increased savings			

Pond / type of water body	**Area (dec.)**	***Baseline production (kg.) a***	**Production after training (kg.)**				**Increase in product-ion (kg)** *e-a*
			Consumed *b*	**Sold** *c*	**Standing crop** *d*	*Total e=b+c+d*	
Female pond							
Male pond							
Total							
Perennial pond							
Seasonal pond							
Rice fish							
Ditch / canal							
Cage							
Pen							
Total							

Key issues (on priority)	*Code**	**Recommended Action**	**Code***
1.			
2.			
3.			

** Code number will be given at PMU office*

Name of SUFO or UFO:

Name..

Signature..

Report prepared by:

Name...

Signature..

Annex 5: Methodology and Data Analysis Issues

1. Analytical Limitations

1.1 Limitations of PRA Data Collection Technique

The data for the present study were collected using semi-structured group interviews, with the results recorded on the format given in Annex 4. The interview groups consisted of all the available Batch 2 trainees for each Fishery Village where the PRA was carried out. In addition to the trainees, in some FVs large numbers of non-trainees were present. This was because the DoF staff of those Upazilas decided to use the PRA as a consciousness-raising exercise for non-trainees.

While the desire to capitalise on the PRA exercise is understandable, it may have had the effect of inclining both the DoF staff and the trainees to display FFP in a favourable light. In some cases it also led to the aquaculture knowledge, practices and views of non-trainees being recorded along with those of trainees. Again there is nothing inherently wrong in this, but where it is not possible to distinguish the trainees from the non-trainees, the data for the whole village have had to be excluded, because it is not possible to relate the PRA results to the project's interventions.

A potentially more serious problem is the study's reliance on semi-structured group interview for obtaining information. Realistically, no other approach could have obtained so much usable information in the time available. Nevertheless, unless very carefully used, the method is liable to produce results, which are more extreme than the true situation of the participating group. This is because group members may be disinclined to express views or experiences, which challenge the group consensus. If this happens, it results in an upward bias when the group consensus is positive (as in almost all villages in the present study) and a downward bias when the consensus is negative. Highly skilled PRA facilitators can prevent this by encouraging the expression of minority views, but the DoF staff who facilitated the PRAs for the present study were newly trained and probably did not have the required levels of skill and understanding. The consequence is that the results presented in this report should be considered to be the upper limit of the likely range of impacts for Batch 2.

1.2 Limitations Imposed by Level of Detail in the Data

The present study focuses on the upper two levels of the AET component logical framework: the component impacts (measured in terms of production and income); and the component outcomes (improved knowledge and application of recommended practices) which are necessary to produce those impacts.

In an ideal evaluation design, if any query arises from analysis of the impacts, it should be possible to trace the chain of causation back from the observed impacts to the outcomes, and from the outcomes back to the project outputs (e.g. training delivered). In the present study there are (at least) two issues which could have benefited from probing in this way. One is the observed superiority of female over male trainees. It would be useful for design of future projects to know whether the female trainees were better at learning the recommended practices, or applying them, or both. A second issue is the poor performance of the recommended practices for canal/ditches. It is very desirable to know whether this was because the trainees failed to understand the recommended practices, or because they did not apply them as recommended. In the first case improved training methods could solve the problem. In the second case the recommendations may not be compatible with the farming system canal/ditches, and the package may have to be re-thought.

However, to analyse the chain of causation in this way requires comprehensive and time consuming data collection and analysis. For the present study, the decision was deliberately taken to keep the level of detail to a minimum, with a simple data recording format. This decision reflected the fact that the DoF staff were newly trained in using PRA, and also that the time that they could allocate to the PRA exercise was limited.

Therefore, although it is possible to measure the difference in production impact between male and female trainees, it is not possible to separate out the levels of knowledge and application between male and female trainees. The same is true for differences between the various categories of aquaculture sites. To probe for the detailed reasons for varying patterns of impact requires a detailed survey, similar to the Sample Impact Survey of AET Batch 1&2 carried out in 2002 carried out by the DoF Upazila staff outside FFP command area; similar impact study of Batch 3 scheduled for June-July 2004.

2. Treatment of Remaining Fish Stock

There are important issues regarding the analytical treatment of stocked fish remaining in the pond at the end of the production cycle. In the recording format used for the present study, post-training production is subdivided into three categories: sales; consumption; and uncaught remaining balance. In some villages the last category appears to be a large fraction of the total production. Its relevance and reliability is therefore critical for the interpretation placed on apparent production benefits.

There are two issues: the conceptual validity of treating remaining stock as a benefit; and the accuracy with which the stock is measured.

2.1 The Conceptual Issue

Consider the annual balance-sheet for the amount of fish in a pond:

	<u>Opening Balance</u> (remaining from last year)
PLUS:	Fingerlings stocked
PLUS:	Growth (of Fingerlings and Opening Balance)
MINUS:	Mortality, Predation and Theft
MINUS:	Fish Harvested
EQUALS:	<u>Closing Balance</u> (at end of year)

Where the Opening Balance was from an unproductive system and the Closing Balance was from an improved system (e.g. after FFP training), it is expected there will be a gain over the year. However, once the improvements have been incorporated in the pond management system, Opening Balance and Closing Balance will be approximately equal (assuming the pond is being managed in a consistent manner from year to year). Therefore, Closing Balance does not represent an annual net benefit.

The gain in closing balance when the improvements are introduced is a genuine benefit, and should be included in the cost-benefit evaluation of the project, but it is a once-only gain, and cannot be counted as an annual benefit. Even if we abandon the simplifying assumption of constant management year-on-year, the benefit (or loss) represented by the Closing Balance is only the difference compared to the Opening Balance, not the whole Closing Balance. Therefore, in analysing the long-term benefit to AET, the remaining (Closing) balance should be presented separately from the recurring annual benefit.

2.2 Measurement problems

From discussions with the FFP AET component, the following appears:

a) there is an established methodology for estimating remaining balance, using sample fishing with seine nets. The Upazilla staff have been trained in use of these methods;

b) there are reasons to doubt that the Impact Study figures for balance remaining were derived using the approved methodology. Specifically:

- the procedure is laborious and Upazila staff are sometimes reluctant to devote the time and effort;
- the seine net used for the approved approach is expensive and many Upazilas do not have one. Substituting a cast net, as sometimes done, is not satisfactory because this net does not catch all species with equal efficiency;
- the remaining balance has to be calculated separately for the different species, because susceptibility to being caught varies between species. This is probably not generally done when the methodology is applied at Upazila level;
- an allowance should be (but often is not) made for mortality in the stocked fish.

For the reasons given under (b), the ‘remaining balance’ element of production must be treated with the greatest caution.