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**RESEARCH FOR DEVELOPMENT OF
SUSTAINABLE AQUACULTURE TECHNOLOGIES**

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**INTERNATIONAL CENTER FOR LIVING AQUATIC
RESOURCES MANGEMENT (ICLARM)**

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RESEARCH FOR DEVELOPMENT OF SUSTAINABLE AQUACULTURE TECHNOLOGIES (1 January - 30 September 1997)

1 INTRODUCTION

The on-going programs registered a good progress. A proposal for extension of the project up to December 1999 with an additional fund of US\$ 1.4 million was finalized and submitted to USAID, Washington, for approval.

The workplan for 1997-98 (Annex-I) was sent to the Bangladesh Fisheries Research Institute (BFRI) on 31 May 1997. An on-station research program (Annex-II) on development of low-input technology for seasonal ponds for resource-poor farmers was initiated at BFRI, Mymensingh, on 3 July 1997 in eight ponds (pond 42 being not available, only two ponds have been kept as control).

The largest NGO in Bangladesh, BRAC, has finally agreed to collaborate with the project once again and work in 14 thanas in 12 districts involving 700 beneficiaries directly. A training workshop for 28 BRAC officials was conducted in ICLARM office on 23 August 1997.

The Director-General, BFRI, has transferred the administrative control of the Scientific Officers and Research Assistants to the Senior Aquaculture Specialist with effect from July 1997.

2 OBJECTIVES

The project has the following objectives :

- i) To develop low-cost, low external-input, integrated agriculture-aquaculture farming systems;
- ii) To foster the adoption of these technologies by the rural poor for increased production and consumption of fish to reduce malnutrition, generate income and create employment; and
- iii) To increase fish availability in urban areas.

3 ACHIEVEMENTS

3.1 Eco-region specific centres

3.1.1 High-rainfall, flood-free, medium highland centre at Mymensingh

Despite the delay in pond preparation and stocking as also the hesitation in the farmers' minds about the low-cost, weed-based system, the results have more than convinced the farmers about the high profitability and the ease with which the technology could be adopted.

Water-logged rice-fields

The production from three water-logged rice fields has ranged from 1,890-2,450 kg/ha (average 2,099 kg/ha) in 108-137 days (average 122 days) of rearing. With an investment of Tk. 10,464 - Tk. 13,230/ha (average, Tk. 12,258.00/ha), the farmer earned a net profit of Tk. 60,070 - Tk. 92,946/ha (average, Tk. 76,579.00/ha), which is over six times the investment (Table 1).

Table 1. Production and economics of weed-based aquaculture system in the water-logged rice fields.

Name of the farmer	Water area (ha)	Culture period (days)	Total production (kg)	Production (kg/ha)	Total cost of production (Tk)	Cost of production (Tk/ha)	Gross profit (Tk)	Net profit (Tk)	Net profit (Tk/ha)
Mr. Ibrahim	0.28	121	548	1,957	2,930	10,464	28,955	26,025	92,946
Mr. Rafiqul Islam	0.10	137	245	2,450	1,308	13,080	8,980	7,672	76,720
Ms. Khuki Rani	0.10	108	189	1,890	1,323	13,230	7,330	6,007	60,070

Ponds

Experiments with the weed-based aquaculture system in *ponds* gave a production of 2,985 kg/ha with a net profit of Tk. 82,559/ha in 221 days' rearing (Table 2). When compared with the feed fertilizer based system, this shows a reduction of 59% in cost of production and an increase of 125% in net return on operational costs.

Table 2. Production and economics of low-input, weed-based, carp polyculture system in ponds.

Names of farmers	Water area (ha)	Culture period (days)	Stocking density/ha	Production (kg/ha)	Cost of production (Tk/ha)	Gross profit (Tk/ha)	Net profit (Tk/ha)
Md. Azad	0.20	190	11,850	3,025	18,530	1,02850	84,320
Ahmed Ali	0.10	195	11,000	2,950	18,520	97,350	78,830
Lokman Hossain	0.24	205	11,042	3,350	21,354	1,17,250	95,896
Md. Malke	0.12	248	11,292	2,933	19,958	96,800	76,842
Abu Bakar Siddique	0.10	214	12,850	3,340	23,730	1,23,580	99,850
Md. Giasuddin	0.06	235	12,750	3,667	23,833	1,24,666	1,00,833
Md. Suruz Ali	0.10	220	12,050	3,140	22,600	1,09,900	87,300
Md. Siddiquil Alam	0.064	218	12,500	3,234	23,719	1,16,438	92,719
Anamul Haque	0.06	235	12,750	2,950	19,333	98,000	78,667
Farid Miah	0.12	230	12,000	1,725	12,075	62,792	50,717
Dulal Miah	0.10	237	11,000	2,520	16,880	79,050	62,170
Average	0.11	221	11,917	2,985	20,048	1,02,607	82,559

During 1997-98, it is proposed to examine the potentialities of the system on a large-scale. As such, 10 water-logged fields (Table 3) and 22 ponds (Table 4) were selected in the Trishal thana, farmers trained and assisted in procuring fingerlings of the desired species and sizes. Stocking has been done at 7,000 fingerlings/ha in rice fields and at 10,000 fingerlings/ha in ponds in the proportion of grass carp 30 : catla 10 : rohu 10 : mrigal 10 : silver carp 20 : common carp 10 : rajputi 10.

Table 3. Names of farmers selected for adoption of low-cost, weed-based, aquaculture system in water-logged rice-fields in the high rain-fall, flood-free, eco-region at Mymensingh.

Sl. No.	Name of the farmer	Village/Thana	Water area (ha)
1	Md. Abu Zulhas	Boilor, Trishal	0.280
2	Md. Moslem Uddin	Boilor, Trishal	0.120
3	Md. Zahirul Islam	Boilor, Trishal	0.140
4	Md. Yunus Ali	Boilor, Trishal	0.080
5	Md. Abdul Gani Miah	Boilor, Trishal	0.088
6	Md. Asad Miah	Kazir Shimla, Trishal	0.140
7	Md. Abdul Kader	Boilor, Trishal	0.120
8	Md. Abdur Razzak	Boilor, Trishal	0.140
9	Hafez Md. Abdul Shabur	Khanharhon, Trishal	0.120
10	Md. Abdul Hakim	Boilor, Trishal	0.108

Table 4. Names of farmers selected for adoption of low-cost, weed-based aquaculture system in ponds in the high rain-fall, flood-free, eco-region at Mymensingh.

Sl. No.	Name of the farmer	Village/Thana	Water area (ha)
1	Md. Rostam Ali	Kazir Shimla, Trishal	0.720
2	Md. Siddique Rahman	Boilor, Trishal	0.108
3	Md. Sujan Miah	Kazir Shimla, Trishal	0.112
4	Md. Ibrahim Khalil	Boilor, Trishal	0.100
5	Md. Helal Uddin	Boilor, Trishal	0.068
6	Md. Sharifqul Islam	Boilor, Trishal	0.080
7	Md. Mokhlesur Rahman	Munshipara, Trishal	0.072
8	Md. Ruhul Amin	Boilor, Trishal	0.088
9	Md. Abdul Malek	Kanharan, Mymensingh Sadar	0.100
10	Md. Abul Kalam Azad	Boilor, Trishal	0.140
11	Md. Abul Hossain	Boilor, Trishal	0.048
12	Ms. Jahanara Begum	Charpara, Mymensingh Sadar	0.088
13	Md. Ruhul Amin	Boilor, Trishal	0.080
14	Md. Rahimuddin Shekh	Boilor, Trishal	0.088
15	Ms. Jaida Khatun	Charpara, Mymensingh Sadar	0.080
16	Md. Abdul Matin Bepari	Boilor, Trishal	0.088
17	Md. Hasmal Ali	Boilor, Trishal	0.080
18	Md. Faizuddin	Charpara, Mymensingh Sadar	0.064
19	Md. Kamal Hossain	Charpara, Mymensingh Sadar	0.080
20	Ms. Jarna Khatun	Charpara, Mymensingh Sadar	0.060
21	Md. Maznu Miah	Charpara, Mymensingh Sadar	0.160
22	Md. Iddris Ali	Charpara, Mymensingh Sadar	0.160

3.1.2 Low-saline, coastal land centre at Khulna

The technology at this centre is being generated and tested in collaboration with Proshika. Data from freshwater and saline water 'ghers' and ponds have been analysed and presented below :

Freshwater 'ghers'

Stocked at 20,000 fingerlings/ha, the freshwater 'ghers' gave a production of 2,421 kg/ha in 11 months' rearing when a 6-species combination was used in the proportion of *Macrobrachium rosenbergii* 75 : catla 8 : silver carp 8 : rohu 5 : mrigal 2 : rajputi 2. While *M. rosenbergii* contributed 34% to the total production, its contribution to gross profit was 71%. A net profit of Tk. 1,22,887/ha was realised (Table 5).

Saline-water 'ghers'

The saline water 'ghers' which were stocked at 14,000 fingerlings/ha in the proportion of prawns 77 : catla 6 : silver carp 8 : rohu 6 : mrigal 2 : mullet 1 (*Rhinomugil corsula*) with *M. rosenbergii* as the main component gave a production of 1,475 kg/ha in 236 days' rearing (Table 6). Over three fold increase in production has been registered with a net profit of Tk. 77,128/ha.

Ponds

Three ponds, stocked at 10,500 fingerlings/ha with a 6-species combination (prawns 47 : catla 12 : silver carp 24 : rohu 7 : rajputi 7 : grass carp 3), gave a production of 2,300 to 2,533 kg/ha (average, 2,444 kg/ha) in 238 days' rearing at this centre with net profits ranging from Tk. 123,571.00 to 142,571.00 (average, Tk. 130,216.00), being more than obtained from both fresh and saline-water 'ghers' (Table 7). The return on operational costs was 517% in case of pond aquaculture followed by 140% and 107% in respect of freshwater and saline gheres respectively (Table 8). Efforts to further increase the pond and gheres' production will be made in the 1997-98 season.

Table 5. Production and economics of prawn-based aquaculture system in freshwater *ghers* at Fultola (Khulna).

Group/ farmer's name	Gher area (ha)	Culture period (months)	Stocking density/ha		Cost of inputs (Tk)				Total cost (Tk)	Cost (Tk/ha)	Production (kg/pond)		Total fish produc- tion (kg/ pond)	Produc- tion (kg/ha)	Gross income (Tk)	Net profit (Tk)	Net profit (Tk/ha)
			Golda	Carp	Finger- lings	Lime	Feed and ferti- zers	Harvesting			Golda	Carp					
Surzo Mukhi Society	0.40	11	15,000	5,000	21,250	500	10,000	3,000	34,750	86,875	280	606	886	2,215	80,898	-46,148	1,15,370
Abdur Rashid Society	0.32	11	15,000	5,000	17,350	480	7,650	2,400	27,880	87,125	260	436	686	2,144	69,932	-42,052	1,31,412
Surzo Mukhi Mahila Society	0.36	11	15,000	5,000	18,850	500	10,000	3,000	32,350	89,861	270	571	841	2,336	76,226	-43,876	1,21,878
Average	0.36	11	15,000	5,000	19,150	493	9,217	2,800	31,660	87,954	270	534	804	2,232	75,085	-43,025	1,22,887

Table 6. Production and economics of prawn-based aquaculture system in saline water *ghers* at Fultola (Khulna).

Farmer's name	Area of gher (ha)	Culture period (days)			Stocking density /ha			Total operational cost (Tk)	Total cost (Tk/ha)	Production before approach (kg/ha)	Production with suggested approach (kg)			Production/gher (kg)	Production (kg/ha)	Production increase (times)	Gross income (Tk)	Net income (Tk)	Net profit (Tk/ha)
		C	G	Average	C	K	G				C	K	G						
Ohsed U-Zaman	0.6	237	160	200	2,750	2,500	2,500	50,700	84,500	500	500	35	320	855	1,425	2.85	85,700	35,000	58,333
Sherr Ali	0.5	230	155	190	2,700	2,500	2,500	36,650	67,300	520	445	40	260	765	1,530	2.90	74,700	41,050	82,100
Kamal Mondol	0.5	240	158	198	2,650	2,500	2,500	37,550	65,100	400	400	45	290	735	1,470	3.60	78,025	45,475	90,950
Average	0.53	236	158	197	2,697	2,500	2,500	38,967	72,300	473	448	40	297	785	1,475	3.10	79,475	40,508	77,128

C-carp; G-Golda (*M. rosenbergii*); K-Khorsula (*Mugil corsula*)

Table 7. Production and economics of prawn-based aquaculture system in ponds at Fultola (Khulna).

Name of the farmer	Area (ha)	Culture period (days)	Stocking density/ha	Total operating costs (Tk/ha)	Production achieved (kg/ha)		Total production (kg/ha)	Gross income (Tk/ha)	Net profit (Tk/ha)
					Carp	Golda			
Ms. Sabita Sen	0.18	240	10,572	28,833	2,150	350	2,500	1,71,350	1,42,571
Ms. Bahi Chakrabarti	0.14	235	10,429	21,429	2,000	300	2,300	1,45,000	1,23,571
Ms. Tobida Begum	0.18	238	10,500	25,250	2,250	283	2,533	1,49,755	1,24,505

Table 8. Return on operational costs from three different eco-systems at the low saline coastal land centre, Khulna.

Eco-system	Total culture period (months)	Production (kg)/ha	Production cost (Tk)/ha	Net profit (Tk/ha)	Return on operational costs (%)
Freshwater <i>gher</i>	11	2,232	87,954	1,22,887	140
Saline water <i>gher</i>	8	1,475	72,300	77,128	107
Pond	8	2,444	25,171	1,30,216	517

3.1.3 Low-rainfall, drought-prone, medium high land centre at Shantahar (Rajshahi)

While the transfer of technology program through TMSS continued, no work could be done at this centre during 1996-97 owing BRAC's withdrawal, shifting of the centre to Shantahar and delayed posting of the Scientific Officer. The Research Assistant was not posted there and instead retained at the headquarters of the Bangladesh Fisheries Research Institute. However, the program on eco-region specific, low-cost, carp polyculture system has been initiated during 1997-98 in 26 water bodies (5.04 ha). A total of 85 farmers were trained on low-cost aquaculture. Subsequent to farmers' training in four villages (Table 9), pond stocking has been done. In the meanwhile, the Scientific Officer has resigned and data collection is hampered again.

Table 9. Farmers trained in low-cost aquaculture system in different villages in the low-rainfall, drought-prone, medium high land centre at Shantahar.

Name of the village	No. of farmers trained		Total No. of farmers trained
	Female	Male	
Dastica, Bogra	28	0	28
Sadarpur, Bogra	15	0	15
Arulia, Bogra	23	0	23
Naogaon	17	2	19

3.1.4 High rainfall, flood-prone, low-land centre, Sylhet

In this eco-region, a total of 29 ponds with a water area of 1.376 ha are being covered in five villages around Sylhet (Table 10). Fifty four farmers were trained and provided necessary assistance to prepare their ponds and procure fingerlings for stocking. A stocking density of 7,500 fingerlings/ha with a species proportion of catla 20 : rohu 25 : mrigal 15 : silver carp 10 : grass carp 10 : common carp 10 : rajputi 10 has been followed at this centre. The work is in progress in collaboration with the NGOs, Voluntary Association for Rural Development (VARD) and Bangladesh Rural Development Board (BRDB).

Table 10. Names of farmers with water area of their ponds selected for adoption of low-cost, aquaculture system in the high rain-fall, flood-prone, eco-region at Sylhet.

Sl.No.	Name of the farmer	Village	Water area (ha)
1	Md. Abdul Ahad	Moktirchar	0.020
2	Md. Abdur Rahim	Moktirchar	0.016
3	Md. Osman Ali	Moktirchar	0.044
4	Md. Shamim Ahmed	Moktirchar	0.016
5	Md. Shamim Ahmed	Moktirchar	0.008
6	Md. Syed Ali	Moktirchar	0.036
7	Md. Abdul Malek	Moktirchar	0.032
8	Md. Abdul Kaiyum	Moktirchar	0.044
9	Hazi Abdur Rahman	Moktirchar	0.012
10	Md. Belal Ahmed	Kallgram	0.068
11	Md. Nokddesh Ali	Bagorkhala	0.072
12	Md. Nizam Uddin	Bagorkhala	0.080
13	Md. Nashir Ali	Bagorkhala	0.112

14	Md. Abdul Rab	Bagorkhala	0.024
15	Md. Abdul Ahad	Bagorkhala	0.048
16	Md. Shaifur Hossain	Bagorkhala	0.052
17	Md. Shaifur Hossain	Bagorkhala	0.112
18	Md. Azizur Rahman	Bagorkhala	0.044
19	Md. Gulshan Ahmed	Bagorkhala	0.060
20	Md. Mokbul Ali	Bagorkhala	0.064
21	Md. Mokit	Bagorkhala	0.032
22	Hazi Shirajul Islam	Mollargaon	0.024
23	Md. Lutfur Rahman	Mollargaon	0.032
24	Md. Nizam Uddin	Mollargaon	0.076
25	Md. Kaptan Mia	Mollargaon	0.056
26	Md. Fayjul Islam	Mollargaon	0.056
27	Mr. Pranoy	Mollargaon	0.056
28	Md. Rakib	Mollargaon	0.040
29	Md. Shahidur Rahman	Khazakalu	0.064

3.2 Breeding and culture of small indigenous species (SIS)

Breeding

With increasing interest of the farmers' in indigenous species as a result of successful breeding of *C. reba* during 1996 and its culture in ponds and rice fields, attempts to collect the broodstock of a number of other species in demand were made. With the technical assistance and logistic support of ICLARM, juveniles and adults of *Labeo bata*, *L. pangusia*, *L. nandina*, *L. gonius*, *Mastocembelus armatus*, *Notopterus chitala* and *Channa striatus* were collected by private hatcheries and stocked in ponds for developing the broodstock. However, only *Cirrhinus reba*, *Labeo gonius* and *Puntius sarana* were induced bred using pituitary extract (two doses for female and one for male) while *N. chitala* spawned naturally in controlled conditions. The details of fry produced are given in Table 11.

Table 11. Spawn and fry production of indigenous species by private hatcheries.

Indigenous species	Fertilization rate (%)	Total spawn produced (kg)	Total number of fry produced	Survival rate (%)
<i>C. reba</i>	74	16.00	76,80,000	60
<i>L. gonius</i>	87	0.50	1,00,000	30
<i>P. sarana</i>	70	0.58	1,80,000	39
<i>N. chitala</i>	40	0.16	349	could not be determined

Fingerlings of all the four species have been stocked in selected ponds through Bangladesh Rural Advancement Committee (BRAC), Thengamara Mohila Sabuj Sangtha (TMSS), Jagorani Chakra (JC), Banchte Shekha (BS) and Rural Reconstruction Centre (RRC) in rice plots and carp ponds at 500 and 1000/ha respectively to study their growth performance and contribution to production and economic returns.

Culture

Fingerlings of *Cirrhinus reba*, which was bred for the first time during 1996, were stocked at 10% of the total density in ponds and rice fields along with other species. The species registered a weight of 36 to 53 g and contributed 5-9 kg (37.5 - 50.00 kg/ha; average 45.2 kg/ha) (Table 12).

The production and income obtained with *C. reba* was compared with *Macrobrachium rosenbergii*, which contributed 7-10 kg (42 to 80 g/individual and 40.00 to 80.00 kg/ha) when stocked at 10%. While the income from *C. reba* ranged from Tk. 3,000 to 4,000/ha, the income from prawns was three to six times more (Tk. 11,800 to Tk. 24,160/ha; average, Tk. 17,921/ha). The total production from ponds ranged from 2,142 to 3,491 kg/ha (average 2,966 kg/ha) in 9.5 months with net profits ranging from Tk. 51,433 to Tk. 116,320/ha (average, Tk. 95,580.00 or US\$ 2,223/ha), prawns contributing 11.0 - 17.0% of the total income (Table 12).

Table 12. Production of SIS (*C. reba*) and prawns with carps in polyculture ponds

Farmers' group	Area (ha)	Culture period (months)	Stocking density (no/ha)	Production (kg)				Production (kg/ha)	Cost of production (Tk)	Income from prawns (Tk)	Income from carps (Tk)	Total income (Tk)	Net profit (Tk)	Net profit (Tk/ha)	Contribution to total income (%)	
				Carp	SIS	Prawn	Total								By prawns	By SIS
Nobojagorani Mohila Soc.	0.144	9.00	12,500	353	6	8	367	2,549	4,752	2,437	13,283	15,720	10,968	76,166	15.50	3.80
Nobojagorani Purosh Soc.	0.108	10.00	12,500	365	5	7	377	3,491	3,540	2,062	13,690	15,752	12,212	1,13,074	13.09	3.17
Ananna Mohila Soc.	0.24	9.20	12,500	495	9	10	514	2,142	8,650	2,850	18,144	20,994	12,344	51,433	13.50	4.28
Sanatan Mohila Soc.	0.132	10.20	12,500	410	7	9	426	3,227	2,982	2,700	15,429	18,129	15,147	1,14,750	14.89	3.86
Nobiron	0.200	10.00	12,500	525	9	8	542	2,710	4,336	2,360	18,900	21,260	16,924	84,620	11.10	4.23
Halima	0.140	9.10	12,500	455	6	10	471	3,364	4,239	2,960	17,057	20,017	15,778	1,12,700	14.78	2.99
Kulsum	0.100	9.20	12,500	315	5	8	328	3,280	2,624	2,416	11,840	14,256	11,632	1,16,320	17.00	3.50

3.3 Integrated aquaculture-livestock-agriculture

Integrated aquaculture-agriculture

Based on the results obtained with low-cost aquaculture system, it is seen that production has increased by 8-13 times from the four low-lying beels with an average net profit of Tk. 37,466/ha (US\$ 892/ha) in 8 months' culture period (Table 13). It has also been observed that integrated farming in the *beel* has helped a large number of beneficiaries who were involved in the program with a significant increase in the profit per person. Keeping this in mind, a program has been taken to further reduce the operational costs and also achieve conservational goals by stocking certain indigenous species which will reproduce in the *beel* itself. Six *beels* in Bhaluka thana, covering an area of 14 ha, have been selected and stocked in collaboration with Proshika for the 1997-98 program.

A significant increase in income has also been registered with the introduction of *Macrobrachium rosenbergii* along with carp species in the integrated rice-fish farming system. With a view to diversifying the system and increasing the availability of small indigenous varieties with high vitamin content for farmers' own consumption, *C. reba* and *L. gonius* have been introduced in some of the rice-fields too. A total of 30 rice plots have been selected in different agro-ecological regions where this work is being undertaken in collaboration with Jagorani Chakra, Proshika, Banche Shekha, Thengamara Mohila Sabuj Sangha (TMSS) and Rural Resource Reconstruction (RRC).

Table 13. Production and income from group-managed, low-lying *beels* at Bhaluka during 1996-97.

Sl. No.	Farmers' group	Beneficiaries (No)	Average water area (ha)	Culture period (months)	Fingerlings stocked (No)	Fish captured before stocking (kg)	Present production (kg)	Production (kg/ha)	Production increase (times)	Cost of production (Tk)	Gross profit (Tk)	Net profit (Tk/ha)
1	Alor Sandhan	15	1.2	8.5	10,800	240	2,010	1,675	8.30	37,300	80,400	35,917
2	Sundarban Society	16	2.0	9.0	14,000	320	3,690	1,845	11.53	73,800	1,47,600	36,900
3	Jubokallyan Society	24	3.4	8.8	23,000	400	5,100	1,500	12.75	60,250	1,98,900	40,779
4	Pather Sandhan	10	0.6	9.1	5,000	120	1,030	1,716	8.50	21,500	43,260	36,267

Integrated livestock-aquaculture

With a view to developing additional low-cost aquaculture technologies based on livestock wastes, two biogas plants have been installed in Jessore. Using the biogas slurry in two nursery trials, the farmer has already earned a net profit of Tk. 2,700.00 (US\$ 62.06) and Tk. 6,845 (US\$ 157.36) from a 0.2-ha pond equivalent to Tk. 13,500.00 (US\$ 310.34) and Tk. 34,225 (US\$ 786.78)/ha within 17 days and 24 days respectively (Table 14). The low profit in the first trial is on account of the low price of the fry of silver carp in Jessore.

Table 14. Fry production using bio-gas slurry.

Farmer's name/ group	Area (ha)	Total spawn stocked (kg)	Total culture period (days)	Total input (kg)		Total number of fry produced	Survival (%)	Cost of production (Tk)	Net profit (Tk)	Net profit (Tk/ha)
				Slurry	MOC					
Ananna Mohila Society	0.20	0.50	17	140	50	1,35,000	68	1,663	2,700	13,500
Ananna Mohila Society	0.20	0.50	24	120	70	1,75,000	87	1,905	6,845	34,225

MOC : Mustard oil cake

3.4 Technology transfer through NGOs and feedback to research program

The NGO activity during 1996-97 has shown that an average production of 2,065.5 kg/ha from seasonal and 2,812.5 kg/ha from perennial ponds is possible in 215 days and 270 days with a net income of Tk. 55,829 and Tk. 74,704/ha respectively (Tables 15 and 16). The cost of production in seasonal and perennial ponds was almost about the same, being Tk. 10.11 and Tk. 10.80/kg respectively.

Table 15. Production and income from fish culture in seasonal ponds under the technology transfer program during 1996-97.

Name of NGOs	Culture period (days)	No. of ponds (water area in ha)	Total production (kg)	Production (kg/ha)	Cost of production (Tk/ha)	Cost of production (Tk/kg)	Gross income (Tk/ha)	Net income (Tk/ha)
Jagorani Chakra	215	16 (1.14)	2,138	1,875	21,000	11.20	69,391	48,391
Banchte Shekha	224	4 (0.004)	936	1,950	16,575	8.50	78,000	61,425
Proshika	215	8 (0.896)	1,837	2,050	20,727	10.11	75,858	55,131
TMSS	205	17 (1.676)	4,001	2,387	25,185	10.55	83,553	58,368

Table 16. Production and income from fish culture in perennial ponds under the technology transfer program during 1996-97.

Name of NGOs	Culture period (days)	No. of ponds (water area in ha)	Total production (kg)	Production (kg/ha)	Cost of production (Tk/ha)	Cost of production (Tk/kg)	Gross income (Tk/ha)	Net income (Tk/ha)
Jagorani Chakra	270	16 (2.208)	5,299	2,400	30,000	12.50	84,000	54,000
Banchte Shekha	280	10 (1.36)	4,080	3,000	30,360	10.12	1,17,000	86,640
Proshika	275	15 (1.74)	4,698	2,700	26,325	9.75	1,02,600	76,275
TMSS	260	10 (1.28)	4,032	3,150	34,650	11.00	1,16,850	81,900

As BRAC and some new NGOs have joined the program, it is now being implemented in 41 thanas in 668 ponds (86.724 ha) and 105 rice fields (19.44 ha) involving 2,111 beneficiaries directly of whom over 50% are women (Table 17).

Considering each farmer to be transferring the technology to 20 fellow-farmers, the total number of farmers covered would be 47,220.

Table 17. Water area (ha) and number of beneficiaries covered by NGOs under the technology transfer program.

NGO	Thana	Ponds		Rice-fish plots		Beneficiaries
		No.	Area (ha)	No.	Area (ha)	
Jagorani Chakra	Jessore Monirampur Jhenaidah Mohammadpur	35	3.6	10	2	95
Banchte Shekha	Jessore Narail Chikorgacha Chikorgacha	44	5.1	10	2.6	185
Proshika	Agaljhara Barisal Gournadi Babuganj B. baria Akhaura Uzirpur Bhola Madaripur Bhaluka Fultola	130	17.6	47	8.4	300
TMSS	Bogra Sadar Adamdighi Shibgonj Kahalu	34	8.164	28	5.104	335
BRAC	Madaripur Gafargaon Banshkhali Baniachang Modhukhali Dasoria Manda B.Baria Adamdighi Paba Raniganj Barisal Fakirhat Bheramara	342	34			700

RRC	Jessore Nowapara	12	4.92			12
Save the Children (USA)	Nasirnagar	18	5.02			349
RDRS	Rangpur Lalmonirhat Kurigram Thakurgaon	18	2.16			90
DOF	Dinajpur Sadar Birampur Chirir Bandar Fulbaria	13	3.50			13
ICLARM/ BFRI	Trishal	22	2.66	10	1.336	32
Total	41	668	86.724	105	19.44	2,111

3.5 Integrated rice-fish farming technology transfer through NGOs and Government Agencies (SERI-82)

Based on a study of 59 plots covering an area of 19.29 ha it was found that an average production of 270 kg/ha is possible in 79 days of fish culture in rice-fields with a net profit of Tk. 4,260/ha. The cost of production is, however, quite high, being Tk. 22.53/kg (Table 18).

Table 18. Fish production from integrated rice-fish plots during boro season (1997) under the SERI-82 program.

NGO	Location	No. of plots	Area (ha)	Culture period (days)	Species stocked	Stocking density (No/ha)	Production (kg/ha)	Cost of production (Tk/ha)	Gross profit (Tk/ha)	Net profit (Tk/ha)
Jagorani Chakra	Jessore	36	11.07	90	cc, puti	3,750	270	6,500	9,990	3,490
MSUS	Gopalganj	20	7.2	73	cc, puti	3,000	280	5,000	10,640	5,640
CARITAS	Barisal	03	1.02	75	Tilapia	3,500	260	6,750	10,400	3,650

cc : common carp; puti : *Puntius gonionotus*

During 1997 *aman*, an area of 73.50 ha involving 383 farmers through 13 NGOs and 5 Government Extension Agencies is being covered for demonstration.

3.6 Manpower development

A total of 605 extension officers and farmers were trained at different centres between 1 January 1997 till date (Table 19).

Table 19. Training programs organized during 1997 under "Research for Development of Sustainable Aquaculture Technologies" project in Bangladesh.

Course	Date	Participants			Total No. of participants
		Government Extension Workers	NGO Extension Workers	Farmers	
Low-cost, environment-friendly, sustainable aquaculture practices	12 January			40	40
Low-cost, environment-friendly, sustainable aquaculture practices	18 January			35	35
Low-cost, environment-friendly, sustainable aquaculture practices	20 January			30	30
Quality Fish Seed Production	21-23 January	10	5	25	40
Low-cost, environment-friendly, sustainable aquaculture practices	5 February			30	30
Low-cost, environment-friendly, sustainable aquaculture practices	16 February			35	35
Low-cost, environment-friendly, sustainable aquaculture practices	26 February			30	30
Quality Fish Seed Production	15-16 March	13	7	30	50
Low-cost, environment-friendly, sustainable aquaculture practices	27 March			30	30
Low-cost, environment-friendly, sustainable aquaculture practices	2 April			25	25
Low-cost, environment-friendly, sustainable aquaculture practices	16 April			22	22
Low-cost, environment-friendly, sustainable aquaculture practices	28 April			20	20
Low-cost, environment-friendly, sustainable aquaculture practices	11 May			25	25
Low-cost, environment-friendly, sustainable aquaculture practices	27 May			20	20
Low-cost, environment-friendly, sustainable aquaculture practices	12 June			25	25
Low-cost, environment-friendly, sustainable aquaculture practices	30 July		2	6	8
Low-cost, environment-friendly, sustainable aquaculture practices	31 July			25	25
Low-cost, environment-friendly, sustainable aquaculture practices	1 August			18	18
Low-cost, environment-friendly, sustainable aquaculture practices	3 August		2	25	27

sustainable aquaculture practices					
Low-cost, environment-friendly, sustainable aquaculture practices	23 August		27		27
Low-cost, environment-friendly, sustainable aquaculture practices	26 August		8		8
Integrated agriculture-aquaculture	20 September		20	15	35
Total		23	71	511	605

3.7 Study tours

Dr. S.D. Tripathi, Senior Aquaculture Specialist, visited the ICLARM Regional Centre, Malawi, on 3-13 May 1997, to study the on-going programs and exchange views on low-cost aquaculture development in small-scale farms in Malawi.

3.8 Training/Meetings/Seminars/Workshops

Training

Dr. S.D. Tripathi participated in the Senior Management Training Program at ICLARM headquarters at Manila from 22-28 February 1997.

Mr. Debashish Mazumder attended a training course on 'Fish pathology and parasitology' organized by the Institute of Fisheries and Marine Biology, Bergen University, Norway, and the Department of Zoology, Dhaka University, during 18-29 June 1997 at the Dhaka University.

Lectures

Dr. S.D. Tripathi participated as a resource person in a training workshop on 12 March, 1997 and delivered a lecture on "The role of fisheries in improving the food and nutrition security in Bangladesh" which was jointly organized by BRRI and Royal Veterinary University, Denmark, at Joydebpur, Gazipur.

Dr. S.D. Tripathi as a resource person delivered a lecture on “Changing ecology of the wetlands and its impact on the fisheries of Bangladesh” on 29 June 1997 in the Training Program on “Fish ecology” at the Department of Zoology, Dhaka University, organized jointly by the Institute of Fisheries and Marine Biology, Bergen University, Norway, and the Department of Zoology, Dhaka University, Dhaka.

Meetings

The following three meetings were held on 27 May at ICLARM office, Dhaka :

- (i) “Research on development of sustainable aquaculture practices” (Copy of proceedings attached, Annex-III).
- (ii) “Integrated rice-fish farming technology transfer through NGOs and Government Extension Agencies” (copy of proceedings attached, Annex-IV).
- (iii) Technology transfer through NGOs and feedback to research (Annex-V).

which were participated by 27 NGOs and 23 Government agencies besides the scientists of Bangladesh Fisheries Research Institute and the Scientific Officers of the USAID-funded FRI/ICLARM collaborative Project. Formats for collection of data on fish consumption by the farmers besides information on socio-economic parameters and fish production were provided to the SOs working at Sylhet, Shantahar and Khulna eco-region centres.

Dr. S.D. Tripathi participated in the meeting of Food Security Team, USAID, and its partners on 28 May 1997.

Dr. S.D. Tripathi participated in the Institute Research Council Meeting at BFRI, Mymensingh, on 17 and 21 July 1997.

Workshops

Dr. S.D. Tripathi participated in the workshop on 'Identification of constraints-based research areas in fisheries resources development', at the Bangladesh Fisheries Research Institute, Mymensingh, on 3 April 1997.

Dr. S.D. Tripathi participated in the International Workshop on 'Expert Consultation on Inland Fisheries Enhancements' jointly organized by FAO/ODA and hosted by the Ministry of Fisheries and Livestock at Hotel Sonargaon, Dhaka on 7-11 April 1997.

Dr. S.D. Tripathi participated in the Workshop on 'Fisheries Dynamics of Modified Floodplains in Pabna' organized by ODA/BAU at the Fisheries Faculty, Bangladesh Agricultural University, Mymensingh, on 30 April 1997 and chaired the Plenary Session.

Dr. S.D. Tripathi attended the Seminar on "Floodplain fisheries management and development" organized by the Institute for Development Policy Analysis and Advocacy (Proshika) on 1 June, 1997 at Hotel Sheraton, Dhaka.

Dr. S.D. Tripathi participated in the Planning Workshop on 'Deepwater Rice-Fish Culture in Bangladesh' held on 4-5 June 1997 at the Bangladesh Rice Research Institute, Gazipur.

Dr. S.D. Tripathi participated in the workshop on Strategic Objectives(s) Merger Process organized by the USAID office at American Recreation Club, Dhaka, on 10 July 1997.

Dr. S.D. Tripathi participated in the workshop on Preparation and Planning of Intermediate Results on Strategic Objectives' organized by USAID office, Dhaka, on 16 July 1997.

Publications

Dr. S.D. Tripathi, M.V. Gupta, D.Mazumder and M.A. Mazid (1997). Group management of small beels for enhanced production. In : National Workshop on 'Policy for Sustainable Inland Fisheries Management' jointly organized by ICLARM/DOF/Ford Foundation and DANIDA at Hotel Sheraton, Dhaka on 21-24 March 1997.

3.9 Visitors

Ms. Robin Wright, Correspondent, Los Angeles Times, alongwith officials from the USAID, Dhaka.

Ms. Natalie Daalder, ACIAR Manager - South Asia, Australian High Commission, New Delhi-110 021, India.

Dr. Mark Prein, Program Leader, Integrated Aquaculture-Agriculture Systems, ICLARM, Manila

Dr. Madan Mohan Dey, Coordinator, DEGITA, ICLARM, Manila.

Mr. Tery Barker, Chief Analysit, Asia and the Nearest, Program & Policy Coordinator Bureau, USAID, Washington, D.C.

Ms. Janet Rudasill-Bey, AID, Washington

Ms. Sheila Blackman, AID, Washington

Mr. Richard Rousseau, USAID, Dhaka

Mr. David Sprague, USAID, Dhaka

Ms. Roswshan Akhter, USAID, Dhaka

Mr. Nasim Ahmed, USAID, Dhaka

Mr. Latifur Rahman, USAID, Dhaka

Dr. Mahfuzuddin Ahmed, PRIA, ICLARM, Manila

Dr. Randy Brummett, ICLARM, Malawi

Mr. Fredson Chikfumbwa, ICLARM, Malawi

3.10 New initiatives

Pen culture

The demand for pen and cage culture systems is increasing. Pen culture has a great potential and is highly relevant in the Bangladesh context. Two pens covering an area of 0.68 ha have been installed in Jhenaidah through the farmers of Jagorani Chakra. Based on the results of these trials, further work will be taken up.

Cage culture

Four cages have been installed in Narail through Jagorani Chakra to provide a system for landless farmers.

Deepwater rice-fish culture

After an intensive search to locate some deepwater rice-fish plots for fish culture, a rather small, 0.84-ha deepwater rice plot has been located in Jessore where fingerlings of silver carp, catla and prawns (*Macrobrachium rosenbergii*) have been stocked at 17,000/ha. The programme is being implemented through Jagorani Chakra.

3.11 Miscellaneous activities

Organized the visit of the officials from DOF and NGOs collaborating with the CBFM project to fishery centres in India.

Organized the admission for Ph.D. programs in Delhi and Auburn Universities for scientists of BFRI under the World Bank Agricultural Research Management Project.

Organized the visit of Dr. Shah Mohammad Farid, Secretary, Ministry of Planning, Government of Bangladesh, to fisheries institutions in India.

Organized the visit of Program Officer, OFA, USAID, Dhaka to aquaculture research institutions, fish farms and universities in Alabama and Arkansas, USA.

Visited the Kapsia field site with Dr. M. Ahmed and Dr. Paul Thompson for initiating the second phase of IFAD-funded project on “Developing an appropriate fisheries extension system for transfer of technology based on evaluation of existing alternative extension approaches”.

ANNEX-I

**FRI/ICLARM/USAID PROJECT
RESEARCH ON DEVELOPMENT OF SUSTAINABLE AQUACULTURE PRACTICES
WORKPLAN FOR 1997-98**

The project aims at developing low-cost, low external input aquaculture technologies besides integrating these with agriculture and livestock farming systems and disseminating the same among the rural landless and marginal farmers. Further, with a view to have sustainable systems the technologies will be largely specific with reference to major agro-ecological regions. These objectives will be pursued through the following research programmes.

I Development of eco-region specific practices

Four major agro-ecological regions have already been identified for which necessary staff has been recruited and posted. Data on the socio-economic status, aquaculture practices and the rates of production per unit area have already been collected by the SOs. In the field program to be initiated now, data on these aspects in addition to water quality, monthly growth rates and various inputs will be kept separately for each pond for proper analyses.

(a) Low rainfall, drought prone, medium high land eco-region centre at Shantahar

The program at this centre is being taken up in collaboration with TMSS. The ponds in this drought-prone ecoregion are managed by groups of poor farmers with very little income. Hence, to obtain high rates of production and increase their share in the total income besides improving their nutritional intake, silver carp and rajputi would be stocked in larger numbers than other carps and multiple stocking and harvesting resorted too. Organic fertilization, preferably with poultry manure, would be emphasized for increasing the growth and production rates.

(b) High rainfall, flood-free, medium highland eco-region centre at Mymensingh

Owing high rainfall, the growth of weeds/grasses is immense in the region which is easily accessible to the farmer without any cost. Hence, grass-carp based polyculture system which was experimented with satisfactory results during 1996-97 will be given a large scale trial to confirm the results and provide a suitable package.

(c) High rainfall, flood-prone, low-land eco-region centre at Sylhet

Fish culture for commercial production is rather new in the Sylhet region. Hence, the low-cost technology, already available, will be tried to begin with and necessary modifications effected later in consultation with the farmers based on their interest to make it sustainable.

(d) Low-saline, coastal land eco-region centre at Khulna

The characteristic feature of the region is the abundance of 'ghers' with freshwater during the monsoons which gradually turns brackish with the onset of winter. These "ponds" are proposed to be utilized for two crops, that of freshwater species in the monsoon and brackishwater species in the summer. *M. rosenbergii* being abundantly available in the region was used along with carps with exceedingly good results. These results will be confirmed during 1997-98 to develop a suitable package for generating high income, employment and also foreign exchange. The brackishwater species of fish will be cultured during the winter and summer so that the water bodies are fully utilized round the year.

As inorganic fertilizers are expensive and also damage the soil these will not be used. Small ponds will be especially utilized for seed production involving women farmers singly or in groups.

A research program for development of a suitable package for seasonal ponds with high rates of production has been developed and will be conducted at FRI, Mymensingh (Appendix-1).

II Integrated agriculture-aquaculture farming systems

Besides common carp, tilapia and rajputi, other species will be experimentally cultured in paddy fields to diversify production. In addition, livestock-based systems would also be disseminated for adoption in rural areas. Dyke cropping with improved varieties of vegetables and fruits will be supported for sustainability and increased income.

III Conservation of biodiversity and culture of small indigenous fish

Development of breeding and culture technologies for small and medium carps will be given a special emphasis and the hatchery operators and NGOs would be provided necessary technical guidance and assistance.

This program will help biodiversity conservation as also increase production and availability of these much sought after species.

IV Genetic improvement of cultured species

In addition to supporting the program on genetic improvement of *P. gonionotus* and the forthcoming one on genetic improvement of indigenous carps, the project will assist the hatcheries in techniques of management of broodstock.

It is also proposed to organize a brain-storm involving 40 hatchery operators from all over Bangladesh with a carp geneticist of international repute to effect further improvement in management strategy.

V Fish culture in irrigation canals

Irrigation canals being located in specific areas and not easily accessible, pens will be installed in large water-logged areas and the technology demonstrated for utilization of these areas.

VI Institutional linkages among GOs and NGOs

The network of NGOs will be further enlarged so that remotely located and lesser NGOs are also able to take advantage of the available technologies and disseminate them in areas which have not been covered so far.

At least 12 training programs, one in each month, involving 20-30 extension workers of GOs and NGOs will be organized by the project besides training 25-30 farmers per month at each of the eco-region centres in collaboration with the NGOs.

ANNEX-II

ANNEX-II

1. TITLE OF THE RESEARCH PROGRAM : DEVELOPMENT OF A LOW-COST SUSTAINABLE AQUACULTURE PRACTICE FOR SEASONAL PONDS

Background information

Seasonal ponds numbering 9 lakhs cover 55,000 ha in Bangladesh and it appears that both their number and area has further increased since the statistics was last collected. In most cases, these ponds belong to the poorer sections of our society who suffer from acute protein malnutrition. Aquaculture is not only a means to meet this challenge of malnutrition but is also a source of great income. The available technologies produce about 2.0 t of fish/ha in about six months. It is proposed to increase this output to over 3.0 t/ha. It is therefore proposed to develop a new low-cost, low-input high output organic aquaculture technology which could be easily adopted by the aqua-farmers on a sustainable basis.

Design of the experiment

The experiment will be undertaken in nine 400 sq m ponds with three replicates for each treatment. Poultry manure will be used as a fertilizer while duck-weed (*Wolffia/Lemna minor*) and rice bran as feeds.

Treatment 1. Fertilisation with poultry manure (initially at 1 kg/pond daily for 15 days and later at 500 g/pond daily).

Treatment 2. Fertilization with poultry manure (initially at 1 kg/pond daily for 15 days and later at 500 g/pond daily). Feed : Duck-weeds.

Treatment 3. Fertilization with poultry manure (as in Treatments 1 and 2).
Feed : Rice bran (Daily at 2% initially for 1 month and later at 1% day)
Both the feeds will be used at iso-protein levels

Species, size, density and proportion of fish to be stocked

All the nine ponds will be stocked simultaneously on 1 July as follows :

Species	:	Silver Carp (SC) : Gift tilapia (GT) : Thai sharputi (TS)
Size	:	40 - 50 mm
Density	:	20,000 fingerlings/ha
Composition	:	SC 3,000 : GT 5,000 : TS 12,000

- Water quality parameters :
- (i) Water depth in the pond in meters
 - (ii) Date when filled/quantity in cu m
 - (iii) pH, O₂, CO₂, total alkalinity, specific conductivity, nitrates, phosphates
- Infrastructure required :
- Pond nos. 34-42 at FRS are available
 - Scale and weighing balance are available
 - Wooden shutters (seven in number) to be purchased
 - Dagnet for sampling by ICLARM
- Inputs required
- Fertilizers and feeds to be provided by FRI (costs to be re-imbursed by ICLARM)
 - Fish seed and duckweeds to be provided by FRI (Free of cost)
- Labour
- Part-time (1/2 day) to be provided by FRI (costs to be defrayed by ICLARM)
- Harvested fish
- At the end of the experiment, the total harvest will be handed over to FRI
- Personnel :
- ICLARM - S.D. Tripathi
 - FRI - Gulam Hussain, Khandekar, Abu Ali and Kohinoor
- Date of start : 1 July 1997
- Duration of the experiment :
- Six months (1 July - 31 December 1997)
 However, production at the ends of 4 and 5 months of culture will also be assessed to adopt the technology in ponds with a shorter water-holding period.

ANNEX-III

**MINUTES OF THE MEETING OF BFRI/ICLARM//USAID PROJECT ON
“RESEARCH FOR DEVELOPMENT OF SUSTAINABLE AQUACULTURE
PRACTICES” HELD AT ICLARM OFFICE, DHAKA, ON 27 MAY 1997**

A meeting of all the four Scientific Officers involved in the project and Chief Scientific Officers of Freshwater Research Station, Mymensingh, Riverine Research Station, Chandpur and Brackishwater Research Station, Paikgacha, Khulna, was held under the chairmanship of Dr. S.D. Tripathi, Senior Aquaculture Specialist at ICLARM, Dhaka, at 3.30 P.M. on 27 May, 1997 to discuss the progress of the program and improve the working system to facilitate smooth operations. The following were present at the meeting :

1. Dr. M.G. Hussain, CSO, FRS, Mymensingh
2. Dr. G.C. Halder, CSO, RRS, Chandpur
3. Dr. Saleh Uddin Ahmed, CSO, BRS, Paikgacha, Khulna
4. Mr. Md. Abu Ali Khan, Scientific Officer, BFRI, Mymensingh
5. Mr. Md. Shafique Uddin, Scientific Officer, Riverine Station, BFRI, Chandpur
6. Mr. Md. Manfuzar Rahman, Scientific Officer, Shantahar, Bogra
7. Mr. Md. Ekram-ul Azim, Scientific Officer, BFRI, ARSD, Paikgacha, Khulna
8. Mr. Debashish Mazumder, Research Associate, ICLARM, Dhaka

Welcoming the participants, Dr. Tripathi informed the scientists that owing the visit of an important team to BFRI, Director-General, Dr. M.A. Mazid, was unable to attend this meeting. Dr. Tripathi suggested that we would discuss the progress and problems and apprise Dr. Mazid about the same. He said that the Scientific Officers will have a lot of work now on as they were appointed half-way through the program last year when the field programs were already initiated by the farmers and NGOs. While the technology transfer program would continue as such with the NGOs, the SOs will have the responsibility of direct data collection from 50-60 ponds where the entire program will be operated under the supervision of the project. In this connection, it is heartening to note that the SOs have already surveyed their respective areas and selected the farmers for implementing the program. Preliminary training of the farmers has also been done. In some cases, ponds have been prepared and in the Sylhet eco-region, even partial stocking has been done. The rains are awaited and probably by mid-June they all will have to swing into action.

In order to facilitate data collection and monitoring, a set of proformae was supplied to each SO with the request for timely submission.

Further, to enable easy contact and coordination of the field program, Dr. Tripathi suggested that the Scientific Officers should send advance tour programs and leave applications to ICLARM office with a copy to the respective CSO. He also added that the actually followed tour program and tour report should accompany the monthly progress report incorporating data on water quality, fish growth, fish consumption along with other biological and socioeconomic information.

In this connection, Dr. G.C. Halder, CSO, Riverine Research Station, Chandpur, suggested that SOs should be given sampling equipment for keeping the records on fish growth. Dr. Tripathi said that if balance and measuring boards were not available, these could be provided. The Sylhet centre will soon be provided the Hach-Kit. Dr. Halder wanted that pen culture could be tried under the project to which Dr. Tripathi replied in the positive and suggested that pens could also be installed in different ecoregions for fine-tuning the technology. He promised to visit Chandpur soon.

Dr. Tripathi invited suggestions from the CSOs and SOs for smooth functioning of the field program. The CSOs indicated that the SOs were not paid any travelling allowance so far which was not only resulting in considerable hardship but also hampering the field program. The SO at Shantahar had to go to Mymensingh every month for his salary too.

Dr. Tripathi informed them that the CSOs have already been authorized to effect payment of salaries; he would, however, request Dr. Mazid to authorize the CSOs for payment of TA also. It was pointed out by Mr. Abu Ali that there were no funds now even for the payment of this month's salary. Dr. Tripathi made it clear that the funds were no problem and could be transferred immediately provided a detailed statement as to the utilization of the amount of Tk. 3.0 lakhs paid to BFRI was sent to ICLARM. The issue of contingent expenditure on stationery, postage etc. was also raised. Dr. Tripathi pointed out that this was to be met by the Institute but in the interest of the project there was no problem in meeting this expenditure too. It was agreed that Tk. 1000/year would be enough to meet these requirements.

ANNEX-IV

Bangladesh Fisheries Research Institute
Freshwater Station
Mymensingh-2201
Bangladesh.

**PROGRAMME ON INTEGRATED RICE-FISH FARMING TECHNOLOGY
TRANSFER THROUGH NGOs AND GOVERNMENT EXTENSION AGENCIES.**

Minutes of meeting held on 27th May'97 at ICLARM Office, Dhaka.

A review meeting of representatives of all participating NGOs and Government Extension Agencies involved in Integrated Rice -Fish farming project was held on 27th May, 1997 at ICLARM office, Dhaka to discuss the status and progress of the present Boro season of the project and formulate some policy guide lines for coming Aman season. The meeting was supposed to be chaired by Dr. M. A. Mazid, Director General, BFRI, but he could not attend the meeting due to his busy schedule at BFRI head quarter. On behalf of Dr. Mazid the meeting was presided over by Dr. M.G. Hussain, Chief Scientific Officer, Freshwater Station, BFRI. Following participants attended the meeting:

1. Director General, Bangladesh Fisheries Research Institute, Mymensingh
2. Mr. Saleh Uddin Ahmed, Chief Scientific Officer, Brackishwater Station, BFRI, Paikgacha, Khulna.
3. Mr. Shahidul Islam, Director. RASDO, Tangail.
4. Dr. Md. Mosharraf Hossain, Chief Executive, RHDS, Mohammadpur, Dhaka.
5. Mr. Md. Tufazzal Hosain, DAE, Khamarbari, Mymensingh.
6. Mr. Md. Mahbubur Rahman Khan, DFO, Mashkanda, Mymensingh.
7. Mr. Md. Mustafa Kamal. Deputy Director, BARD, Kotbari, Comilla.
8. Mr. Marcel D' Costa, CARITAS, Shuntibagh, Dhaka.
9. Mr. Sarker Mohammed Ali, Co-ordinator, TSP, New Elephant Road, Dhaka
10. Mr. Jagobandhu Biswas, Director, SIBAS, Monirampur, Jessore.
11. Mr. Md. Akhtaruzzaman, RHDS, Mohammadpur, Dhaka.
12. Mr. H.M. Edris, Fisheries Expert, TMSS, Thengamara, Gokul, Bogra.
13. Mr. Abdur Rob. Save the Children (USA), Dhaka.
14. Mr. Md. Enamul Haque, Director, Mitali Sangha, Jaipurhat
15. Mr. Sajal K. Mondal, Mitaly Sangha, Jaipurhat
16. Mrs. Farida Yeasmin, MSUS, Verahat, Gopalgonj.
17. Mr. N.G. Biswas, General Secretary, BEDO, Segun Bagicha, Dhaka.
18. Mr. Tapan Kumar Palit, Chief Executive, UPAKAR, Raozan, Chittagong.
19. Mr. Nirmor, SIBAS, Monirampur, Jessore.
20. Mr. Sultan Ahmed, BRAC, 35C Mohakhali, Dhaka.
21. Mr. Utpal Kumar Dutta, Co-ordinator (Fisheries) Jagarani Chakra, Mujib Sark, Jessore.

22. Mr. Mohammad Shahidullah, Executive Director, Grameen Samaj Kendra, Razar Bazar, Dhaka.
23. Mr. M. Habibur Rahman Shiek, Executive Director, SEDA, Mashkanda, Mymensingh.
24. Mr. Md. Shafique Uddin, SO, BFRI, Riverine Station, BFRI, Chandpur.
25. Mr. Md. Mahfuzar Rahman, SO, BFRI, Santahar, Bogra.
26. Mr. Md. Ekramul Azim, SO, BFRI, ARSD, Paikgacha, Khulna.
27. Mr. Md. Abu Ali Khan, SO, BFRI, Freshwater Station, Mymensingh.
28. Mr. Md. Zulfikar Ali, SO, BFRI, Freshwater Station, Mymensingh.
29. Mr. Debashis Mazumder, Research Associate, ICLARM, Dhaka.
30. Dr. S.D. Tripathi Senior Aquaculture Specialist, ICLARM, Dhaka.

Dr. Hussain welcomed every body and expressed his best wishes to all the participants. He stated briefly BFRI's initiation of the programme to disseminate the Rice-Fish farming technology through training and demonstration in different parts of the country for 2 years covering both Aman and Boro seasons. Meanwhile, a total of 24 NGOs and Govt. Extension Agencies have been implementing the Rice-Fish Farming activities in Boro season. Therefore, the Chairman requested the representative one by one to present their status and progress of the present programme of Boro season.

1. PROSHIKA:

Proshika representative reported that the unspent budget of T. Aman season amounting Tk. 33,000 is being used during the Boro season. The programme of the work is satisfactory. He was asked to submit his field data just at the end of the final harvesting.

2. TMSS:

The representative of the organization reported that there were 16 plots of 1049 decimal area under Rice-Fish farming programme during Boro season. Eight plots were harvested after 90 days of stocking. The average fish production about 1.9 kg/dec was obtained. Harvesting of all plots yet not been completed.

3. Jagarani Chakra:

This representative reported that there were 18 plots of 1377 dec. area under Rice-Fish programme. All plots were harvested after 120 days of stocking of fingerlings. Fish species like Rajputi and Mirror Carp were stocked 15/dec and size 5-10g for Rajpunti and 10-15g for Mirror Carp. At the end of the harvest, the average fish production 0.800 kg/dec and rice production 19 kg/dec were obtained. Net income from fish and rice was Tk.20/dec and Tk. 67/dec respectively.

4. **SEDA:**

The representative reported that they undertook rice -fish programme during Boro season in a number of 11 plots having the area of 12 acre at Fulpur and Mymensingh sadar. Total budget received Tk. 45,000/=, but Tk. 3900/= was utilized. The representative promised to send data sheets to BFRI as soon as these are ready.

5. **CARITAS :**

The representative of CARITAS reported that they undertook Rich-Fish programme at Dhaka, Chittagong and Mymensingh during Boro season. -In Dhaka 3 plots and Chittagong 12 plots. Fish stocked was Tilapia and stocking density was 12/dec. The progress of the works satisfactory. He promised to send the field data sheets to BFRI just after the end of harvesting of Rice-Fish plots. Total fund received Tk. 67,500 but some were unutilized.

6. **BEDO:**

They undertook Rice-Fish programme at Gopalganj and Naogaon. Total fund received during Boro season Tk. 25452/= . The overall progress of the programme is satisfactory. Harvesting of fish has yet not been completed. The representative promised to send field data sheets to BFRI after final harvesting of Rice-Fish plots.

7. **SIBAS :**

SIBAS representative reported that the unspent budget of last Aman season amounting Tk. 29,084 is being used during the Boro season. The field data sheets are not yet to present in the meeting. The representative was asked to submit his field data sheets just after the end of the harvesting.

8. **RHDS :**

RHDS received budget Tk. 32,544 during the Boro season. RHDS representative reported that during Boro season, they could not initiate any rice-fish farming programme due to shortage of time, therefore, no fund was utilized. So, they want to utilize the unspent budget in the coming Aman season.

9. **Together for Service of People :**

Total plots numbers were 24. This representative reported Rice-Fish farming activities during Boro season. Fish species like Rajpunti and Mirror Carp stocked at the rate of 20/dec. Size was 8-10 g for Rajpunti and 10-15g in Mirror Carp. The overall progress of the programme is satisfactory. Harvesting of fish has yet not been completed. He will submitted his field data sheets to BFRI just after the end of the final harvesting of Rice-Fish plots.

10. **Mitali Shaughla :**

It was reported that the NGO misutilized the fund during Boro season. After physically visited the activity of their Rice-Fish Farming activity it was clear. But they could not record of fish and rice information from stocking to harvesting. The representative promise to send data sheets to BFRI as soon as these are ready.

11. **RASDO :**

The representative of the organization reported that there were 20 plots under rice-fish farming programme during Boro season. Fish species Rajputi and Mirron carp were stocked at the rate of 15/dec. The overall progress of the programme is satisfactory. Harvesting of fish has yet not be completed. Only ten plots were harvested, Average production was attained 0.94 kg/dec. and net profit from fish was Tk. 20.80/dec.

12. **Grameen Samaj Kendra :**

They undertook rice-fish programme at Gazipur and Jhenaidha. Total fund received during the Boro season amounting Tk. 36000.00. Harvesting of fish has yet not been completed. The representative promised to send field data sheets to BFRI after completion of rice fish harvesting.

13. **BARD :**

BARD representative report that the unspent budget of season amount Tk. 33000.00 will being used during the Boro season. But they could not utilized the fund due to their official formalities. So they could not initiate any rice fish programme.

14. **DAE, Mymensingh :**

The representative of DAE Mymensingh reported that they undertook rice-fish programme during Boro season at Mymensingh sadar, Muktaghacha, Fulbaria, Nandial, Eshorgonj thanas in a number of plots of 15 acre areas. Total fund received during the Boro season was amounting Tk. 46,800/=. The representative was asked, they could not get the final report from their respected thanas. So, he promised to send the field data sheets to BFRI after completed of rice-fish harvesting.

15. **DOF, Mymensingh :**

During the Boro season DOF, Mymensingh, received Tk. 18,000 for rice-fish programme in 10 plots of having an area of 5 acres at Mymensingh sadar, Trishal, Gaoripur, Ishorgonj and Muktagacha thanas. Overall the progress of the programme is satisfactory.

16. **Save the Children (USA) :**

The representative reported that they could not start the project for Aman season due to availability of fund lately. During Boro season, transfer of fund from BFRI account also took long time. Therefore, they have been able to implement this project in about 5000 dec. paddy field. He will send the performance report just after the completion of harvesting. They received fund from BFRI during Aman season Tk. 24000 and Boro season Tk. 27000/-. Now, they had been able to spend Tk. 18900/- for Boro season out of total Tk. 51000/-. He wanted permission to utilize the unspent balance of Tk. 32,100/- in the coming Aman season.

17. **MSUS :**

During Boro season this NGO received Tk. 36000/-. The representative reported that they undertook rice-fish programme during Boro season at Gopalganj district. Field data are not yet ready to present in the meeting. He promised to send the field data sheets to BFRI as soon as these are ready.

18. **UPAKAR :**

The representative reported that during Boro season they initiated the programme at Raozan thana under Chittagong district in 3 plots of 800 decimal land area. Fund received from BFRI during Boro season was Tk. 28,800/-. Fish species like Rajpunti, Tilapia and Catla were stocked. But Catla growth is highly encouraging.

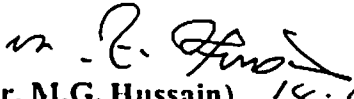
19. **Brackishwater Station, BFRI :**

Chief Scientific Officer of Brackishwater Station reported that they undertook rice-fish programme during Boro season with DAE, Paikgacha. Total 10 plots having the area 330 decimal. They received Tk. 11,000/- during the Boro season. Fish species Rajputi and Mirror carp were stocked as per recommended densities. The overall progress of the programme is satisfactory.

20. **Freshwater Station, BFRI :**

During Boro season, Freshwater Station of BFRI initiated rice-fish farming programme in 34 plots at Gaoripur thana and 9 plots at Bhaluka Thana at Mymensingh district. The selected plots of Gaoripur area were stocked with only Rajputi and the Bhaluka area were stocked with Rajputi plus Mirror carp (50% fish from each of the species). The Stocking densities was 15 individuals/dec. Harvesting of fish has yet not been completed.

The chairman requested all the NGOs and GOs representatives to submit their nominated farmers list for coming Aman season on or before 10 June 1997. Dr. Hussain finally concluded the day long discussion meeting with sincere thanks to every body.


(Dr. M.G. Hussain) 18.6.97
Chief Scientific Officer

ANNEX-V

**AQUACULTURE TECHNOLOGY TRANSFER THROUGH NGOs AND
FEEDBACK TO RESEARCH PROGRAM**

Minutes of meeting held on 27 May 1997 at ICLARM office, Dhaka

A review meeting on the progress of work under the Aquaculture Technology Transfer through NGOs and Feedback to Research Program was held on 27 May 1997 at ICLARM office, Dhaka. Since Dr. M.A. Mazid, Director-General, BFRI, could not attend owing an important engagement in Mymensingh, the meeting was chaired by Dr. S.D. Tripathi, Senior Aquaculture Specialist, ICLARM. The main agenda of the meeting was to discuss the present status and future program of implementation. The meeting was attended by the representatives of the participating NGOs and scientist from BFRI and ICLARM. The list of participants is enclosed (Appendix I).

Welcoming the participants, Dr. S.D. Tripathi, Senior Aquaculture Specialist, ICLARM, indicated that he was missing the opportunity of welcoming Dr. M. A. Mazid as the first Director-General of the newly designated Bangladesh FRI. He informed the participants that despite his keen interest, Dr. Mazid could not attend this meeting which was being held after a gap of about six months owing various reasons. The technology transfer program was in progress in 26 thanas of 24 districts in the country covering 398 ponds of different categories viz. seasonal, perennial nursery and rice fields involving 2,044 farmer beneficiaries, 85% being women. The chairman requested the representative of the five NGOs to brief the participants on the present status of the program and indicate the constraints, if any.

Starting first, Proshika's representative apologised for not having the reports and promised to send them within a short period.

Though BRAC did not participate in the program last year but showed renewed interest to involve itself in prawn farming and other medium high cost or intensive aquaculture technologies. The BRAC representative present in the meeting wanted to have a list of technology packages available with FRI so that they could choose the areas of their interest before responding further. Dr. M.G. Hussain, CSO, promised to send him the list of such technologies.

TMSS reported on its involvement in 6 thanas of two districts in the northern part of the country with a total of 45 perennial, 48 seasonal and 6 nursery ponds supporting 1,450 women beneficiaries under the program. In the nursery ponds, stocking at 0.45 million fry/ha resulted

in 0.225 million fingerlings/ha with 50% survival. The total operating cost was Tk. 25,533.00/ha, the net profit being Tk. 76,000.00/ha. On the other hand, a production of 2,375 kg/ha was obtained from seasonal ponds at a production cost of Tk. 25,000.00/ha with a net profit of Tk. 58,296.00/ha.

The farmers of TMSS are interested in the low-cost technology models and the organization also wanted to extend its activities in other areas in order to expand its support service.

Jagorani Chakra, which is operating in the south western part of the country, covered a total of 52 poor farmers through 22 perennial, 19 seasonal, 6 nursery and 5 integrated rice-fish plots. These ponds are mainly operated by single owners which is not often the case with other NGOs. The production obtained from perennial ponds was 2,400 kg/ha with an operational cost of Tk. 30,000.00/ha, the net profit being Tk. 48,250.00/ha. In the seasonal ponds, however, the production obtained was 1,875 kg/ha with an operational cost of Tk. 21,000.00/ha with a net profit of Tk.-42,500.00/ha.

Besides the participating NGOs in the program there were other NGOs also who showed tremendous interest in getting the technical support for poor beneficiaries and wanted that ICLARM/BFRI extend their support.

The chairman pointed out that despite the tremendous potential, keen interest of the farmers and the participating NGOs, the number of beneficiaries covered has not increased very much. Further efforts in this direction need to be taken. The chairman also indicated that the reports from the NGOs were often delayed or not received at all which adversely affected the monitoring procedure and requested them to provide the information at regular intervals. He assured the participants of all assistance on behalf of the BFRI/ICLARM project and thanked them for their presence. The chairman proposed that the next meeting may be held in the third week of July.

Appendix-I

List of Participants in the meeting on Aquaculture Technology Transfer held at ICLARM office, Dhaka, on 27 May 1997.

1. Dr. M.G. Hussain, CSO, BFRI, Mymensingh
2. Dr. C.G. Halder, CSO, BFRI, RS, Chandpur
3. Dr. Saleh Uddin Ahmed, CSO, Brackishwater Station, BFRI, Paikgacha, Khulna
4. Mr. Md. Abu Ali Khan, Scientific Officer, BFRI, Mymensingh
5. Mr. Md. Shafique Uddin, Scientific Officer, Riverine Station, BFRI, Chandpur
6. Md. Md. Manfuzar Rahman, Scientific Officer, Shantahar, Bogra
7. Mr. Md. Ekram-ul Azim, Scientific Officer, BFRI, ARSD, Paikgacha, Khulna
8. Mr. H.M. Edris, TMSS, Bogra
9. Mr. Sultan Ahmed, BRAC, 354, Mohakhali, Dhaka-1212
10. Mr. Uptal Kumar Dutta, Jagorani Chakra, 44 Mujib Sarak, Jessore
11. Mr. Debashish Mazumder, ICLARM, Dhaka