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# Sub-Project Completion Report

on

Production Enhancement of Carps and Tilapia in  
Creeks of Chittagong Hill Districts

Project Duration  
May 2016 to September 2018

Bangladesh Fisheries Research Institute  
Riverine Sub-station, Rangamati-4500



Submitted to  
Project Implementation Unit-BARC, NATP 2  
Bangladesh Agricultural Research Council  
Farmgate, Dhaka-1215



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**Citation**

Production Enhancement of Carps and Tilapia in Creeks of Chittagong Hill Districts  
Project Implementation Unit  
National Agricultural Technology Program-Phase II Project (NATP-2)  
Bangladesh Agricultural research Council (BARC)  
New Airport Road, farmgate, Dhaka-1215  
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Published in: September 2018

Printed by:

## Acronyms and Abbreviations

|                 |   |   |
|-----------------|---|---|
| BCR             | : | Benefit Cost Ratio                      |
| BFRI            | : | Bangladesh Fisheries Research Institute |
| CHT             | : | Chittagong Hill Tract                   |
| CO <sub>2</sub> | : | Carbon Di-oxide                         |
| DO              | : | Dissolve Oxygen                         |
| DoF             | : | Department of Fisheries                 |
| Etc.            | : | Et cetera (and others and so forth)     |
| FCR             | : | Feed Conversion Ratio                   |
| ft.             | : | Feet                                    |
| ha.             | : | Hectare                                 |
| HRD             | : | Human Resource Development              |
| i.e.            | : | That is                                 |
| kg              | : | Kilogram                                |
| MT              | : | Metric Ton                              |
| SD              | : | Standard Deviation                      |
| SGR             | : | Specific Growth Rate                    |
| Tk.             | : | Taka                                    |
| TSP             | : | Triple Super Phosphate                  |
| yr.             | : | Year                                    |

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## Executive Summary

Chittagong Hill Tracts (CHT) encompasses an extensive hill area about 13,295 km<sup>2</sup> which is approximately one-tenth of the total area of Bangladesh. A total number of 4727 creeks (covering 4297 ha areas) exists in Chittagong Hill Tracts (CHT) among them 1200 creeks are adjacent to the Kaptai Lake. The production capacity of these creeks is eight to nine times compared to the Kaptai Lake. Boosting sustainable aquaculture development in Chittagong Hill Tracts poses huge challenges. The most of the areas are remote and inhabited by many ethnic minorities. The incidence of poverty is very high in CHT. To meet the livelihood needs and protein requirements they need additional source of income and food.

In this context the study was conducted to know the production performance of carps and tilapia in creeks of Chittagong Hill District. A total of 09 creeks (average size 60 decimal) were selected in three upazillas (Langadu, Rangamati Sadar and Mahalchari) of Chittagong Hill District.

After proper pond preparation, healthy fingerlings were collected and stocked @ 60 individuals /decimal in creeks with prior acclimatization. Floating feed was supplied twice daily @ 10 to 5% offish body weight. Fish were collected by seine net and growths were recorded fortnightly. Water quality parameters such as air and water temperature, DO, free CO<sub>2</sub>, total hardness; total alkalinity and pH were monitored fortnightly using water test Kit (HACH Model FF-2) and found suitable for fish culture.

After 10 months of culture, fish were harvested. The highest specific growth rate among the cultured species was estimated 1.86 in monosex Tilapia (T<sub>1</sub> Rangamati Sadar) and followed by 1.22 in Rui(T<sub>1</sub> Rangamati Sadar),1.06 in Mrigal (T<sub>1</sub> Rangamati Sadar) and 0.97 in Catla (T<sub>3</sub> Longodu). The Lowest FCR 1.35 was found in T<sub>2</sub> (Mahalchari) followed by 1.47 in T<sub>1</sub>(Rangamati Sadar) and 1.53 in T<sub>3</sub> (Longodu). The highest BCR was estimated 1.59 in T<sub>2</sub> (Mahalchari) with the annual average fish production of 8286 kg/ha followed by 8067 kg/ha (T<sub>1</sub> Rangamati Sadar) and 7879kg/ha (T<sub>3</sub> Langodu). Thus the culture of Carps and Tilapia with the combination of Rui 14 + Catla 14 + Mrigal 12 + monosex Tilapia 20 /decimal is highly suitable for creek aquaculture which enhances fish production per unit area of Chittagong Hill Tracts (CHT). The technology might create livelihood opportunity for the local disadvantaged people to fulfill their animal protein demand and contribute financial support all the year round as well as during fishing ban in Kaptai Lake.

## CRG-Sub Project Completion Report (PCR)

### A. **Sub Project Description**

1. **Sub-Project title:** Production Enhancement of Carps and Tilapia in Creeks of Chittagong Hill Districts

2. **Implementing Organization:** Riverine Sub-station, Rangamati, Bangladesh Fisheries Research Institute (BFRI)

### 3. Name and Full address of PI/co-PI (s)

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### 4. Sub-project budget (Taka):

4.1. Total: 15,00,000/-

4.2. Revised: 15,00,000/-

### 5. Duration of the sub-project:

5.1. Start date: May 2017

5.2. End date: September, 2018

### 6. Justification of undertaking the sub project:

The area of the Chittagong Hill Tracts is about 13,295 km<sup>2</sup>, which is approximately one-tenth of the total area of Bangladesh. Topographically, the Chittagong Hill Tracts are the hilly areas in Bangladesh. The depression of hilly slope connected with the main Lake or its stream and become inundated with enormous hilly streams during monsoon is called the creek. Fish culture in creeks of the three hill districts has good prospects. Three sides of arms of the creek should be surrounded by hilly land while the rest remain directly linked with the main body of the Lake or not. There are of 4727 creeks (covering 4297 ha areas) in Chittagong Hill Tracts (CHT) among them 1200 creeks are adjacent to the Kaptai Lake (DoF, 2012). The production capacity of these creeks is 2100 kg/ha that is eight to nine times more than the Kaptai Lake (Alamgir and Ahmed, 2005).

According to an estimate of Bangladesh Fisheries Development corporation (BFDC) in the year 2002-03 total fish production of the Kaptai Lake was 4556 MT but it was 9364 MT in the year 2015-16. Over fifteen years, production of total fish from this Lake got poor attention as a result production of major carps (*Labeo rohita*, *Catla catla*, *Cirrhinus cirrhosus*) species decreased remarkably whereas small fishes especially (*Gudusia chapra* and *Corica soborna*) increased briskly. In spite of, the stocking of huge number of carp fingerling in the Lake every year, alarming decreases of aforementioned species were observed. Production of Lake declined due to lack of optimum flow of water, siltation which reduces the rate of water flow and causes habitat degradation, the loss of spawning ground and decline of natural seed production of major carps. Since, the current fish production at this Lake is declining fast intervention through creek aquaculture can be adopted in order to fully utilize the Lake's fishery potential.

The annual fish production of Chittagong Hill Tracts is 14773.46 MT (culture, capture and Kaptai Lake) which is comparatively lower than the total annual inland capture (FRSS, 2014). Our demand is increasing and cultivable land is decreasing for population explosion. To overcome this problem we have to ensure the maximum utilization of the limited resources. For aquaculture practice polyculture is the best culture system for maximum utilization of pond food web and ecosystem (Halver, 1984). The Department of Fisheries is trying to modernize creeks aquaculture activities in hill districts and conducted several training programs for the improvement of existing creeks by repairing and some steps were taken to create new creeks for fish culture. Bangladesh Fisheries Research Institute is trying to adopt various fish culture techniques in the hilly creeks, as well as carrying out research for boosting fish production. In view of the above facts, the proposed project had been initiated to develop a suitable fish culture technique for creeks of Chittagong Hill Districts.

**7. Sub Project Goal:** To enhance the widespread adoption of mixed culture technology across the hilly areas

**8. Sub Project Objectives:**

- To popularize fish production technology in the creeks of Chittagong Hill Districts
- To increase fish production in the Chittagong Hill Districts areas
- To provide alternative livelihood to the fishers during fishing ban in Kaptai Lake

**9. Implementing Location (s):** Chittagong Hill District Rangamati & Khagrachari

**10. Methodology followed:**

**10.1 Study area and experimental design**

The experiment was carried out following a completely randomized design as given in Table 1.

**Table 1.** Experimental design of Creek aquaculture of Carps and Monosex Tilapia

| Treatments                                   | Replications   | Species composition per decimal                              | Stocking density (No./ha) | Sizes (cm) |
|--|----------------|--|---------------------------|------------|
| T <sub>1</sub><br>Rangamati Sadar            | R <sub>1</sub> | Rui (14), Catla (14),<br>Mrigal (12)<br>Monosex tilapia (20) | 14820                     | 7-10       |
|  | R <sub>2</sub> |  |                           |            |
|  | R <sub>3</sub> |  |                           |            |
| T <sub>2</sub><br>Mahalchari,<br>Khagrachari | R <sub>1</sub> | Rui (14), Catla (14),<br>Mrigal (12)<br>Monosex tilapia (20) | 14820                     | 7-10       |
|  | R <sub>2</sub> |  |                           |            |
|  | R <sub>3</sub> |  |                           |            |
| T <sub>3</sub><br>Langadu, Rangamati         | R <sub>1</sub> | Rui (14), Catla (14),<br>Mrigal (12)<br>Monosex tilapia (20) | 14820                     | 7-10       |
|  | R <sub>2</sub> |  |                           |            |
|  | R <sub>3</sub> |  |                           |            |

## 10.2 Creek selection and preparation

Creeks were selected by examining creeks site, water retention capacity, and water depth (01 to 05m). Preparation of the creeks was done by repairing mouth of the creeks and unwanted vegetation and bottom sludge were removed from the creek bottom. Lime was applied @ 250 kg/ha. The selected creeks were fertilized with compost (mixture of chopped and sun dried green plants 88%, cow dung 10%, urea 1% and lime 1%) @ 1,250 kg/ha, urea @ 37.5 kg/ha and TSP @ 25 kg/ha). Then the creeks were left for 10 days to promote algal development.

## 10.3 Collection and stocking of quality fry/Fingerlings

Good quality fingerlings were collected and required numbers of fingerlings were stocked in each creek after proper acclimatization (Plate 1).

## 10.4. Feeding management and fertilization

Formulated feed (25-28% protein) was supplied twice daily @ 10 to 5% boy weight of fish. The feed was adjusted periodically in accordance with the growth performance of fishes. Water of the creeks were fertilized on a monthly basis using urea @ 37kg/ha, TSP @ 25kg/ha and cow dung @ 1235 kg/ha (Plate 2).

## 10.5 Monitoring of water quality parameters

Water quality parameters such as air and water temperature, DO, free CO<sub>2</sub>, total hardness, total alkalinity and pH were monitored fortnightly using a water test kit (HACH, Model FF-2). Transparency and water depth were measured using a Secchi disc and a meter scale respectively (Plate 3).



Plate 01: Fish Fry releasing in Creeks of Chittagong Hill Districts



Plate 2: Fish feed supplied by an aboriginal women in her Creeks of CHT



Plate 3: Dissolved oxygen data recorded by HACH Chemical kit box

### 10.6 Monitoring of fish growth

At least 10% fish of each species were collected by seine net and growth parameters such as length, weight & specific growth rate (SGR) were monitored as well as recorded fortnightly. At the end of the experiment, all the fish were harvested and final length, weight, survival rate, specific growth rate (SGR) and benefit cost ratio (BCR) were estimated by following formula:

#### Survival rate

At the end of the experiment most of the fishes were caught by net and the rest by drying the ponds. It was calculated as:

$$\text{Survival rate (\%)} = \frac{\text{No. harvested}}{\text{No. Stocked}} \times 100$$

#### Specific growth rate (% per day)

The specific growth rate in the instantaneous change in weight of fish calculated as the percentage increase in body weight per day over given time internal. Growth in terms of weight was calculated

by subtracting the initial weight of fish (at the time of release) from final weight of the same. The specific growth rate was calculated from the following formula:

$$\text{SGR (\%day)} = \frac{\text{Log}_n W_2 - \text{Log}_n W_1}{T_2 - T_1} \times 100$$

Where,

W1 = the initial live body weight (g) at time T1 (day)

W2 = the final live body weight (g) at time T2 (day)

#### Food conversion ratio (FCR)

The food conversion ratio of fish expressed by the rate of food consumed to weight gain was determined for each of the three stocking rates.

$$\text{(FCR) Food Conversion Ratio} = \frac{\text{Food fed}}{\text{Live weight gain}}$$

#### Production

At the end of the experiment most of the fishes were caught by net and the rest by drying the ponds. The production was calculated as:

$$\text{Production} = \text{No. harvest} \times \text{Final average weight.}$$

## 11 Results and Discussion

### 11.1. Water quality parameters

Mean values of water quality parameters over the study period are presented in Table 2. The results of the water quality analysis indicated that the parameters for fishes in creeks of Chittagong hill districts *remains* in suitable ranges. The water quality parameters of different sampling sites (Treatments) remained more or less similar. The growth of fish and other aquatic organisms depends on the water quality parameters. The air and water temperature of experimental sites of Chittagong hill districts were found to vary from 16 to 33 °C and 17 to 31 °C, respectively. This result supposed to be suitable for growth of fish (Basar *et al.*, 2014). The concentration of dissolved oxygen (DO) and free CO<sub>2</sub> in the experimental sites ranged from 4.95 to 8.7 mg l<sup>-1</sup> and 2.2 to 10 mg l<sup>-1</sup> respectively. DO concentrations were suitable for fish throughout the study period (Basar *et al.*, 2014). The range of pH of different areas varied from 6.5 to 7.5. The range of total alkalinity and total hardness of the different areas varied from 17.1 to 140 mg l<sup>-1</sup> and 17.1 to 106.6 mg l<sup>-1</sup> respectively. The water depth and transparency of the experimental sites varied from 3.7 to 8.5 ft and 0.6 to 1.6 ft respectively. The DO level was within the acceptable range in all creeks as described by Basar *et al.*, 2014. The observed pH values were in agreement with the findings of Islam *et al.* (2014), Chakraborty *et al.* (2003) and Alamgir *et al.* (2005) and are within the range of good water quality for pond fish culture. Total alkalinity ranged 56.00±17.37 mg/l to 60.01±20.84 mg/l indicating the productivity of the ponds as medium to high (Bhuiyan, 1970).

**Table 2.** Water quality parameters of three different treatments during the study period (Mean ± Standard Error)

| Parameters              | Different areas of Kaptai Lake    |                              |                           |
|-------------------------|-----------------------------------|------------------------------|---------------------------|
|                         | Rangamati Sadar (T <sub>1</sub> ) | Mahalchari (T <sub>2</sub> ) | Langadu (T <sub>3</sub> ) |
| Air temperature (°C)    | 26.20±5.59<br>(16-31)             | 26.20±5.07<br>(16-30)        | 27.10±4.84<br>(17-33)     |
| Water temperature (°C)  | 25.50±4.48<br>(17-30)             | 26.50±4.60<br>(17-31)        | 25.70±4.22<br>(18-31)     |
| Dissolved Oxygen (mg/l) | 6.03±1.01<br>(4.95-8)             | 6.76±1.17<br>(5-8.7)         | 6.18±0.94<br>(5-7.6)      |

| Parameters              | Different areas of Kaptai Lake    |                              |                           |
|-------------------------|-----------------------------------|------------------------------|---------------------------|
|                         | Rangamati Sadar (T <sub>1</sub> ) | Mahalchari (T <sub>2</sub> ) | Langadu (T <sub>3</sub> ) |
| CO <sub>2</sub> (mg/l)  | 4.74±1.99<br>(3.3-10)             | 3.51±1.09<br>(2.2-5)         | 4.38±2.24<br>(2.3-10)     |
| pH                      | 7.10±0.39<br>(6.5-7.5)            | 7.20±0.42<br>(6.5-7.5)       | 7.20±0.26<br>(7-7.5)      |
| Total alkalinity (mg/l) | 59.35±34.46<br>(17.1-140)         | 56.00±17.37<br>(34.2-88)     | 60.01±20.84<br>(17.1-92)  |
| Total Hardness (mg/l)   | 83.66±34.45<br>(43-163)           | 67.16±26.90<br>(17.1-106.6)  | 65.05±20.42<br>(34.2-91)  |
| Water depth (ft.)       | 4.75±1.04<br>(3.7-6.4)            | 5.49±1.57<br>(3.8-8.5)       | 5.05±1.14<br>(4-7.2)      |
| Transparency (ft.)      | 1.22±0.46<br>(0.8-2.4)            | 1.09±0.31<br>(0.6-1.6)       | 1.12±0.21<br>(0.7-1.4)    |

### 11.2. Growth Performance

The details of growth performance of Rui, Catla, Mrigal and Monosex Tilapia during culture in the creeks under three different treatments are summarized in Table 3. The table shows the initial and final mean length (cm) ±SD and mean weight (g) ±SD of fish. Rui (14), Catla (14), Mrigal (12) and Monosex Tilapia (20) were stocked in three treatments at the rate of 60 fingerlings per decimal. The highest final weight of Rui (825.12±35.18), Mrigal (775.15±102.42) and Monosex Tilapia (515.1±35.15) were recorded in T<sub>1</sub> (Rangamati Sadar) whereas highest final weight of Catla (984.10±85.24) was recorded in T<sub>3</sub> (Langadu) (Table 3). The survival rate of major Carps was higher than those of Islam *et al.* (2014) who conducted a study on the feasibility of carp fry rearing in Kaptai Lake creeks. The highest SGRs were calculated for the experimental species under different treatments such as Rui 1.22 in T<sub>1</sub> (Rangamati Sadar) followed by 1.21 in T<sub>2</sub> (Mahalchari); Catla 0.97 in T<sub>3</sub> (Langadu); Monosex Tilapia 1.86 in T<sub>1</sub> (Rangamati sadar) & T<sub>2</sub> (Mahalchari) and Mrigal 1.06 in T<sub>1</sub> (Rangamati Sadar) (Table 3). Lowest FCR 1.35 was found in T<sub>2</sub> (Mahalchari) and total fish productions were found 8067.02 kg/ha/300days, 8286.85 kg/ha/300days and 7879.30 kg/ha/300days in T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> respectively (Table 3). Production was higher in T<sub>2</sub> (Mahalchari) due to higher survival rate. There was no significant difference among three treatments in respect to production. Polyculture is an efficient means of increasing fish production. Polyculture might contribute higher production if the fish with different feeding habits are stocked in proper ratios and combinations Halver (1984). The range of production from the traditional polyculture of Carps in Bangladesh was 3119 to 4067kg/ha/yr (Mazid *et al.* 1997). Hossain and Islam (2006) reported that the key techniques of polyculture are based on the efficient utilization of natural food and thus it results higher fish yield per unit area. Akter *et al.* (2010) obtained 5751kg/ha fish production by applying formulated feed after 140 days of carp polyculture. However, all the above references were more or less in agreement with the present findings.

**Table 3. Growth performance of Rui, Catla, Mrigal and Monosex Tilapia after 300 days of culture in three different areas of Chittagong Hill Districts**

| Treatments                           | Stocking Density |                 | Initial     |             | Final/After 300 days |                      | Survival rate (%) | Production (kg)/dec. | SGR         | FCR  | Total production (Kg)/ha. |
|--------------------------------------|------------------|-----------------|-------------|-------------|----------------------|----------------------|-------------------|----------------------|-------------|------|---------------------------|
|                                      |                  |                 | Length (cm) | Weight (g)  | Length (cm)          | Weight (g)           |                   |                      |             |      |                           |
| T <sub>1</sub><br>Rangamati<br>Sadar | 60 /dec          | Rui             | 12.88±2.82  | 21.28±10.64 | <b>37.80±1.45</b>    | <b>825.12±35.18</b>  | 74                | 8.55                 | <b>1.22</b> | 1.47 | 8067.02                   |
|                                      |                  | Catla           | 15.1±2.83   | 53.45±30.33 | 38.80±3.11           | 966.32±152.12        | 68                | 9.20                 | 0.96        |      |                           |
|                                      |                  | Mrigal          | 15.1±1.71   | 32.55±9.75  | <b>38.00±1.15</b>    | <b>775.15±102.42</b> | 65                | 6.05                 | <b>1.06</b> |      |                           |
|                                      |                  | Monosex Tilapia | 3.91±0.85   | 1.95±1.23   | <b>29.7±1.09</b>     | <b>515.1±35.25</b>   | 85                | 8.86                 | <b>1.86</b> |      |                           |
| T <sub>2</sub><br>Mahalchari         | 60 /dec          | Rui             | 12.88±2.82  | 21.28±10.64 | 36.25±2.10           | 810.14±58.12         | 79                | 8.96                 | <b>1.21</b> | 1.35 | 8286.85                   |
|                                      |                  | Catla           | 15.1±2.83   | 53.45±30.33 | 37.54±2.85           | 945.20±125.08        | 72                | 9.53                 | 0.96        |      |                           |
|                                      |                  | Mrigal          | 15.1±1.71   | 32.55±9.75  | 36.28±1.36           | 729.14±92.22         | 70                | 6.12                 | 1.04        |      |                           |
|                                      |                  | Monosex Tilapia | 3.91±0.85   | 1.95±1.23   | 28.52±2.05           | 508.20±42.04         | 88                | 8.94                 | 1.86        |      |                           |
| T <sub>3</sub><br>Langadu            | 60/dec           | Rui             | 12.88±2.82  | 21.28±10.64 | 35.40±2.14           | 778.24±68.84         | 76                | 8.28                 | 1.19        | 1.53 | 7879.30                   |
|                                      |                  | Catla           | 15.1±2.83   | 53.45±30.33 | <b>39.74±2.47</b>    | <b>984.10±85.24</b>  | 70                | 9.29                 | <b>0.97</b> |      |                           |
|                                      |                  | Mrigal          | 15.1±1.71   | 32.55±9.75  | 34.45±2.20           | 705.15±134.02        | 75                | 6.35                 | 1.03        |      |                           |
|                                      |                  | Monosex Tilapia | 3.91±0.85   | 1.95±1.23   | 26.54±1.84           | 475.24±47.34         | 84                | 7.98                 | 1.83        |      |                           |

### 11.3 Cost-Benefit Analysis

A simple Cost-Benefit Analysis was performed to estimate the net profit of three different treatments. The cost of production was based on the Rangamati wholesale market price of the year 2018 in respect to inputs used. The cost of artificial feed was BDT 48.00/kg. Economic analysis is shown in table 4.

During economic analysis, the net benefits/ha were estimated as BDT 420798.00, 480551.00 and 371587.00 in T<sub>1</sub>, and T<sub>2</sub> & T<sub>3</sub> respectively. The highest net return per ha (BDT 480551.00) and lowest gross cost per ha were found in T<sub>2</sub>. Rahman *et al.* (2017) obtained net benefit of BDT 193513.00 which was remarkably lower than that of the present findings which could be due to higher survival rate and better farm management practices. However, higher net benefit of carps & tilapia polyculture were reported from Mahalchari, Khagrachari creeks, suggestive of its suitability for developing creeks aquaculture technology.

**Table 4:** Cost-Benefit Analysis of Rui, Catla, Mrigal and Monosex Tilapia after 300 days of culture in three different areas of Chittagong Hill Districts per hectare in BDT

| Items                                     | T <sub>1</sub> (Rangamati Sadar) | T <sub>2</sub> (Mahalchari, Khagrachari) | T <sub>3</sub> (Langadu, Rangamati) |
|---|----------------------------------|--|-------------------------------------|
| <b>Cost</b>                               |                                  |  |                                     |
| Creeks lease (Tk. 55,000/ha/yr)           | 41200.00                         | 41200.00                                 | 41200.00                            |
| Lime (Tk. 25/kg)                          | 9262.00                          | 9262.00                                  | 9262.00                             |
| Cow dung (Tk. 6/kg)                       | 7410.00                          | 7410.00                                  | 7410.00                             |
| Aquakleen (Tk.1200/1L)                    | 9880.00                          | 9880.00                                  | 9880.00                             |
| Rotenone (Tk. 300/Kg)                     | 9600.00                          | 9600.00                                  | 9600.00                             |
| Fingerling (Tk.5.85/Pcs)                  | 86697.00                         | 86697.00                                 | 86697.00                            |
| <b>Feed.( Commercial formulated )</b>     |                                  |  |                                     |
| Mega (Tk.48/kg)                           | 569088.00                        | 536978.00                                | 578655.00                           |
| Labor (Tk. 400/day) Harvesting and Others | 82333.00                         | 82333.00                                 | 82333.00                            |
| Miscellaneous                             | 14408.00                         | 20583.00                                 | 24700.00                            |
| <b>Total cost (A)</b>                     | <b>829845.00</b>                 | <b>803910.00</b>                         | <b>849704.00</b>                    |
| <b>Gross benefits</b>                     |                                  |  |                                     |
| Fish Selling (B)                          | 1250643.00                       | 1284461.00                               | 1221291.00                          |
| <b>Net benefit(B-A)</b>                   | <b>420798.00</b>                 | <b>480551.00</b>                         | <b>371587.00</b>                    |
| <b>BCR</b>                                | <b>1.51</b>                      | <b>1.59</b>                              | <b>1.44</b>                         |

Price of Fish was average TK. 155.00/Kg (T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub>)

### 12. Research Highlights/Findings

- Mixed culture technique of Carps and Tilapia in creeks of Chittagong hill tract districts with the combination of Rui 14 + Catla 14 + Mrigal 12 + monosex Tilapia 20 individuals/decimal (with 10 months culture period) had been adopted by the local community for enhancing fish production per unit area.
- Target beneficiaries of Chittagong Hill Tracts (CHT) accepted creek aquaculture as their alternative means of income. The highest achievable fish production is 8200 kg/ha/year with net benefit of Tk. 4,80,000/ ha/year, total production cost Tk. 8,03,910 /ha/year and benefit cost ratio 1.59.
- Alternate livelihood opportunity increased acceptance of the “fishing ban period” (Breeding season, May-July) in Kaptai Lake.

## B. Implementation position

### 1. Procurement

| Sl. No | Items of Procurement | PP Target |          | Achievement |          | Remarks      |
|--------|----------------------|-----------|----------|-------------|----------|--------------|
|        |                      | Phy (%)   | Fin (Tk) | Phy (%)     | Fin (Tk) |              |
| 1.     | Fry/fingerling       | 100       | 200000   | 99          | 198780   | Satisfactory |
| 2.     | Feed                 | 100       | 300000   | 93          | 277793   |              |

### 2. Establishment/Renovation Facilities:

| Description of Facilities             | Upgraded/Refurbished |          |             |          | Remarks      |
|---------------------------------------|----------------------|----------|-------------|----------|--------------|
|                                       | PP Target            |          | Achievement |          |              |
|                                       | Phy (%)              | Fin (Tk) | Phy (%)     | Fin (Tk) |              |
| Maintenance of creeks dike and outlet | 100                  | 30000    | 98.66       | 29600    | Satisfactory |

### 3. Training/study tour/seminar/workshop/conference organized:

| Description  | Number of Participant |        |       | Duration (Days) | Remarks   |
|--------------|-----------------------|--------|-------|-----------------|---|
|              | Male                  | Female | Total |                 |   |
| (a) Training | 11                    | 01     | 12    | 01              | Strategy to increasing production of Carp and Tilapia culture in Creek of CHT |
| (b) Workshop | N/A                   |        |       |                 |   |

## C. Financial and Physical Progress

| Items of expenditure/activities               | Total Approved Budget | Fund Received  | Actual Expenditure | Balance/ Unspent | Physical Progress (%) | Reasons for Deviation |
|---|-----------------------|----------------|--------------------|------------------|-----------------------|-----------------------|
| A. Contractual Staff Salary                   | 200000                | 200000         | 184912             | 15088            | 97.99%                | N/A                   |
| B. Field Research / Lab expenses and supplies | 890000                | 868500         | 873042             | -4542            |                       |                       |
| C. Operating Expenses                         | 180000                | 180000         | 179078             | 922              |                       |                       |
| D. Vehicle Hire and Fuel, Oil & Maintenance   | 55000                 | 55000          | 49411              | 5589             |                       |                       |
| E. Training/Workshop/ Seminar etc.            | 50000                 | 46030          | 46030              | 0                |                       |                       |
| F. Publications and printing                  | 75000                 | 8080           | 0                  | 8080             |                       |                       |
| G. Miscellaneous                              | 50000                 | 50000          | 46979              | 3021             |                       |                       |
| H. Capital Expenses                           | 0                     | 0              | 0                  | 0                |                       |                       |
|   | <b>1500000</b>        | <b>1407610</b> | <b>1379452</b>     | <b>28158</b>     |                       |                       |

**D. Achievement of Sub-project by Objectives:**

| Specific Objectives of the sub Project  | Major Technical activities performed in respect of the set objectives | Output (i.e. product obtained, visible, measureable)  | Outcome (Short term effect of the research)                         |
|---|---|---|---|
| To popularize fish production technology in the creeks of Chittagong Hill Districts | Carp and Monosex Tilapia culture in Creeks of CHT                     | 1. Production found 8067.02 kg, 8286.85 kg and 7879.30 kg in T <sub>1</sub> , T <sub>2</sub> and T <sub>3</sub> /ha.; respectively.<br><br>2. Mixed culture (Carps and Tilapia) technology in the creeks has adopted by the people of CHT | Suitable technology for increasing fish production in creeks of CHT |
| To increase fish production in the Chittagong Hill Districts area                   |   |   |   |
| To provide alternative livelihood to the fishers during fishing ban in Kaptai Lake  |   |   |   |

**E. Materials Development/Publication made under the sub project: N/A**

| Publication                              | Number of Publication |                         | Remarks (e.g. paper title, name of journal, conference name etc.) |
|--|-----------------------|-------------------------|---|
|  | Under Preparation     | Completed and Published |   |
| Technology bulletin/booklet/leaflet etc. |                       |                         |   |
| journal publication                      |                       |                         |   |
| Information development                  |                       |                         |   |
| other publications, if any               |                       |                         |   |

**F. Technology/knowledge generation/policy Support:**

**i. Generation of technology (Commodity & Non-commodity)**

A suitable technology generated on “Mixed culture of Carps & Tilapia in the creeks of Chittagong Hill Tract districts”.

**ii. Generation of new knowledge that help in developing more technology in future**

The technological knowledge might be used for developing further technologies to be adopted in other ecosystems in different aqua-ecological zones of the country.

**iii. Technology transferred that help increased agricultural productivity and farmers’ income**

Adoption of the technology through training and demonstration enhanced the productivity of CHT as well as farmers’ income.

**iv. Policy Support**

The technology could be synchronized with the government policy for socio-economic development of local vulnerable community in CHT districts..

**G. Information regarding Desk and Field monitoring**

**i) Desk Monitoring: monitoring workshops: 4**

- CRG Sub- Project Implementation Progress Workshop/Seminar held in BARC, Farmgate Dhaka on 21 December 2017. Found satisfactory
- CRG Sub- Project Progress review Workshop held in BARC, Farmgate Dhaka on 10 April 2018. Found satisfactory
- CRG Sub-Project monitoring Workshop held in BARC, Farmgate Dhaka on 15 May 2018. Found satisfactory
- CRG Sub-Project Final output Workshop held in BARC, Farmgate Dhaka on 19-20 September 2018. Found satisfactory

**ii) Field Monitoring (Time & No. of visit, Team visit and output): N/A**

**H. Lesson Learned**

- i) There are huge potential for Creek aquaculture in CHT.
- ii) Long term research and extension activities needed to involve the local communities in creek aquaculture

**I. Challenges**

- i) Most of the creeks situated are in remote areas, difficult to reach and sometimes not safe.
- ii) Unavailability of quality feed and seed.

Signature of the PI

Signature Head of the Organization

Date .....

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